Contents

Introduction ............................................................................................................................................... 7
  Catherine Wallace, Marine coordinator, Environment and Conservation Organisations of New Zealand Inc.

Keynote speakers ....................................................................................................................................... 8

Conference Opening .................................................................................................................................. 10
  Dame Cath Tizard

Preferred Futures

Ecosystem approaches to management of human impacts on the marine environment

Some Impacts of Fishing on the Environment .......................................................................................... 13
  Paul Dayton, Scripps Institution of Oceanography, USA

Sea Country Obligations and Opportunities! ............................................................................................ 15
  John Locke, Giru Dala Council of Elders Aboriginal Corporation

Managing Marine Resources Under International Law: Challenges and Opportunities ......................... 17
  A. Charlotte de Fontaubert, Ph.D., IUCN-US The World Conservation Union

The Commercial Fishing Industry ........................................................................................................... 23
  John Pfahlert, NZ Seafood Industry Council Limited

Recreational Fisheries ............................................................................................................................... 25
  M. J. Hetherington, Secretary, New Zealand Recreational Fishing Council

Environment .................................................................................................................................................. 29
  Hugh Logan, Director-general, Department of Conservation

Environmental Aspirations .......................................................................................................................... 31
  Stephanie Mills, Greenpeace

Present Reality

State of the marine environment and indicators

State of the Marine Environment and Marine Ecosystem Indicators ................................................................ 34
  Denise Church, CEO, Ministry for the Environment

Identifying the Effects of Fishing on Marine Communities ........................................................................ 38
  Simon Thrush, National Institute of Water and Atmospheric Research, Hamilton.

Achieving the Preferred Future for our Ocean Ecosystems ....................................................................... 44
  Trevor J. Ward, CSIRO Division of Marine Research, Perth

Marine Management and the Quota Management System: Reform required ........................................... 62
  Catherine Wallace, Lecturer in Public Policy, Victoria University of Wellington and Marine Coordinator, Environment and Conservation Organisations of NZ (inc.)
Benthos: A Datalogger of Marine Environmental Health .......................................................... 79
Chris Battershill, Dennis Gordon and Edward Abraham, National Institute of Water and Atmospheric Research, Wellington.

Coastal Management in New Zealand – Preserving the Natural Character: Problems and an Alternative .................................................................................................................... ............. 88
N.J. Thomson, University of Otago

Management of the New Zealand Pelagic and Deepwater Longline Fisheries with Particular Reference to the catches of non-target fish species and the interactions that occur with non-fish species .......................................................... 95
Richard Cade, Consultant

Euan Harvey, Department of Marine Science, University of Otago, Dunedin; David Fletcher, Department of Marine Science, University of Otago, Dunedin; Mark Shortis, Department of Geomatics, University of Melbourne, Melbourne

Preserving the Natural Character of Estuaries and Other Sensitive Coastal Environments ...... 111
Chris Richmond, Department of Conservation; Victoria Froude, Pacific Ecological Resource Management Consultants

Towards a Co-management Approach to Fisheries Management in New Zealand ............... 120
Michael Bathgate and Ali Memon, Department of Geography, University of Otago, Dunedin

Pelagic Plastics and Other Synthetic Marine Debris – a Chronic Problem .............................. 128
Murray R. Gregory, University of Auckland, New Zealand

Saltmarsh Restoration and Management ..................................................................................... 136
I.D. Marsden, Zoology Department, University of Canterbury; C. Heremaia, Waste Management Unit, Christchurch City Council

Barry Weeber, Senior Research, Royal Forest and Bird Protection Society

A Review of Relations Between the EU and New Zealand ........................................................ 170
Kwame Mfodwo, Environment and Management Programme, Waikato Management School, University of Waikato

Development of Australia’s Oceans Policy ............................................................................... 178
I.R. McPhail, Head, Portfolio Marine Group, Environment Australia; Chair, Great Barrier Reef Marine Park Authority

Management of the By-catch of Protected Species in New Zealand: A Government Agency Perspective ......................................................................................................................... 181
Mike Donoghue, External Relations Division, Department of Conservation

New Zealand Fur Seals: Treasure, Resource and Vermin ........................................................... 186
Chris Lalas, P.O. Box 31, Portobello, Dunedin; Corey J. A. Bradshaw, Department of Zoology, University of Otago, Dunedin

Developing a Network of Marine Reserves for New Zealand .................................................... 191
Kathy Walls, Department of Conservation Te Papa Atawhai, Hamilton
Australia’s Oceans Policy ................................................................. 199
  Diane Tarte, Australian Marine Conservation Society

Changes in the Distribution of Epifaunal Reefs and Oysters During 130 Years of Dredging for
  Oysters in Foveaux Strait ............................................................. 201
  H.J. Cranfield and K. P. Michael, National Institute of Water and Atmospheric Research Ltd,
  Wellington

Closing the Gap

How do we get there?

A System of Marine Reserves: The Opportunity and the Obligation ......................... 202
  W. J. Ballantine, Leigh Marine Laboratory, University of Auckland

Maori, The Industry and Fishing .......................................................... 205
  Shane Jones, Muriwihenua Iwi, Treaty of Waitangi Fisheries Commissioner

Community Involvement in Marine and Coastal Management: Australia’s Marine and Coastal
  Community Network ...................................................................... 209
  T. Flaherty, C. Bell and D.M. Tarte, Marine and Coastal Community Network – Australia

Kia Ora Tonu te ‘Mauri’, o nga Moana te Taitokerau mo nga Uri Whakatupu: To Maintain and
  Enhance the Life-force of the Seas of Northland for Future Generations .................... 216
  Maiki Marks, Secretary, policy and planning, Kororareka Marae Society Incorporated

From Walking the Walk to Talking the Talk: Integrated Coastal Zone Management and
  Community Involvement .................................................................. 224
  Carole Donaldson, Participatory processes consultant, Diamond Harbour

Restoration of the Port Waikato Sand Dunes: A Community-based Rehabilitation Project ...... 230
  By H. Spence, G. Lowe, J. Dahm. and E. O’Callaghan

Neighbourhood Biology: ‘On-line’ and ‘in the field’ services about our local ecology .......... 238
  Mary Gardner, Neighbourhood Biology

Future Options for the Department of Conservation in Conserving New Zealand’s Marine
  Environment .................................................................................. 243
  Jim Nicolson, Principal policy analyst, Conservation Policy Division, Department of
  Conservation

New Zealand’s Ocean Future: Opportunities and Responsibilities .............................. 251
  Patrick Helm, Department of the Prime Minister & Cabinet

Issues for the Future ........................................................................... 258
  Catherine Wallace, Senior lecturer, School of Business and Public Management, Victoria
  University of Wellington

Workshops

Summary of Workshops: Preferred futures for the marine environment and ecosystem
  management – Wednesday, February 11th ............................................. 260

Summary of Workshops: Various topics – Thursday, February 12th .............................. 261
Conference symposia

Opening address to the SeaViews symposia .......................................................... 263
Hon John Luxton, Minister of Fisheries

“...some of the impediments to communication…” .............................................. 264
Paul Dayton, Scripps Institute of Oceanography, San Diego, USA

“...ecosystems are multi-component systems.” ...................................................... 266
Simon Thrush, NIWA, Hamilton

“...it is important to think about what good business practice might be in terms of managing the ocean.” .......................................................... 267
Trevor Ward, CSIRO, Perth, Australia

Indigenous Approaches to Marine Ecosystem Management ............................... 270
Fisheries Act Implementation .................................................................................. 272
Indicators for Marine Ecosystem Management ..................................................... 273
Acknowledgements .............................................................................................. 278
Introduction

Good environmental management is good economic management: it allows us to keep faith with the future and with our fellow inhabitants of the planet. Good environmental management requires recognition of the sea as a series of ecosystems, all part of the biosphere with extensive and at times intricate links between air, land and sea. Securing the natural capital on which we and all future life depend will require some changes in the way we see and use the sea, and the way we organise ourselves, our institutions, laws and management systems.

These considerations underpinned this conference which took place in 1998 the International Year of the Oceans. This year should be the beginning, not the end of attention to the need for change. This conference looks to the future, presents a variety of aspirations, identifies preferred futures, examines the current situation and discusses how we can move ahead.

The papers in this volume come from several countries and a rich range of perspectives. All the papers have some relevance to policy and management – but they come from academics from a variety of disciplines, from fisheries industry practitioners, indigenous people, NGOs, central and local government officials from a wide array of agencies, science providers, lawyers and many others. The views expressed are those of the presenters and summarisers: They are not necessarily those of ECO or the sponsoring organisations.

Some of the proceedings are papers delivered during the conference, others are summaries of key issues emerging from discussions or workshops. Not all the events are evenly covered. In some cases papers were not available. Reportage of workshops varied: but that is the nature of such conferences.

Fisheries came in for particular attention because of its impacts and its economic importance – but the conference ranged far and wide.

We thank all those who made the conference possible and a success. Those who presented papers, facilitated sessions, debated from the floor, provided displays, sponsored the conference, organised and staffed it. The help of unpaid volunteers is warmly and gratefully acknowledged, as is the support of the ECO team and the agencies that put money into the venture, trusting us to produce a good conference and acknowledging the need for discussion of the issues. The sponsors were the New Zealand Ministry of Fisheries, Department of Conservation, the Ministry for the Environment, the Ministry of Foreign Affairs and Trade, the Ministry of Research, Science and Technology, the Auckland Regional Council, the National Institute of Water and Atmospheric Research, the School of Business and Public Management of Victoria University of Wellington and the Jenifer Altman Foundation of the USA.

ECO was pleased by the conference: it was intellectually worthwhile and mapped out grounds for the future. It did not do everything – no single conference could. We do not see it as an isolated event. It was developed on the basis of the ideas and experience of many and it will add to thinking for the future and we hope, influence future directions for management of human impacts on the sea.

Catherine Wallace
Marine coordinator
Environment and Conservation Organisations of New Zealand Inc.
(and Senior Lecturer in Public Policy and Economics, School of Business and Public Management, Victoria University of Wellington)
Keynote speakers

Dr Paul Dayton

Paul Dayton is a professor of marine ecology at the Scripps Institution of Oceanography in San Diego. Internationally recognised for his work on marine ecosystem management, Paul identifies his special research interest as coastal benthic ecology. This research has led Paul all over the globe: he has worked in a range of geographical locations, from Alaska to the West Coast of the US, to Chile and Argentina and the Antarctic, as well as Australia and New Zealand. Fittingly he has served on many national and international committees and panels related to his work on marine ecosystem management.

At present Paul is a PEW scholar in conservation. He is also a fellow of the American Association for the Advancement of Science, and a recipient of the Mercer Award from the Ecological Society of America.

At the SeaViews conference, Paul presented views from his research on the impacts of fishing on the environment.

Shane Jones

Of Te Aupouri descent, Shane Jones is the commissioner of the Treaty of Waitangi Fisheries Commission/Te Ohu Kai Moana. However he is primarily engaged in the complex process of settling the Muriwhenua Treaty of Waitangi claim. Shane took over this task from the late Matiu Rata, who has led the claim since it was first lodged with the Waitangi Tribunal in the mid-1980s.

Shane has a background in public policy development, and has held leading positions in several government departments and bodies. He has been the manager of Maruwhenua, the Maori policy unit at the Ministry for the Environment, has worked at the department of Prime Minister and Cabinet, and was appointed to represent the Far North on the Treaty of Waitangi Fisheries Commission in 1993. In the early 1990s he was awarded a Harkeness Fellowship to study at the John F Kennedy School of Government at Harvard University.

Representing Muriwhenua claimants from Northland, Shane was part of a group that helped initiate the negotiations for what is known as the Sealords deal. This groundbreaking Treaty settlement allocated the rights to 10% of New Zealand’s fishing quota, as well as 20% of future fishing quota allocations, to the Treaty of Waitangi Fisheries Commission. The settlement also provided NZ$150 million for a half share in the Sealords fishing company. Shane became a director of Sealords in 1995, and has held various roles in a number of Sealords subsidiary companies as well.

An innovative thinker, Shane has devoted enormous energies into developing initiatives for good governance and good resource management. He addressed the SeaViews conference on Maori the industry and fishing.

Shannon Kearns

Shannon Kearns is a legal officer at the IUCN–World Conservation Union. Shannon has worked at the IUCN for a year, focussing on marine biodiversity issues. In particular her work has included analyses of legal instruments and institutions affecting coral reef conservation. Shannon has also represented the IUCN-US on freshwater issues, as well as working on issues related to trade and the environment.

Prior to joining the IUCN, Shannon was employed at the Environmental Defence Fund in Washington, DC, concentrating on issues of climate change and ozone depletion. During her time there, Shannon represented the Environmental Defense Fund at the UN Conference on Straddling and Highly Migratory Fish Stocks. Shannon addressed the SeaViews conference on managing marine resources under international law.
Dr Simon Thrush

Simon Thrush is a researcher based at the National Institute of Water and Atmospheric Research in Hamilton, New Zealand. Simon’s particular area of research interest is in the structure and function of estuaries and coastal soft-sediment ecological communities.

In collaboration with his colleagues at NIWA, Simon has undertaken research to understand the natural variability in space and time in relation to estuarine and coastal ecological communities. This research has been used to design and interpret ecological monitoring programmes, to describe contaminant effects on the marine biota, and to examine the consequences of interactions between hydrodynamic and ecological processes. Work on the ecological role of predators and natural disturbance events has led to research on the ecological impacts of commercial fishing.

Simon has disseminated the results of this research in over fifty scientific papers and consultancy reports, and at many national and international conferences and workshops. At SeaViews he discussed the issues surrounding the identification of the effects of fishing on marine communities.

Dr Trevor J. Ward

Trevor Ward of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Perth is renowned for his expertise in the development of water quality and marine ecosystem indicators. Drawing on over twenty years of research experience on the tropical and temperate ecosystems of Australia, Trevor has represented both CSIRO and Australia on various national and international committees concerned with marine pollution and biodiversity. Trevor’s primary fields of research expertise are marine and estuarine pollution, particularly the ecological impacts of heavy metals, management of the impacts of coastal developments on marine and estuarine living resources, the design and implementation of environmental assessment and monitoring programs, and the assessment and management of tropical and temperate marine biodiversity.

Recent projects to which Trevor has contributed include preparation of National Environmental Indicators for Estuaries and the Sea for Australia’s State of the Environment Reporting, the development of estuarine and marine biological indicators for a review of the ANZECC Water Quality Guidelines, a review of the biodiversity issues in Australian fisheries for the Australian Seafood Industry Council, and reviews of Multiple Use Management and Issues in the Conservation of Marine Biological Diversity for use in development of Australia’s Oceans Policy. He is an appointed member of the IUCN (World Conservation Union) Commission on Ecosystem Management, an elected member of the National Biodiversity Council (Australia), a member of the Technical Management Advisory Group for the South Pacific Biodiversity Conservation Programme, and member of various Australian and overseas scientific societies.

In 1996 he was awarded the CSIRO Chairman’s Medal for his work on the design of environmental studies examining the ecology of Port Phillip Bay, Victoria. Trevor’s SeaViews conference presentation deals with how to achieve the preferred future for our ocean ecosystems.

John Locke

John Locke works as a consultant executive officer for the Giru Dala Council of Elders Aboriginal Corporation in the Whitsunday region of Queensland. The elders corporation are the traditional custodians of five tribal homelands, one of which encompasses the Whitsunday Marine Park.

The elders council are seen as one of the leading indigenous groups in Australia in the area of land and sea management, and continue to build on this reputation with innovative planning of both their marine and terrestrial programmes.

His presentation at SeaViews covered the obligations and opportunities to the marine ecosystems under the elders traditional governance and the mapping system developed by the corporation.
Conference Opening
by Dame Cath Tizard

About two years ago and a world away from my life today, I opened another conference on the

Looking over the published account of those proceedings I came across a quotation which seems
appropriate as we launch our respective canoes out on this International Year of the Oceans.

And there are many different canoes represented here today.

There are the big government canoes of the Ministry of Fisheries, the Department of Conserva-
tion, the Ministry of Foreign Affairs and Trade and the National Institute of Water and Atmos-
pheric Research. There is local government involvement in the form of the Auckland Regional
Council whose canoe sails on, and has guardianship of two of
New Zealand’s great harbours, the Waitemata and the Manukau
as well as the Hauraki Gulf and seas beyond.

The canoes of the Ministry of Research, Science and Technol-
ogy and the double-hulled canoe of the School of Business and
Public Management at Victoria University, are we trust, both
being steered with the skill and expertise that we are entitled to
expect from such baskets of knowledge – if you’ll forgive the
mixing of the metaphors.

And from far across the Pacific we welcome the Jennifer Altman
Foundation of the USA.

All of these institutions and organisations are sponsors of this
conference and we thank them for their involvement and support.

I would also add my welcome to that of the tangata whenua to
all the participants and speakers at this conference with an es-
special welcome to those who have crossed oceans to get here.

New Zealand is a country whose relationship with the sea is,
and always has been, very intimate. For a millennium or so, New Zealanders’ relationship with
the sea was a constant – up until the latter half of the nineteenth century and the second wave of
immigration. Except for the tiny island states in the Pacific, there can be no other nation whose
history, culture and lifestyle has been so affected by its maritime isolation. A Maori phrase - “te
ngaunga a Hine-moana” expresses this notion – the gnawing of the land by the sea.

For the first New Zealanders, before it was anything else, the sea was the source of food. And
that, as I’m sure we will hear in the course of this gathering, is not merely an historic concept. It
is an issue of considerable political, social and cultural – even of legal, moment in New Zealand
life today. The sea’s other great function was as an oceanic moat, navigable only by the skilled
and the courageous, first from Polynesia, then from Europe.

The coming of the sailing ships meant that the previous isolation from other oceans and the rest of
the world was reduced not only for human beings, but also for other living organisms. Recent
examples being the introduction of foreign marine life – oysters and algae and several different
unwanted nasties carried on the hulls, or in the bilgewater of ships. If the communications barri-
ers that the surrounding oceans once created between New Zealand and the rest of the world are
much lower than they used to be, so are the contamination barriers.

Over the years we have built up a body of knowledge in our universities and research institutes
about our own marine biology, undersea geography, oceanography, and other scientific disciplines. We have recognised that New Zealand’s fisheries have to be sustainably managed and our coastal regions safeguarded. We are, albeit painfully, grappling with the complex issues involved in Maori customary rights usage of the marine resource.

Perhaps for these reasons, New Zealand representatives were disproportionately influential when the law of the sea was being debated a few years back. Including the maritime environment in all its dimensions within our national policy making, is recognised as being of fundamental importance to our future.

Even so, there is serious concern about the health of our fishery stock, our sea mammals and birds, and even over the survival of inter-tidal molluscan life on many popular shores.

So there is no room for complacency. In many well-informed quarters there is an increasing apprehension that all may not be well with the management of the whole marine environment. At least to this viewer, the scene seems rather akin to New Zealand before the Resource Management Act, with many agencies with varied agendas and fragments of responsibility and jurisdiction, but little in the way of coherence or common approach to the sea as a whole ecosystem.

There are parallels here with another aspect of national concern with which I am presently involved. The preservation of New Zealand’s heritage – both the built and the archaeological has been lamentably deficient. The problems and the losses in that area have been acknowledged and are, at the present time the subject of a ministerial review designed to remove anomalies, rationalise legislation and produce a better result than we have achieved thus far. The Ministry of Fisheries, I know, seeks to take an ecosystem approach to the problems within its area of jurisdiction. But in a political climate of devolution of responsibilities to individual and industry agencies, and a national philosophy of decentralisation, it is a real fear that research and environmental decision-making will tend to be client-based rather than environmentally driven.

We are not an isolated case. These are now world-wide problems and the crisis is already upon us. Once hugely productive fishing grounds in several oceans are even now in serious, possibly lasting decline.

I attended a forum on population last week. Hear this – the population of the planet will reach 6 billion people by the year 2000. It took until the 19th century to reach one billion globally. It took more than a million years to reach the total of one million people on earth. This growth now happens in little more than a decade – close to a billion were added in each of the past two decades and the same number will be added in the next two.

Life began in the seas more than 3,500 million years ago. In the last mere 50 years we have put life in the oceans in peril. We are taking too much out; dumping too many poisons and pollutants in; destroying too much habitat, too many breeding grounds and threatening the complex web of life which sustains the sea.

Many conservation groups and other organisations and some governments are actively campaign-
ing for action on this and inter-related problems. One with which I am currently involved is the World Wide Fund for Nature, which at the international level has been vigorously calling on governments, businesses and individuals to take action.

To raise public awareness the UN has declared 1998, the International Year of Oceans and as its contribution, WWF has dedicated its efforts to ‘creating a sea change for our future’. WWF’s Endangered Sea campaign core group met in Washington DC the week before Christmas 1997 to set priorities for 1998.

The three international marine priorities for WWF this year are, first, to promote and encourage the development of a global network of marine protected areas – ‘no-take’ zones for particular species perhaps, or coastal marine reserves. The names are not important; the concept is.

Secondly, to continue to work towards the eradication of subsidies of the world’s fishing fleets. The capacity of the global fishing fleet exceeds the available fish to be caught by about two-thirds. Government subsidies (for example, by the EU) have been identified as the major contributor to this unsustainable over-capacity. The removal of subsidies by New Zealand is seen by WWF International as a possible model to be emulated.

And the third direction is to promote market mechanisms that support sustainable fisheries. This will principally comprise promotion of certification to Marine Stewardship Council (MSC) standards. Although many here will be aware of the MSC and what it seeks to do, there may be some who do not. The MSC started as a joint venture between WWF International and the global food giant, Unilever, Europe’s largest processor of fish products. It is now a legal entity in its own right with a head office in London.

During the past 18 months, a set of principles for sustainable fisheries has been developed and these are being run through a series of workshops around the world to ensure global applicability and acceptability. One such workshop was held in Wellington early in 1996 attended by key stakeholders from industry, government, Maori interests and the environmental community. This year’s focus will be on Latin America and Africa. Once this series has been completed and the results analysed, it is planned to launch, later this year, a global ‘eco-label’ for sustainable fisheries under the auspices of the MSC.

WWF New Zealand is using the International Year of the Ocean to highlight the continuing annual slaughter of minke whales in the Southern Ocean Whale Sanctuary in the spurious name of science, a situation which WWF describes as barbaric and totally unacceptable. On March 2, WWF NZ will be launching a campaign which aims to get public support for stopping this so-called scientific whaling.

Other activities involve support for research on mangroves, seal ecology, sperm whales, sea lions and dolphins, the effects of gill netting, surveys of albatross populations and mortality, marine reserves and the traffic in endangered species.

The quotation from that former conference that I mentioned at the beginning of this address says this:

The unthinkable has come to pass. The wealth of the oceans, once deemed inexhaustible has proven finite, and fish, once the poor man’s protein have become a resource coveted and fought over by nations. “We’ve come to a reckoning,” says one marine scientist, “the next ten years are going to be very painful, full of upheaval for everyone connected with the sea.”

Some of the ingredients of that upheaval are rather neatly summed up in the sub-headings of the agenda for this afternoon’s session.

Under the title of Aspirations for the future: Preferred futures, we see the sub-titles: Customary Maori; commercial aspirations; recreational; science; biodiversity; environmental;

What can I say, in conclusion, but go to it, and good luck, for the sake of the seas and the survival of all our species!
Some Impacts of Fishing on the Environment

PAUL DAYTON

Scripps Institution of Oceanography, USA

Abstract:

In the marine environment there is a need to consider benchmarks of natural habitats, natural and anthropogenic disturbances and the need for risk adverse management. It has become very difficult to find meaningful representative examples of natural environments necessary to evaluate the many cumulative anthropogenic impacts necessary for management, research, and aesthetics. Pauly et al (1998) have shown the impacts of fishing down food webs as larger and more commercial valuable species disappear. This includes the loss of top predators especially shark species. Biological communities have many adaptations that buffer against natural disturbances; several marine communities are contrasted for the impacts of fishing (Dayton et al 1995, Thrush et al 1995 and 1998). There is a need for conservative management if society is to have natural marine environments in the future.

What is required is:

- Shift in the burden of proof so that those wishing to exploit marine resources must demonstrate non ecologically significant long-term changes (Dayton, 1998);
- Use a historical perspective in setting marine management goals;
- Track natural changes with benchmark non-fishing reserves – using fishing as a research tool to compare effects;
- Risk adverse management – assessment of the effects of fishing before harvest starts. This includes the use of the precautionary approach for uncertainty;
- Protect habitat and non-consumptive resources through the creation of meaningful no-take reserves.

References:


Sea Country Obligations and Opportunities!

John Locke
Executive officer,
Giru Dala Council of Elders Aboriginal Corporation

Introduction

Thank you for your invitation to speak at this marine management conference. As introduced, my name is John Locke, and I work as a consultant executive officer for the Giru Dala Council of Elders Aboriginal Corporation in the Whitsunday region of Queensland. The elders corporation are the traditional custodians of five tribal homelands, one of which, the Ngaro homelands, encompasses the Whitsunday Marine Park.

The elders corporation have been working in a close relationship with the Department of Environment and the Great Barrier Reef Marine Park Authority for the past seven years. The past two years have seen elder Irene Butterworth as the indigenous member of the GBRMPA consultative committee, and Irene is with me at this conference.

The elders council are seen as one of the leading indigenous groups in Australia in the area of land and sea management, and continue to build on this reputation with innovative planning of both their marine and terrestrial programmes.

My presentation today will embrace our obligations and opportunities to the marine ecosystems under the elders traditional governance. The first part of my presentation will cover majestic Hill Inlet which stretches into Whitsunday Island and which is the birth home of Irene’s grandmother. The second element will cover the Wunggomiaili Model GIS Data Mapping System which we have been developing for the past four years and complete late in 1998.

My presentation will combine both elements, so as to provide an overview of the obligations and opportunities which confront us with these particular issues. I hope you will see the direct correlation between what is being done at a mainstream day to day management level, and that at a Giru Dala Council of Elders traditional level. Importance of protection, proper management and planning is of great concern to the elders, and the sooner that government agencies engages in robust and genuine co-management planning the better. Like many world indigenous groups we speak from a position of traditional right, and as such have the same level of concern for particular ecosystems. My message today is not political, but is aimed at working relationships.

Hill Inlet

Obligations

This inlet is great significance to the elders of the Ngaro people who utilised this area as a teaching tool for their people. Their obligation to protect this site is of the utmost urgency. The inlet is an Australian icon with it being splashed over the pages of many books, calendars, company advertising, and used in Australian Tourism promotion on electronic media advertisements in the US and Japan, and domestically. It is one of the most recognisable features of the Whitsunday region and is bound for the stature of places like Uluru and Kakadu.

The values of this inlet are well-known to the elders, and include some of the following values:

- Grey mangroves grow in a bonsai state – no more than two feet off the ground;
- The mangrove ecosystem system is one of only a few which grow in silica sand, and yet still find enough nutrients to grow sturdy and normally;
• The sandbar at the front of the inlet affords a haven for migratory birds;

• A major stingray habitat lies on the ocean side of the spit and is home to a magnificent array of over 100 stingrays, the largest over 12 feet across from flap to flap;

• It is also home to the spiritual links of traditional teaching of the Ngāro people, and includes a number of indigenous rock shelter sites, and shell middens.

These, and other values which have not been identified, are facing the threat of recreational and commercial impact in the near future. Our concerns are currently in the draft management plan for the inlet, but now we would like to express our ideas of the opportunities which present themselves through our eyes.

**Opportunities**

We have had to balance the concerns of all interested groups in the draft management plan of the inlet, but see nothing but trouble looming for this special place. Therefore our proactive direction can be seen in the following issues:

**Earthwatch Research Program**

If successful in our bid to attract the support of Earthwatch we will have five specialists researching the values of Hill Inlet for one month late in 1998. These scientists will cover indigenous cultural values, fish species, flora, fauna, and invertebrates.

We have given in once again to mainstream challenges, but see the research programme as a valuable tool for highlighting to government and community the values of this unique place and why it should be protected under a more robust management plan.

In the elders time, and even my own, stingray habitats such as the one at Hill Inlet are declining. No longer do we see these along our coast in many places, no less than five have disappeared from our coastal section alone and protection of this is of particularly high priority.

**Cultural Tourism – Research Programme**

We understand the problems which confront our government agencies in protecting our vast coastline and different ecosystems. And with this in mind, we are prepared to look at our own resources for developing the working relationships I mentioned earlier.

Because of our strong connection to the Whitsunday Marine Park, we are currently planning a cultural tourism research programme which will assist in long term research and monitoring. We are currently speaking to different major resorts in the Whitsunday to set up a research station for the following issues:

- Dugong, which are in serious decline;
- Turtle;
- Whale;
- Crocodiles;
- Fringing reef;
- Sea grasses;
- Mangroves;
- Cultural sites.

The aim of the programme is to provide long term research and monitoring of these and other specific issues. The programme aims to utilise the world-wide interest in eco-tourism to fund each of the individual units of the programme. Our commitment to the particular resort which backs our programme is to value add by bringing 20 people per programme per month to their resort. The client base of this programme is envisaged to pay the long term costs of the monitoring and research in line with current funding from government, and other funding sources.
Managing Marine Resources Under International Law: Challenges and Opportunities

A. Charlotte de Fontaubert, Ph.D.
IUCN-US The World Conservation Union

The research and editorial assistance of Shannon Kearns, legal officer at IUCN-US, is gratefully acknowledged.

The views expressed in this paper do not necessarily reflect those of IUCN.

Abstract

Since the inception of the UN Convention on the Law of the Sea (UNCLOS, 1982), a series of international legal instruments have been negotiated and implemented that are of direct relevance to the management and sustainable use of marine resources.

Most of these instruments are legally binding (e.g. the convention on biological diversity or the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks) while others are mere undertakings on the part of the states that have negotiated and adopted them (e.g. the FAO code of conduct). These instruments are far ranging and together constitute a mosaic under which a new international environmental regime is emerging.

In parallel to this emerging global regime, a series of regional negotiations have allowed the members of particular regions to customise sub-regimes where their specificity and common interests are recognised.

The South Pacific is a case in point, where the member states have achieved a number of significant outcomes, ranging from protection of the marine environment (with the establishment of the nuclear-free zone) to management of high seas fisheries (with the negotiation of the South Pacific Tuna Treaty). International law therefore must be seen as a vehicle through which individual nation-states can, and need, to join their efforts around a common agenda, and manage ecosystems as a whole to achieve sustainable development.

Background

In 1982, after close to 10 years of negotiations, the participating states in the Third United Nations Conference on the Law of the Sea agreed on most provisions of a comprehensive treaty that re-organized the management of marine resources throughout the world. The treaty (the UN Convention on the Law of the Sea, or UNCLOS) codified an evolution in international law that dated back to the discovery of the Americas by Christopher Columbus. Back in 1493, Pope Alexander VI had attempted to set up an artificial ‘oceans order’ by dividing the Atlantic Ocean between Spain and Portugal along a line that ran west of the Azores, granting Spain control over the oceans west of this line, and Portugal a right over the re-
sources east of the same line. Whereas previous claims had been staked and disputed, sometimes belligerently, over terrestrial areas, this Papal Bull represented the first effort to divide and assign jurisdiction over the seas. Not surprisingly, this arrangement was quickly questioned by the remaining European powers, with Great Britain clearly leading the way. The first round of this dispute was solved when it became apparent that neither Spain nor Portugal had the means to enforce the Papal Bull, particularly after Britain defeated the Spanish Armada in 1588.

Another crucial dispute was the one that pitched the interests of Portugal against those of the Netherlands in the late seventeenth century. Here again, the sources of the dispute were economic, and stemmed from a claim by Portugal over the exclusive right to trade in the Far East. The Dutch position, which really was that of the Dutch East India Company, was championed by Grotius who argued that the seas could not be appropriated by any nation, and that therefore the Dutch had the right to sail to the East Indies and engage in trade. Great Britain also perceived this freedom of the seas doctrine as threatening contemporary British claims to control the seas around its islands. Grotius based his argument on what he called an unimpeachable axiom of the Law of Nations, according to which “Every nation is free to travel to every nation, and to trade with it.” The opposing argument was advanced by John Selden who argued that “the sea, by the law of nature or nations, is not common to all men, but capable of private dominion or properties as well as the land”. This argument was the basic justification for the enclosure movement that would emerge 300 years later.

Freedom of the seas, however, prevailed until the end of World War II, a principle under which oceans resources could not be appropriated since the law of capture determined the property rights over them (i.e. they belonged to no one until they had been harvested and thus appropriated). This regime functioned properly and was kept in place as long as its underlying conditions were maintained. This arrangement was only viable as long as the resources of the sea could not be appropriated (before capture), could not be depleted, and human activities could not impact them in any significant fashion.

One of the reasons this de facto regime survived for so long was that it was the least costly to maintain, and none of the interests were mutually exclusive: by taking its share of the resources, no single nation was depriving another since those resources were deemed to be inexhaustible.

The first cracks in the structure of this regime started to appear as soon as the harvesters developed the capacity to affect significantly the stocks they were targeting. In that regard, the myth of the inexhaustibility of the resources collapsed before the realization that the oceans were not the eternally resilient sink that they had been perceived to be. The depletion of the resources that led to the re-examination of a regime that had so far been universally accepted stemmed from a number of important factors.

First among them was the fundamental misunderstanding that prevented the adoption of any effective management of fisheries: since the prevailing assumption was that the stocks could not be depleted, fishers and governments alike had no overwhelming reason to moderate their efforts, and the resources were available to be ‘mined’ indefinitely. Second, the demographic explosion and the migration of populations toward the coastal zone added to the pressures that were brought to bear on the resources. Even though the stocks had all along been susceptible to depletion, the fishing effort heretofore had not been quantitatively sufficient to affect them significantly. But added to this increase in quantitative effort (more fishers trying to meet the needs of a growing populations) was a third and determinant qualitative factor: the technological revolution. Some trade advertising in the specialised press recently claimed that “Now, fish have nowhere to hide”. Not only are the modern-day fishers able to find the fish through radar and other technologies, their actual harvesting capacity has also significantly improved. The literature sometimes refers to the factory trawlers that can literally ‘hoover’ entire stocks thanks to ‘improvements’ and innovations in the harvesting technology and methods available.

While in hindsight it becomes clear that misconceptions, demographic pressure and technological improvements combined to contribute to stock declines worldwide, the problem was compounded by the fact that such depletions tend to become apparent only after they are well under way. Fishers in a given industry may well believe that the effort they are applying is sustainable even though they prevent the recruitment for the next year’s generation for a given stock. Only when this next generation fails to materialise the following season does it become apparent (belatedly) that the effort the previous year had been excessive.

Therein probably lies one of the reasons why most coordinated international management efforts so far have been essentially reactive, and occurred only after a given stock had been over-harvested. In other
words, nations only started to try and negotiate, and somehow organise and coordinate their efforts, after past excesses depleted the stocks involved, and only when international cooperation was strictly necessary. Prior to the enclosure movement that started after World War II and its subsequent codification in the law of the sea convention, nations had become, de facto if not de jure, bound to one another because any one state could, by its unilateral actions, impact the welfare of all the other nations that depended on the same stocks of marine living resources.

This form of bargaining can actually be traced back to 1911, with the negotiation of the Fur Seal Convention. Here again, cooperation came as the result of dwindling stocks of seals and marked the first instance of the harvesting nations acknowledging their interdependence and formalising this realisation in a joint coordinated management regime.

These efforts, then, were at first reactive and based on a form of piecemeal approach, but did not stem from any broad idea that marine living resources were particularly deserving of coordinated attention. In that respect, these arrangements tended to be essentially distributive in nature and quite exclusionary of other nations. Their aim was not based on any altruistic idea of inter or intra-national equity, but rather to avoid conflicts among a handful or participants (the sealers, the whalers or the fishing nations involved in the harvesting of the stocks for which the negotiations were taking place), and thus to optimise the profits of those who were entering the open access fisheries.

Following World War II the dispute once more pitted the divergent interests of nations who were trying to capitalise on their respective shares of common stocks. This conflictual situation saw the interests of the coastal states opposed to those of other nations whose access to coastal resources was limited and who therefore engaged in distant water fishing.

Up to that point, the jurisdiction of the coastal states had been limited by the cannon-shot rule, which under customary international law allowed coastal states jurisdiction up to three miles from the baseline. While it had by then become apparent that marine living resources were not inexhaustible and that commercial fisheries could collapse, the ensuing response on the part of the coastal states was to stake claims on the shared resources by attempting to ‘enclose’ the areas in which they were found. When stock depletion occurred, however, fishers from the coastal areas tended to blame the foreign fleets who were coming in to ‘steal their fish’.

Distant water fishing nations on the other hand clung to the freedom of the seas paradigm under which coastal states could not claim jurisdiction over resources that could not be appropriated. Then in 1945, President Truman issued a proclamation claiming jurisdiction for the United States over mineral and living marine resources on its continental shelf. The stage was then set for fifty years of negotiations over marine living resources between and among these two categories of fishing nations. The next forum in which this debate was formally taken up was the First United Nations Conference on the Law of the Sea (UNCLOS I), which concluded with the adoption in 1958 of four separate conventions on the territorial sea and the contiguous zone, the high seas, the continental shelf and the living resources of the high seas. Here again, one of the major stumbling blocks was the issue of the breadth of the territorial sea and none of the conventions came into force. Two years later, UNCLOS II was convened, but once again failed on the same issue.

This uncertain regime was next taken up at the United Nations Conference on the Human Environment (UNCHE), held in Stockholm in 1972. In this particular case, however, the goal was not to codify customary international law and the outcomes of Stockholm were ‘soft international law,’ whereas UNCLOS I and UNCLOS II were meant to be constitutive of ‘hard law.’ The same ‘soft law’ approach would be taken up 20 years later at the UN Conference of Environment and Development – UNCED, held in Rio de Janeiro in June 1992. Stockholm provided a forum for the adoption of a Declaration of Principles on the Human Environment, which highlights the importance of preserving the human environment and the aspects that need to be addressed through international cooperation.

**UNCLOS**

These efforts finally came to fruition in the course of the negotiations of the Third UN Conference on the Law of the Sea (1973-1982), which led to the adoption in 1982 of the United Nations Convention on the Law of the Sea (UNCLOS). Numerous analyses have been written on this treaty, dubbed alternatively the new constitution for the oceans or the new oceans regime, and all have shown what a breakthrough UNCLOS represented. For one thing, UNCLOS spelled the end of the freedom of the seas paradigm. Further, the slow creeping enclosure movement was crystallized in the concept of Exclusive Economic Zone (EEZ) or Exclusive Fisheries Zone (EFZ).
Primarily, UNCLOS is a framework treaty, in that it divides up most of the oceans areas between zones wherein the coastal states have exclusive jurisdictional rights, and what remains of the high seas. This enclosure movement resulted in the appropriation by the coastal states of 90 per cent of the fisheries resources worldwide. In that respect, UNCLOS embodies the idea that in order to be managed, fisheries must fall within the purview of an individual nation, which will then have the means to set up the appropriate management regimes and see to the distribution of its benefits. This state of affairs is explained through the so-called ‘prisoners’ dilemma’ theory, according to which fishing actors – be they nations or individual fishers – perceive it to be in their interest to harvest as much fish as possible, before other actors do. As a result, they are under the pressure of perverse incentives to over-fish, if only because they fear that what they leave behind will be harvested by someone else. They then lose any incentive to conserve the resource. The solution therefore lies in granting that actor more certainty, either by granting ownership over the resource, or by ensuring perfect cooperation and information sharing among all the actors. Ironically, the expected downfall of this enclosure movement has failed to materialise and the call for strictly defined property rights has been pushed further, at the individual level, where some individual fishers are now granted individual transferable quotas (ITQs).

The treaty establishes a very detailed regime, where for up to 200 miles offshore the coastal state can, based on the best scientific evidence, determine the level at which most fish stocks can be harvested, give its own fishers priority to that harvest, and, if its nationals cannot harvest the total allowable catch (TAC), grant access to foreign fishers on its own terms. UNCLOS also recognises the specificity of particular stocks and provides for specific measures for anadromous and catadromous species. The treaty also recognises the particularities of straddling fish stocks and highly migratory fish stocks, yet fails to establish a specific regime for these stocks. UNCLOS did not immediately come into force because of major reservations on the part of the US and most other industrialised nations on Part XI of the treaty, which deals with deep sea-bed mining. Ten more years of negotiation were necessary before a new agreement on deep sea bed mining was finally adopted and the convention entered into force in 1994. The US has still not ratified UNCLOS, but applies most of the treaty as customary international law. The conclusion of the negotiations of the law of the sea conference was a clear indication of the kind of bargaining that needed to take place in order to solve the differences among nation-states. UNCLOS was a watershed because UN members were finally able to agree on a treaty that would regulate ocean activities in more than 70 per cent of the planet. Based on this new realisation, a number of international legal instruments were then negotiated that addressed other aspects of marine resource management and all these cases were in one form or another attempting to put an end to the tragedy of the commons. Unlike UNCLOS, however, all the outcomes were not necessarily legally-binding treaties, but sometimes resolutions by the UN general assembly, a variety of programmes of action and mere ‘declarations.’ Whilst treaties and conventions obviously carry more weight in international law, the most remarkable development is the mosaic of processes and outcomes that derived from this new spirit of negotiation. Conflicts over resources were no longer solved through ‘cannon shot rules’ but rather by an understanding that marine resources were essentially shared resources and that one nation could hardly expect to impose its view on all other nations. Management of marine resources had become a zero-sum game, where the gains of some necessarily resulted in losses for others, but overall, common problems had to be addressed through common approaches.

**Global conventions**

Following the adoption of UNCLOS as a framework, the nation-states had a clearer, shared understanding of their rights and responsibilities and were thus able to concentrate their efforts on a series of important topics. Some of those were marine in nature, but in other cases general negotiations on other important topics were to have important consequences for marine policy. For instance, the 1987 Montreal Protocol and the 1992 Framework Convention on Climate Change (FCCC) are two instruments that address the release in the atmosphere of substances (CFCs for the former, greenhouse gases for the latter) that eventually impact the oceans and marine biodiversity, though not negotiated for the protection of marine biodiversity.

Though they were adopted before the end of the UNCLOS negotiations, the 1971 Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar convention) and the 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage (world heritage convention) dealt with more general issues, but were also...
applicable specifically to marine habitats. CITES, the Convention on International Trade in Endangered Species was adopted in 1973 to protect a host of endangered species, and some marine species were later threatened and added to the CITES appendices. Some technical conventions like the International Convention for the Prevention on Pollution from Ships (MARPOL 1973-1978) and the 1972 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (London Convention) were adopted to regulate specific ship-based activities that had direct consequences on the marine environment. In the case of these two last instruments, the negotiators who negotiated the London Convention and MARPOL were often the same diplomats who negotiated UNCLOS, and natural linkages were created among the different processes.

All these instruments are inherently linked in that one series of marine activities will have impacts on series of other marine activities. The law of the sea convention recognises this and refers specifically to organisations such as the International Whaling Commission and defers to it for the management of marine mammals. The Convention on Biological Diversity (CBD) applies to all biodiversity, both marine and terrestrial, and provides the state parties with rights and obligations under which species can be protected. The conference of parties of the CBD recognised the importance of marine biodiversity when it adopted the so-called Jakarta Mandate and a three-year plan of action for the sustainable management of marine resources (for more information, see de Fontaubert et al., Biodiversity in the Seas, Implementing the Convention on Biological Diversity in Marine and Coastal Habitats).

The ultimate example of the realisation of the linkages between terrestrial and marine activities was the convening in 1995 of the UNEP Conference on Protection of the Marine Environment from Land-Based Activities. At the end of this Conference, governments adopted a Global Programme of Action (GPA) to prevent, reduce and control marine pollution from land-based pollution. The GPA particularly endorses the adoption of integrated coastal management as a means to incorporate all the uses that take place in the coastal area and to better link marine and terrestrial activities. This integrated approach was also recommended in the course of the UN Conference on the Sustainable Development of Small Island Developing States. This conference was especially important because it recognised the particular challenges for small island developing states and because it adopted a programme of action that recommends action at the national, regional and international levels (for more details on this conference, see C. de Fontaubert, The United Nations Conference on the Sustainable Development of Small Island Developing States).

Within international fisheries, a whole new sub-regime has been established. This has become particularly important as the latest FAO figures indicate that close to 70 per cent of the world’s fish stocks are fully fished or over-fished. As a result, a series of negotiations have addressed some aspects of over-fishing or destructive fishing practices and the whole of these instruments is greater than the sum of its parts. An overarching effort, the negotiation and adoption in 1995 of the FAO Code of Conduct for Responsible Fisheries addresses all aspects of fisheries management, including fishing operations, aquaculture development, integration of fisheries into coastal area management, post-harvest practices and trade and fisheries research. The code of conduct probably went further than any other legal instrument in applying the precautionary approach and in recognising the need not to exceed Maximum Sustainable Yield (MSY), but partly as a result it has not become legally binding. Other more specific instruments in contrast have acquired the status of hard law. A prime example is the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks, open for signature in 1995, and which applies specifically to stocks that migrate between EEZs and the high seas or over particularly long distances. The application of the straddling stocks agreement is confined to certain stocks and certain geographic areas and, when it enters into force, will be legally binding for states that are party to it. Another legally binding treaty is the Agreement to Promote Compliance with International Conservation and Management Measures by Vessels Fishing on the High Seas (the Compliance Agreement), which aims to curb the activities of vessels flying flags of convenience. The 1991 UN drift-net resolution also played an important role in putting an end to a particularly destructive practice.

**Regional Agreements**

Beyond this global framework, a series of regional negotiations also played an important role, particularly in the South Pacific. This stemmed from the fact that some issues, and particularly some fisheries issues, are better addressed in a regional context. Responses to marine pollution for instance can hardly be the responsibility
of one nation-state alone (particularly when the impacts of one pollution incident are felt in other countries). A series of important regional seas programmes were also developed under the aegis of the United Nations Environment Programme (UNEP).

At the present time, most member states of the South Pacific Forum and South Pacific Commission are in compliance with three international legal instruments that epitomise this more cooperative approach: the South Pacific Nuclear Free Zone Treaty, the Convention on the Conservation of Nature in the South Pacific and the Convention for the Prohibition of Fishing With Long Drift Nets in the South Pacific.

In the negotiation of all three instruments, the island states of the South Pacific showed their ability to overcome some of their differences and instead to bank on their commonalities (embodied in what some call ‘the Pacific way’). This proved particularly helpful in the negotiation of the tuna treaty negotiated with the United States (1987 Treaty Between the Governments of Certain Pacific Island States and the Government of the United States), where the individual member states were able to achieve a much better outcome as a whole than they would have in direct bilateral negotiations with the US. Another remarkable outcome was that in some of the treaties, the area of application included areas of the high seas enclosed by the EEZs of the parties.

The South Pacific is leading the way, and its member states have benefited fully from this climate of cooperation. The island states of the South Pacific played a crucial role in the FCCC negotiations through the creation of the Alliance of Small Island States (AOSIS) and have carried on this momentum in the negotiations of the Straddling Stocks Agreement, the convening of the UN Conference on the Sustainable Development of Small Island Developing States, and even the most recent negotiations of the Kyoto protocol. It is difficult to characterise the specificity of the island states and one still needs to recognise the differences that may exist between Melanesians, Polynesians and Micronesians. Nonetheless, all have taken full advantage of the new climate of international cooperation and even led the way, particularly in the field of fisheries and regional management. In particular, the Forum Fisheries Agency has been instrumental in developing enforcement capacity and is leading the way in overseeing the negotiations of the South Pacific implementing agreement for the UN straddling stocks agreement.

Clearly the small island states of the South Pacific have a very high interest in the management of their marine resources, particularly in view of their limited terrestrial resources. Their geographic isolation has also been highlighted as a substantive impediment to their development. The development of a regional airline and of a common shipping line are symptomatic of their coordinated and cooperative strategies. The area is now endowed with very strong regional organisations (the South Pacific Regional Environment Programme, the South Pacific Forum, the South Pacific Commission, the Forum Fisheries Agency) which often strengthen their international bargaining positions. With the adoption of the South Pacific Nuclear Free Zone Treaty (the Raratonga Treaty) and the Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific Ocean (the Wellington convention), the member states have shown that they can take full advantage of international law, even when it involves non-member states. This approach could maybe be replicated by other developing countries as they strive to manage their marine living resources sustainably.
The following are the aspirations and visions of the NZ Seafood Industry Council Limited (SeaFIC) for the future of fisheries management in New Zealand. The vision requires a commitment from the government, industry, recreational fishers, customary Maori and non-government organisations.

It is in the interests of the seafood industry to look after the marine environment. The best way to do that is simply to make New Zealand’s fisheries management regime work. The key steps toward achieving that objective are for the government to complete the property rights framework it started in 1986, and then to get out of the business of delivering fisheries management. Stakeholders have to take over that responsibility – rather than having the government as a player on the field. At present all the responsibilities end up on the government’s shoulder, since there are no incentives for the various participants to make the system work. The present interventionist regime stifles enterprise and innovation.

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Regulatory Efficiency
We would like John Luxton, as Minister of Fisheries, to do what we’re sure he wants done: Streamline the detail of the Fisheries Act 1996, and repeal most of the 4,500 input control regulations that govern fisheries management in this country. A legislative environment that is cost-effective and efficient should be the objective of government.

Property Rights
The basic flaw in the fisheries management regime is that property rights are not defined for all fishers. For example we would like to see property rights extended to recreational fishers through some form of licensing which provides recreational fishers with an explicit, legal share of the TAC which they cannot exceed. A system of reporting and enforcing such a system would be required. We would also like the government to require all recreational pleasure boats to be licensed and the resulting fees used to contribute to maritime safety matters, coastal planning and fisheries management.

Devolution
We would like the government to get substantially out of the business of delivering fisheries management services and to hand that responsibility back to rights holders. The current proposals to transfer the fisheries registry and responsibility for purchasing research to industry are to be applauded. In future we see consultation processes, TAC-setting recommendations, observer programmes and civil compliance regimes all being undertaken by rights holders in the fishery.

Tariffs and Subsidies
We wish to see increased efforts by the Ministry of Foreign Affairs and Trade and the Ministry of Fisheries in advocating the elimination of trade and tariff barriers to the export of NZ seafood, and to promote the removal of subsidies to commercial fishers in all foreign jurisdictions. This latter initiative would make a significant contribution to reducing fishing effort at a global level, thereby protecting the marine environment.

Customary Maori Fishing Rights
We see a future where customary fishing rights are expressed as an explicit legal entitlement to a share of the TAC, exercised with respect for wider fisheries management objectives and the legal rights of other participants in the fishery.

Industry Attitudes
We see a future where all industry decisions are underpinned by sound science – both investigations of stock assessment and environmental research. A future where industry works cooperatively with conservation groups to achieve a shared goal of managing the adverse effects of fishing on the marine environment.
**Provision of Research**

We see a future where research providers work cooperatively with the commercial fishing industry to find answers to important scientific questions. A future where research is focused on adding value to the businesses which fund the research and where the level of investment in research in the medium term is known with some degree of certainty.

**Public Good**

We want the government to recognise the returns that flow to the economy from the seafood industry. While industry make a significant contribution to management and research costs, there is a public good interest in fisheries management that dictates that the crown should pay a greater share of those costs.

**Ministry of Fisheries**

Our future sees the Ministry of Fisheries as a regulatory and policy agency of 20 – 30 people providing policy guidance, setting standards and auditing the performance of fisheries managers in an environment where they have divested themselves of all but their core government responsibilities.

**NGO Attitudes**

We see a future where non-government organisations meet regularly with industry at both a fishery and national level to resolve matters of concern to them, rather than barracking from the sideline. A future where they can progress important debates in a reasoned manner without continual recourse to the media and use of non-scientific rhetoric. A future where they acknowledge the success of the quota management system despite its flaws. A future where there is some limit to the level of research investment they expect of the commercial sector.

**Conclusion**

Achieving good fisheries management is not difficult. It requires the government to make some important and urgent decisions on matters relating to property rights.

It relies on the commercial and other rights holders taking responsibility for fisheries management, and it requires us all to leave the red corner of the ring and reach agreement on how our different objectives can be achieved.
Aspirations for the Future

Recreational Fisheries

M. J. Hetherington
Secretary, New Zealand Recreational Fishing Council

Policy and Priorities

Let me commence by noting that as the secretary of council I must follow the mandate of my members and the public we represent. I expound for you their aspirations for the future. I therefore note our mandated policy is “no licensing, no quota, crown to manage the fishery”.

This has been the case for the last ten years reconfirmed annually. I have no doubt this policy will continue to be the same for the next ten to twenty years.

Let me also make clear up front that the recreational fisher accepts that there is a priority ranking for the use of the resource. This priority is firstly the resource itself. We want to protect it for future generations and to cover the exercise of the kaitiakitanga role. The second priority is for customary take for the purpose of upholding the mana of the marae. This covers their ability to provide kaimoana to visitors and guests on the marae. The public (recreational) fishers come next with their ability to enjoy a feed of kaimoana and if necessary sustain themselves or achieve enjoyment from the resource. The last priority is take for commercial purposes. This is a priority we believe is set in the Act. We aspire to this being strengthened in the Act.

Ownership

It is important to note that the fishery is a public resource belonging to the public of New Zealand. The problem is that the government in 1986 created without consultation a property right for commercial fishers. They then gave that right to those fishers without recompense or payment. The issue of rights was based purely on catch history.

Maori using the protection of the Treaty took the government to court. In doing so they protected and strengthened their rights (commercial and customary). Since that time the Maori commercial right has been settled with the Sealord’s deal. The customary right is still under negotiation as we know. However, what happened to the public right? It has neither been protected or enhanced. Does the public now have to take the government to court to force it to protect and manage the public resource? Let me note at this stage the only published government policy on recreational fisheries is the National Policy for Marine Recreational Fisheries which states:

“One of the first national objectives is to ensure recreational users have access to a reasonable share of the fisheries resources. Where a species of fish is not sufficiently abundant to support both commercial and non-commercial fishing, preference will be given to the non-commercial fishing.”

Let me predict that if government continues on its present course of “user pays, user says” and devolution of its mandated role, then, yes, the public will speak and take the legal action I refer to.

Let me give a basic scenario for you to ponder. All the early New Zealanders were either born here or arrived by sea. Maori in canoe, Pakeha in ships. They are all “natives” of New Zealand. Back in 1840 Maori (the original inhabitants) entered into a treaty with the English (the settlers). The Treaty of Waitangi. That treaty has three articles. Article one ceded to the English the “governorship and ability to make laws”.

Article two protected for Maori their taonga (treasures) including the fisheries by the use of the words full, exclusive and undisturbed possession. It is this right that was settled by the Sealord deal using a form of consultative negotiation. Under that deal Maori relinquished their right in the commercial fishery in
return for quota. They also released their customary right subject to the passing of customary regulations which are still under discussion. They are retaining their customary right and Kiatiakitanga responsibilities in those regulations for marae purposes.

Article three provided to all “natives of New Zealand” the royal protection and imparted all the rights and privileges of British subjects. It is under this article that all New Zealanders (Maori and Pakeha) descendant of the treaty partners have the common law right of access to the fisheries resource. This then leaves those born here since who are also “natives of New Zealand” or those who have arrived since and taken up New Zealand citizenship. It is my suggestion that they are also covered by the Treaty because they have accepted and are covered by the governorship covered by article one and are “natives of New Zealand” accepting the protection of the crown and the rights and privileges referred to in article three.

Based on this we must question where New Zealand-er’s protection, rights and privileges are within present and past legislation. We suggest they do not exist. We further note that the proposed “devolution of responsibility” is an abrogation of rights of the public and treaty obligations under article one (by the government) that needs addressing in the near future. Our aspiration is that the public right be strengthened in legislation.

**Funding**

The next issue I raise is the “level” playing field of fisheries consultation. As you will appreciate the council survives on voluntary unpaid input as does mainly the environmental sector. On the other hand you have a commercial fishing industry prospering on quota that was given to them in the first instance and is being used for commercial gain. It is soul destroying to front up to consultative meetings to be confronted with upwards of 20 industry personnel, all funded to be there including qualified scientists, accountants, lawyers etc. etc. etc. Then you have up to 10 ministry personnel funded to be there. Meanwhile, sitting on the other side of the table is myself and maybe one other recreational person. Sometimes one or two environmentalists. Infrequently, one or two others.

And these are the official meetings. Separately behind closed doors the ministry staff, minister and politicians are brow-beaten to a particular viewpoint by industry alone. Therefore, for the future the playing field must be levelled. The participation of non-profit groups must be fully funded. If this means restricting and funding industry participation then so be it. Unfortunately, I can’t quite see how you can stop the lobbying.

**Enforcement**

Another issue that needs addressing is that of enforcement. All sectors have their rogues and this is not exclusive to fisheries. Some minor illegal activity can be resolved by education such as those taking slightly over the bag limit or undersized. Therefore greater resources need to be put into education. One of the bigger problems in this more minor area is that of new immigrants. Most of this can be adressed by education. However, most illegal activity is carried out for commercial gain, but we do not blame the commercial sector for it. The only way it can be described is “poaching, black market or fish thieving”. As this is for a commercial gain and deliberate it will not be resolved by education. Recently a lot is occurring under the guise of customary take. Whilst the government fiddles with that issue the problem will continue.

Let’s look at who all this illegal take affects. It affects all sectors and the resource itself. Whose fish are being taken illegally? It is all users fish, as the more taken results in less for the legitimate users. We are too quick to make allowance for it in our stock assessment process and too slow to put resources into solving the problem. Last year’s Required Services Document states appointment of 650 Maori HFOs and 400 Recreational HFOs by 30th June 1998. I question how many have actually been appointed.

The total enforcement budget for this year for “detection of offences” is $16.4 million with an additional $2.7 million for “Prosecution of offences”. Not enough resources are provided in this area. It needs to double initially and probably treble. Officers on the ground and a visible presence are required. The odds of being caught have to be increased. It should be a crown cost as is all other policing. In over 40 years of fishing and diving, I have seen or been approached by a fisheries officer three times. Based on this my chances of getting caught if I was carrying out an illegal activity are virtually nil.

**Management Level**

Under our present legislation the resource is managed for “Sustainable Utilisation”. The minister is required to move all stocks towards a magical figure called $B_{asv}$ (or in other words the biomass that will produce the maximum sustainable yield). We question whether for
inshore fisheries this is in fact the best level to manage at. At that level the most efficient harvesting method (and usually a bulk method) will be used. Conflict will occur as fishers become unable to get what they want out of the resource. Scientific data is not available to ensure the catch level is set correctly. Spikes in recruitment can affect the stock level adversely. Natural disasters and weather patterns can affect the stock. Some fisheries are even now fished down below sustainable levels with SNA 1 and SNA 8 good examples scientifically proven. Conflict occurs where recreational fishers consider kahawai is fished down too low, but ministry staff state it is not. Industry has the same problem with hoki quota where ministry staff and scientists each year seek to increase the quota whilst commercial fishers on the water say the fish are not there and something is wrong. For the future, we therefore suggest we reject this theoretical figure of $B_{MSY}$. We should fish down only to a figure of twice or three times the theoretical $B_{MSY}$ level to provide a cushion for all the problems I have referred to or to some other appropriate percentage above level.

Management Structure

The council has a policy we have expounded for a number of years now of national and regional management which is representative of all sectors working together with co-operation, consultation and where possible consensus. We note that this structure could even come down to a local level, but this level could in itself create problems in our small country.

We already have examples of national management in the form of the TACC council which is a constructive forum used for discussing the amount of quota to be issued for each fishing year. We have national management in the National Rock Lobster Management Group (NRLMG) that works effectively although some representatives turn up to only a few meetings. We have provision in the legislation for a general national management structure in the form of the National Fisheries Advisory Council which is appointed at the whim of the minister and none has yet been so appointed.

We are not, however, endowed on the regional front. We have some Fishing Liaison Committees, a few of which seem effective whilst most others languish. All are not representative of all sectors. We have examples of FLCs being treated with disdain by the ministry and minister with their recommendations and requirements being ignored. I cite the last TACC and regulation review as an example where issues vital to regional areas were ignored. We have a number of local/regional management structures in the pipeline some of which are representative whilst others are not. I cite the taiapure committees, most of which have not yet been appointed despite the taiapure gazetting having been in place for some time.

Therefore for the future a national and regional management structure representative of all sectors needs strengthening and enhancing and needs legislative backing to make it effective.

Inshore Zone/Closed Areas

We presently have a situation where numerous groups are attempting to close down larger and larger areas of the inshore fishery for their own reasons and purposes. Whilst the QMS system may be the best management system for commercial purposes, it does not meet the needs and aspirations of the public generally and especially specific interest groups within that public. We all see the depletion of the stocks within the inshore zone. We each in our own way are attempting to address those problems. As examples, I refer to the closing of areas as marine reserves, taiapure, mataitai, rahui, voluntary accords, regulations and many other means. Council considers that many of the proposed closure methods are too restrictive because of the legislation under which many of the closures are sought. For example marine reserves are supposed to be set up for scientific purposes, but are now being used to lock up areas permanently because of other perceived problems. Council is not opposed to closures, but suggests they need to be in the right place for the right reasons and under the right legislation.

We suggest there is a solution that will meet everybody’s wishes and which would place the appropriate costs where they should lie. It would solve the problem of indiscriminate closures for the wrong reasons and protect the inshore zone from spatial depletion issues. The solution has been suggested before but, the minister and ministry have failed to take it up.

For this solution, I refer to the report on “Sustainable Fisheries” of April 1992 commonly referred to as the Wheeler Task Force. I note the recommendation on pages 53 and 54 which read:

“A general coastal fishing zone be established to address the problem of spatial depletion and the loss of amenity affecting, in order of priority, Mahinga kai, recreational fishers and commercial fishers. Within this zone the use of fishing methods would be restricted to the extent that they are unlikely to result in localised depletion of stocks:
• The coastal fisheries zone would comprise all areas within 1.5 nautical miles of the coast and most enclosed harbours;

• Method restrictions under a coastal fisheries zone could not unduly affect the ability of quota holders to harvest their quota unless such quota holders agree;

• The restriction could only be triggered by an approved recreational group or Iwi. The party that triggers the zone would have an obligation to consult with other affected parties; and

• The initial terms of any coastal fisheries zone be ratified by the Minister of Fisheries, be registered and be available publicly.”

I believe that the suggestion made by that task force places the onus and costs in the wrong area, but does provide the overall solution. I suggest the creation of a coastal fishing zone out to the 12 mile limit. Within that zone all commercial fishing be banned initially. This is not to say that commercial fishing remain banned or that it cannot occur. Some important fisheries (particularly rock lobster and paua) which are low impact and high return need to occur. What I envisage is that those making the profit from the resource should then apply for areas to be opened for commercial take and that it be accepted that this must occur. This will in the longer term solve all the spatial depiction issues and protect the inshore fisheries. It will remove the need for a proliferation of closures being sought for the wrong reasons. It will in time improve the stocks. It will I believe meet the aspirations of local coastal iwi by improving the stocks within the zone. It will allow the “farming” of the inshore zone by means of opening and closing of areas as stocks improve. This method has been used successfully in the Nelson scallop fishery.

No doubt my friends from the commercial sector will be vehemently opposed to this suggestion. I suggest they consider it seriously. They will find the concept will grow on them in the future. It will also allow them to put their efforts into fishing rather than the confrontation that now occurs.

I thank you for your attention and leave you with these thoughts of future aspirations and preferences that we believe in time will come to pass.
Hugh Logan
Director-general, Department of Conservation

I’m going to tell you about my three aspirations for New Zealand’s marine biodiversity and marine environment.

Marine scientists tell us that perhaps 80 per cent of New Zealand’s biodiversity is found in the sea. Some 8000 marine species have been identified living in or on New Zealand’s oceans, 61 species of seabirds, 41 marine mammals, 1200 fish, 2000 molluscs, 350 sponges, 700 seaweeds, etc.

That sounds like a lot of marine creatures, but consider for a moment that currently around seven new species are being discovered in our oceans each fortnight!

What don’t we know? Considering that less than one per cent of New Zealand’s marine area has been surveyed to assess the diversity of marine species and ecosystems, I suggest there is an awful lot we don’t know. Apart form the basics like “what’s down there and how is it living?”, we don’t understand what effects physical changes, such as those induced by El Niño are having on our marine biota, nor do we understand fully how the increasing pressures of exploitation are affecting the marine environment generally, and how those pressures should be managed.

We currently have an environmental calamity in the sub-antarctic, where the endemic New Zealand sea lion is dying in droves because of some as yet unidentified disease. Despite considerable research, we don’t know enough about the ecology and physiology of the sea lion to understand fully what the implications of these deaths are.

As director-general of conservation, my aspiration is to see the marine species and ecosystem knowledge base increased rapidly and accurately, so that we do not end up with marine kakapo scenarios. My guess is that most New Zealanders do not think of marine kakapo scenarios. Why, we all know the ocean is impregnable! We remove species from it, pollute it, dump in it, reclaim it. It seems to bounce back OK. We take it for granted.

If we do the same things to land species and eco-systems, the degradation is there before our eyes. Save the black robin, save the kakapo, save the forests is the cry! How about the black coral, the spotted grouper, the Rangatira Sea Mount? I believe most people have a very low level of understanding and appreciation of the complexity of marine ecosystems – we need a change of national mind-set.

My second aspiration then, is to see New Zealanders looking at their oceans with the same caring attitude they would like to think they have about terrestrial habitats, and to develop a higher level of understanding, and a sense of passion, for the well-being of the ocean and its inhabitants.

On another theme, New Zealand’s multi-agency approach to managing the marine environment involves a range of central and local government agencies, with responsibility for independent functions and particular expertise. This approach requires that the management roles of each agency are clearly defined, and demands a high level of cooperation and coordination between agencies. For example, within the past year, the Department of Conservation and the Ministry of Fisheries have developed a protocol to enable closer cooperation over matters of mutual interest. Such issues as marine biosecurity risks, marine reserve development, and management of protected species by-

Aspirations for the Future

Bio-diversity and the Environment

Hugh Logan
Director-general, Department of Conservation
catch problems, will all benefit from this new level of cooperation.

My third aspiration is then, to see improved inter-agency cooperation, and a clear, coordinated approach to the management and use of our marine environment. I believe the Department of Conservation can contribute significantly to these aspirations through a number of initiatives:

• Help to promote awareness of New Zealand’s marine biodiversity (eg. Seek additions to formal education curricula, and an increase in awareness activities by professional associations). This is something we must do in partnership with other agencies and groups;

• Assist with the identification, classification, and description of New Zealand’s seascapes (within the resources available to us) and marine habits and biota, and the threats to them;

• Monitor marine mammal and seabird populations and marine reserves, in order to develop effective measures to remedy any adverse effects on them;

• Contribute to the establishment of a network of marine protected areas within New Zealand’s Exclusive Economic Zone that is fully representative of our marine ecosystems.

And finally, I believe there must be integrated goals, objectives and actions for the protection of important marine areas, and the sustainable use of marine biodiversity, which are supported by all agencies.

Also, I note that the Australian government’s draft oceans policy was recently discussed at the ANZECC conference; this draft policy sets an example that New Zealand could well follow.

However, there must be a coordinated effort amongst all the agencies with statutory responsibility for management of the marine environment in New Zealand, with input from the public and other professional stakeholders, to facilitate rational management of New Zealand’s marine environment. What better place to start than this SeaViews conference?
Aspirations for the Future

Environmental Aspirations

STEPHANIE MILLS
Greenpeace

When I was asked to speak of my aspirations for the future of the marine environment, two very different images flashed through my mind. One was a pleasant memory of a recent snorkel around the Poor Knights marine reserve, rich in colour, life and biodiversity. The other was a dystopian image – that of eating a genetically engineered fish from a fish farm in the year 2000-and-something and swimming in a cloudy ocean ravaged by over-fishing and impacted by global warming, with reduced productivity, increased new diseases and with all non-commercial species eliminated as pests.

The reason I work in the environmental movement is because I find living with that second image unbearable unless I act. I do not want to wax nostalgic to my grandchildren about the oceans as they once were: I want them to experience the full vitality that is their right.

So my aspirations for the marine environment involve eliminating, or at least reducing, five key threats: over-exploitation, the physical alteration of ecosystems, pollution, the introduction of alien species, and global climate change. 1600 marine scientists from around the world recently launched a call for action in these areas and identified five key steps to reverse these trends.

They are:

• To provide effective protection to all populations of marine species that are significantly depleted or declining, take all measures necessary to allow their recovery, minimise by-catch, end all subsidies that encourage over-fishing and ensure that use of marine species is sustainable in perpetuity.

• Increase the number and effectiveness of marine protected areas, so that 20 per cent of Exclusive Economic Zones and the high seas are protected from threats by the year 2020.

• Stop fishing methods that undermine sustainability by harming the habitats of economically valuable marine species and the species they use for food and shelter.

• Stop physical alteration of terrestrial, freshwater and marine ecosystems that harms the sea, minimise pollution discharged at sea or entering the sea from the land, curtail the introduction of alien marine species, and prevent further atmospheric changes that threaten marine species and ecosystems.

• Provide sufficient resources to encourage natural and social scientists to undertake marine conservation biology research needed to protect, restore and sustainably use life in the sea.

Translated into practical objectives that I would like to see achieved in New Zealand’s marine environment, I would include:

• Agreement on a goal of zero by-catch in all fisheries, and the introduction of sanctuaries and other area closures in fisheries such as the squid fishery in the Auckland Islands and the southern bluefin tuna fishery in high albatross by-catch areas;

• Suspension of fisheries that are below sustainable yield levels, such as the southern bluefin tuna fishery until sustainable populations are regained;

• Fisheries management based on a genuinely precautionary approach and science that is explicit about the consequences of making errors in assessment;

• Marine management that is based on the reverse burden of proof – so that protection of valuable resources does not depend on environmentalists having to wait until they can prove actual harm, but rather those seeking to exploit the public resource must prove that they do not cause damage;

• Phasing out of all discharges into the marine environment of toxic and persistent chemicals by 2005,
in line with programmes in the North Sea and Mediterranean.

- Increased funding of independent fisheries research. I read the other day that in the US, more money is spent studying the oceans of Mars than on the oceans of the Earth. We are currently causing widespread damage to ecosystems that we don’t even know about.

So how do we get there? We need both vision and good management. There are a number of key words that I think of when I look into the future of marine management.

One word is justice. The distribution of the risks and benefits – whether they be economic, social or environmental – from our oceans must be considered transparently and with the involvement of all stakeholders.

Another word is time: We must make the leap into taking genuine intergenerational responsibility, and we must make the time to take decisions carefully, ensuring that competing values and ideas are given full weighting.

Integration: We have no macro management mechanism for our oceans that integrates the many aspects of marine management. Without some kind of ‘one-stop shop’ for marine management we lose not only efficiency, but more, importantly, a common vision of superior protection for our oceans. Without such an overview, we lack an agency to coordinate all the related efforts that are required.

Public Process: Government’s role in providing that one-stop shop is and will remain critical. Meaningful public participation in decision-making is equally important to produce robust public policy and superior environmental protection.

Transparency: Ensuring there is more data, and that access to that information is open to the public is good public policy.

Scale: We must account for and monitor the myriad matter and energy flows of our oceans. However, we must never use a lack of information as an excuse for continuing with behaviour that may be unsustainable.

Caution: We must act with caution, acknowledging the predictive limits of science.

Maori values must inform management and policy.

Economics: Fundamentally, my aspirations for fisheries rest on a sea change in economic management in the industry. The economic theory that dominates fisheries management has become abstracted from any real idea of the scale – the actual physical volume – of the marine ecosystem. There is an assumption that nature is just one more sector, like agriculture or industry: the neo-classical economic paradigm we work in demands growth in capacity and income, when in fact we live in a finite world where continual growth is impossible.

We have consistently over-estimated the magnitude of the ecological resource, and the effect and scale of human activities on it. Added to this, in spite of the quota management system we have the prevailing attitude that “if I don’t catch that fish, someone else will”. So if you can increase your quota, you will gain, even though the burden of everyone doing this, and over-fishing resulting, will be shared by everyone.

This dynamic has been exacerbated by open and more hidden subsidies from governments. On a global scale, this has resulted in a situation where the UN FAO estimated that in 1989, there were one million industrial fishing vessels working, who collectively lost about $US 50 billion. We may have cut our own subsidies to fishers in New Zealand, but we are still content to go into joint ventures with countries like Japan, which extend credit to their industry to the tune of tens of millions of dollars.

I would like to propose an economics of scarcity, or perhaps, rarity. One which sees the act of fishing, or using the ocean’s resources as a privilege, not merely a right. Regulations are often barely tolerated by the fishing community and management of fisheries is typically aimed to maximise the number of fish caught, allowing little safety margin for assessment error, annual viability in recruitment, or other factors such as El Niño and diseases. Even efforts to establish marginal protection to non-commercial species, seabirds and marine mammals are impeded by industry filibustering, and can take years to implement. The idea of those profiting from the oceans taking full responsibility – that is, including financial liability – for damage to the marine environment and wildlife, including for marine mammal and seabird by-catch, damage from bottom trawling, marine pollution and waste dumping, is still an alien concept.

A sea change is needed. We cannot continue to put into the oceans more than they can absorb, while taking out more than they can sustain. We cannot shape natural systems to suit our economic purposes – the full value of marine wilderness cannot be privatised and monopolised by the highest bidders, given a monetary value and ‘rationally managed’ by the most eco-
nomicallly efficient operators. Equally, we cannot con-
tinue to consume the fruits of the ocean at the rate we
have, and as consumers we all have to question our
own consumption. Banks and financiers must ques-
tion investment in high-risk enterprises, which cause
systematic destruction through bigger ships and in-
creased fish catching technologies. Political leaders
and officials must have the courage to make risk
averse decisions to sustain the oceans, even when they
face strong short-term economic pressures. Fishers
themselves must ask whether they can continue to risk
their own livelihoods and the Earth’s vital oceanic life
support system by over-fishing.

Greenpeace has developed a set of principles for eco-
logical fishing. We would like more debate about them.
They call for a new philosophy for the ocean, which
prioritises the wider public concern for the welfare of
the marine environment, local nutritional needs and
ecological and social stability for present and future
generations of both human and marine life. We call not
for freedom of the seas, but for freedom FOR the seas
—a liberation from the abuse of pollution, nuclear trans-
ports, global climate change and over-exploitation.
Only such a paradigm shift will ensure that future gen-
erations of people will be able to fulfil their own aspi-
rations and expectations from the oceans.
State of the Marine Environment and Marine Ecosystem Indicators

DENISE CHURCH
CEO, Ministry for the Environment

Introduction

Compared to the land environment, our knowledge of the marine environment is fairly limited. Yet a lot of our economic and recreational activity takes place in the sea.

We haul 650,000 tonnes of fish out of it every year. We ship our imports and exports through it. We drill into it for fossil fuels and mineral prospecting. We discharge wastes into it. We swim in it, sail on it and gather shellfish from it. And sometimes we just look at it and marvel.

Most of our major cities and towns are on the coast. All our rivers, large and small, drain into the sea – carrying sediment, fertilisers and animal waste with them. Our rains come from the sea and our drains go to it.

It surrounds us, and yet what happens in that mysterious world beneath the shimmering surface is still largely a mystery to us.

This has been highlighted by the scientific confusion surrounding the mass deaths of sea lions in the Auckland Islands, and the spate of sick bathers and dying marine animals along the Wairarapa and Wellington coastlines. Even if specific pathogens or toxins are identified, we still won’t know how or why they came to hit our marine life in these areas at this particular point in time.

Is it a natural event with some cyclical predictability? Is it a result of the unusually intense El Niño weather that we are currently experiencing? Is it a newly introduced organism, perhaps brought here by foreign ships or by migratory fish or marine mammals? Most importantly, whose job is it to ask these questions? And whose job is it to consider their implications for marine life in general and for our use of the marine environment?

The Department of Conservation has responsibility for protected species, including marine mammals, and shares with the regional councils responsibility for our coastal waters. But beyond 12 miles, whose job is it to care? I don’t have the answers to these important questions, but I do propose a way forward in answering them.

Why should we care? I’ll start with the fundamental question – why should we, or anyone, care about the marine environment? Can’t it take care of itself? Well, the first – the fundamental – answer to that question is an ethical one. Where human activities cause avoidable harm to the creatures of the sea, or to people who use the sea, we have a fundamental moral obligation to minimise that harm.

The second answer is no, the marine environment can’t just take care of itself. Drawing on our recently published environmental stock-take, The State of New Zealand’s Environment 1997, it is clear that human activities cause a range of environmental problems.

Let me give you some examples:

Sewage

Animal waste and human sewage can pass disease-causing bacteria and protozoans which get into water and pose a risk to swimmers and shellfish eaters. The risk is greater for shellfish-eaters because the shellfish are filter feeders which accumulate large amounts of bacteria from the water and become heavily infected themselves.

• A 1995 study compared the symptoms of 3,887 bathers at three different types of beach. All beaches had relatively low bacterial levels, and the overall rate of pollution and illness was low by international standards. Nevertheless, small, but statistically significant differences were found. Those who spent more than half an hour in the water at either the rural or town beaches had a slightly higher rate of stomach bugs and chest infections. Paddlers at the town and rural beaches had a slightly higher rate of chest infections, but not of stomach bugs. Those at the ideal beaches, and those who stayed out of the water at all beaches, had no increase in
rates of illness (Bandaranyake, et al. 1995).

• The ministry’s analysis of regional council data for the state of the environment report found that, in general, coastal swimming areas have better water quality than many river sites. However, coastal water near river mouths, in some harbours and estuaries, and near outfall pipes is unsuitable for shellfish gathering (e.g. Wellington’s Moa Point), and in rare cases (e.g. the Whanganui River estuary) may be unsuitable for bathing.

Nutrients
Nutrient enrichment of coastal areas from land-based sources is likely to be significant. The impacts of this are largely unknown in coastal water, but recent blooms of sea lettuce (a native seaweed) in Tauranga Harbour, have been attributed to increased nutrient inputs in combination with other factors such as favourable substrate, and temperature (Hawes, 1994).

The outbreak of toxic algal blooms may also be partly nutrient-related. In recent years, these blooms have become a recurrent problem in some coastal areas.

Algal Blooms
Toxic algal blooms first came to New Zealand’s attention in the early months of 1993. By May the final tally of human poisonings had risen to 187. Environmental effects were also reported, though not all could be definitely attributed to toxic algae. From Northland to Southland, dead shellfish, gulls, shags and little blue penguins were found washed up on the shore.

• The culprits were a spate of ‘algal blooms’ in our coastal waters. The prime offender around the upper North Island was a species of dinoflagellate called Gymnodinium breve. Extensive blooms of other toxic algae, including species from another dinoflagellate genus, Alexandrium, were found around the lower North Island and off the north, south and east coast of the South Island.

• Many theories were put forward to explain the sudden surge of toxic blooms. Some blamed ballast water discharged from foreign ships since the toxic species had not been identified in these waters before. Others argued that the algae may have lain here unnoticed all the time and that their sudden blooming was caused by the unusual weather conditions associated with El Niño. Whatever the explanation, the crisis was not an isolated event and they seem to destined to recur whenever temperature and currents are favourable.

Disposal From Boats
Waste disposal from boats is a problem in some areas, such as harbours supporting dense populations of pleasure craft. It can also be a problem in fishing waters. In 1994, for instance, the Tasman Bay oyster fishery had to be closed because of raw sewage discharges from Russian trawlers which were not covered by New Zealand regulations.

Oil
Oil spills are also a frequent problem. Around 100 oil spills a year are reported to the Maritime Safety Authority. Most are small spills, but some are larger than a tonne, and the risk is always present of even larger spills.

Litter
Non-biodegradable litter (e.g. plastic bags, wrappers, strapping and containers, aluminium cans, glass bottles, wire, synthetic ropes and nets) is a widespread problem, particularly near large urban areas.

• Plastic items are by far the most common. The steady build up of plastic litter on the sea floor can inhibit gas exchange between sediments and overlying waters, thereby reducing oxygen levels and killing organisms that normally dwell there. Plastic items can also entangle or be swallowed by marine mammals, seabirds and turtles. In fact, they may be a greater cause of death among the world’s marine mammals than oil spills, heavy metals, or other toxic materials. Plastic bags were found in the guts of three rare whales which stranded on the New Zealand coast in 1994, and Department of Conservation staff at Kaikoura get 20 to 30 call-outs each year to seals caught with plastic strapping around their necks.

• Although boats are an important source of marine debris, a study of Auckland’s stormwater discharges found that 28,000 pieces of litter per day, or over 10 million items per year, mostly plastic, pour from Auckland’s stormwater drains into Waitemata Harbour. This does not include small plastic granules which escaped the survey nets.

• Beach surveys in Auckland and Canterbury have found that marine litter increases near cities, confirming that stormwater is a major source. Compared with many other countries, New Zealand’s marine debris contains less plastic and more cardboard and paper, fewer bottles, but more food containers and wrappers, less boating waste and sewage waste, but more plastic
sheeting and strapping. It is predicted that, as coastal populations increase, marine debris is likely to worsen.

**Sediment**

Sediment washed down from eroding hillsides and riverbanks is believed to be having an impact on the water and marine life of harbours and estuaries. There is a natural base level of erosion in many New Zealand catchments, even under forest. However, accelerated erosion in farmed catchments is well-documented and sometimes leads to catastrophic sediment dumping by flood waters, as happened with Cyclone Bola in 1988.

- In the South Island, the loss of reef sponges, kelp forests, weed beds, and the disappearance of fish nursery grounds has been linked to increased coastal sedimentation. The disappearance of seagrasses in harbours and estuaries has also been attributed to declining water clarity, which is caused by sedimentation.

These examples all relate largely to our coastal waters. But most of the ocean around New Zealand is pelagic. Very little is known about the impacts of human activity out there. However, we can identify a number of environmental risks.

**Fishing-related Risks**

These fall into two broad categories:

1. Depletion of target species; and
2. Impacts on non-target species through both by-catch and dumping of fish waste.

- Stocks of several target species have been depleted and are now being allowed to recover (i.e. snapper, orange roughy, rock lobster).
- Protected non-target species killed by fishing activities include: seabirds, sea lions, fur seals, Hector’s and common dolphins. Other by-catch species include many marine invertebrates and non-commercial fish species. Some fisheries scientists have expressed concern that invertebrate communities on all our deep water seamounts have probably been hit by trawlers.
- Furthermore, approximately 45 per cent of the total fish catch is waste material, much of which is thrown overboard. For example, some 50,000 tonnes of hoki offal are dumped into the sea each year by vessels fishing on the continental slope off the South Island West Coast. This has raised concerns that the decomposing waste could locally deplete oxygen levels. A preliminary assessment confirmed that enough waste reaches the sea floor to alter the species composition.

**Marine Installations**

Drilling and the building of installations can disturb the marine environment in several ways. The seafloor and organisms living on it are disturbed. Marine traffic and the potential for oil spills also increase around the drilling operation. These can have impacts on marine mammals and seabirds.

- On the positive side, however, the hard attachment surfaces provided by oil rigs and other fixed installations can actually lead to a profusion of sessile marine invertebrates, such as corals. The same is true of scuttled ships.

**Climate Change**

Global climate change (driven, at least in part, by human-generated greenhouse gas emissions) appears to have driven a 0.7 per cent increase in ocean temperatures around New Zealand – and a 15 cm increase in sea level – in the past century or so. The ecological effects of such changes are unknown, but may result in redistribution of fish, invertebrate and marine mammal populations.

In summary, a variety of human-induced pressures are known to have impacts or potential impacts in our waters. What isn’t known is the extent and magnitude of these impacts. To that end, the ministry is attempting to coordinate the development of national marine environmental indicators.

**Environmental Indicators**

MfE is currently developing a comprehensive suite of indicators for assessing the state of the environment and measuring progress towards implementing the E2010 strategy.

- Indicators are management tools. They summarise data on complex environmental issues to indicate the overall status and trends and to signal issues to be addressed through policy interventions and other actions. A good indicator should be policy relevant, analytically valid, cost effective, and simple and easily understood.
- We aim to have a core set of indicators in place by the turn of the century so that the environment can stand alongside economic and social considerations in the development of sound policy and laws. Development of marine biodiversity indicators will be coordinated by MfE in 98/99.
• Some aspects of marine biodiversity were covered in indicator workshops last week. These workshops dealt with coastal and estuarine indicators and fisheries indicators. A second two-day workshop will be held at the end of March for coasts and estuaries and fisheries to identify indicator options, recommend potential Stage 1 and 2 indicators, and discuss monitoring and reporting frameworks. The outcomes from these workshops will be a discussion document to provide a basis for consultation. Stage 1 fisheries indicators should become operational by the year 2000.

At this point the work on marine environmental indicators is divided into three major strands:

• Coasts and estuaries: mean high water springs to territorial sea inclusive of the coastal environment defined as “coastal land undefined, but generally land in which the coast is a significant part or element”. Key topics in this area are seen to be sedimentation and sediment quality, water quality, aquaculture impacts, natural character and ecological processes, and habitats.

• Fisheries: mean aquatic environment to extent of EEZ (200 miles offshore). Key topics: fisheries sustainability for commercial, customary and recreational harvest stocks; by-catch (fish and non-fish); fisheries impacts; fisheries habitats; human use and values.

• Biodiversity: covering aquatic life between high water springs out to the EEZ. Key topics include: genetic diversity; population and species diversity; community and ecosystems and seascape diversity (including invertebrates, diadromous fish, marine mammals and seabirds).

The separation of indicator development into strands is to ensure manageable chunks. However, there are many links among the strands and a challenge is to make sure the links are maintained as the indicators are developed (e.g. fisheries and the coasts and estuaries, fresh water, marine biodiversity, pollution and waste, climate change, pests, weeds and diseases).

**Conclusion**

In summary, there is much we don’t know about the marine environment, its ecosystems and its resources.

Yet, from the little we do know, it is clear that human activities have the potential to cause environmental problems. Assessing these problems and then dealing with them are the two main challenges that we face.

Although many different organisations are responsible for particular aspects of the marine environment, no one has responsibility for “the big picture”. Territorial waters are subject to the environmental sustainability provisions of the Resource Management Act, but the waters and seafloor beyond the 12-mile limit are subject to no guiding philosophy or policy.

The way forward, I suggest, is:

1. (1) To improve our knowledge of the marine environment through systematic monitoring of indicators; and
2. (2) To harmonise responsibilities and duties by extending the ethic of environmental sustainability to the entire Exclusive Economic Zone (EEZ) and continental shelf. Of these, (1) is being achieved through the development of a set of national indicators for the marine environment. This work is being led by the Ministry for the Environment and is the subject of a workshop at this conference on Saturday morning. I urge you all to attend it.

As for (2), accepting the need for a harmonised approach to marine environmental management, I ask YOU to consider is how might that best be achieved? Through legislative changes? A national policy statement? Voluntary accords or memoranda of understanding? Or simply better education about the effects of human activity on the marine environment?
Identifying the Effects of Fishing on Marine Communities

Simon Thrush
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Abstract
A series of predictions tested in the Hauraki Gulf provide evidence that dredging and trawling cause broad-scale changes to seafloor ecology. Perhaps the most important of these are increases in biodiversity and in the density of large animals living on the surface of the seafloor with decreasing fishing pressure.

The research also showed that 15 – 20 per cent of the variation in the composition of the seafloor community was attributable to habitat disturbance by trawling and dredging. This study provides strong evidence that fishing does cause broad-scale changes to seafloor communities by decreasing biodiversity and habitat complexity.

These findings are discussed in light of the need to assess the effect of fishing on marine ecosystems and develop management strategies to ensure ecologically sustainable fisheries.

Introduction
In this paper, I will focus on identifying broad-scale changes in seafloor communities and prioritising effects. The need to identify the ecological effects of habitat disturbance by fishing on seafloor animal communities emphasises how good information is necessary for wise resource management. Scientific information relevant to resolving management problems is especially important in the marine environment because these ecosystems are complex.

There are three ways in which science can help manage coastal resources. Firstly, there are the specific problems of today where focused research is needed to provide answers. Secondly, scientific information and expert opinion can be used to assess and prioritise risks to the environment. Thirdly, there are the environmental issues of the future. It is important we remember that many of the important environmental issues of today (e.g. environmental effects of pesticides and global warming) were not discovered by focused, outcome-orientated research programmes.

The fishing industry is the major industry that is utilizing marine resources, but we do not have a detailed understanding of the environmental costs of its activities. Luckily this is changing, but the current knowledge base is in stark contrast to our knowledge of the environmental effects of land-based industries that directly use the marine environment for waste disposal or indirectly release substances into it. This is especially surprising because we rely on natural productivity and ecosystem function to sustain our fisheries resources. A far higher level of assessment of environmental costs can be expected under the 1996 Fisheries Act (e.g. see Ministry of Fisheries 1996).

Studies of the disturbance of seafloor dwelling animals caused by fishing gear being dragged across the seafloor are increasingly reported in the scientific literature (e.g. see Dayton et al. 1995, Auster et al. 1996 for general reviews and Thrush et al. 1995 as an example from New Zealand). Studies such as that described in Thrush et al. (1995) are experimental and identify effects at the scale of an individual tow. However, in most fisheries not all areas of the seafloor will be swept by fishing gear, and some areas will be swept more frequently than others. This variation in the frequency and intensity of disturbance combined with the broad-scale variability in habitats means that we may over-estimate effects if we simply extrapolate from small experimental studies.

So an important question to address is how do we identify any broad-scale effects? In an ideal world
we would have a series of large areas that are identical in every way, half of these areas would be fished and the others would never be fished. We would then compare time-series samples of the range of animals living on the seafloor from fished and unfished areas and attribute any differences to fishing. Of course we cannot do this, areas that can be fished and areas that are not fished are usually different in some way. Most of the world’s commercial marine fisheries on continental shelves are fully exploited, in fact many are declining (FAO 1995, FAO 1997). This emphasizes the extent of the area fished and the difficulties of finding adequate control sites. But it must also be remembered that simple comparisons can be difficult to interpret because of the natural variability of ecological systems. For example, basic ecological research suggests that the same kinds of event can have different ecological consequences depending on habitat type (e.g., Thrush et al. 1996, Thrush in press a). Natural ecological systems are variable in space and time. This variability is important for natural ecosystem functioning, but it can make it difficult to isolate human-induced changes from natural variability. This is particularly true where the changes that humans can cause occur over a large area and accrue through time. An important challenge for environmental scientists is to develop an understanding of this natural variation rather than treating it as a nuisance that obscures our ability to identify causal relations. If we do not develop such techniques all we will be able to do conclusively is document catastrophes. Long-term or broad-scale and cumulative impacts are hard to manage and study. But analysis of environmental risks emphasises the need to wisely manage these problems.

Based on general ecological disturbance theory and the results of the fishing disturbance experiments we can make some predictions about the kinds of changes to seafloor communities we would expect along a gradient of decreasing habitat disturbance by fishing (Table 1). Then, using some modern statistical techniques we can test our prediction against field data.

The Study

To test the predictions given in Table 1, samples of seafloor communities were collected from a number of sites in the Hauraki Gulf. A full description of this study is presented in Thrush et al. in press b. The Hauraki Gulf was chosen for logistic reasons and cost-efficiencies not because the fisheries in this area were thought to be particularly intensive or disruptive.

Legislation restricting the use of different gear types and information provided by the local fisheries managers was used to create a ranking of sites of decreasing habitat disturbance. The animals on the seafloor at these sites were sampled in three ways:

- Video surveys of the large animals on the sediment surface;
- Grab and suction dredge samples of the large animals living in the sediments that are larger than two millimetres diameter;
- Core samples of the small and abundant animals that live in the sediment that are larger that 0.5 mm in diameter.

After collection of the samples, the animals were sorted, identified and counted. As well as sampling the animals that lived on the seafloor, we also measured a number of environmental parameters that are usually important in influencing community composition

<table>
<thead>
<tr>
<th>Decrease</th>
<th>Increase</th>
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<tr>
<td>Scavengers</td>
<td>Species diversity</td>
</tr>
<tr>
<td>Deposit feeders</td>
<td>Long-lived near surface dwellers</td>
</tr>
<tr>
<td>Small opportunists</td>
<td>Echinoderm density</td>
</tr>
<tr>
<td>Polychaetes/molluscs</td>
<td>Total number of individuals</td>
</tr>
<tr>
<td>Small/large individuals</td>
<td>Surface dwelling animals</td>
</tr>
</tbody>
</table>

Table 1: Predicted changes in benthic communities along a gradient of decreasing habitat disturbance
and which varied widely over the range of sampled sites. These included sediment grain size, organic content, and water depth. We then analysed this data, to test our predictions using generalised linear modelling. When the statistical model demonstrates that fishing was an important factor we can see if the prediction was right or wrong. If fishing pressure does not appear to be an important factor at the end of the statistical modelling processes it may mean that fishing pressure is not important, or just as likely, that we have not collected enough data, in other words at this stage we can not tell. A summary of the tests of the predictions using the statistical modelling procedure are presented in Table 2.

As well as testing individual predictions, multivariate analysis of the entire seafloor communities was performed; this was based on either the core or grab and suction dredge data.

<table>
<thead>
<tr>
<th>Prediction</th>
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<td><strong>Core data</strong></td>
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<td>Decrease scavengers</td>
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<td>Decrease deposit feeders</td>
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<td>Decrease small opportunists</td>
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<td>Decrease polychaetes/molluscs</td>
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<td>Decrease small/large individuals</td>
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<tr>
<td>Increase species diversity</td>
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<tr>
<td>Increase long-lived near-surface dwellers</td>
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<td>Increase echinoderm density</td>
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<td>Increase total number of individuals</td>
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<tr>
<td><strong>Grab and suction dredge data</strong></td>
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<td>Decreases scavengers</td>
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<td>Decrease deposit feeders</td>
<td>No</td>
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<tr>
<td>Decrease polychaetes/molluscs</td>
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<tr>
<td>Increase in surface dwelling animals</td>
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<td>Increase species diversity</td>
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<td>Increase long-lived near-surface dwellers</td>
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<td>Increase echinoderm density</td>
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<tr>
<td>Increase total number of individuals</td>
<td>Yes</td>
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</tbody>
</table>

**Video data**

| Prediction                                      |       |            |
| Increase in surface dwelling animals            | Yes   |            |

Table 2: Predicted changes in benthic communities along a gradient of decreasing habitat disturbance
suction dredge data. This type of analysis is often used to identify pollution gradients or impacts in seafloor communities around outfalls, oil platforms and dredge disposal sites. After accounting for the influence of environmental variation, 15 per cent (core) and 20 per cent (grab/suction dredge samples) of the variability was attributed to fishing. I think this is ecologically significant – especially considering the broad scale over which the survey was conducted.

Conclusions from this Study

The approach briefly described here (see Thrush et al. in press b for detail) provided a way of assessing the broad-scale changes in seafloor communities that can be attributed to habitat disturbance by fishing. This approach should be used and tested in other areas. A major improvement for the technique could be achieved if information defining the actual location and frequency of contact of different types of fishing gear with the sea floor were readily available.

The potential importance of changes in benthic communities due to habitat disturbance by commercial fishing is often discounted because impacts have not been well documented. This study provides strong evidence that fishing is changing seafloor communities, in particular by decreasing biodiversity and habitat complexity. Evidence for the predicted changes in the larger macrofauna collected by the grab/suction dredge sampling was not so strong, but I suspect this is due to lower sample size.

The predictions tested have important ecological ramifications for changes in the structure and function of seafloor communities. The removal of organisms that add three-dimensional structure to benthic habitats (e.g. sponge gardens, horse mussel and bryozoan beds) is potentially extremely destructive, as is the homogenisation of sediment characteristics by the physical action of dredges and trawls. Both effects reduce spatial heterogeneity over a range of ecologically important scales. We have yet to really understand the implications of these changes to the natural functioning of coastal seafloor communities and the sustainability of demersal fin- and shellfisheries. For example, the habitat complexity provided by large animals that live on the sediment surface is likely to be important in providing settlement surfaces and nursery areas. Studies conducted overseas have demonstrated these relationships can occur, but we need to gather information for New Zealand’s commercially exploited species to assess its significance in population stability.

Resource Management

Current concerns about sustainability, ecosystem management, and the maintenance of biodiversity emphasise the need to assess and manage the environmental impact of commercial fisheries. When both conducting and interpreting such studies, it is important to remember that marine environments are dynamic and complex, the knowledge base is small, and many changes are not noticed until it is too late for a rigorous demonstration of cause and effect. Often observations are at the wrong scale to identify connections between exploited species and habitat features. It is important that we advance our knowledge of these issues and this will depend on the successful blending of fisheries management and marine ecology.

The research described in this paper demonstrates a significant relationship between regional scale changes in macrobenthic community structure and habitat disturbance by commercial fishing. However, unequivocally linking structural changes to changes in ecosystem function is difficult. This is an important aspect for future research. Nevertheless the weight of evidence should be of concern to resource managers. There are management strategies that could be employed that will provide some safeguards for these seafloor ecosystems.

The precautionary approach to environmental and fisheries management has been emphasised in the Resource Management Act and Fisheries Act. This approach emphasises gathering appropriate information to identify changes in marine ecosystems over broad spatial and temporal scales to reasonably assess environmental risks to the sustainability of the ecosystem and fishery resources. It is important that both resource users and managers become proactive about gathering appropriate data to enable risk assessment. A sustained commitment to data collection is necessary if we are to determine appropriate time scales over which to assess effects. This will help us to objectively weigh social and economic demands against the biological constraints within which a sustainable fishery must operate.

Adaptive management strategies enable management by experimentation, provide the opportunity of monitoring of effects on ecosystems and provide feedback to management and resource users. With a sustained commitment by managers, resource users and scientists, this approach would allow predictions of ecological effects to be tested and much needed information on large-scale effects would be gained.
As a prudent insurance policy, a series of appropriately-scaled Marine Protected Areas or Fisheries Reserves would protect against poor decision making and provide some control against which to assess changes due to fishing. Recent studies indicate that, for many coastal fish stocks, fisheries reserves could well provide a huge benefit to coastal fish stocks (Roberts 1997). Most importantly, they provide signposts of broader scale changes which may otherwise be inadvertently attributed to fishing and very importantly provide a reservoir of broodstock and biodiversity. However, while marine reserves can protect seafloor habitats and protect the more sedentary species, they are not an appropriate management tool for highly mobile pelagic species.

The problems faced in generating information for the development of ecologically sustainable fisheries are also relevant to dealing with many chronic and cumulative problems. For example, the increasing rate of sediment inputs to our harbours and estuaries. Once predictions of large scale effects have been made (e.g. impact statements and environmental assessments), appropriately designed and cost-effective surveys must be used to test predictions about the large-scale human impacts.

However, understanding large-scale effects is not simply a case of conducting large-scale surveys, much of the information concerning large-scale effects comes from an understanding of natural history and fine-scale details. This basic information is difficult to obtain and often requires intensive and long-term research efforts, but it is essential. We need to keep in mind the cost/effort balancing act which requires trade-offs between confidence and generality. This determines whether too much emphasis is placed on certainty (leading to more and more being known about less and less) or on generality (leading to less and less being known about more and more).

For many large-scale environmental problems, conclusions need to be reached despite the lack of adequate controls. It is important to realise that conclusively identifying cause and effect relationships in the traditions of experimental science will not often be feasible because the necessary comparisons will not be available. The approach described here could be used to provide relevant information.

**Conclusion**

Our data provide evidence that the fishing industry needs to first recognise these environmental impacts and then act decisively to reduce and mitigate them where appropriate. This broadening of perspective to include ecological effects is important, not only as changes to the ecology may affect other resource users, but also because fisheries are sustained by natural productivity and adverse environmental effects may feedback to influence the sustainability of fisheries resources.

Sustaining this industry while conserving marine resources, will be a major challenge for fishers, fisheries and resource managers and ecologists.

**Acknowledgments**

I would like to thank the conference organisers for providing the opportunity to discuss this research with such a diverse audience. This research was funded by the PGSF (FRST – CO1502). It would not have been possible without the support and dedication of my NIWA colleagues J. E. Hewitt, V. J. Cummings, M. Cryer, S. J. Turner, G. A. Funnell, R. G. Budd, C. J. Milburn and M. R. Wilkinson.

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Achieving the Preferred Future for our Ocean Ecosystems

TREVOR J. WARD
CSIRO Division of Marine Research, Perth

Abstract
The existing ways in which we manage our ocean ecosystems are, broadly speaking, not likely to be useful in the future. Many are based on a poor understanding of the way in which ocean ecosystems function, and most are unable to cope with our new levels of awareness about the fragility and values of the oceans.

New approaches to management will need to be more integrated, more inclusive and consultative, and to have a broader base to ensure that the full range of ocean values is maintained in the future. In particular, the sustainable use of ocean resources will need to be evaluated using criteria that focus on the integrity of ocean ecosystems.

In Australia, a form of ecosystem-based management termed Integrated Regional Ocean Management (IROM) has been proposed as the guiding framework for management of Australia’s oceans and estuaries. Integrated Regional Ocean Management is defined as management framework that is spatially-based, hierarchical and inclusive, focussing on accommodating human uses that are consistent with the maintenance of ecosystem integrity while maintaining the human values attributed to ocean ecosystems. The central organising principle is the process of establishing comprehensive and agreed quantitative management objectives for the natural values (such as biological diversity) attributed to each spatially-defined ocean management unit. These ‘operational’ objectives are used as the basis for defining environmental performance indicators, and as the basis for continuous improvement.

In practical terms, actions are needed to:

- Design spatially-based and inclusive management arrangements that can effectively integrate and coordinate activities to ensure that resources are used equitably that management objectives for ocean ecosystems are achieved;
- Establish agreed objectives for natural values such as biological diversity;
- Develop the appropriate monitoring, evaluation and reporting activities for each management unit.

Ecosystem-based management is likely to be the most effective way for conservation objectives for ocean ecosystems to be well-defined, appropriately evaluated, successfully-achieved and to be sustained in the long term.

Preface
“In the beginning, God created the heavens and the earth. And the earth was without form, and void, and darkness was on the face of the deep.”

From that zero base God built up a budget that was His master plan for the earth.

On the first day He created light. This was a debit to the asset account, and a credit to equity.

On the subsequent days He created the land, the seas, the sun the moon and the stars, and all living creatures, all of which increased the assets and equity of the earth.

In this way, the opening balance sheet was formed. Then God created Man to fulfil a stewardship role.
“to replenish the Earth... and have dominion over the
fish of the sea, and over the fowl of the air, and over
every living thing that moveth upon the Earth”.

However, Man was not an imaginative accountant,
and having been given the opening balances, was con-
fused by the debit and credit entries necessary to ac-
count for the self-generating and regenerating assets
which had been entrusted to him. So he consulted his
financial advisor – the Serpent – to see how he could
manage these with the greatest personal gain for the
least amount of effort.

One day, the Serpent introduced Man to leverage. Ser-
pent explained that if he was to consume the Earth’s
non-regenerating assets as well as the regenerating
ones, he could, by making simple entries to a ‘liabili-
ties’ account, increase both his consumption and total
assets. This was very appealing to Man, particularly
as the Serpent offered to do the necessary accounting
for a very small share of the additional assets.

Man was then able to invent technology, and by con-
verting and consuming the natural resources that God
had provided, was able within a very short period to
manufacture exciting man-made assets, such as mo-
tor cars, industrial machinery, and electronic equip-
ment. Later, using additional leverage, he was able to
make even more attractive assets, such as nail polish,
telephone cleaning cloths, pesticides, and nuclear
bombs. His manufactured assets continued to grow,
and the annual reports produced by the Serpent as-
ured him that he was a going concern.

The balance sheet revealed a wonderful array of as-
sets, which the Serpent now classified into two catego-
ries: natural and manufactured. Man was particularly
proud of the ones he had made himself, and wanted to
convert more and more of his assets into this category.

So the Serpent introduced Man to the futures market.
It taught him that by taking a small quantity of assets
such as timber and metal ores, and leveraging the ben-
etit through the use of ‘free goods’ such as clean air or
clean water, the returns measured by growth in manu-
factured assets could be exponential. And, the Serpent
showed Man a neat accounting trick. By disclosing the
pollution produced from this process as ‘contingent li-
bilities’ the equity could remain intact, and God, the
main shareholder, would be none the wiser.

But one day God took a stroll in the garden.

He saw that the natural resources over which he had
given Man stewardship had been depleted and misused.
Whole forests were destroyed, species extinct, degra-
dation was upon the land, and slicks on the waters.

God then called on Man to be accountable for what he
had done. The Serpent writhed away, and Man was left
to balance his own books.

Try as he might he could not balance the assets such as
cars, computers and bombs that he had made with the
liabilities of pollution that he had caused. And the natu-
ral assets he had inherited were degraded and could no
longer regenerate.

As Man laboured over the balance sheets, it became
obvious that his liabilities were many times larger than
his assets. And the equity was gone.

So, finally, God moved in and liquidated Man

(Liberally extracted from God created the accountant,
and the earth was without forms, and avoidance... by
Kathy Gibson, University of Tasmania; published in the
February 1996 edition of the Australian Accountant.)

Introduction

The oceans may well be the cradle of life, but, under
common law, unless otherwise specifically limited, the
ocean’s resources are owned by all. The access to those
resources is free and is a right for individuals, yet the
responsibility for the management and well-being of the
resources is not assigned and is assumed to be shared.

We might also ask ourselves, what is wrong with
business as usual? After all, the fisheries are now
sustainable, the coastal developments and mining are
specifically approved by governments, coastal pollution
is now controlled by catchment management pro-
grammes, and, above all, we have adopted the highest
standards of business efficiency based on world-
class business principles. And, we have marine reserves.

When a problem surfaces that needs fixing, it gets fixed.

So, perhaps, we are on track for a steady and continual
improvement, and the ocean baby is in good hands.

Regrettably, the vital signs that we might use to judge
how healthy our oceans are suggest otherwise. The fish-
ing isn’t what it used to be, algal blooms are much more
frequent and severe than ever before, and conflicts over
uses of coastal areas and ocean resources seem to be
increasing, not decreasing. And worse, the more we
learn about the oceans, the more it seems that we don’t
understand what we need to know to be able to be sure
that the baby is in good hands, and in good health.

Recent analyses of ocean ecosystems, using what lit-
tle we do know, indicate that their integrity is either
unknown, poorly known or is declining (e.g. Australia State of the Environment 1996). For estuaries and coastal ecosystems the messages are clearest, suggesting that many areas have declined, and some are continuing to decline. It is therefore obvious that the approaches we have used to manage marine ecosystems, and particularly the conservation and sustainable use of their living resources, will not serve us well in the future because they do not cope with our new understanding of the values of the oceans and the increasing pressures that we will place on ocean ecosystems in the coming decades. The development of all-powerful new technology in the resources sectors, the changing cultural and business-driven climate in which we now live, the growing public awareness of the fragility of ocean ecosystems, and the growth and increasing expectations of human populations, mean that new ways of managing the oceans must be found.

We also now know that marine ecosystems are not static – or at least they are probably not at equilibrium for very long – and there are many processes that affect the oceans that operate over very long time scales, on the order of decades and centuries. In addition to the cultural, spiritual and traditional uses and values of the oceans, we now also know that the oceans may hold molecular treasures that could be used to inspire modern microbial counter-measures to defeat human diseases, both present and future.

In short, although our knowledge and awareness goes far beyond that of our ancestors, so too do our needs and aspirations for the oceans and their resources. So, as we try to establish the parameters for our stewardship of the oceans into the next millennium, we need to consider carefully the way in which we will use, defend and promote the oceans and their life. The simple, sector-based, cash-driven, and (typically) static management approaches of this century must now be transformed to incorporate our new demands for genuine sustainable use of ocean resources into management arrangements that are consistent with the effective conservation of the ocean’s biological diversity.

Using IROM

Generally speaking, existing ocean management arrangements are fragmented, and lack a strategic and integrated approach to the conservation and management of the ocean’s biological diversity. To have effective and accountable oceans management, a major shift from the present sectoral-based management is required. New ocean management arrangements must include overarching comprehensive objectives for biological diversity applied in an integrated manner. If we fail to develop integrated management arrangements we risk continuing on with the present array of fragmented activities, and this will, and is, leading to a gradual deterioration of the ocean’s ecosystems.

Sectoral-based arrangements are typically focussed on the primary concerns of their sector, be it mining, fishing, coastal development, tourism, defence, or a range of others. This focus may serve the industry sector well, by maintaining or increasing production, but it does not encourage sectors to adequately account for their incidental impacts on non-target biological diversity. In effect, they do not value elements of the oceans that are non-exploitable, and in economic terms, their effects are environmental costs that are externalised – a cost to the environment that does not show on their balance sheets and is not reflected in the price of the product. Some sectors have adopted management arrangements to ensure that there is coordination between different sectors, such as minimising commercial fishing effort in some areas of high tourism activity. However, typically these arrangements perhaps can be best categorised as coordination to minimise inter-sector conflicts, and fall far short of integration.

New approaches to management of marine ecosystems are based on the principles of ecosystem management, otherwise known as ecosystem-based management. These principles reflect the need for an integrated and holistic approach to management of oceans and estuaries, and are based on the concept of managing to maintain ecosystem integrity. Ecosystem-based management for marine ecosystems explicitly recognises that a multiplicity of uses must be accommodated in meeting important economic, social and cultural goals provided that, either singly or in combination, they do not degrade or threaten ecosystem integrity (Grumbine, 1994).

Integrated ecosystem-based management will provide for comprehensive local, regional and national-scale conservation of marine biological diversity within the context of efficient and accountable management of the ocean’s wealth. The principles underlying ecosystem-based management are perhaps best conceptualised in the emerging working definition: “Ecosystem management integrates scientific knowledge of ecological relationships within a complex socio-political and values framework toward the general goal of protecting native ecosystem integrity over the long term” (Grumbine, 1994). The goals of ecosystem-based management may be summarised as to:
**Control** – methods to regulate the activities of people, such as legislation, non-statutory tools, standing orders and operating procedures.

**Organisation** – establishment of administrative structures, memoranda of understanding and other cooperative arrangements between and within governmental and non-governmental bodies with the aim of integrating management over an appropriate region (e.g. total catchment management programmes).

**Planning** – details of current and future uses of the environment; plans, schedules and procedures for controlled use of the environment; explicit strategies for altering activities if undesirable changes are detected (includes plans for amelioration or remediation); integration of plans across an appropriate region.

**Implementation** – resourcing for control, organisation, planning and monitoring, which includes funding, administration, management and supervision.

**Monitoring** – detecting changes in the environment, auditing activities subject to managerial control and disseminating the results of these actions in order to provide a basis for adapting management according to the functioning of the managed system, assess the effectiveness of management strategies and display accountability.

**Stakeholders** – people, organisations and governments who have an interest in the process of management or its outcomes.

**Figure 1. A management framework (after Jacoby, 1994)**
• Maintain viable populations of all native species *in-situ*;
• Represent, within protected and managed areas, all native ecosystem types across their natural range of variation;
• Maintain evolutionary and ecological processes;
• Manage over periods of time long enough to maintain the evolutionary potential of species and ecosystems;
• Accommodate human use within these above constraints.

Ecosystem-based management also has a number of important functional attributes (after Grumbine, 1994), it:

• Operates across the complete hierarchical context of biological diversity (genes to ecosystems) in an attempt to maintain a ‘systems’ perspective;
• Operates within ecological boundaries at a variety of natural scales, and as needed across geo-political boundaries and scales;
• Has as its major target the concept of maintaining ecological integrity – managing to maintain natural genes, species populations, habitats, and ecosystems, and the ecological patterns and processes that maintain this diversity;
• Is based on monitoring appropriate indicators to provide feedback on ecosystem structure and function in response to management settings;
• Is adaptive;
• Promotes inter-agency cooperation, organisational change, and capture of improved data and knowledge about ecosystems;
• Promotes the concept of human uses in harmony with managed ecosystems;
• Recognises that human values play a dominant role in establishing ecosystem management goals.

Adoption of an ecosystem management framework for the oceans implies the need for “a reasonable understanding of the physical and chemical environment and the biological species which describe an ecosystem, plus an understanding of the interactions among and between the species complex as well as their environment” (Harden Jones, 1994).

Ecosystem-based management uses signals from the ecosystem in the process of management, and ensures that human activities can be managed in the light of the feedback from the ecosystems about both the intended and unintended consequences of resource exploitation or other uses of the oceans (Figure 1). Ecosystem-based management also recognises that humans are central players in ocean ecosystems, and that management can only realistically control the human activities, not the ecosystems themselves.

To meet regional and national objectives for management of biological diversity through ecosystem-based management approaches, several key management activities need to be linked and coordinated at the regional scale. In particular, management needs to be integrated so that the contributions of sectors and local activities to the regional biological diversity goals are explicit and accountable.

Integrated Coastal Management (GESAMP, 1996) was developed as a national approach to coastal-zone management across various levels of government. It attempts to integrate the planning, control and evaluation activities of management, using, to some extent, the principles of ecosystem management, and provides an appropriate approach for regional and provincial management of a nation’s oceans.

Integrated Regional Ocean Management, adapted from Integrated Coastal Management, has been proposed for application to the whole of Australia’s marine jurisdiction, based on a suitable set of regions. This form of ecosystem-based management involves nested sets of management arrangements that are embedded within a consistent national (or broader) framework (Ward et al. 1998). In Australia, it has been proposed that these regions would be set within a smaller number of broad-scale provinces that cover our complete marine jurisdiction. The spatial framework would be based on an agreed classification of regional ecosystems – the Interim Coastal and Marine Regionalisation for Australia (Figure 2). Ultimately, each region would also have within it a set of finer scale sub-regions, each of which may be the size of an individual small bay or estuary.

To be fully effective, the ‘grain size’ of these finest spatially-defined management units will need to be coherent with the ‘human scale’ – the scale at which interested local stakeholders can comprehend the issues consistent with day-to-day activities.

The Integrated Coastal Management approach is used as the basis for Integrated Regional Ocean Management to explicitly include local and regional conservation objectives in a consensus-planning approach to management of local, regional and national biological
diversity. This will provide for comprehensive local, regional and national-scale conservation of marine biological diversity within the context of efficient and accountable management of the ocean’s wealth. The success of the Integrated Regional Ocean Management framework will be critically dependant on its capacity to be fully inclusive and comprehensive in involving all stakeholders with a vested interest in the oceans.

As with all effective management arrangements, the performance of Integrated Regional Ocean Management must be assessed using a defined set of objectives. In the case of marine ecosystems, the performance assessment must be based on objectives that are framed in terms of measurable elements of the biological diversity and other elements of the environment, and assessed using agreed criteria.

In Integrated Regional Ocean Management environmental indicators are the measurable entities that act as surrogates for the integrity of ecosystems, habitats, or species, and that are used to assess the performance of marine management in terms of the defined objectives (Table 2).

<table>
<thead>
<tr>
<th><strong>Ecosystem Objectives</strong></th>
<th>Operational objectives are established for all ecosystem values, defined on a spatial basis, and nested within a spatial hierarchy.</th>
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</thead>
<tbody>
<tr>
<td><strong>Surrogates</strong></td>
<td>Surrogates are quantities related to biological diversity or other ecosystem values, but are more easily measured or more readily available than the value itself.</td>
</tr>
<tr>
<td><strong>Indicators</strong></td>
<td>Indicators are surrogates that are used to assess the performance of a management programme, plan or action that is directed towards an ecosystem objective.</td>
</tr>
<tr>
<td><strong>Criteria/Targets</strong></td>
<td>Spatially-based quantitative guidelines for the values of each Indicator, used to control (or guide) sector activities in, or uses of, the oceans ecosystems within a spatially-based management plan.</td>
</tr>
</tbody>
</table>

Table 2. Key structural elements in the process of Integrated Regional Ocean Management

**Implementation of IROM**

There are many possible approaches to implementation of Integrated Regional Ocean Management (IROM), and these can be considered to form a continuum of arrangements and structures.

Taking a complete ‘top-down’ approach, at one end of the continuum, IROM may be implemented by a regional marine management agency that has explicit statutory responsibility for management of all ocean resources, including conservation, and activities within a defined region. This is similar to the role played by the Great Barrier Reef Marine Park Authority in relation to the Great Barrier Reef World Heritage Area. Taking a ‘bottom-up’ approach would, at the other end of the continuum, mean IROM would be implemented by a voluntary and wholly locally-based community group, such as a regional marine management committee, with no (or few) statutory powers or obligations. This model is similar to the approach adopted for the management of river catchments in several Australian states.

A central position on the continuum, and one that is perhaps more achievable in nations where ocean
resource sectors are mature and operate within established sector-based frameworks, might be a government established and facilitated regional oceans commission. This would have explicit responsibilities, and be resourced, for:

- Environment auditing, performance evaluation and reporting;
- Facilitating stakeholder consultation and participation to establish operational objectives, indicators and criteria;
- Representing the public interest;
- Facilitating integration activities among resource sectors, although not control of sector management;
- Control of sector management in agreed ‘critical ocean priority’ management areas or issues.

This latter model has some elements that are similar to the role of the Victorian Coastal Council, which has responsibility for coordination and integration of management of key matters in three coastal regions of Victoria. The council is responsible for ensuring that ‘lead agents’ (government agencies, three Regional Coastal Boards, and community and private sector organisations with control) implement priority actions required to achieve long term ecological sustainability in coastal lands and waters.

The council and the boards comprise government, private sector and community representatives (Victorian Coastal Strategy, 1997).

Figure 2 (a). Australia’s coastal marine ecosystems (from IMCRA, 1997)
Operational Objectives

The process of establishing agreed quantitative (operational) objectives for ocean ecosystems that apply at all nested scales of natural ecosystems is the central organising principle of ecosystem-based management.

The rigour imposed by the need to define the values of the oceans for which objectives must be established, to identify surrogates, and then to transform the surrogates into measurable indicators with numeric targets for each, and finally to have each of these agreed in an inclusive community-based process, forces all stakeholders to adopt a common language, approach and set of reference points for oceans management. Defining the values of ocean ecosystems and establishing their preferred condition in the future is an all-encompassing and broadly inclusive process that is central to the success of Integrated Regional Ocean Management.

To begin the process of establishing operational objectives for ocean ecosystems, we may ask the question: *what do we want for our oceans?* In answering this, we must be clear and explicit about the value set we are using in framing the answers (see, for instance, Callicott, 1991), and be sure to look well into the future (say 50 to 100 years) in a broad and visionary way. Using a broad set of preferred future conditions like those of Table 3 enables specific quantitative objectives to be developed.

Integrated management of ocean ecosystems requires comprehensive and explicit objectives relating to ecosystems as a whole, as well as objectives relating to individual units such as...
### Marine ecosystems that:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are healthy</td>
<td>Have a diverse range of natural biological, chemical and physical processes</td>
</tr>
<tr>
<td>Are clean</td>
<td>Are not polluted or littered</td>
</tr>
<tr>
<td>Are diverse</td>
<td>Comprise a natural variety of genes, species and ecosystems spread across their natural ranges</td>
</tr>
<tr>
<td>Are productive</td>
<td>Provide food, medicines, inspiration, appreciation, and recreation</td>
</tr>
<tr>
<td>Have sustained values and products</td>
<td>Continue to be healthy, clean, diverse and productive in perpetuity</td>
</tr>
<tr>
<td>Have values and products in equitable ways</td>
<td>The use of equity as a principle in resource allocation will reduce conflicts over the use of ocean resources and values, and reduce degradation</td>
</tr>
<tr>
<td>Have sustained evolutionary potential</td>
<td>Be able to continue to adapt and evolve in natural ways, with natural dynamics, and be able to adapt to incremental long-term pressures like climate change and sea level rise.</td>
</tr>
</tbody>
</table>

**Table 3  A desired set of conditions for the oceans**

habits or species. It also requires management to consider and respond to the state of the ecosystem as a whole rather than to individual sector-based activities, impacts or remedial measures. This focuses attention on high-level ecosystem management outcomes (e.g. biological diversity) rather than on intermediate activities or effects.

Comprehensive and measurable objectives for the biological diversity should be set at each relevant (nested) spatial scale. These objectives for biological diversity should apply in all ocean areas and should be taken into account by all resource sectors and guide (but preferably control) their activities. The spectrum of marine protected areas that can be established within any region can provide an essential contribution towards meeting local, regional and national objectives for the conservation of biological diversity.

However, typically, because reserves are often only small, they can only function in the context of effective measures for the management of ocean ecosystems that are implemented in all ocean areas and coastal catchments.

The need for comprehensive spatial management of ecosystems in all ocean and adjacent land areas using explicit biological diversity objectives for marine flora and fauna stems from two key characteristics of marine ecosystems:

- They are typically highly interconnected, mainly by the migration of larger animals, the dispersion of larvae in the water, and movement of the water itself;
- Land-based activities in estuaries and on the coastal margins can have very dramatic effects on marine ecosystems.

In marine ecosystems small areas of seabed that are disturbed can usually be recolonised and their assemblages
re-established relatively quickly, but after repeated disturbance they may not recover. Also, impacts from disturbances may spread well beyond the initial area of impact, through downstream effects, and through movement of mobile animals. So areas that are protected, but that are surrounded by disturbed areas, may not be self-sustaining and can be degraded through time unless disturbances are managed on a scale adequate to ensure broader ecosystem integrity.

Small areas of managed seabed are not, therefore, likely to be self-sustaining in terms of species composition and ecosystem processes, and hence biological diversity.

To achieve effective management of marine biological diversity, the regional management units must be large and match ecosystem boundaries, and the regional management arrangements must encompass the nested arrangements at smaller scales. At each of the principal levels in the management arrangements (e.g., national, regional and local) management objectives must be comprehensive and consistent, and set at the correct spatial and temporal scale for that level. The objectives must cover all valued and important elements of the biological diversity and ecosystem functioning, and be able to relate to measurable performance indicators.

Within each of the nested scales of management arrangements, operational (i.e., measurable) objectives and performance measures should be defined. These definitions should be evaluated to ensure that they are adequate to achieve both the local and the broader objectives, and that they are consistent across the different scales of management. The objectives must be easily linked to measurable performance indicators; they must be explicitly defined at the time and space scales relevant to management; and must be consistent across the nested management arrangements that make up the higher level arrangements.

**Indicators and Targets**

Australia’s 1996 State of the Environment Report forms the first stage of an audit of how Australia is managing its environment and meeting its international commitments in relation to the environment. Subsequent state of the environment reports will assess how the environment, or elements of it, have changed over time, and the efficacy of our responses to the pressures on the environment. In order to assess how, or if, the environment and various elements of it, have changed over time, it is necessary to have some indicators on which environmental performance may be reviewed.

As pointed out in the 1996 State of the Environment Report:

*In many important areas, Australia does not have the data, the analytical tools or the scientific understanding that would allow us to say whether current patterns of change to the natural environment are sustainable. We are effectively driving a car without an up-to-date map, so we cannot be sure where we are. Improving our view of the road ahead by enhancing the environmental data base is a very high priority. Our intended destination is a sustainable pattern of development, but it is not always clear which direction we need to take to get there.*

– (Australia State of the Environment 1996)

To facilitate the assessment of Australia’s progress towards a sustainable pattern of development, a nationally agreed set of indicators is the next stage in the State of the Environment (SoE) reporting process. For this purpose, a set of potential key indicators has recently been developed (Ward et al. 1997).

The national set of key indicators comprises 61 indicators of condition, pressure or response (Table 4). Using the terminology of the National State of the Environment Reporting process, condition is the integrity or ‘health’ of the environment, pressure is the human pressures that are imposed on the environment to degrade it, and response is a measure taken by governments, communities or the private sector to react to perceived changes in the environment.

Development of the a set of key indicators for the estuaries and seas has been based on ecosystem management principles as far as possible to guide all choices. Indicators of condition reflect the key structural elements and processes of ecosystems, as well as the important aspects of major environmental issues.

The 61 quantitative indicators fall into eight classes: Habitat extent; habitat quality; renewable resources; non-renewable resources; protected species; integrated management; water/sediment quality; and ecosystem level processes. Where possible each indicator has been defined as a directly measurable metric, avoiding indices and complex underlying models to ensure that the data on each indicator can be widely used in a range of interpretive models.

For each of the key indicators, the accuracy and precision required in measurement programmes will need to be determined in detailed assessments, and then compared to that currently available from existing monitoring, where it exists. In this way, given that
the indicators are defined, the nature of the required measurement programmes can be also defined, and compared to existing efforts to determine where improvements or amendments are needed, or where major gaps exist.

Each indicator will need, in due course, to be accompanied by a standard operating protocol that defines all the fine scale aspects of measurement, including sampling designs, equipment needed, data reduction approaches, and a range of other matters.

Choosing the appropriate spatial and temporal scales for capture of data on national indicators is critical. Inappropriate choices here will mean that monitoring data fails to adequately reflect ecosystem changes at scales that are meaningful for management agencies, and so indicator data will not prove useful for management of estuarine and marine ecosystems. This means that optimal choices of space and time scales for national SoE indicators will be closely coherent with the scales at which the ecosystems are managed, and to the extent possible, coherent with natural boundaries of the ecosystems.

Choices of temporal scales will be largely unique for each indicator, and should be therefore established separately for each monitoring programme. This is because the various issues and elements targeted by national SoE indicators will have different natural dynamics, and a monitoring programme to detect change will need to employ a temporal scale appropriate to the natural scales of change, but modified according to the management needs for information on rates of change. For example, elements that change only slowly may need to be measured only infrequently in order to detect change, although if a small change is of very great importance then they may nonetheless need to be measured frequently to ensure that small changes are not occurring. So, even if changes are expected to be slow, it is important to verify that this is the case and to provide reassurance that our expectations are correct and that unpredicted impacts are not occurring.

A central issue for SoE reporting is to be able to effectively create the linkage of local to international scale. At each sub-scale the boundaries and complexity of the system being tracked are different. One way of dealing with this is to ensure that at each level of the spatial hierarchy there is an appropriate synthesis and reporting for each indicator, and that this matches the needs for integrated management at that level but is also the basis for reporting at the level above. So, for example, whilst it may be very important for chlorophyll concentrations, or concentrations of nitrogen dissolved in water, to be monitored in an estuary at the very finest scales of space and time (for instance to report on improvements in sewage treatment), a compiled summary of such data reported at the estuary level will be of little value for national-scale reporting and irrelevant for international SoE reporting needs. It may be more useful to report on the number of estuaries that fall within classes of chlorophyll concentrations, and the number of estuaries that exceed regional or local criteria established to reflect improvements in sewage treatment.

Aside from appropriate scales and linkages, it will also be important to ensure that we identify processes to capture, maintain and report on the uncertainty inherent in initial data capture, and the uncertainties introduced by any data aggregation processes we may impose. Since detection of important change is the key rationale for existence of monitoring of indicators it is essential that any reporting on indicators is accompanied by estimates of uncertainty for the data and information reported. Estimating the risk of falsely indicating no change when important change has in fact occurred, and the converse – indicating change when in fact no important change has occurred – is critical to the establishment and maintenance of the credibility and broad acceptance of all environmental management processes. Managers of all natural resources operate on a risk-acceptance basis, and they need to know (or estimate) how risky a decision or process is in terms of established objectives. National and state-wide reporting may introduce large errors in the data aggregation process, and estimates of both uncertainty and the risk of false positives and negatives are essential companions to any derived information used to report on national (or broader) trends. In Australia, the Great Barrier Reef Marine Park Authority has adopted an integrated approach to managing the Great Barrier Reef, but outside this area, moves toward ecosystem-based management for ocean ecosystems are slow. In Western Australia, guidelines for the ecosystem-based management of seagrass beds are under development. The planning involves establishing the local-scale ecosystem boundaries (bay, estuary, coastal unit), defining objectives for seagrass beds in terms of structural and functional attributes (distribution, species composition, productivity, etc), and establishing agreed target criteria for acceptable levels of change of each attribute within each spatial unit.
<table>
<thead>
<tr>
<th>Class of Indicator</th>
<th>Number</th>
<th>Indicator (examples)</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Protected or Cited Taxa</td>
<td>3</td>
<td>Number of marine species formally declared to be rare, endangered or threatened.</td>
<td>Condition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seabird populations</td>
<td>Condition</td>
</tr>
<tr>
<td>2. Habitat Extent</td>
<td>9</td>
<td>Area of mangrove, by major community types</td>
<td>Condition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Area of seagrass, by major community types</td>
<td>Condition</td>
</tr>
<tr>
<td>3. Habitat Quality</td>
<td>17</td>
<td>Species composition of algal beds</td>
<td>Condition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Species composition of mangrove communities</td>
<td>Condition</td>
</tr>
<tr>
<td>4. Renewable Products</td>
<td>6</td>
<td>Aquaculture production, by species</td>
<td>Condition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish stocks, by species</td>
<td>Condition</td>
</tr>
<tr>
<td>5. Non-renewable Products</td>
<td>2</td>
<td>Ocean exploration</td>
<td>Pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ocean mining</td>
<td>Pressure</td>
</tr>
<tr>
<td>6. Water/Sediment Quality</td>
<td>5</td>
<td>Sediment contaminants</td>
<td>Pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sentinel accumulator programme</td>
<td>Pressure</td>
</tr>
<tr>
<td>7. Integrated Management</td>
<td>17</td>
<td>Catchment management programmes</td>
<td>Response</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Waste outfalls (number and type)</td>
<td>Response</td>
</tr>
<tr>
<td>8. Ecosystem-level Processes</td>
<td>2</td>
<td>Sea level</td>
<td>Condition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sea surface temperature</td>
<td>Condition</td>
</tr>
</tbody>
</table>

Table 4 Draft national indicators for estuaries and the sea
(from Ward et al. 1997)
For example, acceptable changes in seagrass distribution are considered to range up to a 10 per cent reduction from their estimated distribution before European settlement of WA. It is anticipated that these targets will be used as a guide by local planning and environment authorities when assessing development proposals, and by resource sectors when developing management plans.

A typical set of criteria that might be used in IROM for temperate seagrasses in the Australian context are outlined in Table 5.

**Good Business Practice**

For efficient and effective management of the ocean’s ecosystems, management arrangements should meet best practice standards in management and public accountability.

The oceans should be managed based on:

- Agreed objectives for those assets;
- Periodic audit and review, assessing performance based on quantitative indicators;
- Revision, adaptation and continuous improvement.

A set of appropriate arrangements for oceans management should contain:

- Clearly articulated objectives for management (in biological diversity terms) and a solid nexus to enabling legislation and administrative procedures;
- Defined strategies and tasks to be implemented to achieve the objectives, including strategies to build partnerships and ownerships with the local community and users of the marine environment;
- Measurable performance indicators to monitor progress towards achieving biological diversity objectives;
- Sound management information systems in support of chosen performance indicators.

<table>
<thead>
<tr>
<th>Spatial Scale</th>
<th>Indicator: Habitat Extent</th>
<th>Indicator: Habitat Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Area: estuary,</td>
<td>&lt; 10 per cent change from natural trajectory (since 1700s baseline)*</td>
<td>Seagrass species composition or ranges show no change from the natural trajectory*</td>
</tr>
<tr>
<td>beach, bay, island, etc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional: IMCRA region,</td>
<td>No local areas with &gt;10 per cent change from natural trajectory</td>
<td>No local areas that show significant change from the natural</td>
</tr>
<tr>
<td>large bay or sound, gulf, etc</td>
<td>(since 1700s baseline)*</td>
<td>trajectory of seagrass species composition or ranges*</td>
</tr>
<tr>
<td>National: province</td>
<td>No regions where change greater than 10 per cent detected*</td>
<td>No regions where seagrass species composition or range has changed*</td>
</tr>
<tr>
<td>(say nine for continen-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tal Australia)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* change detection data (changes either detected or not detected) require specified probability of detection, and those spatial units where data are too uncertain to be used.

Table 5  An example set of criteria for temperate seagrasses
Figure 3.1: Best practice management (from: AS/NZS ISO 14001 (Int) 1995).
These arrangements should be implemented using a continuous improvement approach. Where objectives cannot be achieved immediately, they should be approached incrementally, in an explicit and accountable manner (Figure 3). The main attributes of best practice, including continuous improvement, are based on the standards established by ISO 14000. In environmental management these standards require consensus planning and comprehensive stakeholder involvement, based on full information and equal empowerment. The ISO 14000 series of standards for environmental management are scale-independent: they apply to environmental management of regions, sectors, specific projects, and individual operational activities. A central feature of continuous improvement is the process of audit and review. In Integrated Regional Ocean Management the audit phase would be based, amongst others, on the analysis of environmental indicators.

Who Pays?

Effective management of the oceans will, initially, be more costly than our present approaches. The additional rewards, though, will be disproportionately greater than the additional costs. Initially, new resources will be needed to implement some aspects of integrated management of the oceans, but much of this can be offset against large potential gains in efficiency that stand to be achieved. Ultimately, the overall costs of an ineffective management framework will be greater than those of an effective management framework faced with the same objectives.

Considerable funds are committed at present to such routine activities as environmental impact assessment. Much of this work is ritualised and codified, committing the private sector to substantial initial costs in the feasibility, planning and design stages of new ventures, some of which could be avoided. Also, environmental monitoring is perhaps in vogue, but beyond providing employment for small armies of consultants, there is little to be gained from site unique, uncoordinated and often poorly designed routine monitoring programmes that are typically specified as part of a development consent procedure. Certainly, there is little scientific value or information in most such programmes, and they are an excessive cost for the quality of information they produce.

Also, there are considerable uncertainties in the allocation of resources within and between sectors, particularly resources such as seabed to build or operate an activity (such as an aquaculture venture). These uncertainties translate into major direct costs for the private and public sector as they both attempt to negotiate their way through a veritable planning minefield to achieve acceptable outcomes. Given an integrated framework, many of these uncertainties could be removed, and costs thus reduced.

Further, an often underestimated cost is the social and community cost that results from poor planning, such as might arise where a local community is forced to oppose a venture on the coast. At the local level, major environmental debates impose considerable social trauma on families, job security and productivity. Any process that improves the clarity, effectiveness, accountability and acceptability of ocean resource allocations will assist to maintain local community morale, standards and identity.

The central issue to be tackled on the question of costs is how the sectors that benefit from increased certainty in planning and security in resource allocation can participate in equitable allocation of the costs of implementing the management framework. This is probably best achieved by using resource-based economic instruments (rents, taxes), perhaps offset to the extent that stakeholder funding partnerships are used to subsidise the management costs, as in, say, capturing monitoring data.

Closing the Gap

What do we Need to Do Now?

What approaches, frameworks, procedures and actions will enable us to achieve the desired objectives for our ocean ecosystems? We need to clearly identify the most important set of actions that are needed to change present approaches to ensure that our objectives are reached, or at least progress is in the correct direction. These should be framed within existing laws, policies, uses and frameworks where appropriate, and recognising that there are many dependent communities, cultures and users that may be affected.

In considering what needs to be done, action needs to be taken in three important areas.

1. Establishment of regional (spatially-based) arrangements for integration and coordination of ocean ecosystem management; the first step in this could be to begin to formulate the process for establishing sets of nested operational objectives for the ocean ecosystems, focussing on the important natural values. While it might be appealing to see this as a government responsibility, “bottom-up” initiatives may be equally
as effective, and more so in some circumstances. In any case, governments are quick to recognise successes and most ‘bottom-up’ processes can be dove-tailed into existing ‘top-down’ arrangements. Initially, governments might be persuaded to support and facilitate stakeholder forums to discuss the development and implementation of agreed operational objectives for regions and sub-regions.

<table>
<thead>
<tr>
<th>Allocate the burden of proof to the proponent</th>
<th>This will ensure that uncertainty in knowledge favours the ecosystem, not the proponent (allocates the ‘benefit of the doubt’ to the oceans)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Move incrementally and cautiously</td>
<td>This will enable more comprehensive evaluation of the effects of various management decisions; it will give substance to the precautionary principle</td>
</tr>
<tr>
<td>Provide for continuous improvement of management processes</td>
<td>This will enable adaptive assessment and management to be implemented</td>
</tr>
<tr>
<td>Move to integrated regional management</td>
<td>This will improve the management of oceans by moving decision-making closer to the natural scale of ecosystems and human perceptions, and by facilitating better involvement of a broader range of stakeholders</td>
</tr>
<tr>
<td>Adoption of biological diversity as an important explicit endpoint for management</td>
<td>This will enable diversity as an entity to be more explicitly recognised in management plans</td>
</tr>
<tr>
<td>The use of ecosystem-based management as the primary guiding principle for management</td>
<td>This will promote the ecosystem itself as the focus for management, so that the success of ocean management is evaluated against objectives established for the ecosystem as a whole, and to codify the integration of sector uses within ecosystem management</td>
</tr>
<tr>
<td>The use of ESD principles for management of the activities of each sector</td>
<td>This will promote the use of ecologically responsible management of resources within each sector of activity</td>
</tr>
<tr>
<td>Provide for cultural, social and inter-generational equity in all management decisions affecting the oceans and people dependent on them</td>
<td>This will promote the concept equity in the use of the oceans and their resources</td>
</tr>
<tr>
<td>Provide for transparency and accountability in decision-making</td>
<td>This will promote the ‘ownership’ of the management process, and the subsequent decisions, by stakeholders</td>
</tr>
</tbody>
</table>

**Table 6  Important Principles for Management of Ocean Ecosystems**
<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defining the health and integrity of ecosystems: establishes indicators and target values</td>
<td>This conceptualises and defines the ocean ecosystems in terms that can be measured and evaluated</td>
</tr>
<tr>
<td>Measurement of biological diversity and the processes that support it (an inventory)</td>
<td>This is an on-going process that incrementally adds to our basic knowledge and understanding of the biological diversity or our oceans</td>
</tr>
<tr>
<td>Conducting rapid assessments of the region’s biological diversity</td>
<td>This process is used to synthesise existing knowledge and data for the purposes of making a management decision, and can be conducted at all spatial scales</td>
</tr>
<tr>
<td>Documenting the natural and human-induced changes in ecosystems, to use in management decision-making</td>
<td>This is used to evaluate the importance of changes in ecosystems, and to assist with predictions about future conditions</td>
</tr>
<tr>
<td>Developing and trialing alternative ways of managing ecosystems, to evaluate the effects of different management approaches or decisions</td>
<td>This explores, in an adaptive manner, the various approaches to managing ecosystems and adjusting management controls and responses</td>
</tr>
<tr>
<td>Provide decision support tools in a range of biological, chemical and physical problems</td>
<td>This provides computer-based tools to assist with difficult or complex decisions</td>
</tr>
<tr>
<td>Developing models to predict the distribution of biological diversity in areas that have been poorly sampled or are unknown</td>
<td>This enables high priority areas to be identified, and subsequently targeted for field investigation</td>
</tr>
<tr>
<td>Defining environmental conditions, such as current patterns, and their dynamics</td>
<td>This involves establishing important aspects of the natural dynamics of the oceans for use in predicting future changes, impacts of developments, and explaining observed patterns in biological diversity</td>
</tr>
<tr>
<td>Design and implement processes for integration of management across regions and subregions, and for national synthesis</td>
<td>This is to ensure that cross-region interactions are explicitly recognised and managed, and that vertical integration is achievable</td>
</tr>
<tr>
<td>Identify the specific ecosystem effects of various pressures, such as fishing, pollutants, habitat degradation, tourism developments, etc.</td>
<td>This is to define the importance of various impacts of human activities, to assist with prioritisation of management efforts (and further research needs)</td>
</tr>
</tbody>
</table>

**Table 7** Key roles for science and technology in supporting development of Integrated Regional Ocean Management
2. Continue to improve our knowledge of the ocean ecosystems, and particularly the technical aspects of spatially-based marine ecosystem management, the design, evaluation and reporting of quantitative indicators and monitoring programmes, and continuing to document the nature, distribution and dynamics of ocean and coastal ecosystems.

3. Design and implementation of effective and inclusive consultation and communication processes for involvement of stakeholders in any decision-making process that affects ocean ecosystems.

The pathway to achieving the desired objectives for our ocean ecosystems should be guided by a number of key underlying principles (Table 6).

References


Version 3.2. Environment Australia, Department of the Environment, Canberra. 120 pp.


Marine Management and the Quota Management System: Reform required

Catherine Wallace
Lecturer in Public Policy, Victoria University of Wellington and Marine Coordinator, Environment and Conservation Organisations of NZ (inc.).

Abstract:
Marine management in New Zealand is fragmented, inconsistent and incoherent. It is ripe for the kind of reform that occurred with terrestrial environmental administration during the 1980s. The fisheries Quota Management System (QMS) has been much heralded as a success story. This paper examines the empirical evidence for this claim and concludes that huge information gaps make the claim of a success story at best unproven. The information gaps themselves may be attributable to the QMS and/or the more recent cost recovery system. The QMS has brought its own difficulties. The impact of the QMS on the evolution of the institutional aspects of fisheries management and the fate of non-commercial values in the marine environment are explored. Suggestions for reform of marine management are made.

The Reforms of the 1980s
New Zealand’s marine management has not had the major overhaul that has been done for land management. Marine administration was only partially drawn into the major environmental administration reforms of the 1980s, and by comparison has suffered a lack environmental underpinning, a lack of opportunities for public input, and patchy policy development processes. The environmental administration reforms of the 1980s could be an apt model for urgent reform to marine management and administration. The first part of this paper traces those reforms.

During the Labour government of 1984-90, a huge programme of environmental reform was launched. The old natural resource exploiting government departments were swept away and replaced with a range of more modern policy and administrative agencies. Once these were in place the patchwork of disparate planning, water and other laws were repealed and replaced by the Resource Management Act which was eventually passed in 1991 by the then new National government.

The reforms established the Department of Conservation (1987), the Ministry for the Environment (1986) and the Parliamentary Commissioner for the Environment (1986). The latter two were put in place by the Environment Act 1986. Production forestry, hydro dam building, land ‘development’ and other functions previously undertaken by government were either dispensed with or given to a slew of State Owned Enterprises (SOEs) (Wallace 1997a). Many of these have since been privatised.

Once the Ministry for the Environment was settled in, it was given the task of developing new environmental legislation. This it did in a comprehensive reform process known as the Resource Management Law Reform (RMLR), during 1988-90. Starting by canvassing the first principles of sustainable management of resources, the RMLR involved a series of think pieces on subjects such as intergenerational equity, ecological sustainability, property rights, and the Principles of the Treaty of Waitangi.
No similar comprehensive assessment of national objectives for management of our impacts on the marine environment has been done.

In the development of the RMA, consultation was intensive and extensive. Working parties were developed to explore issues and find agreement. Papers were written and circulated widely for peer and public review. Forums were held. The telephone lines were opened to the public for submissions. Fisheries policy by contrast has only had spasmodic episodes of public submissions. For the most part it is closed to a select groups of “stakeholders” who have “approved party” status under the Fisheries Act 1996. Frequently fishing industry groups dominate the processes of policy making on fisheries at the expense of others.

The Resource Management Act (RMA) enshrines the principle of sustainable management of natural and physical resources. It deliberately eschewed addressing resource ownership issues under the Treaty of Waitangi, leaving that issue to the Treaty settlement process. Instead the RMA set in place a system that would apply irrespective of ownership and without having to settle ownership disputes. It does however require that the principles of the Treaty of Waitangi be taken into account (section 8 of the RMA).

The RMA establishes a policy core in the Purpose and Principles of the Act and a framework for further policy elaboration and implementation within this framework. The architecture of the Act is founded on the construction of policy, plans and standards at the national and regional level, and plans and rules at the regional and district level. Certain other constraining instruments are provided for. These include designations that allow certain utility companies such as airport companies to restrict activities that may affect them and heritage authorities with power over heritage matters. An equivalent arrangement for port requirements was included in a 1993 amendment to the RMA.

The Resource Management Act introduced a coherent ethos and consistent integrating processes for decision making on a whole range of issues from land use to pollution control. But it only reaches to the 12 nautical mile limit.

Management Responsibility

Within the coastal area and out to the 12 nautical mile limit, primary management responsibility for discharges, structures, subdivision, and human disturbance lies with regional councils (sections 30 and 64). Their management is constrained by the RMA itself, the New Zealand Coastal Policy and regional coastal plans. There is no analogous management agency for the area of the Exclusive Economic Zone (EEZ), that area between the 12 nautical mile territorial limit and the 200 nautical mile limit. This is a gap that needs urgent attention. New Zealand simply does not have any coherent or integrated management system for the EEZ or its relationship with the territorial sea.

The RMA covers the sea and marine environment but not fisheries management. Fisheries reforms began after the 1978 declaration of the EEZ with the extension of NZ control out to 200 nautical miles, and hence pre-dated the development of the RMA. New legislation was passed in the 1983 Fisheries Act and further major reforms with the 1986 introduction of the Quota Management System. Since then there has been a succession of ad hoc fisheries policy developments, and frequent legislative amendments.

Most of these failed to address environmental issues and were developed with virtually no public consultation. Provision for public input into decisions remains minimal.

Since the Quota Management System was instituted in 1986, policy making has often been dishevelled, lacking proper analysis or public process, constantly under pressure from an increasingly powerful industry and suffering from many stop-starts. There have been many legislative amendments, but not a lot of analysis. Fisheries policy has followed an erratic process from 1986-96. During the early 1990s there was considerable institutional reform with the separation of fisheries research from fisheries management as research went to the National Institute of Water and Atmosphere and management formed the new Ministry of Fisheries. Previous descriptions or studies of the New Zealand Quota Management System (QMS) and New Zealand fisheries policy include Clark and Duncan (1986), Clark, Major and Mollett (1988), Dewees (1989), Sissenwine and Mace (1992), Memon and Cullen (1992), Annala (1996), Gaffney (1997), Sharp (1997) and Wallace (1997b).

One of the great failings of the Ministry of Fisheries and its predecessor organisation, the Ministry of Agriculture and Fisheries, has been the absence of any coherent environmental philosophy or ethos of fisheries management beyond the property rights framework of the QMS. In law fisheries management finally gained some coherence in the 1996 Fisheries Act – but the principles of environmental sustainability and concern for future generations has not in fact been implemented up to and including 1998.
In the drafting of the Fisheries Act 1996, Members of Parliament and the wider community familiar with resource management debates and contemporary thinking ensured it contained environmental and information principles and some regard for future generations, the Treaty of Waitangi and international obligations. The industry opposed many of these changes (see submissions to the Primary Production Select Committee). Parliament shied off the principle of sustainable management as used in the RMA, opting instead for the purpose of “utilisation of fisheries resources” while ensuring sustainability.

One result of this is that while the Fisheries Act 1996 has a purpose that encompasses the environmental impacts of fishing, the needs of future generations and mandatory environmental principles, many of the officials have little concept of the thinking behind these. For the most part they have conspicuously failed to implement them – a point to be dealt with in more detail below.


The EEZ

The New Zealand EEZ was established in 1978 by the Territorial Sea and Exclusive Economic Zone Act of 1977 (TS & EEZ Act), despite the negotiations of the UN Convention of the Law of the Sea (UNCLOS) not being completed. New Zealand did not ratify UNCLOS until July 1996.

The primary preoccupations behind the declaration of the TS & EEZ Act were the potential for mining seabed minerals and exploitation of fisheries resources. The TS & EEZ Act and subsequent amendments say little about environmental protection though the Act’s long title says it is “to make provision for the exploration and exploitation, and conservation and management, of the resources of the zone…”.

The government’s Environmental Protection and Enhancement Procedures (EP & EP), first developed in November 1973 and last up-dated in 1987 (Ministry for the Environment, 1987) are to be invoked when government funding or consents are required. Resource Management Act processes have largely replaced the EP & EP on land and out to 12 nautical miles, but the EP & EP was to remain in force for other activities (Ministry for the Environment, 1987). Many officials seem unaware of their existence and they have rarely if ever been applied in the marine environment since 1987.

The Ministry of Commerce is now responsible for the allocation of mineral rights over the marine environment under the Crown Minerals Act 1991 and the Continental Shelf Act 1964, for cable laying and other such uses, but has no interest or capacity in environmental management. There are no legislative provisions for public input into decisions affecting the marine environment and the Ministry of Commerce does not consult on the environmental impact of minerals activities.

The Ministry of Fisheries manages fisheries from the coast to the outer limit of the EEZ. The Maritime Safety Authority has responsibility for the control of maritime safety. The Ministry of Transport advises on marine transport policy and looks after the Crown’s interest in the seabed in the EEZ. The Department of Conservation has responsibility for marine reserves, marine mammals and other protected wildlife. Management of the coastal area within the 12 nautical mile limit is shared between the Department of Conservation, which administers the Crown’s purported ownership of the seabed and subsoil and regional authorities who have management responsibilities under the RMA. Maori contest the ownership of the seabed. A pivotal case involving the Marlborough Sounds is being considered by the Maori Land Court.

The Ministry of Foreign Affairs and Trade has primary responsibility for ensuring that New Zealand complies with New Zealand’s international obligations. UNCLOS gives a state the right to manage the EEZ but only subject to Article 192 which requires states to “Preserve and protect the marine environment”. Any exploitation of resources is subject to this requirement. There are a number of other international obligations relating to the marine environment and/or to fisheries. The Department of Conservation is the lead agency for the implementation of the Convention on Biodiversity and the Convention on the Trade in Endangered Species Act (CITES).

The Ministry of Research, Science and Technology has studied the need for a national marine science strategy (Williams and Forch, 1996) but there seems to be little chance that one will be done. The Foundation for Research, Science and Technology (FORST) funds a small selection of marine Public Good Science Fund projects, but commonly, as in other areas, many of these are essentially private good rather than public good projects.

Assessing this plethora of agencies with disparate responsibilities under a patchwork of laws, it is difficult to escape the conclusion that the marine environment, especially in the EEZ, is not managed in a coherent,
The Quota Management System

In 1983, the year of the passage of the 1983 Fisheries Act, the government instituted a trial quota system in the relatively new deep-water fisheries (e.g., hoki, hake, orange roughy, etc.). Since the late 1970s it had encouraged and subsidised the expansion of New Zealand fishing effort into the deep water with the first of its “Think Big” policies. A much fuller Quota Management System (QMS) with Individual Transferable Quota (ITQ) was introduced in 1986. This included important inshore species. See Clark and Duncan (1986), Clark, Major and Mollett (1988), Dewees (1989), Sissenwine and Mace (1992), Memon and Cullen (1992), Annala (1996), Gaffney (1997), Sharp (1997) and Wallace (1997b).

The intellectual foundation of the QMS was the idea of creating a market for property rights of access to the fisheries. The hope was that this would achieve the economic prescription of excluding excess fishing effort from the fishery. This exclusion is prescribed by basic renewable resource economics. Limitation of effort is predicted potentially to increase stock size, increase yield, reduce harvest costs and hence to improve economic returns. The economically efficient stock sizes are, under many conditions, larger than those stock sizes that result from open access fishing thus also providing biological benefits.

ITQs were intended to cure the problem of open access where forbearance and saving fish for the future is discouraged by situations where there is a “race to fish” to beat competing fishers. Benefits of saving in a race to fish are lost to other fishers. ITQs were expected to give fishers a greater stake in the future of the fish stocks, so giving them a greater incentive to avoid over-exploitation of the fisheries resources. Thus the ITQ system was seen as providing both economic and biological benefits.

The creation of the market for quota followed the initial allocation of quota rights to individuals and companies on the basis of their catch history, a process known as “grand-parenting” quota. In effect these allocations were a gift from society to the fishers.

The Crown had the quota valued at 1.8 billion (Ministry of Agriculture and Fisheries, 1993: Appendix A: 4). Some left the industry, selling quota to those who remained or newcomers. Others stayed, made wealthy by the allocations.

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1 For treatment of the economics of fisheries management, see Andersen, 1995; Bromley 1995; Larkin 1977; Scott 1988; Stokes 1979; Pearce and Turner (1990), chapters 16, 17 and 21.
At first ITQs were issued as rights of access to fish for absolute tonnages of catch. It was then discovered that a number of significant stocks, especially orange roughy, had been over-allocated. The fiscal burden on the government of buying back quota when significant total allowable commercial catch reductions were required was dauntingly high: so high in fact that after the QMS establishment rounds of quota buy backs, for example of snapper and other inshore species quota, the government did not buy back any more of the over-allocated quota.

The system of absolute tonnage allocations in perpetuity essentially meant that the government would carry all the risk of over allocation and over-fishing. The government changed the basis of the ITQs to alter this on the advice of economist Lee Anderson (1988). Instead of being denominated as rights of access to absolute tonnages of fish, they were made into proportionate shares of the total allowable commercial catch. In both cases the ITQs were and remain entitlements to access to harvest rather than ownership of the fish themselves.

It was accepted that in addition to catch limits there would be a range of “input controls”. These include area and seasonal closures, certain gear limitations and other measures aimed at environmental protection as well as the controls imposed on the total quota of tonnage of fish that could be taken each year, known as “output” controls.

Maori and Treaty Claims

Maori took exception to the Crown purporting to bestow entitlements on quota recipients, since they believed that the Treaty of Waitangi explicitly reserved fisheries to Maori. They also resented the expulsion of many part-time fishers from fishing, many of whom were Maori. Hence Maori rather than the Crown owned fish or at least the right to control access to fish. The upshot of legal and political moves to challenge the quota system was the Maori Fisheries Act 1990, followed by the Treaty of Waitangi Fisheries Settlement Act 1992.

This negotiated settlement gave Maori $150 million for a half share with Brierley Investments in the Sealords Company, 10 per cent of the existing quota species and 20 per cent of any future quota allocations. The quota and Sealords company were to be held in trust for Maori by the Treaty of Waitangi Fisheries Commission (ToWFC), Te Ohu Kaimoana, while Maori developed agreement on how to pass the quota on to them.

Return to society

Originally a return to society was to be recovered from quota holders through the levy of a resource rental on quota. This was set very small initially in 1986 but gradually rose to total $21.7 million\(^2\) in 1989. With the total of exports that year valued at $797 million, this was 2.8 per cent of total export revenue: even less when domestic sales are included in revenues (Wallace 1997b).

From October 1989 to September 1995 the Crown gave fishers the $125 million in resource rentals that it collected as compensation to quota holders for TACC reductions during this period and the change from absolute tonnages to proportional quota (Ministry of Fisheries, 1997a). Thus there was no payment to society for the use of the scarce resource in that period. In addition, though a reduction in hoki total allowable commercial catch (TACC) was compensated for, when this was restored, there was no equivalent repayment by fishers for the increase in TACC.

Cost Recovery

Resource rentals were dispensed with under pressure from the industry (New Zealand Fishing Industry Association, 1992), in favour of the industry’s preferred option of a system of cost recovery. The principle behind this system, introduced in 1994 was that since fishers benefited from fisheries management which maintained exclusion of fishing effort and thus enhanced both stocks and profitability, fishers could reasonably be expected to pay on an “avoidable costs” basis. The core of this idea was that fishers should pay for those costs which would not have arisen had there been no fishing industry.

In 1992 when the discussion of the move to the cost recovery system was underway, the Cabinet expected revenues to include $33m in recovered costs and $20 million in resource rentals to total $53 million (Officials Memorandum for Cabinet 13/2/94). Though according to officials papers (27/4/93), in 1993 industry offered to pay $47 million of cost recovery plus a one-off payment of $60 million for species to be added to the QMS. The return to the Crown has since been whittled away as cost recovery was introduced. This is despite considerable increases in export revenues that have been over $1 billion since 1992.

\(^2\) Dollar figures are New Zealand current values unless otherwise stated.
The reasons for the government wanting to charge for new quota allocations are explained in various official documents of the time. In an aide memoire to the Minister of Fisheries (2/12/92) an official explains:

“Looking back it’s hard to satisfy the public that they got fair market value when they gave fishers exclusive commercial access to their (public) resource, e.g. rock lobster brought onto QMS at annual rental of $346.50 per tonne (capitalised return to government of perhaps $3,500 per tonne). Today some quota is being traded for up to $90,000 per tonne.”

“The government must be seen to do a better job in future for the public. Valuable public assets must not be given away to private interests again. It is the market – through tendering and subsequent trading – that will ensure the public a fair market return.”

– (Ministry of Agriculture and Fisheries to the Minister of Fisheries, 1992;1)

Since the cost recovery scheme actually began operation in 1994, the industry has been able substantially to erode the figure they pay for fisheries services. First, it succeeded in persuading the government to drop resource rentals, then it managed to get the requirement for tenders of new quota dropped in favour of grand parenting of quota for no charge. The industry has since turned its attention to cutting away at cost recovery with pressure on both the Ministry of Fisheries and politicians. This has been done by challenging costs, objecting to research programmes most others involved believe are required for fish stock management, and other activities. In 1996-7, the fishing industry mounted a major campaign to trim the scope of the services for which it is expected to pay. It argues that the industry should not have to pay for policy or enforcement services from the ministry, and that it would prefer to undertake much of the management and research itself (see submissions to the Minister of Fisheries and to the Primary Production Select Committee Inquiry into fisheries cost recovery, 1997).

In 1995/6 the industry was levied $35.29 million plus $0.75 million for the Department of Conservation portfolio of fisheries conservation services. This levy dropped in 1996/7 to $32.54 million, 66.6 per cent of the Ministry of Fisheries’ budget of $48.97 million. The industry was also levied to pay $1 million for fisheries conservation services (Ministry of Fisheries 1997a; 12).

The industry’s payment of $32.54 million is well down on the government’s 1992 expectation. Some of this reduction may be attributable to efficiencies from restructuring and other measures, but for the most part it is derived from considerable reductions in services received. Most worrying to other stakeholders are the cuts in research commissioned by the ministry, research on which sustainable management depends.

Taking the figure of $33.5 million for cost recovery levied in 1996/7 ($32.54 million + $1 million for conservation services levies) the industry is being asked to pay for the Ministry’s services and for research at about 2.7 per cent of their total (declared) export revenues.

The industry argues (New Zealand Fishing Industry Board, 1997) that it should have a dominant say as to what fisheries management and research services should be provided, on the grounds that “user pays means user says”.

Environmental organisations and others do not share this view (Environment and Conservation Organisations of NZ, 1997; NIWA, 1997). Instead, the Environment and Conservation Organisations of NZ (ECO), Royal Forest and Bird Protection Society and others argue that fishers should pay for fisheries management and research. Their grounds for this are that such management enhances the profitability of fishing. Further, fishing impacts on fisheries and the environment. Management and research are necessary to control these impacts (submissions to the Primary Production Select Committee inquiry into fisheries cost recovery, 1997).

Environmental organisations argue that fishers should also pay for depletion of a scarce resource and for the control of impacts of fishing on exactly the same grounds that polluters should pay.

Environmental, recreational fishing and some scientific interests are increasingly alarmed at the government’s intention to hand over to the fishing industry the management of crucial data bases and the commissioning or doing of research. These other interests identify considerable conflicts of interests. Data contamination is feared as well as biases to research, research questions and information.

Effects of Cost Recovery

An effect of the cost recovery system has been to allow the industry and other stakeholders far greater scrutiny of the ministry’s activities. Fishers have been anxious to see precise breakdowns of the costs of the services that the ministry provides or commissions so that there are not cross-subsidies between fishers. On
average the Crown pays for 30 per cent of fisheries management, the fishers 70 per cent. In some fisheries such as the deepwater fisheries the figure is 100 per cent, while in snapper and others with substantial recreational or customary Maori catch, the figure is much lower than 70 per cent (see allocations in schedule 1E of the Fisheries Act 1983).

The cost recovery process has had a number of highly significant impacts.

Fishers have come to see fisheries management as primarily for themselves. Their clearly defined legal property rights and the fact that they pay for fisheries management has left some key industry representatives and many officials and politicians with the conviction that commercial fishing has far more legitimacy than recreational fishing or environmental protection and non-extractive uses. Lip service is paid to the place of other interests but many of the consultation and other arrangements and many of the decisions reflect this perception and reality of industry dominance. Both the QMS and the cost recovery arrangements have changed the perceptions of legitimacy of the stakeholders and ideas of who should be listened to. The evolution of fisheries management institutions continues to reinforce this dominance.

Fishers have gained unprecedented power over the ministry because of the power they have as those who pay the bills. The expenditure planning and consultation process over what fisheries management services should be provided has become increasingly laborious, detailed and costly as the ministry has struggled with information demands from the industry. It has allowed the industry to have a high degree of influence on the ministry’s budget, line by line, even to the point of challenging spending on legal actions: when they know that they themselves are the likely protagonists. Knowing they may be paying the bills, they have frequently objected to work on the environmental impacts of fishing and to various research projects.

The ministry for its part, has paid far more attention to the representations of commercial fishers than it has to those of recreational fishers or to environmental interests. This can be demonstrated by analysis of its highly uneven reporting of the views of stakeholders to the minister and the latter’s preference for approval of industry representations over those of other stakeholders. In 1997, until protests of environmental groups forced it to re-do its advice to the minister, the ministry at first reported only the submissions of the Fishing Industry Board and Te Ohu Kaimoana (TOWFC), and none of those by other parties. Even when the environmental organisations forced re-submission of advice to the minister, no changes were made to the decisions.

Research

Commercial fishers also want to be the ones commissioning the research – and even doing it. This worries the other parties because of the scope for biases in research and in the choice of research provider, notwithstanding ministerial assurances that there will be standards and specifications set by the minister with stakeholder input. National Institute of Water and Atmosphere (NIWA) scientists who tender for such research are increasingly subject to pressure. They find themselves confronting the fact that if they irritate or offend the commercial fishers, then in future, if the industry does gain the control over research commissioning that it seeks, they could lose research contracts. Some observers believe that this is leading to self-censorship.

Industry commitment to research is not strong, especially if the research in question might reveal unwelcome facts such as stock declines or environmental

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</thead>
<tbody>
<tr>
<td>Budget</td>
<td>22.75</td>
<td>21.34</td>
<td>19.40</td>
<td>19.03</td>
<td>17.31</td>
<td>14.45</td>
<td>13.13</td>
<td>16.86</td>
</tr>
</tbody>
</table>

Table 1. Fisheries research budget, excluding contracting costs, nominal values ($NZ million).

Source: Annual Appropriations, and approvals by minister

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3 Nature and Extent of Fisheries Required Services and Conservation Services, annual proposals, consultations and submissions.
damage. In the years since cost recovery, there has been sustained industry pressure against projects aimed at assessing the impacts of fishing on the marine environment.

Overall, the research commissioned for the minister’s responsibilities under the Act have been under sustained downward pressure from the industry since 1990/91. In 1991/2 the official fisheries research budget was about $22 million. By 1996/7 this was reduced to $15.06 million ($14.45 million if contract management costs are excluded) – and that figure was only held there after the intervention of environmental groups and others worried by proposals to lower the budget further. The Fishing Industry Board (now the Seafood Industry Council) pressed the minister to slash the research budget to $10 million. The Treaty of Waitangi Fisheries Commission (which is commercially focussed) wanted the budget cut to less than $8.5 million (Submissions to the Minister on the 1997 round of Nature and Extent of Services Required by the Minister). The 1997/8 budget is $14.85 million ($13.13 million if contract costs are excluded), the 1998/9 budget was increased to $18.45 million ($16.86 million).

The Fisheries Research Budget, unadjusted for inflation, and minus the contracting costs since 1994/5, has been as shown in Table1.

This is the budget for research projects commissioned to assist the Minister of Fisheries in decision making for management measures to be implemented under the Fisheries Act. This generates the information, basic to setting catch limits, including the TACC.

These figures do not include research on fisheries impacts on conservation portfolio issues, nor figures for research undertaken privately by the fishing industry or fisheries research funded by universities or other agencies. A figure between $400,000 and $700,000 (it varies annually) is allowed for the costs of contract management.

A very small part of the decrease in research funding can be attributed to research programmes that the industry has commissioned directly and which have been displaced from the minister’s commissioned work – but this would be less than $500,000.

In 1993/4 fishing companies reportedly commissioned $11.2 million of research (FORST, 1994; 11) but most of this was for market and product research and exploratory fishing, not for stock assessment or sustainability purposes.

Cutbacks to research might be justifiable if most of the information needed for decision making was at hand and only updating needed doing. This is not the case for New Zealand, current stock biomass estimates are only available for around 10 per cent of the stocks in the QMS.

To a large extent the ministry has failed to come to grips with its statutory environmental obligations under the Act. It has entirely failed to assess the requirements of the Act against its budgeting for environmental research or its development of the research portfolio.

The State of the Fish Stocks

There are many claims made for the success of the Quota Management System. New Zealand ministers, industry and others have frequently claimed that the QMS is a success. It is not clear what is the basis of these claims except for theory and hope. There is little in the empirical evidence to suggest that we have enough information to make such a claim.

The status of the fish stocks and the yields from these is surely one of the acid tests of the QMS. Each year available fish stock assessments and other biological research results are presented to and debated by stakeholders. Working groups attempt to hammer out agreement on the state of the stocks. Such agreements are intended to be the basis of the TAC and TACC setting process so they are vital to the long-term health of the fisheries.

We do know that a few stocks appear to be in good health, others we know to be well below the statutory target level of the stock associated with maximum sustainable yield ($B_{\text{MSY}}$). In a large number of cases we really do not know and management is proceeding by allowing catch without having much idea of stocks or yields. Despite this situation research funding has been substantially reduced. Data from NIWA, shown in Table 2, takes 150 of the stocks and assesses the state of our knowledge of these.

In 1997 there were still no stock estimates for 55 per cent of the stocks. Most of the remaining 45 per cent for which there are estimates have great uncertainties in the sustainable catch estimates. Even where stock estimates exist, the modelling may be based on just averaging catch over several years or on highly uncertain data.

The uncertainties provide great scope for argument and strategic behaviour by the industry. Often catch limit reductions are opposed on the grounds of lack of information – yet research projects designed to acquire
such information are also opposed by the industry. There is little in the evidence above to suggest that there is scope for reductions in the research budget.

An important question is whether the continuing lack of information is exogenous or endogenous to the QMS and the associated cost recovery system. A precautionary approach by the quota owners is not evident (see annual submissions by New Zealand Fishing Industry Board on “sustainability measures”. On the basis of quota management theory the fishers were expected to be more cautious with “their” quota than before the property rights regime (e.g. Anderson, 1995). They were also predicted to be keen to see research necessary to ensure improved management of the stocks for which they own quota.

What can be observed instead is sustained pressure for the elevation of catch limits while simultaneous downward pressure is put on research budgets (see annual submissions on “sustainability” measures and on the “Nature and Extent of Fisheries Services”).

<table>
<thead>
<tr>
<th>QMS species (all)</th>
<th>QMS species (TACC for fishstock &gt;1000t)</th>
<th>Non-QMS species (Mean catch &gt;1000t)</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>No of species</td>
<td>30</td>
<td>21</td>
<td>10</td>
</tr>
<tr>
<td>No of fish stocks</td>
<td>150</td>
<td>60</td>
<td>10</td>
</tr>
</tbody>
</table>

Percentage of fish stocks for which:

- $B_0$ has been estimated
- $B_{\text{CURRENT}}$ and $B_{\text{MSY}}$ have been estimated
- MCY has been estimated
- Stock status unknown with respect to MSY
- The TACC is risky*

<table>
<thead>
<tr>
<th></th>
<th>QMS species (all)</th>
<th>QMS species (TACC for fishstock &gt;1000t)</th>
<th>Non-QMS species (Mean catch &gt;1000t)</th>
<th>Total</th>
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<tbody>
<tr>
<td>$B_0$ has been estimated</td>
<td>17</td>
<td>31</td>
<td>43</td>
<td>20</td>
</tr>
<tr>
<td>$B_{\text{CURRENT}}$ and $B_{\text{MSY}}$ have been estimated</td>
<td>11</td>
<td>18</td>
<td>43</td>
<td>14</td>
</tr>
<tr>
<td>MCY has been estimated</td>
<td>67</td>
<td>68</td>
<td>43</td>
<td>65</td>
</tr>
<tr>
<td>Stock status unknown with respect to MSY</td>
<td>59</td>
<td>53</td>
<td>64</td>
<td>59</td>
</tr>
<tr>
<td>The TACC is risky*</td>
<td>56</td>
<td>53</td>
<td>64</td>
<td>59</td>
</tr>
</tbody>
</table>

Table 2. Stock knowledge summary

* Risky is defined as there being no Maximum Constant Yield estimate available or that the current TACC is at least twice the MCY (excluding fish stocks for which there are CAY estimates).

$B_0$ is unfished stock size; $B_{\text{CURRENT}}$ is current biomass; $B_{\text{MSY}}$ is the biomass that will support maximum sustainable yield.


Note: The relationships between MSY, MCY and CAY referred to above are explained as follows “MSY corresponds to the highest or maximum point on a theoretical yield curve of the whole range of stock biomass sizes. BMSY is the stock biomass that will allow this yield to be taken on a sustained basis... The reference points most commonly used are Maximum Constant Yield (MCY) and Current Annual Yield (CAY) which derive from two ways of viewing MSY: a static interpretation and a dynamic interpretation. MCY is based on the idea of taking the same catch from the fishery year after year. The latter interpretation from which CAY is derived, recognises that fish populations fluctuate in size from year to year (for environmental and biological reasons, as well as fishery reasons) so that to get the best yield from a fishery it is necessary to alter the catch every year. This leads to the idea of a maximum average yield, MAY, which is how fisheries scientists generally interpret MSY.” (Ministry of Fisheries, Review of Sustainability Measures and other Management Controls for the 1997–98 Fishing Year: Final Advice Paper, 28/7/97; pp7–8)
Pressure to Raise Catch Limits

Industry discount rates seem to be high since not only do they frequently oppose research required by the minister to clarify the stock size and dynamics but also TACC cuts to protect the stocks and/or the environment. They often use uncertainty about stock robustness as a basis for opposing TAC and TACC reductions while also opposing research to clear up this uncertainty. Such behaviour seems to be risk preferring rather than risk averse.

The high discount rate drivers may be the pressure to pay off loans for vessels and to avoid cuts in quota which have become increasingly recognised as bankable assets. Changes in the 1996 Fisheries Act were designed to promote this bankability.

The net effect of increased bankability appears at least to this observer (who participates in many of the meetings) to be that fishers are increasingly resistant to TAC and TACC reductions, notwithstanding the longer term impacts of over-fishing. A search through the TACC and TAC setting records over the last decade reveals that it is rare for the industry not to resist, TAC and TACC reductions. Far more often they press for increases or resist decreases. This suggests that increased bankability may be counter-productive to the long-term health of the fisheries, despite the anticipated incentive effect. Further research is required.

The ratchet effect of industry pressure can be seen in the 1997 round for setting the TACs, TACCs and other sustainability measures. Of the 36 stocks discussed, the industry wanted catch limits increased in five for which limits were proposed to be unchanged; they resisted proposals for reductions in 11, advocated a lesser cut than proposed for two and wanted an increase for three which the ministry proposed to hold or increase. For 15 of the stocks the industry accepted no change. In no case did they propose a cut when one was not already suggested (Ministry of Fisheries, 1997b: p56-59).

In the past the main exception to this behavioural trend has been the case of hoki. This is a special case though, since the pressure to avoid TACC increases has come from a section of the industry for which there is price-elastic demand. These representatives have resisted increases of quantity apparently because the price elasticity of demand is such that for some quota holders, extra sales will depress prices proportionately and hence lower their total revenues. Other hoki quota holders have pushed for increases.

Profitability

The QMS was adopted in part because of the expected increase in economic efficiency and the increase in profitability to those remaining in the industry after exclusion of excess fishing capacity.

Profitability information is not easy to find. It seems likely that there has been considerable concentration of quota ownership within the industry as transactions based cost recovery levies and industry-pricing practices have squeezed out many of the smaller players. There may also be economies of scale.

Most of the accounts are not available but the few enterprises for which there have been public annual accounts, Sanfords, a publicly-owned company, and the Treaty of Waitangi Fisheries Commission have shown continuing profits. It seems likely that at least some of the economic efficiency objectives of the QMS have been achieved.

It is not clear though that all the profits are sustainable. It is apparent from the stock history of many of the deep water and other species that much of the profit taking is likely to have been during the stock reduction phase of “fishing down” which has often overshot the yield consistent with MSY.

It remains likely that a considerable proportion of the profits derive from fish “mining” rather than sustainable use. Further research is needed into this issue.

The Environment

Since the passage of the Fisheries Act 1996, the Ministry of Fisheries has put little effort into understanding or implementing its environmental provisions. There is little evidence in the documentation of research planning, budgeting or the decisions on catch limits and other “sustainability” measures that the requirements to consider international obligations...
(section 5), future generations’ needs and adverse impacts of fishing on the environment (section 8) or the environmental principles (section 9) of the Fisheries Act 1996 have been applied. This is despite regular urgings by the Environment and Conservation Organisations and other environmental organisations (Environment and Conservation Organisations, Royal Forest and Bird Protection Society and Greenpeace, 1996 and subsequent letters and minutes of meetings between the Ministry of Fisheries and NGOs).

Seemingly regarding the legal requirements as discretionary, the ministry and minister instead have devoted most of their energies to the complaints and demands of the industry. Ministerial and ministry enthusiasm for the idea of “devolution” and their concern to devolve to the industry crucial fisheries management services have deflected the ministry from any serious attention to the environmental provisions of the Fisheries Act. These provisions borrow from, but do not exactly mirror, the provisions of the Resource Management Act 1991.

Particularly relevant sections of the Fisheries Act include section 5 which imposes the duty to comply with “international obligations relating to fishing” and the Treaty of Waitangi Fisheries Act. Despite urging, the ministry has still not identified which environmental obligations apply here and so far has equated “international obligations relating to fishing” with only fishing agreements.

A more reasonable interpretation of the term would suggest that the Convention on Biodiversity, UNCLOS, Agenda 21, the statutes and agreements of IUCN, the Noumea convention, CITES, the Convention on the Conservation of Marine Living Resources (CCAMLR) and a range of other international and regional agreements apply. To date the Ministry has not provided any exploration of these matters.

As noted above, Article 192 of UNCLOS requires states to “preserve and protect the marine environment”. The Biodiversity Convention requires in situ conservation and the collection of information. The statutes of IUCN were re-written and approved in 1996 and there are a number of Resolutions and other agreements that derive from IUCN’s General Assemblies.

The Purpose of the Fisheries Act 1996 is:

“Section 8: Purpose:

“The purpose of this Act is to provide for the utilisation of fisheries resources while ensuring sustainability."

‘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.

‘Utilisation’ means conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural well being."

The ministry has done little to explore the meanings of these requirements. Nor has it budgeted to do any work to explore what are the needs of future generations or the adverse effects of fishing on the aquatic environment. There is little sign that the ministry has lived up to its fiduciary duty of protecting New Zealand’s natural marine capital.

In the RMA the duty to avoid, remedy or mitigate adverse effects of activities on the environment is taken seriously and is a core element of the legal force of that Act. By contrast, in fisheries, little attention has been given to the requirement to avoid, remedy or mitigate the adverse effects of fishing on the aquatic environment. The Ministry of Fisheries has done little except to manage fish stocks. With the exception of certain measures undertaken with the Department of Conservation to avoid marine mammal and seabird bycatch, it has done very little to identify or assess fishing impacts on the marine environment, still less to avoid, remedy or mitigate these.

Marine invertebrates, especially benthic species, have been especially neglected. What it has tried to do has often been vigorously opposed by the industry.

Environmental protection is mandatory under the Fisheries Act but the ministry has not treated it as such. Sections 5 and 8 both impose obligations on decision-makers. There is no gainsaying the force of section 9. It is clearly mandatory:

“Section 9. 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 and dependent species should be maintained above a level that ensures their long-term viability;

“(b) Biological diversity of the aquatic environment should be maintained;"
“(c) Habitat of particular significance for fisheries management should be protected.”

There is no evidence that the ministry has seriously engaged with these requirements in any systematic way. They have so far refused to budget for, or to do, research required to discharge these responsibilities. They have not developed any implementation mechanics such as environmental assessment programmes or paid any systematic attention in decision making to these mandatory requirements. There is no system for the identification of associated or dependent species, no identification of biodiversity or screening of impacts of fishing on these, no geographic mapping or other identification of habitat of particular significance to fishing.

In decisions to date on budgets, research portfolios or sustainability controls, the ministry appears to have taken the position that the only thing it has to do to comply with this, is “business as usual”. The ministry seems to regard as adequate its focus on fish stocks and the MSY target, with a bit of attention to the impacts of fishing on bycatch of marine mammals and seabirds.

New Institutional Developments

During 1997 a small group of industry and ministry officials developed in secret plans to devolve to the fishing industry key fisheries management functions including control of the fisheries management data bases and the commissioning and potentially the doing of fisheries management research. A “discussion paper” which was really a paper designed to persuade, not to explore, was eventually released in November 1997: after it had been approved in principle by ministers (Ministry of Fisheries, 1997c).

Founded on the economic theory of clubs, the move is to allow fisheries quota holding associations or companies to manage more of the affairs of the fisheries. The idea is that these entities will then develop rules which peer pressure, contractual arrangements and other internal controls will promote compliance. Fishers will begin to behave more in concert and less in competition, so further diminishing the “race to fish” and incentives for defection from group rules.

Such arrangements have been widely discussed in the fisheries economic literature (Townsend, 1995; Dubbink and van Vliet, 1996; Sen and Nielsen, 1996; Couper and Smith, 1997), and in other resource management literature.

Quota holder associations may help to provide greater incentives to look after stocks – but there is nothing in these arrangements which will give fishers a strong incentive to look after the environment, biodiversity or non-commercial stocks.

Even for the commercial stocks the fundamental economic drivers to “mine” fish stocks will not be eliminated. These are high discount rates, high prices, relatively low fishing costs and low fish productivity. Discount rates may be moderated by new institutional arrangements but ultimately these may only ensure cooperative “mining” rather than sustainable fishing if the fundamental biological characteristics and economic settings are unchanged.

Quota holder associations or companies also have the effect of further stratifying by fish stock fisheries management. They also reinforce the power and political and legal clout of the commercial fishers at the expense of recreational, customary Maori, scientific and environmental interests.

Assessing Fisheries Management

It is possible that the Quota Management System has helped with fisheries management by imposing a clear ceiling on the total allowable commercial catch. However, it has brought its own problems, and it is clear that on its own it is by no means sufficient to provide for environmentally sound fisheries management.

The QMS has also distorted decision making to take account much more of the commercial fishers’ wishes than those of other stakeholders. In particular, the definition of extraction rights of the commercial sector has marginalised politically and legally the rights of society to environmental protection and passive and collective services from fisheries resources including ecosystem services.

The environment has continued to be at risk from the impacts of fishing. The political dominance of the industry and their wealth from grandparented resource allocations have allowed it to get its way both politically and legally at the expense of other, much less organised and resourced interests.

The Ministry of Fisheries has been both bullied and captured via the cost recovery system and its own sense of how to achieve relief from the constant political and other pressure.

The moves to devolve to the industry crucial aspects of fisheries management is styled by the minister and
ministry as moves to better management of commercial fishers within the club goods framework. In reality these moves constitute a process of industry capture of fisheries management at the expense of other stakeholders and the environment.

**Future Requirements**

The first and most obvious requirement is that the Fisheries Act’s environmental and future regarding aspects are implemented. The failure to take these seriously and to implement these is a major flaw.

This failure may be endogenous to the QMS because of the dominant position in terms of wealth and power that the QMS has given commercial fishers, especially the large players who oppose implementation of these controls. By contrast, the equivalent provisions of the RMA have had considerable attention. In both cases though, non-governmental organisations have lacked the money to take legal enforcement action.

Major reform is required. The moves by the government to enhance the position of customary Maori is one worthwhile step, as is the lip service given to improving the position of recreational fishers. Ultimately, however, this will not be enough.

Recognition is required of the non-extractive services of fisheries resources and the marine environment, especially the ecological functions. This will take both action to make the Ministry of Fisheries implement its Act, and administrative and legal reform.

**Reform Needed**

The marine environment is unlikely to be properly administered to meet either international obligations or the public’s aspirations for good stewardship until major reforms, similar to those for land administration during the 1980s is done.

Perhaps the first and most fundamental requirement is for an ethos that sees the sea as an ecosystem and applies an ecosystem approach to marine management. To implement this will require reallocation of responsibilities to either an existing agency such as the Department of Conservation or the creation of a Ministry of Marine Impacts Management – or some such agency. New legislation which establishes a Resource Management Act-style purpose and principles and an agency with the responsibility for management of the marine area is required. The responsibility should encompass the area from at or near the coast to the outer limit of the EEZ is required.

This would provide for integrated management. Maori involvement should be active and be substantial in recognition of the Treaty of Waitangi.

Existing agencies such as the Maritime Safety Authority, and the Ministry of Fisheries should either become subsidiary bodies to the new agency or be bound by the new legislation and subject to oversight by the new body. The Department of Conservation should retain its responsibilities for marine mammals, wildlife and marine reserves, but the grounds for establishing reserves should be expanded beyond scientific grounds and allowed to extend into the EEZ.

**Conclusions**

In 1998, 12 years after the introduction of the QMS, there remain serious gaps in even the most basic information such as stock biomass estimates. As a result, setting total allowable catches (TACs) and total allowable commercial catch limits (TACCs) is difficult and risky to the stocks and the environment.

The QMS has not delivered on its promise of responsible fishers with long time horizons: other controls are required.

It has created a political and legal climate of dominance of commercial extractive interests over all others. In part because of this the Ministry of Fisheries has neglected its mandatory statutory duty to the environment, future generations and the wider New Zealand community while pursuing institutional reforms of benefit to the commercial industry whose interests have come to dominate the thinking of both the ministry and minister.

Legal and administrative reforms to set commercial fishing within effective environmental and social constraints within an ecosystem approach to marine management are required. A Ministry of Marine Impacts Management is one route to this. What is required is a major administrative and legal reform of the kind implemented for the terrestrial environment in the 1980s. The public should be closely involved in this debate which must first address the question of the ethos required for an ecosystem approach to marine management.
References


Ministry of Fisheries, Quota Monitoring System Reports.


Appendix 1. Relevant Sections of 1996 Fisheries Act


This Act shall be interpreted, and all persons exercising functions, duties, or powers conferred or imposed by or under it shall act in a manner consistent with:

(a) New Zealand’s international obligations relating to fishing:


Part II: Purpose and Principles

Section 8: Purpose:

The purpose of this Act is to provide for the utilisation of fisheries resources while ensuring sustainability.

“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.

“Utilisation” means conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural well-being.

Relevant Definitions:

Relevant definitions to section 8 are:

“Fisheries resources” means any one or more stocks or species of fish, aquatic life, or seaweed:

“Fish” includes all species of finfish and shellfish, at any stage of their life history, whether living or dead:

“Aquatic life”:

(a) Means any species of plant or animal life that, at any stage in its life history, must inhabit water, whether living or dead; and

b) Includes seabirds (whether or not in the aquatic environment).

“Seaweed” includes all kinds of algae and sea grasses that grown in New Zealand fisheries waters at any stage of their life history, whether living or dead:

“Aquatic environment”:

(a) Means the natural and biological resources comprising any aquatic ecosystem; and

(b) Includes all aquatic life and the oceans, seas, coastal areas, inter-tidal areas, estuaries, rivers, lakes, and other places where aquatic life exists:

“Fisheries resources” means any one or more stocks or species of fish, aquatic life, or seaweed:

“Stock” means any fish, aquatic life or seaweed of one or more species that are treated as a unit for the purposes of fisheries management:

“Conservation” means the maintenance or restoration of fisheries resources for their use; and “conserving” has a corresponding meaning:

Section 9. 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 and dependent species should be maintained above a level that ensures their long term viability:

(b) Biological diversity of the aquatic environment should be maintained:

(c) Habitat of particular significance for fisheries management should be protected.

Definitions:

Relevant definitions are:

“Associated or dependent species” means any non-harvested species taken or otherwise affected by the taking of any harvested species.

“Harvested species” means any fish, aquatic life, or seaweed that may for the time being be taken with lawful authority:

“Biological diversity” means the variability among living organisms, including diversity within species, between species, and of ecosystems:

Section 10. Information 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 information 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 any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of this Act.

Relevant definitions:

Relevant definitions for section 10.

“Best available information” means that best information that, in the particular circumstances, is available without unreasonable cost, effort, or time:

“Information” includes-

(a) Scientific, customary, Maori, social, or economic information; and

(b) Any analysis of any such information.

Section 11. Sustainability measures -

(1) The Minister may, from time to time, set or vary any sustainability measure for one or more stocks or areas, after taking in to account-

(a) Any effects of fishing on any stock and the aquatic environment;

(b) Any existing controls under this Act the apply to the stock are area concerned; and

(c) The natural variability of the stock concerned.

(2) Before setting or varying any sustainability measure under subsection (1) of this section, the Minister shall have regard to any provisions of -

(a) Any regional policy statement, regional plan, or proposed regional plan under the Resource Management Act 1991; and

(b) Any management strategy or management plan under the Conservation Act 1987-

that apply to the coastal marine area and are considered by the Minister to be relevant.

13. Total allowable catch

(1) Subject to this section, the Minister shall, by notice in the Gazette, set in respect of the quota management area relating to each quota management stock a total allowable catch for that stock, and that total allowable catch shall continue to apply in each fishing year for that stock unless varied.

(2) The Minister shall set a total allowable catch that-

(a) Maintains the stock at or above a level that can produce the maximum sustainable yield, having regard to the interdependence of stocks; or

(b) Enables the level of any stock whose current level is below that which can produce maximum sustainable yield to be altered -

(i) In a way and at a rate that will result in the stock being restored to or above a level that can produce the maximum sustainable yield, having regard to the interdependence of stocks and any environmental conditions affecting the stock; and

(ii) Within a period appropriate to the stock and its biological characteristics; or

(c) Enables the level of any stock whose current level is above that which can produce the maximum sustainable yield to be altered in a way and at a rate that will result in the stock moving towards or above the level that can produce the maximum sustainable yield having regard to the interdependence of stocks.

(3) In considering the way in which and rate at which a stock is moving towards or above a level that can produce maximum sustainable yield under paragraph (b) or paragraph (c) of subsection (2) of this section, the Minister shall have regard to such social, cultural, and economic factors as he or she considers relevant.

(7) After considering information about the abundance during the fishing year of any stock listed in the Second Schedule to this Act, the Minister may, by notice in the Gazette, increase the total allowable catch for the stock with effect from such date in the fishing year in which the notice is published as may be stated in the notice.

[Second schedule species are: flatfishes (8 species) and red cod.]

(8) If the total allowable catch for any stock has been increased during any fishing year under subsection (6) of this section, the total allowable catch for that stock shall, at the close of that fishing year, revert to the total allowable catch that applied to that stock at the beginning of that fishing year...

Relevant definitions:

“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.
Benthos: A Datalogger of Marine Environmental Health

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Abstract

There is an urgent need for marine ecosystem indicators to facilitate management aimed at either ameliorating impacts or guiding sustainable utilisation of marine resources.

We propose that qualitative and quantitative examination of marine benthic communities will provide robust indication of responses to short and long term environmental conditions, and further suggest that information exists which permits creation of a hierarchy of indicators for establishing ecosystem health in a regional context. These are in the form of identifiable marine community assemblages, together with biomass and growth indices determined from morphological parameters associated with the characterising species for each assemblage. Examples are provided to demonstrate the sensitivity of such indicators by focusing on sponge and bryozoan characterised communities.

The composition of assemblages and population statistics of key species reflect ecosystem disturbances following catastrophic sediment deposition following cyclones, and in response to more recent and relatively short term impacts. The latter include responses to sediment disruption from trawling and sand mining, and responses to water quality change during algal bloom events.

Marine environmental indicators are likely to take the form of well-defined ecotypes described by characterising species presence. These species have known ranges of tolerance to environmental variables such as light, current, food supply, turbidity, BOD, and sediment regime. They are, by their very nature, relevant at a regional level and will be set in the context of a biogeographic classification for any coast or shelf. They can be further refined by interrogation of models relating population structure of key species to biological and physical attributes of the environment.

Environmental Health

For the purposes of this paper, we will define compromised environmental health as follows: an unhealthy environment or habitat is one which has been altered such that prevailing physical and biological conditions are significantly different from the range normally experienced, to the extent that the ecological interactions of biota within that system are affected. Thus the population dynamics of one or more species within the system shifts outside normal ranges.

The Need for Indicators

Environmental managers need inexpensive, reliable, ecologically relevant early warning devices to detect shifts in environmental health and assess effects of mechanisms designed to ameliorate further damage. We suggest that the most useful indicators for monitoring marine environmental health are to be found in the marine benthos. By examining the make-up of identifiable species assemblages together with quantitative analysis of key species’ demography and community
structure, accurate interpretation can be made of the well-being and ‘naturalness’ of a wide variety of habitats. This paper will demonstrate how analysis of marine benthic macro-fauna or flora, can provide a snap-shot image of prevailing environmental condition. We will demonstrate how such information may be used for a variety of spatial and temporal scales and in a fashion amenable to direct use by environmental managers.

To fully understand the effects of human activities on the environment at all levels from global warming to point source pollution, indicators of environmental health need to be established. Indicators are also needed to monitor the effects of management designed to ameliorate or correct impacts. For them to be useful, indicators need to be pertinent to the ecology of the system in question and applicable to a variety of spatial and temporal scales, from global to regional. Such indicators need to be relevant to the ecosystem in question and reflect aberrations from a ‘normal’ condition. What constitutes normal ranges in ecological interactions of component species, and indeed what constitutes a normal assemblage of species within each habitat, in any one particular area, needs to be established before indicators are selected.

Indicator organisms or assemblages will be those which characterise the environment in some manner or which represent sentinel species/species groups. Recent developments in toxicology aimed at identifying indicator species which reflect levels of pollutants, have focused on chronic effects of pollutants which enter the environment from diffuse sources, most commonly urban storm water (Desbordes and Hemain, 1990) which conducts nutrients (Caddy, 1993; Caddy and Bakun, 1994, Fabric and Bell, 1993), pesticide and herbicidal compounds (Clark, et al, 1989; Haya, 1989; Neskovic et al, 1996), PCB’s (Gunkel et al, 1995), heavy metals (Chan, 1995; Vukadin, et al, 1995), and sewage (Seager and Abrahams 1990). Such pollutants represent effluent streams, with relatively low initial acute toxicity, but emanating from point source discharges.

Previous work on establishing indicators has therefore focused on sublethal problems and evidence of pollution is often presented in the form of histological or biochemical abnormalities in key species (Neskovic et al, 1996; Ostrander et al, 1995). Only recently have behavioural methods been used (Little et al, 1993). The sensitivity and relevance of these types of observations needs to be demonstrated or ground-truthed in a wider ecological context. Frequently the natural relationships between target species and their environment is poorly understood. Over larger spatial scales, there is an urgent need to establish what may be happening to whole ecosystems in response to other forms of potential environmental damage. Here impacts of terrestrial sediment runoff and fishing activities are cited as being of great concern. It is with respect to these latter considerations, that use of benthic species assemblage indicators, within a biogeographic context, is particularly relevant.

A Hierarchy of Indicators
The use of various categories of quantified benthos description as an indicator of environmental health allows application of indicators at various spatial and temporal scales:

<table>
<thead>
<tr>
<th>Global Biodiversity</th>
<th>New Zealand Wide Biogeography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within Region (Habitat) Species Diversity/Demography/Morphology</td>
<td></td>
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</tbody>
</table>

Thus key species may be identified within recognisable assemblages which characterise a variety of habitats and use of quantifiable attributes of these species groups can be couched in terms of a wider New Zealand biogeography (e.g. are they unique or representative habitats) and in turn can be viewed in a global biodiversity context.

Benthic Assemblages
There are a number of well-known marine benthic assemblages which characterise environments and provide opportunity to select suitable species to be used as indicators (see Cook ed, 1998).

Bryozoans
On certain parts of the New Zealand coast and out to the edge of the continental shelf bryozoans dominate. Whereas in the tropics bryozoans are mostly cryptic and of relatively low taxic and morphological diversity compared to scleractinian corals, in temperate waters bryozoans can substitute for corals in abundance and structure. While bryozoan colonies do not themselves form reefs, they can form the structural basis of biothermal mounds and comprise the principal frame-builder of assemblages that attract epibionts and/or may entrap sediments. There are two examples in New Zealand waters.
Tasman Bay bryozoan beds are known as Tasman Bay coral by trawlfishers. Present-day beds up to 272 km² in extent have been reported at various locations from Separation Point to D’Urville Island and the outer Marlborough Sounds (Bradstock & Gordon 1983). Principally comprising the cheilostome Celleporaria agglutinans (Hutton) (‘hard coral’), the bryozoans occur at depths of 10-35m, forming coralline clumps up to 0.5m high and locally attaining up to 50 per cent cover. Less robust is ‘Hippomenella’ vellicata (Hutton) (‘cornflakes coral’) which co-occurs with C. agglutinans, either sparsely growing with it or separately forming coarse foliaceous and platy growths to 0.3m across and 0.15m high. The mounds and honeycombs of these two species collectively provide attachment surfaces for other calcareous frame-building components, including 92 additional species of bryozoans, plus serpulids, bivalves that die and become entrapped, and a homotrematid foraminiferan. Additionally, numerous mobile invertebrates (e.g. gastropods, chitons, ophiuroids, holothurians, polychaetes, ascidians, sponges) occur in the interstices of the coralline growths. The food items and shelter provided by the habitat attract juveniles of commercial and other fish (Vooren 1975). Significantly, this bryozoan biotope has occurred in the northwest Nelson area since the Early Miocene (c. 20-22 Ma) (Gordon et al. 1994).

Endemic Celleporaria agglutinans is a common species around the entire coastline of New Zealand. It can occur as an infrequent component of subtidal rocky reef assemblages or, as at Separation Point, on shell islands on a fundamentally muddy-sandy bottom. On the outer shelf off Otago it occurs with shell and bryozoan gravel associated with a lag mud veneer. In these latter environments it is surprisingly tolerant of fine sediments, but the current speeds at these locations are generally high and the water nutrient-rich. Because of its wide occurrence and tolerance of a range of current speeds and sediment conditions, C. agglutinans is a suitable indicator of anthropogenic impacts in areas that would normally have elevated invertebrate and fish diversity. It will not tolerate prolonged smothering by sediments stirred up by trawling activities. When not smashed by trawl gear and allowed to grow to significant heights from the sea floor, the three-dimensional structure of C. agglutinans, with cavities and interstices within its tubes and laminae, will ensure an associated sessile and mobile fauna. It is a distinctive species and can be easily recognised during dive surveys and routine monitoring.

Less well-known, but in some ways even more impressive, are the bryozoan-structured reefs of eastern Foveaux Strait. These are in the process of being mapped by NIWA and their structure and growth studied in detail. The principal frame-builder is a cheilostome bryozoan, Cinctipora elegans (Hutton), type species of a genus and family found extant only in New Zealand. Ranging from offshore Wanganui to Foveaux Strait and out to the Chathams, Antipodes, and Bounty Islands, it is particularly common on the Otago shelf and in Foveaux Strait. It forms erect branching colonies of cylindrical stems up to 30 or more centimetres high, providing a structural framework that is associated with other bryozoans, worm tubes, bivalve molluscs, and entrapped sediment. The low-elevation (c. 0.5-1.0m high) aggregate mounds can form linear structures more than 10 km long and 0.5 km wide.

The surfaces of these linear reefs support a range of marine life including bushy bryozoans, sponges, actinians, ascidians, nested mussels, and Bluff oysters. It has been noted that oyster populations on the Cinctipora reefs suffer lower mortalities during Bonamia outbreaks (Hine pers. comm.). Possibly reef health generally, including that of the oyster, is elevated by the secondary metabolites continually released by the sponges, bryozoans, and ascidians to deter predation, overgrowth, and infection.

Cinctipora elegans occurs in a similar range of situations to C. agglutinans, though only the southern half of New Zealand, and is likewise easily recognised. It can occur solitarily, as in the fiords, or aggregated as in Foveaux Strait. It tolerates far less fine sediment than C. agglutinans and its occurrence is correlated with clean, nutrient-rich water conditions. Its loss from areas in which it was previously common would be indicative of negative environmental impacts, from whatever source.

Currently 930 known species of bryozoans live on the seafloor around New Zealand (representing more than 16 per cent of bryozoans known globally, but possibly 1200 species occur in total). The species mentioned above, because of their wide distribution, ease of recognition, and structural significance, are probably the two best indicators from this group. Notwithstanding, other species would be suitable as indicators in specific settings, such as the free-living species of Otionella and Selenaria. These form small 0.3-1.0cm diameter discoidal or lentil-like colonies whose peripheries are surrounded by bristle-like structures that
are able to move, thereby giving the power of mobility to these colonies, which are able to right themselves if overturned or return to the sand surface if covered by sediment. Their restricted occurrence on clean sand or muddy sand at depths below wave break (generally 20-200m) is indicative of non-turbid, non-stagnant conditions free of continual overturn by regular fishing activities.

**Sponges**

Sponges also characterise significant expanses of benthos in the deeper subtidal (from about 20 meters depth) to abyssal plains. Such communities are very important globally constituting nursery and feeding grounds and supporting a diverse assemblage of encrusting invertebrates (up to 60 species per 50m2). Diversity as measured at this scale is not significantly different to that found on tropical coral reefs or in the Antarctic.

Sponge-characterised reef is certainly prevalent around the New Zealand coast and continental shelf, although increasingly evidence suggests that these habitats have undergone massive impact from terrestrial sediment runoff and bottom trawling impacts. Typically these habitats are very stable in space and time with monitored populations showing no significant recruitment in over 20 years and where individual sponges have not changed in shape or size over that time (Ayling, 1983; Battershill, 1986; Battershill and Bergquist, 1990). Sponges and associated encrusting fauna bind sediments thus imparting resistance to storm or current disturbance. Modes of reproduction of most of the species present in these habitats are strongly linked to physical conditions, particularly sediment regimes (Battershill and Bergquist, 1990).

The difference between the presence and absence of a sponge-characterised assemblage is a change of ambient sediment depth by plus or minus one centimetre and only a very slight shift in the quality of sediment with introduction of fine silts causing immediate and long term destruction (Battershill and Bergquist, 1998a,b). Therefore these types of communities represent very important indicator assemblages of prevailing coastal condition.

As the descriptor suggests, these communities are populated by diverse sponge assemblages, which account for most of the 450 species found in New Zealand (almost 10 per cent of the sponge species known globally). It is estimated that possibly twice this number exist. Together with sponges are many bryozoans (mentioned above) and ascidians which perform similar ecological roles in terms of characterising habitat and maintaining stability in community structure. There are 159 species of ascidian described in New Zealand (over 10 per cent of the global total), with many more new species being found almost daily. Based on an assessment of multi-taxon species composition, New Zealand can be partitioned to 13 biogeographic zones based on the structure of sponge characterised communities (this classification will be verified over the next six years by NIWA with close association with the Department of Conservation). At broad scales, however, two clear communities may be described to provide an example of the usefulness of these community characteristics.

1. **Polymastia/Axinella** Assemblages
   
   A suite of *Polymastia* species (massive or thickly encrusting growth forms) and axinellid sponges (finger sponges) characterise most northern New Zealand reefs below 20m to 100m depth (the coastal perimeter). They are always associated with a wider group of sponges, bryozoans and ascidians together with tube building amphipods and, in clear waters, coralline turf. Sediments are always between 0.5 and 1.5cm average yearly depth and always of a medium grain size (Battershill 1986). The community is extremely stable, but once disturbed by trawling or in response to a shift in prevailing sediment regimes (due to sand mining or enhanced land runoff), the community quickly disintegrates and expanses of unstable sediment flats predominate probably for extensive periods of time (Figure 1). Reproduction by most species in the assemblage is predominantly asexual, but all recruitment leading to successful settlement is intimately attuned to sediment dynamics (Battershill and Bergquist 1990, 1989). These communities support orders of magnitude more fish than adjacent habitats.

2. **Thorecta/Strongylacidon** Assemblages
   
   From Wellington south, on both coasts, benthic reef communities from 20m to 100m look very different from northern assemblages. *Thorecta* and *Strongylacidon* are two key species which typify these communities. These communities are also biodiverse and stable and their origin and structural maintenance appear to be established in very similar fashion to the communities described above. They occur in areas of increased sediment deposition and can always be found in areas with less than 0.5cm of sediment overlay, although ambient sediment grain size is much
Figure 1: A selection of possible indicators of environmental health as applied to the Gisborne area. The impact of the Cyclone Bola storm and an annual input of 13 million tonnes of sediment per year from one catchment alone can be seen as a depression of extent macroalgal forest, decrease in biodiversity and an increase in the level of anoxic sediments when compared to the same habitat, with the same bathymetry, level of exposure and geology, but where sediment input is only 0.4 million tonnes per year (the north Taranaki coast).
finer than that found in the northern sponge community. Associated benthos includes rich bushy bryozoan assemblages (*Amathia*, *Cribricellina*, *Costaticella*) and richer components of ascidians (*Aplidium* species and *Synoicum*). Once again, should prevailing physical conditions change, these communities disappear. This seems to have occurred in areas around the Kaikoura Peninsula where only small remnant assemblages are now found where bottom current strength is sufficient to keep cobbles and reef topography clear of substantial fine sediment build-up (Figure 2, Page and Battershill, 1998).

The above are just two broad scale examples of the intimate relationship between benthic community structure and prevailing physical and biological conditions. The presence or absence of these communities and the nature of the species within them reflects in detail prevailing conditions and indeed is a true indicator of reef health. They point to larger scale impacts associated with land runoff or fishing technique. They also will instantly reflect response to small-scale point source pollution. Within the large biogeographic zones portrayed above, smaller scale regional and habitat subsets of species assemblages can be identified. In New Zealand there has been a great deal of biosystematic work on which to base accurate description of community make-up for the purpose of creating indicators. We are already well advanced for this application. The general goal for use of NIWA collected and integrated databases is:

“To define, classify and map coastal and offshore biotic assemblages and their habitats in the EEZ, at various scales, in order to determine the distribution and abundance of New Zealand’s living marine resources so as to sustainably manage them by maintaining and enhancing biodiversity.”

**Benthos Models as Indicators**

Not only can we accurately describe indicator communities on the basis of species complement and community structure, but by examining the morphology of key species within these groups it is further possi-
ble to accurately describe prevailing physical and biological conditions. Sponges and indeed most modular organisms grow in a manner that reflects their ability to survive in the conditions they experience.

Their energetic investment in body size and shape is directly related to food availability, ability to withstand storm disturbance and to keep themselves free of settling sediments. These are but a few of the interacting demands placed on benthic invertebrates (and indeed algae) to which they respond. Thus their size and shape reflect prevailing physical and biological conditions. Morphological or allometric character does not change in deeper reef organisms for substantial periods of time (Ayling 1983), so we can assume that the shape and biomass of individuals observed on any one reef reflects long-term environmental condition.

Contrary to common belief, many species of very long-lived sponge can grow rapidly when conditions change. Thus a sponge transplanted into an area which is better suited to growth will respond instantly and assume a new size and shape best equipping the sponge to optimally make use of the new environment. In this sense, what we see on any one reef represents a snap-shot image of prevailing conditions. The allometry of species will change instantly to any change in conditions.

Thus if the environment is impacted by increased rates of fine sedimentation for example, sponges (and other organisms) will not be able to feed as well, use more energy in repelling accumulation of mud, and possibly succumb to infection. The result is usually a reduction in biomass and a rounding in shape (Battershill, 1986a).

To use this phenomenon as an indicator of prevailing environmental health and to track response to changing environmental condition, it is possible to model key species allometry and ground truth the model with environmental parameters (Figure 3; Battershill, 1986b; Kaandorp, 1994; Abraham 1998). Figure 4, shows the response of the patch size of encrusting sponges, bryozoa and encrusting coralline algae to variation in exposure, and light. This model can be interrogated and is found to predict animal and plant size correctly. It can thus be used as an indicator, as if there is a shift in patch size at any particular location, the model can be used to indicate both the direction of the shift and provide hypotheses as to the cause.

This is a very crude and superficial example, but the power of such models which are based on the ability of benthic organisms to integrate environmental condition and reflect it in allometry, is viewed as being substantial.

Such models and the type of monitoring likely to be required are inexpensive to generate and perform. They are sensitive and relevant to the ecology of the coast and can be selected to demonstrate prevailing environmental health at a variety of scales for the complete range of habitats pertinent to any region.
Figure 4: Response in average patch size of encrusting benthos to variation in light and exposure (Battershill, 1986).
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Coastal Management in New Zealand – Preserving the Natural Character: Problems and an Alternative

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Abstract
This paper is based on the findings of a study on the management area approach in Regional Coastal Plans (Thomson 1997). The coastal management regime has changed due to the Resource Management Act of 1991 (RMA), stipulating new initiatives and priorities for coastal management.

The response of the regional authorities to the imperative for the management and preservation of coastal natural character has led to the establishment of conservation management areas. These areas in general have a narrow focus on particular aspects of the coastal environment, and do not recognise the processes that underpin the natural character of the coast, that a wider management approach could address.

The Resource Management Act
The RMA introduced a new coastal management regime to New Zealand. The purpose of this legislation is to “promote the sustainable management of natural and physical resources” in New Zealand. In particular the Act identifies imperatives for the management and preservation of coastal resources. These imperatives include the safeguarding of the life-supporting capacity of ecosystems and the preservation of coastal natural character.

The New Zealand Coastal Policy Statement is prepared under the direction of the RMA. The purpose of this document is to achieve the purpose of the RMA in relation to the coastal environment. Policies pertaining to the preservation of natural character outline the priorities for management. These priorities include the preservation of the integrity, functioning, and resilience of the coastal environment and the management of areas of significant vegetation and significant habitats of the coastal environment. This acknowledges that to preserve natural character it is necessary to manage the processes that underpin it.

Natural character of the coastal environment includes the dynamic functioning of the physical coastal processes, the presence of indigenous vegetation on the coastal fringe, coastal landforms, sea views, the topography and composition of the seabed, marine ecosystems, and the diversity of life they support (Auckland Regional Council 1995). The preservation of natural character therefore presents a challenge to policy makers in councils around New Zealand.

The coastal marine area in New Zealand has a landward boundary of Mean High Water Springs and a seaward boundary of the outer limits of the territorial sea, that is twelve miles from shore. This area falls into the jurisdiction of the Regional Authorities. Above the line of Mean High Water Springs the Territorial Local Authorities have jurisdiction (Figure 1).

Under the RMA the regional authorities are required to prepare a coastal plan that details objectives, methods and policies that will achieve the purpose of the Act, in relation to the coastal marine area of the region. It is through these policies and methods that coastal natural character is preserved. The policies focus on preventing inappropriate subdivision, use and
Regional authorities are therefore expected to ensure that all activities occurring in the coastal marine area are compatible with maintaining the integrity of the coastal environment. The appropriateness of a proposed activity in the coastal marine area is decided on a case by case basis.

The approach taken by the regional authorities, in the first generation of regional coastal plans, to preserve natural character on the coast has been to identify areas in the coastal marine area that are of significant conservation value. These management areas are for conservation purposes and are justified on the basis of particular species, and habitat types.

Many of the management areas around New Zealand that have been identified for conservation management are estuaries (Thomson 1997; Thomson and Hilton 1997). Of the 480 conservation management areas identified around New Zealand approximately 32 per cent of them contain an estuary. The natural values that these habitats hold are their primary reason for being identified as conservation management areas. Birdlife is the most common reason for management as these areas are the known breeding, feeding, and roosting sites for many endangered coastal bird species. Other reasons that were given by Regional Authorities for conservation management areas included marine life, such as sponge gardens, horse mussel beds; scenic and historic values such as land and sea scape views, and shipwrecks; the haulout areas for seals and penguins.

The majority of the conservation management areas on the coast focus on shallow marine habitats and are justified on a biological basis, rather than ecological and geomorphological processes.

The problem with this narrow approach to management areas, is that the processes that create and maintain many of the habitats that have been identified as containing significant conservation value are not being managed. This then creates the potential for these habitats to become degraded by mis-management of the processes that sustain them. It is important that it is recognised that natural character does not need to be seen in order to exist (Smale 1996). The preservation of natural character is conditional on sustaining the processes that create it (Smale 1996).
Figure 2. The coastal and shelf ecological regions of New Zealand (King et al. 1985).
Figure 3. The ecological districts of the northern neritic territory (King et al 1985)
Research found that there is an abundance of information on the physical and biological components that effect natural character (Thomson 1997). Much of it is focussed at the regional or local level. Yet there is little or no recognition of this in the regional coastal plans.

Information on the circulation of sediment around the coast has led to the classification of the New Zealand coast into regions and districts. One such study completed by King, Bailey and Clark in 1985 used marine topography, geomorphology, hydrology and biology.

New Zealand was first divided into territories using marine topography, then ecological regions were defined using hydrological data, such as ocean temperatures, salinity, and current patterns, biological information was then used to refine the regions into ecological districts.

By further refining the study of King et al. a greater detail of the communities of organisms and the processes and functions that maintain them can be achieved (Thomson 1997). These subdistricts provide a meaningful ecological boundary. An example of this is on the east coast of Auckland at Pakiri (Thomson 1997).

The Pakiri Beach Example

Pakiri Beach is a closed sediment system. The sediment is periodically cycled between the beach and shallow coastal environments (Hilton and Hesp 1996). The offshore limit for sediment movement in the beach-nearshore system occurs approximately at the 25-metre isobath with is about two-and-a-half kilometres offshore. This is then a closed sediment cell that should be recognised in management plans. This sand system includes the dunes that occur along the upper reaches of Pakiri Beach these support several indigenous species, such as pingao and the New Zealand Dotterel.

Pingao is a native sand binder that is relatively rare in the Auckland region, but at Pakiri it has a strong presence. It was once widespread around New Zealand, but has been replaced by more aggressive introduced sand binding species such as marram and tree lupin. It is the nesting habitat of the New Zealand Dotterel, and other native bird species and a food source for indigenous moths and butterflies (Herbert and Oliphant 1991).

The Auckland Regional Council has identified Pakiri Beach as a coastal protection area due to the beach being the only one of its kind on the Auckland east coast, the breeding area for several coastal bird species, and its areas of native vegetation. (Figure 4) The boundaries of the protected area, however, do not coincide with the sediment regime for the beach.

Pakiri Beach then is the only large ocean beach on the east coast of the Auckland region, it is also a breeding area for many coastal birds that includes endangered indigenous species and it is a closed sediment system to approximately the 25-metre isobath. Yet sand mining occurs in depths of just eight metres.

The methods employed by the regional authorities identify management areas that recognise particular habitats or areas that are important to particular species. There is no ecological relevance to the boundaries to these areas as the Pakiri example illustrates.

Ecological Management

A management system that recognises the physical and biological processes is therefore required. This approach to coastal management would include the following elements of the coastal environment (Thomson 1997):

• Oceanographic characteristics, such as bathymetry, currents including the areas of mass water movement their origin and destination, temperature, salinity, areas of nutrient richness, upwellings, and the nature of the sea bed including patch reefs;

• Geomorphology of the coastal area, the sediment type, the beach profile and characteristics, geological formations in the area such as sand spits, dunes, rock formations, the sources of sediment for these structures. Any sediment reservoirs should also be identified and managed;

• Marine life and fish species in the region, their behaviour, migratory paths and home ranges, preferred habitats and diets, their breeding times, and threats to species well-being and survival. The identification of key marine species may also prove invaluable for monitoring purposes. For instance, Red Moki is a territorial reef fish that is easily identified and has been found to be a good indicator of the health of reefs in the upper North Island;

• Bird species in the area, both migratory and permanent, their food sources and preferred diets, preferred habitat and nesting sites, life history, migratory behaviour, threats to well-being and survival;

• Coastal vegetation in the region, seeding times and dispersal methods, nutrient requirement, and any threats. Certain species of coastal plant are also important for
Figure 4. Boundaries of the sediment system and management areas at Pakiri Beach (Auckland Regional Council 1995; Hilton and Hesp)
the successful breeding of many species of birds.

However, while this approach identifies the different facets of the coastal environment, it is also important to identify elements and processes of the terrestrial environment that effect the coastal environment such as water catchments. The water catchment area, and the catchment of an estuary, are significant because fresh water quality is important for the coastal environment. Fresh water enters coastal waters either by direct discharge into the sea via rivers, streams, and drains, or as runoff from land. The quality of the fresh water entering the coastal environment therefore affects its health and well-being.

This broader approach then identifies the physical and biological components that influence the coastal environment and its natural character. In preserving natural character it is necessary for the policy maker to be made aware of these different components and processes of the coastal environment and the influence that these have on the natural character in the region in question.

This method does not seek to hinder the development and use of the coastal environment, rather to assist it. By better understanding the processes and biological systems human use of the coastal marine area can be enhanced, without further degrading the systems that maintain natural character on the coast.

The management area approach that has been adopted by regional councils in New Zealand as the method with which to preserve natural character does not acknowledge the need to manage ecosystems and the processes that underpin them. Instead, they attempt to preserve areas that contain significant conservation value by selectively managing only the area of direct interest to the community. A major deficiency of this method is that it fails to recognise the dynamism of the coastal environment and the effects that the wider ecosystem and the coastal processes have on these areas. By not appreciating the importance that these wider systems have in the health of the areas of conservation value there is a threat that may cause the degradation of these areas due to the lack of management of the processes that maintain them.

The primary purpose of the RMA is to promote the sustainable management of the natural and physical resources of New Zealand including the coastal environment. The majority of the conservation management areas that the regional councils have identified around New Zealand will not achieve this objective, and neither will they preserve the natural character of the coastal environment.

A broader management approach that integrates all the facets of natural character into decision-making can at least acknowledge the importance of the processes and ecosystems in preserving the natural character of the environment and go some way to promote the sustainable management of the coastal environment.

The jurisdictional boundary of Mean High Water Springs is, however, inappropriate for such an initiative, as it changes with every spring tide. The coast cannot be defined with lines arbitrary or otherwise, it is a zone which goes inland and out to sea.

Each Regional Authority should define the extent of coastal influence in their areas, and designate this as a littoral zone, and then formulate appropriate policy that will ensure the preservation of coastal natural character for future generations.

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Management of the New Zealand Pelagic and Deepwater Longline Fisheries with Particular Reference to the catches of non-target fish species and the interactions that occur with non-fish species

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Abstract
(paper not supplied)

The paper will review the development and progress of these two longline fisheries over the last 10 years with reference to:

• the increase catch of the target species;
• the catches of non-target species;
• the interaction with seabirds and marine mammals.

While this paper gives a commercial fisheries perspective, it will also examine changes in fishing operations and practices including:

• the mitigation of accidental capture of seabirds;
• the spatial conflicts that arise between different competing groups that utilise the pelagic fishery;
• issues that will have to be addressed in the next few years if these fisheries wish to continue to develop within the New Zealand Exclusive Economic Zone.

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Abstract

The abundance, size frequency and biomass of reef fish are often used as environmental indicators of anthropogenic and natural impacts.

Traditionally, programmes which monitor reef fish populations have depended on data collected by scuba divers. We question whether the data collected by these divers is sufficiently accurate and precise to detect changes with an adequate level of statistical power. We calculate the statistical power of visual length estimates made by novice and experienced scientific scuba divers to detect changes in the mean length or biomass of three common species of fish from New Zealand coastal waters.

We show that by using length estimates from a stereo-video system much greater statistical power can be obtained to detect changes in the mean length or biomass of two of the three species. Stereo-video is particularly effective where a small effect size is selected (5-10 cm), or where low numbers of fish are recorded per sample.

Introduction

The identification and monitoring of indicator species within the marine environment is essential for identifying natural and anthropogenic perturbations. In order to monitor these indicator species we need baselines data to enable comparisons. As highlighted by Paul Dayton, we have no way of knowing what changes have already taken place. Internationally, it is accepted that monitoring programmes require a BACI (Before After Control Impact) (Underwood, 1992) sampling design to detect real changes due to anthropogenic or natural episodic impacts from spatial and temporal variability. In order to achieve the goals of monitoring programmes we need to have controls which contain communities which resemble natural pre-impact states.

The establishment of a network of marine reserves incorporating the full range of habitats from around the country, which effectively prevents the removal of organisms, will allow a control against which to compare the impacts of recreational and commercial fishing.

In New Zealand many species of reef fish are important culturally, recreationally and commercially. Reef fish are also important predators on rocky reefs and have an important role in the structuring of these communities. Reef fish have been used as indicators of environmental change because of their size and ease
Visual census techniques have many advantages in comparison to other sampling techniques, in that they are quantitative, quick, non-destructive and repeatable (English et al., 1994). They are widely applied and have been used to monitor changes in the relative abundance or mean length of reef fish species and assemblages within marine reserves and sanctuaries (Bell, 1983; McCormick and Choat, 1987; Alcala, 1988; Cole et al, 1990; Francour 1991, 1994; Russ and Acala, 1996) and as a tool for assessing the standing stock or biomass of individual species of reef fish (Craik, 1981; Russ, 1985; Medley et al., 1993; Polunin and Roberts, 1993; Hart et al., 1996).

In recent years the advantage of assessing the statistical power of biological monitoring programmes has been discussed by a number of authors (Green, 1979; Hayes, 1987; Andrew and Mapstone, 1987; Gerrodette, 1987; Peterman, 1990a; Peterman, 1990b; Fairweather, 1991). Statistical power is defined as the probability of falsely retaining a null hypothesis (a Type II error) and is expressed as 1-β (Andrew and Mapstone, 1987; Gerrodette, 1987; Fairweather, 1991). For example, a Type II error in biological monitoring, would be to conclude that no impact has occurred when in fact one has. Therefore, low statistical power can be disastrous for environmental monitoring due to the results of adverse environmental impacts being undetected by monitoring programmes (Fairweather, 1991). Despite this, few marine ecologists and biologists make use of power analysis (Fairweather, 1991). In environmental monitoring the analysis of statistical power can be used in the design phase of a sampling programme to answer questions about the appropriate size of sample units and optimum levels of replication needed to detect a trend of a particular size with a desired level of probability.

Post hoc, power analysis can be used to determine how large a trend could have been detected by a sampling programme and with what probability (Andrew and Mapstone, 1987; Gerrodette, 1987; Fairweather, 1991). Statistical power is a function of sample size, the probability of a Type I error (α) and the magnitude of the difference between the estimated value of a variable and the real value of the variable (known as the effect size) (Gerrodette, 1987). Low statistical power can be attributed to an inappropriate sample design or biases inherent in the sampling method (Andrew and Mapstone, 1987). Many sampling methods have significant measurement errors associated with them and power analysis must account for the uncertainty of each estimate of a variable (Gerrodette, 1987).

Historically, reef fish ecologists have failed to calculate and publish the power of their sampling programmes. Furthermore, it is often assumed by many researchers that their visual estimates of reef fish length are both accurate and precise. In the available published literature on reef fish studies containing data on visual length estimates, we found only two examples (Polunin and Roberts, 1993; Green, 1996) out of forty-two papers where the authors have stated the accuracy of their in situ visual length estimates.

In this paper we:

• Look at the accuracy of length estimates made by a variety of scientific and novice scuba divers and determine their power to detect changes in the mean length or biomass of populations of three common species of reef fish from around New Zealand coastal waters;

• Demonstrate that the power of visual length estimates to detect changes in the mean length or biomass can be significantly improved for two of the three species by using an underwater stereo-video system instead of divers’ visual estimates.

The three fish species that we have calculated the power curves for are blue cod (Parapercis colias), red cod (Pseudophycis bachus) and snapper (Chrysophrys auratus).

Stereo-video

The stereo-video used in this research uses two Sony VX1E Hi 8 video cameras in underwater housings. The underwater housings are mounted on an aluminium frame which separates the cameras at a constant distance of 1.4m (see Figure 1). Both cameras are inwardly converging at eight degrees.

Using this information along with data on the focal lengths of each camera and the internal and external characteristics of the cameras, it is possible to calculate the three dimensional position of common features within the images. This facilitates the measurement of reef fish length. The stereo-video
system is neutrally buoyant underwater and can be easily manoeuvred by a diver. Back in the laboratory, paired images are frame grabbing and measurements made using stereo-photo comparator software on a PC. Measurements are made by simply locating features of interest with a mouse (Figure 2). More detailed descriptions of the system may be found in Harvey and Shortis (1996). Recent field measurements show that the system has good accuracy and precision recording a mean error of 0.03cm (standard error = 0.09cm, standard deviation = 0.82cm).

Methods

Power Analysis

In studies where visual estimates of reef fish length are made the variability of the accuracy of the length estimates needs to be incorporated into the power analysis. Our power calculations are based on the standard deviation in mean length between replicate sites for a number of fish seen per site. This standard deviation has four components:

- Variation between sites in the true mean length of reef fish;
- Variation between true sizes of fish within each site;
- Variation between measurements of the same fish by different scuba divers or a stereo-video;
- Variation between measurements of the same fish by one scuba diver or a stereo-video.

The first two of these components are estimated from data collected by New Zealand’s National Institute of Water and Atmospheric Research on populations of red cod, blue cod and snapper from around New Zealand. The distribution of the sites from which samples were collected and the mean lengths of the fish collected at each site are shown in Figure 3. The last two components of the power analysis are based on the relative errors (error/known length) of length estimates recorded from a stereo-video, novice scientific and experienced scientific divers (Harvey et al., 1998a)(see below).
Figure 2. The computer interface

Figure 3. Distribution of samples, and mean lengths, of populations
Errors in Divers’ Length Estimates

In this study the measurement error of novice scientific divers, experienced scientific divers and a stereo-video were determined by a simple testing procedure used for calibrating diver estimates of the lengths of reef fish. Silhouettes of fish were placed in the water and their lengths estimated following the methods of GBRMPA (1979), Bell et al. (1985) and English et al. (1994). The measurement error was calculated from the difference between the real length and the estimated length of the silhouettes. The data used for calculating power curves in this paper were presented in Harvey et al. (1988a) which includes a detailed description of the methodology.

All length estimates were made in a salt water pool for the novice scientific divers, whilst some of the experienced scientific divers made their measurements in a swimming pool.

Novice scientific divers were defined as those divers who, although experienced in the use of scuba and familiar with subtidal sampling techniques, had made few if any estimates of the lengths of reef fish. Experienced scientific divers were defined as active marine scientists who had been involved in research in the past or present which required them to make estimates of reef fish length.

Results

Measurement Error

Stereo-video has the smallest range of measurement error (Figure 4) of the three sampling techniques, while experienced scientific divers have a much smaller range of error than novice scientific divers.

Comparison with published data.

One of the most commonly cited papers on the training of divers to estimate fish lengths with accuracy and precision is Bell et al. (1985). The data for this paper originate from a report published by the Great Barrier Reef Marine Park Authority (GBRMPA, 1979). Tables 7, 10, 12 and 15 contain underwater length estimates made by experienced scientific divers of pieces of orange PVC conduit cut into 50 lengths ranging from six to 94cm. We have disregarded a data set recorded by a diver who was considered inexperienced. Estimates and real sizes are published permitting the calculation of measurement error. These divers had a mean measurement error of 2.75cm which is comparable to the 2.01cm mean measurement error recorded by the experienced scientific divers used in our study (Figure 3). The standard error of the estimates was 0.273cm and 0.274cm for GBRMPA (1979) and this study, respectively.

<table>
<thead>
<tr>
<th>Species</th>
<th>Effect size</th>
<th># Fish per sample</th>
<th>Stereo-video</th>
<th>Experienced divers</th>
<th>Novice divers</th>
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<tbody>
<tr>
<td>Snapper</td>
<td>15%</td>
<td>30</td>
<td>12</td>
<td>29</td>
<td>37</td>
</tr>
<tr>
<td>Red cod</td>
<td>15%</td>
<td>30</td>
<td>37</td>
<td>55</td>
<td>60</td>
</tr>
<tr>
<td>Blue cod</td>
<td>15%</td>
<td>30</td>
<td>12</td>
<td>29</td>
<td>37</td>
</tr>
<tr>
<td>Blue cod</td>
<td>30%</td>
<td>30</td>
<td>5</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Blue cod</td>
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<td>30</td>
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<td>6</td>
<td>7</td>
</tr>
<tr>
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</tr>
<tr>
<td>Blue cod</td>
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<td>10</td>
<td>14</td>
<td>32</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 1. Sample sizes required to detect changes in the mean length of three New Zealand coastal species calculated for length estimates made by stereo-video, experienced and novice scientific divers.
The results show that the experienced scientific divers used in our study have comparable skills to experienced scientific divers from the GBRMPA (1979) report.

**Power**

Figures 4, 5 and 6 show the power of visual estimates made by novice and experienced scientific divers and a stereo-video to detect a 15 per cent change in the mean length of populations of blue cod, snapper and red cod based on recording 30 fish per sample. The results show that for each of the three species, the experienced scientific divers have greater power to detect changes in the mean length of a population than novice scientific divers. However, for blue cod (Figure 4) and snapper (Figure 5) stereo-video has much greater power to detect changes in the mean length than either novice or experienced scientific divers for an equivalent number of samples.

Peterman (1990a) suggests that power ($1 - \beta$) should be equal to $\alpha$. Therefore if $\alpha = 0.05$ then $\beta = 0.95$. For stereo-video optimum power (0.95) for blue cod sampling was reached after sampling at 12 sites. For experienced scientific divers to obtain a similar power to stereo-video they would need to record approximately 29 samples and novice scientific divers 37 samples. The power curves for snapper are very similar. For red cod stereo-video is better than the other two sampling procedures, but it does not achieve similar levels of power for the number of samples recorded as for snapper and blue cod (Figure 6). This is a result of the wide variability in the mean length of a population of red cod between different sites.

**Effect Size and Influence on Power**

Theoretically, stereo-video measurements of blue cod (Figure 7) had greater power to detect small changes in the mean length of the population than visual estimates made by either novice or experienced scientific divers. Around the southern coastal waters of New Zealand blue cod may reach a maximum size of 50cm, averaging 20-30cm. (Ayling and Cox, 1982).

The population of blue cod from which our power analysis is based has a mean length of 33cm. A five centimetre change in the mean length of this blue cod population represents a 15 per cent change in the overall mean length. To detect a five centimetre change with 95 per cent power one would need to record 12 samples with stereo-video, 29 samples with experienced scientific divers or 37 samples with novice scientific divers. The advantages of stereo-video become less as the size of the change that one are trying to detect increases. For example to detect a 10cm change in the mean length of this population of blue cod (which represents 30.3 per cent shift in the mean length of the population) with 95 per cent power one would need to take five samples per site with stereo-video, nine samples with experienced scientific divers or 11 samples with novice scientific divers. A 40-50 per cent change (15cm) is detected with 95 per cent power by taking three samples per site with stereo-video or six samples by experienced scientific divers or seven samples with novice scientific divers. At this effect size there are no great advantages in using stereo-video.

**Effect of Numbers of Fish Recorded**

Where low numbers of fish are recorded per site (in this instance blue cod) stereo-video provides much more power to detect changes than either experienced scientific divers or novice scientific divers when recording an equivalent number of samples per site (Figure 8). At an effect size of five centimetres with 95 per cent power and with only one fish being recorded per sample, one needs to record 37 samples per site with stereo-video, 78 with experienced scientific divers and 90 with novice scientific divers.

As the number of fish recorded per sample increases, the number of samples that need to be recorded per site decreases. For example, to detect a five centimetre change with 95 per cent power recording, 10 fish per sample would require 14 samples per site being recorded by stereo-video, 32 by experienced scientific divers, or 40 by novice scientific divers.

**The Effect of Changing $\alpha$ Values**

An increasing $\alpha$ value has minimal effect on the power of stereo-video to detect changes in the mean length of a population of blue cod. At $\alpha$ values of 0.05, 0.10 and 0.20 respectively it requires 12, 11, or 8 samples per site, respectively to be recorded per site to detect a 5cm change with 95 per cent power (Figure 9).

To achieve a similar level of power with experienced scientific divers 29, 24, and 20 samples need to be undertaken per site whilst for novice scientific divers 37, 31 and 24 samples need to be recorded.
Figure 4. Error associated with estimates of the length of the silhouettes of fish made by novice and experienced scientific SCUBA divers.
Figure 5. The power of novice scientific divers, experienced scientific divers and a stereo-video to detect a 15 per cent change in the mean length of a population of blue cod. Based on 30 fish per sample.

Figure 6. The power of novice scientific divers, experienced scientific divers and a stereo-video to detect a 15 per cent change in the mean length of a population of snapper. Based on 30 fish per sample.

Figure 7. The power of novice scientific divers, experienced scientific divers and a stereo-video to detect a 15 per cent change in the mean length of a population of red cod. Based on 30 fish per sample.
Figure 8. The affect of different effect sizes on the power of novice scientific divers, experienced scientific divers and a stereo-video to detect changes in the mean length of a population of Blue Cod. Number of fish per sample: 30
Figure 9. The affect of different numbers of fish being recorded per sample on the power of novice scientific divers, experienced scientific divers and a stereo-video to detect changes in the mean length of a population of Blue Cod. Based on a 5cm effect size.
Discussion

Our research shows that the power to detect changes in the mean length or biomass of three common species of fish from New Zealand’s coastal waters is greater, for an equivalent number of samples, when length estimates are made by stereo-video rather than experienced or novice scientific divers. Additionally, the level of power to detect changes in the mean length of a species of fish will differ between species depending on the natural variability in mean length between different sites. Managers and environmental researchers need to be aware of this issue when selecting suitable species of fish to be included in monitoring programmes. For some species of fish (e.g. red cod) the variability in mean length or biomass between sites may be so great that even when using a stereo-video unrealistically large numbers of samples need to be taken per site to detect changes in mean length or biomass of 30 per cent or less with high statistical power.

If the design of a monitoring programme incorporates a high level of power (i.e. $\beta^3 = 0.8$), and aims to detect a 30 per cent change or less in the mean length or biomass of a fish population, particularly where low numbers of individual fish are recorded per sample, stereo-video may have many advantages. A lower number of samples can be taken per site with stereo-video to obtain an equivalent level of power compared to experienced scientific divers (Figures 4 and 5) potentially saving both time and money.

Even though calibration procedures are recommended and used by some researchers (GBRMPA, 1979; Bell et al., 1985; Polunin and Roberts, 1993; Darwall and Dulvy, 1996) inter-diver variability and diver measurement error may invalidate spatial or temporal comparisons of the changes in the mean length or biomass between sites and over time. It is important that the level of precision and accuracy of length estimates is stated in reports and publications, and that measurement error is minimised to allow realistic interpretation of the data and comparisons of populations or individual species of interest. As a result of errors and biases, it is probable that many studies lack the statistical power to detect small, but real changes in the length of reef fish communities.

This is of concern because of the increasing numbers of volunteers becoming involved in assisting with sampling for monitoring programmes, particularly in third world countries (Halusky et al., 1994; Mumby et al., 1995; Darwall and Dulvy, 1996). Darwall and Dulvy (1996) note that the advantages of using volunteers in surveys of reef fish abundance and length include: greater people-power enabling large spatial surveys; financial savings and increased public awareness of environmental issues through participation.

We suggest that to overcome the problem of subjectivity in visual estimates and to enhance the accuracy and precision of length estimates, and ultimately the power of a monitoring programme, an underwater stereo-video system could be used. The use of underwater stereo-video provides an opportunity whereby volunteers can be involved in monitoring programmes, use an underwater stereo-video system and make measurements without compromising the quality of the data.

The stereo-video system that has been developed is easy to use and can be operated by inexperienced persons after minimal training. Given the cost and availability of remote video and stereo-video systems there are some procedural and technical limitations. However, rapidly developing technology and decreasing costs of video equipment means that many of these problems will be overcome in the near future.

The whole system is currently worth approximately $15,000 (two video cameras $6000, underwater housings $8000, aluminium frame and accessories $1000). Additionally a PC computer and frame grabbing software are required. Stereo-video can only count and measure fish that are clearly seen. Therefore they are not suitable to cryptic reef fish living in small holes and cracks. It is generally accepted that the only way of quantitatively sampling this suite of fish is with an ichthyocide.

In recent years advances in videography have provided tools for the acquisition of high volumes of visual data. Consequently, many marine laboratories have developed underwater imaging equipment and have many hours of video tape which has to be manually analysed. Variable image quality, changes in the depth of field, and the images cluttered with many specimens cause researchers difficulties in data analysis. Such manual data analysis creates a bottleneck reducing the availability of data, limiting the level of spatial and temporal replication and the confidence in the outcomes of a sampling programme.

This bottleneck is also applicable to the stereo-video measurement process. The manual synchronisation and selection of paired frames, and measurement of subjects within the frames is time consuming, causing delays in data processing. However, it is technically possible to overcome many of these inefficiencies. The
use of cameras synchronised by either a common time code or other reference points make it possible to pre-programme the selection and digitisation of pairs of corresponding images from the left and right cameras or sequences of images (Shortis and Snow, 1997). Further refinements in software will enhance the accuracy, precision, reliability and speed of calibrations and the measurement of common features within images, such as automatic matching within image sequences (Gruen and Baltsarias, 1988).

Future Developments

Stereo-video System

Research into biological pattern recognition and discrimination using Artificial Neural Networks (ANNs) is well established. This research has highlighted the ease of use of ANNs for such visual classification tasks as the identification of a variety of marine plankton species including dinoflagellates (Simpson et al., 1991, 1992), tintinnid species (Culverhouse et al., 1994) and of fish larvae (Culverhouse et al., 1995). Culverhouse et al. (1996) demonstrate that ANNs could correctly classify 23 species of dinoflagellate with 83 per cent accuracy, similar to the accuracy of an expert panel of taxonomists. To be of use to marine biologists, ANNs need to be able to accurately and reliably identify, classify and distinguish multiple and overlapping organisms in the same image. They also need to be able to separate target species from background noise and to cope with subjects at different orientations that are moving in different directions.

ANNs also need to be able to recognise and analyse the natural morphological variation in different specimens from the same species.

It is likely that the identification and classification of marine organisms by ANNs could be aided by three dimensional feature data such as morphometric characteristics which can be extracted from paired stereo images.

There would be significant advantages in the development of adaptable and intelligent 3D moving object recognition and measurement techniques for applications in marine science and marine conservation, based around the merging of research involving stereo-video and ANNs. Such a tool would be able to identify, classify, enumerate and record 2D and 3D morphometric features in real time, or near real time where required with minimal input from the end user. The primary aim of such tools will be to increase the ability of monitoring programmes to establish baselines in order to detect environmental impacts on marine biological communities (VIGO, 1996).

Hybrid systems

One of the main objectives of international environmental monitoring programmes, such as GLOBEC, JGOFS, LOICZ and GOOS, is to determine how anthropogenic impacts affect marine ecosystems and their subsequent effects on rates of global climate change. To achieve this objective, extensive research is required on the response of the biota to physical and biological forcing. While rapid developments in instrument technology have provided efficient and reliable methods for real-time monitoring of physical and chemical changes in the marine environment, there is no equivalent array of instrumentation for real-time or near real-time analysis of biological processes on either a local or a global scale.

The integration of stereo-video technology with ANNs as described above can theoretically form an automated tool with which biologists can obtain quantitative and statistically defensible data on numbers and biomass of marine organisms. The development of such a tool will increase the ability of monitoring programmes to establish baselines in order to detect environmental impacts on marine biological communities (VIGO, 1996). There is a huge potential to develop hybrid systems to overcome sampling biases and problems within the marine environment.

To guide environmental biologists in the design of sampling programmes environmental managers need to set guidelines in terms of the effect size and level of power that the programme should achieve. Additionally, sufficient levels of funding need to be allocated to biologists to achieve these goals.

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Preserving the Natural Character of Estuaries and Other Sensitive Coastal Environments

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**Abstract**

Preservation of the natural character of estuaries and other parts of the coastal environment has been a matter of national importance under the planning and resource management legislation (since 1973) and under protected area legislation (since 1977). This reflects international agreements within the 1971 Ramsar Convention on Wetlands requiring protection of the ecological natural character of important estuaries and other wetlands.

Natural character has aesthetic and ecological dimensions which are formally elucidated in case-law and the 1994 findings of the Board of Inquiry into the New Zealand Coastal Policy Statement. The key elements of ecological natural character, above and below mean high water, are described for New Zealand estuaries and enclosed coastal waters.

Methods of protecting, preserving and restoring ecological natural character will be described, together with responsibilities for implementation by central and local government. Progress to date will be assessed. This will include examples of best practice using: planning tools such as estuarine protection zones, protected area tools such as marine reserves and wildlife management reserves; and comprehensive restoration strategies such as that for Maketu Estuary.

Reviews of progress by the Parliamentary Commissioner for the Environment and Pacific Ecological Resource Management Consultants will be reported. Suggestions will be made about the design and implementation of provisions for protecting, preserving and restoring natural character of estuaries and other sensitive coastal ecosystems.

**Introduction**

New Zealand legislation and policy has required, since 1973, the preservation of the natural character of the coastal environment, as a matter of national importance. While some progress has been made, especially in terms of protected area networks, the overall trend has been towards degradation of natural character. This has been most severe in estuaries and other sheltered coastal waters.

Recent reports (e.g. MfE, 1997) have highlighted the lack of information about trends in the condition of estuaries and two (Froude, 1997; OPCrE, 1996) noted the difficulties some agencies were having in implementing the policy of preserving their natural character. Amongst these difficulties were misunderstandings of the scope and intent of the policy goal and the legislation on natural character. Clearly, there
is a need to expand on the historical context, the current situation and some options for the future.

But firstly, our working definitions in a semantic minefield. Preserving natural character means sustaining the existing degree of naturalness of important components, and can include restoring some degraded elements of natural character. Natural character is not a presence/absence attribute, like pregnancy, but rather a quantifiable attribute that falls within a spectrum. A pristine wilderness would exhibit a high degree of natural character, while a major port would only have a low degree of natural character. Natural character may include elements which were created by nature, but which now have special cultural value, but it would be a contradiction in terms to consider cultural artefacts of human creation to be integral elements of natural character.

In addition, natural character has an aesthetic dimension as well as the biophysical/ ecological underpinning on which this paper concentrates. Both the ecological and aesthetic dimensions of natural character in the coastal environment exist above and below MHWS (Mean High Water Springs), and within the water column as well as on land and seabed. A later section discusses in more detail what the policy and case law have decided about the meaning of natural character and our role in its preservation.

A Focus on Estuaries

Although there are many types of coastal environment that are sensitive to perturbations that may result in loss of natural character (e.g. reefs and pinnacles newly accessible to intensive fishing via GPS; submarine geothermal vent ecosystems associated with energy rich volcanoes, etc.), estuaries and other types of enclosed coastal waters (including lagoons, sounds, fjords, harbours, inlets etc.) have some special attributes that both highlight the urgency for special attention and illuminate some insights and methods that are also applicable to other sensitive parts of the coastal environment.

Estuaries, and enclosed coastal waters, contain features which make them our most valuable ecosystems in terms of the environmental products and services they provide. For example, recent research at Massey University (Patterson and Cole, 1997) has determined, using contingent valuation, that the direct and indirect value of estuarine ecosystems in New Zealand is $40,026 per hectare per year (in 1994 NZS). This compares with agricultural ecosystems averaging $1029 and open coastal marine ecosystems averaging $423 per hectare each year.

The intrinsic characteristics of estuaries and their functional usefulness create a special vulnerability to development, exploitation, modification and sometimes irreversible loss. The natural fertility of the lowland margins and the agricultural potential of the salt marshes have provided the incentive for conversion of natural wetland communities (incl. mangroves and floodplain forests) into drained agricultural systems. In some parts of New Zealand (e.g. Bay of Plenty), rivers were often removed from their estuaries to increase drainage of the lowlands by re-routing floods directly to sea.

The sheltered, shallow accessible waters of estuaries meant that fishing and other seafood gathering could be easily practised by increasing numbers of people nearly every day, having a profound effect on trophic structure and biological pattern in some estuaries and nearby coastal waters. Some of the natural process elements of estuarine natural character (e.g. cyclical erosion/accretion, dune migration) may be in conflict with more tradable values, especially where expensive investments have been made in property development on coastal margins.

The ecological natural character elements of estuaries are influenced by perturbations in ecological systems up-catchment and in linked marine areas, as well as in situ disturbances. This means that estuaries are vulnerable mirrors of distant changes, such as depletion of coastal predatory fish stocks associated with eruptions of paddle crabs and biscuit urchins in estuaries, or blooms of benthic estuarine algae resulting from catchment-derived nutrient enrichment. In-situ disturbances may result from changes associated with marine farms, structures, discharges, excavations and dumping.

A profound feature of estuaries and other enclosed coastal waters is that they are depositional environments. Several factors contribute to the irreversibility of that process, including the processes of flocculation and settlement of fine sediments from the rivers, and the overall one-way traffic of marine sediments suspended by high energy storm conditions outside and distributed across lower energy sheltered environments within. The deposition of inert sediments facilitates the accumulation of biologically active contaminants derived from both marine and catchment sources. Other effectively irreversible changes to estuarine natural character are associated with reclamations, embayment-slicing causeways, structures...
that modify tidal currents or river flows, catchment land clearance or development that can substantially increase flood peak intensity and sediment transport to the coast.

Another estuarine vulnerability recently highlighted has been the particularly high risk of introduction, establishment and spread of invasive alien biota associated with boat traffic and marine farming (e.g. Undaria).

**Community Responses**

Concerns about the apparently irreversible losses of valued and vulnerable elements of the natural character of the New Zealand coastal environment started growing in the 1960s and early '70s and were expressed most eloquently by a range of passionate professionals. A series of books, seminars and conferences disseminated that concern and knowledge (e.g. Morton and Miller, 1968, and Morton, Thom and Locker, 1973).

Several major multi-disciplinary studies were commenced on estuarine ecosystems under threat including Pauatahanui Inlet, (W.B. Healy, 1980), the Avon-Heathcote Estuary, (Knox and Kilner, 1973).

The policy responses to concerns expressed by researchers and the general public included new legislation and amendments aimed at preventing or controlling inappropriate development and use in the coastal environment.

In 1971, the Marine Reserves Act was passed, following years of lobbying by scientists concerned to ensure that there were areas of coastal marine ecosystems retained in their natural state to allow the ongoing study of natural conditions and processes. The resultant reserves were to be protected from harvest and other forms of damage to natural character.

The 1953 Town and Country Planning Act was amended in 1973 to include a national objective of “preserving the natural character of the coastal environment”. The 1977 Town and Country Planning Act retained this as a matter of national importance. Subsequently the Resource Management Act 1991 reiterated, as a matter of national importance, the requirement for all persons exercising powers and functions under the Act, to recognise and provide for the preservation of the natural character of the coastal environment (including the coastal marine area), and the protection of it from inappropriate subdivision, use and development. It was intended that this national imperative would be pursued through the planning documents and decisions of regional and territorial local authorities, with further guidance from a statutory New Zealand Coastal Policy Statement (NZCPS).

The NZCPS was eventually gazetted in 1994 on the recommendation of the Minister of Conservation, following a detailed investigation and hearing of submissions by an independent board of inquiry. A useful commentary on the NZCPS and the deliberations of the board of inquiry was prepared by two of the three members (Nugent and Solomon, 1994). A discussion of the relevance of the NZCPS for natural character definition and preservation is provided in the next section.

Other institutional responses were made to implement the evolving policies. The 1977 Reserves Act included within its purpose statement, the goal of acquiring and managing reserves to promote the preservation of the natural character of the coastal environment. A nationwide survey of potential coastal reserves was undertaken, and some of the priority sites were subsequently acquired and protected.

The international Ramsar Convention on Wetlands came into force in New Zealand in 1976. Many of our wetlands of international significance are estuaries or shallow sheltered coastal waters. One of the key objectives is to maintain the natural ecological character of wetlands of international significance, and to report on any changes in that character. Further research and negotiation is currently being undertaken to more clearly specify the key elements of ecological character (Ramsar, 1996).

**Natural Character**

What is it that constitutes the mysterious ‘natural character’ of a waterbody and its margins, for which New Zealand society has consistently sought preservation over the last 25 years?

Neither the planning nor the protected area statutes provide a formal interpretation of ‘natural character’. The term has, therefore, ended up being defined by context, case law and subordinate policy instruments.

The primary policy instrument relevant to the natural character of the coastal environment is the NZCPS. Early attempts in drafting the NZCPS to define natural character (to include its polar opposite cultural character) were aborted and the board of inquiry provided a commentary that natural character was an evolving concept that was best determined
through case law. However, the board of inquiry did arrange the NZCPS to give pre-eminence to natural character preservation as the over-arching framework within which the management of other natural resources should be managed.

The NZCPS specified that preservation of natural character should be pursued through priority actions to:

- Protect indigenous biota, indigenous community types, habitats, ecological corridors, vulnerable ecosystems and areas important to migratory species (with particular emphasis on estuaries and wetlands);
- Protect elements of natural character contributed by features such as landscapes, seascapes and landforms, natural features or areas which have spiritual, cultural, or historic significance;
- Protect the integrity, functioning and resilience of the coastal environment in terms of natural processes and movements of sediment, water, air and biota; natural composition and of substrates, water, biotic pattern, biodiversity and productivity;
- Restore and rehabilitate key elements of natural character where appropriate, through mitigation and proactive measures.

In summary, the NZCPS defined natural character preservation to include activities resulting in: protection of ecological structures and processes; retention of biotic patterns and biological diversity; safeguarding of the aesthetic and other cultural values associated with natural features; as well as restoration and rehabilitation of key elements of damaged natural character.

Accordingly, the case law has evolved through decisions of the planning tribunal and the environment court to further tease out what is required of decision-makers and others to give effect to the goal of preserving the natural character of waterbodies and their margins.

Although there are a number of decisions which provide guidance about where ‘preserving natural character’ fits within the overall purpose of the RMA, there is a series of decisions which build upon the earlier case law of what preserving ‘natural character’ might require of decision-makers.

Gill and others v Rotorua District Council (1993. 2NZRMA 604(PT) was a successful appeal against a decision of the Rotorua District Council to grant consent for a lake edge residential development within a site with regenerating indigenous vegetation. The planning tribunal agreed with witnesses that implicit in preservation of natural character is the need to protect ecosystems and ecological succession processes that generate natural biological pattern.

Opoutere Residents and Ratepayers Association v Planning Tribunal (CA 216/88) was a Court of Appeal decision of July 1989 overturning planning tribunal consent for a camping ground adjoining Wharewaka sandspit, on the basis that the “breeding grounds” of shorebirds were a key element of natural character “entitled to the planning protection afforded by (the Act)”.

Trio Holdings and Treble Tree v Marlborough District Council (W 103/96) was a largely unsuccessful appeal against the refusal of the council to grant consent for mussel farming in a relatively unmodified part of Pelorus Sound. The planning tribunal found that the subtidal area of the site was part of an unbroken natural biological pattern, and that mussel farming sedimentation impacts on part of the sequence would diminish the overall natural character of the marine area.

Director-General of Conservation v Marlborough Mussel Co./Marlborough District Council (W89/97). This was a successful appeal against consent granted by the council for a mussel farm in a relatively unmodified part of Pelorus Sound. Central to this 1997 decision was a finding that this marine area was highly natural in character, and that deposition associated with the proposed farm would truncate an important part of the natural biological pattern and ecological sequences that comprise the natural character of the site. The environmental court found that biodiversity in the marine environment is a part of the natural character and requires protection, even for sites that are not in pristine condition.

**Key Elements**

The scope of natural character of the coastal environment was debated in Trio Holdings and Treble Tree v Marlborough District Council (W103/96). It was found to be a complex integration and interaction of several components relating to aspects of the vegetation, landform and aesthetic aspects of adjoining land, as well as beaches, coastal marine waters and the benthic environment.

Expert evidence given to that appeal hearing by senior conservation officer Andrew Baxter of Nelson identified a number of factors or elements contributing to the natural character of the relevant parts of the Marlborough Sounds. He classified these as biotic features (including species, communities, habitats,
biotic pattern and productivity), abiotic features (including natural substrates, geology, and environmental complexity) and natural processes (physical and biological). Of these, he considered biotic pattern to be a key element in the natural character of the sounds, and this conclusion was accepted by the planning tribunal.

At other sites, and in other cases about the natural character of waterbodies and their margins, experts have identified related elements which are consistent with the features and processes specified in NZCPS Policies 1.1.2, 1.1.3, and 1.1.4. These can be categorised into the specific biophysical features and natural processes that apply to the hydrological, geomorphological, physico-chemical, energetic, trophic, biotic and ecological domains into which we subdivide the natural world (Richmond, 1996).

In effectively preserving coastal environment natural character, it is important to identify and manage the critical or key elements most relevant to the values at risk at that site. A similar conclusion has been reached by the Ramsar Convention in researching an early warning system for changes in natural ecological character. Preliminary research on selected indicators of changes in natural character for freshwater ecosystems has commenced (Urlich and Ward, 1997) and is needed for coastal systems.

**Performance Reviews**

There have been few reviews addressing the status of natural character in a series of New Zealand estuaries or the coastal environment generally. A 1975 review by McLay provides an initial baseline on the general condition of estuarine waters in the mid-1970s. Two reviews (Froude (1997)), and Office of Parliamentary Commissioner for the Environment (1996) addressed how various agencies with responsibilities for natural character protection were addressing this requirement.

**McLay, 1976**

This paper presented summary data on the extent, character, status and number of surveys in 301 New Zealand estuaries. Information was largely collected from topographic maps and a questionnaire sent to more than 100 authorities and individuals with personal knowledge of individual estuaries.

Questions addressed water stratification, present (1975) condition, condition compared to 10 years earlier, the existence of any surveys of reports on the estuary and information about agencies responsible for some aspect of management.

The questionnaire results suggested that the water in most estuaries was well mixed and clean or slightly polluted with the status of more than two-thirds of estuaries remaining unchanged over the last ten years. Of those estuaries that had changed the majority had deteriorated. This was more pronounced in the South Island.

**Office of Parliamentary Commissioner for the Environment, 1996**

This paper reviewed the performance of three territorial authorities (Far North, Tauranga and Wanganui) in the implementation of their coastal management responsibilities. The report concluded that “despite a long-standing obligation to preserve the natural character of the coastal environment, councils have not made this a high priority”. A number of recommendations were made for improving performance with respect to natural character protection.

The report observed that an estuarine protection zone in the transitional Tauranga District Plan that included areas of ecological value both above and below mean high water was an innovative ecosystem approach to preserving natural character.

“However, the Resource Management Act 1991, with the division between district and regional council responsibilities in the coastal environment, may not allow a single zone of this kind to protect estuarine areas in the new district plan.”

**Froude, 1997**

This document reviewed how 36 territorial authorities, three unitary authorities and seven regional councils were implementing the biodiversity protection provisions in the Resource Management Act 1991. This included performance on section 6(a), which contains the requirement to preserve the natural character of the coastal environment. The review found that natural character protection was addressed at a policy level by only some territorial authorities. While about half of the territorial authorities reviewed had some form of coastal zone, overlay or setbacks, these generally only extended 20 metres inland. Some setbacks extended inland 100 metres. A few councils had a more comprehensive coastal zone – extending for example, to the top of the first ridge inland.
Activities regulated in a coastal zone or setback often included vegetation clearance, earthworks and structures. Some coastal zones provided little ‘protection’ for the biophysical elements of natural character, and instead focused mainly on aesthetic matters such as the siting or type of buildings.”

The report found that natural character protection in the coastal environment was more consistently addressed at the regional council level. Even so, it was found that a number of regional policy statements were relatively weak on biophysical elements of natural character below MHWS.

Regional coastal plans generally had a zone identifying certain ecologically significant sites, although the comprehensiveness of this varied considerably between plans. A number of the rules covering matters such as reclamations, dredging, disturbance, deposition and structures were relevant to natural character protection. Few coastal plans were found to have addressed habitat protection through water quality standards and habitat rehabilitation where coastal water quality is degraded.

The report observed that “coastal planning does not generally address estuaries as a unit, partly because estuaries straddle mean high water springs and therefore the regional/district boundary”.

Ministry for the Environment, 1997

The State of New Zealand’s Environment addresses the preservation of the natural character of estuaries and other sensitive coastal environments at only a general level. It noted that there had been no national survey of estuarine condition, although McLay (1976) had identified 1975 pollution status in qualitative terms. While the 1997 report observed that water quality had improved in some estuaries since 1975 there was little assessment of other elements of natural character.

Protecting Natural Character

This section provides a very brief evaluation of the effect of the main management programmes giving effect to the policies of natural character protection and restoration.

National Coastal Reserves Programme

This involved a comprehensive national survey during the 1970s and 80s, with ongoing implementation through Crown designation, acquisition or covenaniting of priority coastal sites. Many reserves and responsibilities were subsequently assigned to local authorities. The programme has generally been effective in safeguarding natural character for those sites protected, although many natural reserves classified to accommodate recreational use have been degraded by development. However, many important coastal areas of high natural character are still inadequately protected.

Marine Protected Areas

The marine reserves network has been substantially extended during the last 10 years, together with a few marine mammal sanctuaries and restricted fishing areas. These can provide a high degree of protection and restoration of biotic elements of natural character, but have mainly been established around islands and on open coasts. Parts of some estuaries and enclosed waters (eg. at Westhaven/Whanganui Inlet, Milford and Doubtful Sounds) have been reserved, and more are under investigation.

Resource Management Planning

A variety of protective tools have been used under current and earlier planning frameworks. Estuarine Protection Zones were effective in safeguarding some important elements of natural character in and around parts of Tauranga and Ohiwa Harbours from inappropriate subdivisions and developments. More recent planning tools were evaluated earlier in this paper. Some of these show promise, but are as yet inconsistently applied applied for the protection of natural character.

Ecological Restoration Projects

Natural character restoration projects have been initiated for a limited number of valued and vulnerable estuaries and enclosed coastal waterbodies. A representative range includes Maketu Estuary (river return), Whakaki Lagoon (natural outlet return), Matata Lagoon (open water protection), Paunatahanui Inlet (saltmarsh repair) and the Avon-Heathcote Estuary (water quality recovery). Although relatively expensive, costs are increasingly being shared between public agencies and private sector sponsorship (deferred offset works?). Innovative use of the ‘financial contributions’ provisions of the Resource Management Act could further boost resources for priority restoration projects. The high degree of community involvement and initiative
present usually means these ongoing projects are likely to effective and viable.

**Barriers to Effective Preservation**

**Legislation and Agency Roles**

Many agencies are involved with various aspects of estuary/sheltered water management. It can be difficult to coordinate these many agencies to achieve effective protection of the natural character of estuaries/sheltered coastal waters, particularly where restoration works are required.

None of the existing legislation effectively protects the natural character values of whole estuaries, and often three or four statutes are needed to cover all threats.

While the Marine Reserves Act legally protects marine biota, the restrictive scientific purpose of this Act has severely limited its application, especially for estuarine habitat elements of natural character.

Under the Resource Management Act the overlapping functions and land-water boundaries between territorial authorities and regional councils can hinder the effective protection and rehabilitation of estuaries. Relatively few territorial authorities and regional councils work closely together to achieve a coordinated mix of policies and methods (Froude, 1997).

The protective zoning of the natural margins around some estuaries is being discontinued in the plans prepared under the Resource Management Act (Office of the Parliamentary Commissioner for the Environment, 1996).

**Lack of Awareness**

There is generally a low-level of awareness in the community about estuary natural character values, vulnerabilities and threats, and how natural character values can be effectively protected. This lack of awareness also applies to many professionals and politicians involved with the management of estuaries and their catchments.

**Funding**

Most New Zealand estuaries and much of their lowland catchments have been significantly modified. For many estuaries the effective protection of natural character values requires rehabilitation works and/or changes to biota harvesting regimes. It is often very difficult to obtain funding for the necessary rehabilitation research and works. Coastal land prices are often very high compared to that further inland. This limits the amount of land that can be purchased for reserves.

There are often significant development pressures around estuary margins and the opportunity costs of development restrictions can be high. Territorial authorities can, therefore, be reluctant to impose restrictions on landowners to protect natural character values.

**Lack of Priority**

Councils have many functions under a variety of statutes. Estuarine and sheltered coastal water natural character protection under the RMA can be seen as a low-priority by many councils. The effective preservation of the natural character of the coastal environment under the RMA has been viewed by some councils as too difficult.

Recreational and commercial fishers often oppose biota harvest controls (such as marine reserves) especially in accessible areas such as estuaries/sheltered coastal waters.

**Suggestions for Improvements**

The purpose of this section of the paper is to identify methods that could assist those implementing relevant legislation to more effectively preserve the natural character of the coastal environment. Some additional and more detailed mechanisms are found in Froude (1995).

**Resource Management Act Methods**

The regional policy statement process can be used to clarify:

- The administration of the Resource Management Act across the MHWS territorial/regional council boundary;
- Regional and district council roles in the control of catchment land use activities;
- Agency responsibilities within coordinated programmes to restore the natural character of priority estuaries and sheltered coastal waters.

Objectives, policies and methods included in planning instruments can be better targeted to protect specific elements of the natural character of the coastal environment. For regional coastal plans, this focus can be sharpened through the conservation minister’s approval process. For district plans, the esplanade protection mechanisms provide a complementary tool for terrestrial margins.
Specific protective ‘zoning’ tools can be used to promote the preservation of the natural character of valuable and vulnerable parts of the coastal environment (e.g. estuarine protection zones that apply to the predominantly natural ecological communities above and below MHWS, including adjoining freshwater wetlands).

To be most effective such zoning provisions should be included in planning instruments applying above and below MHWS. Examples include Estuarine Protection Zones in the transitional Tauranga and Whakatane District Plans.

Consideration could be given to amending the legislation to:

- Make provision for the appropriate elements of water conservation orders and heritage protection orders to be applied to estuaries of outstanding natural character at risk;

- Provide for a combined regional coastal plan/district plan for sensitive estuary catchments. This would imply more than one RCP per region and more than one district plan per district.

**Other Tools**

Coordinated interagency programmes can be developed for protecting or restoring natural character for valuable estuaries (e.g. Maketu Estuary). Such programmes generally require operational components with public or sponsorship funding and community planning processes (e.g. Matata Lagoon).

A suite of tools can be used to control the site-specific degree of harvest of marine biota, where this may impact on ecosystem components of natural character (e.g. marine reserves, taiapure local fisheries, restricted fishing areas).

The coastal reserves network could be extended by realigning programmes such as the Natural Heritage Fund towards the public acquisition of a legal interest (freehold, leasehold, covenant, etc) in priority coastal margin lands where the retention of existing natural character is not viable in current ownership.

The provision of incentives and information to landowners can assist them to protect and restore the natural character of sensitive coastal margins.

Community group projects to rehabilitate components of natural character can be encouraged, especially on public land and foreshore (e.g. Dunecare and estuary guardian groups).

**Natural Character Standards**

At present there are few tools for objectively setting standards or bottom lines for degradation of natural character, and for objectively assessing the relative degree of natural character (or naturalness) remaining at a site. Possible tools include:

- The determination of specific environmental standards for key elements of natural character which are critical for the values of sites being managed for natural character protection (e.g. tidal prism kept within its natural range). This approach was recently proposed by Austin and Hilton (1997);

- The negotiation and application of a ‘natural character index’, equivalent to other multi-factorial management indices such as the ‘eutrophication index’ and the threatened species ‘status score’. The primary uses of such an index would be to:
  - Assess management performance in protecting or restoring natural character;
  - Rank and prioritise sites for action to protect or restore natural character;
  - Provide a more objective basis for determining the degree of unavoidable/unremedied loss of natural character for which an equivalent level of compensatory restoration may be appropriate mitigation (e.g. restoration of natural vegetation pattern to compensate for degradation of a hydrological characteristic such as flow rate).

Because the most important elements of natural character may be very different for various types of estuarine environment, it would be difficult to compare between eco-types unless the index was based on combining naturalness ratings for just the top five or six most important elements for each ecotype. These could be drawn from the full suite of physical and ecological processes and structural elements that contribute to the natural formation and form of an estuary or other sheltered coastal waterbody.

**Conclusions**

- Natural character has an underpinning biophysical/ecological dimension as well as more commonly perceived aesthetic aspect. In the coastal environment this applies above and below MHWS, to the water as well as to the land and seabed.

- Preserving the natural character of the coastal environment is about safeguarding the existing degree of naturalness of the key elements of waterbodies and
their margins, namely biophysical features and ecological processes.

• New Zealand legislation and policy has made this a matter of national importance for over 25 years. Since 1994, the New Zealand Coastal Policy Statement has made it a national priority to restore or rehabilitate the natural character of the coastal environment where appropriate.

• There has been little monitoring of the effectiveness of provisions designed to protect natural character. Outside of reserved areas it appears that we have not been very successful with this goal, especially within estuaries and other sheltered waters.

• More comprehensive progress requires better understanding, greater commitment to action, and clearer agency accountability.

• There is potential for better coordination, linkages between agencies and roles, innovative tools for assessment and standard-setting, and new opportunities for funding repairs to natural character.

• The linkages between estuaries, their catchments and open coastal waters means that effective protection of natural character requires a coordinated application of complementary tools addressing marine conservation and land-use effects as well the estuaries themselves.

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Towards a Co-management Approach to Fisheries Management in New Zealand

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Abstract
Management of the marine environment in New Zealand is heavily influenced by the Quota Management System (QMS). The QMS is based on the use of individual transferable quotas to manage marine fisheries, and aims to provide a framework for the sustainable utilisation of fish stocks. However, the focus of the QMS on production and economic goals appears to be precluding sustainable outcomes. There is a bias against non-commercial and non-extractive values in the marine environment, and little attention paid to ecosystem-based management.

Co-management provides an opportunity for a more holistic, ecological approach to marine management. By involving a range of marine stakeholders, co-management encourages a more integrated approach to fisheries management. The greater emphasis that co-management gives to non-commercial and non-extractive uses and values of marine resources has the potential to shift focus from a narrow fisheries management perspective to a wider ecosystem-based management approach.

Within the Otago/Southland paua fishery, a co-management initiative was established in 1992 in response to concerns about the paua stocks. The PAU 5 Working Group represents an informal attempt at co-management involving different stakeholder interests. Despite providing a forum for communication and cooperation between competing interests in the paua fishery, the PAU 5 Working Group has been unable to reap the full benefits of co-management.

The factors that have stalled the PAU 5 Working Group initiative are related to the wider difficulties in establishing effective marine ecosystem-based co-management in the current New Zealand context. These issues are addressed in this paper, and recommendations are developed for incorporating the wider participation of marine stakeholders.

Introduction

The objective of our paper is to examine the potential for co-management of New Zealand’s fishery resources. Achieving the sustainable management of marine fisheries and ecosystems presents one of the biggest challenges to natural resource management. Inherent in the challenge is the characteristic of the resource.

It is extremely difficult to place boundaries around what is sometimes a highly migratory and widely dispersed resource, let alone excluding fishers from fishing grounds. Other difficulties in delineating property rights to marine fisheries include the impossibility of allocating specific stock units to individual resource users, and the difficulty in both measuring biomass and determining sustainable levels of extraction.

Recent trends amplify these difficulties in sustainable management. Rapidly increasing human population levels have led to an increasing demand for seafood products. The globalisation of the international
economy means that fisheries previously harvested for local markets are now often subject to high export demand. Advances in fishing technology have made it easier to both find and catch even highly depleted and fugitive fish stocks.

In response to such pressures, Western nations have historically relied on state regulation, usually through controls on inputs into the fishing process, such as limited entry licensing, gear restrictions, and fishing ground closures. Such input controls do little to avoid a ‘race for fish’ situation, resulting in unsustainable fishing practices. Their modest overall level of success has prompted policy makers to look for alternative solutions. Two major paradigms represent recent and contrasting approaches to fisheries management, namely individual transferable quotas and co-management.

Individual Transferable Quotas (hereafter ITQs) result from the trend towards output controls in fisheries management. ITQs assign individual private property rights to harvest fish and make these rights transferable in the marketplace. In New Zealand, the commercial fisheries Quota Management System (hereafter QMS) was introduced in 1986 based on the use of ITQs. New Zealand’s QMS has been described as the most advanced fisheries quota system in the world (Pearse and Walters 1992). Yet there have been reports that the QMS may be struggling to ensure sustainable outcomes (Duncan 1993; Hawkey 1994; Sissenwine and Mace 1992). There may be friction between its economic efficiency goals and its conservation goals, with many resource users more interested in economic profit than in conservation.

The second paradigm is that of co-management (or cooperative management). Co-management shares management responsibility between the state and local communities or resource user groups. By including a range of stakeholder input and values, co-management has the potential to transform the current extractive and single-species management focus to a more sustainable, ecosystem-based approach. Such an approach would recognise the marine environment as an ecosystem linked to the land and air, not just a ‘fish basket’ for human consumptive purposes (Wallace 1997).

Recent emphasis in Western nations has been on competitive resource management solutions based on individual property rights. By contrast, systems that encourage cooperation and mutualism may have been little understood and appreciated (Berkes 1989). Co-management presents a new challenge to our way of thinking about the management of natural resources.

**Sustainability and the QMS**

In New Zealand, inshore fisheries started to come under extreme pressure in recent decades, ultimately leading to the introduction of ITQs under the QMS in 1986. ITQs take the form of a fixed proportion of the Total Allowable Commercial Catch (hereafter TACC), allocated in advance to fishers. New Zealand’s coastline has been split into 10 quota management areas (hereafter QMAs), with TACCs established for fish stocks within each of these QMAs. ITQs are allocated in perpetuity, with quota holders having the ability to lease out some or all of their quota each season. While the rights of customary and recreational fishing and environmental interests are to be considered in the TAC and TACC setting process, ongoing disputes remain as to the level of priority between these and commercial interests (Pfahlert 1996).

The most cited advantage of ITQs over other fisheries management devices lies in the area of economic efficiency, with an incentive to minimise costs created by the market (Moloney and Pearse 1979). Transfer-ability of quota enables quota to consolidate in the hands of more efficient operators able to pay higher prices. Another argument in favour of ITQs is that they favour the conservation of fish stocks, through setting the TAC at a sustainable level. Sustainable behaviour by resource users is also purported to result from the allocation of clearly-defined, long-term property rights over the resource. Fishers should act to guarantee the integrity and economic value of their quota rights.

However, ITQs may actually provide disincentives for fishers to prioritise resource conservation. Under such a system, natural resources become valued by the market at the same rate as other factors of production. Commercial resource users wish to get the same rate of return as on other inputs, creating a pressure to exploit the resource in the short term. The short-term economic returns from unsustainably harvesting at present may outweigh the costs of not having the resource available in future (Grima and Berkes 1989). A related bias is that the market cannot represent the entire range of values of a fishery. Non-economic values such as intrinsic value, ecological value, non-consumptive use value, and bequest value are not captured (Rennie 1993). A third
A basic principle is self-governance within a legal framework established by government (Jentoft and McCay 1995).

A successful co-management agreement depends on a willingness amongst resource users to contribute to management, while government must make available at least one management function for co-management, often leading to the expansion of the arrangement to other functions (Pinkerton 1989).

Co-management provides a number of benefits for marine management. Bringing different stakeholder

<table>
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<th>Consensual, democratic decision-making</th>
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<td>Reduced stakeholder conflict</td>
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<td>Broader resource knowledge</td>
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<td>Increased compliance</td>
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<td>Greater stewardship by resource users</td>
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Table 1. Ideal benefits of co-management
groups together to communicate helps these groups to both redefine their own problems, and to gain understandings of the problems of other groups. Shared solutions become more likely and conflict less likely, as previously fixed preferences can change when different groups articulate their interests together (Healey 1993; Young 1995).

The inclusion of stakeholders within a management process can provide a wider base of information and knowledge, particularly in respect of local and regional fish patterns, and the identification of key issues. A common argument is that local, cooperative organisations are much better placed to make more equitable regulations than government (Jentoft 1989).

Legitimacy of any regime is essential to encourage fishers to voluntarily advance their collective interests at the partial expense of their private interests. By involving different stakeholders in the management process, and by establishing a pattern of cooperation based on reciprocity, co-management has the potential to enhance legitimacy. Increased legitimacy is also likely to procure increased levels of compliance with rules and regulations (Jentoft and Mikalsen 1994).

Perhaps most importantly, the opportunity for participation in decision-making should encourage stakeholders to see themselves as collective managers or stewards of the resource. This may provide the incentive for adopting sustainable fishing practices, and for action in conservation spheres such as habitat protection.

At its most fully-developed, the co-management process should see stakeholders take an ecological approach to management rather than focussing purely on single species management. Whether the benefits of co-management will be realised will depend on a number of factors, including the institutional design of any fisheries co-management regime. There is no single right way to design and implement a co-management agreement (Pinkerton 1994). However, certain factors can be identified as predictors of success, which can cumulatively contribute to the realisation of the benefits of co-management benefits. These factors are presented in Table 2.

Other factors may influence successful co-management. Firstly, co-management tends to operate more favourably when stakeholder groups already have a cohesive social system. Valuable social capital may accompany such social cohesion, including the presence of social norms against resource misuse, the likelihood of reciprocal behaviour patterns, and effective means of social sanctioning of rule transgressors (Ostrom 1990; Pinkerton 1989). Secondly, co-management is likely to be more easily implemented if there is already a degree of trust amongst the various stakeholder groups (Jentoft 1989). Thirdly, other exogenous factors may be important, such as having a facilitative political mechanism, and the absence of strong external threats to the legitimacy of the co-management agreement (Ostrom 1992; Pinkerton 1989).

### A Regional Framework

The framework proposed here for fisheries co-management in New Zealand is based at the regional or QMA level. It is proposed that Co-management Groups be established for each species within each QMA, comprising equal representation from the commercial fishing sector, the recreational fishing sector, iwi customary fishing, and environmental interests.

| 1.  | Clear boundaries          |
| 2.  | Clear membership criteria |
| 3.  | Appropriate scale management units |
| 4.  | Clear interception agreements |
| 5.  | Local all-stakeholder co-management boards |
| 6.  | Coordinating regional management board |
| 7.  | A degree of local control |
| 8.  | Clear definition of local powers |
| 9.  | Protocols and rules that promote multi-party collaboration |

Table 2. Institutional design factors for successful co-management (adapted from Pinkerton, 1994)
The Ministry of Fisheries should be involved in an advisory and technical support role, but not in any voting or management capacity. The recommended process sees the Co-Management Groups advising the Minister of Fisheries of their decisions, and the minister endorsing these decisions. Retaining a power of veto at the ministerial level offers a safeguard over the national interest.

Each Co-Management Group would formulate a management plan for their respective fishery, collectively outlining their vision, goals and objectives for the fishery. The planning function would include providing advice to the relevant agencies on habitat protection, research, and enforcement. It is proposed that the Co-Management Groups set the catch levels for their respective QMAs, drawing on the advice of MFish and NIWA. The same process is proposed for other harvest regulation decisions, such as the setting of recreational bag limits, size limits, and season closures.

The requirements of the Fisheries Act 1996 to take environmental effects into account before varying any sustainability measure would benefit from such a cooperative process. Those resource users with day-to-day contact with the fishery would have direct responsibility to protect the marine ecosystems that they are reliant on.

The allocation of fishing rights between stakeholder groups becomes the responsibility of Co-Management Groups via the TAC and TACC setting processes. Stakeholders must directly negotiate with one another for access and extraction rights, rather than the current process of independently lobbying the minister. Allocation of commercial quota remains the function of the quota market, to ensure that economic efficiency gains are realised. The framework suggested here will now be compared to a case study of regional stakeholder co-management in the Otago/Southland paua fishery.

Case Study: The Pau 5 Working Group

The Otago/Southland paua fishery, or PAU 5, provides an example of a fishery under pressure. Much pressure has come from increasing export demand over recent decades. Paua have also become a popular target for illegal fishing due to high prices, ease of access to stocks, and the lack of large capital outlay required to harvest paua. Such pressures on the resource are exacerbated by the fact that paua are a slow-growing species with low recruitment rates in many areas.

PAU 5 is the largest commercial paua fishery in the country, with 36 percent of the national TACC (443 tonnes). Customary harvest levels in PAU 5 have not been quantified, but the recreational take was estimated at 65 tonnes for the 1991/92 season. A conservative estimate in the 1993/94 season placed the illegal harvest for PAU 5 at 130 tonnes (Annala et al. 1996).

At twice the recreational take, and nearly 30 percent of the commercial take, this is a serious issue. A further interest in the fishery stems from the non-extractive values held by environmental and scientific interests. As reef dwellers, paua occupy an ecosystem highly valued for marine reserve status, placing non-extractive stakeholders in competition with extractive users of the resource.

The PAU 5 Working Group was established in 1992 by different stakeholder groups concerned about the state of the fishery. It had become apparent that an integrated management plan for PAU 5 was needed. Ngai Tahu, the commercial fishing sector, the recreational sector and environmental interests became equally represented on the group. Ministry of Fisheries officials convened and serviced the group without actually becoming members.
Early signs for the PAU 5 Working Group were positive, as the different stakeholder representatives collectively formulated a vision, and identified issues and strategies for the fishery. A significant achievement of the working group has been to open up communication channels between competing interests in the paua fishery. However, the PAU 5 Working Group has not built upon its early successes. There is a high degree of uncertainty regarding its future role in the management of the fishery. The reasons for this uncertainty are fourfold.

The first reason is the fact that management rights have not been delegated to the working group. As a result, a disparity has emerged between the objectives the group set for itself, and what it has been able to achieve as a fishery manager. In contrast to the proposed framework for regional co-management, harvest regulation and allocation decisions are not the responsibility of the group. The group is fulfilling a consultative role, rather than a co-management role.

A second and related reason is the lack of external recognition for the PAU 5 Working Group. The group has no formal or statutory management role in the paua fishery. Any informal recognition is negated by the difficulties that it faces in implementing its strategies, and the legitimacy of the group is under threat as a result.

Thirdly, the problems that working group representatives have in communicating with and representing their constituents has left them without strong links to a supportive local constituency. The regional scale at which the group is operating may be questioned, with a more localised approach worthy of investigation.

Lastly, levels of trust and cooperation between the different working group representatives have not fully evolved. A fundamental dissatisfaction with harvesting rights amongst some stakeholders does little to predispose them toward trusting other groups. In addition, the perceptions of the non-commercial representatives of inequality within the group further damage the chance to build trust and cooperation.

The PAU 5 Working Group has only partially realised the benefits of co-management. The desired final stage of co-management, with the group collectively and sustainably managing the paua resource in a stewardship role, has not been reached. Despite this, there is a strong desire for an increased management role for the group within the fishery, both among group representatives and other paua stakeholders interviewed.

Conclusion

Barriers to the equitable participation by stakeholder groups in marine ecosystem management do exist. These include the wider social, economic, and political context within which co-management regimes must exist. The problems in ensuring adequate representation and community involvement in PAU 5 exemplify the difficulties facing any attempt to introduce cooperative resource management strategies into a highly individualistic and capitalist society such as New Zealand.

Recent moves toward cooperative stakeholder strategies within fisheries management appear to be something of an enigma. Or rather, they reflect the inability of the purely commercial, individualistic approach of the market economy to sustainably manage marine ecosystems.

Certain problems in the PAU 5 fishery reflect market biases against conservation, namely, the dominance of commercial paua stakeholders, and the tendency toward current extraction caused by high paua prices, increasing commercialisation, and uncertainties regarding stock levels and sustainable harvest rates. Such problems within the QMS have been recognised by ongoing legislative reviews, culminating in its re-enactment through the Fisheries Act 1996. The Act attempts to give greater weight to sustainability, to the consideration of environmental externalities, and to wider consultation with different stakeholder groups.

However, the lack of statutory requirement for an integrated fisheries management planning approach tends to preclude opportunities for sustainability and environmentally-sound decision-making, or for greater stakeholder participation in the fisheries management process.

There needs to be a clearer definition both of non-commercial extractive and non-extractive rights to fisheries, and of the level of prioritisation between the different sectors. A significant barrier to co-management would be removed if all stakeholder groups could participate on a more equal footing. The greater contact between different stakeholder groups that co-management enables would act toward removing the distrust and misunderstanding toward the rights of other fisheries stakeholders.

Significant political barriers to fisheries co-management are evidenced by the lack of formal political recognition and insufficient delegation of management rights facing the PAU 5 Working Group. A clear mandate is required from government to overcome
such political barriers. The emphasis for government needs to shift to developing co-operative relationships amongst the different marine stakeholder groups.

Despite such exogenous barriers to co-management, initiatives such as the PAU 5 Working Group demonstrate the potential for marine co-management in New Zealand. At the moment, co-management is typically initiated as a crisis response to a fishery being placed under severe stress. This paper argues for a more proactive response through the implementation of a network of regional co-management groups.

A major factor in the ability to successfully involve the community is the scale of the co-management initiative. Adopting a nested structure within each regional QMA, with local subgroupings of each regional co-management group, could help to overcome difficulties in achieving communication, representation, and community involvement.

A nested co-management structure could give effect to sustainable decision-making and integrated planning in a manner conceptually similar to the nested environmental planning processes of the Resource Management Act 1991.

Adopting such a framework on a formal, legitimised basis would cement those benefits of co-management that the informal PAU 5 initiative could only partially realise.

Bringing together the various marine stakeholders to participate in management should increase trust and cooperation between them, particularly with more clearly defined rights and roles for each stakeholder group. Better and more equitable decision-making by those people more familiar with their respective fisheries should be the result. Stakeholders would be encouraged to view themselves as guardians or stewards of their local fisheries and marine ecosystems.

A manifest strength of this approach is the potential for integrated and ecologically-based fisheries management, currently lacking in New Zealand.

While Co-Management Groups are proposed on an individual species basis, it would be advantageous for groups within the same region to collaborate in areas such as habitat protection, public education and enforcement. Such collaboration would reinforce the role of regional councils and the Department of Conservation in integrated coastal management.

Under such a framework there is the potential for a shift in focus from fisheries management to ecosystem-based management, offering a more sustainable approach toward New Zealand’s inshore fisheries.

References


Pelagic Plastics and Other Synthetic Marine Debris – a Chronic Problem

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Abstract
Over the past three decades there has been growing realisation that pollution by plastics and other synthetic debris has become an environmental threat to the marine realm reaching global proportions.

The widely recognised impacts include: death and/or debilitation of wildlife through entanglement and ingestion; reduced quality of life and reproductive performance; hazards to shipping and health; vectors for the dispersal of alien taxa that may endanger coastal ecosystems and seafood resources; visually distasteful, compromising tourism.

Because plastics float, degrade slowly, disperse easily and their flux is slowly increasing with time, the environmental effects are cumulative and the problems created are becoming increasingly chronic and global rather than acute and local or regional.

It is now recognised that much (perhaps most) marine pollution has land-based origins. Thus addressing the problems of marine debris is not solely the preserve of Annex V to MARPOL and the London Dumping Convention. On-land waste disposal practices also need to be considered. Management and alleviation of the problems require integrated strategies involving local, regional, national and international consultation before policy decisions can be made. This task will be a challenging one and practical solutions are likely to reflect education rather than regulation.

Definitions
Marine pollution is “...the introduction by man, directly or indirectly, of substances into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hindrance to marine activities including fishing, impairment of quality for use of sea water and reduction of amenities”. (GESAMP, 1991; p. viii).

Marine debris is “...any manufactured or processed solid waste material (typically inert) that enters the marine environment from any source”. ‘Marine litter’ and ‘floatables’ are considered equivalent terms (Coe and Rogers, 1997; p. xxxi).

Introduction
The imprint of humanity’s activities has been felt by the oceans for millennia – from the broken pottery preserved in beach rock around the Mediterranean and pre-dating the Christian era, to munitions from World War II and the tear tabs of modern cans in beach rock of the western Pacific.

For so long as most of the materials being cast indiscriminately in the ocean were biodegradable, the environmental impact was minimal. Indeed, until quite recently there was tacit assumption that because of their geographic expanse, the oceans had an infinite capacity to absorb and assimilate wastes
of all kinds, and furthermore they were generally considered 'self-cleansing'.

In the 1960s, if not earlier, it became evident all was not well with the oceans and the general state of their health was questioned (e.g. Carson, 1961; Goldberg, 1976; Waldichuk, 1978; GESAMP, 1991). Increased fluxes of identifiable pollutants have been known and monitored for some time. Several substances once considered pollutants of importance (e.g. heavy metals) are now regarded less seriously, except for local hot spots, while others (e.g. tributyl tin) are under control (see Goldberg, 1995b). In the case of coastal oil spills, many knowledgeable observers claim the supposed damaging environmental impacts have been grossly overstated largely at the popular media’s instigation – they are a myth rather than reality (e.g. Owens, 1992). Plastics, perhaps surprisingly, are one of several marine pollution problems that have been identified by Goldberg (1995a and b) as probably becoming progressively more important in the 21st century and ones to warrant continued global monitoring. As well as plastics, the problems Goldberg identifies include: nutrients and eutrophication; algal blooms and biotoxins; alien organism introductions and pathogens; environmental oestrogens and synthetic hormones.

At first glance, these apparently disparate aspects of marine pollution have little in common. However, all exhibit the following attributes: persistence and extended residence times (or half lives) leading to continued slow accumulation; fluxes gradually increasing with time; non-point sources with easy dispersal and hence wide dissemination. The problems they create are chronic and potentially global, rather than acute and local or regional.

**Marine Debris**

**Distribution, Sources and Sinks**

Plastic products are an indispensable part of contemporary life and one for which there is an ever-growing demand. It is their desirable properties, such as durability and inertness; resistance to microbial, physical and chemical degradational processes; adaptability, flexibility, versatility and cost effectiveness in manufacturing; as well as benefits with packaging and display, that makes them the environmental nuisance they are in the oceans today. Most discarded plastic items float and they are numerically and volumetrically over-represented in marine debris (Pruter, 1987).

Unsightly accumulations of marine debris, generally dominated by plastic and other persistent synthetic items of one kind or another, have become a conspicuous feature of shorelines world-wide, no matter how remote or isolated (see Coe and Rogers, 1997). The proportion of plastic in marine debris at any locality is generally between 60 per cent and 80 per cent, and occasionally exceeds 95 per cent. These materials greet visitors to coastal localities from the Aleutian archipelago (Merrill, 1980) to remote parts of the Pacific and uninhabited atolls in the Pitcairn Group (Benton, 1995) or seldom visited sub-antarctic islands (Gregory and Ryan, 1997), together with shores closer to major metropolitan centres of the eastern seaboard of North America, from the popular recreational beaches of the Gulf of Mexico, to those of North and South Carolina and Georgia facing into the Atlantic (NRC, 1995) as well as distant Newfoundland and remote Sable Island (Lucas, 1992), and across the ocean to Wales, where some beaches are amongst the most heavily fouled of all by plastics (Williams and Simmons, 1997).

The results of numerous marine debris beach clean-ups and surveys are now available. However, the validity of some are questionable and comparisons difficult as data have been variously recorded in true counts and other measurements or simply based on estimates, and expressed in terms of numbers, volume and weight, and either linearly or by area with continuous, systematic and representative or random transects. The approach adopted may reflect time available and a survey’s objectives – either determination of standing crop, type and amount and spatial variations or accumulation rates and temporal changes, both seasonal and longer term.

There is clearly need for adoption of a uniform approach as outlined by Ribic et al. (1992). Nevertheless, it is evident that quantities are highly variable (e.g. German Bight, 1160 items km⁻¹, Vauk and Schrey, 1987; Ducie Atoll, 397 km⁻¹, Benton, 1995; Tasmania, 300 km⁻², Slater, 1991; New Zealand, from under five to more than 60,000 items km⁻¹, Gregory and Ryan, 1997).

Quantities tend to be greatest near major population and manufacturing centres and progressively decrease away and down-drift from them. Wind, waves and currents are effective long-distance dispersal agents. Material from South America has reached southern New Zealand by way of the west wind drift and eastwards flowing circum-Antarctic current, and items from central and northern America have reached Europe and United Kingdom through the Gulf Stream.
Elsewhere greatest quantities are to be found on windward shores and least on leeward ones. Thus under the driving influence of the SE trade winds, east-facing shores of Oceania host more seaborne plastic than west-facing ones (e.g. Dravuni Island, Fiji, with 121 kg/km² on the east-facing windward shore and only 1kg/km² on the leeward shore). Similarly, on sub-antarctic islands to the south of New Zealand, marine debris is not uncommon on beaches facing the westerly winds of the roaring forties and furious fifties and is extremely rare on eastern (leeward) shores (Gregory and Ryan, 1997). Marine debris is also concentrated along oceanic convergences and other frontal systems.

In general terms there are three sources for marine debris. They are:

• Land-based and local;

• Nearby offshore recreational boating and other inshore or coastal maritime activities as well as fisheries;

• Truly oceanic or pelagic having spent a lengthy period afloat with distant sources whether these were land-based or vessel-generated.

Composition and types of plastic items in marine debris helps to identify possible sources, but it is seldom unequivocal. Beverage containers, confectionery items, fast food packaging and smokers materials suggest local land-based sources and recreational visitors. Fish floats, netting, ropes and crates together with fresh domestic purposes are as readily sourced to local based or vessel-generated.

It is widely accepted that 75 per cent of all marine pollution has a land-based source. This, however, is not equivalent to 75 per cent of marine debris having the same origin, although the evidence of 10 million items annually entering the local Waitemata Harbour from storm water drains and outfalls (ICNZT, 1996) is testament to its importance. Thus, although increased emphasis is being placed on land-based sources for marine pollution (e.g. Qing-nan, 1987; Nollikemper, 1992; Schumacher et. al. 1996; Siung-Chang, 1997) the contribution from vessel-based sources should not be underestimated (see Horsman, 1982; NRC, 1995.) On the other hand it is also evident that some marine debris is uncritically ascribed to local inshore and coastal zone marine operations, if not distant blue water activities. With crates, ropes, netting, monofilament line, packing straps and loops, etc. fisheries-related sources are reasonably obvious. However, containers for toiletry, hygiene and cleaning products as well as general household and domestic purposes are as readily sourced to indiscriminate and uncontrolled disposal on land, as they are to vessels on the high seas. A local example is Smith and Tooker’s (1990) early census of marine debris on New Zealand beaches where the claimed importance of fisheries-related sources is overly generous (Gregory, 1991).

While the sources of marine debris may be reasonably well-known even though quantification is fraught with difficulty, identification of the sinks into which plastics and other synthetic materials disappear is uncertain. Degradation rates for pelagic plastics remain largely speculative and range from a few to several hundred years. If immersed in sea water the period is much extended (Andrady, 1990).

Through photodegradation-induced embrittlement plastics stranded on mid- to low-latitude beaches will ultimately fall apart into powder and pass from view (and be absorbed into the environment). It is now recognised that much plastic litter settles to the seafloor at all depths (e.g. Williams et. al., 1993; Galgani et. al., 1996; Uneputty and Evans, 1997) where it may be preserved almost indefinitely and entombed by sediment. On some shores, marine debris may be covered by and stored in drifting sand or advancing dunes, and from which it may be returned to the visible litter stream during later episodes of erosion and deflation. Where onshore winds are strong plastic litter and other marine debris may be blown considerable distances inland. It has been claimed that in some circumstances the quantities so removed, and hidden from view in vegetated cover and dune fields may exceed those visible at the shoreline source.

Until the sources, sinks and degradation rates of plastics in marine debris are better understood the input/output equation will not be solved and determining global fluxes for the material will remain illusory. In all probability the phenomena are cumulative and the quantities of marine debris, both visible and invisible, will predictably continue to increase as will their detrimental environmental impacts.
**Environmental Impact**

The indiscriminate disposal of plastics and other persistent synthetic material into marine waters has created a number of problems, some of which have attracted considerable media and public attention. Foremost of these are the visual affront of unsightly plastic and aesthetic values as well as emotive issues arising from entanglement and ingestion which may lead to death and debilitation if not reduced quality of life and reproductive performance amongst marine vertebrates (e.g. Laist, 1987).

Other impacts that have received less recognition, but which are of no less importance include damage to subsistence fisheries (Nash, 1992); hazards to recreational boaters as well as larger commercial vessels; damage to the biota of soft sediment, reefs and rocky substrata through the blanketing effects of plastic sheeting (Uneputty and Evans, 1997) as well as possible anoxia and hypoxia induced by inhibition of gas exchange between pore water and overlying seawater (Goldberg, 1997); the role pelagic plastics may play as a vector for local, regional and perhaps even transoceanic dispersal of marine and some terrestrial organisms and with aggressive alien taxa that could imperil the ecology of their new environment (Gregory, 1991; Winston et al., 1997); damage to terrestrial flora and fauna from seaborne plastics being blown inland after stranding (Wace, 1995); the prospects for chemical toxicity arising from plastic microlitter and its interference with the ecology of the ocean surface microlayer (Gregory, 1996) as well as matters of public health and safety.

With ever increasing quantities of plastic litter reaching and being absorbed into the marine realm their environmental impacts are predictably cumulative. In addition to the above well known factors, there is a growing appreciation that marine debris may impact tourism as it has around the Caribbean (Siung-Chang, 1997) and Pacific (Minerbi, 1992) and is evident from quotations about it along the beach at Doughboy Bay, Stewart Island, New Zealand, that are cited by Gregory (1998, Table 3) (e.g. "Most dirty and polluted beach I’ve seen in New Zealand – what a shame... we did our best to clean it up, but only scratched the surface").

<table>
<thead>
<tr>
<th>Garbage Type</th>
<th>Outside Special Areas</th>
<th>Inside Special Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastics of all kinds; synthetic ropes, fishing nets, plastic garbage bags</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>Floating dunnage, lining and packaging materials</td>
<td>&gt;12 naut. miles offshore</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>Paper, rags, glass, bottles, metal, crockery and similar wastes</td>
<td>&gt;25 naut. miles offshore</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>All other garbage</td>
<td>&gt;3 naut. miles offshore</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>Foodwaste not ground</td>
<td>&gt;12 naut. miles offshore</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>Foodwaste comminuted to &lt;25mm</td>
<td>&gt;3 naut. miles offshore</td>
<td>&gt;12 naut. miles offshore</td>
</tr>
</tbody>
</table>

Table 1: Summary of vessel-generated garbage disposal at sea regulations – MARPOL Annex V
Discussion

Annex V to the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) prohibits discharges into the sea of all plastics including, but not limited to, synthetic ropes and fishing nets, and plastic garbage bags, as well as that of macerated food wastes and other floating materials within specified distances from land (see Table 1). This includes high-seas disposal of incinerator ash whose generation will be further precluded by the proposed Annex VI which will prevent air pollution at sea.

Discharge of vessel-generated waste of all kinds is prohibited in some designated Special Areas such as the Caribbean, Baltic and Mediterranean Seas. Vessels carrying the flag of ratifying nations must comply with the regulations and guidelines of Annex V. Adequate port reception facilities for the disposal of vessel-generated wastes are also a requirement. However, despite wide publication and intensive or concerted training efforts with vessels’ crews, particularly large passenger and cruise liners, establishing total compliance is difficult and the problems with implementation and enforcement are widely acknowledged (e.g. Joyner and Frew, 1991).

Legislation enabling New Zealand to be a party to MARPOL 73/78 did not come into effect until 20th August 1998. Only from this date has the country been in a position to enforce the convention’s regulations as summarised in Table 1.

For this local New Zealand audience there are some facts that may be of interest. Quantitative data on the amounts and composition of vessel-generated garbage that is disposed at sea are notoriously unreliable, but figures of between 2.5 and 3.5kg/person/day are widely accepted with more than 600,000t of litter entering the oceans annually from this source (see NRC, 1995). Of this c.1kg is considered combustible (mostly plastics, cardboard and paper which would otherwise float for some time if tossed overboard); 0.5 kg is food and related wastes, and as much as 1.5kg is glass, tin and similar sinkable materials (Deerberg, 1995).

Thus large liners or cruise vessels with a thousand or more passengers and crew will have the garbage-generating capacity of a small town. As a further example, consider frigates in service with the RNZN. Experience elsewhere suggests they will generate 0.89 kg/person/day of dry (i.e. burnable) general garbage (see Bravery, 1993). It follows that the older Leander class frigates with a complement of c.250 will generate 222kg of waste/day (or 1.56t/week) and in the newer Anzac (Meko 200) class with 163 crew this reduces to 145 kg/day (or 1.02t/week). Garbage generation on recreational vessels probably approaches 0.5 kg/person/day (NCR, 1995).

For reasons of space, safety and hygiene, storage of garbage for long periods at sea is difficult. While the cruise industry may be able to control its discharge around the Caribbean where voyages are of brief duration, unauthorised disposal ever remains a problem as recent fines of US$500,000 to P & O’s Princess Cruises would indicate (see Garfield, 1993). Because of the distances to traverse, voyaging times will be lengthier for cruise vessels operating around the SW Pacific or visiting ports of eastern Australia and New Zealand (e.g. 26 calls to the Port of Auckland over the summer of 1997/98 and 29 programmed for 1998/99).

Compactors may partially solve the problems as would shredders, but incineration, as efficient and simple as it may seem, is unlikely to be acceptable under the proposed Annex VI to MARPOL. Port reception facilities for the quantities of waste generated by large cruise vessels are non-existent at most small Pacific Island countries and otherwise often inadequate or poorly managed.

It is also perhaps appropriate here to mention briefly Auckland and the America’s Cup defence of the year 2000. Several large cruise liners are likely to be based in the Port of Auckland over this period. The New Zealand Herald of February 3, 1998, carried a brief report on a probable call by the ‘World of Residensea’. This luxury 280-apartment ship of 83,000t being built for the Norwegian company ResidenSea Ltd is expected to enter service in late 1999 and ‘...can be expected to be found in the Mediterranean for the Cannes Film Festival, the Monaco Grand Prix, and the Rome Opera; at Auckland for the America’s Cup... and in Sydney for the Olympics...’ (Mathisen, 1997, p.13).

These, together with the spectator fleet, recreational and local boaters, as well as visiting luxury yachts and floating gin palaces have the potential to flood with marine debris, surface waters of the outer Waitemata Harbour and Inner Hauraki Gulf where race courses will be set – if forethought and planning is not adequate. Preliminary work addressing the problems is in progress under the banner of Island Care New Zealand Trust (ICNZT) (G. Arnold, pers. comm.).
Conclusions

Marine pollution by plastics and other persistent synthetic materials, has been a growing problem for more than thirty years, and will predictably worsen for some time yet. The relative contributions to the problems which are already of global proportions, from either land-based or vessel-generated sources are difficult to establish. The latter can be addressed through Annex V to MARPOL and the London Dumping Convention, but the international community will need to enforce the regulations with rigour and local authorities ensure adequate port reception facilities in place.

The former is more difficult and requires local and regional agreements and protocols such as those being developed for the Caribbean under the WCISW Project (IMO, no date) and in an action plan for the South Pacific Region (SPREP, 1997). The consultative processes need to be broad in scope involving legislators, policy makers and planners, port authorities, shipping and fishing industry representatives, regulators and educators, environmental scientists, waste management specialists and engineers, as well as conservationists, tourist operators and economic analysts.

There is going to be no quick-fix, single or unique solution. Tax incentives may be of use, but difficult to enforce, draconian regulations are unlikely to alleviate the problems. Recycling, re-use, reduction, replacement and strict controls on plastic products all have strong advocates, but at present in many instances these approaches are impracticable. Replacement of plastic by biodegradable materials such as paper and cardboard in much packaging warrants serious contemplation – even if it appears a backward step to marketing modernists.

Beach clean-ups may be but a socially acceptable palliative, for there is little evidence to date that they have lead to decreases in the amounts of marine debris reaching the shore. Humankind can ill-afford continued trashing of the oceans. Amongst the suggested solutions, broad public education and awareness campaigns are probably of paramount importance. It should focus on the next generation who will inherit the problems. Out of sight, out of mind is no answer.

Acknowledgements

My ongoing research programme into marine debris and its many environmental implications has had funding since the early 1970s from the University of Auckland’s research grants. Further support came through the research agenda of the Ministry of the Environment. In preparing this contribution I have also had the benefit of access to resources in the library of IMO, London. Technical assistance has been provided by R. Bunker, L. Cotteral and K. Johnston.

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Saltmarsh Restoration and Management

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Abstract
This paper describes marine and estuarine wetlands in the Canterbury area and evaluates the current status of marshlands surrounding the Avon Heathcote Estuary.

It presents a concept plan, developed by the waste management unit of the Christchurch City Council for the restoration of marshes in a 90 hectare area currently used for stock grazing.

We present current research on the plant and animal communities within the remnant marshes, including seasonal patterns shown by invertebrates, birds and fish.

We identify some of the scientific information necessary before marsh restoration can proceed and consider some of the management (planning) options in developing and restoring the marshlands.

Introduction
Coastal wetlands and saltmarshes occur worldwide from the Arctic through the tropics to southern temperate regions (Mitsch & Gosselink, 1993). These unique habitats have in the past been considered as wastelands and many have been lost due to reclamation, harbour formation and as sites for rubbish disposal (Williams, 1990). In New South Wales some 50 per cent of the saltmarshes have been lost since 1788 (Morrisey, 1995), but in New Zealand this estimate could be as high as 91 per cent. We have been slow to recognise the true value of this now threatened landscape. Tidal marshes close to urban areas can provide hydrological, physical, biological and sociological benefits (Mercer, 1990), they are also ideal targets for conservation, providing areas where the public can see interactions of the air, water, vegetation and wildlife.

Saltmarshes develop in sheltered coastal areas where rivers and creeks meet the sea, behind shingle spits and in coastal lagoons (Ranwell, 1972). In New Zealand some 26 sites around the coast have been identified as having high ecological value. In the Canterbury area these include four sites, Ashley-Saltwater Creek, Brooklands Lagoon, Avon-Heathcote Estuary and Lake Ellesmere. Figure 1 shows a map of Central Canterbury showing scattered marshes throughout the region. The most important area is Saltwater Creek, representing the largest undisturbed region of saltmarsh. This is an important reference area for marsh development elsewhere in Canterbury. In contrast with the relatively undisturbed Saltwater Creek, the Avon Heathcote Estuary, over the last 150 years, has undergone considerable changes (Harris, 1992).

Prior to European occupation there were large expanses of swamp, rushes and tidal wetlands. While the remaining marshlands represent only about 10 per cent of the original, the diversity of plant species remains high (McCombs and Partridge, 1992) and similar to saltmarsh vegetation in other parts of central New Zealand (Cockayne, 1967; Mason, 1969; Partridge and Wilson, 1987). Although many of wetland
habitats of the estuary disappeared, other habitats were created including the oxidation pond reserves and the paddocks for stock grazing, bird roosting and feeding.

**The Green Edge Proposal**

In 1995 Christine Heremaia of the Waste Management Unit coordinated the Estuary Green Edge proposal to link wildlife areas and restore tidal wetlands in the area known as the Linwood Paddocks. This land, consisting of about 90 hectares is currently used to recycle treated solids from the Bromley Sewage works. As the council have approved in principal a plan to apply the biosolids to forestry, rather than the farm area, this council land can be considered for alternative uses.

The initial concept plan and discussion document pointed out the ecological, cultural and recreational advantages of restoring marshlands to this area, reviewed the current land usage, sea level rise and planning under the Resource Management Act (1991). Three initial plans were developed to investigate the opportunities to enhance the ecological and recreational values of the council-owned land.

The components include the sewage treatment plant, farm park, playing fields and the restored saltmarsh, formed by opening the existing tidal gate. There would also be new playing fields, a visitor centre and enlarged windsurfer area. Dana Thomsen is currently undertaking research aimed at improving the potential ecological values of the proposed marshland (Reimold, 1994). This research investigates the practicalities of establishing a gradient from freshwater to saltwater marsh areas, reserve areas and a succession of scrubland plants leading to bush at the urban edge. Fundamental to this research is a planting scheme based on the known growing requirements of the marshland plants. The revised concept plan also will consider the possible addition of storm water, spring inputs and treated freshwater effluent from the oxidation ponds (Corbitt and Bowen, 1994).

Amongst the local scientists there has been overwhelming support for the marsh reclamation project. However, it was recognised that there were considerable gaps in the knowledge necessary to fulfil this dream of a tranquil saltmarsh, with birds feeding and small crabs scuttling over the mud surface. While there has been tremendous research effort in the Avon Heathcote, summarised by Knox and Kilner, 1973, and Knox, 1992, this has concentrated on the main parts of the estuary. There was no information on the invertebrate fauna of the tidal marshes and the current marine fish fauna was poorly known. The most recent records were those of Webb (1966). Good general information was available for the birds (Crossland, 1993), but this was not suitable for predicting how particular species would utilise the new marsh area.

In this paper, we report the findings from a number of research projects on the marshlands, undertaken by students from the Zoology Department, University of Canterbury.

**Macrofauna**

In their survey of the plants of the Avon Heathcote, McCombs and Partridge (1992) identified 17 different plant species and/or plant associations. These represented different tidal levels, a gradient of salinity and groupings based on levels of disturbance and presence of weeds. Webster (1997) has investigated the macrofauna associated with these different plant groupings within five of the remnant marshes (Figure 2). She also sampled bare mud adjacent to the saltmarsh plants at three marsh levels.

In contrast with the high diversity of plant species recorded in McCombs & Partridge (1992) the invertebrate fauna was very sparse (Table 1) consisting of approximately 13 marine species of molluscs (4), crustaceans (5) and polychaetes (5), oligochaete worms and a few insects. This is similar to the aquatic
Table 1. Number of aquatic species recorded from each of the sites (total), the area in hectares, the number of different vegetation types (V) and salinity range of the mud within marsh areas.
fauna described from the North Island (Morton and Miller, 1968) and Hoopers Inlet, Otago (Paviour-Smith, 1956). There were no species that were found exclusively on saltmarshes. In some other parts of the world up to 25 per cent of the fauna of high shore marshes is found only in that habitat (Long and Mason, 1983).

The dominant species was the small gastropod *Potamopyrgus estuarinus* which occurred at maximal densities of up to 5000 individuals per m$^2$. In all of the marsh remnants the species diversity was low, consisting of 2.35 species in the Heathcote Marsh and 3.65 in the Bexley marsh at the mouth of the Avon River. Invertebrate abundance differed between the sites investigated for this study.

Figure 3 compares the invertebrate abundances during summer and winter at different shore levels. Analyses of these data showed that macrofauna abundance depended on site and vegetation type. In addition there were greater densities of invertebrates in the vegetated sites than in the bare mud samples. This is a common feature of low tide saltmarsh meadows which are thought to provide protection to invertebrates from predation (Howard et al 1989).

Greater densities of invertebrates were found within sites close to the Avon river than at Sandy Point, within the main estuary and at the Heathcote River mouth. An alternate method of determining macrofauna abundance is by determining the weight or biomass of animal tissue. These results, calculated for the ash-free dry weight present in each sample are shown in Figure 4. This shows a similar pattern, but in contrast with the density values, the biomass is relatively similar between sites. This is due to the greater contribution to the populations by larger individuals. These biomass values are clearly dominated by the small snails and mudcrabs, *Helice crassa* that generally are abundant in vegetated rather than bare mud sites. A comparison of the phyla shows that only the annelid worms, represented mainly by the polychaetes showed a different pattern of distribution to the other groups (Figure 5). Abundances were higher in mud than in the vegetation and increased at lower marsh levels. Also these marine worms were more abundant at the Charlesworth site than Sandy Point and the Heathcote River marsh. This Charlesworth site is of interest as it consist of a small remnant of the original Humphries Drive marshland and a restored area created in 1991.

We conclude that the aquatic invertebrate fauna of the saltmarshes is not critically determined by particular species of plants. It consists of a few exceptionally tolerant specialist species that are highly resistant to the harsh conditions of salinity, temperature and aerial exposure. These invertebrates all occur higher up the rivers than the proposed marsh and would colonise regardless of the plants established. However greater densities would be expected if a variety of plants was established. The marsh grazers assist in nutrient cycling and the breakdown of saltmarsh detritus. However, they most likely form only a small portion of the total biomass (Paviour-Smith, 1956; Moore, 1990).

**Bird Density**

Love (1997) has investigated the seasonal occurrence of four species of wetland birds within parts of the remnant marshes. The birds investigated were the oystercatcher, pied stilt, heron and godwit. The study found significant differences between the species, sites and with season (Figure 6). Highest numbers of oystercatchers were found at Sandy Point which is part of the estuary not separated by a stopbank or roads. Pied stilts favoured the newly-formed marsh area (Charlesworth Site 2) and during summer, herons were found in all the marsh sites, at densities greater than that seen in control areas within the estuary proper. Godwits, which winter over in the estuary were found only at Sandy Point.

Wading birds are known to use saltmarsh areas for a variety of functions (Crossland, 1992) including feeding, roosting and nesting. At low tide within the estuary over 80 per cent of their time is spent in feeding related activities; searching, probing, catching and consuming prey (Caesar, 1993). However, within the marshland sites, the wading birds spent less time feeding at some sites and there were seasonal differences (Figure 7). The capture success of the birds feeding in the marshland habitats was generally similar to birds feeding in the main estuary channels (Figure 8). For many bird species the time spent feeding is related to the efficiency of prey capture and the prey availability (Goss-Custard et al, 1993; Ens et al, 1996).

Food resources were estimated for the marsh sites (Figure 6) which show that upper six centimetres of sediments contained more invertebrates than lower sediments and that prey availability was similar summer and winter.
Figure 3. The effects of site, season, tidal level and vegetation on the abundance (mean +SE) of macrofauna within tidal marshes. Duncan's multiple range test was used to compare values from sites. The lines drawn under the names show similar mean values. The range from lowest to highest occurs from left to right (from Webster, 1997)
Figure 4. The effects of site, season, tidal level and vegetation on biomass (mean ±SE) of macrofauna within tidal marshes. Duncan's multiple range test was used to compare values from sites. The lines drawn under the names show similar mean values. The range from lowest to highest occurs from left to right (from Webster, 1997).
Figure 5. The effects of site, vegetation and tidal level on biomass (ash-free dry weight of annelids within tidal marshes (from Webster, 1997)
Figure 6. Top – combined abundance data (per hour) for waders at marshland sites over summer. Bottom – abundance of invertebrates (0.01m²) in upper and lower levels of the sediment, separated into prey types (from Love, 1997)
Figure 7. Comparison of time spent on feeding-related behaviour of waders from marshland sites during summer and winter (from Love, 1997)
Figure 8. Prey capture success of waders from marshland sites (top) and main estuary sites (bottom) during summer (from Love, 1997)
These site related differences in food availability do not correlate with bird density or differences in feeding activities of particular bird species. Within the estuary oystercatchers are known to feed on bivalves, (Baker, 1969) which were relatively rare within the marsh areas. Stilts and herons consume fish as well as invertebrates and therefore we might not expect a relationship between feeding rates and invertebrate density for these species.

In a related study, Nairn (1998) has investigated the distribution of fish within the estuary and marsh channels. Over the summer period he found abundant juvenile flatfish and yellow-eyed mullet in channels close to all of the marsh areas. The exception to this was the newly formed Humphries Drive wetland, where in the absence of fish, herons must find alternative prey including crabs and polychaete worms.

From our studies, we have found that the wetland birds have readily colonised the marshland artificially constructed in 1991. Within this habitat, pied stilts show a high feeding level and use the adjacent areas for other activities including nesting. From these studies we can be optimistic that oystercatchers pied stilts and herons would visit any newly created marsh area. However, godwits may need further encouragement.

Conclusions

These studies confirm the need for detailed scientific research prior to re-establishing marshland areas (Kent, 1994). Further research will be needed on the plant communities, some of which is currently in progress. This will determine the elevation, tidal flow and channel construction required to maximise invertebrate and plant colonisation. It will also be necessary to investigate the suitability of the metal-enriched sediments to support plant growth.

The research described here from the newly established marsh site suggests that shallow dyke enclosures can act as suitable wildlife areas, and these could be easily constructed by allowing increased tidal invasion. However, on a larger scale it will be important to try to maximise plant diversity and to construct a range of narrow and deeper channels to encourage fish and shellfish colonisation.

Our findings suggest the Green Edge Concept can become a reality. The research undertaken within this programme will be of value in the maintenance and re-establishment saltmarsh regions in other parts of the main estuary. It will also be of use in the restoration of marshes that have been damaged by human and natural disturbances here and elsewhere in Canterbury.

Finally we have to recognise that even if we are successful at restoring tidal marsh habitats they may not remain stable. They are naturally dynamic with the tendency to change with environmental conditions. They are fragile and in many cases their role within the larger marine community is not fully understood. For the Christchurch City there are obvious cultural, ecological, educational and some economic advantages in seriously considering marsh restoration.

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Ecosystem Management Principles: New Zealand’s Marine Legal Framework

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Abstract
For coherent management of the sea as an ecosystem, New Zealand needs to develop an integrated management regime that has similar objectives, processes and public participation on either side of the 12 nautical mile limit subject to the provisions of international law. This management should be framed within an ecosystem approach and incorporate the principles and provisions of recent international obligations such as Agenda 21 and the Convention on Biological Diversity. There should be a rationalisation of the agencies involved in marine management with coordination and oversight from the Ministry for the Environment.

New Zealand currently has a patchwork of legislation that applies to various activities in the marine environment. These laws lack a consistent approach, common objectives or an ecosystem focus. Any attempt at an ecosystem focused approach would be severely dislocated by the fact that the laws that apply inside the 12 nautical mile territorial limit2 are mostly different from those beyond 12 nautical miles out to the edge of the contiguous zone, Exclusive Economic Zone (EEZ)3 or continental shelf.

Inside 12 nautical miles the Resource Management Act 1991 (RMA) applies an ecosystem approach which is administered jointly by regional councils and the Minister of Conservation. The RMA does not apply to managing fisheries and instead the Fisheries Acts of 1983 and 1996 apply right out to the 200-mile limit of the EEZ.

Beyond 12 nautical miles the environmental and resource management arrangements are ad hoc and lack integration. Some statutes apply differently inside and outside 12 nautical miles. Others apply inside or outside the limit.

The agencies that manage resources in the EEZ are in most cases different from those who manage the same resources inside the territorial sea. For example, the Department of Conservation is the agency in charge of the seabed within 12 nautical miles while in the case of the EEZ, it is the Ministry of Transport.

1 Thanks are due to Cath Wallace for help with the development of proposals for integrated management and for other advice.

2 A nautical mile is 1852m which is about one-sixtieth of a degree.

3 The territorial sea is limited to 12 nautical miles, the contiguous zone is up to 12 nautical miles further offshore and the EEZ is limited to the area 188 nautical miles outside the territorial sea.
Introduction

In the International Year of the Oceans it is an opportune time to consider the arrangements for marine management in New Zealand.

Marine management in New Zealand suffers from a disconnected patchwork of legislation and different agencies that manage various activities in the territorial sea and the Exclusive Economic Zone (EEZ).

The laws lack a consistent approach, common objectives or an ecosystem focus in the EEZ, continental shelf and territorial sea. Any attempt at an ecosystem-focused approach would be severely dislocated by the fact that the laws that apply inside the 12 nautical mile territorial limit are mostly different from those outside it. Legislation tends to be oriented towards management of single activities (e.g. fishing) rather than the integrated management of different activities.

The agencies that manage the marine environment are similarly dislocated. While the Resource Management Act (RMA) provides a coherent ecosystem approach and there is some coordination between the Department of Conservation and regional councils inside 12 nautical miles, no such coordination occurs in the EEZ (see Table 2).

The need for better coordination of marine management between inside and outside the 12 nautical mile limit has been recognised for over 10 years. The Resource Management Law Reform, which ran from 1988 to 1990, recognised the problem with current statutes and administration (for example, RMLR Working Paper No 2, 1998a).

In this paper I will review and assess the current law and agencies that manage the marine environment and natural resources in the territorial sea and the EEZ. I will also look at New Zealand’s international obligations relating to marine management. I will consider whether the present arrangements prevent integrated management inside and outside the 12 nautical mile limit.

The last section of this paper proposes changes to current law and administration aimed at integrated resource management.

New Zealand Policy Content

Current government policy on resource management is set out in the Environment 2010 Strategy (1995). This recognises a key condition for the vision of the strategy to be:

“Effective laws and policies – a body of laws and government policies that provide certainty and achieve environmental goals effectively and efficiently.” (p9)

This condition is expanded in the Environmental Management Agenda of the 2010 Strategy, which includes goals:

“To develop and maintain an effective, coherent body of law and practice for achieving efficient and sustainable management of the environment.” (p54)

“To ensure that people have the opportunity for effective participation in decision making that affects the environment.” (p58)

The Parliamentary Commissioner for the Environment (PCE) has suggested that the:

“Key requirements for effective environmental management... include:

- Procedures must be clear to all affected parties;
- Coordination between agencies with different legislative responsibilities;
- Procedures for assessment of environmental effects, including cumulative effects;
- Procedures for adequate public consultation;
- Procedures for setting conditions to protect the environment.”

— (Parliamentary Commissioner for the Environment, 1996)

Additional requirements recognised are legislation with a consistent purpose and principles, including consideration of the Treaty of Waitangi or its principles. Good environmental management has been defined by previous governments as including the needs of future generations, the intrinsic values of ecosystems, and sustainability (Core Group, RMLR, 1998).

How does the current patchwork of New Zealand law meet these goals and what changes need to be made if these or others goals are to be met?

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4 The office of Parliamentary Commissioner for the Environment was established in 1986 as part of the environmental reforms.
Current Marine Legislation

Inside 12 Nautical Miles

Resource Management Statutes

The key statutes that only deal with resource management issues inside 12 nautical miles are:

Resource Management Act 1991 – is the major integrating statute inside 12 nautical miles, which sets the parameters for ecosystem management. Coastal management is administered by regional councils with the concurrence of the Minister of Conservation;

Biosecurity Act 1993 – management of unwanted organisms and pest management strategies. The Act is administered by the Ministry of Agriculture and Forestry. An amendment in 1996 allows the Ministry to take action out to 24 miles offshore – the edge of the contiguous zone. The Forests Act (section 69 and 71C) also contains powers to control potential biosecurity threats to forest products from cargo and vessels in the territorial sea;

Hazardous Substances and New Organisms Act 1996 – manages hazardous substances and the control of the import of new organisms, including genetically modified organisms. This Act will not be fully in force until April 1999.

The Resource Management Act 1991

The purpose of the RMA is set out in section 5 of the Act and it:

"Is to promote the sustainable management of natural and physical resources."

"In this Act, “sustainable management” means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while –

(a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
(b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and
(c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment."

The definition of sustainable management includes promoting the mitigation of adverse effects. The principles set out in sections 6, 7 and 8 define a range of additional objectives including:

“The preservation of the natural character of the coastal environment (including the coastal marine area), and their margins, and the protection of them from inappropriate subdivision, use, and development.” (section 6(a))

The Act contains the control of coastal management but does not include fisheries management or the allocation of Crown owned minerals. The Act manages:

• The allocation of space – including, marinas and marine farming;
• The control of structures – e.g. wharves, jetties, etc;
• Discharges to water and into the air;
• The use of sea water;
• Reclamation.

Whether rules in regional plans can manage the adverse effects of fisheries activities has still to be tested in court.

Under the RMA coastal management is administered by regional councils who produce coastal management plans with the agreement of the Minister of Conservation.

The Minister for the Environment approves marine pollution regulations that will implement MARPOL and other international law requirements inside of 12 nautical miles.

When the OECD carried out its Environmental Review Report on New Zealand in 1996 the review team noted, diplomatically, the patchy implementation of the RMA’s ecological management principles:

“The RMA provides a comprehensive and integrated framework within which policies and plans can be developed to provide a mechanism for broad ecosystem management and the protection of natural values irrespective of land tenure. The extent to which such opportunities are taken, however, rests with regional councils and the territorial authorities responsible for planning under the RMA.”

(P 53, OECD 1996)

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5 This includes unitary authorities. The role of district councils ends at mean high water spring.

6 On 20 July 1998 the Resource Management (Marine Pollution) Regulations 1998 were gazetted which will enable New Zealand to ratify MARPOL (see international agreements).
Figure 1.

Diagram of Our Maritime Zones

- **Territorial Sea**: 3 nm
- **Contiguous Zone**: 24 nm
- **Exclusive Economic Zone**
- **Continental Shelf**
- **Continental Rise**
- **Deep Seabed**

**Sea Level**: Above the 200m isobath

**Sovereign rights**: for exploring, exploiting, conserving and managing living and non-living resources of the sea-bed and subsoil, plus sedentary species.
### Inside 12 Nautical Miles

**Conservation Statutes**

Most of the conservation statutes administered by the Department of Conservation apply only to the land or extend to foreshore. The National Parks Act 1980 and the Reserves Act 1977 is limited to land down to low water. The Conservation Act mainly applies to the land and foreshore.

The principle statutes covering marine areas and marine species follow.

The **Marine Reserves Act 1971** is limited to the territorial sea. Reserves cannot be created outside 12 nautical miles. Fishing is usually excluded from all marine reserves, although the Act does allow recreational fishing (section 3(3)). The main purpose of the Act is to preserve areas “for the scientific study of marine life”. Other objectives include preserving areas in their natural state and protecting and preserving marine life.

Since the Act was passed 14 marine reserves have been established which now cover around one per cent of the territorial sea. The largest reserve includes all the territorial seas around the Kermadec Islands and makes up over 98 per cent of the marine area now covered by marine reserves.

The **Marine Mammals Protection Act 1978** covers all marine mammals throughout the territorial sea and the EEZ. Marine mammals are absolutely protected. This Act controls marine mammal watching, effects of fishing on marine mammals and the creation of marine mammal sanctuaries.

New Zealand has two marine mammal sanctuaries covering 335,111 ha. One around Banks Peninsula (1988) protects Hector’s dolphin. The other is the area within 12 nautical miles of the Auckland Islands (1993) and protects Hooker’s or New Zealand sea lion.

The **Wildlife Act 1954** covers all birds, turtles and, since 1996, three marine ‘species’ – black and red coral and spotted black grouper (schedule 7A). In 1996 provisions were introduced to manage sea bird deaths in fishing. This control extends to the outer edge of the EEZ (section 3). The provisions relating to wildlife sanctuaries, wildlife refuges, and wildlife management reserves are restricted to within the territorial sea (12 nautical miles). Conservation management strategies dealing with wildlife can extend throughout the EEZ while general policies and plans are restricted to the territorial sea (section 2B).

The **Conservation Act 1987** and the **Conservation Law Reform Act 1990** are principally focused on land management. The provision relating to conservation management strategies (for marine mammals and wildlife) and conservation management plans and general policy (for marine mammals) can extend to throughout the EEZ (sections 17B, 17C, 17D and 17E).

The **Sugarloaf Island Marine Protected Areas Act (1992)** is a special Act, which creates a marine park for the Sugarloaf Islands, near New Plymouth. The main controls in this Act are to prevent mining (i.e. oil drilling) within the park. The fisheries controls in the park are established under the **Fisheries Acts 1983 and 1996**.

<table>
<thead>
<tr>
<th>Statute</th>
<th>Foreshore</th>
<th>Inside 12nm</th>
<th>Outside 12 nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Parks Act</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Reserves Act</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Marine Reserves Act</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Wildlife Act</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes for seabirds and protected marine species</td>
</tr>
<tr>
<td>Marine Mammals Protection Act</td>
<td>Yes</td>
<td>Yes</td>
<td>Only conservation management strategies and marine mammals conservation plans</td>
</tr>
<tr>
<td>Conservation Act</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Limits of Conservation Statutes Administered by Department of Conservation
Statutes that Cover Inside and Beyond 12 Nautical Miles

Apart from some of the conservation statutes, several laws apply both within the 12 nautical mile limit and the EEZ.

The Fisheries Acts 1983 and 1996 manage the allocation of rights to go fishing, the creation of taiapure (local customary fishery covering estuarine and littoral waters, Part IX of the 1996 Act) and mataitai areas (Maori customary fishing areas, section 186, 1996 Act) (Ministry of Maori Development, 1993) and the recovery of costs from the commercial fishing industry. These Acts are administered by the Ministry of Fisheries.

The 1996 Act has a clear purpose and principles and includes limited public processes (eg sections 12 and 266(7)). The Act’s purpose (section 8):

"Is to provide for the utilisation of fisheries resources while ensuring sustainability".

"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 Act also includes two sections setting out principles which impose obligations on decision-makers:

Section 9 requires:

“(a) Associated and dependent species should be maintained above a level that ensures their long term viability:

(b) Biological diversity of the aquatic environment should be maintained:

(c) Habitat of particular significance for fisheries management should be protected.”

Section 10 contains a set of information principles (a type of precautionary approach);

Section 5 also requires decision-makers to act in a manner consistent with:

“New Zealand’s international obligations relating to fishing; and

The provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.”

Wallace (1997 and 1998) has further described some of the key elements of the objectives of the 1996 Act and problems with its implementation.

The Crown Minerals Act 1991 establishes mineral programmes for the allocation of Crown owned minerals and sets in place a framework for granting access to those minerals. The Act is administered by the Ministry of Commerce. It has no defined purpose, has no provisions for public processes for input into decisions regarding granting mineral permits and includes no environmental evaluation of mineral activity. The only processes the Act requires are the establishment of mineral programmes. It only covers the area outside of 12 nautical miles for petroleum mineral activity. This is done via the provisions of section 4 of the Continental Shelf Act 1966. For non-petroleum minerals the Act is restricted to within 12 nautical miles.

The Territorial Sea, Contiguous Zone and EEZ Act 1977 establishes the 200 mile Exclusive Economic Zone and the 12 nautical mile territorial sea. The Act is administered by the Ministry of Foreign Affairs and Trade. The Act has no stated purpose, has no public processes and includes no environmental evaluation of an activity. Most of the provisions of the Act operate outside the 12 nautical mile limit.

The Maritime Transport Act 1994 (MTA) covers a range of shipping related controls, but most of the marine pollution, marine dumping and incineration provisions only apply outside 12 nautical miles. The wider shipping controls apply both to the territorial sea and the EEZ. This includes the oil pollution control parts of the Act.

This Act is administered by the Maritime Safety Authority. This authority is appointed by the Minister of Transport. There is no representative of the Minister for the Environment. MTA includes public processes for establishing rules to control dumping, incineration and pollution but no public processes for considering permits. The Act has no principles and purpose for its environmental provision and no requirement for environmental assessments.

Outside 12 Nautical Miles

There are four main statutes that cover environmental management outside 12 nautical miles.

The Continental Shelf Act covers mineral activity on the continental shelf, principally outside 12 nautical miles. The continental shelf can extend beyond the
<table>
<thead>
<tr>
<th><strong>Inside 12 mile limit</strong></th>
<th><strong>Beyond 12 mile limit</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lead Agency</strong></td>
<td>Regional Councils (Resource Management Act, 1991 – RMA)</td>
</tr>
<tr>
<td><strong>Other agencies with responsibilities</strong></td>
<td>Ministry for the Environment, Ministry of Agriculture and Forestry (MAF), Department of Conservation (DOC), Ministry of Fisheries, Ministry of Commerce (MOC), Maritime Safety Authority (MSA)</td>
</tr>
<tr>
<td><strong>Purpose of legislative control</strong></td>
<td>Sustainable management of resources (RMA); advocacy of conservation (Conservation Act, 1987); management of crown-owned minerals (Crown Minerals Act, 1991, CMA); management of unwanted organisms (Biosecurity Act, 1993)</td>
</tr>
<tr>
<td><strong>Outcome of law</strong></td>
<td>Manages environmental effects of activities</td>
</tr>
<tr>
<td><strong>Treaty of Waitangi obligations</strong></td>
<td>Principles must be taken into account (RMA, Conservation Act)</td>
</tr>
<tr>
<td><strong>Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 must be considered (Fisheries Act 1996)</strong></td>
<td>Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 must be considered (Fisheries Act 1996)</td>
</tr>
</tbody>
</table>

**Procedures**

| **Public and Iwi Participation** | Conservation Act, RMA, Wildlife Act, MMPA | No further consultation after rules promulgated (MTA, Fisheries Act 1996); No consultation in CSA, CMA, TSEEZA |
| **Accountability** | Accountable to ratepayers (RMA); Accountable to taxpayers (Fisheries Acts, Conservation Acts) | Accountable to taxpayers (TSEEZA, CSA, CMA, Fisheries Acts, MTA) |
| **Environmental assessment** | Environmental assessment required under RMA and Conservation Act | No requirement to assess environmental effects but must comply with marine protection rules |
| **Monitoring** | Can be made a condition of resource consent (RMA); MAF have power to inspect any craft (Biosecurity Act); Fishing craft may be inspected at any time and observer may be placed on vessels (FishA); power to search and seize (MMPA); effect of mineral permits may be monitored by MOC (CMA) | Inspections and audits may be carried out by MSA (MTA) |
| **Enforcement provisions** | Enforcement orders or abatement notices may be served and imprisonment or fines imposed (RMA); cost of cleaning up pollution and damages may be recovered by marine agency (MTA); prevention of spread of unwanted organism may be enforced by destroying organisms, fines or imprisonment (BioA) | Marine protection document may be suspended or revoked, cost of clean up recovered, fines, imprisonment and detention of property (MTA); fined if mining not in accordance with licence (CSA); revocation of mining permit (CMA); fishing licence may be suspended or cancelled if conditions not met (TSEEZA) |
| Fines may be imposed (MMPA, Wildlife Act); prison may be imposed (Fish Acts) |  |

Table 2: Statutory Framework for Marine Environmental Management (Based on table 2, PCE, 1996, p5)
EEZ. This Act is administered by the Ministry of Foreign Affairs and Trade. The Act has no section defining its purpose, has no public processes and includes no environmental evaluation of activity. The Minister of Energy grants consents to mine petroleum (section 4) and other minerals (section 5) on the continental shelf.

The Minister of Energy set royalties within the EEZ while the Minister of Transport applies royalties for the continental shelf that extends beyond the 200 nautical mile limit of the EEZ. Petroleum mining is subject to the conditions set by the Crown Minerals Act (section 4) but other mineral extraction is only subject to the provisions of the Continental Shelf Act and the safety provisions of the repealed Coal Mines Act 1979 and the Mining Act 1971 (section 5). The Minister of Transport is the minister in charge of the seabed in the EEZ for petroleum (section 4), but no minister is defined for other minerals. The maximum fine for illegal mining is only $200. The Maritime Transport Act 1994 as previously described controls marine pollution and shipping in the exclusive economic zone.

The Fisheries Acts 1983 and 1996 powers extend to cover the exclusive economic zone.

**Part II of the Territorial Sea, Contiguous Zone and Exclusive Economic Zone Act 1977** deals with the EEZ.

### Poor Integration: Oil Exploration and Marine Protection

It is useful to consider an example of the problems that the absence of an integrated and consistent management regime causes for sustainable resource management in New Zealand’s surrounding seas.

The PCE (1996) considered the impact of an oil processing facility attached to the Maui gas platform. The facility was allowed without a public process or public scrutiny. The application of the environmental protection and enhancement procedures (EP & EP – Ministry for the Environment, 1987) to the Maui field meant that some scrutiny occurred of the environmental effects of the project.

This scrutiny is not required in other facilities because they are not covered by a previous agreement between the commissioner and the Minister for the Environment on auditing projects under the EP & EP.

The government could tender petroleum exploration licences for areas between Stewart Island and north of the Auckland Islands without considering the potential impacts on marine mammals, fisheries or the marine environment in this area. This includes impacts on the New Zealand sea lion and right whale populations.

### Agencies Managing Impacts

This section of the paper traces which agencies manage what aspects of the marine environment. Subsequent sections will trace the scope and areas of application of resource and conservation laws.

Due to the Resource Management Act (1991) regional councils can be seen as the lead agency inside 12 nautical miles (Parliamentary Commissioner for the Environment, 1996). Outside 12 nautical miles there is no lead agency (see Table 3). Instead there are several agencies that have a role but none of these operate in concert with each other. There is no common management objective, nor is there any common process.

The Department of Conservation has responsibility for marine protected species, marine reserves, and has an important role under the RMA. This includes advising the Minister of Conservation on approving coastal plans under the RMA. The minister also approves the New Zealand Coastal Policy, the only national policy statement approved under the RMA. This policy statement has helped to integrate coastal management between regional councils.

Unlike on land, the Department of Conservation has a limited statutory base in the marine area. Very few conservation or protection statutes apply in the territorial sea and only two (the Marine Mammals Protection Act and the Wildlife Act) apply in the EEZ. The Marine Reserves Act provides the main mechanism for protecting marine areas.

Although the Ministry for the Environment plays an important role inside 12 nautical miles as administrator of the Resource Management Act, including passing regulations to control pollution, discharges and dumping from vessels, it has hitherto had little role in the EEZ.

In the EEZ the Maritime Safety Authority is the agency that deals with marine pollution and dumping through the Maritime Transport Act.

Fisheries management (Ministry of Fisheries and the Fisheries Acts 1983 and 1996) applies consist-

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7 New Zealand is currently undertaking the required 10-year process under the Law of the Sea to delineate the continental shelf outside the EEZ.
### Sea Views

<table>
<thead>
<tr>
<th>Agency</th>
<th>Legislation Inside 12-nautical mile</th>
<th>Legislation beyond 12-nautical mile limit</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry for the Environment (MFE)</td>
<td>RMA Environment Act</td>
<td>Environment Act, 1996</td>
<td>Management of environmental effects</td>
</tr>
<tr>
<td>Minister of Transport (serviced by Ministry of Transport)</td>
<td>RMA(s 384A, s395)</td>
<td>Crown Minerals Act (CMA) for petroleum mining only via s4 Continental Shelf Act (CSA)</td>
<td>Inside: interim approval of structures and reclamations, and approval of port areas. Outside: regulation of access to minerals and petroleum resources (no environmental controls)</td>
</tr>
<tr>
<td>Minister of Energy (serviced by the Ministry of Commerce)</td>
<td>CMA</td>
<td>CMA for petroleum mining in s5</td>
<td>Authorisation of prospecting, exploration and mining for mineral and petroleum resources (no environmental concerns)</td>
</tr>
<tr>
<td>Ministry of Foreign Affairs and Trade (MFAT)</td>
<td>-</td>
<td>CSA</td>
<td>Approval of installations on continental shelf</td>
</tr>
<tr>
<td>Ministry of Agriculture and Forestry (MAF)</td>
<td>Biosecurity Act; Forests (s69, 71C)</td>
<td>Biosecurity Act (s4 for EEZ and s31 to the contiguous zone)</td>
<td>Management of unwanted organisms; pest strategies; boarding; quarantine controls</td>
</tr>
<tr>
<td>Environmental Risk Management Agency (ERMA)</td>
<td>Hazardous Substances and New Organisms Act 1996</td>
<td>-</td>
<td>Management of hazardous substances and import of new organisms including genetically modified organisms</td>
</tr>
<tr>
<td>Regional Councils</td>
<td>RMA, Biosecurity Act (ss71-100)</td>
<td></td>
<td>Management of environmental effects and pest management strategies</td>
</tr>
</tbody>
</table>

Table 3. Agencies with Statutory Responsibilities Inside and Beyond the 12-Nautical Mile Limit
ently within and beyond the 12 nautical mile limit but is not integrated with other marine management. Fisheries management is excluded from the Resource Management Act 1991 and only limited controls on the impacts of fishing can be established by the RMA due to the exemptions for fishing in sections 12 and 30. Section 6 of the Fisheries Act 1996 further limits the controls of the RMA.

While the Department of Conservation is the Crown agency for the seabed within 12 nautical miles, the Minister of Transport is the agency that grants access to the seabed for mineral activity outside 12 nautical miles. The Ministry of Commerce administers the Crown Minerals Act and mineral activity beyond the territorial sea via the Continental Shelf Act. Within 12 nautical miles mineral activity is subject to the Resource Management Act.

There is no environmental control or public participation mechanism beyond 12 nautical miles. The only exception may be if the Environmental Protection and Enhancement Procedures (EP & EP) apply. It seems that these are not being applied.

On Biosecurity matters the Ministry of Agriculture and Forestry is the lead agency but within the territorial sea regional councils have a role in producing and administering regional pest management strategies. To date few, if any, pest management strategies deal with marine pests or exotic species. Biosecurity matters are limited to up to 24 nautical miles offshore. This is consistent with the Law of the Sea provisions that allow states to take action on such matters up to 12 nautical miles beyond the territorial sea, known as the contiguous zone (article 33).

International Law Considerations

New Zealand has a range of international obligations that are relevant to marine management. In the Australian context Herriman et al (1997) has reviewed international obligations, many of which are relevant to New Zealand. Table 4 sets out some of the key agreements and the lead agency for each convention. The UN Convention on the Law of the Sea (UNCLOS) and the Biodiversity Convention are the two key pieces of international law that deal with the marine environment.

The United Nations Convention on the Law of the Sea (UNCLOS) was signed in 1982 but did not come into force internationally till 1994. New Zealand ratified the convention in 1996. The convention is a framework regime for all marine management including fisheries, mining, marine pollution, and structures. This convention is linked to the Agreement Relating to the Implementation of Part XI of the UNCLOS 1994 which amended the deep sea bed mining provisions of the Treaty. The convention has only partially been incorporated into New Zealand law. Kimball (1995) describes the environmental obligations of UNCLOS.

The Convention on Biological Diversity (CBD) includes a number of articles relevant to marine management including article 8 (In-situ Conservation) and article 10 (Sustainable Use of Components of Biological Diversity). This convention has been ratified by New Zealand and came into force internationally in December 1993. This convention has not been directly incorporated into New Zealand law but is relevant to laws which have provisions that refer to New Zealand’s international obligations. These include section 5 of the Fisheries Act and section 6 (f) of the Hazardous Substances and New Organisms Act 1996. The Department of Conservation is the lead agency for the CBD and is jointly developing a national biodiversity strategy with the Ministry for the Environment. Glowka et al (1994) describe the provisions and obligations of the convention.

There are a range of other important pieces of maritime international law or agreements. Listed below are some of the main international agreements related to the marine environment.

The first is the UN Agreement for the Implementation of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks. The provisions of Part II (Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks) and Annex II (Guidelines for the Application of Precautionary Reference Points in Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks) are relevant to all fisheries management. It also includes provisions to conserve non-fish species including seabirds. New Zealand has signed the agreement but not ratified it.

The Rio Declaration 1992 and Agenda 21 (particularly chapter 17) are relevant. New Zealand signed these provisions which while initially not legally binding, are developing into customary international law. For example the Rio Declaration principle 15 on the precautionary approach has become widely accepted.

The FAO International Code of Conduct for Responsible Fisheries 1995 includes objectives and general
principles of fisheries management; data gathering and management; the precautionary approach; and fisheries research. New Zealand has not formally adopted this code but it represents an internationally accepted standard that is relevant to the implementation of UNCLOS.

The International Convention for the Prevention of Pollution from Ships (MARPOL) 1973 and the 1978 Protocol (known as the marine pollution convention) has six annexes which deal with: oil; noxious liquid substances in bulk; harmful substances in packages; sewage from ships; garbage from ships; and air pollution. Annexes I, II and V encourage countries to identify “special areas” where greater controls are applied (Van Dyke 1993). New Zealand is in the process of ratifying this convention which should be completed by late 1998.


The International Convention for the Regulation of Whaling (IWC) 1946 includes measures to control the exploitation of whales.


The Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention) includes measures to conserve migratory animals including seabirds. New Zealand has not acceded to this convention but all our albatrosses are listed on the convention’s schedules. Australia is a party to this convention and is promoting a regional agreement on albatross conservation that could involve New Zealand.

The Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention). In 1997 New Zealand applied for the listing of our sub-Antarctic islands, including our surrounding territorial sea, as a World Heritage Site. This application is under active consideration by the World Heritage Commission. This convention is not directly incorporated into New Zealand law, but New Zealand already has two terrestrial world heritage sites.

The Convention for the Protection of Natural Resources and the Environment of the South Pacific Region (Noumea Convention) includes measures to control pollution from vessels and land-based sources, disposal of wastes and specially protected areas. This convention applies to the NZ EEZ.

The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) controls the management of fisheries south of the Antarctic Convergence (see later section).

The statutes of IUCN – World Conservation Union are relevant. New Zealand is a state member of IUCN and is represented by the Department of Conservation. At the IUCN World Conservation Congress that occurs every three or four years resolutions are passed which are relevant to marine management. The last three congresses have adopted resolutions on fisheries management, marine reserves, fisheries by-catch, and threatened marine species.

UNCLOS and associated international law provides an integrated management regime covering fisheries, marine research, marine pollution, marine protection, the continental shelf exploitation, and movement of vessels.

An explicit provision for marine protected areas is the major omission from UNCLOS but is covered by the Noumea Convention and the Biodiversity Convention.

**New Zealand’s Responsibilities**

When considering the management of the marine environment it is important to remember that in international law states have obligations, responsibilities and interests which differ according to whether they are managing the internal waters, territorial sea, continental shelf, the contiguous zone or the EEZ.

The 12 nautical mile territorial limit became a feature of New Zealand law with the passage of the Territorial Sea and EEZ Act (TS & EEZ Act) in 1977. This Act set the limit of the territorial sea at 12 nautical miles and the Exclusive Economic Zone at 200 nautical miles. These are the limits of the territorial sea and continental shelf set in the UN Convention on the Law of the Sea (articles 3 and 57).

As Sanger (1987) acknowledged in his review of UNCLOS “it is perhaps well to remember that the various limits that had been put forward for different reasons were all arbitrary”. The limits are politically defined and have no relationship to ecosystem boundaries.

As Levy (1993) put it:

“The jurisdiction of the coastal state diminishes as distance offshore increases. The coastal state has full sovereignty over its land territory and its internal
<table>
<thead>
<tr>
<th>Agreement</th>
<th>Signed</th>
<th>Ratified</th>
<th>Domestic Law</th>
<th>Lead Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonn Convention – Convention on the Conservation of Migratory Species of</td>
<td>No</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wild Animals, 1979</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convention on Biological Diversity, 1992</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>DoC/MFAT</td>
</tr>
<tr>
<td>CCAMLR – Convention on the Conservation of Antarctic Marine Living</td>
<td>Yes</td>
<td>Yes</td>
<td>Antarctic Marine Living Resources Act, 1981</td>
<td>MFAT/ Ministry of Fisheries</td>
</tr>
<tr>
<td>Resources, 1980</td>
<td></td>
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<td>CCSBT – Convention on the Conservation of Southern Bluefin Tuna, 1993</td>
<td>Yes</td>
<td>Yes</td>
<td>Fisheries Act</td>
<td>Ministry of Fisheries</td>
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<tr>
<td>Driftnet Convention – Convention for the Prohibition of Fishing with Long</td>
<td>Yes</td>
<td>Yes</td>
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<td>Driftnets in the South Pacific 1989</td>
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<td>Dumping of Wastes and Other Matter 1972 and Protocol 1996</td>
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<td>MARPOL – International Convention for the Prevention of Pollution from</td>
<td>Yes</td>
<td>Yes</td>
<td>Maritime Transport Act, 1994, through rules</td>
<td>MFE/Maritime Safety Authority</td>
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<tr>
<td>Ships 1973 and Protocol 1978</td>
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<td>Noumea Convention – Convention for the Protection of the Natural Resources</td>
<td>Yes</td>
<td>No</td>
<td>Partial – Maritime Transport Act, 1994</td>
<td>MFAT/DoC</td>
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<tr>
<td>and Environment of the South Pacific Region, 1982</td>
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<td>Agreement for the Implementation of the Provisions of the UNCLOS relating</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
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<td>to the Conservation and Management of Straddling Fish Stocks and Highly</td>
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<td>Migratory Fish Stocks, 1995</td>
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<td>RAMSAR – Convention on Wetlands of International Importance, 1971</td>
<td>Yes</td>
<td>Yes</td>
<td>No, only protected from mineral activity in Crown</td>
<td>DoC</td>
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<td>Minerals Act 1997</td>
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<td>World Heritage – Convention Concerning the Protection of the World Cultural</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>DoC</td>
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<td>and Natural Heritage, 1972</td>
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Table 4: Examples of International Obligations
waters; it has to concede a right of innocent passage in its territorial waters; and it possesses only sovereign rights over the resources of its exclusive economic zone and its continental shelf. Finally, on the high seas, it exercises its jurisdiction and control only over ships flying its flag.”

New Zealand’s internal water includes the West Coast harbours and estuaries, Marlborough Sounds, the fiords and parts of the Hauraki Gulf.

State sovereignty over the territorial sea also applies to the air space as well as to its seabed and subsoil (article 2, UNCLOS). In New Zealand’s case, Treaty of Waitangi claims may attach to those areas.

In addition to the territorial sea, UNCLOS establishes a “contiguous zone” up to 12 nautical miles beyond the territorial sea where a coastal state can “exercise the control necessary to:

(a) Prevent infringement of its customs, fiscal, immigration or sanitary laws and regulations within its territory or territorial sea;

(b) Punish infringement of the above laws and regulations committed within its territory or territorial sea.” (article 33)

Part V of the convention establishes the legal regime for the Exclusive Economic Zone (EEZ). Article 56 sets out the rights of the coastal state:

“(a) Sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the sea-bed and of the sea-bed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds;

(b) Jurisdiction as provided for in the relevant provisions of this convention with regard to:

(i) The establishment and use of artificial islands, installations and structures;

(ii) Marine scientific research;

(iii) The protection and preservation of the marine environment;

(c) other rights and duties provided for in this convention.”

New Zealand’s rights and duties to its EEZ are, then, more limited than to the territorial sea but this does not prevent a consistent regime or administrative structure being established to cover both.

The convention (Part VI) also sets the limit to exclusivity over the continental shelf. The limit of the continental shelf can be up to 100 nautical miles beyond the 2500m isobath to a limit of 350 nautical miles from the shore (article 76, UNCLOS). New Zealand has until 2006 to delineate the continental shelf and to submit the limits of its EEZ to the Commission on the Limits of the Continental Shelf.

On the continental shelf New Zealand has the sovereign right of exploration and development of:

“Minerals and other non-living resources of the seabed and subsoil together with living organisms belonging to sedentary species, that is to say, organisms which, at the harvestable stage, either are immobile on or under the sea-bed or are unable to move except in constant physical contact with the sea-bed or subsoil.”

– (article 77, UNCLOS)

New Zealand can also control, but not impede, the laying of cables or pipelines by other states along the continental shelf outside 12 nautical miles.

Environmental Protection/Biodiversity

UNCLOS: “Establishes for all states the unqualified obligation to preserve and protect the entire marine environment (Article 192). Its comprehensive framework addresses many aspects of this obligation. Also articulated are a number of principles to guide the formulation of additional international rules and standards.”

– (Kimball, 1995, p17)

Kimball goes on to state that UNCLOS has: “shaped ecosystem-based marine living resources agreements and evolving concept of marine protected areas. They support a preventative approach to marine pollution and require caution in the use of technologies and the introduction of new or alien species.” (p17)

The Biodiversity Convention imposes wider obligations on states and does not distinguish between the territorial sea and the EEZ or continental shelf.

The Convention on Biological Diversity includes obligations to identify and monitor biological diversity (article 7) (Glowka et al 1994). Article 8 sets out the provisions for in-situ conservation – that is conservation in “conditions where genetic resource exist
within ecosystems and natural habitats…” The obligations in this article which are relevant to marine ecosystem protection include:

“(a) Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity;
(b) Develop, where necessary, guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity;
(c) Regulate or manage biological resources important for the conservation of biological diversity… with a view to ensuring their conservation and sustainable use.
(d) Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings.
(e) Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas;
(f) Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, inter alia, through the development and implementation of plants or other management strategies…
(l) Where a significant adverse effect on biological diversity has been determined pursuant to article 7; regulate or manage the relevant processes and categories of activities;”

The convention also contains provisions relevant to the control and management of alien species. Article 8 includes an obligation on states to:

“(h) Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.”

The convention also includes requirements for sustainable use of biodiversity (article 10) and environmental impact assessment (article 14). Article 22(2) requires states when implementing this convention to act “consistently with the rights and obligations of states under the law of the sea”. This last obligation includes all marine law not just UNCLOS. Article 22(1) affects other international agreements “where the exercise of those rights and obligations would cause serious damage or threat to biological diversity”.

The 1995 second meeting of parties of the convention adopted a series of recommendations on Scientific, Technical, and Technological Aspects of the Conservation and Sustainable Use of Marine and Coastal Biological Diversity – the Jakarta Mandate. The mandate includes requirements for: integrated coastal area management, the development of marine protected areas for conservation and sustainable use, sustainable fisheries, etc. It also identified five general principles including wide consultation and public participation and the adoption of a precautionary approach.

**CCAMLR – Ecosystem Management**

The convention on the Conservation of Antarctic Marine Living Resources (CCAMLR, 1980) manages on the basis of the “ecosystem as a whole” the fisheries south of the Antarctic Convergence. This includes the high seas and EEZs of several sub-Antarctic islands. New Zealand and 22 other countries are members of the Commission of the Convention. Article II of the convention sets out some ecosystem principles for fisheries management

“1. The objective of this convention is the conservation of Antarctic marine living resources…

3. Any harvesting and associated activities in the area to which this convention applies shall be conducted in accordance with… the following principles of conservation:

(a) Prevention of decrease in the size of any harvested population to levels below those which ensure its stable recruitment. For this purpose its size should not be allowed to fall below a level close to that which ensures greatest net annual increment;
(b) Maintenance of the ecological relationships between harvested, dependent and related populations of Antarctic marine living resources and restoration of depleted populations to the levels defined in subparagraph (a) above; and
(c) Prevention of changes or minimisation of risk of changes in marine ecosystems which are not potentially reversible over two or three decades, taking into account the state of available knowledge of the direct and indirect impact of harvesting, the effect of the introduction of alien species, the effects of associated activities on the marine ecosystem and of the effects of environmental changes, with the aim of making possible sustained conservation of Antarctic marine living resources.”

Since CCAMLR nations make decisions on the basis of consensus decision-making, the fishing states have the ability to veto any recommendations meetings of the parties may make that are designed to control fishing. This feature handicapped implementation of the
convention for its first 10 years (Wallace, 1990). In a national jurisdiction such as New Zealand, a government would not usually encounter this problem.

In the last seven years CCAMLR has made significant progress in developing a precautionary approach to fisheries management and agreeing to a wide range of conservation measures which are innovative for an international fisheries management regime. This has included setting precautionary limits for krill, which considers the impact on krill predators (e.g. whales, seals and penguins), and measures to control exploratory and developing fisheries.

These measures have to be developed with a view to preventing fisheries developing quicker than the time it takes to obtain information to manage them. If there is no information, CCAMLR has taken a precautionary approach to limit catch or close areas, what is known as the “no data, no fish” approach.

CCAMLR’s Achilles heel is the absence of an enforcement regime to control illegal or unregulated fishing. At the 1997 CCAMLR meeting it was reported that the illegal catch of Patagonian toothfish was 10 times the legal catch and over 100,000 albatrosses and petrels may have been killed in this fishery (CCAMLR 1997).

CCAMLR includes provisions for the establishment of closed special areas for protection and scientific study (article IX(2)(g)) or the designation of protected species (article IX(2)(d)). These provisions are matched by the Annex V of the Antarctic Environmental Protocol of the Antarctic Treaty. For CCAMLR, these protected areas could include the high seas, the territorial seas or EEZs for sub-Antarctic islands within the CCAMLR area. The Antarctic Environmental Protocol is limited to the seas south of 60° South, but the CCAMLR area is the south of the Antarctic convergence.

An Integrated Regime

Law Reform Process 1987-1990

The need for better integration between inside and outside the 12 nautical mile limit was recognised during the Resource Management Law Reform process. This process, which took place between 1988 and 1990, led to the passage of the Resource Management Act 1991 and key elements of the Hazardous Substances and New Organisms Act 1996.

In December 1989 the then Labour cabinet:

“Agreed that control of pollution, wastes and hazardous installations in the Exclusive Economic Zone should be undertaken through the Minister for the Environment in terms of the resource management legislation.”

Further:

“Agreed that the Minister for the Environment should be the principle adviser to the government on...means for managing pollution, wastes and hazardous installations in the Exclusive Economic Zone.”

These decisions appear to have been ignored by the National government when the Maritime Transport Act 1994 was passed and amendments were made to the marine pollution provisions of the Resource Management Act in 1993.

The recent OECD review of environmental performance also examined marine management and recommended that government “increase the role of the Ministry for the Environment concerning protection of the marine environment.” (OECD 1997; p185).

Recognition of the Need for Change

The 1996 Parliamentary Commissioner for the Environment review arising from a proposal to add a floating oil treatment facility to the Maui oil and gas field was referred to above. This proposal was sited outside of the 12 nautical mile limit. In requesting the Parliamentary Commissioner to be involved the Minister for the Environment, Simon Upton, noted “the lack of coordination in legislation and procedures for environmental management outside of the 12 [nautical] mile limit.” (1994)

In reviewing the environmental management of petroleum and mineral mining beyond the 12 [nautical] mile limit (PCE, 1996, p13) the commissioner noted:

- Procedures are claimed to be confusing, overly complicated and continually changing;
- Many agencies involved;
- No lead agency;
- Many acts involved;
- Perceived lack of coordination in legislation;
- A perceived lack of procedures for environmental
effects assessment;

• Lack of procedures for setting environmental conditions;

• No opportunities for public comment during the planning stages;

• Procedures for environmental management beyond the 12 [nautical] mile limit are not consistent with procedures inside the 12 [nautical] mile limit."

The commissioner went on to recommend that the “Minister for the Environment set up a multi-agency working to:

• Clarify procedures for environmental management of petroleum and mineral mining activities beyond the 12 mile limit;

• Nominate a lead agency to coordinate the large number of Crown agencies with environmental management responsibilities beyond the 12 mile limit;

• Identify strategies whereby environmental effects assessment, setting and enforcement of environmental conditions and public consultation are included in management procedures for petroleum and mineral mining activities beyond the 12-mile limit and are consistent with procedures inside the 12-mile limit.”

A multi-agency working group has not been established. The Ministry for the Environment is making some progress in responding to the Parliamentary Commissioner for the Environment’s recommendations but the response to date has been low key. As far as I can determine no other agencies have considered a response to the PCE’s report.

International Recognition of the Need for Integrated Management

The IUCN World Conservation Strategy: Caring for the Earth (1991) called for countries to:

• Use... an ecosystem approach to management of marine resources;

• Develop a national policy on the coastal zone and ocean;

• Establish a mechanism to coordinate the planning and allocation of uses of the coastal zone;

• Promote marine protected areas.

The marine chapter of Agenda 21 (Chapter 17) includes goals for integrated management of the coastal areas, including the economic zone.

Integrated coastal and marine management was an important feature of the Jakarta Mandate of the Biodiversity Convention. It includes a recommendation that:

“Governments should establish and strengthen the institutional, administrative and legislative arrangements for the development of integrated management of marine and coastal ecosystems, plans and strategies for marine and coastal areas, and their integration within national development plans.”

Integrated management makes it easier for the sea to be managed as an ecosystem rather than a set of disaggregated resources. This also ensures that the impact of one activity on alternative activities, including marine protection, can be considered.

Different Levels of Jurisdiction

As previously mentioned there are differences in states jurisdiction between the internal waters, territorial sea, contiguous zone and EEZ. This does not prevent a consistent management regime or a rationalisation of agencies involved. Such an approach occurs with the Canadian Oceans Act and is being considered by Australia as part of their proposals for an Oceans Policy. This management could include:

• Ecosystem management;

• Precautionary management;

• Public consultation processes;

• Protected areas;

• Environmental effects assessment;

• Reversal of the burden of proof.

Public Consultation

There is nothing in UNCLOS or for that matter other international agreements which prevents public consultation on measures to “protect and preserve” the marine environment, marine pollution, mining and fisheries management. Agenda 21 specifically urges public participation, including general participation obligations:

“Ensuring access by the public to relevant information, facilitating the reception of public views and allowing for effective participation.” (chapter 8.4, p94.)

“Mechanisms for appropriate involvement of individuals and groups in the development and enforcement of laws and regulations on environment and development.” (chapter, 8.21, p 101).
Further, in regard to specific obligations in the coastal area and the marine environment:

“Provide access, as far as possible, for concerned individuals, groups and organisations to relevant information and opportunities for consultation and participation in planning and decision-making at appropriate levels.” (chapter 17.5, p 236)

The Australian Oceans Policy issues paper (1998) recommended the process for assessing, allocating and managing oceans’ resources should:

• "Be easily understood and openly justified;
• Be certain;
• Have clear lines of accountability;
• Be equitable in considering the needs of present and future generations;
• Be designed to deliver outcomes that balance long- and short-term economic, environmental, social and cultural considerations;
• Involve the minimum effective regulatory burden on oceans users;
• Ensure cooperation and coordination between governments and across the sectors which use the oceans;
• Encourage effective community involvement, including involvement of indigenous peoples."

IUCN has several resolutions calling for public participation in natural resource management (see various IUCN general assembly resolutions).

Protected Areas

Protection of biodiversity and the creation of protected areas is currently limited under New Zealand law in the EEZ. As noted previously the Marine Reserves Act is limited to the territorial sea. The Biodiversity Convention, Agenda 21 and the Noumea Convention places obligations on the government to extend protected area statutes out to the edge of the 200-mile limit.

Article 14 of the Noumea Convention includes an obligation on states to:

“Take all appropriate measures to protect and preserve rare or fragile ecosystems and depleted, threatened or endangered flora and fauna as well as their habitat in the convention area. To this end, the Parties shall, as appropriate, establish protected areas, such as parks and reserves, and prohibit or regulate any activity likely to have adverse effects on the species, ecosystems or biological processes that such areas are designed to protect.”

Agenda 21 Chapter on the Oceans includes several references to marine protection, including:

“17.7 Coastal states... should undertake measures to maintain biological diversity and productivity of marine species and habitats under national jurisdiction. Inter alia, these measures might include: ..establishment and management of protected areas...

Taking action to ensure respect [by shipping] of areas designated within their exclusive economic zones, consistent with international law, in order to protect and preserve rare or fragile ecosystems, such as coral reefs and mangroves; (17.30)

17.75 States commit themselves to conservation and sustainable use of marine living resources under national jurisdiction. To this end, it is necessary to:

(e) Protect and restore endangered marine species;
(f) Preserve rare or fragile ecosystems, as well as habitats and other ecologically sensitive areas.

17.86 States should identify marine ecosystems exhibiting high levels of biodiversity and productivity and other critical habitat areas and provide necessary limitations on use in these areas, through, inter alia, designation of protected areas.”

UNCLOS includes provisions that are relevant to marine protected areas:

• Article 61(2) requires states to “ensure through proper conservation and management measures that the maintenance of the living resources in the EEZ is not endangered by over-exploitation”. This could include the creation of marine reserves. Article 62(4) enables countries to limit the species and the area that may be caught by fishers and areas for fishing.
• Article 77(2) makes it clear that states can decide whether or not to exploit resources on or under the continental shelf.

• Article 194(5) requires states to take measures “necessary to protect and preserve rare and fragile ecosystems as well as the habitat of depleted, threatened, or endangered species and other forms of marine life.
• Under article 211 states have the ability to set aside special areas for the prevention, reduction and control of pollution from vessels where a state considers the international rules and standards are inadequate.”
As noted previously the Biodiversity Convention places obligations on states to:

“Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity.” (Article 8(a))

Also relevant are articles 8(b), guidelines for selecting protected areas and 8(e) considering buffer zones around protected areas. This obligation extends to marine areas under national jurisdiction (e.g. territorial sea and the EEZ) and could extend to the high seas (article 4).

Other states have provisions to establish marine protected areas throughout the EEZ. Examples include:

- Canada’s Oceans Act 1996 enables the establishment of marine protected areas in the internal waters, territorial sea and EEZ of Canada (article 35);
- The United States has established closed areas in the EEZ e.g. on Georges Bank (Fogarty and Murawski, 1998);

Australia’s Endangered Species Protection Act allows “prohibiting or restricting activities” throughout all or part of the Australian Fisheries Zone (Part 5 – Conservation Orders). These orders are to protect a “listed native species or a listed ecological community”.

**Protected area goals:** IUCN – the World Conservation Union has called for more than 10 per cent of each ecological region to be included in protected areas by 2000 (IUCN, 1991, rec 4.9). Recent work on land protection has indicated that protecting “only 10 per cent of Earth” ecosystems could make at least half of all terrestrial species vulnerable to artificial anthropogenic extinction (Soule and Sanjayan, 1998). Soule and Sanjayan have estimated that to protect most elements of biodiversity 50 per cent of land ecosystems must be protected. A similar principle probably applies to marine ecosystems.

In marine areas a range of marine scientists have been calling for 20 per cent of the marine areas globally to be protected by 2020 (Lubchenko *pers com*, also Bonchek, 1983 and Costanza et al 1998). For fisheries management purposes recent work has indicated that 50 per cent of target species habitat should be protected in order to hedge against over-fishing (Lauck et al, 1998). As noted previously less than one per cent of New Zealand’s territorial sea is in marine reserves.

**Principles for Management**

To ensure integrated management of resource use and environmental management any integrated regime should be based on the principles of ecosystem management.

CCAMLR is one agency that operates such an approach for fisheries and the interaction with other parts of the food chain including marine mammals and seabirds.

The Ecological Society of America defines ecosystem management as:

“...management driven by explicit goals, executed by policies, protocols, and practices, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem, structure, and function.” (Fogarty and Murawski, 1998).


- Maintenance of ecological processes in all ocean areas, including, for example water and nutrient flows, community structures and food webs, and ecosystem links;
- Maintenance of biological diversity, including the capacity of evolutionary change; and
- Maintenance of viable populations of all native marine species in functioning biological communities. (p19)

They went on to propose eight elements for ecosystem based planning and management:

- Ecological connections are recognised – between and across species populations and regions;
- Planning and management boundaries recognise ecosystems;
- Ecosystem integrity is maintained;
- Data are collected for ecosystem-based management;
- Management is monitored for ecosystem maintenance;
- Management decisions are planned and precautionary;
- Human activity is recognised as a fundamental
influence;

• Natural and human values should be integrated. (p29)

A review of principles for fisheries management has been presented by this author elsewhere (Weeber and Wallace, 1992). Talbot (1996) has put forward a range of principles for sustainable living resource management.

As indicated earlier, many of these objectives for management already exist in the purpose and principles of the Resource Management Act 1991, Fisheries Act 1996 or Hazardous Substances and New Organisms Act 1996. These include: the needs of future generations; the need to avoid, remedy or mitigate adverse effects; intrinsic values of ecosystems; a precautionary approach; the maintenance of biodiversity; reference to the Treaty of Waitangi.

Dayton (1998) has reported on the need for the burden of proof to be on the side of the resource exploiter. He recommended that the “burden of proof must be applied to our marine resources so that those hoping to exploit them must demonstrate no ecologically significant long-term changes” (1998). This approach is consistent with precautionary management and recognises the need for environmental impact assessments.

Precautionary Management

Any integrated management regime for New Zealand’s marine area must include the precautionary approach. “The application of the precautionary approach involves the application of prudent foresight.” (FAO, 1995). Principle 17 of the Rio Declaration (1992) is one description of the precautionary approach. As Young (1992) put it:

“When the ecological impacts of resource use are uncertain, take a precautionary approach, give preference to risk-averse decisions and avoid irreversible action.” (p67)

An FAO technical review of precautionary management of fisheries considered the approach requires:

a) Consideration of the needs of future generations and avoidance of changes that are not potentially reversible;

b) Prior identification of undesirable outcomes and of measures that will avoid them or correct them promptly;

c) That any necessary corrective measures are initiated without delay, and that they should achieve their purpose promptly, on a time scale not exceeding two or three decades;

d) That where the likely impact of resource use is uncertain, priority should be given to conserving the productive capacity of the resource;

e) That harvesting and processing capacity should be commensurate with estimated sustainable levels of resource, and that increases in capacity should be further constrained when resource productivity is uncertain;

f) All fishing activities must have prior management authorisation and be subject to periodic review;

g) An established legal and institutional framework for fishery management, within which fishery management plans that implement the above point should be instituted for each fishery;

h) Appropriate placement of the burden of proof by adhering to the requirements above. (FAO, 1995)

There are a range of definitions of the precautionary approach or precautionary management in the literature but all rely on the need for caution in the face of no or inadequate information and acting in a risk averse way. This should be a fundamental feature of any revised marine law.

Agency Development

As part of the Australian development work for an Oceans Policy there have been several reports looking at institutional arrangements for oceans management. The major focus has been on integrated management and developing agencies that are coordinated.

In the five models of administrative structure proposed in a review of Australian oceans management (Pitts, 1997 and Grierer et al 1997) only the establishment of an overall coordinating body or an overall management agency was there effective integration of resource management towards ecosystem management. The Australian analysis suggested that:

“An overall coordinating agency may constitute best practice at a whole of the EEZ scale where the emphasis is on the setting of desired outcomes at a national level, on ensuring stewardship of Australia’s marine resources and providing a national sense of leadership.”

In New Zealand the experience has been for individual agencies to develop their own statutes and practice with little consideration of the effects on resources or parts of the environment managed by other agencies. Within 12 nautical miles better integration of statutes and agencies was achieved through the Resource Management Law Reform that established the Resource
Management Act, but fisheries management still lies outside this law.

Given the fragmented nature of marine law and the number of agencies that deal with marine management the need in New Zealand for a resource management law reform process (RMLR, 1998b) for the marine environment is long overdue. Such a process would ensure that the impacts of one activity on other activities and the cumulative effect on the environment would be considered. The need for expanded protected areas in the marine environment would have to be recognised.

**Recommendations**

For integrated management of the marine environment surrounding New Zealand there needs to be the development of an overall oceans policy. Similar to the Australian proposed policy, it would set out an ecosystem approach to planning and management of activities in the marine environment.

Other changes that would be needed for integrated management based on clear principles and purposes:

An administrative agency managing the statutes:

The Ministry for the Environment should be given the role of coordinating government’s approaches to marine management. This should include the development of an oceans policy.

In addition, a new Ministry of Marine Management should be established to take over the functions of the Ministry of Fisheries, Maritime Safety Authority and the marine functions of the Ministry of Commerce. This management would be integrated with the marine functions of the Department of Conservation who would have the task of creating marine protected areas throughout the territorial sea, EEZ and continental shelf as well as protecting marine mammals, seabirds and other protected marine species.

**Management statutes:**

There should be the development of an integrating statute to manage the marine environment. This would incorporate the Continental Shelf Act, Fisheries Act and the environmental provisions of the Maritime Transport Act. This Act would be designed to have a smooth interface with the Resource Management Act.

Objectives of the statutes should be:

- Clear purpose and principles which should include ecosystem and precautionary approaches;
- Reference to the principles of the Treaty of Waitangi;
- Clear public processes for policy and plan development as well as granting of permits;
- Precautionary management;
- Integrated management so that effects on other activities and the environment are considered eg mineral activity on marine mammals or fishing;

The overall goal is to establish an ecosystem approach within an integrated regime for marine management that is effective, workable and results in ecological sustainability for the next millennium.

**References**


A Review of Relations Between the EU and New Zealand

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Abstract
This paper reviews briefly the state of EU relations with New Zealand in terms of access to New Zealand waters and addresses the environmental issues likely to emerge should such an agreement eventually be signed. There is no focus on market access issues to EU markets in any detail. A good overview of the EU system is provided.

The EU Common Fisheries Policy

The Legal Aspects of the CFP
The Common Fisheries Policy (CFP) has the function of regulating access to waters within the Community Exclusive Economic Zone (the internal aspect) and also allows the Community to assume powers in external relations in order to conclude bilateral agreements and participate in international fisheries arrangements (treaties, conventions, other meetings – the external aspect). It is principally the external aspect which concerns us in this paper.

In legal terms, the European Community (EC) has had the power to act in the sphere of fisheries policy since 1976, but the Common Fisheries Policy (CFP) in its current form has existed since 1983. Following the mid-term review of 1992 the CFP retains the same policy aims until its expiry in 2002. Before this date the situation will be reviewed again – probably in 1999.

Operations in Non-EU Waters

The Crisis in EU Waters
The Community fleet operating in Community waters is estimated by the Commission of the European Communities (the Commission) to be operating at approximately 40 per cent over-capacity. This is putting enormous pressure on the stocks with consequences that are now well-known worldwide. In particular, in the North Sea, the marine area at the heart of Community waters, the following stocks are in major crisis:

- Herring and cod are in danger of complete collapse;
- The plaice stock is also at a low level and is considered to be outside Safe Biological Limits;
- The population component of mackerel that spawns in the North Sea has been at a very low level for many years;
- Other stocks such as haddock, saithe and sole are also exploited at high levels and the continued stability of these stocks depends critically on good recruitment.

Other features of the crisis are:

- High levels of exploitation allow relatively few individuals to survive to spawning age;
- The decrease in the population size of a number of species of fish and shellfish that are not at present the primary focus of commercial fisheries (inter alia oysters, halibut, sharks, rays and skates) is a matter of serious concern;
- There is a low population size for some seabird species and the local extinction of some marine mammal species seems to be a possibility;
- There is a general decrease in the abundance of fish and benthic species that grow to a large size with a shift from long-lived to short-lived species, with a trend in certain areas towards a decrease in species diversity.

Bilateral Agreements

As a result of this crisis, arrangements permitting access to third countries’ waters, particularly in the form of fisheries agreements, now constitute an essential element in the CFP. Without these agreements, the widespread extension of post-UNCLOS fisheries zones and the associated substantial reduction in fishing opportunities would have had very serious economic and social consequences for Community fishers. Bilateral agreements to access the fisheries resources of other states are clearly a crucial policy instrument whereby fishing activity in the Community EEZ may be reduced with the minimum effect on the EC fisheries sector. Also, they allow the Community to balance its trade with other countries, since the fish caught and carried away in other country zones are allotted to the EU’s account in balance of payments calculations.

Unsurprisingly, in view of these factors, the number of fisheries agreements that the Community has with third countries increased in the 1980s and currently now stands at 27 in force (see Annexes to this paper) with the intention that they should continue to rise to provide new fishing opportunities for Community fleets. Around 4000 Community vessels are currently authorised to fish in third country waters.

Community Processes for Agreements

The Commission negotiates bilateral agreements in accordance with negotiating guidelines laid down in advance by the Council. In order to enter into force, these agreements must be adopted by the Council by way of a regulation pursuant to Article 43 of the EEC treaty, which requires prior consultation of the European Parliament (EP).

This consultation usually results in a report by the EP subcommittee on fisheries and opinions by the EP committee on development and the EP committee on budgets. This consultation is, however, purely formal, since the EP’s opinion is sought only after negotiations have been concluded and the agreement reached, sometimes even after it has been finally adopted by the Council. In some cases the EP’s opinion is not even sought (e.g. in the case of the EC–Greenland fisheries agreement). The European Parliament has frequently expressed its dissatisfaction with this state of affairs.

This concern is understandable when one considers that fisheries agreements occupy an increasingly important place in the funding of the CFP, representing ECU 300 million (61.9 per cent of the total) in commitment appropriations and ECU 230 million (64.3 per cent of the total) in payment appropriations in the 1991 CFP budget. One further reason is that for most of these agreements, Parliament is informed only of the theoretical quota uptake – not of the actual quota uptake – as it appears from the fishing licences dealt with by the Commission.

Content and Typology

Most of the bilateral agreements concluded by the Community are ‘framework agreements’. These agreements establish the general conditions governing fisheries relations between the contracting parties. They include general provisions on access to fishing zones, financial compensation or licence fees (if appropriate), scientific cooperation in the region involved and procedures for the settlement of disputes. They are normally concluded for several years and include a tacit renewal clause.

The technical and financial conditions directly linked to fishing activities are contained in an annex and a protocol to the framework agreement. These differ from one agreement to another and are reviewed periodically. In every case the conditions are negotiated between the two parties with a view to balancing mutual interests, on the basis of available information both scientific (level of stocks) and economic (value of the products) deriving from the main international organisations (regional FAO bodies, etc.), data provided by the third country in question and the experience of shipowners familiar with the fishing zone, or, where appropriate, from the results of experimental campaigns partly financed by the Community.

The substance of these agreements theoretically reflects a state of compromise accepted by the two parties. The periodic revisions of the technical and financial conditions are negotiated on the basis of the actual application of the current annex and protocol, and – provided that the two parties can arrive at a compromise in good time – agreed before the expiry date of the existing conditions.

The various bilateral fisheries agreements concluded by the Community with third countries may be divided into the following categories:

- Reciprocal agreements whereby the Community grants fishing rights to vessels from third countries (e.g. Norway, Sweden, the Faroe Islands), in exchange for similar rights for Community vessels in those countries’ waters (access to stocks/access to stocks);
- The American agreements. The EC-US agreement, relating to ‘surplus stocks’, is now practically void.
The EC-Canada agreement (now having been reactivated after a seven-year freeze) permits Community vessels to fish in Canadian waters in exchange for preferential access for certain Canadian fishery product quotas (access to stocks and access to markets);

- Agreements with developing countries who have signed the Lomé Convention (ACP). In exchange for fishing rights, the Community grants these countries financial compensation, contributions to scientific programmes, and study and training grants relating to the fisheries sector (access to stocks/financial compensation);

- The agreements with Morocco and Greenland. These are a combination of access to stocks/access to markets/financial compensation;

- Finally, the recently concluded agreement with Argentina is the first of the ‘Second Generation’ agreements envisaged by the Commission as the future direction for fisheries agreements, based on access to stocks against reinforced cooperation within the framework of joint ventures and technical assistance. It is in this category that an agreement with New Zealand falls.

Following the third enlargement of the EC (1986), the Community’s fisheries agreements with third countries were subject to further negotiations aimed at extending their benefits to cover Spain and Portugal. Spanish and Portuguese agreements with third countries have been managed since accession by the Community, which deals with them as part of its network of international relations relating to fisheries. Exceptionally, in the case of the Spanish and Portuguese bilateral agreements with South Africa, the Council has issued authorisation for their continuation. There are currently 32 agreements which the Community has negotiated and/or signed with third countries, 27 of which are currently in force.

Agreements were also reached with Gabon in 1988, with Sierra Leone in 1989, and Tanzania, but have not yet been signed by the countries in question. In 1987, the Community established its first fisheries agreement in the Caribbean region with Dominica, though this has still not yet entered into force. The same is true of the agreement reached with Finland in 1983.

EU documentation shows that the Commission intends to continue its efforts on the basis of Council guidelines with a view to concluding new fisheries agreements with certain countries of Eastern Europe (in particular Russia), other African countries, states fronting the Indian Ocean and also the Caribbean. In addition, in view of the interest expressed by some member states’ fishers in the stocks of the South Atlantic particularly Namibia and Latin America, and the potential for tuna fishing in the Pacific Ocean, the Community is extending its fishing opportunities to those regions. Most of the bilateral fisheries agreements signed by the Community were signed with developing countries and are of mixed type (trawlers and tuna fishing vessels).

**Competing Interests**

The operation of the external aspect of the Community fisheries policy is a constant battle between meeting the needs of the various elements concerned. These are: first and foremost, the needs of Community fishers; an on and off commitment to global rational exploitation of stocks with due concern for the marine ecosystem; an on and off commitment to sustainable development in developing countries and a consequent desire to sign non-exploitative agreements; a need to avoid distortion of Community fish markets by not allowing overgenerous tariff concessions in the terms of agreements; constraints on the Community budget necessitating careful scrutiny of agreements in order to assess their cost/benefit ratio; the growing, demand by Community consumers for fish products; the growing pressure from the food processing sector for cheaper fish inputs into complex consumer products; pressure from the European environmental movement. It is when disequilibrium of any combination of these factors occurs that controversy erupts. The needs of Community fishers are the most politically sensitive and this contributes towards their demands remaining paramount over other issues. The environmental aspect, backed up by scientific evidence, and the harsh reality of falling catches is also high on the political agenda at present – the reality is that it often takes second place.

The majority of EC bilateral fisheries agreements are with signatories to the Lomé Convention and it is these agreements which are the most controversial. The remit of the Commission is to negotiate commercial agreements to the advantage of the Community fleet and yet these agreements quite clearly contain development aspects such as the obligation to contribute towards the training of local crews and the landing of catches to contribute towards local food sources. Some would like to see these aspects strengthened whereas others see the commercial cost and what the EU can get back in return for the financial compensation as the most important factor.

Access to markets is the key factor in the reciprocal agreements and a strong element in the agreements
with Morocco and Greenland. The Community effectively bargains reduced tariff ratings for certain fish products in exchange for much needed quota allocations in foreign waters. This is in the interest of EU consumers as it can contribute towards reduced prices and increased choice of fish food, but it can work to the disadvantage of the Community fishing sector. An example of this is the opposition of Spanish and Portuguese sardine producers to the phasing out of tariffs on this product entering the market from Morocco.

The system has also been open to abuse through incorrect statements of origin and species. Also price offers are difficult to control. For example, the EC market crisis in white fish in the early to mid-90s was due to a sudden increase in low priced imports. This led to a fall in market prices and consequent unrest amongst fishers, most notably in France.

**Fisheries in the Community Budget**

The amount allocated for the Common Fisheries Policy constitutes only about one per cent of the total community budget, and of this the total allocated to bilateral agreements has risen substantially over the years particularly following the accession of Spain and Portugal in 1986. Many agreements have come under criticism due to what is perceived as their excessive expense.

It has been suggested that the amounts paid in financial compensation have more bearing on a desire to maintain good relations with the country concerned (e.g. Morocco) or to promote political stability there (e.g. Angola) than the benefit gained for the Community fleet in the terms of the agreement. When the second protocol to the fisheries agreement with Greenland was negotiated, the European Parliament was highly critical that the financial compensation concerned had risen by a third – from ECU 24 million to ECU 36 million – whereas the anticipated catches had been reduced.

**NZ – EU Fisheries Agreements**

Essentially, the EU approached New Zealand to explore opportunities for re-location of vessels into New Zealand waters. Given the character of the New Zealand quota system, this means effectively that European interests will have to enter into subsidiary agreements with New Zealand quota holders to catch all or some of the quota that New Zealand interests hold. EU fishing (by charter out to New Zealand owners) will thus be within the terms of the QMS, unless it is for non-quota species such as southern bluefin tuna.

For their part, the New Zealand side has been interested in reduced or zero tariffs to EU markets to expand market share and discussions with the EU on an ongoing basis to seek the removal of subsidies in EU markets and fleets. New Zealand interests are also interested in lease and purchase agreements which would see a phase out of EU crews over time with the vessels becoming fully domesticated, as has occurred in recent times with Japanese and Norwegian vessels. The exact state of the negotiations is unclear, although the outline of what the different parties want is.

**The Environmental Dimension**

This aspect would seem to involve at least four issue areas:

- A higher visibility of New Zealand issues on the agenda of EU environmental organisations revolving around issues such as live exports of fish; Antarctic fishing by New Zealand companies; the marine mammal aspects of New Zealand fisheries and possibly the balance of settlement matters in the Maori arena;
- The integration of environmental impact assessments into second generation agreements, as the New Zealand agreement;
- The position of southern bluefin tuna, which Spanish fleets located in Tahiti would be interested in fishing;
- The sale of ecologically certified New Zealand fish in EU markets.

**Conclusions**

It remains to be seen how these issues will shape up in the future. I would argue that an agreement between the EU and New Zealand is only a matter of time. The current negotiations, should they not lead to an agreement, should be regarded as the EU having been engaged in a fishing exercise – a testing of New Zealand waters.
Annexes

Table 1. Agreements negotiated between the EEC and third countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Type of Agreement</th>
<th>Year negotiated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senegal</td>
<td>Stocks/financial compensation</td>
<td>1980</td>
</tr>
<tr>
<td>Guinea Bissau</td>
<td>Stocks/financial compensation</td>
<td>1980</td>
</tr>
<tr>
<td>Norway</td>
<td>Reciprocal</td>
<td>1981</td>
</tr>
<tr>
<td>Faroe Islands</td>
<td>Reciprocal</td>
<td>1981</td>
</tr>
<tr>
<td>Sweden</td>
<td>Reciprocal</td>
<td>1981</td>
</tr>
<tr>
<td>Canada</td>
<td>Stocks/markets</td>
<td>1981</td>
</tr>
<tr>
<td>Finland</td>
<td>Reciprocal</td>
<td>1983</td>
</tr>
<tr>
<td>Guinea Conakry</td>
<td>Stocks/financial compensation</td>
<td>1983</td>
</tr>
<tr>
<td>Seychelles</td>
<td>Stocks/financial compensation</td>
<td>1984</td>
</tr>
<tr>
<td>Sào Tomé &amp; Príncipe</td>
<td>Stocks/financial compensation</td>
<td>1984</td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>Stocks/financial compensation</td>
<td>1984</td>
</tr>
<tr>
<td>Greenland</td>
<td>Stocks/markets/financial compensation</td>
<td>1985</td>
</tr>
<tr>
<td>United States</td>
<td>Access to surplus</td>
<td>1985</td>
</tr>
<tr>
<td>Madagascar</td>
<td>Stocks/financial compensation</td>
<td>1986</td>
</tr>
<tr>
<td>Mozambique</td>
<td>Stocks/financial compensation</td>
<td>1986</td>
</tr>
<tr>
<td>Gambia</td>
<td>Stocks/financial compensation</td>
<td>1987</td>
</tr>
<tr>
<td>Angola</td>
<td>Stocks/financial compensation</td>
<td>1987</td>
</tr>
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<td>Mauritania</td>
<td>Stocks/financial compensation</td>
<td>1987</td>
</tr>
<tr>
<td>Dominica</td>
<td>Stocks/financial compensation</td>
<td>1987</td>
</tr>
<tr>
<td>Comoros</td>
<td>Stocks/financial compensation</td>
<td>1988</td>
</tr>
<tr>
<td>Morocco</td>
<td>Stocks/financial compensation</td>
<td>1988</td>
</tr>
<tr>
<td>Gabon</td>
<td>Stocks/markets/financial compensation</td>
<td>1988</td>
</tr>
<tr>
<td>Mauritius</td>
<td>Stocks/financial compensation</td>
<td>1989</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>Stocks/financial compensation</td>
<td>1989</td>
</tr>
<tr>
<td>Tanzania</td>
<td>Stocks/financial compensation</td>
<td>1990</td>
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<td>Ivory Coast</td>
<td>Stocks/financial compensation</td>
<td>1990</td>
</tr>
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<td>Cape Verde</td>
<td>Stocks/financial compensation</td>
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</tr>
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<td>Iceland</td>
<td>Reciprocal</td>
<td>1992</td>
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<td>Argentina</td>
<td>Second generation</td>
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</tr>
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<td>Latvia</td>
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<td>Lituania</td>
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<td>1992</td>
</tr>
<tr>
<td>Estonia</td>
<td>Reciprocal</td>
<td>1992</td>
</tr>
</tbody>
</table>

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*Numbers indicate the number of agreements with the country.*
Notes to Table 1
1. In renegotiation.
2. Not currently in force.
3. Never entered into force
4. Not yet in force
5. Details to be adopted.
6. Agreement covers tuna fishing only.
7. Agreement of mixed type (tuna fishing and general trawling).

Table 2. EEC/ACP fisheries protocols in force
All figures in ECUs

<table>
<thead>
<tr>
<th>Country</th>
<th>Period</th>
<th>Financial comp.</th>
<th>Scientific programme</th>
<th>Training</th>
<th>Total cost</th>
<th>Average cost per annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>3.5.92 – 2.5.94</td>
<td>13 900 000</td>
<td>2 800 000</td>
<td>1 800 000</td>
<td>18 500 000</td>
<td>9 250 000</td>
</tr>
<tr>
<td>Cape Verde</td>
<td>6.9.91 – 5.9.94</td>
<td>1 950 000</td>
<td>500 000</td>
<td>160 000</td>
<td>2 610 000</td>
<td>87 000</td>
</tr>
<tr>
<td>Comoros</td>
<td>20.7.91 – 19.7.94</td>
<td>900 000</td>
<td>325 000</td>
<td>175 000</td>
<td>1 400 000</td>
<td>466 666</td>
</tr>
<tr>
<td>Ivory Coast</td>
<td>11.1.91 – 10.1.94</td>
<td>6 000 000</td>
<td>600 000</td>
<td>500 000</td>
<td>7 100 000</td>
<td>2 366 666</td>
</tr>
<tr>
<td>Gambia</td>
<td>1.7.90 – 30.6.93</td>
<td>3 870 000</td>
<td>80 000</td>
<td>165 000</td>
<td>4 115 000</td>
<td>1 371 666</td>
</tr>
<tr>
<td>Guinea-Bissau</td>
<td>16.6.91 – 15.6.93</td>
<td>12 000 000</td>
<td>850 000</td>
<td>550 000</td>
<td>13 400 000</td>
<td>6 700 000</td>
</tr>
<tr>
<td>Guinea (Conkary)</td>
<td>1.1.92 – 31.12.93</td>
<td>6 700 000</td>
<td>400 000</td>
<td>400 000</td>
<td>7 500 000</td>
<td>3 750 000</td>
</tr>
<tr>
<td>Madagascar</td>
<td>21.5.92 – 20.5.95</td>
<td>1 350 000</td>
<td>375 000</td>
<td>450 000</td>
<td>2 175 000</td>
<td>725 000</td>
</tr>
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<td>Mauritania</td>
<td>1.8.90 – 31.7.93</td>
<td>27 750 000</td>
<td>900 000</td>
<td>360 000</td>
<td>29 010 000</td>
<td>9 670 000</td>
</tr>
<tr>
<td>Mauritius</td>
<td>1.12.90–30.11.93</td>
<td>1 200 000</td>
<td>480 000</td>
<td>120 000</td>
<td>1 950 000</td>
<td>650 000</td>
</tr>
<tr>
<td>Mozambique</td>
<td>1.1.92 – 30.9.93</td>
<td>300 000</td>
<td>180 000</td>
<td>480 000</td>
<td>960 000</td>
<td>480 000</td>
</tr>
<tr>
<td>São Tomé &amp; Príncipe</td>
<td>1.6.93 – 31.5.9</td>
<td>1 650 000</td>
<td>250 000</td>
<td>275 000</td>
<td>2 175 000</td>
<td>725 000</td>
</tr>
<tr>
<td>Senegal</td>
<td>2.10.92 – 1.10.94</td>
<td>31 200 000</td>
<td>600 000</td>
<td>200 000</td>
<td>32 000 000</td>
<td>16 000 000</td>
</tr>
<tr>
<td>Seychelles</td>
<td>18.1.93 – 17.1.96</td>
<td>6 900 000</td>
<td>2 700 000</td>
<td>300 000</td>
<td>9 900 000</td>
<td>3 300 000</td>
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</table>
Table 3. Member state vessels authorised to fish in third country waters

<table>
<thead>
<tr>
<th>Agreement</th>
<th>Member states</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>Denmark, UK, Germany, Spain, France, Portugal, Netherlands, Belgium</td>
</tr>
<tr>
<td>Sweden</td>
<td>Denmark, Germany</td>
</tr>
<tr>
<td>Faroe Islands</td>
<td>Denmark, Germany, France, Netherlands, Belgium, UK</td>
</tr>
<tr>
<td>Canada</td>
<td>n.a.</td>
</tr>
<tr>
<td>United States</td>
<td>n.a.</td>
</tr>
<tr>
<td>Greenland</td>
<td>Denmark, UK, Germany, France</td>
</tr>
<tr>
<td>Morocco</td>
<td>Spain, France</td>
</tr>
<tr>
<td>Senegal</td>
<td>Spain, France, Greece, Italy</td>
</tr>
<tr>
<td>Guinea Bissau</td>
<td>Spain, France, Greece, Italy, Portugal</td>
</tr>
<tr>
<td>Guinea</td>
<td>Spain, France, Greece, Portugal</td>
</tr>
<tr>
<td>Seychelles</td>
<td>Spain, France</td>
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<tr>
<td>São Tomé and Principe</td>
<td>Spain, France</td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>Spain, France</td>
</tr>
<tr>
<td>Madagascar</td>
<td>Spain, France</td>
</tr>
<tr>
<td>Mozambique</td>
<td>Spain, France</td>
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<tr>
<td>Gambia</td>
<td>Spain, France, Greece, Italy</td>
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<td>Angola</td>
<td>Spain, France</td>
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<td>Mauritania</td>
<td>Spain, France, Portugal</td>
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<tr>
<td>Comoros</td>
<td>Spain, France</td>
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<td>Cape Verde</td>
<td>n.a.</td>
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<tr>
<td>Gambia</td>
<td>n.a.</td>
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<tr>
<td>Ivory coast</td>
<td>n.a.</td>
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– Own elaboration on the basis of agreements in force in June 1993
Table 4. Bilateral fishing agreements between EU and third countries: Number of Community vessels authorised to fish in third country waters under agreement (Fishing possibilities as registered in treaties in force in 1991)

<table>
<thead>
<tr>
<th>Member state</th>
<th>Angola</th>
<th>Cape Verde</th>
<th>Comoros</th>
<th>Ivory Coast</th>
<th>Gambia</th>
<th>Guinea</th>
<th>Equatorial Guinea</th>
<th>Madagascar</th>
<th>Mauritius</th>
<th>Mauritania</th>
<th>Mozambique</th>
<th>Namibia</th>
<th>São Tomé &amp; Príncipe</th>
<th>Senegal</th>
<th>Seychelles</th>
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<th>Morocco</th>
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<td></td>
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<td>Denmark</td>
<td>Germany</td>
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<td>Spain</td>
<td>France</td>
<td>Italy</td>
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<td>Portugal</td>
<td>United Kingdom</td>
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<td>Angola</td>
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<td>Comoros</td>
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<tr>
<td>Ivory Coast</td>
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<tr>
<td>Gambia</td>
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<td>Guinea</td>
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<td>Madagascar</td>
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Notes to Table 4

1. Figures in parentheses are gross tonnages for vessels rather than vessel numbers.
2. Partial figures due to incomplete data.
3. Before independence, approximately 200 Community vessels, of which 150 were Spanish, fished in Namibian waters.
Development of Australia’s Oceans Policy

I.R. McPhail
Head, Portfolio Marine Group, Environment Australia
Chair, Great Barrier Reef Marine Park Authority

Abstract
The Great Barrier Reef Marine Park remains the largest marine managed area in the world. Apart from its World Heritage status, it is also one of few areas managed at a large marine ecosystem scale. Since its creation in 1975, other marine protected areas have joined it in Australia, New Zealand and other countries.

Australia is presently embarking on the creation of an Oceans Policy to provide the policy framework within which to manage its EEZ and contiguous continental shelf. The lessons from the Great Barrier Reef are valuable in testing options for management on the broader scale. Concepts of multiple use, representative areas, stakeholder and indigenous involvement, and the maintenance of biodiversity – as well as the unequivocal acceptance of economic use under conditions of assured sustainability – underpin the management philosophy of the marine park.

The Great Barrier Reef Marine Park Authority has a deserved reputation for effective co-management, but management decision can still be controversial. Resource management involves resolution of competing demands for access, and decision taking can place relationships under pressure. For the larger ocean there are a number of lessons. The paper will explore the transferability to Oceans Policy of the management experience of the Great Barrier Reef.

Introduction
As the head of the marine group within Environment Australia, and also as chair of the Great Barrier Reef Marine Park Authority, I am pleased to have the opportunity to be involved in this conference. The designation of the International Year of the Ocean is a sign of the emerging concern of nations that the seas are not the limitless and inexhaustible source of wealth that T.H. Huxley at the end of last century proclaimed them to be. Geopolitics and the extension of economic activity to garner, at long distance, the resources of the sea, have led nations to consider hegemony over the oceans. Once ships sailed past the horizon and over the edge of the world, now the oceans are familiar and mapped, with an increasing number of arbitrary lines of ownership and influence.

Certainly the United Nations Convention of the Law of the Sea is a major and powerful reflection of the shift from an unknown and threatening realm, to an extension of terrestrial governments and their affairs.

As Australia enters an ocean age based on the Exclusive Economic Zone (EEZ), the development of public policy and the role of the commonwealth in establishing the parameters for the successful and sustainable use of the oceans’ resources become an important component.

Today I would like to outline the approach that Australia is taking in developing an oceans policy. I will be focussing primarily on the policy development process that we have adopted and not on the content of that policy which is still being developed.

The basis of this approach is that in order for an Australian Oceans Policy to be well-received there must be both a well-informed and involved constituency in
developing the policy and a strong level of support by peak bodies and user groups of the oceans for the resultant policy.

I believe that the best way to achieve this outcome is by actively involving all groups, users, stakeholders, call them what you will, in the policy development process.

EEZs and Oceans Policy

In 1994 the Law of the Sea Convention entered into force and Australia declared an Exclusive Economic Zone (EEZ) of some 11 million square kilometres – almost 15 million square kilometres when our claimable continental shelf area is determined.

To put Australia’s zone into some sort of perspective this area is nearly twice the size of the landmass of continental Australia. We have one of the largest Exclusive Economic Zones of any nation and one of the most diverse in its geographic spread and its physical and biological diversity. It borders the EEZs of five neighbouring nations and includes an almost complete range of oceanic regimes from the tropical to the antarctic.

The government is sensitive to the ecological and economic significance of our marine and coastal environments and in line with their policy commitment under Coasts and Clean Seas, a comprehensive and integrated oceans policy for Australia is to be developed.

But an oceans policy must address more than just managing our coastline, fisheries and marine parks. Now that Australia has ratified the Convention on the Law of the Sea we have an obligation to protect and sustainably manage the entire Exclusive Economic Zone ocean on the basis of the best available scientific information. Others may be permitted access to the living resources not being used by Australia, subject to appropriate terms and conditions and to the limits of sustainability. To achieve this goal, for the first time in the nation’s history the government will develop a comprehensive and integrated oceans policy to ensure that we meet this challenge.

The Prime Minister has tasked the Minister for the Environment, Senator Hill, with coordinating and preparing a whole of government position for the oceans policy. The portfolio marine group of Environment Australia has the responsibility of coordinating the development of that policy.

An oceans policy will provide the strategic framework for the planning, management and ecologically sustainable development of amongst other things – fisheries, shipping, petroleum, gas and seabed resources – while ensuring the conservation and protection of our marine environment. If well managed, the oceans can continue to provide us with considerable and even greater economic, environmental and social benefits.

Australia has well-established regimes for managing specific ocean sectors such as shipping, fisheries, oil and gas and marine protected areas. But we lack a comprehensive planning and management regime that can resolve conflicts and competing interests and identify gaps. To manage the oceans effectively we need to develop an overarching policy framework which accommodates, in a rational and orderly manner, the large range of sectoral and cross-sectoral interests and ensures the ecologically sustainable development of Australia’s oceans.

Key Steps and Timing

On March 3, 1997 the Prime Minister released a consultation paper to assist discussions with governments, peak bodies, organisations and the wider community on the broad framework and associated actions that should underlie an oceans policy. The release of the consultation paper was the first public stage in the development of the oceans policy. Following this first stage of consultation further public discussion was carried out in 1997 and 1998.

A series of background and issues papers were prepared as a means of stimulating debate about the oceans policy. These papers provide both a factual information base about our oceans and also canvass options for the oceans policy. The mainly academic and scientific authors of these papers participated in a fairly testing seminar on their arguments, and the documents now stand as a valuable base for policy development.

A major forum was held in December, 1998 to debate options for the oceans policy. A wide range of interests and their representatives participated in this discussion, and an independent rapporteur is presently completing the forum report. The background and issues papers, as well as the consultation document underpinned the debate at the forum, which expectably canvassed a wide range of views.

On the one hand there were representatives of economic sectors who considered themselves sufficiently regulated through conventional mechanisms, to those who felt the seas had insufficient integrated planning
and management, and that a capacity to intervene over cross-sectoral issues and ecosystem impacts was essential.

A draft oceans policy is expected to be released in late February 1998. A three-month public comment period will follow.

Another forum is planned for April 1998 to debate aspects of the draft policy. I expect that the oceans policy will be finalised and released in July 1998 as an important government contribution to the International Year of the Oceans.

The process and key steps in developing the Australian Oceans Policy is being supplemented by two key groups which are looking at:

- Interjurisdictional matters; and
- Issues relevant to non-government organisations.

**ICESD Working Group**

Australia is a federation of states and territories. In 1975 the High Court determined that the Commonwealth has sovereignty and sovereign rights over the adjacent territorial sea and continental shelf. As part of the 1979 Offshore Constitutional Settlement (OCS) the Commonwealth granted to the state and Northern Territory governments title to the seabed and concurrent legislative power within three nautical miles of the territorial sea baselines, providing them with a greater legal and administrative role in that offshore areas.

A major proportion of the use of the marine environment and resources of the EEZ therefore occurs through activities carried out from the territory of, and to a varying extent regulated by, the states and territories. Their involvement and the linkages to the management of the three nautical mile coastal waters is a central factor in the development of an oceans policy.

To assist in the task of developing an oceans policy an intergovernmental committee responsible for ecologically sustainable development (the Intergovernmental Committee on Ecologically Sustainable Development – ICESD) has established an oceans policy working group. The ICESD working group constitutes the primary forum for intergovernmental participation in, and consultation on, the development and implementation of a national oceans policy.

**NGO Reference Group**

The Minister for the Environment, Senator Robert Hill, has also recognised the key involvement that a group of representatives from a diverse array of non-government organisations can play in developing the oceans policy. Accordingly, Senator Hill has established a non-government reference group to provide advice to the commonwealth government, through him, on the views of a broad range of relevant non-government stakeholders on the development of the oceans policy.

Members of the ministerial advisory group on oceans policy have been appointed by the minister on the basis of:

- Their ability to represent the views of non-government stakeholders with significant interests in Australia’s marine environment; and / or
- Personal expertise on issues relevant to the oceans policy.

The advisory group members are also required to promote awareness of the oceans policy amongst non-government stakeholders by providing such stakeholders with relevant information and seeking feedback to the extent practical.

**Conclusions**

Australia is on the path of developing an oceans policy. The policy development process that we have taken to date has been an inclusive approach recognising that we are not the holders of all knowledge and ideas about the marine environment and that all users have a valuable contribution to make in developing an oceans policy.
Management of the By-catch of Protected Species in New Zealand: A Government Agency Perspective

M I K E  D O N O G H U E
External Relations Division, Department of Conservation

Abstract
Conservation Services Levies may be charged by the Minister of Conservation to commercial fishers to cover the costs of work undertaken by the Department of Conservation to identify and remedy the adverse impact of commercial fishing operations on protected species of marine wildlife.

While attention has been mainly focused on marine mammals and seabirds, marine species protected under the Wildlife Act also include two species of corals and the spotted black grouper from the Kermadec Islands. The programmes to be funded under the Conservation Services Levies are determined annually through a consultation process with approved stakeholders, including representatives of the fishing industry, Maori interests and conservation groups.

The incidental take (or by-catch) of protected species of marine wildlife in New Zealand is managed through a statutory process involving officials from the Department of Conservation and the Ministry of Fisheries and stakeholders. Section 15 of the Fisheries Act provides the Minister of Fisheries with the power to take such measures as are considered necessary to limit the fishing-related mortality of marine wildlife.

Additionally, the Minister of Conservation can require the production of Population Management Plans (PMPs), that may set maximum allowable fishing-related mortality for certain species, as well as recommending other ways to mitigate the adverse impacts of fishing operations. PMPs bring together government officials, fishing industry representatives and other interested parties, to develop legally-binding long-term strategies for the management of by-catch. The Minister of Fisheries must concur with any PMP, but is then required to ensure that any allowable levels of fishing-related mortality are not exceeded.

Introduction
Two items in the news recently have caught my eye as an indicator of the state of our oceans. One was that the North Atlantic is now so contaminated that a daily teaspoon of cod liver oil, that old favourite for keeping children’s colds at bay, now contains more than the allowable daily dose of dioxin. The other depressing news is that because of the phenomenon known as the ‘condenser effect’, long-lived chemical pollutants that are predominantly produced and used in temperate and tropical latitudes, are being deposited mainly in remote polar regions. Consequently, birds such as the Antarctic pintado petrel, inhabiting what we consider to be pristine environments, are carrying contaminant loads up to six hundred times greater than birds in heavily industrialised areas such as the Waddensee, where the Rhine flows into the North Sea.
Perhaps there is not a great deal that a government department in New Zealand can do to address such global issues, but I should like to concentrate today on one way in which the maintenance of marine biodiversity can be more readily addressed – through the reduction of by-catch in fishing operations. We all gasped at those images of huge grouper and sea bass produced by Paul Dayton yesterday. Most of you will agree that large marine animals – be they fish, birds or mammals – generally elicit more respect and sympathy from humans than sardines or jellyfish.

Large-scale harvesting of fish stocks is often an inherently unselective exercise, with non-target species of fish, mammals and birds often unintentionally taken as by-catch. The implications for the by-catch of birds and mammals are generally more severe than they are for fish. Because they are usually longer-lived and slower-breeding, any losses to fishing operations are not easily or rapidly replaced.

It is hardly surprising that with the rapid development of deep-water fisheries in New Zealand over the past 20 years, we have had to cope with the same kinds of problems of unintended by-catch of marine wildlife as have been reported from all around the world. The big difference between New Zealand and most other areas of the world is that in many cases, the species most impacted through interactions with fishing operations, like the land fauna, are unique to this area.

The Department of Conservation has the responsibility for the protection of marine mammals and seabirds in our Exclusive Economic Zone, the fourth largest in the world, spanning 30 degrees of latitude, and including sub-tropical to sub-antarctic environments. New Zealand waters contain almost half the world’s species of whales and dolphins, and are the sole breeding area for at least two marine mammal species – New Zealand (Hooker’s) sea lion and Hector’s dolphin. Additionally, New Zealand has the greatest number of seabird species breeding anywhere in the world, and more species of albatross breeding in our EEZ than anywhere else. The more spectacular animals such as large seabirds and marine mammals are good indicators of the state of the biodiversity of the marine ecosystem, and, because they are long-lived and slow-breeding, are especially vulnerable to human impacts.

All these species are incidentally taken in fishing operations in New Zealand, through three main fishing methods.

Deep-water Trawl Fisheries

The New Zealand deep-water resource is predominantly fished by large trawlers (greater than 1000 tonnes), towing pelagic trawl nets with headlines as high as 80 metres and a span from wingtip to wingtip of 200 metres.

Fur Seals

The major deepwater trawl fisheries for hoki, hake, southern blue whiting and squid also capture and drown large numbers of New Zealand fur seals. Fur seals are widely distributed throughout New Zealand fisheries waters, as well as in Bass Strait and South Australia. Estimates of initial abundance of fur seals range up to one or even two million, but the species was severely depleted, firstly by early human settlers and later by European and American sealing vessels. There is no reliable current population estimate, but their numbers in New Zealand waters probably exceed 70,000 animals. Most of the major breeding colonies are on rocky shores of the South Island or the sub-antarctic islands, often close to major trawl fisheries.

Over the past ten years, Ministry of Fisheries observer data suggest that between several hundred and a thousand fur seals have been drowned annually in trawl nets, with the largest numbers usually killed in the West Coast hoki fishery. When the Southern Blue Whiting fishery operates near the Bounty Islands, with their breeding colony of 16,000 or more seals, large numbers are taken. Analysis of effort data suggests that more experienced crews catch significantly fewer fur seals.

Despite the impacts of trawl fisheries, however, the fur seal population appears to be healthy, and the species seems to be reoccupying much of its old range throughout the New Zealand EEZ.

New Zealand Sea Lion

Even before the tragic events of the past two weeks, greater concern had been raised over the by-catch of New Zealand sea lion, because:

- The population is much smaller;
- 95 per cent of breeding occurs on two sites in the Auckland Islands;
- It is endemic to New Zealand;
- Breeding and pup-rearing occurs at the same time as one of New Zealand’s major trawl fisheries.
Also taken to the brink of extinction by subsistence hunters and commercial sealers of the nineteenth century, the New Zealand sea lion probably numbers between 11,000 and 15,000 animals. Almost the entire breeding population assembles on two small beaches in the Auckland Islands each summer.

This dense aggregation of breeding animals makes the species extraordinarily vulnerable to the type of mass mortalities that have just occurred on Dundas and Enderby Islands. After the latest reports from the Auckland Islands, we are now cautiously optimistic that the epidemic is almost over. The species has suffered 50 per cent pup mortality and an unknown level of adult mortality.

The summer breeding season is also the time when a fleet of up to 50 large trawlers is fishing for squid (Nototadrus sloanii) on the Aucklands Shelf. Sea lions and trawlers are often seeking the same prey in the same area. Some sea lions are caught each year in the nets of trawlers. The by-catch rate of sea lions (total number of trawl tows divided by the total number of sea lions caught) is fairly constant from season to season, but the annual by-catch of sea lions varies with the occurrence of squid, which may appear in large quantities either around the Snares Islands or the Aucklands.

The ministers of fisheries and of conservation both take the view that even with the best will in the world from the fishing industry, some degree of by-catch of protected species in fishing operations may be unavoidable. Any level of by-catch must not only be sustainable, but must also allow for recovery of the population if it is depleted. In recent years, ministers have agreed on an annual catch limit (or Maximum Allowable Level of Fishing-Related Mortality – MALFIRM) for the number of sea lions that may be accidentally drowned in this fishery.

Last year, the Auckland Islands squid fishery was closed early because the catch limit of 73 sea lions had been exceeded. The catch limit was derived from a model developed by the National Marine Fisheries Service in the USA, which predicts that compared to a zero by-catch, an annual catch of 73 sea lions will still allow the population to recover to at least 90 per cent of its carrying capacity, and it will take no longer than an additional ten years to do so. Ministers have accepted this possible reduction in the final population abundance and the time delay in reaching it as a trade-off to allow the continuation of a valuable fishery.

Events of the past fortnight, of course, have drastically altered the picture for the sea lion – the epidemic that has killed half of this year’s pups and an unknown number of breeding adults is a sharp reminder that a species may be extremely vulnerable to unforeseen events that can quickly change its status.

### Pelagic Longline Fisheries

Pelagic longlines are generally set in oceanic waters to catch tuna and billfish. In New Zealand, the main target for pelagic longliners has been one of the world’s most valuable fish – southern bluefin tuna. Besides reducing bluefin tuna to very low levels of abundance (perhaps less than 10 per cent of its population 30 years ago in New Zealand waters), pelagic longline vessels have also had a serious impact on some of our most magnificent sea birds.

Ocean-going tuna longliners these days set up to 3000 hooks daily, in a line covering as much as 120 kilometres. Occasionally, a sea bird following the boat gets hooked as it tries to take the bait as the vessel is setting or retrieving the line. Although this is a relatively rare event, the sheer number of hooks set each year in the Southern Ocean (estimates in excess of 150 million hooks per year in recent times) mean that many thousands of albatross and petrels are accidentally killed each year in fishing operations, many hundreds of them in New Zealand waters. Because albatross, in particular, are essentially monogamous and slow breeders, the impact of even a small increase in the adult mortality rate can be sufficient to tip the population into decline.

Throughout the Southern Ocean – and New Zealand is no exception – the albatross populations seem to be generally in decline, with pelagic longlines the most likely cause.

### Gill Net Fisheries

The use of gill nets to catch fish is one of the oldest fishing methods, but the development of the plastics industry in the 1950s resulted in a massive expansion of their use, as cheap monofilament nylon nets replaced the traditional heavier mesh nets, culminating in the rapid expansion of the deep-water fisheries using large-scale drift nets in the late 1980s, and the subsequent ban on their use on the high seas through the actions of New Zealand and other countries at the UN. Gill nets which are anchored to the seabed (set nets) are still in widespread use in coastal waters throughout the world, including New Zealand. While
fishers claim that gill nets can be highly selective, only catching fish which are of the right size to become enmeshed by their gill plates, it is also clear that small cetaceans such as dolphins and porpoises are vulnerable to entanglement in the loose meshes.

**Hector’s Dolphin**

New Zealand’s only endemic cetacean, Hector’s dolphin, is a coastal species, inhabiting shallow murky waters around the South Island, with a total population estimated at only 34,000. The by-catch of this dolphin in the nets of both commercial and recreational fishers is a serious problem.

In 1988, New Zealand’s first marine mammal sanctuary was established covering 1140 km² of coastal seas around Banks Peninsula, with a ban on the use of commercial set nets and restrictions on the use of recreational set nets.

However, dead dolphins continue to wash up in significant numbers in the Canterbury region, and whenever possible are autopsied to determine cause of death. The numbers of Hector’s dolphins killed by set nets around New Zealand is unknown, although there has also been clear evidence of deaths from set net entanglement in Taranaki and the West Coast. An observer programme is currently running in Canterbury, with observers deployed on both inshore gill net vessels and trawlers. Additionally, a survey to estimate the size of the Hector’s dolphin population in the region is taking place this summer. Results of these studies are due later this year, and will provide the basis for informed decision-making in the future management of this unique species.

**Management**

Recognition of the scale of the by-catch problem in New Zealand has been gradual. Anecdotal reports from fishers, fisheries observers and marine scientists have all played an important part, and of course, conservation groups have effectively publicised the issue. In order to effectively protect marine wildlife the Minister of Conservation requires reliable information on:

- The numbers of animals of various species taken as by-catch each year;
- Whether fishers are taking all reasonable care to minimise by-catch;
- Which mitigation methods exist or need to be developed to reduce by-catch to insignificant levels;
- The sustainable levels of by-catch for the various affected species.

Politicians have acknowledged the need for a concerted attempt to address the problem, and the Fisheries Act that was passed by parliament in October 1996 contained a number of important initiatives:

**Conservation Services Levies**

As part of a general move to recover costs from the fishing industry, CSL were established to allow the Minister of Conservation to carry out such research and monitoring activities as the minister deems necessary to avoid, remedy or mitigate the impacts of commercial fishing on protected species of marine wildlife. CSL have so far been used in the following ways:

- Increased observer coverage in key fisheries;
- Improved estimation of by-catch;
- Carcass retrieval and autopsy programmes;
- Investigations into ways of mitigating the by-catch of marine mammals in trawls and gill nets;
- Investigations into the population, breeding rates and foraging behaviour of New Zealand sea lions.

It is clear that there is an encouraging and increasing degree of cooperation from the industry. They accept that the sooner these issues are successfully addressed, the sooner levies will be reduced or cancelled.

**Mitigation**

Ultimately, by-catch of protected species in fishing operations should be reduced to insignificant levels through the development of mitigation devices that provide a technical fix. CSL levies have been used to develop such devices in both longline, trawl and gill net fishing. Pelagic longliners, for example, are required to use tori poles in New Zealand waters, and considerable effort has gone into developing the most effective types of lines for New Zealand conditions. Further work has gone into the development of devices to keep the baited hooks well beneath the water surface during the setting process.

**Population Management Plans**

(PMPs) in which the fishing industry, NGOs and officials come together through a statutory process to discuss and find solutions to the impacts of fishing on protected species. Development of PMPs is also funded through CSL. At present, a PMP is in preparation for the New Zealand sea lion, and a draft proposal will be released for public comment in the next few months. I must say that the development of this PMP is proving more difficult than I had expected. First, the fishing industry commissioned a detailed technical analysis by an overseas consultant that has required close consideration. Then the consequences of the major epidemic this month will also require a significant further re-working of the draft plan. The final product, however, will unquestionably be all the better informed.

PMPs allow for the setting of catch limits for threatened species (Maximum Allowable Levels of Fishing-Related Mortality, or MALFIRMs). A species can be declared threatened by the gazetting of a notice by the Minister of Conservation, but only if the species status is recognised as threatened by relevant international (such as the IUCN criteria) or domestic standards. Any catch limit set for a threatened species must not prevent it from achieving non-threatened status within twenty years.

At present, DOC has employed the NMFS model for setting catch limits, but alternative approaches may be developed in the future. The concept of the MALFIRM is seen as an insurance policy, to ensure that the impacts of by-catch from commercial fishing do not compromise the conservation status of protected species. The department’s objective is to reduce the level of protected species by-catch towards insignificant levels.

Much practical work still remains to be done, but the legislative framework established by the Fisheries Act and consequent amendments to the Wildlife Act and the Marine Mammals Protection Act provides both a funding mechanism and a clear mandate to devote more significant resources to dealing with this issue than has been possible in the past. Importantly, it also provides strong incentives for fishers to adopt more environmentally-friendly practices where possible. While it is premature to suggest that the problems have been largely overcome, I believe that there is a greater commitment than ever before on the part of the fishing industry, conservation groups and government departments to better address the problem of by-catch of protected species in New Zealand fisheries, and that the framework for doing so is a better model than in most other parts of the world.
New Zealand Fur Seals: Treasure, Resource and Vermin

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Abstract

Human exploitation has been the driving factor in the population size and distribution of New Zealand fur seals (Arctocephalus forsteri) through the last millennium. The species was eliminated from North Island and most of South Island by Maori subsistence hunting and later brought to the brink of extinction by commercial sealing on sub-antarctic islands.

The ongoing re-colonisation of mainland New Zealand in recent decades has raised issues of debate and conflict on the future of the species. Opinions vary from preservation to extermination. We discuss management options in terms of feasibility, practicality and outcome.

The most controversial issue involves the interaction between fur seals and commercial fisheries. Issues with fur seals ashore include interactions with people and impacts on foreshore habitats. We suggest that any extreme management options would be untenable and unachievable. However, fur seals are one of very few native species that could sustain Te Tikanga Maori o Mahinga Kai, the traditional harvest of wildlife by Maori. A lucrative option is non-consumptive exploitation through tourism that must address conservation issues in order to endure.

New Zealand fur seals offer a rare and exciting opportunity to test the theoretical processes of population expansion and recovery that can be tested in a kind of natural experiment. The creation of models to define population dynamics will then be applicable to recovery plans for this and other species.

Introduction

New Zealand fur seals (Arctocephalus forsteri) are distributed around New Zealand, southern Australia and the Australasian temperate and sub-antarctic islands (Crawley 1990; Shaughnessy et al. 1994). Their distribution and abundance have been profoundly altered by human exploitation, but numbers have increased in recent years.

Debates encompass the perceived and postulated impacts between fur seals and fish stocks, land use and tourism. Opinions vary from preservation to extermination. There appears to be much misunderstanding on both the status and possible impacts and interactions of fur seals within the New Zealand marine environment.

In this review we discuss the possible impacts of an increasing fur seal population around New Zealand, dispel some myths, and discuss management options in terms of feasibility, practicality and probable outcome. Research done overseas helps to understand the
complex relationships between fur seals and their environment and their interactions with humans. We present some simple population models for fur seals to postulate past trends resulting from human exploitation, current trends, and future management direction. Our goals are to present an objective overview of the issues and to offer targets for future research.

History

Prehistoric Exploitation for Food

Fur seal breeding sites were spread around the entire coasts of North Island and South Island before the arrival of Polynesians in approximately 1000 AD (Smith 1989). Data is insufficient to even remotely estimate the fur seal population size at that time and so any postulated figures (e.g. Anon. 1992; Anon. 1995) must be regarded as unfounded speculation. Fur seals were an important source of food for the early human inhabitants, a fact that has been well-documented, but largely overlooked (Davidson 1984). Subsistence hunting progressively eliminated fur seals from north to south and their mainland breeding range was confined to south-western South Island by the late 18th century (Smith 1989).

A realistic model to represent the impact of subsistence hunting on fur seals on the New Zealand mainland requires estimates for the dynamics of both human and fur seal populations. However, a vital missing parameter is a valid estimate for the number of fur seals before people arrived. Instead, we applied a simplified interim model that assumed a constant rate of change in fur seal numbers. This simple model indicated that the rates of decrease in fur seal numbers were probably very small. A two per cent annual rate of decrease in the mainland population of fur seals would have resulted in their near elimination after 200 years (e.g. 1000-1200 AD), but at 0.5 per cent this elapsed time would have increased to 800 years (e.g. 1000-1800 AD).

Historic Exploitation for Pelts

A period of intensive commercial sealing by Europeans began in 1792 at south-western South Island, spread to offshore temperate and sub-antarctic islands after 1800, and ceased through lack of seals by the 1830s (Crawley 1990). The assumption of a constant rate of change model here probably gives a realistic interpretation of the annual rates of decrease in fur seal numbers because sealing effort was intense throughout the period. A 15 per cent annual rate of decrease in the population of fur seals would have resulted in their near elimination after 25 years and at 10 per cent this elapsed time would have increased to 35 years.

Current Population Trends

Today New Zealand fur seals in the New Zealand region are increasing in number and spreading northward into parts of their prehistoric range (Taylor 1982, 1992; Dix 1993; Lalas and Harcourt 1995; Taylor et al. 1995; Lalas and Murphy in press). However, the true population size of fur seals in New Zealand today is unknown and we suggest that any estimates (e.g. Crawley 1990) are speculation.

Counts of pups offer the only valid and repeatable assessment of changes in numbers of New Zealand fur seals (Shaughnessy et al. 1994). The few estimates within the New Zealand region indicate geographical differences with present numbers stable at Open Bay Islands, West Coast South Island (Baird 1994), increasing at about five per cent annually at Bounty Islands (Taylor 1982), and increasing at about 20–25 per cent along the northern and south-eastern coasts of South Island (Lalas and Harcourt 1994; Taylor et al. 1995; Lalas and Murphy in press). Recent estimates indicate an annual rate of increase of about 30 per cent for pup numbers at Otago Peninsula, South Island. These higher rates exceed the highest population growth rates of about 20 per cent reported for any other fur seal populations.

How can pup numbers at Otago Peninsula be increasing at such a fast rate? We used Vortex population viability analysis software (Lacy and Kreiger 1992) to assess maximum intrinsic population growth rate. Input of the published reproductive parameters for New Zealand fur seals (Mattlin 1987) produced a nonsensical result: the model population decreased about 25 per cent annually. We then applied the highest parameters published for any of the eight Arctocephalus species of fur seals (Wickens and York 1997). This multi-species model indicated that the maximum possible annual population growth rate was 15 per cent. Therefore, even under optimal breeding conditions, population growth rates are still lower than those recorded for parts of South Island. This indicates immigration. In addition, there appears to be a seasonal pattern of movement around South Island by non-breeders (Bradshaw et al. in review).
Interactions With Fisheries

Between 160 and 1400 fur seals are killed annually in trawl nets within the New Zealand 200-mile Exclusive Economic Zone (Baird 1994, Slooten and Dawson 1995). Some have argued that this incidental kill is unacceptable for a recovering seal population, and have proposed the closure of West Coast South Island trawl fishery targeting hoki (*Macruronus novaezelandiae*) (Slooten and Dawson 1995) or major changes to fisheries management policy (Anon. 1995). Lost and discarded debris from fishing boats also forms a threat. Up to one per cent of fur seals on Otago Peninsula are entangled around the neck with plastic debris (Slooten and Dawson 1995).

Commercial fisheries often view fur seals as significant competitors for fish resources and believe that controlled culls would reduce competition (e.g. Talley 1991, Lavigne 1992). Does culling work? As a model here we used figures from southern Africa where the species population of two million South African fur seals (*Arctocephalus pusillus pusillus*) annually consumes an amount similar to the total catch by fisheries (Crawford et al. 1992). However, fisheries catches would not double if all seals were exterminated. About 80 per cent of the consumption of fish is attributable to other fish (Crawford et al. 1992). Therefore, in this example, the extermination of two million seals would increase annual fisheries catches by less than 10 per cent.

Tourism

Tourist operations targeting or including fur seals are on the increase in New Zealand. The numbers and activities of these operations are controlled under government legislation in order to minimise any detrimental effects on the environment. However, their long-term impacts are unknown.

Other Interactions with Humans

Recent increases in numbers of fur seals ashore has resulted in increased contact with people and has raised several issues. The establishment of fur seal colonies on Otago Peninsula has obstructed access to some areas of coastline for recreation. Some recreational fishers complain of loss of fish from lines and nets. The illegal killing of fur seals ashore (e.g. Anon. 1992) could be on the increase and is indicative of “predator paranoia” (Lavigne 1992) or vandalism. Hauling-out onto grazed pastures on Otago Peninsula began about 1995 and could lead to conflict with farmers.

Interactions with Seabirds

New Zealand fur seals potentially can impact on seabirds in three ways predation, competition for food and disruption of breeding. To date there has been no evidence for predation on seabirds nor for competition for food although both forms of interaction have been recorded for other species of fur seals.

Seals ashore can damage coastal vegetation and displace breeding seabirds. To date such interactions have been recorded in New Zealand only for titi (sooty shearwater: *Puffinus griseus*) (Hamilton 1993).

Some Management Options

- Closure of the West Coast South Island hoki trawl fishery – this appears untenable given the general trend of increase in numbers of fur seals around South Island.
- Culling to reduce competition with fisheries – we suggested that extermination of fur seals would have little impact on fisheries catches. Consequently, culls would have even less effect and would be difficult to justify economically.
- Commercial sealing – the collapse of the international market for seal pelts in 1983 removed most of the commercial incentive for culling (Butterworth et al. 1988).
- Te tikanga Maori o mahinga kai – Ngai Tahu have claimed propriety rights for seal fisheries (Waitangi Tribunal 1992), but have not expressed an interest in renewing the status of fur seals as mahinga kai (Garven et al. 1997). As fur seal numbers continue to increase there may be more demand to re-instate a consumptive, but sustainable, exploitation by Maori.

Recommendations

The high rate of increase in numbers of fur seals at South Island represents a rare opportunity for ecological research. The theoretical processes of population expansion and recovery can be tested in a kind of natural experiment. This information is not only useful for testing purely empirical and theoretical science. It provides information on the likely future trends in the number of fur seals and could be applicable in the management of other species.

It is our opinion that a count of all the fur seals in the New Zealand region would be not only highly imprecise, but alsologistically unfeasible. Our review and modelling suggest that funds at this stage should be channelled into research programmes rather than
management options. To properly understand the complex relationship between fur seals and the marine environment, research should focus on the understanding of population dynamics such as population growth rates, reproductive parameters, foraging ecology, diet analysis, and migration.

This research must be done at several locations for several years in order to correctly deduce patterns.

There are too many risks involved in management of marine resources without reliable data.

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Developing a Network of Marine Reserves for New Zealand

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Abstract

New Zealand’s Exclusive Economic Zone (EEZ) encompasses some 4.8 million km² of sea. The marine communities within the EEZ are diverse, ranging from subtropical to subantarctic regions and from shallow to deep. The wide variety of physical conditions and the country’s geographic isolation have contributed to a rich marine flora and fauna, including many endemic species.

In New Zealand, the Marine Reserves Act, 1971 is implemented to establish marine reserves within the territorial sea. There is no comparable legislation for protecting marine areas further offshore. Marine reserves are areas of the foreshore, sea, and seabed which are protected from harvesting. Although the Act was promulgated in 1971, only 14 marine reserves had been established by February 1998 with greatest progress made during the 1990s (12 established).

Only four per cent of the 0.16 million km² territorial sea is protected in marine reserves with the Kermadec Islands Marine Reserve accounting for 75 per cent of protected marine area. When comparing the total area of the EEZ, the percentage of protected area is minuscule.

Although the limitation of the marine reserves legislation to the territorial sea prevents protection of offshore habitats, the Department of Conservation has begun to facilitate development of a network of marine reserves within the territorial sea.

A network of marine reserves around New Zealand will incorporate a full set of complimentary sites representing the range of near-shore habitats, assist with preserving biological diversity, and protect New Zealand’s marine heritage. Work has begun on a near-shore marine classification to assist development of the network. The classification integrates information from a wide range of sources including interviews with marine specialists. The classification may also be used as a guide for external groups interested in proposing marine reserves. Consultation on potential marine reserve sites will continue to be a crucial component of the marine reserve establishment process.

Background

New Zealand has a coastline of more than 15,000 km and an Exclusive Economic Zone (EEZ) which extend 26° – 56° S latitude. The coast is varied and includes rocky shores, cliffs, harbours, beaches, fiords and bays.

The marine communities within the EEZ are diverse, ranging from sub-tropical to sub-antarctic regions and from shallow to deep. The wide variety of physical conditions and New Zealand’s geological isolation have contributed to a rich and varied marine flora and fauna, including many endemic species (Walls and Dingwall, 1995).

In New Zealand, the Marine Reserves Act 1971 is the legislative tool implemented to establish marine
reserves. Marine reserves are areas of the foreshore, sea and seabed within the territorial sea which are protected from harvesting and established for the scientific study of marine life in its natural state. There is no comparable legislation which protects marine areas further offshore.

Although the Act was promulgated in 1971, only 14 marine reserves have been established to date (February 1998), with the greatest progress being made during the 1990s (12 marine reserves established).

New Zealand’s record of marine protection lags far behind that on land, where approximately 30 per cent of the area, or 0.27 million km$^2$ is protected in some form of reserve. In comparison, approximately four per cent of the 0.16 million km$^2$ territorial sea is protected in marine reserves, with the Kermadec Islands Marine Reserve (748,000 ha) accounting for three-quarters of the total protected area. A further comparison with the total area of the EEZ of 4.8 million km$^2$ indicates just how minuscule the percentage of protected marine area really is (Statistics NZ, 1993).

There is a large and expanding scientific literature on the justification for and benefits of marine reserves. These include:

- Benefit to fisheries – insurance against stock collapse; buffer against recruitment failure; increases in densities and average sizes of individuals increases reproductive output; provide centres for dispersal of propagules and adults (ie. spillover); contain more ‘natural’ species composition, age structure, spawning potential and genetic variability (Alcala & Russ, 1990; Bohnsack, 1990; Bohnsack & Ault, 1996; Dugan & Davis, 1993; Polunin & Roberts, 1993; Rowley, 1994; Shepherd, 1991);
- Contribute to increased knowledge of marine systems (science and education) – information on functional linkages; implementation of the precautionary principle; provision of control sites for research and ecological benchmarks against which to measure human induced changes; potential as nodes in monitoring networks; more ‘natural’ systems where natural mortality can be compared with fishing mortality (Agardy, 1994; Ballantine, 1991; Bohnsack, 1990; Dayton et al, 1995; Roberts, 1997; Thrush et al, 1995);
- Protection of critical habitats eg. nursery grounds and spawning grounds (Agardy, 1994; Dayton et al, 1995; Roberts, 1997);
- Spatial escape for intensely exploited species (MacDiarmid & Breen, 1993); and,
- Protect genetic diversity of heavily exploited populations (Dayton et al, 1995).

The Convention on Biological Diversity and the New Zealand government strategy ‘Environment 2010’ have identified the need to protect representative examples of marine habitats. Through the Marine Reserves Act, the Department of Conservation (DoC) is facilitating the development of a network of marine reserves which includes complementary sites representing the range of marine habitats. The network will assist with protecting New Zealand’s biological diversity and natural heritage. This has been identified in departmental policies and the recently released Strategic Business Plan (Department of Conservation, 1995; 1998).

The limitation of the Marine Reserves Act to the territorial sea prevents protection of important deep water marine habitats such as seamounts, rises, trenches and canyons. Plans for the marine reserve network will focus, therefore, on establishing marine reserves in the near-shore area until such time as legislation is developed to extend protection beyond the territorial sea.

The current spread of marine reserves has occurred through an ad hoc approach where both outside groups and DoC have made applications in an attempt to create a geographic spread of reserves around the country. This approach was used because there was no agreed marine classification for New Zealand (Walls & McAlpine, 1993). A marine classification system is necessary to assist DoC with identifying the full range of habitats which in turn will aid with selection of sites with potential for reservation.

DoC has reviewed a number of classification systems and considered that Handford’s recommendation for a marine classification comprising broad geographic zones within which habitat/ecosystem types were identified for representation within a system or network was the most practical approach (Handford, 1987).

Past attempts at developing marine classifications for New Zealand have largely failed to gain the acceptance of the scientific community (eg. Powell, 1961; Knox, 1963, 1975; Dell, 1962 and King et al, 1985; also detailed in Walls, 1995).

DoC recognised that an acceptable scheme for selecting marine reserves required the involvement and cooperation of scientists and other specialists working in the marine environment.

There are four steps involved in developing a marine classification which fulfils the objectives of general acceptance by specialists, relevance to the Marine Re-
serves Act, providing a mechanism for identifying potential sites for protection; and, is user-friendly for non-scientists.

These are:

Step 1: Gain agreement from marine specialists on New Zealand’s marine biogeographic regions.

Step 2: Identify near-shore ‘marine units’ (within regions) by working with key specialists and collating all the relevant information currently available.

Step 3: Apply relevant criteria to identify sites with potential for marine reservation.

Step 4: Involve scientists, the community, stakeholders, interest groups and tangata whenua in the selection process of particular marine reserve proposals.

**Step 1**

Gaining the required level of agreement from marine specialists on marine biogeographic regions was a two-stage process undertaken in 1992. G. McAlpine and I presented a paper to the Second International Temperate Reefs Symposium where we stressed the need for a network of marine reserves and suggested “in the interests of marine science and conservation in New Zealand, a working group of scientists is formed to assist...” (Walls & McAlpine, 1993).

Having gained a favourable response from scientists at the symposium, DoC held a workshop in late 1992 which included specialists in a range of marine taxa, and marine geology, coastal geomorphology, oceanography, coastal resources and marine reserves. The information base used to develop the classification system included distribution patterns of fish, molluscs, echinoderms, bryozoans, sponges, ascidians, antipatharians, foraminiferans, brachiopods and algae. Factors used to differentiate distribution patterns included endemism and species diversity, as well as geological and oceanographic features. Following assessment and analysis of this information, the participants produced a map of New Zealand’s biogeographic regions (Figure 2). In all, eight biogeographic regions were identified. They ranged from the sub-tropical Kermadec Islands through to the cold temperate sub-antarctic. The very large central region was identified on the basis that it was an area of mixed water masses with a wide distribution of taxa. The Chatham Islands, situated in the sub-tropical convergence, was characterised by the absence of many taxa, probably as a result of the island group’s remoteness from mainland New Zealand (Walls, 1995).

However, the biogeographic regions cover areas of hundreds or thousands of square kilometres (mesoscale) and are of limited value in determining a network of marine reserves which generally focuses at the microscale (tens to hundreds of square kilometres) or smaller (picoscale). A system which worked at the scale of tens to hundreds of square kilometres was required to assist with identifying potential marine reserves.

The current spread of proposed and established marine reserves shows poor representation over large areas of the west and east coasts of the North and South Islands, while most of the offshore islands (excepting the Kermadec Islands) do not have any marine reserves.

The focus of the remainder of this paper is on the processes involved in Steps 2 and 3.

**Methodology**

**Step 2: Identify Near-Shore ‘Marine Units’ By Working with Key Specialists and Collating all the Relevant Information Currently Available**

DoC is regionally arranged into 13 conservancies covering the whole of New Zealand and 12 conservancies have coastlines. I interviewed specialist departmental staff working in each of the ‘coastal’ conservancies who, because they work in the area, have an excellent knowledge of the local coast and marine biota. Specialists from other institutions, such as regional councils and universities, were also involved and their contribution added to the information base.

The purpose of the interviews was to collate all relevant information – local knowledge, published and unpublished literature, and, to identify representative coastal marine areas within each conservancy on a 1:500,000 map. Each area was identified on the basis of local geology, geomorphology, marine biota and the influence of major water masses. Any unique or distinctive areas were also identified.

I later supplied the interview write-up and relevant references to the conservancy specialist for verification and endorsement.

The term ‘marine unit’ was used as a general descriptor for coastlines of tens to hundreds of kilometers.

**Step 3: Apply the Relevant Criteria to Identify Areas with Potential for Marine Reservation**

Selection criteria are used by managers to assist with identification and selection of protected marine areas and have two functions; (i) to assess the eligibility of sites; and, (ii) to prioritise the sites (Salm & Clark,
Figure 1. New Zealand marine biogeographic regions and locations of marine reserves and proposals. Note that the seaward extent of the regions has not been determined and is indicative only.
There are many types of criteria documented in the literature on protected marine areas (e.g., Salm & Clark, 1989; Kelleher & Kenchington, 1991).

Ideally, development and application of relevant criteria should be by agreement between specialists with each site assigned a score for each criterion and the scores then summed. The sites with the highest scores have the highest priority (Salm & Clark, 1989).

A preliminary set of key selection criteria for potential marine reserve sites was developed through consultation with specialists. These criteria were: (i) diversity, (ii) representativeness, (iii) special/distinctiveness, (iv) intactness/restorative potential, (v) connectedness; and, (vi) threat/risk. These criteria are based on natural resources values and are relevant to the Marine Reserves Act, 1971.

A single conservancy is examined as a case study and reported in this paper.

Results

The Nelson/Marlborough Conservancy was used as a case study because its coastal marine area has a wide diversity of habitats and physical influences. The conservancy lies within the very large ‘central’ marine biogeographic region. The coast is approximately 2,500 km long and incorporates the top of the South Island’s west coast, Farewell Spit, Golden Bay, Marlborough Sounds, Kaikoura coast and estuaries and embayments throughout. The west coast is exposed to the Tasman Sea and influenced by the Westland Current while the north facing coastal areas are influenced to varying degrees by the Cook Strait. The east coast is influenced by the Southland Current and exposed to the north, east and south (King et al, 1985).

The results showed there were 17 marine units, each one identified on the basis that it was uniquely different from the other (Figure 2).

Marine reserves and proposals in this conservancy are located in Unit 1 (Whanganui Inlet), Unit 4 (Abel Tasman National Park coast), Unit 6 (North-west Nelson), Unit 7 (French Pass – Durville Island), Unit 11 (Outer Queen Charlotte Sound) and Unit 17 (Kaikoura Peninsula).

The limitations to identifying the marine units for this conservancy were two-fold; firstly, not all marine units were surveyed in detail, in particular, the exposed west and east coasts, resulting in variable information on habitats and biota; and, secondly, the information was limited to diving depths (c. 30m).

The key criteria were considered in the context of the 17 marine units. However, because each unit was identified on the basis that it was uniquely different, use of selection criteria at this scale proved to be of limited value. It was apparent that application of the criteria would be most useful in determining priorities for particular sites within the marine units. Ideally, this would require a greater level of detail on habitats and species assemblages than provided by the larger marine units. However, when the marine units were compared with the current location and number of marine reserves and proposals, it was evident that there was poor representation over most of the conservancy even at the relatively coarse marine unit level.

Discussions and Conclusions

The marine classification uses an hierarchical approach based on eight biogeographic regions and smaller marine units within each region. The purpose of the classification is to assist with development of a network of marine reserves. The process of involving specialists to determine the broad divisions of areas is similar to that used for the Protected Natural Areas Programme which identifies key terrestrial habitats requiring protection.

The Nelson/Marlborough case study highlighted the variety of near-shore marine areas present for one relatively small area of the country. The study also indicated that more information was required on habitats and assemblages within the marine units if the selection criteria are to be put to use to identify sites for potential protection.

This is exemplified in a study by Davidson and Chadderton (1994) who examined the subtidal rocky communities of the Abel Tasman National Park coast (Unit 4). They quantitatively sampled dominant subtidal laminarian and fucoid algae, echinoids and herbivorous molluscs and showed that algae and grazer assemblages varied between granite and limestone substrata. They recommended that selection of one or more marine reserve sites within this marine unit would need to recognise the different community structures both between and within limestone and granite substrata. The existing marine reserve in this unit is representative of the granite coastline and its associated marine assemblages (Department of Conservation, 1993). On the basis of the recommendation of Davidson and Chadderton, it would be necessary to protect at least one other site characterised by a limestone substrate in this marine unit to ensure protection of sites repre-
Figure 2. Nelson Marlborough Conservancy marine units and locations of marine reserves and proposals. Note that the information used is limited to diving depths (c. 30m)
sentative of the marine unit.

Although the present paper focused on the marine units of a single conservancy and attempted to apply criteria to identify potential sites within marine units, it should be remembered that mesoscale areas may also require protection, such as; large areas which are unique (e.g. Kermadec Islands) or areas representative of a biogeographic region or a key ecological process. Other factors to be considered include the optimal size of particular sites and replication of sites. These concepts were not addressed in the case study, but should, nevertheless, be included for consideration when developing a marine reserve network.

While this paper has demonstrated the lack of information available for many near-shore areas, it also shows what can be achieved by getting specialists together to share information. This classification provides a framework within which more detailed investigations can focus.

For example, the Museum of New Zealand is currently investigating the ichthyofauna of the East Coast/Hawkes Bay ‘transition’ area and the Jackson Bay/Fiordland biogeographic ‘boundary’ between the central and southern biogeographic regions, to further refine our understanding of these areas (refer to Figure 1).

Although this paper has shown that refinement of the information within marine units is necessary, it is not a signal to wait for more information before a network of marine reserves can be further advanced. On the contrary, New Zealand should move swiftly to support the protection of more marine areas. The arguments in the scientific literature are persuasive, as are the lessons experienced in New Zealand already. New Zealand’s oldest marine reserve of 23 years, the Cape Rodney – Okakari Point Marine Reserve at Leigh, north of Auckland, now has populations of rock lobster which are more numerous, where individuals are of a larger size and where the population structure more ‘natural’ than similar areas which are fished (MacDiarmid & Breen, 1993). These are reasons enough to progress marine reserves.

This marine classification will, when completed, comprise a series of maps of each coastal conservancy showing all the marine units. Each unit will be separately described and can be updated whenever new information comes to light.

It will be a tool with which DoC, scientists, local communities, stakeholders, interest groups and tangata whenua can work together to identify potential sites for protection. The classification will underpin a marine reserves strategy which DoC is developing. That strategy will outline the direction the department will be taking for marine reserves in the future.

This classification deals only with the near-shore because of the limitation of the marine reserves legislation to the territorial sea. However, NIWA plans to develop a classification of deepwater habitats using information from a range of taxonomic groups to increase our knowledge of these largely ignored areas. It is hoped that some of those areas will also receive the benefits of protection at some stage in the future.

References


Australia’s Oceans Policy

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Australia is in the process of developing an Oceans Policy as a mechanism for meeting our responsibilities under the United Nations Convention on the Law of the Sea. It is worthwhile noting that this initiative has bipartisan political party support and so it should not be affected if there is a change in government at any future election.

In March 1997 a consultation paper was released for public comment. This proposed an Oceans Policy and covered all aspects of oceans management including biodiversity conservation, marine pollution, different marine industry management, science, international obligations and community participation. The Australian Government’s objectives for Ecologically Sustainable Development are a driving force behind the process.

In addition to the consultation paper a series of commissioned studies were released as seven issues papers and four background papers (see list below). These looked at a wide range of issues that are critical to the development of an oceans policy, including biodiversity conservation.

In December 1997 Environment Australia organised a public forum which reviewed an early draft of the vision, principles and major directions for the Policy. Many of the participants at the Forum noted that this early draft was quite weak particularly with regard to biodiversity conservation outcomes. As well it did not address the lack of co-ordination and the need to consider cross-cutting and cumulative impact of activities in the marine environment.

If the timetable for completion of the Policy is followed, then a draft document will be released in May 1998 (Environment Australia) with submissions closing in July.

So far, the process has also involved the establishment of a Ministerial Advisory Group consisting of representatives from the key non-government and industry sectors. The report of the Advisory Group will be finalised in March 1998. Additionally in late 1996 the Marine and Coastal Community Network undertook a survey of attitudes on Oceans Policy where 8,000 people were asked to respond to a questionnaire distributed by the Network.

Key messages coming from the background papers, the Forum, the Ministerial Advisory Group and the survey included:

- There is a need for the Policy to encompass a stewardship ethic and capacity building for NGOs and others
- There is a need for an integrated planning and management regime, which involves:
  - integrated regional management;
  - use of measurable objectives;
  - use of precautionary and adaptive management;
  - development of improved partnerships;
  - clear institutional arrangements;
  - adequate incentives; and
  - improved baseline understanding of the marine environment.
- The Oceans Policy must include the development of a national representative system of marine protected areas.

We also need to be clear in oceans management on whether we are talking about co-ordination or integration. The proposals for the Australian Oceans Policy are set against the background of the Offshore Constitutional Settlement which gave the Australian States management responsibility out to 3 nautical miles. The Federal Government then has responsibility in the EEZ outside of the 3 nautical miles.

One of the background papers looked a Biodiversity conservation (Ward et al 1997). The recommendations include:
1. Improving our knowledge of biodiversity.
2. Establishing an integrated management process for our marine jurisdiction in each region.
3. Improving our national capacity to manage the oceans.
4. Reducing the impacts of sector activities.
5. Monitoring and reporting on the condition of biodiversity.
6. Improving the community’s stewardship and participation.
7. Facilitating the participation of indigenous peoples.

Other countries are also considering the development of Oceans Policies. The United States Senate is currently discussing an Ocean Act and Canada has recently passed an Oceans Act.

**Papers from Australian Oceans Policy**


Changes in the Distribution of Epifaunal Reefs and Oysters During 130 Years of Dredging for Oysters in Foveaux Strait

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In the high-energy environment of Foveaux Strait aggregations of bryozoan epifaunal patch reefs form extensive reefs (here termed biogenic reefs) aligned with the direction of the strong tidal currents. Originally these reefs covered much of the seafloor.

The bryozoan, Cinctipora elegans principally forms the structure of biogenic reefs and the reef is further strengthened by the cementing of encrusting bryozoa ascidians sponges and tubiculous polychaetes. The molluscan epifauna is dominated by oysters (Tiostrea chilensis).

In Foveaux Strait oysters were originally found only on biogenic reefs. Fishers discovered that locally, only aggregations of biogenic reefs were large enough to warrant exploitation of their oysters. These local aggregations of reefs became known as oyster beds.

Dredging these oyster beds inevitably caught many of the organisms constituting the reefs and progressively broke up the reef structure and currents washed the fragments away. The delicate epifaunal species were crushed by dredging so finally the only epifauna remaining from the biogenic reefs were the robust oysters (whose beds became progressively more widespread).

Dredging has progressively destroyed most of the biogenic reefs in Foveaux Strait. The rate of destruction was slow early in the fishery, but the rate has got faster in the last 37 years as intensity of disturbance (with the introduction of heavier dredges) and frequency of disturbance (with the increase in number of vessels) from fishing greatly increased.

After biogenic reefs were destroyed locally, fishing mortality from highly focused dredging rapidly depleted the now more vulnerable oyster populations.

The destruction of biogenic reefs and subsequent depletion of oysters has followed a general pattern of serial depletion, starting in the eastern Foveaux Strait and finishing in western Foveaux Strait, and in each sector of Foveaux Strait starting in the centre and finishing in the northern and southern periphery.

Oysters appear to have higher growth rates and higher recruitment among biogenic reefs and the reefs have had some influence on survival of oysters in two major epizootics possibly mediated by allelopathic exudates of reef fauna.
A System of Marine Reserves: The Opportunity and the Obligation

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Abstract

Over the past 30 years, New Zealand has discussed the practicality and value of ‘no-take’ marine reserves. The first was established 20 years ago. There are now 14 in place. At least 25 more proposals are under active public discussion. All the major political parties say they favour more marine reserves. However, up till now each reserve proposal has been considered separately. Despite steadily increasing approval, there is no overall policy, no final aim and no timetable for the process.

The opportunity now exists to create a full system of marine reserves based on clear and generally-agreed principles:

(i) Full representation – of all regions, and all major habitats in each region;
(ii) Suitable replication – adjusting to popularity and guarding against accidents;
(iii) Network design – making the remote dispersal of most marine species an advantage;
(iv) Sufficient total amount to make the system self-sustainable (at least 10 per cent by area).

Our uses of the sea depend on its natural processes. Our power of positive control over these processes is minimal, but our ability to disrupt these processes is already large and is increasing rapidly. Our knowledge of these processes is still very limited. There is thus an obligation to keep areas in the sea maintained in their natural state as far as possible. This is important for science, valuable to education, helpful to many forms of recreation, and essential for marine conservation at all levels. Natural and unexploited areas in the sea are also required as insurance against ignorance and errors; and as support for exploited stocks.

Clear policy aims for a marine reserve system should be included in both general marine planning (e.g. the New Zealand Coastal Policy and Regional Coastal Plans) and in the management of exploited species (i.e. fisheries policy). At present both specifically exclude marine reserves from consideration.

The Opportunity

New Zealand has been considering ‘no-take’ marine reserves for more than 30 years. The first proposal – by the University of Auckland – was made in 1965. It took six years to get general empowering legislation passed (Marine Reserves Act, 1971), four more years to get the actual site gazetted and a further two years to establish the first reserve. Since then the rate of creating of new reserves has slowly, but steadily, increased. There are now 14 reserves in place, five more proposals sit on the Minister of Conservation’s desk awaiting final approval, and at least 25 more suggestions are under active public discussion. The range of organisations making or strongly supporting the existing reserves included government departments, conservation groups, commercial
fishers, Maori groups, educational organisations, diving clubs and local citizen associations. At the last election all the major political parties stated that they favoured the creation of more marine reserves.

Despite increasing support for the idea, so far the whole process of selection, discussion and approval has been conducted in isolation for each case. The approach has been localised, analytical and sectorial. ‘Policy’ has been restricted to approving reserves only after local groups have gained large amounts of support through their own efforts. This means that the pros and cons used in discussion focus on the particular case. Special features of the site and the opinion of small sectional interests become very important. It is difficult to raise general issues, to involve the wider public or to see where the whole process is heading.

It is now sensible and appropriate to move to a clear policy, based on generally-agreed principles. We can raise our thoughts above single reserves and aim for a system. We can consider what we want such a system to do. The opportunity exists to create a full and proper system of marine reserves.

We have had enough time to get used to the concept of permanent ‘no-take’ marine reserves – pieces of the sea with no extractions, no dumping, and no constructions. Places where people are welcome to appreciate and study the full natural development of marine life. Despite problems in setting up each new one, they are clearly practical in socio-political terms. Indeed, the longer reserves are in place the more popular they become. We have enough examples in place to work out what a system could and should do.

The existing reserves cover a wide range of regions, habitats and size. They have demonstrated their direct usefulness in science, education, recreation and conservation. Their indirect benefits – in support of exploited stocks, as insurance against ignorance, accidents and errors, and in measuring the effects of general management – are likely to be even more important.

The Principles

The principles for a system of marine reserves must be clear, basic and generally-agreed. This is quite possible. The four principles listed below are relatively simple and easily understood; they are firmly based on fundamental science and general experience: and they attract widespread agreement amongst anyone who has taken the trouble to think about the matter. If accepted, however, they are both subtle and far-reaching in their effects. The order of consideration is important. If followed, it allows simple and conservative distinctions to be effective. Any ‘difficulties’ at one level are much easier to resolve at the next.

1. Representation

On land, it took almost a hundred years to realise that all regions should have some reserves and that within each region all major natural habitats should be represented by at least one reserve. Not just pretty bits, not just remote areas, not even just the high-diversity places, but examples representing all. The same arguments apply equally well to the sea. Whether the approach is moral, religious or strictly rational, the conclusion is the same. If there are to be reserves at all, for whatever reasons, it makes sense to include examples of all major types.

Each region which has different life and conditions should have reserves (biogeographical representation) and, within each, all major habitats should be included in at least one reserve (ecological representation). The definition of difference should be kept simple and highly conservative – to maintain widespread agreement and to prevent nit-picking.

In New Zealand seas, there would probably be broad support for around seven marine geographic regions in waters out to the continental shelf edge: (i-iii) round the three off-shore island groups (Kermadecs, Chathams and sub-antarctic islands); (iv-vi) the northern, central and southern parts of the eastern coastal waters, and (vii) west coast waters. It is perfectly possible to subdivide further, but for our present purpose it is not necessary. Finer distinctions or additions can easily be made under ecological distinctions, replication and network design (see below). For the open ocean (out to 200nm) it would be sufficient to use the major oceanic fronts or convergences as regional boundaries.

Ecological distinctions can be made to any desired level, but again, clear and minimal distinctions are best. For example, off the north-east coast, it would be sufficient for present purposes to distinguish simply between four major habitat groups: (i) harbours and estuaries; (ii) semi-enclosed waters, like the inner Hauraki Gulf; (iii) the open coast out to the mid-shelf; and (iii) the open ocean beyond that.

2. Replication

If something is important, we must ensure it cannot be destroyed by a single accident. As granny used to say “don’t put all your eggs in one basket”. So in a marine reserve system each region should include more than one estuary, more than one piece of open coast, etc.
There are many other reasons for replication, including scientific (to exclude chance and measure variation), and social ones (some reserves are so popular there is danger of them being ‘loved to death’). Replication also allows ‘finer’ ecological distinctions to be included – e.g. since harbours and estuaries vary greatly in size, it helps to have ‘replicates’ that cover this range.

3. Network Design

The sea is different from land. On land single large reserves are generally best for the conservation of natural habitats and populations. But in the sea this is unlikely to be true. Most marine species have small dispersive stages in their life cycle – spores, eggs, or larvae – that drift in the currents for days or weeks before settling somewhere well away from their parents. Because of this feature, single marine reserves will not be self-sustaining, unless they are enormous – which is impractical.

However, a network of reserves, which allows the drift of larvae from one reserve to reach others, is potentially sustainable. The ‘mesh’ of the network will vary. In complex inshore areas, where different habitats form a dense mosaic, reserves would be relatively small and closely spaced. Further out in open waters with much less variation in depth and habitat, the reserves would be larger and further apart.

The purpose of a network is to maximise the variety of ‘connections’ (distances and directions between reserves) as well as their number. Since we rarely know the ‘sources and sinks’ of the larvae, we must take this precaution. But even if we could design optimally for one species, other species would have quite different requirements, so a network design is necessary (Roberts, 1997).

4. Self-sustainable Amount

While a network design is essential for sustainability, a series of tiny reserves would not be sufficient. The system must be large enough to sustain its full natural processes indefinitely, even when our management of the rest of the sea is imperfect. The key point is not the size of particular reserves (or their number) but the size of the whole system. This size is measured as a proportion of the whole sea – a percentage of area, and is maintained at all scales – regional, ecological, etc.

The aim is clear, but we do not know how much is required to achieve it. We must go back to even more basic principles. General experience and ecological principles make it likely that the self-sustainable amount is more than 10 per cent. The same experience strongly suggests that the total required is less than 50 per cent. Even this limited knowledge is sufficient to act on principle.

The immediate policy must to be place 10 per cent of all major habitats in all regions into the ‘no-take’ reserve system. This is equivalent to standard business practice of ‘10 per cent contingencies’ in a building contract. When and where we feel it is sensible to increase this amount, we should do so. Until recently, ‘no-take’ areas were generally regarded as a net loss to fishers. Many fisheries scientists now believe that ‘no-take’ areas are helpful to fisheries, and that 20 – 30 per cent ‘no-take’ actually increases overall yields (Bohnsack, 1996; Schmidt, 1997).

The Obligation

Compared to land, the sea is still largely natural. Despite the many and various changes we have made in the sea, its processes still proceed mainly in ways which would have occurred in our absence. Most of our uses of the sea, especially the harvesting of fish and shellfish, depend on the natural processes. Our power of positive control over these processes is minimal, although our power to disrupt them is already large and is increasing. Our knowledge of these processes is still very limited – the continuing rapid increase in our knowledge demonstrates this.

There is thus a real obligation to keep areas in the sea maintained in their natural state as far as possible. This is important for science, valuable to education, and helpful to many forms of recreation. It is essential for marine conservation at all levels. We need such areas as a base-line for evaluating management; as a hedge against unpredictable changes; as an insurance against ignorance or error; and as support for exploited stocks.

References


Maori, The Industry and Fishing

SHANE JONES
Muriwhenua Iwi, Treaty of Waitangi Fisheries Commissioner

Commercial fisheries

I specifically asked if the title of this speech could include industry and let me start by beginning there.

We have come a long way since 1986, but have a long way to go. For those of you who are familiar with the history surrounding Maori fisheries and the various attempts to litigate against the crown, you would know that about ten or twelve years ago we were confronted by a policy of privatising access rights to the commercial sea fishery, a conversion of the traditional system of permits and licences and a transformation into freely tradeable property rights known as quota, supposedly to rationalise the over concentration of effort and too many dollars, too many boats, too many people chasing an ever-diminishing resource called fish.

The government, as is its wont, proceeded to create these new rights believing that they ought to be given freely to the people who had already invested in the industry. The industry, as you may recall, mounted and sustained an argument that the boats and the effort that they had expended over the years gave them rights to receive quota free of charge.

The first major obstacle that they encountered was in the north, later joined by our relatives in Te Wai Pounamu, the Ngai Tahu, saying that there was a subsisting title to the fishery and that until that was dealt with it was both odd and unconstitutional for a new bunch of rights to be created. Colin Moyle was the minister back then – he has a sort of dim part in the recesses of our memory – and his officials basically said: “Well, interesting story, but that’s for fairy books”. That lead to litigation, a huge amount of money was spent, and it eventually materialised that Maori did indeed have property rights – ownership rights in the commercial fishery.

Then, in the early ‘90s an attempt, history will judge how endurable and sustainable the attempt has been, was made to settle Maori claims to the commercial sea fishery in a durable, and full and final sense. An interesting decision was made by the Maori leadership in the late ‘80s – that the manner in which the Maori interest of a commercial nature in the fishery would be settled, would be by taking possession of actual commercial assets. I can’t stress that enough, because that then opened up a huge number of potential contradictions and major areas of debate within Maoridom.

There were other options that Maori could have pursued in the late ‘80s. For example, there was a model that in order to reflect the Maori ownership interest in the fishery what you could do was have them, with the crown, operating a fisheries management system where they were both the recipients and collectors of rent.

Secondly, you could have a system where Maori were major players in the actual business and activity of fishing. I think we would have had a different set of consequences had a settlement emerged which enshrined Maori, in a regulatory sense, with the crown as the receivers of the rent from those who catch the fish – but that was not the route that was taken. The route that was taken was that if Maori have an interest in the fishery, it ought to be reflected through the actual business.

I’m not here to say that that was the wrong decision, but it has pushed some consequences that now characterise the debate between the environmental movement, between the Maori stewards of the capital that are represented in the commercial sector, and between those Maori that feel that over-commercialisation has actually ruined the Maori ethic, in respect of the marine environment anyway. And I should say that openly, as I’m often the object of many of those criticisms, having been a former employee of the Ministry of the Environment. That troubles me occasionally.

Now, what are some of these contradictions? First, When we took possession of actual fishing quota and shares in companies and other forms of capital, we
were immediately expected to be fine stewards of that capital. Because that capital is the institutional expression of the treaty legacy in so far as it relates to the commercial component of the Maori involvement in fisheries.

However, your stewardship in many respects is defined by how you perform in a highly competitive environment, whilst the moral underpinnings and the ethical admonitions may be that you should err on the side of caution. If there is a doubt about the sustainability of a fish stock or the damage being done to a particular ecosystem area, one should err and enable nature to heal herself.

The difficulty is arisen where the Maori players in the industry may be expressing that view, but the competitors in the industry who perhaps don’t face those similar moral or ethical constraints are quite prepared and are probably driven by shareholders to operate in a quite different manner. They operate completely within the confines of the law, and if their behaviour has to change, then you have a fight about the law.

That kind of stewardship, of being a good steward of the capital, has in some areas, and certainly in my own area, clashed with notions of stewardship of the actual resource, for the actual taonga of the fishery. In some respects what you have witnessed over the last two or three months through the press and over the television is a clash of approach and a clash of philosophy as to what is the proper and appropriate involvement for Maori in the fishery. Ought it to be a simple replication, a brown version of the ordinary behaviour of the fishing industry? That issue is unresolved.

That issue, however, flowed the day that we decided to settle our fishing grievances by taking a major stake of capital of assets and having to play the game by the rules that governed every other industry player. There was not a set of different rules created for Maori. There’s a set of different policies that have emerged from the fisheries commission, but not a different set of rules in terms of me as a commercial operator from Muriwhenua or a commercial operator who might be Talleys, Sanfords or whoever.

So what are some of these clashes? Firstly, many of the Maori communities are sick to death of hearing about fishing. It has been characterised by ugly debates between lawyers, confused debates between rural kin and urban cousins, and I think that what is emerging is that the debate has become confined to what the shape or form of Maori representation in the commercial fishery should be. There is no longer a debate about the quality of care to the coastal environment that used to be the flag and the catchcry in the early ‘80s, thanks to Nganeko Minihinnick and a host of other Maori advocates. They never dominated the scene, but their rhetoric and their approaches were of a different nature to those of today. We are slowly moving back to that and the commercial component that dominates the Maori debate at the moment is only a tiny piece. It should remain a small, but important, piece of the larger debate.

If we are serious in respect of Maori ethic, and in respect of providing a better backdrop for making sensible decisions about natural resources, then there must be a way of getting better information. In my view, as a community we suffer from poor information. A better way of getting information must be a way that Maori not only can monitor, but integrally be a part of, so that when we have the discussions and we fight the inevitable fights to protect more of the coastal environment for food gathering purposes or for preservation purposes, our vision is a bit wider than our leadership seems to reflect at the moment, which is ongoing internal politicking about the shape of our future commercial sector.

In a sense we are a microcosm of the bigger debate in Aotearoa, and that is a blessing or a curse depending on how you look at Maori politics. Every debate which is acted out on the national scene is acted out in our small communities. The small communities don’t have the resources and often don’t have the networks to access the sources of funding for information gathering, either from public goods side or from the manner in which fisheries-related science might be funded. A gulf exists between the iwi groupings and an environmental movement that is keen to see better information and scientific rigour. As long as that gulf is there, and there is poor sharing of information, we will get ongoing misunderstandings and fear – and rest assured those will be exploited. In many cases it will be quickly, and in my view, ill-defined, as an issue of race. Which it ought not to be.

**Customary rights**

The extent to which Maori customary rights have been retained is a matter of hot debate. I will give you my personal view. It is probably the view of a heretic, but that is my reputation – at the moment.

Customary rights were defined and understood, in the context of the fisheries settlement, to be primarily about food gathering. And as a part of food
gathering, enabling our marae, our hapu and some iwi groups to assume a role in managing that activity and effecting management influence and control over the areas from where the people could continue to engage in food gathering. It was never, ever, intended that customary fishing rights would be an opportunity to continue in commercial fishing.

The fundamental decision that was made was that if you want to get into the commercial arena and in the business and activity of fishing then you play by the rules like other commercial operators and you have quota and you abide by those rules. That may have been the wrong decision and future generations may curse us for having made it, but it has been made.

So, I am particularly aggrieved by, not only the ignorance of the media, but any suggestion that customary food gathering should be dressed up as an alternative form of commercial fishing. I think it is wrong philosophically and I think it is wrong in respect of the policy underlying the settlement. Similarly, I think it reduces the integrity and the status of wider customary rights. And we suffer enough the doubts and the slings and arrows of the general public, and unless there is a better definition and those of us who are of a wont to, stand and give a different view, I fear there will be erosion on a wider scale in respect of Maori customary rights.

What are some of the innovative approaches that are being undertaken, or ought to be undertaken? We have pretty blunt and crude instruments in terms of institutional responses – policies and legal responses. There are three models that have been tried to effect a better outcome of Maori involvement in the coastal environment – and I’m not talking about the land side at the moment, I’m just talking about te moana.

There were small endeavours earlier this century to use an instrument in the Maori affairs legislation called a section 439 reserve, and these were tiny reserves where, by restricting access from the land down to the sea, local marae could be assured of having a place to gather oysters and occasionally gather fish. They were so obscure and isolated they never really created a problem.

With the explosion, however, of the Auckland recreational and amateur fishing association and the power that they exert, power which unfortunately seems to be primarily visited on the area which I come from, in the northern parts of Hauraki, the instruments to settle their concerns and to enable Maori to continue to enjoy the relationship between their customary and historical areas are not good enough. The tiny Maori reserves are not large enough to actually sustain the needs of the local population.

Secondly, an attempt was made in 1989 and 1990 by Geoffrey Palmer to create a specific type of reserve called a taiapure. Very few of our kaumatua and leaders of that time agreed with that model, and I think that probably explains why it has not really gained much currency. It is highly bureaucratic, very expensive, and it is poorly understood within the Maori communities. By and large they were local community management mechanisms where there would be a deep level of involvement from the Maori, but you couldn’t exclude commercial fishing and you certainly had to work together with elements from your local community. Information on that is readily available from the Ministry of Fisheries.

The third issue are the mataitai regulations. Unfortunately, after four years of negotiations, a national set have not emerged. But for those of you who are keen to see how they might work in practice, I would encourage you to look at the rather elegant model and the pragmatism that was shown by the people who introduced them into the South Island. From what I know about them, the way in which they have worked down there provides quite a workable solution for other parts of the country. But I must confess this is probably a minority view.

Moving to the question of what role Maori ought to play in effecting a better set of futures, you can’t overlook the fact that fishing politics and the emotionalism surrounding fishing and my part of the coast has a local flavour. It is a tangata whenua issue. And the mere expression tangata whenua reflects the fact that there is a locality in mind and the custom often is defined and has particular application to a given location. So there has to be local responses to local challenges.

**Information supply**

In terms of national lobbying, the local voice is easily lost in the cacophony of confused agendas and people are easily split and divided unless there is also a national spearhead or drive. And one area where there has to be a better drive, and we ought to see better performance, is in the area of gathering information, sharing information, and expecting a higher quality of output from those institutions that are responsible for providing practical, credible information.

If you have any doubts about that look at the pitiful amount of money that has been delivered into the Maori
communities from the public good science fund over the last three or four years. It is humilitatingly low and it means one of two things: that Maori are too disorganised, or too lazy, to get off their arses to get the money; or they have been unable to penetrate the white coat brigade and get a decent share of the funds dedicated to purposes that have a local level of importance and are serving a Maori purpose. And I doubt if you would find very many universities or local Maori groups who would be either content or very knowledgeable as to why and how the funds are being distributed because information gathering is an expensive business.

It has led to an important debate, however, within the Maori sector of the commercial fisheries sector. As you know there is a levy system, and not insignificant amounts of money are yielded from the industry in order to administer the statutory framework within which fishing takes place. An important part of that surely is the gathering of information, and through sensible levels of information, and good information, hopefully we get good decisions. Although that is probably impossible given that we mediate it through mostly political processes at the end of the day. But unless the information gathering and the efficiency associated with providing that information is better monitored there will be and continue to emerge howls of disdain and disappointment from the Maori sector in the commercial fisheries saying “Gosh, we’ve just arrived, paying all this money out to administer a system that is actually not providing information or a service that meets the needs of where we are in our cycle of development or involvement with the fishery.” And the criticism that comes from Maori communities about access to funds and poor information is met by a criticism from within the same community with a commercial hat on. They are saying it is fine paying a tax, for want of a better expression, but unless the quality of services there and unless that service is meeting some of these Maori community needs in terms of natural resources, it is a tax with an inadequate return.

The trick, however, is that we must not allow those concerns to be hijacked or kidnapped by elements within the industry who have no intention of paying one cent.

Now I want to go back just to round off. In thinking through the Maori involvement with the fisheries and the coastal environment, the primary involvement has been with the transfer of assets and capital into Maori ownership and that has caused a host of tensions and a host of consequences which in some cases have pitted Maori against Maori, and have led to us having been identified as brown capitalists or as equally hedonistic and as capable of pillaging as every other supposed bad industry player. I think that rhetoric is predictable, but it’s not actually going to build bridges between the Maori owners of those assets because they hold assets that are more to be seen as a legacy.

It may prove in time that as a strategic decision another route could have been taken, but that is the route that we have.

Conclusions

So to cap off. Better information, better monitoring, and applications of information that actually meet the expectations and needs of Maori on a local community level as well as driving questions of fundamental science. By that I mean how sick, or how capable, fundamentally, is this natural resource called the coastal environment and its inhabitants, including fish. How safe is it.

Secondly, more innovative approaches that are developed in consultation with local communities. But more importantly, approaches that show that there is some local benefit to them. The question of customary fisheries is integral to the involvement of Maori through the settlement, integral to an effective system of managing fisheries, but in my view, primarily directed at enabling food gathering and the replenishment of that food source to continue.

And most importantly, please understand some of the dynamics that are happening within the Maori polity, for want of a better expression. Take away the debates between tribe to tribe. But the tension that exists when you receive a settlement in the form of capital, and you’re required to be a fine and good steward of that, whilst at the same time having to reach understandings, if not compromises, as to where is a safe and wise level to settle upon and respect of the pace and the depth to which you mine the underlying resource. Because the quota at the end of the day will be worthless unless there is a reservoir of resource that you can safely draw on and hand on to future generations so they will actually have some material benefit by way of the quota.

The red light has buzzed, I think, which means that I’ve talked almost as long as Sir Tipene would have, so I’d better shut up. Kia ora katou.
Community Involvement in Marine and Coastal Management: Australia’s Marine and Coastal Community Network

T. Flaherty, C. Bell and D.M. Tarte
Marine and Coastal Community Network – Australia

Abstract
The Marine and Coastal Community Network was established in May 1993 under the Australian Government’s marine conservation programme. It is coordinated by a national non-government organisation, the Australian Marine Conservation Society, under contract to the Australian government. Seven regional coordinators are located around the country.

The network’s mission is to achieve a cooperative and coordinated approach by the community, government and industry to the preservation of marine biodiversity and ecological processes and the ecologically sustainable use of the Australian marine and coastal environments.

Currently the network is involved in a number of key policy issues and programmes including development of a national oceans policy and establishment of a national representative system of marine protected areas. It has contributed to the development of the Australian Coastal Policy, establishment of the Coastcare community grants programme, various coastal management and planning regional studies, revision of fisheries legislation and management, and establishment of community monitoring programmes for introduced marine pests and seagrass communities.

The authors will summarise the work of the network during its four years of operations, areas of success and experience gained.

The MCCN
Since its establishment in 1993, the Marine and Coastal Community Network (MCCN) has become a major catalyst for increasing community awareness and involvement in the conservation and management of Australia’s marine and coastal areas. The network’s primary objective is to assist community involvement in caring for our oceans and coasts. It promotes the protection of critical areas and species and the wise use of resources to ensure long term sustainability of marine ecosystems.

The network is not a government agency, but is funded by the Australian government by way of a contract with the Australian Marine Conservation Society, a national, non-government, marine conservation organisation, to establish and coordinate the network nationally.

Aims, Goals and Principles
The network’s primary aim is to encourage and facilitate community support for the conservation and ecologically sustainable use of Australia’s marine and coastal areas. It seeks to:

• Promote understanding and awareness of impacts on marine systems and the need to manage human activities;
• Identify community, industry, other user groups and individuals who have interests in environments, and encourage liaison and collaboration amongst these sectors;
• Provide information and feedback from the community to all spheres of government;
• Encourage community participation in marine initiatives, both policy and on the activities; and
• Encourage industries and government agencies to consult, and work with local communities.

MCCN operations are premised on principles that seek to ensure that the network provides a forum for free discussion and facilitates community input into decision-making processes.

These are:
• The community has a right to be involved in decision-making.
• Good decision-making relies on relevant, accessible, up-to-date information that is clearly understandable.
• There is a need to manage human activities to ensure that long term sustainable use of marine systems can be achieved, and detrimental environmental impacts minimised;
• Everyone has a right to their point of view, but decisions that affect whole communities should be based on informed and considered opinions.

Over 6,000 individuals, groups and agencies participate in the network (Figure 1 provides an overview of the different categories of participants). Network participants include a wide-range of individuals and interest groups including Aboriginal and Torres Strait Islander peoples, aquaculture, conservation, consultants, diving, education, engineers, ethnic, farming, commercial and recreational fishing, local progress associations, media, natural history, petroleum, scientific, shipping and ports, surfing and tourism.

To operate efficiently the network requires supportive administrative structures. Our challenge, however, is to operate genuinely at the ‘grass roots’ level. A national coordinator oversees the work of seven regional coordinators, while a national assistant provides support to all in the production and distribution of newsletters, maintaining a national mailing list and web page and responding to inquiries.

A seven-person, voluntary National Reference Group helped establish the network and meets regularly to provide ongoing guidance and review. Members of the National Reference Group provide a wide range of marine, cross-sectoral experience including planning, policy, fisheries, conservation, tourism, indigenous, research, local government and education. Seven regional coordinators are located in Hobart, Adelaide, Perth, Townsville, Sydney, Melbourne and Darwin.

Figure 1: Overview of Participants’ Categories
They provide direct assistance and support to participants. The regional coordinators draw upon the expertise and advice of voluntary regional coordination committees.

Network Activities
Core activities of the MCCNs staff include establishing and linking contacts, producing quarterly national and regional newsletters, providing opportunities for feedback, organising and/or facilitating workshops, maintaining a web-site, and facilitating national awareness activities. The regional coordinators establish an extensive library of relevant information and draw upon the information resources of expert network participants and the Internet. Workshops on current marine and coastal issues are organised. The coordinators also are requested to facilitate other group’s workshops, particularly where the discussion topic is contentious and an ‘independent’, and knowledgeable facilitator is needed. The network facilitates and runs activities and displays in association with major events. It coordinates Ocean Care Day, an annual ‘event’ day on the first Sunday of summer in December. This is a day of community involvement and education that provides an opportunity for community groups to promote their work and the messages of marine conservation through community action. The network assists and facilitates the establishment and operations of community-based monitoring projects. It has also facilitated the formation of a number of important coastal and marine focused community groups seeking solutions to environmental problems. Coordinators are often requested to represent community interests on government and industry forums. They are involved in a number of state and local government legislative, policy and planning initiatives.

All coordinators provide information and interviews on marine and coastal issues and initiatives for the print and electronic media. Some coordinators also produce regular radio programmes for community radio.

An important aim of the MCCN is to remain responsive to the needs of its participants. Consequently the network has sought regular feedback on the direction of its activities. Participants and key people are canvassed for their views on network operations, priorities and directions, which then contribute to a strategic plan and work programmes. Network participants scored the following tasks as the main priorities for the regional coordinators: meetings with key stakeholders; regular contacts with government agencies; meetings with participants; organising specialist workshops; preparation of material on specific marine topics; and distributing relevant information. These activities were also seen as key performance indicators. Other indicators include the generation of media stories, assistance to relevant groups for submissions and involvement in relevant field projects.

Case Studies To Date
The following are examples of how the MCCN is working in various parts of Australia.

Progressing an Oceans Policy...
Community Participation, Public Awareness and Understanding

In response to the entering into force of the United Nation’s Convention on the Law of the Sea, the Australian government is progressing the preparation of a national oceans policy. As a lead up to the development of this policy, the MCCN designed and distributed a survey to gauge community perceptions and values associated with Australia’s marine areas. The survey targeted a non-probability quota sample of over 8000 people. The majority contacted could be assumed to have a current interest in marine and coastal areas. A total of 896 persons responded to the oceans policy survey, a response rate of 11 per cent.

What does the community think of our oceans? The majority (87 per cent) of respondents considered Australia’s marine environment requires stronger levels of environmental protection. Less than two per cent considered that Australia’s marine environment can withstand further development, and less than four per cent think that current levels of resource use and environmental protection are adequate. Two-thirds of respondents (65 per cent) felt that Australia’s seas were in a fair condition. At a national level, only seven per cent of respondents considered Australia’s seas to be generally in good condition, and 27 per cent considered the seas to be generally in poor condition. The three most important concerns were water quality issues, fisheries management issues and marine protected areas.

The majority (91 per cent) of respondents considered that water quality issues and marine pollution (including ballast water and the introduction of exotic species) should be addressed by the oceans policy. Overall, 73 per cent of respondents considered that domestic and/or foreign commercial fishing and depleted fish stocks were important issues for the oceans policy to address. Marine national parks were considered by 59 per cent of respondents to be an important topic for...
the policy to address. The draft oceans policy will be released in early March at which time the network coordinators will organise a series of workshops in each of their regions to assist community and sectoral comment on the draft policy. From discussions to date and a review of the survey results, the MCCN has identified that the oceans policy will need to address a range of issues including: increased knowledge and understanding of the marine environment, both at the scientific and community level; the benefits and impacts of the use of the marine environment; the need for a stewardship ethic; and capacity building of individuals and organisations.

**Progressing Marine Protected Areas**

The network facilitates community discussion on Marine Protected Areas (MPAs). This reflects the Australian government’s commitment to establishing a National Representative System of MPAs. Numerous workshops, travelling displays and forums relating to MPAs have been organised, as well as tours of key speakers. In Victoria, the network initiated a series of seminars about MPAs to raise the level of informed debate surrounding the role of MPAs as a means of protecting ecological processes and conserving biodiversity. Regional seminars were facilitated during the public comment period for marine park proposals. The number of public submissions received on the proposal rose dramatically after the seminars. The Victorian Land Conservation Council noted that the network’s role was catalytic in encouraging community input. In South Australia, public forums and information nights on the Great Australian Bight Marine Park (GABMP) proposal were organised and facilitated in Adelaide and Ceduna. As well several public forums on MPAs and marine conservation have also been held. The establishment of the GABMP has now been initiated by the state government and the Australian government has announced its commitment to establish a marine park in adjoining commonwealth waters.

In Tasmania, the network has organized a range of workshops and seminars promoting the value of marine reserves in marine ecosystem protection measures. These workshops have involved a very diverse range of interest groups. The network acts as an information clearing-house on MPAs and receives many requests from groups and individuals. The MCCN has also organised specialist seminars on habitats such as sea mounts and the need for their protection. In part as a result of these initiatives Tasmania is the only Australian state where the peak recreational and commercial fishing organisations accept the ‘no-take’ approach to Western Australia, the network coordinator undertook a two-month tour of regional areas promoting MPAs which facilitated submissions on the state government’s report on proposed MPAs. The network co-hosted, with the Australian Marine Conservation Society, a national series of public lectures by Professor David Bellamy about marine conservation and network organised a series of regional public lectures by New Zealand marine reserve advocate, Dr Bill Ballantine on the value of MPAs, in particular ‘no-take’ reserves.

A good example of an outcome directly related to network activities is the Victorian Environment Conservation Council’s moves to recommend the establishment of a Marine Protected Area in the southern end of Port Phillip Bay. The announcement was made during the first meeting held between the network and the recently restructured council. The proposal to have the southern end of Port Phillip Bay encompassed by a MPA has been one of the network’s work priorities in Victoria over the past three years. The area was the first priority for a MPA presented to the state government in November 1997. Progress for establishment appears well underway. The number of organisations and individuals beginning to openly support MPAs continues to grow although opposition is still encountered particularly from sectors with vested interests. Throughout Australia there are an increasing number of local communities putting forward proposals for ‘no-take’ marine reserves. These groups frequently seek the network’s assistance in providing information and coordinating data collection and scientific contacts for surveys.

**Darwin Harbour Proposals**

A Case Study from Northern Australia

Darwin Harbour is almost twice the size of Sydney Harbour and is in relatively good condition. The harbour’s shores support some 17,500 ha of mangroves which contribute to substantial commercial and recreational fisheries.

In 1990, the Northern Territory (NT) government released the Darwin Land Use Structure Plan 1990. Proposed developments for the harbour included a port, oil tank relocation, the damming of a major tributary of the harbour for recreational purposes, insect control for planned nearby suburbs, a LPG processing plant and a large canal development named Darwin South. The Darwin City Council in 1991 conducted
a survey of Darwin residents. Of those interviewed 20 per cent wanted no foreshore development at all; and a further 56 per cent wanted low key development in limited foreshore areas.

Following community concern, the network organised a number of public meetings, with a range of speakers providing differing views about the Darwin Harbour development proposals. The meetings attracted considerable media coverage. After the 1994 meeting, the government dropped the Darwin South canal development. MCCN never advocated a particular viewpoint or position during the dispute. Rather, it organised meetings of relevant parties to discuss issues which provided opportunities for the participants to discover that they had much in common. The network helped by suggesting contacts and resources for those concerned by the development proposals.

An overarching concern regarding Darwin Harbour has been the lack of a coordinated harbour and catchment management plan. In 1996 the network conducted a survey of Darwin residents’ attitudes to Darwin Harbour. The survey found overwhelming support for harbour protection and careful management from a surprisingly wide cross section of the community. The majority of residents felt that the harbour is more important for its natural values rather than human uses. Aboriginal people felt that the harbour remained central to their cultural and spiritual life. While support had been demonstrated in the past, it was valuable to accurately quantify it in a professionally designed and statistically valid survey that will not be easily dismissed by harbour decision-makers. Following the release of the survey results in February 1997, the proclamation of The Charles Darwin Park was announced. It will protect approximately four per cent of harbour mangroves.

Community Involvement in Monitoring

Divers can be pioneering scientists, since virtually nothing is known about many marine creatures. With this in mind the network sought to establish a pilot dive monitoring programme, called Dragon Search, to encourage diver participation in marine natural history. Seadragons are spectacular small fish with a delicate seaweed-like appearance. Related to seahorses, two species, the Leafy and Weedy seadragons, are found only in southern Australian waters. They are icon species for southern Australian marine endemism. Many divers record their sightings of seadragons in their dive logs.

Dragon Search encourages divers to submit records of sightings, with habitat and other information. Non-divers have been involved in the project by recording beach-washed records of the species. This information is entered on a database to gain a broader knowledge of distribution, status and life history. The information is helping to define important habitat areas for these fish and may assist in the establishment of marine protected areas.

The project also aims to involve divers in general marine conservation issues and heighten public awareness for marine habitat protection. This pilot experience with divers has been used to better assist and develop a habitat monitoring project, Reefwatch, which looks at long-term monitoring of temperate reefs.

The Dragon Search project has succeeded in creating awareness of potential impacts to seahorses, pipefish and seadragons and, more importantly, their habitat. Over 500 groups and individuals are involved in South Australia, and community groups in four other states have recently received Coastcare grant funding to initiate the project and contribute to a national database.

There has been increased community concern over unregulated exploitation of seahorses and seadragons (ie. syngnathid fish). As a result the Australian government has recently introduced an export permitting system for these fish. A number of state governments also have started the process of examining policies for their protection.

What Have We Learned?

Key Considerations in Networking

Networking facilitates links between groups and individuals and encourages more informed and energetic groups. Its strength and dynamism comes from grass roots participation. To be successful, emphasis must be placed on cross linkages between participants, rather than establishing a top-heavy hierarchy of responsibility. In terms of ‘networking’ it is important to:

- Identify the issue(s) carefully;
- Take time to establish trust;
- Be relevant;
- Have continuity;
- Build laterally, rather than vertically.
As networkers in marine areas we have come to realise:

• There is a great deal of interest, concern and enthusiasm within communities; people genuinely want to do something; people acknowledge the need for networking and want more information;

• There is little knowledge of marine conservation and concerns are often very localised. The network seeks to make available up-to-date information, and stays informed of current research and government initiatives;

• Despite limited knowledge, there are issues, icons and habitats that attract the public’s attention. These can be used to generate community involvement and response to management and planning processes;

• People are confused about who is responsible. People need to know which agency or group to approach if there is a concern; how to report a problem, or seek information, addresses and phone numbers. Here the MCCN has an important role in knowing whom to contact, and how. Our contact directories are a specific response to this issue;

• People are only just starting to communicate across state boundaries. Many issues are national, such as ballast water and the impacts of fishing and shipping. Yet there have been few truly national efforts to address problems.

**Future Directions**

The success of the network nationally can be related to a receptive and supportive bureaucratic environment. Continued funding can be directly attributed to the response of a wide range of network participants in industry, community and government who have voiced their support for continued funding of the network.

The network’s role in disseminating information is a key component in ensuring the community has adequate knowledge to contribute to management processes. Two major programme areas in the immediate future are the development of Australia’s oceans policy and the establishment of the national representative system of Marine Protected Areas.

The network’s role as a mechanism for conflict resolution has best been achieved in the organisation of community workshops and distribution of information, to provide a balance of information.

In a recent issues paper on socio-cultural considerations written for the Australian Ocean’s Policy (Claridge 1997), the elements of successful collaborative management are reviewed. They include:

• A supporting cultural and bureaucratic environment;

• Participating stakeholders have adequate skills and knowledge to allow them to play their assigned role in the collaborative management process;

• An adequate and appropriate organisational structure exists to support and facilitate the collaborative activities;

• Collaborative activities are adequately funded;

• Primary stakeholders support, or at the minimum do not oppose, the collaborative process;

• An established process of monitoring and review that takes into account process and performance and in which the community members participate;

• Conflict resolution mechanisms exist;

• Clearly defined boundaries and membership for the collaborative arrangement resource management rules are appropriate to local conditions;

• Potential for collective modification of rules by those affected;

• A system of graduated sanctions for infringement of rules;

• There are nested management units;

• There is an appropriate and agreed policy regarding extension and replication of the model to other stakeholder groups wishing to emulate the collaborative management structure.

The network is not strictly a collaborative/co-management arrangement. However, it contains many of the elements that should be strived for in successful community involvement.

A number of important steps can improve community participation in management (Claridge 1997) including:

• Developing a coordinated strategy for encouraging collaborative management;

• Focusing a significant effort to turning Australia’s beach culture into an ‘ocean culture’;

• Greater involvement of industry in collaborative management arrangements;

• Generating real commitment to sharing responsibilities;

• Exploring the range of types of collaborative management arrangements.
The network undertakes regular review and a strategic planning process that allow it to reassess priorities and directions. Indeed, in Claridge’s recent review of collaborative management the MCCN is recognised as one of the few arrangements in its field to have carried out any kind of review of the factors that promote success in reaching its objectives. Much discussion on management of marine and coastal environments is related to the nature and development of a stewardship ethic. A weakness in developing this and other collaborative management mechanisms lies in the lack of attention paid to efforts to change and develop social norms. Such efforts should encourage change in behaviour that give rise to personal and corporate stewardship ethics (Claridge 1997). MCCN is a suitable mechanism to develop community participation through information sharing and assistance with decision making processes. As its participants have increased and diversified it has the potential to further develop the necessary awareness base to facilitate continuing change of social attitudes.

The challenge for the network is to maintain momentum. It needs to evolve to better facilitate the change within which appropriate management and community participation can occur and collaborative management can better develop.

The other major challenge facing the network is its own success. As the number of participants grows, there are more and more demands on the regional coordinators’ time and skills. It is becoming increasingly difficult to cater to all community needs and requests, and still maintain a strategic approach to national issues. In having to become more selective in dealing with community requests there is always the danger of alienating sections of it.

Further Reading


Marine and Coastal Community Network 1997, Prospectus, Brisbane.

Kia Ora Tonu te ‘Mauri’, o nga Moana te Taitokerau mo nga Uri Whakatupu

To Maintain and Enhance the Life-force of the Seas of Northland for Future Generations

MAIKI MARKS
Secretary, policy and planning, Kororareka Marae Society Incorporated

He mea hanga, Ko Papatuanuku te paparahi, The house is constructed. Papatuanuku is its floor,  
Ko nga maunga nga poupou, Mountains are its posts and the sky is its roof  
Ko te Rangi e titiro iho nei te tuanui Pihanga Tohora faces Te Ramaroa,  
Pihanga Tohora titiro ki Te Ramaroa, Te Ramaroa faces Whiria  
Te Ramaroa titiro ki Whiria The root of anger, the proceedings of Rahiri  
Ko te païaka o te riri, ko te kawa o Rahiri Whiria faces Pangaru and Papata  
Whiria titiro ki Pangaru ki Papata The numerous trees that stand in the west.  
Ki te rakau-tu-papata i tu ki te Taihau-a-uru Pangaru Papata faces Maunga-taniwha,  
Pangaru Papata titiro ki Maunga-taniwha, Maunga-taniwha faces Tokerau,  
Maungataniwha titiro ki Tokerau, Tokerau faces Rakau-mangamanga  
Tokerau titiro ki Rakau-mangamanga, Rakau-mangamanga faces Manaia,  
Rakaumangamanga titiro ki Manaia, Manaia faces Tutamoe,  
Manaia titiro ki Tutamoe, Tutamoe faces Maunganui,  
Tutamoe titiro ki Maunganui, Maunganui faces Pihanga Tohora  
Maunganui titiro ki Pihanga Tohora This is the house of Ngapuhi  
Ko te whare ia tenei o Ngapuhi  

Ko Rahiri te Tupuna Rahiri is the ancestor  
Ko Maiki te Maunga Maiki is the mountain  
Ko Pikopiko i Whiti te Moana Te moana o Pikopiko i Whiti is the sea  
Ko Kororareka te Marae Kororareka is the marae  
He Paangakainga tenei o nga iwi o te motu This is a place of many Pa which housed the people of the land
Abstract
This paper is about the practice of Kaitiakitanga (guardianship) over te moana o Pikopiko i Whiti (the inner sea of the Bay of Islands) and the Resource Management Act and its accompanying processes and procedures, enforced by territorial authorities in Northland which limit, frustrate and create enormous workloads and costs for Kaitiaki (guardians) and Kai-tautoko (supporters) of Te Ao Maori (the Maori world view).

The Kororareka marae society was established to build a marae and to promote te reo Maori and tikanga Maori (Maori language and culture) in Kororareka. With the advent of the Resource Management Act and the adoption of significant aspects of Te Ao Maori (the Maori world view) members have taken a proactive stance to protect taonga tuku iho (precious gifts handed down into our care) by establishing quality systems, processes and procedures from a Maori base. Transparent and open management systems ensure that all participants are able to determine the nature and scope of such practice.

This paper will present case studies arising from the practices of Kaitiakitanga in te moana o Pikopiko i Whiti and the Kororareka environs (the inner sea of the Bay of Islands and Russell). We will provide examples which reveal the nature of the relationship of Maori and our culture and traditions, our ancestral lands, sites, water, waihi tapu and other taonga.

Introduction
We have laws passed by parliament. One of these laws is the Resource Management Act, where parliament has passed down to regional and district councils, the authority to make laws and rules, for the environment, in their own areas.

The Resource Management Act has provisions for the Treaty partners to realise the common goal of caring for our environment. These provisions are set out in Part II of the Act, and I would like to quote two of them:

Section 6: Matters of National Importance – In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of the natural and physical resources, shall recognise and provide for the following matters of national importance:
(e) The relationship of Maori and their culture and traditions with their ancestral lands, water sites, waahi tapu, and other taonga;

Section 8: Treaty of Waitangi – In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

The Northland Regional Council and the Far North District Council have yet to adequately implement processes addressing sections 6(e), 7(a) and 8 of the Act. These councils rely on the resource consent process to accommodate these sections of the RMA, with little regard to the principles of the Treaty.

The Crown cannot evade its Treaty obligations by conferring authority on some other bodies. We, the tangata whenua maintain that regional and district councils possessing powers delegated by parliament are responsible for the living application of the principles of the Treaty of Waitangi.

The way the Resource Management Act has been written, when we talk of a regional council, or a district council we mean that all people, employees, officers, managers and councillors who exercise authority under the Act are subject to Part 11 of the Act.

The exercising of this authority delegated by parliament includes all district and regional plans, and all resource consents considered or issued under these plans. This is the background we are posing with my paper. Do district and regional councils know they are Treaty partners? The example we have chosen, revealing answers to this question, is the disposal of sewage into Uruti Bay, Kororareka, Russell.

Background
Practising Kaitiakitanga throughout Te Taitokerau is a challenge. The Resource Management Act 1991 requires territorial bodies and others, Far North District Council, Northland Regional Council, Department of Conservation and central government to recognise and provide for the relationship of Maori, our culture and traditions, our ancestral lands, sites, water, waahi tapu and other taonga. Kaitiaki (guardians) and Kaitautoko (supporters of the common kaupapa or cause) are consistently and overwhelmingly compromised by
broad and varied interpretations of territorial bodies of their rules and plans which produce negative outcomes for Te Ao Maori. As well as coping with Pakeha law, processes, procedures and governance, kaitiaki and kaitautoko must also cope with the effects of colonisation and the subsequent breakdown of Te Ao Maori (the Maori world view) in Te Taitokerau.

Current Maori leadership are expected to achieve cultural, spiritual, social, economic and political outcomes for their people. There is a lack of skills or knowledge to fulfill these obligations and expectations. The work of kaitiaki and kaitautoko is carried out under the double burden of the expectations arising from the Maori and Pakeha worlds, the new world and the old.

This paper outlines the Russell sewage case and highlights the role played by Kaitiaki and kaitautoko and the dominant stance taken by the Far North District Council, Northland Regional Council to deny the existence and practice of Maori cultural values and traditions, over our ancestral lands, sites, waahi tapu, water and other taonga.

Prior to 1991, Maori groups worked independently to ensure that the rivers and seas in the Bay of Islands were free of human effluent. In 1988 local Maori of Kororareka, Te Runanga o Taumarere and Te A watapu o Taumarere effectively stopped the Bay of Islands County Council from erecting a sewage plant and discharge of effluent into Kororareka Bay. Kaitiaki and Kaitautoko spent a year researching the significance of the site.

The Hikuwai waahi tapu was found to be directly in the pathway of the sewage plant. Maori presented their findings to Kaumatua and Kuia, council engineers and others. They agreed that water containing human effluent could not flow over waahi tapu. They found this practice unacceptable and offensive.

Kororareka Sewage System

In 1989 the Far North District Council (FNDC) was established. The council in its second term of office, introduced a land-based sewage system for Kororareka. FNDC was confident that this plan would be acceptable to Maori. Numerous preliminary consultation hui took place with community groups, oyster farmers, Russell Ratepayers Association, Russell Protection Society, Te Runanga o Taumarere, Kororareka Marae Society and others. Maori groups supported the need for a sewage system for Kororareka. The point of dissent for Maori was the discharge of effluent into the sea at Uruti Bay. This process was lengthy and costly for Kaitiaki and Kaitautoko. The council spent considerable time and ratepayer money promoting their scheme to Maori which they claimed was acceptable to other Maori and Pakeha.

A special hui was called by Te Runanga o Taumarere and the Kororareka marae society to address the application for a resource consent by the Far North District Council to the Northland Regional Council (NRC) for a water right to discharge treated sewage to sea. The purpose of the meeting was to ask that NRC refuse application to FNDC and replace the proposed method of discharge with one that was culturally appropriate and acceptable to Maori.

The Runanga was advised by a council consultant (Maori liaison person) “to not take the council to appeal because they would never win, and the council had never lost a case.” However, members present were unanimous in their decision to fight to protect the mauri of the bay by stopping sewage discharge into it. This episode highlights the role of kupapa Maori applies to Maori who side with Pakeha without a mandate from the people they are purported to represent. The issues are the usurping of traditional authority (Tino Rangatiratanga) by kupapa Maori and the failure of local authorities (as Treaty partners) to properly identify who they should be consulting with, and to have in place a protocol agreed to by both the Treaty partners.
SeaViews

Maori in this saga. 1

**Trying to Reason with Council**

A pre-hearing conference was held in Whangarei in October 1994. Legal fees and technical expertise became an issue at this time. Te Runanga o Taumarere, Te Awatapu o Taumarere and Kororareka marae and others contributed to the legal costs generated by the appeal hearing.

Meanwhile the district council commissioned an independent report at the end of 1994 from an engineering firm. The report showed that land disposal options were feasible, affordable, and would remove bacteria, viruses and retard nutrient build-up better than the proposed disposal system to Uruti Bay. The report concluded that the scoria trench option proposed by council disregarded the adverse effects on oyster farms, Maori collecting kai moana, tourists and others.

At this stage Maori were full participants working alongside others on all aspects of a land-based sewage system for Kororareka. A group called Keep Our Harbours Clean (KOHC) was formed by concerned citizens, including oyster farmers, tourist operators, Te Runanga o Taumarere, Kororareka marae society, Russell Ratepayers and Citizens and the Russell Protection society, all working for land disposal of Russell sewage.

A mediation meeting took place in Paihia on the January 31, 1995. The positions of the appellants were presented to the district and regional council representatives.

The appellants did not oppose a sewage treatment and disposal scheme for Kororareka. They opposed the decisions of the Northland Regional Council and FNDC to grant a resource consent for the discharge of effluent. The appellants asked FNDC to determine the feasibility of disposing treated effluent by a combination of land irrigation and deep bore injection. They made it clear to the council that they would fully support consent applications for a properly engineered land disposal. Work could then proceed without delay on the property adjacent to the treatment plant offered by a local landowner.

The Kororareka Marae Society and Te Runanga o Taumarere opposed the spiritually and culturally insensitive method of effluent disposal which FNDC had applied for.

There were alternative methods of treated effluent disposal which were not offensive to Maori. The Resource Management Act requires FNDC to investigate alternatives when applying for resource consents, and requires the consent authority to have regard to these alternatives when considering any application. Uruti Bay is a traditional shellfish gathering place. Land is the best method for disposal of human effluent as it is spiritually and culturally acceptable to Maori because the end product is cleaned by passing through the earth.

An appointed mediator asked council representatives to take these requests under consideration and to report back. In the end, the council chose not to pursue the land disposal options, at this time, preferring instead to spend ratepayers’ money defending the council proposal before the Planning Tribunal.

**Community Support Grows**

Te Runanga o Taumarere, Kororareka marae society and others raised funds from the local community. Support for the kaupapa (conservation of our coast) was phenomenal.

In July 1995, the FNDC Mayor Sue James called in the Parliamentary Commissioner for the Environment, Helen Hughes, as an independent advisor. Representatives from the Kororareka marae society and others met with the commissioner’s representatives to express their concerns.

As a result, the commissioner sent a letter to the mayor expressing concerns about aspects of the council’s proposal, asking for simple background information (e.g. the results of water quality testing at Uruti Bay and Orongo Bays, a detailed map of the site, a copy of the lease on the treatment site) The council’s reply, three months later, was sent the same week that the Planning Tribunal gave notice of the upcoming hearing.

As was expected the Parliamentary Commissioner for the Environment could not give any further assistance once the hearing had been set.

The hearing took place in Kaikohe over 12 days in August, September and October 1995. Appeal was made under section 120 of the Resource Management Act, 1991.

The Planning Tribunal released a 61-page interim decision, dated November 24, 1995, which effectively ordered the Far North District Council to investigate the bore disposal option of the treated sewage effluent.

A summary of the Planning Tribunal findings “…we find the district council’s proposal generally serves the sustainable management of natural and physical
resources as defined. However it falls short of promoting that purpose and of meeting the expectations of the provisions of Part II of the [Resource Management Act] in the particular respect that the effluent disposal fails to provide for the attitudes of the tangata whenua in respect of their customary taking of shellfish from the beds of Te Uruti Bay for traditional marae hospitality according to their culture. We also find that the feasibility of another option for effluent disposal which would avoid those adverse cultural effects has not been adequately investigated.”

Consideration and interim conclusion of the Planning Tribunal includes: “We are not seeking to avoid making a decision. We recognise that there is tension and conflict between important public interests. However, we are not satisfied that the district council, in rejecting ground disposal, gave Maori cultural attitudes to the present proposal the weight and importance that parliament intended. In our judgement, the feasibility of the ground disposal option that would avoid conflict with those cultural needs has not been investigated to the stage that would give them the importance and weight intended. In those circumstances we would grant the discharge permit in the evidence presented to us.

“However we recognise that if the district council makes further investigations into the ground disposal option and finds that it is not feasible, it may well wish to pursue the present proposal again. In that event, it should not have to start again with fresh applications...

“Likewise if the district council decides to pursue ground disposal, it would need to apply for resource consent for that, but would wish to obtain the other resource consents the subject of these proceedings. For those reasons we are not by this decision allowing appeals. We are giving this as an interim decision, to allow the district council to reconsider its position in the light of it. We would be willing to consider the proceedings further, including by re-opening the hearing if requested, after the district council has further investigated ground disposal of effluent and either has obtained resource consent for that and/or wishes to present further evidence to show that[it] is not a feasible option.

“The Tribunal’s decision on these appeals is therefore further reserved accordingly.”

**Cost to Ratepayers**

The total estimated Planning Tribunal costs incurred up to February 1996 by council, was $238,472.47. The appellants costs, including donated services were considerable and represented a significant burden for a small community. The Keep Our Harbours Clean group (KOHC) contended that this expenditure could have been avoided if council had listened to the community from the start of planning the scheme.

**Council Fails to Deliver**

In December 1995 by letter from the councils’ lawyer the appellants were promised a meeting: “The council would like to give all parties involved with the hearing an opportunity to have some input into the formulation of investigation plans.” A meeting in January, was proposed saying that the appellant parties, “may wish to have your own experts” at the meeting. However, council proceeded to tender out investigation work and delayed the promised meeting until September 9, 1996.

**Visit to Borehole Investigation**

In early May 1996, having just learned of the borehole investigation (then near completion) the council’s lawyer hastily arranged a site visit by the appellants. Disappointed at not having been kept informed of the district council’s activities over the past five months, the appellants viewed the three test holes and received an explanation of the method of work by the on-site engineer. The geologist and consultant to the appellants, was unable to attend the site visit, as he was given only one day’s prior notice by the district council.

Subsequent borehole investigations and review of findings revealed the continuing inability of council to establish a working relationship with the community.

The appellants emphasized: “It is important that all parties work together towards a mutually acceptable method for the disposal of Russell sewage”. There was again an escalation of costs with further reports from consultants engaged by council.

The burden was on the community to employ experts to respond to these reports. The council agreed for the next steps to include:

“...that the brief for the further investigation be jointly developed by technical experts employed by the appellants and the council...”

“...that the brief be circulated amongst the parties for agreement before the investigation is implemented.”

By October 1996, the council had acknowledged considerable cost over runs for the project. Issues of equity were commented on by the mayor “...it was
unfair that some 640 Russell ratepayers were expected to pay for a system which requires a peak loading to cater for 4,500,” and said she would push for regional and national funding. KOHC was pleased that the mayor arrived at the decision and hoped for a successful outcome in her attempt to gain funding.

**Conclusion**

Major concern remains because of distrust of council. The continuing parade of experts, technical and financial reports has not helped this situation.

There is a real need for Kaitiaki and Kaitautoko to be included in all decision-making with council kaupapa. The Resource Management Act requirements are clear. The regional and district councils have obligations to Maori placed on them by parliament, as set out in the RMA. The regional and district councils in Te Taitokerau have not acknowledged sections 6e, 7, 8 and Part II of the RMA.

The crown cannot evade its Treaty obligations by conferring authority on some other body. Conversely, regional and district councils, have been delegated power from the crown, and are therefore responsible for the application of Treaty principles, (refer to Appendix 2) guarantees of protection under law. The performance of the crown and local authorities under the RMA, (sections 6e, 7 and 8) must be subject to credible monitoring programmes.

National guidelines and criteria with accompanying educational packages for all councillors and interested parties must be implemented immediately. Working side by side with the community to achieve environmental outcomes set out by the RMA is a pre-requisite for all councils.

**Acknowledgements**

I would like to thank members of the Kororareka Marae Society, particularly Necia Shortland, Frances Ututaonga and Andrew Riddell for their support and encouragement to participate at this conference.

**Whatungarongaro te tangata**
People pass on/People die

**Toitu nga moana**
The seas remain forever

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**Recommended Reading**


**Appendix 1**

**Russell Sewage Case: Critical Events Leading Up To and Following the Planning Tribunal Decision**

1984 – Bay of Islands County Council notified the establishment of a sewage plant with no consultation. Russell Ratepayers Association rejected proposal. Sewage plans abandoned.

1988 – Bay of Islands County Council purchased sewage plant without notification and consultation with ratepayers, generated costs to Russell Ratepayers ($100,000?) Maori cultural values prevented treated sewage from being released into Kororareka Bay

1992 – Numerous hui and meeting have been held with council staff and other affected parties beginning with the application of the FNDC to discharge treated sewage direct to wetland. Te Runanga o Taumarere and Kororareka Marae Society lodged submissions in opposition to the proposal, including other parties.

Significant meetings occurred during the period of December 1992 to the pre-hearing conference before the Planning Tribunal on October 14, 1994. Some parties agreed that there should be meetings to discuss appeal.

15/8/94 – Meeting of parties in Auckland, an agreement was reached that investigation of bore options jointly by experts these being the appellants and council (FNDC
did not contact our experts after this, instead they looked into reasons as to why they should not investigate bore disposal).

18/10/94 – Meeting called by NRC to discuss monitoring for scoria trench disposal option. Parties told NRC that it was premature to talk about a disposal system that was subject to appeal.

31/1/95 – Mediation conference at Paihia – Runanga and other parties demand FNDC investigates alternative bore disposal option.

23/2/95 – Council decides to not investigate disposal but to continue with appeal in expectation of winning.

July 1995 – Parliamentary Commissioner for the Environment meets FNDC and appellant parties. We understand she told the mayor the scoria trench disposal systems had big problems: lack of buffering area, Tangata Whenua opposition.

8/9/95 – Appeal before Planning Tribunal.

24/11/95 – Planning Tribunal release a 61-page interim decision which effectively orders FNDC to investigate the bore disposal option of the treated sewage effluent.

December 1995 – Council lawyer promises meeting between FNDC and appellant parties to discuss deep bore investigations, meeting to be in December and before any research contract is let. As a show of good faith appellant parties get expert consultant to design a preliminary investigation programme and make it available to council.


February 1996 – FNDC let contract for research work, meeting of parties postponed further.

May 1996 – On-site tour to be shown research programme on very short notice (difficulty getting people to this critical meeting).

July 1996 – FNDC consultants (Riley) attend Russell ratepayer meeting and gives summary of research results and promises copies by the end of week.

August 1996 – Riley consultants report to operations committee of FNDC, Runanga and other appellant parties at meeting. Reports made available a week after meeting.

September 1996 – FNDC finally hold meeting to discuss what to do next. Agreed that further deep bore investigation will be worked out by meeting of all technical experts and that their recommendations will be returned to all parties for their comment.

September 1996 – FNDC decides to limit further investigation to no more than $25,000.

October 1996 – Technical experts meet and make recommendation which is sent to FNDC, but not to other parties. Recommendation is 10 test bores and trickle irrigation surplus.

November 1996 – The FNDC works manager meets technical experts and tells them suggested further investigation programme unacceptable to FNDC – the land where the scoria trenches were to be, must be used for irrigation of surplus effluent.

January 1997 – FNDC receive Riley consultant report proposing 10 test bores and scoria trench irrigation behind Uruti Bay for balance.

February 1997 – FNDC decide to endorse 10 test bores and scoria trench irrigation option and instruct FNDC works manager to organise an urgent meeting of all parties to discuss this option.

February 1997 – Following FNDC meeting other parties sent copies of Riley Consultants report – no correspondence to date from the FNDC works manager about council decision or request for a meeting.

25/3/97 – Runanga/Kororareka Marae advisor sends letter to council lawyer requesting meeting on behalf of appellant parties.

Replied several days later that lawyer has passed letter on to FNDC works manager for instructions.

28/7/97 – Meeting of appellants, FNDC officials, FNDC lawyer. Purpose of meeting is to move forward together. FNDC works manager appears to have difficulty trusting the process.

13/10/97 – Meeting of appellants, technical advisors and FNDC officials. Discussions on details of proposed Pilot Borehole Programme and disposal of treated effluent.

24/10/97 – Tangata Whenua, archaeologist and FNDC examined borehole test area.

12/12/97 – Submissions received on borehole disposal. Seek approval of the process from new Russell Ratepayer Committee.
Appendix 2

A Summary of Principles of the Treaty of Waitangi

(Chapter 3 of Tangata Whenua section, proposed far north district plan, October 1996)

The council endorses the following principles as being a current reflection of the purpose and intent of Te Tiriti o Waitangi (Treaty of Waitangi), as interpreted by the courts, that are relevant to the management of natural and physical resources.


The first article of the Treaty gives expression to the right of the crown to make laws and its obligation to govern in accordance with constitutional process. This sovereignty is qualified by the promise to accord the Maori interests specified in the second article an appropriate priority. The Court of Appeal has noted that the principles of the Treaty do not authorise unreasonable restrictions on the right of a duly elected government to follow its chosen policy. Under the act, the delegation of resource management powers to local authorities means that those authorities can set objectives, make policies and make rules affecting the management of natural and physical resources subject to satisfying sections 6(e), 7 and 8 of the act.


The second article of the Treaty guarantees to iwi Maori the control and enjoyment of those resources and taonga which it is their wish to retain. The preservation of a resource base, restoration of iwi self-management, and the active protection of taonga, both material and cultural, are necessary elements of the crown’s policy of recognising rangatiratanga.

Rangatiratanga is full chiefly authority over resources including lands, forests, fisheries and other taonga. Rangatiratanga also includes elements of management, control and tribal self-regulation of resources in accordance with their own customary preferences.


The Treaty signified a partnership between Maori tribes and the crown. The exchange of promises under articles I and II of the Treaty is seen as an exchange of gifts. The gift of the right to make laws and the promise to do so as to accord the Maori interest an appropriate priority. The principles of the Treaty require the Treaty partners to act toward each other reasonably and with the utmost good faith. Reasonable cooperation and compromise through effective, early and meaningful consultation by both partners are also fundamental to this concept of partnership.


The guarantee of rangatiratanga given in Article II is consistent with the obligation to actively protect Maori interests and values in their lands, water, waahi tapu and other taonga, to the fullest extent practicable, and give a priority to these when they may be adversely affected. In the context of resource management, the various elements which underlie and are fundamental to the spiritual association of Maori with the environment may be described as taonga that have been retained by Maori in accordance with Article II of the Treaty. The principle of active protection therefore extends to the spiritual values and beliefs of Maori.


Article III of the Treaty gave to Maori the same rights and duties as other New Zealand citizens. The Treaty guaranteed to Maori retention of their property rights under Article II, and the choice of developing those rights under Article III. To Maori, the efficient use and development of what are in many ways currently under-utilised hapu/iwi resources is a very important principle of the Treaty in the context of Resource Management Act. The Treaty recognises the right of Maori to develop those resources in accordance with their own needs and aspirations. Recognition of the ability and needs for hapu/Iwi to develop their resources in a manner which achieves the purposes of the act is a fundamental principle embodied in the Treaty.
From Walking the Walk
to Talking the Talk:
Integrated Coastal Zone Management
and Community Involvement

CAROLE DONALDSON
Participatory processes consultant, Diamond Harbour

Abstract
The efforts of Canadian coastal stakeholders to work collaboratively and effectively towards meaningful coastal management is epitomised in the Atlantic Coastal Action Program (ACAP).

ACAP encompasses 13 watersheds and their receiving harbours and estuaries in the four Atlantic Canada provinces. It was initially a federal government response to three key issues: the inability of the science and government sector to communicate their knowledge in such a way as to precipitate action amongst coastal stakeholders; the lack of trust between ‘the public’ and the political machine (including politicians and bureaucracies); and the need for an ecosystem-based approach to resolving environmental issues (recognising that conventional regulatory schemes were not delivering desired results).

Using a participatory approach, the project led to a good working relationship between coastal communities, industry and other commercial activities, local, provincial and federal governments, and the science sector.

ACAP has been highly successful and is heading into a second five-year phase, testament to the commitment and willingness of stakeholders to work cooperatively and move from talking the talk to walking the walk.

Successes include keeping diverse stakeholders together for the initial six years of the project; the completion of comprehensive environmental management plans for the project areas; measurable difference in the quality of the environment; a fuller understanding of the linkages and inter-connectedness of environment, society and the economy; many projects that have achieved community-set goals for sustainability; and a focus for scientific effort.

Getting the many stakeholders to participate in the project, and then keeping them actively involved, was a mammoth task and several lessons have been learnt. These include: taking the time to build strong, trusting relationships; being clear about the outcomes; being flexible and sensitive to the many needs; providing learning opportunities for developing new skills, providing workshops etc. to share experiences; and providing the resources for success.
Introduction
This paper is not about theory, but about practice. While as a professional I naturally maintain an interest in theory and its development, my professional development is more guided by practice and ‘seat of my pants’ learning. I will not, therefore, be presenting any grand theories of community involvement in the coastal zone, but will restrict myself to sharing with you some reflections based on my many years practice.

I would also like to provide a little context of who I am and what I do. I am labelled by those who are meant to know of these things a ‘participatory processes consultant’. This means, in essence, that I work in three major areas:

- Building capacity inside organisations in such areas as participatory decision-making; team building; and skills development (e.g. facilitation).
- Design of participatory processes that engage a diverse range of interests and viewpoints. This involves processes for ‘inside’ as well as ‘outside’ involvement.
- Engagement and motivation of communities in participatory and consultative processes.

Participatory Processes
Most of you will be aware of the emergence of public involvement as a major political movement in the 1970s, particularly with respect to social, women’s, and peace issues. The late 1970s and early 1980s saw environmental issues take centre stage and with it the growth in membership of environmental organisations. The public were restless, fed-up and disillusioned with decisions that were being made that affected their quality of life; their perception that the planet was doomed and that they were powerless to effect change; and the growing awareness that by polluting our own nest, we were closing options for the survival of species other than our own.

The 1980s saw a major swing towards involving the public in one form or another in environmental decision-making. Often this was a confrontational process. ‘Experts’ decided what the real issues were and how they should be addressed, and the public was asked to endorse the decisions. This was, and still is in many cases, the institutional response to the demand for consultation.

Several key events in the mid-1980s, however, broadened the understanding of the nature of environmental and social issues and how they should be addressed. This brought with it a number of models that were seen to be a turning point in the resolution of serious social and environmental issues. For example, in 1986 an international conference of health professionals concluded that health must be viewed in a much broader context than treating the sick, that the health of individuals was inextricably tied to the health of the natural and built environments; to the health of the economy; and to spiritual health. This resulted in the World Health Organisation sponsoring a project that is ongoing to this day known as the Healthy Cities/Communities project. In 1987 we saw the release of Our Common Future, commonly referred to as the Brundtland report. This report gave us the term ‘sustainable development’ – a term that has given countless academics a lifelong research topic! There are other events that were key in North America and I will not take the time to discuss these here.

However, what these key events had in common was the call to view environmental and other societal problems in a holistic and integrated fashion. The now infamous three intersecting circles diagram was an attempt to illustrate that only by thinking and acting holistically could we begin the journey towards ‘sustainability’ or ‘health’.

One of the major recommendations from all the events over the last 10 or so years has been that communities must be more actively and meaningfully involved in decision-making processes, especially those that will determine their future. It is fair to say that the interpretation of what this means has been very broad indeed. It is generally agreed that there is a continuum of involvement and while it can be argued that each point on the continuum has a place, the more ‘participatory’ the process is, the more ‘ideal’ it becomes.

Coastal Zone Management
The coastal zone is a prime example of where many issues come together and create inordinate tensions between communities, government at all levels, and development. There is a quality about the land-sea interaction that defies description for the public, that is spiritual and of immense amenity value. The coastal zone conjures up many graphic images from sandy beaches, blue water and white surf, through to coastal dunes and rugged cliffs. Development that infringes on these images is likely to meet with resistance unless the development at best enhances the landscape, and at least ties in with the natural character
and meets the needs and aspirations of the community. This is indeed an area where meaningful and effective community participation is critical if successful outcomes are to be achieved.

Community Involvement

We have been very good over the last decade at attempting to engage communities in some form of process and not succeeding. I would put it to you that the fundamental problem is the lack of understanding of what constitutes good process to begin with. The rest of the paper will focus on the elements that need to be considered by an organisation, whether public or private, when community involvement is required.

Participatory Decision-making

Participatory decision-making (PDM) processes differ significantly from conventional processes. Table 1 outlines some of these differences. PDM is a principled process, that is, it is driven by a series of principles that guide its design and its function or operation. Many examples of principles exist that have been developed by various organisations and individuals.

PDM is also a facilitated and facilitative approach. By this I mean that the process usually engages a facilitator who ensures that the process is safe, equitable, relevant and moving towards achieving agreed outcomes. It also means that those engaged in the process practice facilitative behaviours.

Environment Canada has a set of ‘ecosystem principles’ that guide the development of integrated coastal management projects. The following is an adaptation of these:

- **Ecosystem approach**: projects should recognise humans as part of the ecosystem and not apart from it. This means incorporating environmental, social and economic considerations into all facets of the project;
- **Partnerships**: this recognises that no one agency, organisation or individual has the ability to resolve issues or manage for sustainability, and that only by creative partnerships can sustainability be addressed;
- **Knowledge**: there are many sources of knowledge and all must be considered and respected (that is, scientific, local, and traditional);
- **Environmental Stewardship**: projects should raise awareness and educate decision-making towards sustainability;
- **Leadership**: every project needs leadership and this can come as validly from a community or individual as from a government agency. What is important is that leadership is maintained and nurtured wherever it resides.

Participatory decision-making, then, is recommended as a framework for community involvement in the management of the coastal zone. All very well, but what else do we need to know to make it work?

Institutional Constraints

There is a tendency to put meaningful community involvement into the ‘too hard’ basket and instead to engage in cursory consultation. We are all, I am sure, familiar with the excuses: ‘too time consuming’; ‘who is the community anyway’; ‘what do they know, we are the experts’; ‘we have been elected to make those decisions’; ‘it is too expensive’.

I am sure that in many cases the real reason is fear and a professional isolationism that has shut many minds in boxes thereby restricting the ability to think laterally or holistically, or as some might say, to think at all!

Our bureaucracies and corporations still run by and large on the old hierarchical and linear model of command and control. I put it to you that you will not be successful in working with communities until the command and control operating paradigm changes to one of teamwork and the learning organisation. With this learning will come a recognition of the value of participation, and a keen awareness of both institutional and personal capacity to succeed in the community involvement arena.

I offer here a short commentary on three areas that I believe institutions should grapple with before launching themselves on the over-consulted, under-involved public.

Changing Paradigms

For an institution this means changing the *modus operandi* from command and control to a flexible, flatter, and team-based organisation. Many institutions and organisations will claim either to have done this, or are in the throes of the change as we speak. The success of the change, and the comfort level of

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<table>
<thead>
<tr>
<th>PARTICIPATORY GROUPS</th>
<th>CONVENTIONAL GROUPS</th>
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<tbody>
<tr>
<td>Everyone participates, not just the vocal few</td>
<td>The fastest and loudest get more air time</td>
</tr>
<tr>
<td>People give each other room to think and get their thoughts expressed fully</td>
<td>People interrupt on a regular basis</td>
</tr>
<tr>
<td>Opposing views are allowed to co-exist</td>
<td>Differences are treated as conflict that must be stifled or ‘solved’</td>
</tr>
<tr>
<td>People draw each other out with supportive questions</td>
<td>Questions are perceived and delivered as challenges</td>
</tr>
<tr>
<td>Each member makes the effort to pay attention to the person speaking</td>
<td>Unless the speaker is captivating, people space out, doodle, check the clock, yawn</td>
</tr>
<tr>
<td>People are able to listen to each other’s ideas, and know their own ideas will also be heard</td>
<td>People have difficulty listening because they are too busy rehearsing what they want to say, usually in judgment</td>
</tr>
<tr>
<td>Each member speaks up on controversial matters, everyone knows where everyone stands</td>
<td>Some members remain silent and no one really knows where everyone is at</td>
</tr>
<tr>
<td>Members can accurately represent each other’s points of view – even when they don’t agree with them</td>
<td>Individuals rarely give accurate representation of views that do not coincide with their own</td>
</tr>
<tr>
<td>People don’t talk behind each other’s backs</td>
<td>People talk behind each other’s backs, or ‘scheme’ in other environments</td>
</tr>
<tr>
<td>People are encouraged to stand up for their values and beliefs</td>
<td>People with minority perspectives are discouraged from speaking out</td>
</tr>
<tr>
<td>Problems are not considered solved until everyone understands the reasoning</td>
<td>Problems are considered solved as soon as the fastest and loudest pronounce them so, others are expected to ‘come on board’ regardless of understanding</td>
</tr>
<tr>
<td>Agreements reflect a wide range of perspectives</td>
<td>Agreements are assumed to mean that everyone is thinking the exact same thing</td>
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the staff with the change and how it was achieved, is a good measure of the capacity of the institution to work with communities. Changing paradigms can strike at the values and professional identity of staff – a not dissimilar situation to working with communities who will feel that their values and aspirations may be under threat by the proposed decision.

For the individuals within the institution, a new professionalism needs to emerge that recognises the role and function of interdisciplinary and holistic expertise, and acknowledges the value of community participation. So-called ‘experts’ need to accept that knowledge comes in many forms and that local and traditional knowledge provides valuable insight that no amount of scientific research can uncover.

Both the institution and the individual need to develop a deep and sincere trusting relationship with the community and this can best be accomplished through honesty, openness, flexibility and clarity of purpose.

**Identifying the Need and Designing the Process**

One of the common complaints I hear from communities is the lack of a clearly defined ‘need’ for the process. It appears that the need identified by government or some other organisation may not reflect a need as seen by the community. This is more often than not a function of how the need is articulated. It should be obvious that one has to ‘find the button’ that will interest and motivate the community sufficiently that they will participate.

Failure to establish the need from all perspectives leads to process breakdown and confusion. Many techniques exist for determining needs. However, face-to-face interactions with small groups of people are an excellent starting point, and this may culminate in a series of larger meetings, or in the establishment of an advisory or working group.

Once the need has been agreed upon, the process of engagement should be carefully thought through with the community. Too often a process is forced upon them and this leads to frustration and lack of commitment. This requires the identification of ‘opinion leaders’ within the community who agree to not only assist with the design of the process, but also to champion the process within their community.

A common purpose or vision, agreed upon goals and objectives, and a suite of activities that appeal to many diverse interests are critical for the successful buy-in to the decisions that will ultimately be made. Guidelines should be drawn up that guide behaviour and reflect the values and aspirations of the participants. These become the framework within which all participants, community and institution alike, agree to work.

**Control and Fear of Change**

It is not enough for an institution to decree that consultation in whatever form is now the way of doing business. There has to be a real commitment to the participation philosophy. This can be demonstrated in several ways:

- As stated above, the change to a team-based, learning organisation;
- The development of a consultation charter with guiding and operational principles;
- Access for staff to skills development to meet changing demands placed upon them;
- A simple communication strategy that is enabling both to staff and to the communities with whom you wish to engage.

However, having a committed institution is only one part of success. The individual staff members must also feel committed to meaningful participation or they will not succeed in the field. Inviting the views of those who may in the past have presented a confrontational face to staff is not always seen as desirable. Indeed, there may be a significant measure of resistance and the tendency will be to keep out of the process those who represent varying points of view. Fear of losing control, and the fear of change, often blocks attempts at meaningful participation and results in ‘window-dressing’ consultation processes.

Individuals must believe that participation will add value to the decision for the process to work. There is no doubt amongst communities that they have a place at the table; there is also little doubt amongst communities that there is a role for the expert and for government. What they seek are committed and sincere individuals with whom to engage.

The fear that control will be lost if the community is invited to participate fully is overcome with experience. Communities can be extremely supportive to staff in return for sincerity and honesty. If the community is behind you, what do you have to lose?

Fear of change is a common issue in today’s turbulent times. There is a certain comfort in doing what you have always done, even if it means getting what
you’ve always got! The ‘as long as there is no major crisis, leave well alone’ attitude prevails. It is my experience that conflict resolution is always more preferable to conflict avoidance and this is achieved through meaningful involvement and good process.

**Requirements for Success**

While there will be specific requirements that are determined by the scale and nature of individual processes, the following appear to be critical:

- Be very sure of the need from your perspective, and then ‘marry’ this with the needs of the community – there must be a match;
- Have realistic expectations of what can be achieved;
- Be committed to participatory processes and demonstrate this through visible means, e.g. participation charter;
- Ensure that you have adequate resources – human, financial and time;
- Develop people skills (communication, facilitation, leadership) to complement other professional expertise;
- Develop institutional and personal learning strategies so that something is learnt from every experience;
- Hang loose and keep a sense of perspective – flexibility is the key!
- Smile and enjoy.
Restoration of the Port Waikato Sand Dunes: A Community-based Rehabilitation Project

By H. Spence, G. Lowe, J. Dahm and E. O’Callaghan

Abstract

Sand dunes are a dynamic natural buffer between the land and marine environments and therefore an important component of New Zealand’s coastal ecosystem. Dunes provide a unique habitat for endemic vegetation and fauna. Anthropogenic pressure on dunes has resulted in widespread damage throughout large areas of New Zealand.

Port Waikato is a small settlement located at the southern and landward end of a large sand spit extending across the mouth of the Waikato River. Public access to the ocean beach, particularly pedestrian and vehicle traffic, extensively destroyed the dune vegetation in this area. As a consequence, the sand dunes in this area were seriously damaged by wind erosion – with migrating sands causing problems for some of the landward properties.

After preliminary discussions with individuals and community groups, Environment Waikato and the Franklin District Council launched a community-based partnership to address the problem. The Beach Care group, formed in Easter 1993, has attracted widespread community support. The group encompassed a wide range of community interests – including those actively involved in off-road vehicle activities, implicated in much of the severe dune damage. However, there was also scepticism from within some elements of the community, who regarded the Beach Care approach as ‘soft’ and naïve. Alternative ‘get tough’ and regulatory/enforcement approaches were advocated by these sectors.

Despite the relatively untested and crude nature of the Beach Care partnership, it has proved to be a very useful forum – enabling the various community interests to improve communication, develop a common agreement in regard to management issues and objectives, and to work together to develop and implement management action. As a consequence, within just four years, the Beach Care group has successfully repaired the severe foredune damage and re-established a good cover of native sand-binding dune grasses. Pedestrian and vehicle access problems have also been addressed – successfully protecting the restored dune while enhancing public access and amenity.

The experience and success of this community-based, partnership approach has also encouraged the community, local iwi and various agencies to now attempt to use a similar partnership approach to address significant land degradation issues over the entire area of the three kilometre dynamic coastal spit.

This experience is similar to that emerging at a large number of sites around the globe and emphasizes the critical role community-based, multi-stakeholder partnerships can play in effectively promoting sustainable management of coastal and marine ecosystems.
Introduction

Port Waikato is a small settlement located at the southern and landward end of a large sand spit extending across the mouth of the Waikato River. Public use of the ocean beach (Sunset Beach) is concentrated at the southern end of the spit where road access terminates at a large car park on a public reserve. Facilities in this area include a surf club, shop and public toilets. There is also nearshore coastal subdivision at this end of the beach.

As a consequence the coastal foredunes in this area are subject to heavy pedestrian and vehicle traffic. This places considerable pressure on the dunes and their fragile vegetation cover. By mid-1992, the destruction of sensitive native coastal vegetation had culminated in severe wind erosion damage to the dunes, with major gullies (blow-outs) having developed in the dune face and large sand sheets migrating inland towards adjacent coastal dwellings. The dunes in front of the car park had also been completely denuded of coastal vegetation, resulting in significant problems with wind blown sand on the car park area and associated remedial maintenance costs.

In response to community concerns, Franklin District Council staff initiated liaison with Environment Waikato and the Department of Conservation in June 1992 to discuss appropriate remedial action. These preliminary discussions and community consultation identified the desire to restore the dunes to their natural state – including the re-establishment of indigenous coastal vegetation, in preference to traditional methods of dune management using exotic species such as marram grass (*Ammophila arenaria*) and ice plant (*Carpobrotus edulis*). However, no previous experience existed to guide such an approach.

It was recognised at an early stage that the solution would require not only appropriate rehabilitation work, but also significant changes in the existing patterns of community and recreational use.

Community participation in the analysis of the problem and implementation of appropriate remedial action was considered to be the most effective means of promoting such user changes.

Initial discussions between key community members, local groups and iwi supported the idea of a Port Waikato Beach Care programme. The decision was made to promote the idea further over a holiday weekend with presentations and a display that highlighted the Beach Care concept and possible steps to resolve the problems at Port Waikato. At the public meeting held on Easter Sunday 1993, attended by over 110 members of the public and agency staff, it was decided to adopt the Beach Care approach at Port Waikato. This was the first time the approach had been adopted on the West Coast of New Zealand and, at the time, only the second such group in New Zealand (Dahm and Spence 1994).

**Group Organisation**

Over 100 members of the community joined the Beach Care group at the initial meeting and the community elected a widely representative steering committee to coordinate activities. Representatives from Franklin District Council and Environment Waikato committed to attend meetings and working bees.

The committee seeks ideas from the wider Beach Care membership and informs them by means of regular newsletters (see Appendix 1). Beach Care members promote participation and understanding among the wider community through informal networking and promotional activities including articles in the local press.

Once plans have been widely discussed and agreed to, working bees are held to put the plans into action. At present, funding is provided by the statutory agencies, while the community undertakes the agreed works, a reflection of the Port Waikato Beach Care partnership (Dahm and Spence, 1997).
Port Waikato Beach Care Group

At the initial meetings, the Beach Care group identified a number of goals and objectives.

The primary goals relate to:

• The restoration and enhancement of the dunes, including re-establishment of appropriate native coastal vegetation; and

• Facilitating community use and recreation, while avoiding adverse impacts on the dune. Emphasis is placed on information, consultation and participation rather than regulation and enforcement.

The Beach Care group objectives which relate to the above goals include:

• Protect and enhance the natural and amenity values of the dunes;

• Enhance the cultural values of the dune systems including restoration of the culturally significant endemic sand pingao (*Desmoschoenus spiralis*);

• Promote awareness, involvement, and responsibility for dune protection among the local community and all beach users;

• Restore and enhance the dunes as a protective buffer against natural hazards such as wind erosion, coastal erosion, and flooding;

• Develop simple and cost-effective techniques for dune repair and native revegetation on the exposed West Coast;

• A partnership approach between the statutory agencies and the community.

These goals and objectives relate closely to the resource management responsibilities and objectives identified in the statutory plans of the Franklin District Council and Environment Waikato.

Beach Care Activities

The Beach Care group has used a series of activities to successfully stabilise the dunes and eliminate the threat of severe wind erosion, including:

• Reconstruction (using machinery) of the most badly damaged dunes and initial stabilisation of these works with sand fences;

• Installation of temporary fences, access-ways and signage to guide pedestrians over the dunes with minimum disruption to dune vegetation. Temporary access-ways have been well used by the public, enabling dune vegetation in adjacent areas to re-establish;

• Significant plantings of native sand binding grasses and ground covers (over 14,000 to date) and fertilisation of existing sand grasses to help re-establish the vegetation cover on the damaged dunes;

• Research trials with the Forest Research Institute looking at the effectiveness of techniques for the re-establishment of native sand grasses on the dune face;

• Construction of a viewing platform that allows visitors to see the beach and sand-slit without damaging the dune vegetation;

• Ongoing promotion and education by Beach Care members of the aims and activities of the group amongst the local community and visitors.

Outcomes of the Programme

Partnership Approach

From the initial meeting, Beach Care has been supported well by the community with good attendance and active participation at regular committee meetings. Similarly, frequent working bees have been well-supported. Council staff have attended all meetings and working bees, even though most meetings are held in evenings and most working bees on weekends.

The commitment by both the community and council staff demonstrates that the programme has developed and strengthened the partnership between the community and the management agencies. Strong inter-agency cooperation between Franklin District Council and Environment Waikato has also been characteristic of the programme. Both agencies have committed staff time and financial resources to supporting and developing the Beach Care programme. This partnership has been supported and reinforced by politicians of both councils – exemplified by the attendance of councillors and community board members at Beach Care working bees, including both the Mayor of Franklin District Council and the Chairperson of Environment Waikato.

The partnership has expanded to incorporate other agencies. Most notably, the Indigenous Species Unit of New Zealand Forest Research Institute has worked closely with the Beach Care group to develop and implement techniques for revegetation using native
species. This included research trials at Port Waikato. The Department of Conservation has maintained contact with the group and supported its activities.

Increased liaison and cooperation has also been developed with local iwi groups. This includes the participation and support of the Huakina Development Trust, the environmental management arm of Tainui, in dune management activities.

**Dune Repair and Revegetation**

Following the major earthworks which were required to repair the dune shape, the group has held a number of working bees to re-establish appropriate native vegetation. Activities have included planting of approximately 12-15,000 plants, including more than 10,000 pingao. Revegetation has also been promoted by fertilising and by access control measures. The combination of these techniques has been particularly effective, and the badly damaged dunes at the south end of the beach have been successfully reconstructed (Figure 1). In some areas over two metres of sand has accumulated, burying signs and temporary fences!

Group members have also developed a simple and low cost sand fence design using lightweight battens which has proved to be well-suited to the harsh West Coast conditions. Over most of the site the dune profile is now recovering.

**Community Participation**

Beach Care has stimulated considerable community interest and awareness. The group has continued to encourage wide community participation – today there are over 120 households on the mailing list. Since 1993 regular committee meetings have been held, 15 newsletters (see Appendix 1) have been sent out and about the same number of working bees have been held. Working bees have typically involved at least 25 people and sometimes up to 70. Local iwi have also been involved in the dune works, both within the Beach Care group and independently.

The group’s activities have also been reported in local and national press (e.g. Franklin County News, 1997, 1994). Members have ensured that the group activities and objectives have been promoted among local groups such as the surf club, the ratepayers association, and a local garden club. The management agencies have also promoted Beach Care activities in their corporate publications.

Local community members have demonstrated a commitment to monitoring and maintenance of the Beach Care works. This has included repair of fences and re-establishment of plants damaged by the elements. It is also notable that the works have suffered no significant vandalism, despite the high use and relatively secluded nature of the site. Further indication of community support has been the acceptance of access control measures installed by the group to protect the dunes and their vegetation. Therefore, the group has had some success in changing beach user attitudes and behaviour.

Group members have also developed an increasing self-reliance, demonstrated in a number of ways:

- Members have independently obtained information on dune management and revegetation, both from sources within New Zealand and overseas;
- A number of members have grown native coastal plants from seeds sourced locally;
- A viewing platform was designed and built by group members;
- Members have traveled to dune management seminars (including one held in the Bay of Plenty, two and a half hours away);
- Members have liaised with other Beach Care groups to share their experiences and learn from other groups.

**Expansion of the Programme**

The success of the Beach Care concept has given agencies, iwi, and community members involved the confidence to address the wider community concerns on the sand-spit. Off-road vehicles and illegal rubbish dumping were two of the most pressing issues raised at a public meeting held at the end of 1997.

The close relationships which have been developed between all parties, while working on the Port Waikato Beach Care programme, have been invaluable as the community addresses other issues outside the original objectives of the Beach Care group.

**Key Elements of the Group’s Success**

- Commitment of ALL relevant agencies at political, management and staff levels
- Flexibility of hours. Most activities, meetings, work-
Figure 1: Comparison of sand-dune profile (from the same point) a) 1993; b) 1995
ing bees etc. occur out of hours. This challenges the traditional ‘office hours’ mentality.

- Willingness to work at a pace which suits the community. Communities often need time to debate concepts, understand them and decide what the implications are for them. If they are allowed this time then they ‘own’ the actions and become on-going promoters of the project’s aims and objectives. Many of the ideas that group members embraced were initially disputed strongly.

- Having ‘experts’ be prepared to listen and learn from the local experiences and opinions. Often agency staff’s ‘textbook’ understandings were enhanced or altered by the anecdotal evidence provided by Beach Care members.

- Recognition that the social and physical settings are different at each location. These unique characteristics must be taken into account when undertaking community-based rehabilitation projects. For example the Port Waikato Beach Care group would never have worked if a strict committee structure had have been imposed on them. In addition some of the dune rehabilitation techniques developed and used at Port Waikato are not suitable for other sites (particularly North Island East Coast beaches).

- Making activities enjoyable. In a voluntary programme like Beach Care people are giving up their precious free time. Barbeques and other social occasions encourage people to remain involved.

- Clear goals and concentrated effort. At Port Waikato effort was focused on the foredune around the surf club. In a short time everyone could see the difference and this was a constant inspiration for the group to continue.

**Conclusion**

The Port Waikato Beach Care programme has, without precedent, developed proven models for:

- Encouraging community participation and interagency cooperation in the management of recreational use in dune environments, a sensitive and vulnerable component of the marine and coastal systems; and,

- Repair and revegetation of severely damaged coastal dunes, using native coastal vegetation, in the harsh environment of New Zealand’s west coast.

Now into its fifth year the Port Waikato Beach Care programme has also attracted widespread interest and has been visited by representatives of agencies from throughout New Zealand and overseas.

Many other sites in New Zealand have now adopted the Beach Care approach and the experience gained at Port Waikato has provided subsequent groups with many important lessons.

Further to this success, lessons learned as the participatory process evolved have been utilised by communities addressing issues both in the marine and terrestrial environments.

**References**


*Franklin County News*, 1997, Clean-up at Beach Tackled. 9th December 1997.

Hi everyone!!

Well a hot and busy summer has come and gone. A few points about how our beach care area has coped over the last few months.

The lookout has been a tremendous success. It has been well used over the summer providing visitors with spectacular views of the spit and protecting the fragile dune vegetation at the same time.

The planted area in front of the Surf Club has been buffeted by a series of storms swells and as a consequence there is still quite a steep drop off in front of the pingao. But the pingao is looking great, there are a few spinifex plants which have seeded naturally amongst them and we have a functioning dune that we have re-created.

CONGRATULATIONS EVERYONE!!

The access points to the beach in front of the car park are going to need some thought this year. The temporary warrattahs and yellow cord that we have used up until now have done a great job of protecting the developing dune, but now we need to think of what we want there in the long term.

Further up the beach (to the north) our plantings have also survived well although there are areas which still need our attention.

There are some points along the beach which have been damaged by the summer traffic, pedestrian, horse, motorbikes and four-wheel drive vehicles. Beach Care will continue work with the agencies (Environment Waikato, Franklin District Council and DoC) towards finding some appropriate long term solutions to this problem.

More people are now on the Port Waikato Beach Care mailing list. Remember if you think of, or meet anyone, who wants to receive our newsletters so they can get involved in our planning, working bees etc. just use the contact numbers or addresses at the end of this newsletter.

Really these all point to a great summer for Port Waikato Beach Care!

Autumn is upon us and that means PLANTING SEASON.partial!!!

The Beach Care committee met in March to have a think about what we need to do this year. There are two things to let you know about.

Firstly we NEED a few more people for our committee. The group itself is alive and well we know that just from the support we have for the working bees! Being on the committee is not arduous. We meet at the surf club only three or four times a year to discuss how things are going and what we need to do next. Its fun and worth while too because there’s always a great supper afterwards (thanks Eva and others!!). Anyone can be on the committee so if you could help us out then please give us a call or come along and talk to us at the working bee!
Next Working Bee
Saturday 11th of May 9.30 AM
Activities include:
The first PINGAO planting for 1996;
Maintenance work on some of the existing beach access-ways.
You won’t need any tools just bring the family!!
THERE WILL BE FOOD AFTERWARDS INCLUDING CHOCOLATE FISH!!!
(That should bring even more people along!!)
SEE YOU THERE !!!!!!!

• We have enclosed notification of a training day being run by Environment Waikato for Care Groups on growing native plants. If you are interested then we encourage you to go along. It will be a really useful day – and its FREE!!!

In the mean time if you have anything you want to tell the group or committee just phone Environment Waikato TOLL FREE on 0800 800 401 or the committee’s address is:

Port Waikato Beach Care Group Committee, C/- Greg Lowe, Franklin District Council, Private Bag, PUKEKOHE

– THE BEACH CARE COMMITTEE.
Neighbourhood Biology: ‘On-line’ and ‘in the field’ services about our local ecology

MARY GARDNER
Neighbourhood Biology

Kia ora tatou katoa
Ko Rangi Marie toku waka
Ko Meri Gardner taku ingoa
Ko Rangitoto toku maunga
No Tamaki makarau ahau
Ko Waitakere toku awa
Ko Lietuvo toku iwi
Tena koutou tena koutou
Ko Te Huarahi toku marae
Kia ora tatou katoa

Abstract

Throughout Aotearoa, more and more locals are taking the initiative about the state of the places near and dear to them. There are surprising gains made, both environmental and social. And more are to come.

Over the past few years of work in this area, we became aware of just what kind of assistance local people need in this work. First, with communications – many locals work in isolation, unaware of what is being attempted or even accomplished from place to place. Second, with specialist information. How to set up monitoring and surveys? How to work as a group among the powers that be? How to make that positive difference?

Our ‘on-line’ and ‘in the field’ services address these needs. Our website opened in December 1997 offering new perspectives about local ecology, action research, contacts, a community news bulletin, an activity network, kids’ stuff and more. (http://www.coverge.org.nz/nbio/)

One of the ‘on-line’ features is a catchment homepage, specially for community projects on this ecological scale. The first profiled on the website is Blueskin Bay, just north of Dunedin. This coastal catchment is its own Neighbourhood Biology team. A full time community facilitator/oral historian and a group of science workers all working alongside locals in protecting and enhancing local places.

As our definition of catchment includes coastal shelves, we consider ocean places as well as terrestrial ones. Our community facilitator keeps a finger on the local pulse, compiles information and arranges meetings as varied abuses threaten. Already, a sensitive commercial/recreational fishing dilemma has come to an unexpected and quick resolution, largely because of the heightened local awareness and organized voice.

This is just one of the activities and benefits of the neighbourhood biology approach. We can show more examples and share our ideas concerning local people and coastal marine ecosystems. We see over and over again, locals can make all the difference. As specialists, we’re committed to assisting them in this.
Introduction

I live at Karekare on the West Coast of Auckland. Sixteen years ago, I came from USA and before that my family came from Lithuania as refugees during WW2. I work as a freelance biologist. I trained in this country and what I have learned is of this land, water and species, including people.

Today, let’s talk a new story. Let’s shift from echoing the past and arguing in the present. Let’s talk from an ecozoic future. Let’s talk from this future and look into our present.

Why do I suggest this? Because our collective imagination enjoys a good stretch as much as our bodies do, especially after these intense days of conferencing. We feel better, are more relaxed and refreshed after a good stretch.

I am talking to you from the future, from about 100 years from now.

The Future

To characterise our current ecozoic age, we look at that great common denominator – our common sense. Nowadays, it is taken as common knowledge that our maritime islands here are assemblies of zones defined by nature, known as catchments. That along the coasts, these catchments extend from the tops of ridges to down under the seawater to, say, the edge of coastal shelves. That within each of these coastal catchments that there are neighbourhoods, comprising of places – on land and at sea.

We expect maps at information centres and the AA and the city council to display this understanding. Catchments have names of their own. People know where they live according to these ecological units as well as by their street address.

We also take it for granted that everywhere, plants, animals and people are neighbours in varied relationships. Biodiversity is only meaningful when the context – relationships – are considered as well. That the first feature of these relationships is subsistence – water, food, shelter. Where is it? How much is there? Is it any good? That the second is life cycles – who’s with whom? How is it going? Are there young? Do these grow up to be adults themselves?

When we go about places we see them differently from the way of folks at the end of the Industrial Era. We know that what we’re looking at, what we are being in, is always becoming something else, on a scale and at a speed of its own. We take it for granted that change is afoot, afloat, dancing its merry own way.

These days, we train ourselves to read the signs of this in the lie of the lands and flow of the waters, fresh and marine. We have a new set of everyday words about all this process in action in these places, neighbourhoods and catchments. Words of process – they are more verbs rather than nouns, phrases posing questions rather than imposing labels. We say things to each other like

“Good day! How are processes continuing here?”

“Well, yes. And how are they varying?”

“Right. And what opportunities are expanding or contracting?”

That’s ecological thinking of the mid-21st century.

In this ecozoic age, places themselves have people who are paid to keep a finger on the pulse – local community and science workers who work alongside local people. In neighbourhoods, monitoring and surveys are community events, managed locally, networked globally and assisted in practical and financial ways by government. In a way, public service has become just that – service of the public. Can you imagine – in spite of the label, it didn’t use to mean that once.

Now people everywhere participate in this monitoring and surveys, becoming part of the studies themselves. In the early days, some specialists thought this whole process was a kind of public education. But quickly it became clear that something else was happening. Specialists and locals sampling together had conversations which made each other aware of what they didn’t know they didn’t know. A durable mutual respect for each other and their experiences was created.

And, as we all know now, in that happening, something else arises. A sense of coordination, an interdependence. We moved beyond systems thinking, which was all about how to do things in some sort of orderly way, according to some method. We developed systemic thinking, which is all about how to do things in a way which arises from the whole body, be it a person, a family or a group.

Systems behaviours – centred around individualism – have given way to systemic behaviours. Interestingly enough, the pioneers in this first learned about this in heavy road traffic. Learning to drive not as someone going somewhere quickly, thwarted, raging
at obstacles, but learning to drive as part of a pack of people who are all getting somewhere best way they can and in safety. This is the kind of thing we do nowadays in all sorts of situations, when we, in our social group, shift from our personal reactions to group focused responses which then ‘create’ in the group as a whole.

Can you imagine how it was once when people didn’t think and act systemic? They enshrined competition, winning, being right – it would be a living nightmare. I won’t go into it now. Back to the story of the sampling which specialists and locals do. Now the knowledge built in these events, as everyone knows these days, actually becomes the local lore and custom, influencing society locally and beyond.

What is some of this marine ecozoic lore and custom?

First that people think it normal to know more detail of the marine part of their neighbourhoods and catchments. Yes, out to the 200-mile zone. And along a stretch of adjacent coast.

We often see maps and charts of the water and seabed on the evening news. The currents, the patterns of plankton blooms, the changes of temperature and water clarity are usual stuff in the paper as well as on telly. You find it along with the weather and the horoscope. You find it along with the day’s closing rates on the stock market or the latest pop music.

See, the old days of the static natural history articles and programmes are far gone. Seasonal information is one of those rights and responsibilities of modern citizenship – hardly something to be left to a few academics or officials.

Another thing. At the start of the 21st century, a new fad takes hold – local food. This revolutionises people’s behaviour about food, especially seafood. People now expect to eat local fish, which is becoming increasingly available. We went through years of pollution clean ups and temporary fishing bans and some fascinating temporary enhancement/aquaculture programmes. Now the marine situation is about a new abundance. In some ways, sadly, we see new assemblages of species, but fish are there nevertheless. And we here are a lot more sober about how our grandparents’ attitudes about personal property don’t apply to fish, to marine ecosystems.

Who fishes commercially each year is an honour shared among local pro-fishers. The aim of the industry is high quality local and regional sales. And still there is a proud tradition of being able to fish and harvest as a lay-fisher, even in urban areas.

The regulation of fishing and harvesting is a community activity, within and between catchments in a way which is quite unlike the late 20th century practice. So how did this come about? If we look over the history of that period, we’d see parts of this in the making.

End of story. So that is my version of what an ecozoic future would be like. A nice tale. A fantasy. Of course there is lots unaccounted for. You could fill some in. C’mon, I can’t imagine everything.

So those are our fantasies. What does this mean we do in the present? Remember the last line of my story? “If we look over the history of the late 20th century we’d see parts of this in the making.”

So what at are we looking for? What is gaining momentum here that can contribute to such an abundant future? I can only speak of what I see myself.

I do see an ecozoic future. It is said by some that we as humans do not have the biological hardware to change our thinking and survive as a species. I disagree. I believe we can, we do, and we will.

Neighbourhood Biology

Here in our time, I feel the stirring of a sleeping giant. These days, I sense rumours of glory on the wind. This is a time of local action. People of many places are becoming proactive about the welfare of other species, of physical elements, of natural processes themselves.

They are also beginning to do monitoring and survey work in their local places, making results public and initiating local responses to this news. They are also refraining from old customs – for instance the harvest of shellfish on certain shores in the Auckland region.

New Zealanders are not alone in this. It’s happening throughout the world. In some places, government is squelching it. In others, government is scrambling to keep up. In still other places, government is entering into a new partnership. They find out they are sharing power and quickly find what’s really happening is that they are having conversations with locals which make each other aware of what they didn’t know they didn’t know. A durable mutual respect for each other’s experiences is being created. And in that happening,
something else arises. A sense of coordination, an interdependence. Systems thinking is giving way to systemic thinking.

Wait a minute here. Haven’t we heard this already somewhere? Well, yes, sure, enough. I mentioned this in my earlier fantasy. After all I am the one telling the stories here. Can’t get away from it.

But this is what we were looking for. Something in the present which ties up with this future fantasy. I can get very specific here about this.

What we see in the present is what I call Neighbourhood Biology. The name sounds like somewhere you yourself might want to be. It stands for an approach, a perspective, a banner. It’s a collective effort, a new discipline of our modern sciences, a challenge to specialists, a chance for locals. It is also an alternative career and an opportunity in real life. Grand claims. How is that?

Neighbourhood Biology is a small group of people across the country. Ordinary people who are quite remarkable. We believe that people belong in ecology. That ecology is all about exactly where we all live and how. We have as our aim to promote both awareness of local ecology and action by local people in their places.

We have four simple objectives:

To raise discussion of local ecology and local action;

• To innovate in setting standards for both discussion and activity;

• To clarify local aims, objectives and targets;

• To include everyone. A hallmark of Neighbourhood Biology projects.

We have many ways of meeting these objectives. We have set up a website you can access (http://www.converge.org.nz/nbio/). It came into existence by means of determination, rather than money, on the part of Don Anderson and the rest of the folks at Converge, a non-profit internet services provider. It offers a variety of vital free services:

• A community news bulletin: From and about any community based initiatives, not necessarily Neighbourhood Biology;

• An activity network, innovations, ideas, support helping set the needed standards;

• A feature by and for young people, who are already into tomorrow;

• Highlights from Neighbourhood Biology workshops, explaining how to get started;

• Catchment home pages – more about this later.

This website is full of opportunities for officials and researchers to support these efforts and to be more able themselves in their own. Suggest an activity. Voice a concern. Coordinate a field day. And become a subscriber/sponsor. Determination got it started, but money is needed to keep it going.

Neighbourhood Biology is also a field service you can use. Walkabouts are a great way to begin to include people, making awareness of local neighbourhood a living reality.

Neighbourhood biology is already a part of a number of communities. A prime example is the catchment of Blueskin Bay, just north of Dunedin. Here, locals, are working alongside a team of local natural and social science specialists, including a paid full time community worker, Jannine Cunningham. Together we are building local lore – we are using oral history techniques to develop our knowledge of the catchment in the past as there are no studies of the area. We are initiating new customs. In the past two years we:

• Ran local ecology classes;

• Held informative discussions – bringing together, locals, officials, farmers, foresters commercial fishers, to talk about fish, shellfish, riparian zones, forestry, agriculture;

• Built knowledge of local ecology through networking and field days;

• Conducted individual and group oral histories about local environment;

• Started stream monitoring: finding whitebait spawning sites, counting invertebrates;

• Identified some of the highest ratings for stream life in the Otago region;

• Organised a meeting when commercial take of local paua was felt to be getting out of hand. By bringing this information to attention of Ministry of Fisheries, the commercial quota was rearranged to exclude these sites;

• Enrolled dog owners to conduct survey of dog/bird interactions on local beach;

• Liaised with schools in a socio-environmental history project of the catchment;
SEA VIEWS

Planted trees, restoring a wetland, building a boardwalk;
Investigated local sedimentation and pollution of the bay itself.

Most importantly, we are creating a presence in the neighbourhoods of Blueskin Bay about the local ecology the way they use their local mechanic for their car and the local babysitter for their children.

Thanks to Lotteries, the City of Dunedin and a number of other providers of funding to date. We didn’t start with money. We just started. We just started creating ways and means for people to come together. Classes which raised questions. Quests which located whitebait spawning sites. Discussions which brought together people who had argued for years and began to talk again. Asking locals – an old man, much moved, told me, that for all his lifetime in the bush and thirty years in the bay, we were the first people to actually listen to what he had seen and learned.

The catchment programme – we believe every catchment can use an Neighbourhood Biology team. That it is an employment opportunity. An alternative career path. That our society can simply insist on its existence, like we do schools and hospitals.

Why do we take this approach? Because Earth and Ocean are systemic thinkers. And we could learn from that – my observation is we tend to “save a species” and it is not enough. I was part of the original efforts at Cheltenham Beach, where in 1991 only seven adult tuangi were found. Because many juveniles were also found, a rahui/harvesting ban was set in place and locals have been sampling twice a year for seven years.

Will shellfish flourish at this beach again? To date, the abundance of tuangi is a precarious 25 per square metre compared to up to several hundred in 1985.

Why? No one knows for sure, but I wonder about their reproduction, local pollution, about stormwater, about other beaches and currents. And time. How much time is needed?

Developing any of this understanding hasn’t even been started. Why not? Frankly, the Cheltenham Beach Caretakers have just barely the resources to keep the sampling happening. And why is that? Because we as a society think “save a species” and we’re pleased to do a little, little bit. We don’t think “consider the processes and relationships here”. We don’t act in context of the ecological units within which what we see is taking place. We actually aren’t in our ecozoic future yet.

There isn’t a Neighbourhood Biology approach under way in Devonport as a whole – nor at neighbouring Takapuna or further up the east coast. But there could very well be, sometime soon, in some shape or form. There isn’t a Neighbourhood Biology approach throughout the communities on the West Coast of Auckland, coordinating sampling and networking, either. But there could be – there are some beginnings. There isn’t the funding for Neighbourhood Biology in Blueskin Bay for 1999. But there will be.

What there is, though, is space – for locals, for specialists, for officials, for business. There is special room for young people, keen to be trained, keen to be involved in meaningful work. There are many possibilities for many neighbourhoods, urban and rural.

We are creating a non-profit trust and beginning fundraising and networking. We are planning programmes and events in a number of places. We are working towards getting a New Zealand presence – a team of local community workers, including young people – at the international conference on community-based coastal initiatives in Canada, in August of this year (http://www.ios.bc.ca/ios/ios/czc98/).

There are many, many ways to the future. Eventually, the Neighbourhood Biology approach will give rise to the next one which will really make the difference. Till then, this is here. And you are most cordially invited to participate. Start right where you live.

• Planted trees, restoring a wetland, building a boardwalk;
• Investigated local sedimentation and pollution of the bay itself.
Future Options for the Department of Conservation in Conserving New Zealand’s Marine Environment

JIM NICOLSON
Principal policy analyst, Conservation Policy Division, Department of Conservation

Abstract
This paper provides a summary of where the Department of Conservation (DOC) is wishing to head in undertaking its responsibilities for the conservation of New Zealand’s natural heritage in the marine environment.

The paper summarises the status and effectiveness of current statutory arrangements for management of the marine environment and marine living and non-living resources; identifies areas and issues, within the existing statutory framework, which need to be addressed to improve the management and protection of this environment; outlines an overall framework for addressing outstanding issues and problems; and, summarises the work DOC will pursue in the short to medium term to contribute to an enhanced framework for marine environment management and protection.

The SeaViews conference provides the department with an excellent opportunity to discuss its intended policy direction with interested stakeholders.

Introduction
Responsibility for monitoring and managing New Zealand’s marine environment is spread across a range of statutory agencies. The Department of Conservation’s roles include: development and monitoring of the New Zealand coastal policy statement; protection of marine species including seabirds, marine mammals, marine reptiles and a small number of fish and coral species; other protected areas; research into fishing related impacts on marine protected species.

Although many agencies are involved in the management of New Zealand’s marine environment, little is known about the characteristics of this environment. Marine living resources are nevertheless harvested without knowing the effects of this harvest on many stocks or the ecosystems these stocks occupy. Also, other than in fisheries and marine transport, there is little regulation or restriction in the use of the marine environment and little in the way of protection applied to it. Aside from the Kermadec Islands Marine Reserve, less than one per cent of the area of New Zealand territorial waters is formally protected, compared with approximately 30 per cent of New Zealand’s terrestrial environment. There is no area based statutory measure available for use outside the 12 mile limit. Risks from a range of marine and land based activities on marine species and habitats are however becoming more widely known. By-catch from fishing is known to adversely affect some marine protected species and some fishing methods are known to damage habitats. Land based activities are known to create habitat change in estuarine and coastal areas.

The department’s policy direction is aimed at enhancing its conservation activities in the marine environment to manage these risks. This direction includes: development of better marine environment knowledge base; development of a comprehensive marine conservation strategy including a strategy for establishing a representative range of marine reserves; and development of collaborative arrangements for managing New Zealand’s environment with other
statutory and non statutory bodies with interests in this important part of New Zealand’s natural heritage.

**Background**

Responsibility for monitoring and managing New Zealand’s marine environment is spread across a range of statutory agencies.

Below is a brief summary of marine environment management agencies and the roles allocated to them in statute.

**Department of Conservation**

- Marine species and ecosystem research and protection, especially marine reserves, marine mammal sanctuaries and other marine protected areas;
- Development and monitoring of the New Zealand Coastal Policy Statement;
- Some marine biosecurity under the protocol for biosecurity between Ministry of Fisheries and DOC;
- Participation in emergency responses to marine oil spills;
- Whale strandings and other marine mammal incidents.

**Ministry of Fisheries**

- Developing and implementing policy to provide for the utilisation of fisheries resources while ensuring the sustainability of those resources through maintaining commercial stocks for future generations and avoiding remedying or mitigating the adverse effects of fishing on the aquatic environment;
- Managing either directly or indirectly the QMS;
- Some marine biosecurity;
- In association with DOC, managing the adverse effects of commercial fishing on protected species.

**Treaty of Waitangi Fisheries Commission**

- Allocation of commercial fish quota to tribes (more to come).

**Iwi Maori**

- Management of mataitai areas establishing customary fishing rights;
- Management involvement in taiapure.

**Ministry of Agriculture**

- Some marine biosecurity.

**Regional councils**

- Coastal management according to New Zealand Coastal Policy Statement;
- Enforcement of maritime safety and marine pollution in territorial waters including harbours.

**Community groups**

- Proposal of areas to be reserved under the Marine Reserves Act 1971.

**Maritime Safety Authority**

- Development of maritime safety marine pollution regulations.

**Police**

- Law enforcement.

Clearly, a plethora of agencies are involved in the management of New Zealand’s marine environment at local and national levels. This enables a range of specialist agencies and skills to be brought to the table to manage specific areas according to their specialties, rather than attempting to manage all aspects of the marine environment through one generic agency.

In line with its responsibilities, the Department of Conservation’s current activities include: development and monitoring of the New Zealand Coastal Policy Statement; protection of marine species including seabirds, marine mammals, marine reptiles and a small number of fish and coral species; protection of marine areas through management and enforcement of marine reserves and other protected areas; research into fishing related impacts on marine protected species; research into marine protected species and their habitats.

This work is undertaken through a number of statutes, including: Conservation Act 1987 sections 6 & 53; Resource Management Act 1991; Foreshores and Seabed Endowment Revesting Act 1991; Wildlife Act 1953; Marine Mammals Protection Act 1978; Marine Reserves Act 1971; Sugar Loaf Islands Marine Protection Act 1991; Fisheries Act 1996.

During the 1990s, considerable gains have been made from a conservation perspective in the marine
environment. Briefly, these include:

• Gazettal of 12 new marine reserves;
• Establishment of marine mammal sanctuaries for the protection of New Zealand sea lion and southern right whales (Auckland Islands), and Hector’s dolphin (Banks Peninsula);
• Identification and development, through funding from the fishing industry, of devices that, with further development, could see large reductions in the numbers of seabirds, seals and sea lions incidentally killed in some fisheries;
• Gazettal of the first fish and benthic species – spotted grouper and red and black coral, respectively – as protected under the Wildlife Act 1953.

Protection of New Zealand’s marine environment has also been enhanced through the introduction of the Fisheries Act 1996 which carries a set of environmental and information principles aimed at ensuring that commercial fishing is managed in a sustainable way. This includes not only stocks fished commercially, but also non-target fish and non-fish species, and the aquatic environment generally. Provision for the establishment of taiapure and mataitai areas also enables customary management measures to be used in protecting aquatic environments and species using Maori methods, as well as providing for ongoing customary use of marine living resources.

The Resource Management Act 1991 also provides added incentives for marine protection through the New Zealand Coastal Policy Statement which requires implementation through regional coastal plans, including the identification of areas of significant conservation value.

**Outstanding Problems**

Despite improvements in the statutory framework for marine environment management and protection and the conservation gains achieved as outlined earlier, there remain a number of specific impediments to fully effective management of this environment.

Little is known about the characteristics of New Zealand’s marine environment, with as little as one per cent of waters in the New Zealand EEZ having been surveyed to determine biota or the overall health status of this environment. Commercial fish species are nevertheless often harvested without knowing the effects of this level of harvest on many stocks, other species which may be associated with or dependant on these stocks, or the ecosystems these stocks occupy. Also, other than in fisheries and marine transport, there is little regulation or restriction in the use of the marine environment and little in the way of formal protection applied to it. This point is seen in the slow response to date of statutory agencies to the growing knowledge of the serious environmental impacts of land based pollution, sedimentation and raw sewage discharge on many of New Zealand’s estuarine and coastal areas.

In respect of area based protections, excluding the Kermadec Islands Marine Reserve, the 13 reserves around New Zealand’s main islands cover less than one per cent of the area of New Zealand territorial waters, compared with terrestrial protection which covers almost 30 per cent of New Zealand’s terrestrial environment. Also, even if, for example, 50 reserves of sizes similar to these 13 were established around New Zealand’s coast, only four per cent of territorial waters would be protected, so their application is limited.

While marine reserves are an essential protection tool for New Zealand’s marine biodiversity and ecosystems, other tools are required to ensure that comprehensive protection and sustainability of marine resources is achieved. There is for example no measure available for use outside the 12 mile limit to reserve geographic areas not related to particular marine species, although the Fisheries Act 1996 does provide for fishing area closures in order to ensure that particular species in these areas remain unharmed from fishing.

Risks from a range of marine and land based activities on marine species and habitats are, however, becoming more widely known. By-catch from fishing is known to adversely affect some marine protected species and yet in 1996 large numbers of seabirds including some rare albatross species were again killed in the tuna long line fishery. Also, the squid fishery on the Auckland Islands shelf was again closed because of excessive deaths of New Zealand sea lion. Some dredging and trawling methods are also known to damage benthic habitats and yet these fishing methods are still used. Land-based activities are also known to create adverse habitat change in estuarine and coastal areas.

Although having a multiplicity of agencies involved in the management of New Zealand’s marine environment brings a range of specialist skills, this shared statutory responsibility can also make some issues difficult to resolve. This arises because specialist agencies administer statutes which have specific and at times competing purposes in relation to the components of the marine environment they have authority over. Considerable time
is therefore often spent locally and nationally re-
solving differences between government stake-
holders, between non-government stakeholders and 
between government and non-government stake-
holders, on a case by case basis.

The department believes that these impediments are not 
fundamental and can be dealt with within the current 
statutory framework, subject to some refinements to 
that framework. However, complicating the resolution 
of these outstanding issues are emerging pressures for 
access to, and exploitation of our marine resources.

These emerging issues include, but are no doubt not 
limited to, the following:

• Increasing domestic and foreign pressure for com-
mercial exploitation of New Zealand’s marine living 
and non living resources;

• Increasing ecotourism which is beginning to put 
presure on wildlife and wildlife management arrange-
ments both terrestrially and in the marine context. For 
example, the Marine Mammals Protection Act 1978 
provides a framework for protecting marine mammal 
species from harm or exploitation. However, the regu-
lations under this Act governing tourism ventures such 
as whale watching are now dated and do not provide 
controls relevant to the current level of demand for 
whale watch and similar opportunities;

• The need to ensure that protection decisions as well 
as decisions on access to commercial opportunities 
in the marine environment are consistent with the 
Treaty of Waitangi and customary access to and use of 
marine resources by Maori.

The department believes maintaining the status quo 
in the management of New Zealand’s marine environ-
ment is likely to see a continuation of the following 
eexisting threats and negative trends:

• Continued pressure on commercial fish stock ge-
etic, and possibly species, diversity through deple-
tion of fish stock biomass and diversity within and 
across species;

• Unnatural changes to trophic structures, such as 
the removal of a significant prey species, through com-
mercial harvest;

• Continued risk to non-fish species biodiversity, eco-
systems biodiversity and geodiversity through adverse 
impacts of commercial and non-commercial exploi-
tation of marine resources and land based activities;

• Continued limited effectiveness of management 
measures for use and protection of the marine envi-
ronment through a lack of coordination and cooperation 
amongst management agencies;

• Limited, non-representative network of marine re-
erves and protected areas.

Enhancing Protection

DOC has identified three themes as covering the work 
required to ensure that New Zealand’s marine envi-
ronment can be sustained as both a productive and 
protected component of our very special and unique 
natural heritage.

Improving Information and Awareness

Our knowledge of the diversity of marine life and the 
processes of interaction in New Zealand’s marine en-
vironment is minimal. Less than one per cent of New 
Zealand’s marine ecosystem has been surveyed. Also, 
management and information gathering effort in the 
marine environment in the past has focused on com-
mercial fishing; emphasising catch and effort data and 
more recently, a quota management system based 
around total allowable catch of fish species.

It is becoming clear, however, that some marine 
habitats in the New Zealand EEZ are distinctive for 
broader biodiversity reasons – Fiordland, the sub-Ant-
artic Islands, the Kermadecs, some seamounts and 
underwater volcanic vents are among these.

New and existing practices in the marine environment 
have also created or potentially create threats to the main-
tenance of marine biodiversity. Introduction and spread 
of exotic organisms through ballast water discharge or 
hull defouling, pollution, habitat modification or dis-
turbance through dredging, trawling, aquaculture, 
dumping, sedimentation, mining, and tourism, and 
overfishing and the effects of fishing on non-target 
species are having or potentially have adverse impacts 
on New Zealand’s marine environment.

These threats require a comprehensive management 
regime based on: greatly enhanced knowledge of the 
marine environment; increased capacity to predict and 
quantify threats over time; improved processes for de-
termining the appropriate management responses to 
threats; and, increased public awareness of the impor-
tance of the marine environment. An essential first step 
in managing marine biodiversity is the identification, 
classification and depiction of marine habitats, assem-
blages of marine life within them, processes which link 
species to each other and to their environment and the
threats and threatening processes which may undermine the protection and sustainable use of marine biodiversity.

The department regards the development of an acceptable level of classification and description of New Zealand’s seascapes and marine habitats, biota, processes and threats as fundamental in improving information for better marine environment management. This enhanced information will also increase public awareness of New Zealand’s marine environment. Key elements of such an information system include:

• A comprehensive coastal/marine environment classification on the full range of landscapes and habitats in the New Zealand coastal environment and EEZ, suitable for all agencies with management responsibility over some aspect of the marine environment. This classification will identify uniqueness, representativeness and importance of coastal and marine ecosystems, species and genetic diversity, for the purposes determining protection priorities;

• A marine environment monitoring system to provide information on: commercial fish stock trends; marine biodiversity health; marine environment health; and, effectiveness of measures to avoid remedy or mitigate the adverse effects of activities on marine living resources, marine ecosystems, habitats and processes. This system is required to support fisheries, conservation and environmental management decisions. For conservation purposes, identification and quantification of threats to coastal and marine biodiversity will be a significant element of a monitoring system. The department sees the Environmental Performance Indicator Programme being developed by the Ministry for the Environment as an essential ingredient of an appropriate monitoring system.

Key agencies in these initiatives include the Ministry of Fisheries, DOC, the Ministry for the Environment and research agencies such as NIWA.

Ensuring a Full Range of Management Tools is Available for the Protection and Sustainable Use of Marine Living and Non-living Resources


Other management tools used include voluntary approaches, some negotiated by agreement between users and management agencies, such as initiatives taken by the fishing industry to limit the damaging effects of fishing practices. Biosecurity is a management activity undertaken to secure New Zealand’s borders against the introduction of unwanted organisms, and to eradicate or control unwanted organisms in the event of them becoming established. Database and monitoring tools are essential for guiding management effort to the highest risk activities or to attend to management of the most internationally and national significant features of New Zealand’s marine environment. Several key initiatives can be distilled as central to developing a comprehensive and cohesive range of marine environment management tools and these can be broken into three broad areas: protection; sustainable use; biosecurity.

1. Enhancing Management Tools for the Protection of Marine Biodiversity

Specific components of this process identified by the department so far include:

• Review the Marine Reserves Act 1971 to enable its full use as an area based measure for protection of marine biodiversity in New Zealand’s EEZ. Currently this Act requires reserves to be established for scientific purposes, rather than for conservation purposes. This Act also restricts reserves to within territorial waters, meaning that reserves cannot be established to cover special areas such as seamounts or volcanic vents known to accommodate often unique species and species assemblages;

• Review the Marine Mammals Protection Regulations (promulgated under the Marine Mammals Protection Act 1978) in order to more effectively manage pressure on cetaceans in New Zealand coastal waters arising from increasing demand for the development of whale watch enterprises;

• Development of a strategy for the establishment of a network of marine protected areas such as marine reserves and marine mammal sanctuaries for the protection of species and genetic diversity according to agreed priorities for protection of marine environment representativeness, uniqueness and importance;

• Development of a process to identify triggers for considering management options for fisheries when adverse effects are identified or predicted;

• Establishment of a complementary and cooperative
approach to the use of customary and generic tools to manage or protect marine biodiversity;

- Adoption of a proactive approach in all regional coastal plans to identifying and preserving the ecological elements of the natural character of the coastal environment, as required under the Resource Management Act 1991 and the New Zealand Coastal Policy Statement;

- Determination of responsibilities for monitoring and surveillance of marine pest species to ensure that control and eradication measures can be implemented effectively through regional pest management strategies, regional coastal plans, or emergency measures under the Biosecurity Act 1996;

- Clarification of responsibilities in respect of developing management responses to mitigating the threat of identified marine pests.

2. Identification and Implementation of Fishing Practices and Management Tools to Ensure Sustainability of Stocks, Related Species and the Environment

The department has identified the following initiatives as important in achieving this.

In respect of quota management, it is essential that the biomass and productivity/recruitment of all fish species taken commercially, recreationally or for customary purposes is estimated. This will help improve the prospects of setting sustainable TACs (Note: fisheries stock assessment is an inherently risky business and this risk should be reflected in our confidence in stock and biomass assessments). Where biomass is not known or information is incomplete, the precautionary principle must be applied when setting TACs and TACCs.

In respect of fishing and aquaculture practice, it is essential that sustainable methods are adopted. Therefore, fisheries and marine conservation research strategies must include research and development of measures to avoid, remedy or mitigate the adverse effects of aquaculture and fishing on the marine environment, non-target fish species and protected marine species. Over recent years, significant work has been undertaken by DOC and the Ministry of Fisheries through funding from the fishing industry, and separately by some fishing industry sectors. This has resulted in major progress being made on methods to reduce seabird capture in long line fishing and seal/sea lion capture in trawl fishing. Future research must also ensure that it is targeted at the highest priority fisheries, species and areas.

3. Effective Identification and Management of Risks to Biodiversity

With increased fishing in New Zealand’s EEZ by both New Zealand and foreign licensed and charter vessels, and deregulation of the marine transport industry, it is essential that adequate systems are in place to control the possibility of introduction of exotic organisms to New Zealand waters. The department sees the following initiatives as essential to managing biosecurity risks in the marine context.

Enhancement of border control in order to monitor and prevent the introduction of harmful species and diseases to New Zealand’s marine environment, from discharge of ballast water and defouling of ship hulls.

Establishment of measures to ensure marine aquaculture prevents the escape of farmed species and prevents the spread of aquaculture-related marine pests into marine environments.

Achieving Cooperation

New Zealand’s multi-agency framework for managing New Zealand’s marine environment has the advantage of ensuring that a wide range of expertise is available to help manage New Zealand’s marine resources. It also requires a high level of cooperation and coordination amongst the agencies involved.

Currently, some responsibilities for managing marine biodiversity appear overlapping or unclear, resulting in a lack of accountability for actions and outcomes and variable cooperation on issues. It is essential that all relevant agencies know their place in this framework, know their responsibilities and act in a collaborative way to ensure that this complex framework succeeds. The following initiatives are offered as ways of achieving clear responsibilities and accountability in the management of the marine environment, in a context of collaboration and cooperation.

Development of a marine biodiversity action plan, linked or flowing from the New Zealand Biodiversity Strategy, to provide integrated goals, objectives and actions for coordinated protection of marine areas and biodiversity, and sustainable utilisation of marine living resources.

Establishment of appropriate agreements, protocols or memoranda of understanding between relevant agencies clarifying statutory roles and responsibilities and defining requirements in relation to communication, liaison, consultation and consultation over operational and policy matters. These agreements
would be based on responsibilities as clarified in a marine biodiversity action plan. Key agencies in this exercise would be DOC, Ministry of Fisheries/Ministry for the Environment, regional councils and Iwi.

An additional initiative that could be worth investigating, but which is not the department’s to pursue, is the establishment of a standing committee or oversight group on the marine environment. This committee could monitor collaboration and consistency with a marine biodiversity action plan in policy development and implementation, and report to a relevant cabinet committee or minister. Various models for this exist, such as the New Zealand Conservation Authority and the Historic Places Trust.

**DOC Initiatives**

As mentioned, a number of the initiatives discussed are not within the management responsibilities of DOC and are offered as DOC’s perspective on what may be done to improve the management of New Zealand’s marine environment. A number of initiatives are, however, within the ambit of the department and its statutory responsibilities and will be pursued over the next two years. These initiatives are:

**Review and Amendment of the Marine Reserves Act**

The Marine Reserves Act was established with the purpose of establishing reserved coastal marine areas for the purposes of scientific study. These areas must be of such distinctive quality in respect of marine life or natural features that they should be preserved in the national interest. This purpose means that the ability to establish or promote the establishment of reserves on the basis of conservation need is constrained. The current purpose of scientific study does not really allow the establishment of a fully representative range of marine reserves, as full representativeness is not achieved through protection of areas of distinctive quality in respect of marine life or natural features.

**Completion of a Marine Depiction/Classification/Inventory**

In order to determine what range of marine areas should be protected to ensure they are representative of New Zealand’s marine environment, information must be available to describe this range and the processes such as current movement and nutrient changes which form part of them. Considerable work has gone into compiling a regionally based coastal classification system. This system is nearing completion.

**Developing a Strategy for Establishing a Network of Marine Reserves**

Development of a marine reserves strategy will be based on the marine classification and depiction work described above. When this picture is built up advice will be available on exactly what range of environments require protection due to their uniqueness and importance in respect of biological uniqueness and diversity, and contribution to ecosystem processes.

It is important however that marine reserves continue to be proposed, considered and approved whilst a more strategic approach is developed, because of the extremely low proportion of the marine environment currently protected. Work should therefore continue on consideration of formal marine reserves applications already made.

**Consolidating Other Marine Protection Measures**

Although a range of measures other than marine reserves is available for protection of marine areas and ecosystems, these are not well coordinated and not used in the most effective manner by the department and other relevant agencies. To achieve comprehensive marine protection, the department is aiming to develop a marine protection framework to identify protection measures available and indicate in which situations these could be used. This will enable conservancies and other agencies and individuals to consider all measures available for protecting marine areas and applying these where appropriate.

**Developing Cooperative Approaches with Other Agencies**

The range of agencies involved in marine environment issues requires the department to work constructively with other government and non-government agencies to get good conservation results. The other key agencies in this context are regional councils, in respect of coastal management, and the Ministry of Fisheries in respect of protecting marine species and areas, and establishing and advocating for/against the establishment of marine reserves, taiapure and mataitai. The department has recently completed a set of general protocols with the Ministry of Fisheries providing agreement on roles and responsibilities and guidance on agency behaviour in areas of common interest. Protocols will be enhanced by memoranda of understanding detailing specific functions, actions and interactions of agencies in specific areas, including but not confined to:
• Interactions between fishing and protected species;
• Marine based biosecurity;
• Freshwater fisheries management;
• Marine reserves.

It is hoped that these initiatives will enhance the department’s effectiveness in undertaking its statutory responsibilities relating to managing and protecting marine resources, in conjunction with a number of other agencies, both government and non-government. The department is, however, keenly aware that success in managing the marine environment for future generations is ultimately in the hands of the public. The department hopes that all interested parties take up the call for increased focus on protecting New Zealand’s unique marine environment and will do its best in ensuring public awareness of the importance of this environment is increased.
New Zealand’s Ocean Future
Opportunities and Responsibilities

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Abstract
New Zealand is largely underwater. Most of our natural resources are under our vast ocean areas. Therefore, our future prosperity will increasingly have a marine orientation. Successful and sustainable management of our ocean environment will be a major challenge for New Zealand in the next millennium.

Introduction
This last part of the conference dealing with Solutions and the Way Forward represents a change in direction from what we have been dealing with in the last few days. I want to introduce some thoughts on opportunities and responsibilities.

What I will do as a lead-in to the presentations which follow is set the scene from the perspective of central government. I should emphasise that I am not speaking on behalf of the government in respect of future policies since they are still evolving. But I can provide some background on recent decisions and current thinking.

So this presentation will cover three broad themes:
• What has been done and why (ie. recent decisions and changing policies);
• The opportunities ahead (ie. New Zealand’s marine opportunities);
• National responsibilities (ie. the obligations and liabilities we will have to assume).

The key message that I want to leave with you is that we are singularly fortunate in this country in now possessing rights over an immense zone of ocean – an area that when fully defined could be as much as 6 million square kilometres (20–24 times our land area). This makes us a large nation with sovereign rights over a seafloor area that covers more than one per cent of the earth’s surface.

Thanks to the fortunate configuration of our many small distant islands, each generating a 200nm circular area, our ocean area is the fourth largest in the world. Moreover, a good proportion is shallow continental shelf and includes the margins of major tectonic plates – a promising setting for a great variety of living and mineral resources.

New Zealand’s Ocean Areas

• New Zealand Exclusive Economic Zone area: 4,053,000 km²
• New Zealand territorial sea area: 169,000 km²
• Legal continental shelf extensions area 800,000 – 2,400,000 km²
• New Zealand land area: 270,500 km²
• New Zealand’s EEZ is the fourth largest in the world, with an area of about 15 times that of the land mass (5.7 per cent of world’s EEZ).

• With continental shelf extensions, our eventual area of ocean jurisdiction around New Zealand will be 20-24 times the area of land (1.2 per cent of the earth’s surface).

• Water depth within NZEEZ: five per cent shallower than 100m; 72 per cent deeper than 1000m; base of continental shelf slope generally at 4000 – 5000m.

• New Zealand also has rights and responsibilities in the southern ocean sector of the Ross Dependency in Antarctica (Ross Dependency EEZ – 2.3 million sq km).

Under the United Nations Convention on the Law of the Sea (UNCLOS III), which the New Zealand Government ratified in July 1996, we formally acquired significant new rights over our 200 nautical mile Exclusive Economic Zone and continental shelf extensions. In the waters of the NZEEZ we have specific economic rights concerning the management of marine living resources, and throughout the continental shelf can exercise rights over the exploitation of non-living resources (ie. minerals, etc). UNCLOS III has confirmed New Zealand’s sovereignty over our continental shelf, including the resources of the sea-bed and in the subsoil, even where it protrudes well beyond the 200nm boundary.

The opportunities, therefore, for enhancing our social and economic well-being are immense.

But with opportunities come responsibilities. In recognition of the fact that the oceans are a common asset of all humanity, UNCLOS III defines important obligations in respect of conservation and environmental matters. In ratifying the convention the government has acknowledged new liabilities. For both national and international reasons, risks to the marine environment must be managed in ways that ensure that future generations will continue to benefit. While the regeneration capacity can be considerable, experience elsewhere has shown how vulnerable marine ecosystems can be in the face of harsh exploitation.

Recent Developments

Throughout this decade, and in the last five years in particular, the government has taken more than a dozen key decisions on marine affairs which will have long term implications.

These developments have taken place without great fanfare. No individual steps have been of earth-shattering importance, but in combination they have begun to change the way that marine affairs will be conducted in New Zealand in future. They have provided crucial building blocks on which new national policies for marine activities will stand, and have started the process of positioning this country to be an effective maritime nation in the 21st century.

It is debatable where this process began. The Resource Management Act of 1991 set out some important principles. The Maritime Transport Act of 1994 was also a key piece of legislation, as was the Fisheries Act 1996. And, of course, the entry into force of UNCLOS III in November 1994 and subsequent ratification by government in mid-1996 were key steps.

But in respect of highlighting opportunities it was perhaps the demise of the DSIR research vessel, Rapuhia, and a follow-on study commissioned by government in 1992, that marked the real turning point. That study was organised by the Ministry of Research, Science and Technology and conducted by an independent external team.

The resulting report was entitled Our Ocean: A Wealth of Opportunities – Research Vessel Needs for the 21st Century. As the title suggests it ranged far and wide. Midway through the process, cabinet approved a widening of its terms of reference to include hydrography and related survey topics. The report drew attention to the potential wealth of our ocean areas but also pointed out how relatively unexplored they were.

When cabinet considered the report in late 1993, ministers directed a group of officials to examine the issues raised and to explore options. A small interdepartmental officials’ group, in consultation with external specialists from Crown Research Institutes and elsewhere, worked on the issues throughout 1994–96 and brought to cabinet various proposals to rectify problems and to help position New Zealand for maritime opportunities in the 21st century.

Initially the group addressed specific problems concerning the availability and use of Crown owned research vessels but, in time and following further direction from ministers, the scope was widened to encompass hydrography, sea-bed cadastre responsibilities, marine scientific research, Law of the Sea issues, and more general marine policy matters.

In the absence of any central ministry to manage marine affairs in New Zealand, that group of officials and specialist committees formed from it have continued to
provide advice to government and coordinate policies in the marine area. Some of the key initiatives taken by the government in the past five years are set out in Annex One.

One noticeable feature of recent policy decisions is the emphasis given to survey matters. There are two reasons. Firstly, a systematic framework is fundamental to understanding oceans, not just for marine safety reasons but in order to help catalogue new information, to study the diverse environment, to assist exploration and development, and to comprehend interactions between different elements of the ecosystem. In many senses New Zealand’s ocean situation now resembles that of our land settlement phase 150 years ago: We possess vast unexplored territories and urgently require a survey framework in order to move ahead.

The second reason for the early emphasis on hydrography and bathymetry is that once government had ratified UNCLOS III in August 1996 the clock began ticking on a 10-year period by the end of which New Zealand must submit its claim for the continental shelf areas beyond the 200 nautical mile limit. This is a unique opportunity to extend New Zealand’s sovereign claim and to formally acquire an additional seafloor area of about five (and possibly nine) times that of our land area. By August 2006 we must submit the estimates of our legal continental shelf boundaries to the UN Commission on the Limits of the Continental Shelf in order to formalise a final and binding delimitation. Achieving this project will stretch national survey capabilities to the limit.

An outline of the sequence of the processes and the approximate timing of decisions made (or yet to be made) by cabinet is shown on the chart in Annex 2. This outline might give the impression that every stage was connected and flowed in sequence. That was not always the case. Different groups of people were responsible for different phases, and they progressed in parallel within an overall framework. With a relatively small maritime community such as we have in this country, it was not difficult to ensure that the different strands were coordinated in being brought together for cabinet.

The decisions taken in the past several years have provided a sound foundation for facilitating future use and management of our oceans, and for ensuring that the tools needed for effective governance will be available. We are some way ahead of other nations in that respect.

For the future it will be important to promote greater integration of policy and management processes within formal strategic planning. New policies will need to be founded on principles of comprehensive and integrated oceans management, sustainable development, and the precautionary approach to exploitation. Preliminary work is under way on bringing together a national oceans strategy that will provide an overarching framework for development and management. At some point government may want to consider mechanisms to more formally coordinate policies through a designated minister or through the creation of a new ministry of marine affairs.

Further out there may be advantages in consolidating existing legislation touching on marine matters into a single oceans act. That should not present a serious challenge given that New Zealand has none of the legislative and jurisdictional complexities of maritime nations such as Australia, Canada and the United States.

### Ocean Resources
- Fisheries resources are projected to be worth $1.7 billion annually by the year 2000. The aquaculture industry is projected to grow to $250 million per annum in exports by the year 2010.
- Within the next few years annual returns from fishing, aquaculture and hydrocarbon extraction will be in the order of $3 billion per annum.
- Potential returns in the foreseeable future are difficult to estimate, but on current data it is possible to define resource totals in the order of up to $100 billion from hydrocarbons, and even larger returns from mineral deposits.
- Mineral deposits from the relatively small nearby areas surveyed so far include: the Chatham Rise phosphoric deposit estimated in 1990 to be worth over $10 billion; large alluvial gold, salt, and silica aggregates; and long term manganese nodule deposits of possibly more than $200 billion (the true value of these resources will depend on the future market price relative to extraction costs).
- Over 90 per cent of New Zealand’s exports and imports by value, and almost 99 per cent by volume, are carried by sea.
Ocean Opportunities

By way of scene-setting to highlight opportunities, the box on the previous page presents some current statistics on known resources in New Zealand’s marine environment. These figures are based on survey results from just a relatively small part of New Zealand’s total ocean area, and are therefore indicative only of the likely lower limits of resource potential.

These figures would suggest that New Zealand’s oceans are of considerable significance in our day-to-day affairs. New Zealand is often described as a maritime nation and most of us live in coastal regions. We claim a vast oceanic area; have a relatively long coastline; and are isolated by long sea distances from the rest of the world.

Yet our maritime status does not really figure prominently in our national identity. Little of our legislative base deals with ocean themes, and marine issues rarely feature in government policies. There is no central government ministry responsible for coordinating all maritime affairs. That is not to suggest that existing arrangements are inadequate. They work effectively and are appropriate for the needs of the late 20th Century (although they may need reconsideration in years to come).

Within the national economy, only a relatively small part of our GDP is derived from the ocean. We crudely exploit some marine resources but we cannot claim to “manage” our maritime wealth in any strategic sense. Our most significant ocean resource currently is fishing, and that is not highly developed (we remain essentially ‘hunter-gatherers’). Conservationists have argued that the $13 million that is directed annually to fish stock surveys and research is small by international standards compared with the income earned.

But in the light of trends elsewhere, the growing pressures on resources and the opportunities presented by new technologies, these numbers describing current marine resource use can move in one direction only. If the experiences of Australia, Canada and other maritime nations tell us anything, it is that the part played by New Zealand’s oceans in its social and economic life will increase rapidly in the years to come. Many countries these days are experiencing growth in their marine industries that is at least twice that of general national economic growth. Australia, for example, which is some years ahead of us in relative development of its marine industries, has experienced annual growth rates of about 8 per cent in real terms for its marine sector over the past decade.

Resources

New trends are emerging which are beginning to influence the ways that New Zealanders will utilise their oceans in the future. Science and developing new technologies are widening the range of opportunities, refining knowledge on the sustained use of marine resources, and improving access for recreation, tourism, commerce, science and other activities.

There is little point in speculating about individual opportunities since information we have on most resources is very sketchy indeed. The figures shown earlier are thought to represent only the tip of the iceberg. We know relatively little about the broad span of our ocean resources despite decades of scientific research, and so any estimates made on the basis of data collected so far will almost certainly underestimate the true potential.

As a general comment though, there is no reason why the resources of our ocean should be any less plentiful than those on land. Sunlight, the prime source of energy and the ultimate resource, falls on the oceans at the same rate as it does on land. Moreover, the location and general morphology of the NZEEZ endow us with significant geostrategic advantages. Our mid-latitude location and long meridional span provide a prolific and diverse aquatic environment. Our contiguous ocean floor is geologically interesting and potentially resource rich with continental plateaus, large sedimentary basins, and active submarine volcanic areas. And, we are not adversely affected by the activities or pollution of other nations.

Responsibilities

With opportunities such as those outlined above come significant responsibilities. We have been fortunate to inherit a vast ocean region with the potential to meet our natural resource needs for centuries to come. But at the same time we have now assumed responsibility for managing over one per cent of the Earth’s surface. We have important international obligations under both the Law of the Sea Convention and international instruments such as those developed at the UN Conference on Environment and Development in Rio de Janeiro in June 1992.

Moreover, we have compelling domestic imperatives. The long-run importance to New Zealand of proper
management of its EEZ and continental shelf lies not only in short-term economic benefits but in:

- Balancing use and conservation of the resources in these vast areas;
- Enhancing New Zealand’s sovereignty over its oceanic claim;
- Addressing equity issues in the management of international waters;
- Securing the environmental well-being of these regions of responsibility; as well as
- Meeting obligations under UN and other international conventions and treaties.

Our ocean environment might, or might not, be as vulnerable to human activities as the land environment. We do not yet know, but we must not repeat the mistakes made elsewhere. We must create effective new systems of ocean governance, and develop new methods of marine risk management set in a broad ecosystem context. Risk assessment techniques would appear to have considerable promise in this area. It will be especially important to develop quantitative methods of evaluating risk significance in order to devise realistic mitigation and control measures.

Until the issues are better understood we should be conservative as we consider strategies for development, and as a first priority must orient all marine policies around safeguarding the long term health of the oceans.

Summary

What I have outlined here is the set of government policies and decisions that have evolved and been implemented in the past five years – a relatively short space of time for far-reaching policy development of this type. These have formed important building blocks for a process by which New Zealanders will begin to explore and understand their oceans.

We are still at a very early stage. Moving forward will inevitably be a slow process but it will be productive. We have immense ocean wealth. There is great potential for improving our social and economic circumstances, but we cannot take the ocean for granted. Improper use of its resources would present grave risks for marine systems and the biosphere generally.

As a nation we have a strong appreciation of the need for careful management of the environment. As we gradually progress outward into our ocean zones in the coming decades, we must do so in ways that ensure sustainability of resources for later generations, and that preserve our oceans and those beyond as integrated ecosystems.

This will happen only through the active involvement of all sectors of our community. It will take time. It will require intelligent central planning, responsible sovereignty, and strategic investment. Only with prudent management from the outset can we expect to safeguard the interests of future New Zealanders.
Annex 1. New Zealand Marine Initiatives

**Institutional Arrangements**
- Restructuring of the Department of Survey and Land Information (DOSLI) with a widening of its role to include sea as well as land.
- DOSLI (LINZ) given prime responsibility for purchasing hydrographic, bathymetric and related services.
- DOSLI (LINZ) given roles of maintaining public good spatial data (sea as well as land), and of managing the Crown’s seabed cadastre responsibilities.
- Justice department responsibilities for Lands and Deeds Registry transferred to LINZ.
- Ministry of Fisheries formed from MAF, to manage and control the exploration and exploitation of New Zealand’s fisheries resources.
- National Institute for Water and Atmospheric Research given MAF research capabilities.

**Coordination Arrangements**
- Research Vessel Committee comprising government departments, Crown Research Institutes, and universities, created to facilitate access to research vessels and to advise government on strategic matters concerning marine science and NZEEZ management.
- Interdepartmental committee to advise LINZ on priorities for seabed survey.
- Various interdepartmental committees formed to coordinate aspects of marine policy.
- Joint research with Australia to help define continental shelf boundaries in Tasman Sea.

**Administrative/Policy Matters**
- Cabinet direction given that spare capacity on Crown research vessels would be made available to other science providers for the conduct of marine research.
- Purchaser-provider split introduced for hydrographic and bathometric information, and moves towards contestability.
- LINZ tasked with developing a national marine survey information system (e.g. distributed data-base) to unify data sets held by government agencies.
- RNZN directed to work with commercial operators to create hybrid commercial-military marine survey capability.
- Recognition of “compelling reasons relating to maritime safety and national economic and strategic issues” for maintaining a national capacity to conduct sea floor surveys.
- Ratification of UNCLOS III by New Zealand.
- Lead responsibility for aspects of NZEEZ and Continental Shelf Boundary delimitation transferred from Ministry of Foreign Affairs & Trade to Ministry of Commerce (LINZ).
- Cabinet policies developed for furthering New Zealand’s claims to continental shelf.
- DOSLI (LINZ) directed to develop seamless system for sea and land in respect of regulatory framework, property rights, and Crown liabilities and responsibilities.

**Reviews/Major Reports**
- Research vessel needs review.
- Study of contestability matters in Crown coordination of research vessel use.
- Review of DOSLI (to form LINZ).
- Hydrographic Services Review.
- Strategic study of marine science by MoRST.
- Compilation of information on resources and potential benefits of the NZEEZ.
- Continental shelf delimitation review.
- Desk top studies of seabed.
- NZ Hydrographic and Bathometric Information Strategy (1997).

**Financial Arrangements**
- Annual funding of $45 million transferred from Vote: Defence to Vote: Survey and Land Information (LINZ).

**Equipment Purchases**
- HMNZS Resolution (replacing HMNZS Monowai and HMNZS Tui)
- Multi-beam swathe sounding system purchased by RNZN.
Annex 2. Outline of Marine Policy Changes

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<th>Year</th>
<th>Event</th>
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<tr>
<td>1992</td>
<td>Our Oceans review</td>
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<td></td>
<td>Policy development</td>
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<td></td>
<td>Research Vessels Committee [coordination mechanisms]</td>
<td>(government, RNZN, CRIs, university, industry)</td>
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<td></td>
<td>Review on hydrography</td>
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<td>EEZ study</td>
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<td>Marine sciences review (NSS)</td>
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<td>Policy development on hydrography</td>
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<td></td>
<td>DOSLI review</td>
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<td>Decisions on regulatory framework for marine areas seabed cadastre responsibilities</td>
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<td></td>
<td>Continental shelf boundary review</td>
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<td>MAF – Ministry of Fisheries – NIWA</td>
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<td>Desktop studies</td>
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<td></td>
<td>Lord Howe survey with Australia</td>
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<td></td>
<td>Compilation of national bathometric and hydrographic data/NZMS review</td>
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<td>LINZ formed, responsible for hydrography</td>
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<td>RNZN funding transferred</td>
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<td>Ratification of UNCLOS</td>
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<td>Resolution purchased</td>
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<td>Hybrid mil-civilian H service</td>
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<td>Hydrographic/bathometric information strategy</td>
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<td>Hydrolink formed</td>
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<td>Multibeam sounder</td>
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<td>Contestable hydrographic activities</td>
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<td>Ocean strategy</td>
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<td></td>
<td>Antarctic survey</td>
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In the light of the conference and considering issues that have been canvassed during the SeaViews conference, some issues for the future which will require careful thought and consequential research or policy action include:

- A need to reorient marine management and administration so that it has at its core a recognition of the sea as an ecosystem and so that marine management is carried out in the framework of an ecosystem approach to managing human impacts on the environment. This is notably lacking now with marine management fractured, fragmented and incoherent;
- It will be important to recognise and manage for the interests of future generations and non-humans – including the ecosystem itself;
- New Zealand has not seriously addressed the implications of international law relating to the marine environment and for the most part has not established the operational mechanics to give it effect in New Zealand. Attention to this will be required.
- New Zealand law and administration relating to the marine environment – as Barry Weeber’s paper shows – is a patchwork in terms of its application within and outside the 12 nautical mile limit; as to its management objectives and ethos, and as to its provisions for public processes and participation. It needs the same kind of overhaul as the management of the terrestrial environment received during the 1980s with the environmental administration reforms and the Resource Management Law Reform process.
- It is clear that with the marine area 15 times the size of the land area of New Zealand, much more will have to be done to get to grips with responsible management of the human impacts on the marine environment.
- A consistent message from the conference seems to be that we need to do far more environmental research to get a better understanding of the marine ecosystems and our impacts on these. Management in an information scarce environment must be precautionary and should manage for both uncertainty and risk.
- Any property rights frameworks must be constrained by the need to protect the environment. Property rights should clearly recognise and protect the collective rights to ecosystem services and functions, non-extractive uses of the marine environment and the need to maintain and protect biophysical processes. Private appropriation and rights should be constrained by these other requirements. Community partnerships and good public access to, and participation in, decisions is a basis for robust management, but this should not exclude the government discharging its responsibilities – and such participation needs funding;
- A national strategy for marine management and science is required to provide data, implement risk management and to help avoid irreversible or significant adverse effects of human activity;
- Indicators for the marine environment are required and the work on these should be progressed;
- Devolution of control of data bases for fisheries management and other fisheries management services could contaminate data and put the attainment of an ecosystem approach with non-extractive services from the marine environment and ecological function protection at risk. The devolution proposals should be reversed;
- Interpretation and implementation of the Fisheries Act’s environmental provisions needs urgent attention;
- Land-based sources of marine pollution as well as other sources should be addressed, with land managers taught to recognise and avoid the adverse impacts of their activities on the marine environment;
- There is an urgent need for proper processes for public input into decisions about the marine environment;

All of this will require a great deal of communication between Maori and Pakeha; conservationists and non-conservationists; government and non-government; national and international policy and research communities.

For New Zealand to make reforms, there are two broad approaches, which could also be combined. Both require serious, resourced public debate.
1. One possibility would be to move to an overarching statute with a coherent ecosystem philosophy and management approach. Several agencies could then be tasked with giving effect to management. This is the model used by the Resource Management Act 1991.

2. There could be a single agency with a responsibility for marine ecosystem management. This would remove the problem of “the little blue dots” – small marine units in bigger agencies mostly concerned with the land. This agency would have to avoid being a ‘multi-use’ agency with a plethora of objectives. We found that this did not work in the environmental administration before the reforms of the mid-1980s. Such an agency could be the Department of Conservation or a Ministry of Marine Impacts Management. Any exploitation of fish or minerals would be subject to the marine ecosystem approach to management.

It is time to debate the ethos, management objective, administration, public processes and research needs. We cannot go on as we are because the marine environment is at significant risk – especially from the impacts of fishing.
Common Threads and Themes

There were some common threads that were evident in the workshops and these produced a wish list:

- Eliminate pollution;
- Respect whole ecosystem—a living sea—not Paul Dayton’s kelp forest with no inhabitants;
- Need a holistic approach;
- Recognise values and conflicting uses;
- Preserve biodiversity;
- Ensure sustainability—defined as living off the interest not the capital;
- Enforcement, and;
- Public access to a public resource.

There were also common themes which we need to consider how to deal with.

Improve Understanding

We need to get out of the ‘out of sight out of mind mentality.’ There is a need to educate and to improve our resource-base knowledge and maybe that requires a national science strategy for marine research. We need to understand the historic, including the cultural record. There is an enormous challenge. Cousteau started to inform the world, we need to continue and raise awareness.

Property Rights

The allocation of property rights of access in the present regime has improved the situation but they are not the whole answer. Can we do better? Can we devise an economic system that recognises habitat is as valuable as the species within it? Should we consider kaitiaki rights over habitat? Should there be a mixture of both?

We need a clear resolution of what is understood by property rights.

Management/administration

There was a call for cooperation and coordination including a community approach to management (integrated management). A legislative regime is required that is supported and which actually works.

Leadership in ocean management is needed to:

- Raise awareness;
- Establish marine reserves;
- Clarify property rights;
- Institute acceptable legislative systems.

Summary

To summarise—this conference may be able to suggest a framework for a way forward or reach agreement on how to work with what we have.
Summary of Workshops – Thursday, February 12th

Introduction
The workshops were collapsed into five, of which two were very small and specialised, one was large, dealing with local management, and two were also large and were characterised by some very healthy debate.

These two focussed on institutional arrangements and fishing impacts.

The specialised workshops will be summarised first and the last will be the grand picture of institutional arrangements and ocean policy.

Fishing Impacts
The issues were identified first and then their possible solutions.

- International enforcement for dealing with straddling stocks, high seas fishery, institutional arrangements, trade.

  Suggestions included certification of products, blacklisting companies, nation-states, impounding vessels, monitoring, international observers, ratify straddling stocks.

- Protection of species.

  Suggestions were fish as well as sea birds and mammals e.g. moki and snapper, sharks/top order predators. Penalties for killing protected species OK but monitoring is a problem.

- Habitat protection.

  There was a need to focus on equipment and protected areas. Protection is required for recruitment and should be voluntary. Gear technology is improving. Cooperation is needed with all sectors.

  Information is needed on ecosystems, by-catch, management and sectoral tensions. It needs to be collected by an impartial third party, coordinated and disseminated.

  Information must be credible. There are questions about what is researched and who pays. There is insufficient funding for research on non target species. Research needs to be prioritised. Ecosystems need definition.

  It was emphasised that information should be available to all parties, there was too much emphasis on sectoral interests. A coordinating independent agency to ensure a level playing field was essential.

Pollution and MARPOL
This workshop recognised the issue of the 12-mile limit and tended to focus on sewage discharges and the lack of reception facilities for sewage at some ports.

Questions asked were: Who is going to regulate? and Who is going to educate?

Difficulties with compliance were acknowledged.

SER/Research/Indicators
The workshop was helped by the Australian input. Information needed by managers includes identified indicators and thresholds.

In a management framework there is a need to:

- Identify issues;
- Identify policies;
- Identify critical environmental elements including pressures;
- What is measured must relate to the policies;
- Monitoring of indicators must be kept simple (KISS strategy);
- Reporting must be to all audience levels.

It was emphasised that if people do not perceive there is a problem there is no support for action.

Local Coastal Management
Issues identified included lack of coordination, conflicts, variability, local knowledge disregarded, complex systems, Treaty issues.

It was recognised that the RMA was not delivering and there were poor community attitudes. Local gov-
ernment was making ad hoc decisions due to a lack of information.

Solutions put forward were:

• Coordinate planning by all decision makers;

• A coastal environment plan by the regional council was essential;

• Community planning was the key (where a council perceived that community involvement was too costly there need to be different ways of costing the alternatives and of ensuring compliance – some lateral thinking is required).

• Networking

With consultative community planning we need

• Policy changes;

• Fisheries Act brought into line with the RMA;

• Controls placed on fishing methods (s30 RMA);

• A precautionary approach particularly for aquaculture;

• Enforcement of council responsibilities.

The aim is networking (for education and understanding) leading to action, on the one hand, for legislation, and on the other, for community involvement, which together result in an innovative solution.

**Institutions/Ocean Policy**

It was government OUT or government IN? Industry would prefer government OUT.

If the government was IN what was its role? The global context is important and the discussion can be helped by learning of Australian initiatives.

Oceans need intervention this is helped by international law. The New Zealand debate is looking at the 12-mile limit. We need a lead agency to take responsibility for the gap beyond the 12-mile. This area is one of the largest in the world. We should use it or lose it!

There are sovereign rights, we need to manage particularly when there is so much uncertainty. It is a core government responsibility.
Opening address to the SeaViews symposia

Hon John Luxton
Minister of Fisheries

Introduction
I trust that the just concluded SeaViews Conference was successful. I am pleased to be able to briefly address you today before you go to one of the three symposia on various aspects of the marine environment from a range of perspectives.

Following the conference, these symposia provide an opportunity to bring together people from a variety of backgrounds – academic, professional, indigenous, stakeholders – to work through the detail of some of the issues touched on during the main conference.

Having had a brief look at the symposia programmes, I am sure that the output of today’s discussions will be of great value, not only to those working in government, but to anyone having an interest in the area of environmental policy.

Commitment to environmental and fisheries policy
Environmental issues are critical to the management of natural resources, and by their very nature, the management of natural resources requires a strategic long-term view. The government’s vision and broad strategic direction for environmental policy is set out in Environment 2010 Strategy.

Elements of this strategy include:

• The need to integrate environmental, social and economic factors into the mainstream decision-making process;
• The need to develop and maintain an effective, coherent body of law for achieving efficient and sustainable management of the environment where we impact on it;
• The need to develop a range of policy tools, to be used within a framework of law, to achieve the desired environmental outcomes that most benefit society and the economy;
• The need to establish a comprehensive and reliable information base on the environment which will aid informed and sound decisions on the protection and sustainable management of our natural and physical resources.

These elements of the Environment 2010 Strategy seem to touch on much of the material you will be discussing later today.

Success of the government’s Environment 2010 Strategy will depend not only on the actions of central government, but also on the actions taken by local government, iwi, industry, non-government organisations, communities and individuals.

The EPI programme
Two core areas of work currently underway in government are firstly the Environmental Performance Indicators (EPI) programme being coordinated by the Ministry for the Environment, and secondly, the development and implementation of policies underpinning the 1996 Fisheries Act. Under the EPI programme, indicators are being developed for each of the goals of the Government’s Environment 2010 Strategy – including indicators for sustainable fisheries.

The EPI programme for fisheries will address sustainability for commercial, customary and recreational harvest, fisheries impacts, and fish and non-fish by-catch.

The first part of the EPI programme is to focus on what elements of the marine ecosystem could be placed at risk, and those of you who are participating in today’s indicators workshop will help identify what we should measure, how and why.
**Fisheries Act implementation**

Work underway on policy development for the implementation of the Fisheries Act dovetails neatly with the EPI programme.

Later today, some of you will spend time exploring how some of the concepts contained in the Fisheries Act, for instance, the Section 9 environmental principles and the Section 10 information principles, might be implemented in practice. Today’s symposium will provide an opportunity for you to share with others your perspective and knowledge of these concepts.

I am keen that the momentum gained in this Act implementation area continues and I am sure that today’s workshop will assist with this.

I am aware that some may be apprehensive about the proposed reviews of the Fisheries Act announced earlier this month. I have become increasingly concerned with some elements of the framework by which New Zealand’s fisheries are managed, and the associated general compliance costs of doing business. As a result of my concerns and advice from the Ministry of Fisheries, I have asked the chief executive to instigate two related reviews:

- Firstly, a review of the policy settings in the Fisheries Act 1996 by an independent person, focusing on simplifying its operation, efficient resource use, and if possible reducing compliance costs on stakeholders, to report to me by the end of September;
- Secondly, a stock-take of work on the implementation of the Fisheries Act 1996 to take a closer look at what other options might be available, while still ensuring the sustainable utilisation of our fishery resource.

These reviews are timely, but they will not impact on the key fundamental principle of our fisheries management, that of sustainable utilisation. It is vital for the future of our marine environment and the ability of future New Zealanders to enjoy the fish within it, that we continue to work hard to ensure its good health. In advance, I would like to thank you all for the input that you will be having today, and I now declare this session open. Thank you.

**“...some of the impediments to communication...”**

**Paul Dayton,**

Scripps Institute of Oceanography, San Diego, USA

THIS is the first meeting that I’ve ever been to where all the various players are actually talking and more or less communicating. What I wanted to do is talk about some of the impediments to communication that I think come from just very different cultural backgrounds and vested interests amongst the players in the U.S. If it applies here fine, and if it doesn’t apply fine too. But I think it is worth getting out into the open to talk about the different agendas that the players have.

As I said on Friday the scientists tend to try to identify what we don’t know, we’re trained to be highly sceptical and, at least in the U.S., we’re extraordinarily aggressively critical of each other because we are competitors. So if I say something in public that one of my competitors can use he’ll skewer me with it later when I am trying to get a grant. So we have this peer pressure to be very, very constrained in what we say and really all we like to do is talk about all the things we don’t know and why we need more research. This is why there are really good economic and social reasons for scientists to stay firmly in the ivory tower and not be very involved.

I see NGO’s as representing societies interest and that ecosystems and especially the non-commercial species, but all the species, belong to society as a whole, and I think this is forgotten by many people. The NGO’s represent society as a whole in the long term. Often, however, they represent the need to get more money, to be publicly visible and to sort of keep after people. NGO’s have been known to distort the truth and to talk with intent to deceive as well. So NGO’s I think represent societies interests and yet often have their own agendas in addition.
The managers, in my experience, often tend to get into the business for really good idealistic reasons. They see these problems they want to get into the solution, but as soon as they get into the management armour, they start to get some of the political pressures, the successful ones that rise to the top, learn to make compromises with the real world. Compromises often end up to be very one sided and the managing in many cases gets left behind. But the managers also, in principle, represent societies interests, and they should be representing sustainability for the long term and the non-commercial interests. There is a mixed bag, some of the best people in the business are managers but also, in my experience, the ones who float to the top are the most easily compromised and often represent an extension of the politicians.

The politicians in the U.S. tend to be ignorant of most of this business, they are really there to be re-elected. The people that really work are their staff and unfortunately the staff are not elected, they might be very naive or most often are very Machiavellian. The politicians in my experience, are staff people not the real politicians who, often don’t have any feeling for what is going on at all but read what the staff writes. The staff don’t really know very much and they read what lobbyists write for them. So this is the way politics are managed in the U.S. The lobbyists write stuff for the staff, persuade the staff that this is the truth, and that then becomes politically a political tool. Granted I’m a little cynical but I’ve been in the trenches for a few years now and got pulled out of the ivory tower over a sewer outfall of all things. And then I got into the fishery problems, where I saw much much more serious problems than sewer outfalls and pollution, and that is my own track into it.

Finally in my own interactions with the fishers, again you run the complete gamut. Many of them are father and son operations and they want their grandchildren to be there and have the resource. The smaller operators are, in many cases, very concerned with sustainability. They see the animals that they pull up and kill and they don’t like it but they still have to make a living. As you get higher in the fishing industry, concern for sustainability and especially concern for the turtles and seagrasses and sponges and things like that get left behind. And in the trenches, at workshops, national meetings, panels and committees, the representatives for the fisheries are very good at obfuscate. They will say all sorts of things about fishing, they will talk about lack of control because that is a very serious problem and we have no controls - because they fished up the controls in most cases.

So its been in my experience extremely difficult to actually have a meaningful conversation, to have a group where you actually hear each other and you don’t have to deal with the obfuscation because it is very easy to obfuscate ecosystem issues. The data are soft, the questions are soft, the parameters are soft and obfuscation is easy. You saw some of that yesterday when I was talking about risk analysis, the fishing representative talked about ‘well we don’t need data, just let us do it’. He heard part of my message, the rest of my message was mainly a risk averse message. This is an example of some of the sort of cross talk that goes on and why it is so urgently important to forget your agendas. If we really need a solution we’re going to have to speak the same language and stop having the cross talk.

[Slide presented of coccolithophore bloom in the Bering Sea]

It has been claimed by Larry Mercullieff that the Bering Sea is an ecosystem in cardiac arrest. I think that is an overstatement and it’s a healthy and actually a very well studied ecosystem. But the coccolithophore bloom wiped out all the reproduction in the seabirds and the epifauna. The seals are probably seriously compromised, certainly the seabirds had zero reproduction, adults were dead all over the ocean. This is a single event, which has long lasting effects, it doesn’t have anything to do with the fishing, and for the most part the fishing was relatively good although it was effected by the ENSO.

In the mid 70’s the Bering sea had a regime shift which essentially much reduced crab recruitment. This occurred just as the fishing was gearing up and big crab boats were going out and the crab fishery then collapsed. Now it’s sustained but, like sea bass it is sustained at a very low level and I think the crab fishers are actually doing a very good job of managing their resource. They’re working with the fisheries council, they’re suggesting lower quotas, it’s a situation where I think the management is working very well. Nevertheless the crab population is way down because of a natural background shift. So we have in natural ecosystems we’ve had examples of natural events, such as the coccolithophore algal bloom, and over that you superimpose a very heavy fishing take and this management idea that we are going to manage o Maximum Sustainable Yield or MSY which has caused all the major fisheries in the world to collapse.

All the major fisheries are harvesting down the food web, and there’s a paper that just came out in science last week by Daniel Pauly (1998), which shows the
upper food webs which have sustained the fisheries for a long time might have collapsed and fishers are now working on the middle and lower trophic levels. Pauly used FAO as a global picture of lack of sustainability. If you have this very hard constant pressure of MSY philosophy and then you have these natural events on top of it El Nino, regime shifts, algal blooms you’re going to have a collapse. It’s inevitable and this is why the precautionary approach is so important. This is why we need to look at the precautionary approach and why we are talking about managing for uncertainty.

My effort yesterday was to say that we already know quite a lot about most of these ecosystems and they really aren’t uncertain - we have a high degree of certainty that there are serious risks, that these habitats are vulnerable, they’re being knocked off. We really need to think about risk averse management when we really know it is not uncertain. Are the orange roughy fishers really scraping off all the life off the seamounts? Yes they jolly well are. Do we know what that means to the fishery or the rest of the ecosystem? No, and this is where the scientists have to come back in and why it is so important to have really good science. Remember with the Californian large kelp story, there’s all these perturbations and a fairly minor one collapsed the system. If we hadn’t been doing the science correctly we wouldn’t have seen that. So its really essential that the scientists come out of their ivory towers and that we all do talk to each other on the same plane, and that we really do understand some of the risks as we get into ecosystem management.

So with this I would like to let Simon Thrush and Trevor Ward recap and extend some of their thoughts so you can get more ammo for a day of discussion.

Paul has made the point and emphasised that there are barriers to communication. Yesterday I was invited to lunch to discuss the New Zealand biodiversity strategy. There were certainly some barriers to communication there. The emphasis seems to be on the process rather than the product, which is kind of ironic given the way we end up doing things in New Zealand.

We need to try and talk about some definitions because I get the feeling that there are some words being used in our legislation that have proved to be very difficult to actually implement and so I thought I’d give you a little bit of a view of what I thought these words mean.

One of these words is an ‘ecosystem’. As an ecologist, a scientist who studies the natural environment, these are my views. Firstly I would like to say don’t get hung up on a definition. Now that is really problematic I know – but the bottom line is that the terms we ecologists use are often operationally defined. So we can talk about the ecosystem of a seal, we can talk about the ecosystem which is the area in which the seals breed and feed, we can talk about the ecosystem that is perhaps most of the southern ocean which is the potential range of the adults for our geological history. So there is a scale dependant on operational definition and you can use these terms in that way quite successfully. In fact ecologists have come down to the fact where we just talk about levels of revolution within ecological systems. We start off with individuals, then we have species, then populations, then communities of organisms and then ecosystems.

The critical issue with respect to legislation, policy and management is that ecosystems are multi component systems. They are multi process systems: they include all these natural events like El Niño events and algal blooms, they include human impacts, they include small-scale impacts and large scale impacts. They’re interactive, they’re dynamic and they are... ecosystems are multi component systems.”

SIMON THRUSH, NIWA, Hamilton
fluid. So the critical issue here is we need to manage in light of nature not against it. Ecosystems are not single issues and they’re not single processes so fish don’t exist in a vacuum. Ecosystems include people, so I guess my point is that we don’t really manage an ecosystem, but we can, if we choose to, manage within an ecosystem context. My point is that we can stall on these issues and nothing can happen and we can’t, we don’t have time for that.

I’m not entirely clear how this relates specifically to New Zealand, but what the FAO have said about global fisheries, and they’ve said this in 1995 and they’ve said this in 1996 and they’ve said this in 1997 is that all of the fisheries on the world’s continental shelves that can be exploited are already being exploited and about 60% of those are being over exploited. So simply from the perspective of the sustainability of fisheries we need to do something different because what we have been doing hasn’t worked.

“The other thing that I suppose is fairly obvious to me in Australia is that as we move towards improving our management of the oceans we seem to have put aside a very dominant theme in the way we do business and that is the use of good business practice. I know now that New Zealand of course promotes this and this is a paradigm of how it will proceed into the future and you are moving in the same direction as we are in Australia. But I’d just like you to think about that for a moment – how would one apply good business practice to managing the oceans as a whole? Perhaps because I am a scientist it is pretty hard for me to simplify this but let’s give it a go.

A simple analogy might be that we own a supermarket and we are attempting to manage it using good business practice principles. The way we do business in Australia is that we manage that supermarket by having a fairly good idea of the inventory of the cigarettes and the ice cream, they’re pretty hot property and they make us good profits so we track them, we model them, we predict what we’re going to need next week and how the sales are going to go. But we don’t seem to worry much about the rest of the supermarket, it sort of ticks along just fine. Or does it? And the answer of course we are not sure if it does or doesn’t but the information we do have suggests that some bits of it may not be going too well and of course there are many interactions that are buried there that we know very little about.

I think it is important to step back and think about what good business practice might be in terms of managing the ocean.

Trevor Ward
CSIRO, Perth, Australia
element in how we like to do business with something like the oceans. Revision, adaptation and continuous improvement, and leading particularly in the case of the oceans, to something that is fairly defensible in the way of management arrangements and in terms of good business practice. Arrangements that are efficient and accountable and are also effective, and in the case of the oceans that are sustainable use of ocean ecosystems as opposed to perhaps individual components. There are very fundamental questions about who might pay in implementing this good business practice. I believe there are major efficiency gains in treating the oceans as a single unit. The sort of areas in Australia where I can see big gains are the creation of certainty in planning, resource allocation and particularly in the areas of environmental impact assessment. We squander millions of dollars a year on what I believe is unnecessary data collection and analysis procedures to support environmental impact assessment. It’s not that I don’t support environmental impact assessment but I think that much of the data that’s collected is frankly useless and is certainly not efficiently used.

What I am supposed to be talking about is ecosystem based management but I think that this is an important context in which we need to think about how to manage the ecosystem of the ocean. As I said the other day, managing the ecosystem is not what we do; we manage our human activities. Nonetheless in managing human activities it is important to listen to the message that the ecosystem sends back to us.

In recent times we have been working on supporting the development of Australia’s Oceans Policy and I might point out this is a one in fifty to a one in a hundred year opportunity. It’s not often one gets the opportunity to access, to add to a nation’s territory many times its previous amount and I know this is the case in New Zealand as well. Along with that comes the responsibility of how to manage that huge area.

In our case we’ve been working on big picture planning approaches to this and some of us have recently derived what we want for integrated regional ocean management. But the important thing about that is these are the elements, attributes of what an ocean management regime should look like. These are derived directly from the principles that underpin integrated coastal area management and a number of other things that are well developed and documented in the literature all around the world.

These are ecosystem based management principles that are applied in forests and so on all across the world and we have adapted them here to apply to oceans management. They ought to be able to operate across the hierarchy of the biodiversity system and the nested scales, as Simon Thrush was talking about and particularly from genes to ecosystems. They operate within each of the nested boundaries in both space and time. Their focus is on the maintenance of the ecological integrity of the oceans both the structural and functional processes, the dynamic ocean currents, productivity and so on. They use appropriate indicators to provide feedback so we can control our human activities. Not so much the ecosystem but the things we do to influence it. These last things are more about us and about how we do business. It promotes adaptivity so we can respond and then change our management practices and, most importantly I think for today’s discussion, how we deal with inter-agency co-operation. The focus on the ecosystem as a whole should promote inter-agency co-operation because agencies are dealing with individual bits within the ecosystem. It also promotes organisational change. It acknowledges and recognises that it is human values and humans that are used to establish management objectives and it is seeking to harmonise those for the benefit of the ecosystem as a whole.

Let me just very quickly skip over and around all sorts of other things and I think focus on the nub of the question about the process of implementing integrated management.

The first is the establishment of ecosystem objectives and the last is setting criteria and targets.

In a sense this is almost a linear flow and the way in which we see this implemented in Australia in the nested spatial scales is that there would be a set of ecosystem objectives, there would be a set of surrogate indicators and their indicators that would be used to track the forms against. Within each nested spatial and for each indicator one needs to decide is it say 10% or 50%, is it 4000 hectares or 2000 tonnes so we need numeric criteria.

I think the establishment of ecosystem based objectives is the central organising principle which brings people together. That’s where the stakeholders need to focus, interact with each other and establish an agreement a consensus based agreement. Establishing ecosystem objectives is I think the central core principle on which we should focus. I talked a little about some of the sorts of objectives in my talk on Thursday. [See pages 44–61]

I’d just like to back up some of the things that Simon
Thrush and Paul Dayton have said and talk about the technical issues. This is not easy and there’s no recipe book—you can’t just go to the library and get out the book on regional ocean management, look to page 29 and that’s where we’ll start, thank you. It doesn’t happen like that of course you all know that. There are many science and technical issues, which underpin how we need to proceed in the future. Australia and New Zealand are well positioned I think and have the capacity and the expertise and it needs to be used very carefully. I should just say that I don’t believe any of these things are irreversible. We can address them but they need to be thought through extremely carefully, appropriately targeted and sourced and I think that can be done.
The discussion was led by John Locke for the Giru Dala Council of Elders of Great Barrier Reef, and facilitated by Dana Petersen.

The session commenced with the showing of a video The Last Great Reef depicting the Great Barrier Reef area and in particular the Whitsunday Islands, highlighting ecological problems of damage to coral through tourism.

Major issues for indigenous peoples in this area include:
• Traditional rights for fishing marine zones;
• The need to educate mainstream groups in oral traditions and oral history;
• Plans for economic self-sufficiency through eco-tourism.

Programmes are currently being set up for training indigenous people as rangers, but there is a lack of funding.

The discussion then compared the worst events in the lives of grandparents, parents, and individuals in the group, contrasting the experience of indigenous and non-indigenous communities. One issue that emerged was the loss of indigenous knowledge over two generations in Aotearoa through family breakdown. A possible way of preventing this loss would be to store traditional information such as that needed for marine ecosystems management in a library or on CD-ROM. However, this approach would need some way of protecting cultural integrity and knowledge, with the possibility that consultants may end up taking over the process of information transfer. The flexibility of oral culture may be lost through recording it in written form.

John Locke described the programmes currently run by the Giru Dala Council of Elders:
• Setting up a diversionary centre and education for youth in institutions to do environmental research and conservation work, with the aim of teaching youth skills, while simultaneously performing valuable environmental research;
• Eco-tourism programmes;
• Working with schools on issues of environmental and cultural heritage. Both traditional and mainstream approaches are vital;
• Regional training and employment programmes.

The Giru Dala Council of Elders currently has monthly meetings with recreational fishing groups, government departments etc. in order to make planning decisions.

We discussed the importance of indigenous knowledge in enforcing tribal fishing areas, recognising intruders, and in protecting the fish supply. There are significant differences between the farming and fishing industries in that farmers don’t kill off their breeding stock, while fishermen do. Traditional Maori practices involve taking small to medium size kina rather than large ones, thus protecting the biggest individuals with the greatest egg-bearing capacity. Institutions such as taiapure can improve management practices – for example in the case of the Maketu fishery. A problem is that the extinction of migratory species may occur as a result of habitat destruction overseas, rather than as a result of local practices. These species are a traditional taonga and resource, and the government still needs to find some way of protecting them.

One problem is that indigenous knowledge can be used against indigenous peoples by colonisers. We need to examine how cultural and indigenous knowledge can be mapped and brought into marine ecosystems management. Indigenous knowledge is easily discounted because it is not quantifiable, or else its sacredness and integrity may be lost.

In Aotearoa, Maori are still being removed from their lands to create national parks, the Department of Conservation estate. Even if traditional sites are de-
Views

Multilateral Agreement on Investment may restrict the ability of governments to protect marine ecosystems and traditional rights. There may also be conflict between government-imposed marine reserves, and traditional fishing areas.

Taiapure and mataitai reserves have some potential for protecting marine ecosystems while preserving traditional rights.

Summary of Issues

• Where traditional sites are mapped in written form, the control of information needs to be retained by indigenous peoples.

• Any government legislation and policy needs to be appropriate and responding to community needs.

• We need a model of local control from a holistic Maori perspective, but in partnership with recreational interests. Tangata whenua and recreational fishers may act as allies in promoting sustainability and guardianship. How do we shift the control of local resources from centralised government and the commercial sector back to the local indigenous community?

• Local stewardship for local subsistence needs to be implemented in a sustainable way.
Paul Dayton, Scripps Institute (USA)
Paul Dayton was the keynote speaker from the main Seaviews conference and provided an overview of the key issues that came out of the main conference. The presentation highlighted the inherent difficulties in fisheries stakeholder communication and provided a definition of the “ecosystem management approach”.

Simon Thrush, NIWA
Simon Thrush provide definitions of commonly used terms associated with the “ecosystem management approach.”

Alex Woods, Sealords Group Ltd.
Alex Woods provided a description of the common fishing methods used in New Zealand. He went on to describe how these methods may impact on the marine ecosystem. Practical examples were provided that illustrated how technology can lessen the impact of fishing activities on the ecosystem.

John Annala, Ministry of Fisheries
John Annala outlined the key policy concepts of the Fisheries Act 1996, including the purpose, environmental principles, information principles and sustainability measures.

Rochelle Selby-Neal, Ministry of Fisheries
Rochelle Selby-Neal gave an interpretation of parts of the Fisheries Act 1996 regarding providing for future generations and the utilisation of New Zealand’s fisheries resources. Key areas addressed were how to provide for the reasonable foreseeable needs of future generations and what is meant by social, economic and cultural well-being.

Shannon Kearns, IUCN
Shannon Kearns made a presentation on UNCLOS fisheries treaties that relate to New Zealand. Shannon also made a request for information relating to UNCLOS fisheries treaties that affect New Zealand.

Ben Richardson, Auckland University Law School
Ben Richardson’s presentation provided a detailed legal interpretation of the ‘future generations’ clauses of the Fisheries Act 1996.

John McKoy, NIWA
The focus of John McKoy’s presentation was an explanation of the environmental principles outlined in section 9 of the Fisheries Act 1996. Key issues discussed were associated and dependent species, biological diversity and the protection of significant fisheries habitat.

Ken Hughey, Lincoln University
Ken Hughey gave an explanation of the information principles outlined in section 10 of the Fisheries Act 1996. Key issues discussed were what represents best available information, uncertainty, the precautionary principle and the best approach in the absence of useful information.
Indicators for Marine Ecosystem Management

The following list gives the aims and purposes of international agreements and the requirements on signatories under these agreements.

Policy Relevant Indicators of International Relevance

Conservation and Management of Straddling and Highly Migratory Fish Stocks United Nations Implementing Agreement LTNIA (signed but not ratified by New Zealand).

- Ensure sustainability measures are based on best scientific evidence available;
- Adopt conservation and management measures for species belonging to same ecosystem or associated with/dependent upon target stocks;
- Minimise pollution, waste, discards, by-catch (fish and non-fish), impacts on associated/dependent species;
- Protect biodiversity of the marine environment;
- Collect and share, in a timely manner, complete/accurate data concerning fishing activities, catch of target/non-target species and fishing effort, as well as information from national/international research;
- Promote and conduct scientific research in support of fishery conservation and management (Article 5);
- Develop data collection and research programmes to assess impacts of fishing on non-target and associated or dependent species and their environment (Article 6);
- Collect and provide information and cooperate in scientific research (Article 14);
- Follow standardised requirements for the collection and sharing of data (Annex 1), apply stock specific precautionary reference points and use these to trigger pre-agreed conservation and management actions (Annex 11).

Convention on Biological Diversity CBD (signed and ratified by New Zealand)

- Identify/monitor components of biodiversity important for conservation/sustainable use; activities that adversely impact biodiversity; monitor effects of activities (Article 7).

Convention for Conservation of Antarctic Marine Resources CCAMLR (signed and ratified by New Zealand)

- Take into account the state of available knowledge of:
  - direct/indirect impact of harvesting;
  - effect of the introduction of alien species;
  - effects of associated activities on marine ecosystem;
  - effects of environmental changes (Article 11);
- Compile data on the status of and changes in population of Antarctic marine living resources, and on factors affecting the distribution, abundance and productivity of harvested/dependent or related species/populations acquire catch and effort statistics, analyse, disseminate and publish information;
- Identify conservation needs and analyse effectiveness of conservation measures (Article IX);
- Provide forum for consultation/cooperation for collection, study and exchange of information (Article XV).

Convention for the Conservation of Southern Bluefin Tuna CCSBT (signed and ratified by New Zealand)

- Acknowledge the importance of scientific research for the conservation and management of southern bluefin tuna (SBT), the importance of collecting scientific information relating to SBT and ecologically-related species (Preamble). The commission shall collect and accumulate scientific information, statistical data and other information relating to SBT and ecologically-related species.
**United Nations Convention on the Law of the Sea (UNCLOS)** *(signed and ratified by New Zealand)*

- **Exclusive Economic Zone**: Take into account best scientific evidence to ensure conservation/management that maintains living resources;
  - Consider effects on species associated/dependent upon harvest stocks;
  - Contribute/share scientific information, catch/effort statistics and other data relevant to conservation of fish stocks (Article 61);
- **High seas**: Take measure designed on best scientific evidence to maintain/restore populations of harvested species, taking into account fishing patterns, interdependence of stocks, effects on associated/dependent species and marine mammals (Article 119);
- **Monitoring and environmental assessment**: Monitoring of the risks or effects of pollution (Article 204);
  - Publication of reports (Article 205);
- **Assessment of potential effects of activities** (Article 206).

**International Convention for the Prevention of Pollution from Ships (MARPOL)** *(recently signed by New Zealand)*

- Prevent pollution of the marine environment by the discharge of harmful substances or effluence (Article 1);
- Reports on incidences involving harmful substances (Article 8).

**Ramsar Convention on Wetlands of International Importance (RAMSAR)** *(signed and ratified by New Zealand)*

- Protection and monitoring of the ecological characteristics of wetlands of national importance.

**Organisation for Economic Cooperation and Development (OECD)** *(New Zealand is a member country)*

- Environmental performance reviews.

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### Policy Relevant Indicators of National Relevance

#### Biosecurity Act 1993
- Protect New Zealand from unwanted organisms;
- Continuous monitoring of New Zealand’s status in regard to pests and unwanted organisms.

#### Conservation Act 1987
- Promote the management of New Zealand’s natural and historic resources;
- Conservation management strategies;
- Surveys, investigations and inventories, research and study;
- Dissemination of information;
- Protect freshwater fish habitat;
- Protect recreational freshwater fisheries;
- Preserve as far as practicable all indigenous freshwater (including estuarine) fisheries.

#### Environment Act 1986
- Advise on all aspects of environmental administration including policies for influencing management of natural and physical resources and ecosystems advise on procedures for assessment in monitoring environmental impacts, pollution control.

#### Fisheries Act 1996
- Provides for utilisation of fisheries resources in New Zealand or New Zealand fisheries waters while ensuring sustainability;
- Maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations;
- Avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment (Purpose);
- Associated or dependent species maintained above a level that ensures their long term viability;
- Biological diversity of aquatic environment maintained;
- Habitat of significance for fisheries management protected (Principles);
- Keeping of registers and setting and variation of sustainability measures for stocks or areas after taking into account effects of fishing on aquatic environment scientific observer scheme for catch and effort data fisheries research.

#### Foreshore and Seabed Endowment Revesting Act 1991
- Maintain in public ownership all foreshore and seabed.
**Freshwater Fisheries Regulations 1983**
• Safeguard and restore natural passage for migratory fish control the transfer and release of fish (and other aquatic life) to waterbodies to minimise adverse effects.

**Marine Farming Act 1971**
• Establishment and development of industry for farming of sea fish, shellfish, oysters and marine vegetation.

**Marine Mammals Protection Act 1978**
• Protection, conservation and management of marine mammals within New Zealand and New Zealand fisheries waters;

• Protect marine mammals and manage the adverse effects of human interactions on them.

**Marine Reserves Act 1971**
• Establish and manage areas of the sea and foreshore as marine reserves to preserve them in their natural state as a habitat for marine life, for scientific study;

• Monitoring of marine reserves and marine life within the reserve;

• Establish, restore and manage a network of marine protected areas representative of the full range of natural features and marine life of New Zealand waters.

**Resource Management Act 1991**
• Promote the sustainable management of natural and physical resources:
  – safeguarding the life-supporting capacity of air, water, soil, and ecosystems;
  – avoiding, remedying or mitigating any adverse effects of activities on the environment;

• Monitoring and investigation of any matter of environmental significance;

• Protection of areas of significant indigenous vegetation and habitats of indigenous fauna;

• Life supporting capacity of land, air and water ecosystems preservation of natural character;

• Protection of outstanding natural features and landscapes maintenance and enhancement of the quality of the environment maintenance and enhancement of amenity values recognition and protection of heritage values;

• Protection of habitat of trout and salmon;

• Maintenance and enhancement of public access to and along the coastal marine area;

• Allowing people to provide for their health and safety;

• Avoid or mitigate natural hazards;

• Recognise and provide for the relationship of Maori and their culture and traditions with ancestral lands, water, sites, waahi tapu and other taonga;

• Have particular regard to kaitiakitanga;

• Take into account the principles of the Treaty of Waitangi;

• New Zealand Coastal Policy Statement.

**Wildlife Act 1953**
• All wildlife (except those specified in 1st -5th schedules) subject to the act is absolutely protected throughout New Zealand and New Zealand fisheries waters;

• Conduct wildlife surveys.

• Build up a comprehensive and reliable information base on the environment;

• Sustainable fisheries;

• Protecting indigenous habitats and biological diversity;

• Managing our water resources;

• Managing pests weeds and diseases.

**New Zealand Coastal Policy Statement**
• Protect the natural character;

• Avoid or remedy adverse effects on significant areas and habitats of any indigenous species;

• Protect ecosystems which are unique to the coastal environment and vulnerable to modification;

• Maintenance and enhancement of water quality;

• Limiting adverse effects from vessel waste disposal or maintenance;

• Identification and protection of characteristics of the coastal environment of special value to tangata whenua in accordance with tikanga Maori;

• Transfer of functions, duties and powers to iwi authorities;

• Protect landscapes, seascapes and landforms;

• Protect significant places or areas of historic/cultural significance;
• Maintenance and enhancement of amenity values;
• Protect habitat or species important for commercial, recreation, traditional or cultural purposes;
• Maintenance and enhancement of public access recognition of natural hazards and avoiding or remedying their effects;
• Protect public health and safety.
Analysis of the goals and legislation

Analyse current monitoring and state of science

Investigate, develop and evaluate indicators and supporting parameters

Produce discussion document

Wider consultation

Confirm Stage I or II indicators II or parameters

Identify possible indicators

Undertake pilot studies or further research

Develop protocols

Implement indicators through administering agencies

Generic process for developing indicators
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