



MINISTRY OF
RESEARCH, SCIENCE
& TECHNOLOGY

TE MANATŪ PŪTAIAO

Marine Research in New Zealand: A survey and analysis

A project of
the Ministry of Research, Science and Technology
(MoRST)

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A handwritten signature in black ink that reads "Helen Anderson". The signature is written in a cursive, flowing style.

Helen Anderson
Acting Chief Executive

This is a Ministry of Research, Science and Technology report that has been co-authored by Ralph Chapman (Maarama Consulting Ltd) and Carol Lough (MoRST).

Table of Contents

List of Tables	4
Abbreviations and websites	5
Survey of Marine Research in New Zealand	6
Executive Summary	6
<i>Acknowledgements</i>	7
Introduction.....	8
<i>Aim</i>	8
<i>Scope</i>	8
<i>Context: the state of marine knowledge</i>	8
<i>What is meant by ‘research’?</i>	10
<i>Methodology and response level</i>	10
<i>Structure of this report</i>	13
Results	15
<i>A How much marine research is going on in New Zealand?</i>	15
<i>B The providers of marine research</i>	17
<i>C Marine research funders</i>	21
<i>D Capability and expertise</i>	24
<i>E The purposes and emphases of research</i>	30
<i>F Strategic questions relating to Oceans Policy</i>	34
Discussion and Conclusions	37
Annex 1 Request for Information.....	39
Annex 2 Survey Form	44
Annex 3 Statistics New Zealand Survey of R&D	45
Annex 4 Organisations contacted.....	47
Annex 5 Marine research providers and examples of project types	49
Annex 6 Marine research funders	54

List of Tables

Number	Title	Page
A1	Focus of marine research	15
A2	Geographic zone of marine research	16
B1	Marine research provider groups	17
B2	Public providers of marine research	18
B3	Crown Research Institutes undertaking marine research	19
B5	Focus of research by private providers	20
B6	Zone of private provider research	20
C1	Research funder groups	21
C2	Public funders	22
C3	Focus of the big three research funders	23
C4	Focus of the private sector research funders	24
D1	Research discipline	25
D2	Research discipline by focus area	26
D3	Research discipline by marine zone	26
D4	Research discipline by main provider	27
D5	Focus of internationally collaborative marine research	28
E1	Expected benefit of marine research	30
E2	Research benefit by focus	32
E3	Research benefit by marine zone	32
E4	Research benefit by funder	33
E5	Research benefit by sector	34
3.1	Marine and freshwater research in New Zealand	45
3.2	Marine and freshwater research in New Zealand: summary	45

Abbreviations and websites

AgResearch	http://www.agresearch.co.nz/
CRI	Crown Research Institute (CRIs were established in 1992)
DoC	Department of Conservation http://www.doc.govt.nz/
EEZ	Exclusive Economic Zone http://www.oceans.govt.nz/libraryElements/publications/juris-boundaries.doc
ESR	Institute of Environmental Science and Research Limited http://www.esr.cri.nz
FRST	Foundation for Research, Science and Technology http://www.frst.govt.nz/
GNS	Institute of Geological and Nuclear Sciences Limited http://www.gns.cri.nz/
HortResearch	The Horticulture and Food Research Institute of New Zealand Limited http://www.hortresearch.co.nz/
IRL	Industrial Research Limited http://www.irl.cri.nz/
MoRST	Ministry of Research, Science and Technology http://www.morst.govt.nz
MFish	Ministry of Fisheries http://www.fish.govt.nz
NIWA	National Institute of Water and Atmospheric Research http://www.niwa.cri.nz/
NSOF	Non-Specific Output Funding
RSNZ	Royal Society of New Zealand http://www.rsnz.org
SeaFIC	New Zealand Seafood Industry Council http://www.seafood.co.nz/

Survey of Marine Research in New Zealand

Executive Summary

This survey provides a benchmark overview of current and recent New Zealand marine research, both publicly and privately funded, and publicly and privately provided. The survey has been conducted in the context of the ongoing Oceans Policy development process. This process underlines the case for both short-term research to meet operational management needs (e.g. coastal erosion hazard assessment) and long-term research and science to improve understanding and meet strategic needs (e.g. snapper population modelling).

The survey covers the New Zealand marine sector but, in keeping with the Oceans Policy, it excludes associated industry activities such as seafood processing. Geographically, it covers New Zealand estuaries, and coastal and offshore waters as well as the South Pacific and Antarctica. It focuses on the last two years (2001/02 and 2002/03) and, provisionally, the current financial year (2003/04).

The survey results suggest that current and forthcoming research investments are addressing a wide range of the marine research issues and a number of the gaps identified by Oceans Policy stakeholders. Other conclusions are that:

- A significant amount of marine research effort has been going on in the last two years, and appears to be continuing in 2003/04. Marine research investment in the last two years has averaged \$63 million per year.
- The bulk of New Zealand marine research is publicly funded, although the private sector makes a significant contribution, particularly through cost recovery from industry for Ministry of Fisheries (MFish) and the Department of Conservation (DoC) research. A small but noteworthy amount comes from international sources. The Foundation for Research, Science and Technology (FRST) is the main funder.
- New Zealand marine research has recently had a major focus on understanding physical systems. However, if biological and ecological systems are grouped together then research on understanding living systems can be seen as the largest area of focus. There are emerging signs of more focus on aquaculture and bioactives, and less on physical systems. Little marine research relates to impacts on humans.
- While most marine research focuses on our Exclusive Economic Zone (EEZ) plus coastal research, in the last two years at least one research dollar in seven has gone on research outside our EEZ, mainly in the South Pacific and Antarctica.
- There is a diversity of marine research providers in New Zealand, with Crown Research Institutes (CRIs) (particularly NIWA) and universities dominant among public sector providers. 70 private sector research providers and 15 Maori and community research providers are identified in this survey.

- New Zealand's marine research activity relies on a diverse set of skills and capabilities, with oceanography, biology and related disciplines being foremost. Although respondents were not specifically asked to specify international research collaboration, analysis identified that such collaboration has recently been running close to 10% of total marine research investment.

Acknowledgements

This report would not have been possible without the excellent cooperation of the wide range of individuals, companies and organisations in the sector who provided data and supporting information, often at a busy time for them. Their contributions are greatly appreciated.

Chris Cosslett of Corydon Consulting provided advice on the database.

Introduction

Aim

This survey aims to provide an overview of all current and recent New Zealand marine research, both publicly and privately funded, and publicly and privately provided. It will help to provide an understanding of the 'state of play' of marine research in New Zealand and a starting point for discussions on the appropriate scale and focus for such research. The Hon Pete Hodgson (Minister of Research, Science and Technology) asked the Ministry of Research, Science and Technology (MoRST) to conduct this survey.

Scope

This survey covers the New Zealand marine sector and includes a wide range of marine research, such as ocean-climate interactions, marine geology, oceanography and marine hazards. It excludes associated industry activities such as seafood processing, handling, transport and distribution. In a geographical sense, it covers New Zealand estuaries, coastal waters and offshore waters, as well as the South Pacific and Antarctica. The period covered is the last two years (2001/02 and 2002/03) plus provisional estimates of forthcoming spending (2003/04).

The scope of questions we sought to answer is covered in the section below on the report's structure.

Context: the state of marine knowledge

This survey has been conducted at the same time as the Oceans Policy development process. The latter has provided an opportunity for views to be expressed about the state of our knowledge, research and science relating to our marine environment. One important theme that has been articulated is that, given the vast size of our marine environment, our present knowledge is comparatively limited. For example, in November 2002 the Hon Pete Hodgson stated:

*"We collect a range of information on different aspects of the marine environment and the management of it. But despite a lot of effort and cost, we are still profoundly ignorant about much of the marine environment."*³

³ Address to meeting of Oceans Policy stakeholders, Port Nicholson Yacht Club, Wellington
<http://www.oceans.govt.nz/libraryElements/speeches/current/Pete27nov02.doc>

Rob Murdoch of the National Institute of Water and Atmospheric Research (NIWA) has commented that:

“Our knowledge of ocean resources and the way marine ecosystems function is poor relative to our knowledge of land systems.”

and that there is a need for:

*“recognition of the scant knowledge that we have of marine resources and ecosystem functioning.”*⁴

This theme was reiterated in the summary of feedback to the Government on the Oceans Policy draft papers, for example:

*“It is... important that decision-makers acknowledge that they know little about the marine environment.”*⁵

*“It is difficult to imagine how much we don’t know about the marine environment. About 70 percent of species under the sea have not yet been identified. How can we try to manage human impacts on the environment in the face of such uncertainty? We end up only trying to manage problems that we think might exist. The more information we have about the marine environment, the better we can try to manage human impacts on it.”*⁶

However, an alternative stakeholder view has also been articulated, to the effect that it is not clear that further information or research is always necessary for policy purposes:

*“Too much weight is put on ‘information’ and ‘databases’ especially when their absence or inadequacy are the reasons given for not implementing timely policies based on existing knowledge.”*⁷

It is worth noting that research and science relating to the marine environment are not the only elements of “information” relevant to oceans management – e.g. monitoring information is important for good management and policy. And there may be a distinction between short-term operational and long-term strategic research:

*“Government needs the best knowledge possible for decision-making. Recognition is needed of the difference between the short-term research required to meet information needs for operational management and the long-term research projects and underpinning science which provide information on which sound decisions will ultimately need to be based.”*⁸

⁴Murdoch, R (2002) Oceans Policy Guest Editorials.

<http://www.oceans.govt.nz/libraryElements/editorials/RMurdoch23.07.01.doc>

⁵ Ministry for the Environment: Oceans Policy Secretariat (2003) **Oceans Policy: Feedback from Stakeholders March-April.** <http://www.oceans.govt.nz/libraryElements/stg2workdoc/feedback-report.doc>

⁶ *ibid*

⁷ *ibid*

⁸ *ibid*, Section on Information Sources

What is meant by 'research'?

Research has been defined for this survey in terms of the 'Frascati methodology' that draws distinctions between research and non-research activities. Examples of the latter include routine data collection (e.g. resource consent monitoring), fishing exploration, petroleum exploration and other commercial operations (e.g. pre-production activity). Capital expenditure is included (no distinction is made between current and capital spending). Details on this methodology were made available to survey respondents. This supporting information is provided in Annex 1.

Methodology and response level

Survey Method

Research providers and research funders were initially contacted by phone to inform them of the MoRST survey. The person who would be coordinating the information was identified in each organisation. The New Zealand Seafood Industry Council (SeaFIC) provided the link to 150 seafood companies and 26 commercial stakeholder organisations.

A formal request for information was sent from the Chief Executive of MoRST (refer Annex 1). This letter gave more details about the project, the definition of research being used and a sample table of the type of information required. An Excel template was then emailed to coordinators for completion (refer Annex 2).

Expenditure measure

Aspects of the survey design were checked with FRST, MFish and NIWA. We considered that most organisations would find expenditure information easier to provide than staffing levels. However, as indicated from feedback, we recognised the disadvantage of using expenditure as a measure of research effort. That is, if research inputs are rising in price, expenditure levels can remain the same even if research effort is reduced. In the interests of consistency and simplicity, we requested expenditure figures per project rather than staffing levels.

A benchmark

The expenditure figures for 2001/02, 2002/03 and the estimates for 2003/04 are given in the results. In interpreting the 2003/04 figures, it should be noted that this survey, conducted towards the end of 2002/03, might not have picked up some forthcoming research that had yet to be fully specified and arranged.⁹ The prospective figures for 2003/04 are best used as a provisional guide to any emerging changes in areas of focus, discipline and so on.

It would be misleading to use the survey results to indicate any trends in marine research. For example, just one large capital-intensive project (e.g. use of an offshore vessel) can heavily skew the yearly totals. Also, a longer period is needed

⁹ It does, however, include research that has been 'funded' but not yet allocated to a provider, where this has been reported in the survey.

to reliably establish a trend. An average of the last two years is presented as a reasonable indication of the current level of expenditure on marine research. The three years of information together provide a snapshot or benchmark indication of the funding of marine research at the beginning of the decade.

Data verification

In order to gain the best picture possible of the research going on, we contacted both funders (e.g. FRST, MFish) and providers (e.g. CRIs, Universities, Cawthron Institute). This made it possible to cross-check provider returns against funder returns. Also, where funder information was incomplete (e.g. if FRST contracted research to a provider who subcontracted to another provider), the records supplied by providers could give more complete information than funders' records. Private funders and providers were identified with assistance from SeaFIC. However, it is expected that there are some research providers funded by industry that we have not been able to pick up.

As a rough cross-check, the Statistics New Zealand survey of R&D (Research and Development) providers for 1999/2000 was compared with the marine research survey results presented in this report (refer Annex 3).

Data reconciliation

The data presented in the report may in some cases differ from the figures provided by respondents to the MoRST survey.¹⁰ There are several possible reasons for this:

- 2003/04 expenditure estimates by research providers were not used if the contract had not yet been allocated by the funder.
- Where a number of research providers were listed for a project, and in the absence of information about the split of expenditure, we have assumed that the project's expenditure was divided evenly among providers. This may not always be plausible, but is a consistent method. This allowed the valuable information about other research providers to be retained.
- Some of the research did not fit the Frascati definition of research, and seafood processing, handling, and transport research has not been included.

Response Level

In total, 31 returns were received from research providers and funders. This captured information about more than 100 research providers and 80 research funders or funding schemes.

In the public sector, information was requested from seven CRIs, seven Universities, two university commercial research companies, all members of the Regional and Unitary Authorities' Coastal Planners Group, Te Papa Tongarewa, the Department of Conservation, the Foundation for Research, Science and Technology, the Ministry of Fisheries, Land Information New Zealand, the Royal Society of New Zealand, and the Maritime Safety Authority. Refer to Annex 4 for the full list.

¹⁰ **Rounding errors accumulate with each calculation from the raw data. But the totals given are more accurate than if these rounding errors were hidden by adjusting the totals.**

In the private sector, information was requested from 150 seafood industry companies, 26 commercial stakeholder groups, the Cawthron Institute, one group of marine consultants, one port company, WWF-NZ (World Wide Fund for Nature) and one environmental group coalition (ECO). Refer to Annex 4 for the full list.

Information was received directly from seven CRIs, five Universities (including Canterbury), nine out of the fifteen Regional and Unitary Authorities represented on the Coastal Planners Group, Te Papa, DoC, FRST, MFish, and RSNZ. From the private sector, information was received from only one seafood company, two commercial stakeholder groups, and the Cawthron Institute. Refer to Annex 4 for the full list.

From information received from the above contacts, further data was derived for 25 public research providers, 70 private research providers and 15 Maori and community research providers. Refer to Annex 5 for the full list and examples of the type of projects carried out.

On the funder side, information was collected about funding from 22 private funders, 11 international funders, and 47 public funding agencies or funding schemes. Refer to Annex 6 for the full list.

In the end, the information gained from both research funders and providers about other funders and providers meant that the survey captured the bulk of marine research being carried out in New Zealand.

Database

An extensive database (Microsoft Access) was constructed with the information supplied. There are 786 records in the database, containing the information supplied by the respondents in the survey form set out in Annex 2.

This number of records does not, however, reflect the number of research projects. This is for a number of reasons. Where a project involves collaboration among a number of research providers and/or research funders, these different parts of the project have been recorded separately in order to include these details in the analysis. Also, for ease of management, some smaller projects have been grouped into larger research programmes by both research providers and research funders, for example, large FRST-funded programmes. This is why the number of projects on an annual basis is not a reliable measure of research effort.

Structure of this report

The results from the survey are reported in the following sections:

Section	Topic
A	How much marine research is going on, its focus, and the marine zones covered
B	The providers of marine research
C	Marine research funders
D	Capability and expertise
E	Main purposes and emphases of marine research
F	Strategic issues

The survey results are followed by a brief discussion and conclusions.

In respect of section A, 'research focus' and 'marine zone' require explanation. **Research focus** is defined in terms of what sort of understanding the marine research in question is aimed to provide. While the question on focus was a 'prompted' question, extra categories could be supplied by respondents (refer Annex 2). We then grouped the large number of research foci provided into the following main categories for analysis:

- Aquaculture and bioactives
- Understanding biological systems, e.g. fish physiology
- Understanding ecological systems, e.g. ecological effects of fishing
- Understanding physical systems, e.g. marine geology
- Impacts on humans, e.g. marine algal toxins

Marine zone categories used were as follows:

- Estuaries
- Coastal and near-shore
- Exclusive Economic Zone (EEZ), including Sub-Antarctica
- South Pacific and other non-EEZ
- Antarctica
- All zones/Other

In section D, **capability and expertise** issues are indicated by examining research **discipline** and within that, cross-tabulating by research focus and marine zone. Again, respondents could add extra disciplines if those supplied were not adequate. We then grouped the many disciplines supplied into the following main discipline categories:

- Biology and related
- Chemistry and related
- Ecology and related
- Oceanography and related (including geology, physics)
- Modelling, statistics and related
- Social sciences (including economics).

We were also able to gain a limited insight into collaboration by identifying research projects that involved either domestic collaboration (multiple providers) or international collaboration (where at least one provider or funder was offshore). However, interpreting the data in this way is likely to systematically underestimate the extent of collaboration, since respondents may often not have reported non-central collaborative elements of a research project (e.g. smaller research inputs, peer review). The survey was not focused on collaboration as such, and thus did not highlight to respondents that it sought to gauge the extent of collaboration.

Projects were assigned to the various categories based on where the majority of the work fitted. In many instances, a single project could in fact deliver on a number of categories but these details were not captured by this survey.

Results

A How much marine research is going on in New Zealand?

A1 How much research is going on and what is its main focus?

Table A1 shows that there is around \$50-70 million of marine research conducted annually in New Zealand. The average figure for the last two years is \$63 million. As noted in the Introduction, while provisional figures for 2003/04 are supplied, it would be wrong to conclude that total marine research spending levels are declining because not all contracts had been finalised.

The numerous research foci provided were grouped as outlined in the Introduction. Table A1 shows that recent research has focused heavily on understanding physical, ecological and biological systems (about 81% of spending fell in these areas in the last two years). Research on understanding physical systems (e.g. oceanography, geology and ocean-climate interactions) is the most substantial single area (32%). However, if the two large international projects are removed (see note to Table) the expenditure on research focussing on physical, ecological and biological systems is roughly equal. Research on aquaculture and marine bioactives (9%) has been slightly greater than research on impacts on humans (6%).

Table A1: Focus of marine research:
Focus area by marine research spending (\$ million)

Research Focus	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
Understanding physical systems ¹	13.7	26.3 ¹	20.0 32% ¹	13.1
Understanding ecological systems	14.4	17.0	15.7 25%	15.0
Understanding biological systems	14.9	15.2	15.0 24%	15.0
Aquaculture & bioactives ²	4.0	6.8	5.5 9%	8.6
Impacts on humans	3.0	4.9	4.0 6%	2.8
Other/Unspecified	2.0	2.6	2.3 4%	2.9
Total (all focus areas)	52.1	72.9	62.5 100%	57.4

1: Note that the 2002/03 total and the physical systems focus have been skewed by two large international projects: a \$7.1 million marine research project by the Alfred Wegner Institute (Germany) to improve understanding of the geology and evolution of the New Zealand continental margin; and a project funded from USA (\$3.4M), which was focused on understanding the plate tectonics of the Adare Trough region of the Antarctica.

2: Note that research into seafood processing was excluded.

A2 What are the main zones for marine research?

Table A2 shows that the largest portion of marine research spending (42%) relates to New Zealand's Exclusive Economic Zone (defined here to exclude coastal and near-shore research - these are covered in separate categories). It should be borne in mind, however, that offshore research is more expensive per 'unit' because of ship, fuel and equipment costs. The second largest category is coastal and near-shore research. In looking at research centred on estuaries, it should be remembered that this survey excludes freshwater research and the boundary between some freshwater and estuarine research is difficult to draw.

Looking beyond New Zealand, research in the South Pacific is significant (South Pacific and other non-EEZ research constituted 9% in recent years), and Antarctic zone research is also significant, at 5% of New Zealand's marine research effort. Together, the South Pacific and Antarctic research effort (around \$8.5 million per year; 14% of total marine research investment) means New Zealand is making a tangible contribution to marine research and knowledge in the region.

Table A2: Geographic zone of marine research:
Zone by marine research spending (\$ million)

Marine Zone	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
Estuaries	3.6	4.1	3.8 6%	0.9
Coastal & near-shore	15.9	19.5	17.7 28%	21.5
EEZ incl. Sub-Antarctica ¹	25.2	26.9	26.0 42%	24.4
South Pacific and other non-EEZ	1.3	9.3	5.3 9%	1.5
Antarctica	1.3	5.1	3.2 5%	1.2
All zones/Other	2.9	5.3	4.1 7%	5.1
Unspecified	2.0	2.6	2.3 3%	2.8
Total (all zones)	52.1	72.9	62.5 100%	57.4

1: For a map of New Zealand's EEZ, see <http://www.seafriends.org.nz/fcl/NZeez2mr.gif>.
For a more detailed description see <http://www.oceans.govt.nz/libraryElements/publications/juris-boundaries.doc>

B The providers of marine research

B1 How much research is provided by different 'sectors'?

Table B1 shows that **public** research providers predominate, delivering on average in the last two years around \$50 million of the more than \$60 million per year in marine research.

The picture for 2003/04 is not clear because many government contracts for 2003/04 had not been allocated at the time of the survey.

Table B1: Marine research provider groups:
Research provider group by marine research spending (\$ million)

Research Provider	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
Public providers	44.0	53.0	48.5 77%	36.7 64%
Private providers ¹	7.9	19.8	13.8 22%	10.2 18%
Community/Maori providers	0.5	0.3	0.4 1%	1.0 2%
Not yet allocated	0	0	0	9.7 17%
All providers	52.4	73.1	62.8 100%	57.6 100%

1: This may understate the contribution of private research providers as returns were not received from many seafood companies and commercial stakeholder groups.

B2 How much research is provided by the main public groups?

Table B2 shows that the CRIs are the dominant public providers of marine research, with universities also significant. Other public providers are relatively small players. Together, CRIs and universities provided about 93% of the marine research delivered by public sector providers, and CRIs alone have delivered almost three quarters in recent years. Masters and PhD students at New Zealand universities provide a significant contribution to marine research.

Table B2: Public providers of marine research:
Public provider group by research spending (\$ million)

Public Provider Group	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04 ¹
CRIs	30.5	37.8	34.2 71%	23.4
Universities ²	10.9	10.9	10.9 22%	9.2
Government ministries	1.7	3.1	2.4 5%	3.0
Museums	0.8	0.7	0.8 2%	0.7
Local authorities	0.1	0.4	0.2 0%	0.3
All public providers	44.0	53.0	48.5 100%	36.6

1. Figures are lower because not all contracts had been finalised.
2. For two universities, the expenditure includes an estimate for each marine research Masters and PhD student of \$20,500 and \$26,000 per year respectively.

B3 Which are the main CRIs involved in marine research?

Table B3 shows NIWA's marine research spending is an order of magnitude larger than that of other CRIs. NIWA delivered on average 82% of all CRI spending on marine research over the last two years. NIWA stock assessments, however, have averaged \$11.5M in the last two years. Stock assessments often involve modification of population models rather than development of new methods. This means only part of those projects are defined as research by the Frascati definition (Annex 1), unless they were undertaken as an integral part of a marine research project.

The Institute of Geological and Nuclear Sciences (GNS) also provided a significant quantum of marine research.

The type of marine research projects carried out by the different CRIs is outlined in Annex 5.

**Table B3: Crown Research Institutes undertaking marine research:
CRI by research spending (\$ million)**

Crown Research Institute	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
NIWA	24.2	30.8	27.5 82%	17.7
GNS	3.6	3.6	3.6 11%	3.5
AgResearch	1.6	1.4	1.5 4%	1.0
ESR	0.5	0.5	0.5 1%	0.3
IRL	0.0	0.7	0.4 1%	0.6
HortResearch	0.2	0.2	0.2 1%	0.0
All CRIs			33.7 100%	

B4 Who are the main private providers of marine research?

There are a considerable number of private providers of marine research in New Zealand. Projects involving 70 private research providers were covered in this analysis. The largest private providers are the research institutes such as the Cawthron Institute (average over last two years: \$2.5M), a few substantial companies, such as Sealord Shellfish Ltd, and smaller companies or individuals such as Kingett Mitchell Ltd, Akroyd Walshe Ltd and Trophia Ltd. The industry stakeholder groups, such as the Rock Lobster Industry Council, and Orange Roughy Management Co. Ltd, also conduct a small amount of research themselves, though mainly they contract research out. A selection of the type of marine research project carried out by research providers is given in Annex 5.

B5 What is the research focus of the private providers?

Table B5 analyses the focus of the marine research provided by the private sector. It can be compared with the focus areas of (all) providers, Table A1, which is dominated by the focus areas of public providers. Table B5 suggests that for private providers, understanding physical systems has been very much the primary focus (48% of research spending). However, if the two large international projects are removed, the focus on understanding biological and ecological systems has been most important (45%), aquaculture and bioactives (23%), understanding physical systems (15%), and impacts on humans (13%). There are provisional indications of some shift in activity by private providers from physical systems research to aquaculture and bioactives research, though the focus of individual organisations may not have shifted.

Table B5: Focus of research by private providers:
Focus area by privately provided marine research by spending (\$ million)

Focus area	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
Understanding physical systems	1.2	11.9 ¹	6.6 48%	1.2
Understanding biological and ecological processes	3.8	4.0	3.9 28%	3.7
Aquaculture & bioactives	1.8	2.1	2.0 14%	4.0
Impacts on humans	1.1	1.2	1.1 9%	0.6
Other	<0.05	<0.05	<0.05	<0.05
Not specified	<0.05	0.6	0.3	1.0
Total (all focus areas)	8.0	19.8	13.9 100%	10.3

1. This total is skewed by two large international projects totalling \$10.5M; see note to Table A1.

B6 Which zones are the private providers mainly working in?

Table B6 below suggests that private marine research providers are more focused on coastal and near-shore zones than are providers as a whole (cf. Table A2). The cost of offshore, vessel-based research could be a factor here. Whereas for all providers, 28% of research relates to the coastal and near-shore zone, for private providers 34% relates to this zone.

Table B6: Zone of private provider research:
Marine zone by privately provided marine research by spending (\$ million)

Marine Zone	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
Estuaries	0.0	<0.05	<0.05	0.0
Coastal & near-shore	4.3	5.2	4.7 34%	6.7
EEZ incl. Sub-Antarctica	2.8	2.5	2.7 19%	1.7
South Pacific and other non-EEZ	0.0	7.3	3.6 26%	0.2
Antarctica	0.1	3.5	1.8 13%	0.1
All zones	0.9	1.3	1.1 8%	1.6
Total (all zones)	8.0	19.8	13.9 100%	10.3

C Marine research funders

C1 What are the public and private funding contributions?

Table C1 shows that the public sector funds the bulk of marine research. The money provided by the industry levies is also for research initially funded and allocated by the public sector and then recovered from industry. In the interests of transparency, these figures have been shown separately in Table C1. The private sector total comprises funding by seafood industry stakeholder groups and industry companies. Direct domestic private sector funding and the proportion of research costs that is recovered from industry, taken together constitute 27% of total marine research expenditure.

Table C1: Funder groups:
Funder group by marine research spending (\$ million)

Funder Group	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
Public funders ¹	36.6	44.0	40.3 65%	40.8
Industry levies ²	13.8	16.0	15.0 24%	14.6
Private funders ³	1.5	1.7	1.6 3%	1.5
International	0.1	11.1 ⁴	5.6 9%	0.5
Unspecified	0.1	0.2	0.2 0%	0.0
All funders	52.1	72.9	62.5 100%	57.4

1. This excludes the proportion of MFish research funding that is cost-recovered from the fishing industry and the Conservation Services Levies that are recovered from the fishing industry for DoC research. The former proportions were derived from the annual MFish Research Plans and the latter were provided by DoC.

2. See note 1 for description of levies.

3. These totals may understate the contribution of private research funders, as returns were not received directly from many private sector companies and commercial stakeholder groups.

4. This total is skewed by two large international projects; see note to Table A1.

The New Zealand Seafood Industry Council conducted a Research and Development Survey in the seafood industry in 2000. It concluded that the seafood industry spent approximately \$6 million per year on research (compared with above: private funders 1.5M in 2001/02, excluding industry levies). However, the results of that survey are not comparable with this survey because the SeaFIC survey included research on exploratory fishing, processing methods/technology, new products, and transportation/handling. Those categories were not included in this survey.

C2 Who are the public funders?

It is clear from Table C2 that FRST and MFish are the two largest public funders, allocating around 80% of the total of recent years' public funding for marine research. However, over the last two years, an average of \$13M (from a total of \$16.8M) was allocated by MFish for stock assessments. As noted in B3, these projects often only partially qualify as research (refer Frascati definition, Annex 1).

Local authorities tend to become involved in public funding of marine research in respect of specific estuary and coastal/near-shore issues. For example, two Environment Bay of Plenty projects are assessing coastal hazards around the harbour margins and examining the effects of development on harbour ecosystems.

Table C2: Main public funders:
Funder by marine research spending (\$ million)

Public Funder	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
FRST ¹	24.2	27.1	25.7 47%	25.7
MFish	2.9	4.7	3.8 7%	5.0
MFish Levy on industry ²	12.4	13.5	13.0 24%	12.2
CSL Levy on industry ³	1.4	2.5	2.0 4%	2.4
Marsden Fund	2.2	2.6	2.3 4%	2.3
Other govt agencies etc	2.6	2.7	2.7 5%	2.6
Local authorities	1.2	2.2	1.7 3%	1.5
Other	3.3	4.3	3.7 7%	3.3
All public funders	50.2	59.6	54.9 100%	55.0

1: Includes NSOF (Non-Specific Output Funding). This funding provided CRIs with funding equivalent to 10% of the value of public good science contracts awarded by FRST in the previous year.

2: The "MFish Levy" refers to the MFish research expenditure that is cost-recovered from the fishing industry. These figures were derived from the annual MFish Research Plans.

3: CSL is the Conservation Services Levy that is recovered from the fishing industry for DoC marine research. DoC provided these figures.

C3 What is the main research focus of the largest funders?

The big three funders are FRST, MFish, and the Marsden Fund. Table C3 shows that the big three funders had a greater focus (32%) on understanding biological systems than did all funders (24% - Table A1), and correspondingly, a somewhat lesser focus on understanding physical and ecological systems.

Table C3: Focus of the big three research funders:
Focus area by marine research spending (\$ million)

Research Focus	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
Understanding biological systems	14.5	14.7	14.6 32%	14.6
Understanding physical systems	11.9	13.4	12.7 28%	11.0
Understanding ecological systems	9.2	9.8	9.5 21%	9.1
Aquaculture & bioactives	3.6	5.7	4.6 10%	7.4
Impacts on humans	2.6	3.9	3.2 7%	2.5
Unspecified	0.1	0.7	0.4 1%	1.0
Total (all focus areas)	41.9	48.2	45.0 100%	45.5

C4 What is the research focus of the private sector funders?

Table C4 shows that, if direct private funding is considered on its own, privately funded marine research has tended to focus on understanding physical systems. However, if the two large international research projects are removed, the bulk of the private sector research focus is on understanding biological and ecological systems. This is further increased by adding the research for which costs are recovered from industry because this is focused mainly on understanding biological and ecological systems (e.g. stock assessments, ecological effects of fishing).

Table C4: Focus of the private sector research funders:
Focus area by marine research spending (\$ million)

Research Focus	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
Understanding physical systems	0.3	10.7 ¹	5.5 25% ¹	0.1
Understanding biological and ecological systems	1.9	3.0	2.5 11%	2.9
Aquaculture & bioactives	0.6	0.7	0.6 3%	0.6
Impacts on humans	0.2	0.2	0.2 1%	0.2
Unspecified (includes industry levy research)	12.4	13.5	13.0 60%	12.2
Total (all focus areas)	15.4	28.1	21.8 100%	16.1

1. These figures are skewed by two large international projects; see note to Table A1.

D Capability and expertise

The survey provides some insight into matters of capability and expertise by providing a picture of the disciplines in which marine researchers are working, the focus of work within those disciplines, and again within those disciplines, the marine zones covered. Thus, for example, we can establish the extent of any research going on in the oceanography and related disciplines focused on physical systems, or biology-related work going on in the coastal and near-shore marine zone.

It goes almost without saying that scientists and researchers often have capability well outside the area in which they are currently working. Therefore, even if a discipline appears weakly represented in terms of current research, it may be the case that New Zealand scientists are capable of conducting high quality research in that area should funding become available.

Other aspects of capability were beyond the scope of this survey, and thus cannot be comprehensively reported here.¹¹ However, we do present here a short primer on what information is published elsewhere and is readily available, on the considerable capability that exists in the form of Collections and Databases of CRIs and other organisations (refer D6).

¹¹ For example, capability is enhanced by the existence of journals such as the New Zealand Journal of Marine and Freshwater Research (<http://www.rsnz.govt.nz/publish/nzjmf/>).

D1 What disciplines are represented in the research?

Survey respondents were given a 'prompt list' of disciplines; some chose to add further disciplines or sub-disciplines to the list. They fell into the broad categories shown in Table D1, which also shows that oceanography and related disciplines were the dominant ones as far as recent marine research expenditure is concerned. Biology, modelling (including marine population modelling) and ecological disciplines were also well represented. Spending which drew on social science disciplines, including economics, was considerably lower than that drawing on other disciplines.

Table D1: Research discipline:
Research discipline by marine research spending (\$ million)

Research Discipline	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
Oceanography & related ¹	10.9	24.1 ¹	17.5 28%¹	13.1
Biology & related	14.9	19.2	17.0 27%	17.1
Modelling, statistics & related	13.6	14.2	13.9 22%	14.0
Ecology	6.3	7.4	6.8 11%	5.9
Chemistry & related	3.3	4.4	3.8 6%	3.3
Social sciences (incl. economics)	0.7	0.7	0.7 1%	1.2
Other	2.4	2.9	2.8 5%	2.8
Total (all disciplines)	52.1	72.9	62.5 100%	57.4

1. Note that the 2002/03 total and the Oceanography discipline has been skewed by two large international projects; see note to Table A1.

D2 Within these disciplines, what are the main foci?

An additional insight into the uses to which New Zealand's scientific and research capability is being put is given by cross-tabulating discipline by research focus. Table D2 takes the two main research discipline categories, oceanography-related, and biology-related disciplines, and shows the main areas of research focus within those discipline categories (i.e. it shows those focus areas where more than 10% of spending within that discipline has occurred on average over the last two years). Within the largest discipline grouping, oceanography and related, a physical system focus is clearly dominant.

Table D2: Research discipline by focus area:
Research discipline by focus by research spending (\$ million)

Discipline grouping	Research focus	Average last 2 yrs¹
Oceanography & related	Understanding physical systems	14.5 82%²
	Understanding ecological processes	3.0 17%
Biology & related	Understanding ecological processes	9.8 61%
	Aquaculture & bioactives	3.4 21%
	Impacts on humans	1.9 12%

1: Percentages of the total spending within the discipline grouping.

2: This total is skewed by two large international projects; see note to Table A1.

D3 Within these disciplines, what are the main zones involved?

Similarly, some further insight into the directions in which New Zealand's scientific and research capability is being directed is given by cross-tabulating discipline by marine zone.¹² Those marine zones where more than 10% of research from these disciplines is going on are identified in Table D3 below. It shows that the main zone where our oceanographic capability has been applied (on average over the last 2 years) is the EEZ and the South Pacific. However, the main zone where our biology and related disciplines capability have been applied is the coastal and near-shore zone.

Table D3: Research discipline by marine zone:
Research discipline by focus by research spending (\$ million)

Discipline grouping	Marine zone	Average last 2 yrs¹
Oceanography & related	EEZ including Sub-Antarctica	9.6 55%
	South Pacific	4.4 25%
	Antarctica	2.2 12%
Biology & related	Coastal & near-shore	9.2 56%
	All/Other	3.0 17%
	EEZ including Sub-Antarctica	2.2 13%

1: Percentage of total spending within discipline grouping.

¹² The categories for marine zone are given in Table A2 above.

D4 In terms of these disciplines, who are the main providers?

Table D4 below provides an ordered listing of the main research providers, for the two principal discipline groupings. The Table thus gives an indication of research capability and expertise of the main providers. Note that some providers – e.g. Cawthron – have an expertise that is predominantly exercised in one of the discipline categories rather than both. Of course, this Table does not bring out that considerable “niche” expertise lies within small providers, who often subcontract to the larger providers.¹³

Table D4: Research discipline by main provider:

Research discipline by main provider in descending order of research spending (\$ million)

Discipline grouping	Main provider		Average last 2 yrs¹
Oceanography & related	1	NIWA	5.6 32%
	2	GNS	3.6 21%
	3	University of Otago	0.9 5%
	4	Victoria University	0.4 2%
Biology & related	1	NIWA	6.9 43%
	2	Cawthron Institute	1.6 10%
	3	University of Auckland	1.5 9%
	4	Te Papa Tongarewa	0.7 4%
	5	University of Otago	0.6 4%

1: Percentages of total spending within discipline grouping.

D5 International linkages and collaboration

As remarked in the Introduction, we were also able to gain some insight into collaboration by identifying research projects that involved international collaboration (where at least one provider or funder was offshore). We noted also that interpreting the data in this way is likely to systematically underestimate the extent of collaboration, since respondents may often not have reported non-central collaborative elements of a research project (e.g. smaller research inputs; peer review). It should be remembered that the survey was not focused on collaboration as such, and thus did not emphasise to respondents that it would report on collaboration.

¹³ It would be unwise to deduce any funding policy conclusions from this information alone. For example, from a policy point of view, there is no reason to think that research funding at the margin should be directed more to established large providers with particular expertise than to niche providers – each has a role, depending on the expertise needed.

Table D5: Focus of internationally collaborative marine research:
Focus area by internationally collaborative marine research spending
(\$ million)

Research Focus	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
Understanding physical systems	<0.05	10.9	5.4 98% ¹	<0.05
Understanding biological and ecological processes	0	<0.05	<0.05	0
Unspecified	<0.05	<0.05	<0.05	<0.05
Total (all focus areas)	<0.05	10.9	5.5 100%	<0.05

1: This total is skewed by two large international projects; see note to Table A1.

This survey has revealed a number of examples of international research collaboration¹⁴. For instance, GNS is collaborating with the Alfred Wegener Institute in Germany in a \$7.1 million marine research project to improve understanding of the geology and evolution of the New Zealand continental margin. GNS is also collaborating with a number of USA organisations in a \$3.4 million marine research project, which is focused on understanding the plate tectonics of the Adare Trough region of the Antarctica.

D6 Main Collections and Databases

“Biodiversity databases and biological specimen collections housed in Crown Research Institutes and museums... are the fundamental libraries of data for recognition and inventory of native and introduced organisms.”¹⁵

Significant collections and databases are held by all the CRIs (e.g. marine biology collection) and a number of other organisations, including:

- Ministry of Fisheries (e.g. National Aquatic Biodiversity Information System (NABIS))
- Auckland Institute and Museum (e.g. marine fauna and fossils)
- Te Papa Tongarewa (e.g. NZ fish collection)
- Regional Councils.

¹⁴ The Oceans Policy team also noted in 2002 that the New Zealand branch of the World Wildlife Fund for Nature is carrying out a biodiversity assessment of New Zealand's marine environment. This is said to be part of a global programme, is due to be completed by the end of 2003, and will provide a qualitative assessment of the state of key habitats and species within New Zealand oceans based on information from key scientific experts. It could also provide further content for an inventory of datasets on New Zealand's marine biodiversity – as well as a baseline for assessing research gaps and priorities.

¹⁵ Ministry for the Environment: Oceans Policy Secretariat (2003) **Oceans Policy: Feedback from Stakeholders March-April**. Section on Information Sources.
<http://www.oceans.govt.nz/libraryElements/stg2workdoc/feedback-report.doc>.

Further information is available from Statistics New Zealand, which has compiled an environmental directory that includes many marine research items. It lists databases and collections held by a wide range of organisations including government departments, Crown Research Institutes, regional councils and environmental groups.¹⁶ The directory is, however, updated only to 1998, so is now becoming dated.

As the following box indicates, the level of knowledge of New Zealand's marine biodiversity is expanding.

Box 1

Marine Biodiversity and Systematics Research

(an excerpt from the NIWA website)

"This [NIWA research programme (FRST contract C01X0026)] aims to provide the biodiversity knowledge necessary to identify, classify, and sustain New Zealand's living marine resources and habitats. The focus ...is on the production of tools (such as manuals, guides, CD-ROMs and Internet accessible guides) that can be used to identify New Zealand's marine life and help educate a wide variety of people and organisations about the natural state of our biodiversity.

Much of the research is in taxonomy (i.e. the classification of organisms according to their natural relationships), and is being carried out on high-interest, high-diversity organisms (plankton, marine worms, echinoderms, toxic marine algae and bryozoans). These organisms are important in open-ocean and seafloor food webs, they structure marine habitats, they can affect environmental and human health, and they can be sources of marine natural products. They include potential environmental performance indicators and invasive species.

By improving knowledge of New Zealand's marine biodiversity, and the global processes that influence it, the research helps in better predicting the effects of human impacts on biodiversity, aids in the recognition of invasive species and biosecurity risks, and guides sustainable ecosystem management. These abilities, together with better understanding of the cultural and societal significance of biodiversity, will help identify how in New Zealand we can better empower our communities and industry to manage the marine environment and improve our ability to conserve our marine biodiversity. The programme also helps New Zealand meet its internal and international legislative biodiversity obligations, and supports research on ecology and the sustainable management of marine biota and resources."

Source: <http://www.niwa.co.nz/rc/prog/marinebiodiversity/intro>

¹⁶ <http://www.stats.govt.nz/domino/external/web/catv2.nsf/About?open>

E The purposes and emphases of research

This report has already described research focus, which is one dimension of purpose (Tables A1, B5 and C4). However, another important dimension of purpose is 'benefit' or key socially desired outcomes – be they economic, environmental or social outcomes, knowledge for its own sake, or special benefits to Maori.

Respondents were asked to identify the primary benefit of each research project themselves. It should be noted that this categorisation is “fuzzy” at the margin, given that, in a sustainable development context, it is often very difficult to draw a clear line between say, environmental and economic benefit, and other categories of benefit. For example, understanding fish stock recruitment will assist longer term in stock management, with economic benefits.

E1 What is the expected benefit of research spending?

Table E1 tabulates research spending by primary research outcomes. Respondents were asked to identify these outcomes. However, many large research projects have more than one outcome. This means that the figures require careful interpretation. The Table suggests that the main area of benefit is economic, but that environmental benefits and general 'knowledge' benefits are also major priorities in current spending decisions. Social benefits are of very limited importance in current marine research and, while benefit to Maori appears on provisional figures to be increasing (in terms of spending), it remains of relatively small significance as far as funding goes.

Table E1: Expected benefit of marine research:
Primary benefit by marine research spending (\$ million)

Primary research benefit	2001/02	2002/03	Average last 2 yrs	Provisional 2003/04
Economic	20.7	24.0	22.3 36%	16.2
Environmental	18.4	24.2	21.3 34%	27.4
Knowledge	8.8	19.6	14.2 23%	7.1
Maori	0.9	1.7	1.3 2%	2.5
Social	1.2	0.8	1.0 2%	1.3
Unspecified	2.1	2.6	2.3 4%	2.9
Total (all benefits)	52.1	72.9	62.5 100%	57.4

An example of economic benefit from marine research is provided by Box 2, which describes collaborative research into anti-fouling agents.

Box 2

An excerpt from ESR's 2002 Annual Report:

“CREATING WEALTH BELOW THE WATERLINE”

“ESR's ...expertise in biotoxins is helping to research a new generation of marine anti-foulant which could capture a lucrative share of an international market. We are part of a consortium including NIWA, Victoria University and Tauranga-based Altex Coatings exploring the commercial prospects of “Wellington Harbour Toxin”. Anti-foulants help prevent marine life such as barnacles, slimes and grass growing on ships' hulls. Reduced fouling increases a vessel's speed and fuel efficiency, and helps prevent marine organisms being transported from one location to another, causing biosecurity problems.

In Australasia and the Pacific alone, 700,000 litres of anti-foulant are used each year. The international market includes leisure, commercial, maritime and defence vessels and specialist undersea structures such as oil drilling platforms.

Deadly algae

Wellington Harbour Toxin is produced by a newly discovered microscopic algal species *Karenia brevesulcata*, which appeared during an intense algal bloom in Wellington Harbour in 1998. The bloom decimated almost all marine life and is remembered by fishermen for the massive fish kill it caused. Such a potent compound could be an effective anti-foulant, and an ideal organic replacement for the chemicals and heavy metals that are now used. Marine researchers around the world are desperately searching for more environmentally friendly substitutes, particularly with an impending ban on the use of heavy metals in anti-foulants.”

Source: <http://www.esr.cri.nz/>

E2 Within these main purposes, what are the principal foci?

Breaking down research benefit by principal research focus gives us some further insight into the intended benefit of current marine research. Since research focused on understanding biological and ecological systems is the main component of research with an economic focus, it underlines the close relationship between environmentally-related knowledge and the extraction of economic value from such understanding.

Table E2: Research benefit by focus:
Research benefit by focus by research spending (\$ million)

Main research benefit	Research focus	Average last 2 yrs ¹
Economic	Understanding biological and ecological systems	11.7 52%
	Aquaculture & bioactives	4.7 21%
	Understanding physical systems ²	3.4 15%
	Impacts on humans	2.5 11%
Environmental	Understanding biological and ecological systems	11.7 55%
	Understanding physical systems ²	8.1 38%
	Impacts on humans	1.4 7%
	Aquaculture & bioactives	0.2 1%
Knowledge	Understanding physical systems ²	8.4 59%
	Understanding biological and ecological systems	5.7 40%
	Aquaculture & bioactives	0.1 1%

1: Includes percentages of the total spending within the benefit grouping.

2: The totals for this focus are skewed by two large international projects; see note to Table A1.

E3 Within these main purposes, what are the main zones covered?

Table E3 shows that within the economic and environmental benefit categories, EEZ-focused research is of prime importance, while for the broader 'knowledge' benefit category, the South Pacific zone is of greatest significance. Most of our Estuaries zone research comes within the Environmental benefit category. The Antarctic research zone is more important within the 'Knowledge' benefit group.

Table E3: Research benefit by marine zone:
Research benefit by zone by research spending (\$ million)

Main research benefit	Marine zone	Average last 2 yrs ²
Economic	EEZ including Sub-Antarctica ¹	12.1 54%
	Coastal & near-shore	8.9 40%
	South Pacific and other non-EEZ	0.7 3%
Environmental	EEZ including Sub-Antarctica ³	9.4 44%
	Coastal & near-shore	5.0 23%
	Estuaries	3.4 16%
Knowledge	South Pacific and other non-EEZ ⁴	4.6 32%
	EEZ incl. Sub-Antarctica	3.7 26%
	Antarctica	2.6 18%
	Coastal & near-shore	2.4 17%

1: E.g. remote sensing of fisheries. 2: Percentages of the total spending within the benefit grouping.

3: E.g. sustainability of seabird populations in the Southern Ocean. 4: E.g. using unique NZ marine fauna to examine the evolution of animal development.

E4 How does purpose of research vary by funder?

It is of interest to know how funders vary in terms of the purpose (benefit) of the research they fund. Table E4 gives some measure of this for the two main funders of marine research in New Zealand. Broadly speaking, FRST funding is focused on research of environmental and economic benefit, with some of more general 'knowledge' benefit, while MFish research is more economically oriented, with some of environmental benefit.

Table E4: Research benefit by main funders:

Research funder by research primary benefit by research spending (\$ million)

Main research funder	Research benefit	Average last 2 yrs
FRST	Environmental	50%
	Economic	32%
	Knowledge	12%
	Maori	4%
	Social	0%
MFish	Economic	76%
	Environmental	16%
	Knowledge	12%
	Social	5%
	Maori	1%

E5 How does purpose of research vary by sector?

An allied question is how funding coming from the public sector varies in terms of its purpose (benefit) from that deriving from the private sector. After the private sector international funders are separated out, Table E5 indicates that domestic private sector funders are more focused on economic benefits than the public sector.

Table E5: Research benefit by sector:
Research funding sector by benefit by research spending (\$ million)

Main research funder	Research benefit	Average last 2 yrs
Public sector ¹	Economic	21.2 38%
	Environmental	20.8 38%
	Knowledge	8.6 16%
	Maori	1.3 2%
	Social	1.0 2%
	Unspecified	2.3 4%
Private sector ¹	Economic	1.2 80%
	Environmental	0.3 20%
International	Knowledge	5.2 100%

1. These percentages were based on MFish and DoC funding of research *before* any cost recovery from industry.

F Strategic questions relating to Oceans Policy

In the development of Oceans Policy, officials suggested that some gaps may exist in terms of data sets on:

- Ecological processes
- Marine taxonomy – including ecosystem classification
- Impacts of fishing on target (and non-target) species
- Water quality issues
- Climate change impacts, and
- Maori environmental concerns.¹⁷

Also, Oceans Policy stakeholder feedback included comment that the following were important areas for future research:

- the land/sea interface
- impacts of land-based activities on this ecosystem
- accelerating impacts of climate change on the wider marine environment.¹⁸

¹⁷Ministry for the Environment: Oceans Policy Secretariat (2002) Draft paper on Oceans Policy Information Issues, circulated to stakeholders for discussion.

The marine research survey enables us to offer some comment on research going on in these areas. All New Zealand research effort should be assessed in the light of the contextual comments (see Introduction) about the large size of New Zealand's EEZ and our relatively limited current knowledge base. However, it must be remembered that an amount of expenditure does not measure its adequacy and "gaps" do not always need to be filled.

Ecological processes (including impacts on marine ecosystems)

Table A1 shows that there is a significant investment (\$16 million per year) in marine research into ecological systems (broadly defined and excluding biological systems research). This ecological research amounts to around 25% of total marine research. It appears from provisional 2003/04 figures that this investment is continuing.

Marine taxonomy/ecosystem classification

This is a more specialised area of marine research, but the survey indicated that there is nevertheless significant work going on in this area, such as that of NIWA's Marine Biodiversity and Systematics Programme¹⁹. Another example of research in this area is a project carrying out biosystematic investigation of New Zealand fishes to facilitate their accurate identification. A comprehensive illustrated guide to all EEZ fishes will be produced.

Impacts of fishing

Although it is not possible to make an accurate quantification of research in this area, much of the research that is taking place to understand biological systems (\$15 million per year recently) pertains to impacts of fishing. Some of the research on understanding ecological systems (\$16 million per year) sheds light on impacts on both target and non-target species. However, there are clearly still gaps in understanding a number of fisheries and ecosystems.²⁰

¹⁸ Ministry for the Environment: Oceans Policy Secretariat (2003) **Oceans Policy: Feedback from Stakeholders March-April**. Section on Information Sources.
<http://www.oceans.govt.nz/libraryElements/stg2workdoc/feedback-report.doc>.

¹⁹ <http://www.niwa.co.nz/pubs/bm/>

²⁰ In respect of New Zealand's hoki fishery, for example, the Netherlands based organisation SGS is reported to have stated that "The medium to long term impacts of hoki fishing on the ecosystem or habitats are not well understood at this time... There is little available knowledge about the impacts of the fishery on the ecosystem, habitats and non-commercial biodiversity other than formally protected species in the areas of fishery operation," See <http://eces.org/articles/static/98506800072188.shtml>

Climate change

Significant investment is occurring in marine research which underpins our understanding of climate change. In the research focus area of ocean-climate interactions, for example, there was expenditure of \$3.6 million in 2002/03.

Maori environmental concerns

Again, it is not possible to quantify how much marine research specifically addresses Maori environmental concerns, in part because research which has a primary benefit such as economic or environmental may not be categorised by survey respondents under the Maori knowledge heading. Nevertheless, we can identify that around \$1.3 million of research has a primary research benefit to Maori (Table E1).

Management regime issues

This survey has identified some research which is pertinent to management regime issues. For example, there is some research going on which focuses on strategies for management of low information fish stocks, and performance indicators used in New Zealand fishery stock assessments are being reviewed.

Discussion and Conclusions

This survey has provided a benchmark stocktake of marine research in New Zealand. This can be used in future to calibrate trends in the amount and allocation of marine research funding.

The survey has not extended to exploring research gaps – it is the starting point for a research strategy. A research strategy would require detailed analysis of research priorities and needs, with reference back to this survey. We also know that, with New Zealand's vast EEZ, there are inevitably many research areas remaining to be explored in respect of New Zealand's marine environment. Nevertheless, the survey results suggest that current and forthcoming research investments are addressing a wide range of important marine research issues and a number of the gaps identified by Oceans Policy stakeholders.

The survey also has a number of limitations relating to the lack of trend data, inexactness over the quantum of private sector research, and a lack of information on aspects of marine research, such as the extent and nature of collaboration.²¹ Having said that, the survey is a useful first step in shedding light on what is going on across the broad canvas of marine research in New Zealand. It has illuminated a number of issues of significance, and allowed us to draw the following overall conclusions.

Significant marine research investment occurring

- A significant amount of marine research effort has been going on in the last two years, and appears to be continuing in 2003/04. Marine research investment in the last two years has averaged \$63 million per year.

Funding of marine research remains largely from the public sector

- The bulk (almost two-thirds) of New Zealand marine research is publicly funded, although the private sector makes a major contribution, particularly through cost recovery of MFish and DoC research from industry. A small but significant amount comes from international sources. FRST is the main funder of marine research.

²¹ The reader is reminded that there are a number of things we **cannot** tell from this survey:

- **Trends** in marine research: These cannot be established because the time series is too short and the 2003/04 figures are provisional.
- Research **effort or output**: This survey has gauged expenditure levels, not effort or output. Spending may, for example, diverge from output – with some research being high cost per unit of output and other research being low-cost.
- Extent of **collaboration**: Respondents were not specifically asked to identify collaborative research. However, some respondents did indicate examples of collaboration, including international collaboration.
- **Exact levels of private sector** funded and provided research: While we believe we have a reasonable coverage of private sector funding and provision of marine research, we are likely to have missed a few private funders and providers – essentially because it is costly and time consuming to locate them all and have them respond, for example, if they are particularly busy. We doubt that this omission will have distorted the results significantly.

Focus of the research is on understanding living systems, and within-EEZ research

- New Zealand marine research has recently had a major focus on understanding physical systems, although two large international projects have affected this total. However, if we group biological and ecological systems together, research on understanding living systems can be seen as the largest area of focus. There are emerging signs of more focus on aquaculture and bioactives, and less on physical systems. Little marine research relates to impacts on humans.
- While most marine research focuses on our EEZ (plus coastal research), at least one research dollar in seven goes on research outside our EEZ, mainly in the South Pacific and Antarctica.

Providers are diverse

- There is a diversity of marine research providers in New Zealand, with CRIs (particularly NIWA) and universities dominant among public sector providers, about 70 private sector research providers and 15 Maori and community research providers identified in this survey. Private providers have focused recently on understanding physical systems, although the two large international projects have affected this total.

Diverse capability and significant collaboration

- New Zealand's marine research activity relies on a diverse set of skills and capabilities, with oceanography, biology and related disciplines being foremost. There are difficulties in undertaking a significant proportion of marine research because of the nature of the marine environment. Relative to terrestrial science, marine science is expensive due to the need for specialist equipment, boats and ships.
- International collaboration on marine research has not been the focus of this survey but, from the data collected, it appears that such collaborative projects currently comprise close to 10% of total marine research expenditure. A closer exploration of the extent and value of such collaboration would be of interest.

Annex 1 Request for Information

17 April 2003

«Title» «FirstName» «LastName»
«JobTitle»
«Company»
«Address1»
«Address2»
«City»

Dear «Title» «LastName»

INFORMATION REQUEST - MARINE RESEARCH STOCKTAKE

I would like your assistance with a stocktake of marine research that the Ministry of Research, Science and Technology (MoRST) will be undertaking over the next few weeks.

The stocktake aims to provide an overview of all current and recent New Zealand marine research, both publicly and privately funded.

This stocktake will provide an important starting point for subsequent discussions and decisions about the appropriate scale and focus of marine research in New Zealand. We currently lack a comprehensive understanding of the “state of play” of marine research in New Zealand. This is compromising our ability to inform Government policy processes such as the Oceans Policy. The Hon Pete Hodgson (Minister of Research, Science and Technology) has requested this stocktake.

The stocktake will cover:

- marine research carried out in New Zealand since June 2001;
- marine research that has been approved but not yet commenced; and
- recent or current overseas marine research that contributes directly to New Zealand’s oceans management, for example collaborative research involving New Zealand researchers.

Guidance on the definition of research, based on Frascati methodology, is attached as Annex 1.

For the purposes of this study, the definition of “marine” will be consistent with the scope of the Oceans Policy and will include all research in the marine environment within New Zealand’s jurisdiction. It will take account of research from the inter-tidal zone to the extent of the Exclusive Economic Zone or to New Zealand’s continental shelf margins beyond. However, unlike the Oceans Policy, the stocktake will include marine research in the Southern Oceans and in the South Pacific.

It would be much appreciated if you could provide us with information about the marine research that your organisation undertakes or funds by **Thursday 8 May 2003**. I have attached below (Annex 2) a sample table of the type of information we would like to receive from you. We will send you an Excel template by e-mail shortly.

The stocktake's Project Manager at MoRST is Carol Lough (04 917-2944 (DD) or 04 917-2900). Please do not hesitate to contact Carol if you have any questions and I thank you in advance for your cooperation in this important project.

Yours sincerely

Dr James Buwalda
Chief Executive

Definition of Research (or R&D)

R&D covers

- Any activity characterised by ORIGINALITY; it should have INVESTIGATION as a primary objective, the outcome of which is the prospect (or expectation) of gaining **new technology**, with or without a specific practical application or **new or improved materials**, products, devices, processes or services.
- **Basic** and **applied research** and experimental development in the natural and applied sciences and social sciences and humanities.

R&D includes

- Design, construction and operation of prototypes where the main objective is technical testing or to make further improvements.
- Construction and operation of pilot plants not operated or intended to be operated as commercial units.
- Research into and original development (or substantial modification) of computer software such as new programming languages and new operating systems.
- “Feedback R&D” directed at solving problems occurring beyond the R&D phase, for example, technical problems arising during initial production runs.
- Research work in the biological, physical and social sciences, and the humanities.
- Social science research includes economic, cultural, educational and sociological research.

The following are only included if used primarily for the support of, or as part of, R&D projects

- Scientific and technical information services.
- Policy related studies, management studies, efficiency studies.
- Routine quality control and testing.
- Pre-production activities such as demonstration of commercial viability, tooling up and trial production runs.
- Prospecting, exploring or drilling for minerals, petroleum or natural gas.
- Cosmetic modifications or style changes to existing products.
- General purpose or routine data collection.
- Routine computer programming, systems maintenance or software development and application.
- Operations research and mathematical or statistical analysis.
- Commercial, legal and administrative aspects of patenting, copyrighting or licensing activities.
- Activities associated with standards compliance.
- Specialised routine medical care, for example, routine pathology services.

Where does R&D end?

- R&D ends when the work is no longer experimental and pre-production begins.

Stock assessment and monitoring Routine data collection is not included as R&D, unless this is specially collected or processed for the purpose of scientific research.

R&D in this area consists of:

- the development of new surveying methods and techniques;
- monitoring undertaken as an integral part of a research project on marine phenomena; and
- research on marine phenomena per se, undertaken as a subsidiary part of assessment and monitoring programmes.

Marine Research Stocktake

Project Title	Project Description	Research Topic	Main Science Discipline	Research Outcome Focus	Marine Zone	Funder(s)	Contract No. ¹	Research Provider ²	R&D Expenditure ³ 2001-2002	R&D Expenditure ³ 2002-2003	R&D Expenditure ³ 2003-2004

¹ If applicable, e.g. FRST contract number.

² Organisation doing the research.

³ 1 July – 30 June. R&D expenditure includes: salaries, wages, current and capital costs. Preference is to exclude GST.

Note we will shortly send you an Excel template by e-mail along with further instructions. The Excel worksheet should be returned by e-mail to **carol.lough@morst.govt.nz** by **8 May 2003**.

Annex 2 Survey Form

Organisation	Contact person	Project Title	Project Description (paragraph including objectives)	Main Research Focus	If in research focus category "other", please specify	Main Research Benefit	Marine Zone	If in marine zone category "other", please specify	Main Science Discipline	If in science discipline category "other", please specify	Funder(s)	Contract No.	Research Provider	R&D Expend 2001-2002	R&D Expend 2002-2003	R&D Expend 2003-2004	Does the R&D Expend excl GST? (Yes/No)	
Main Research Focus				Research Benefit			Main Science Discipline											
			Aquaculture	Economic			Bioinformatics											
			Biodiversity	Environmental			Chemistry											
			Biosecurity	Knowledge			Ecology											
			Coastal processes (incl. physical and ecological)	Maori			Economics											
			Ecological effects of fishing	Social			Geology											
			Ecosystems (excl. ecological effects of fishing)				Marine Biology											
			Geology (excl. mineral exploitation)				Marine Taxonomy and Biosystematics											
			Human health (e.g. toxic organisms)				Oceanography											
			Marine bioactives	Marine Zone			Seismology											
			Mineral exploitation	Antarctica			Other (please specify)											
			Ocean-climate interactions	Coastal zone and nearshore														
			Physical oceanography	Estuaries														
			Seafood processing	Offshore and open ocean (within EEZ)														
			Wild fisheries exploitation and management	South Pacific														
			Other (please specify)	Other (please specify)														

Select one focus from drop-down menu or, where project has more than one focus, make separate entries for the same project – remembering to apportion the costs accordingly.

Please select only one benefit from drop-down menu except where multiple benefits correspond with multiple research foci that have been identified.

Select one zone from drop-down menu. If research covers all zones please enter "All" in the category "Other" column.

If there is more than one funder for a project, please enter details in separate lines.

Enter number if applicable, e.g. FRST contract number.

i.e. organisation doing the research

1 July – 30 June. Include: salaries, wages, current and capital costs. Preference is to exclude GST.

Predicted value

Annex 3

Statistics New Zealand Survey of R&D

As a rough cross-check, the Statistics New Zealand survey of R&D providers²² for 1999/2000 (the most recently available with the required detail) can be compared with the marine research survey results presented in this report. However, for present purposes, the Statistics NZ survey has one significant problem – it groups freshwater R&D along with marine R&D. Thus the numbers below “overstate” the extent of marine research. Moreover, given that the figures are for 1999/2000, they cannot be directly compared with the figures in the report above, which are for later years.

Table 3.1: Marine and freshwater research in New Zealand:

Marine and freshwater research spending by provider sector, 1999/2000 (\$ m)

	Business enterprise R&D	Government sector R&D	Higher education sector R&D	Total domestic R&D
Fisheries & aquaculture	3.7	5.7	4.1	13.4
'Marine' (incl. freshwater)	0.1	36.4	7.0	43.5
Total	3.8	42.1	11.1	56.9

These data are summarised in the next table, which groups providers into public (higher education spending along with government sector spending) and private sectors.

Table 3.2: Marine and freshwater research in New Zealand: summary

Marine and freshwater research spending by provider sector, 1999/2000 (\$ million and proportions)

Provider sector	\$ million	Percentage
Business enterprise R&D	3.8	7%
Public sector R&D	53.2	93%
Total domestic R&D	56.9	100%

It is interesting to note that the Statistics New Zealand survey suggests the proportion of marine *and freshwater* research provided by public sector providers as around 93% in 1999/2000. This compares with the 77% of marine research estimated to be provided by public sector providers in the current marine research survey (Table B1 above). The latter figure may be

²² MoRST R&D Statistics Report 1999-2000 plus unpublished data

lower in part because it excludes freshwater research (which is likely to be more heavily government-funded than marine research), and partly because patterns of research funding may have changed in the period between the two surveys (more than two years).

The Statistics NZ figure for total domestic marine *and freshwater* R&D in 1999/2000 is \$56.9 million. The total from this survey for marine R&D in 2001/02 is \$52.4 million. After consideration of the above reasons for why the totals are not directly comparable, the fact that the figures are of a similar order of magnitude suggests a degree of confidence in the results of this survey.

Annex 4

Organisations contacted

Organisation	Return received
AgResearch	Yes
Canterprise Ltd	Yes
Cawthron Institute	Yes
Crop and Food Research	Yes
Department of Conservation	Yes
HortResearch	Yes
Industrial Research Ltd	Yes
Institute of Environmental Science & Research	Yes
Institute of Geological and Nuclear Sciences	Yes
Ministry of Fisheries	Yes
National Institute of Water & Atmospheric Research	Yes
NZ Mussel Industry Council Ltd	Yes
NZ Rock Lobster Industry Council	Yes
Royal Society of New Zealand	Yes
Sealord Group	Yes
Te Papa Tongarewa	Yes
University of Auckland	Yes
University of Canterbury	Yes
University of Otago	Yes
University of Waikato	Yes
Victoria University of Wellington	Yes
<i>Regional Coastal Planners Group:</i>	
Auckland Regional Council	Yes
Environment Bay of Plenty	Yes
Environment Canterbury	Yes
Environment Waikato	Yes
Marlborough District Council	Yes
Northland Regional Council	Yes
Otago Regional Council	Yes
Taranaki Regional Council	Yes
Wellington Regional Council	Yes
Aquabio Consultants Ltd	Nil
Bluff Oyster Management Co Ltd	Nil
CentrePort	Nil
Environment and Conservation Organisations (ECO)	Nil
Geoscience Research & Investigations NZ	Nil
Land Information New Zealand	Nil
Landcare Research	Nil
Lincoln University	Nil
Maritime Safety Authority	Nil
Petroleum Exploration Association of NZ	Nil

Victoria Link Ltd	Nil
World Wide Fund for Nature (WWF NZ)	Nil
<i>Regional Coastal Planners Group:</i>	
Environment Southland	Nil
Hawkes Bay Regional Council	Nil
Horizons MW	Nil
Nelson City Council	Nil
Tasman District Council	Nil
West Coast Regional Council	Nil
Auckland University of Technology	No
Lincoln Ventures Ltd	No
Massey University	No
Shell Todd Oil Services	No
149 seafood companies and 23 commercial stakeholder groups contacted through SeaFIC	No

Annex 5

Marine research providers and examples of project types

Research Provider	Examples of Project Types
AgResearch	Algal Technologies Marine algal toxins
Australian Institute of Marine Sciences	Reef fish
Akroyd Walshe Ltd	NZ QMS fishery system Shellfish management
Alfred Wegner Institute, Germany	Geology and evolution of New Zealand continental margin
Alison Davis	Chatham Island Oystercatchers
AMSResearch	Tubeworm reefs
Antarctica New Zealand	Antarctic research programme advice
Auckland War Memorial Museum	Environmental impact assessment
Australis Consultants	Coastal Reef Fisheries
Peter Batson	Deep Sea New Zealand Book
BioDiscovery NZ	Marine Biotechnology
Blue Water Marine Research Ltd	Management of game fish
Cambridge University	Geophysical transect
Cawthron Institute	Biosensors Marine ecosystems Ballast water management Aquaculture Estuarine environmental assessment protocol Bioactives Fish ecology Oil spill impacts
Chris Glasson Landscape Architects Ltd	Aquaculture seascape assessment
CJR Robertson	Seabirds
Commonground Associates	Harbour study
Consultus NZ Ltd	Marine biosecurity
Crop and Food Research	Marine bioactives
D Kellian	Seabird capture mitigation
Davidson Environmental Ltd	Biological monitoring
Diffuse Solutions Ltd	Health of marine communities
Department of Conservation	Seabirds Marine reserves Marine farming Protected marine species Maori marine management Sub-Antarctic islands Marine environment classification
Dr Bruce Hayward	Paleogeology
Eclectic Energy	Fisheries management
Environment Bay of Plenty	Coastal and estuarine ecology Coastal dynamics

Research Provider	Examples of Project Types
ESR	Microbiological water quality indicators Biotoxins in seafood
FishServe	Ballast water database
Florida University	Reef fish
Franz Smith	Marine environment classification
Friends of Mana Island	Fairy prion management
Geoenvironmental Consultants	Harbour sedimentation
GNS	Plate tectonics Auckland volcanic caldera Antarctic ice sheets Geology and evolution of EEZ Harbour sedimentation Bathymetry Geophysical transects Ocean-climate interactions Origin and development of marine diversity Mineral resources Delimitation of NZ legal continental shelf
HortResearch	Nutraceuticals from shellfish
Ian Ruru	Te Mauri O Te Kaipara
Innovative Solutions Ltd	Fisheries management
IOS	Hazardscape tools and models
IRL	Seaweed glycotherapeutics
Various iwi	Maori interests in marine protection
Jim Dahm, Coastline Consultants	Coastal hazards and dynamics projects
Kahurangi New Zealand Maori Dance Theatre	Te Mauri O Te Kaipara
Kairakau Land Trust	Te Mauri O Te Kaipara
Kath Walker	Seabirds
Kingett Mitchell Ltd	Fish ecology Environmental impact assessment Undaria management Marine reserve assessment Marine recreational fishing surveys Technical guidelines for hull cleaning facilities
Kody Koroumatai Pewhairangi	Toheroa relocation methodology
Landcare Research Ltd	Sedimentation Fur seals
Lat37 Ltd	Data management
Lincoln University	Shellfisheries
NZ Rock Lobster Industry Council	Data management Stock assessment
M. Downes	Ocean ecosystems
Malaghan Institute	Drug development
Patricia Mather	Ascidians
Melbourne University, Australia	Marine population connectivity
Ministry for the Environment	Maori interests in marine protection Marine classification system
Ministry of Fisheries	Marine biosecurity National aquatic biodiversity information system (NABIS) Stock assessment processes
Mike Stuart	Marine biosecurity

Research Provider	Examples of Project Types
Massey University	Marine mammals
Muaupoko Trading Co. Ltd.	Te Mauri O Te Kaipara
New Zealand Diving and Salvage Ltd	Underwater vacuum system
Nga Kaitiaki O Tangaroa ki Te Whanganui A Orotu	Te Mauri O Te Kaipara
Ngai Tahu	Aquaculture
Ngai Tahu Development Corporation Ltd	Toheroa relocation methodology
Ngati Kahungunu Iwi Incorporated	Traditional fisheries and management
Ngati Koata	Coastal reef fisheries
NIWA	Aquaculture Biophysical monitoring Coastal hazards Coastal pollution Coastal reefs Coastal sedimentation Coastal sustainability Deepwater fisheries stock assessments Environment and fisheries Fish disease Fishing technology Middle depth fisheries stock assessments Inshore finfish fisheries stock assessments Marine algae Marine bioactives Marine biodiversity Marine biosecurity Marine ecology Marine environment classification Marine mammal modelling Mineral resources Non-commercial fisheries – stock assessments Nutraceuticals Ocean-climate interactions Oceanography Pelagic fisheries – stock assessment Remote sensing of fisheries Sea ice Seabirds and fisheries Seamounts Shell fisheries – stock assessment Wave modelling
NZ Whale and Dolphin Trust	Dolphins
Offshore Technology Development Ltd	Offshore technology assessment
Optimx Ltd	Marine biosecurity
Orange Roughy Management Group	Seamounts
Ornithological Society of New Zealand Inc	Intertidal organism survey
Otago Regional Council	Coastal hazards
Pacific Eco-Logic	Data management
Pip Consulting	Harbour study
Proteus Research and Consulting Ltd	Sealion SLED analysis
Sanford Ltd	Stock assessment
SeaFIC	Stock assessment
McDermott Fairgray Group Ltd	Cost/benefit analysis
Sealord Shellfish	Aquaculture

Research Provider	Examples of Project Types
Sinclair Knight MERZ Ltd	Marine biosecurity
Spherion Recruitment Solutions Ltd	National aquatic biodiversity information system
Starrfish	Rock lobster stock assessment
Taiapure O Porangahau	Toheroa relocation methodology
Te Kete Mahinga Kai	Toheroa relocation methodology Te Mauri O Te Kaipara
Te Mua Whanau Trust Inc.	Te Mauri O Te Kaipara
Te Papa Tongarewa	Antarctic fish taxonomy Biosystematics Fisheries and seabirds Reference collection and database of marine species Marine mammals
Te Riu o Waiapu	Te Mauri O Te Kaipara
Taranaki Regional Council	Water quality monitoring Marine ecology
Triton Consultants	Hazardscape tools and models
Trophia Ltd	Fisheries and shellfish stock assessment
University of California/California Institute of Technology/Lamont Doherty Earth Observatory	Antarctica plate tectonics
University of Auckland	Marine ecology Underwater acoustics Marine reserves - social and economic effects Marine productivity in reserves Biologically active natural products Seaweed chemicals Computer modelling of tidal flows Fish ecology Health of marine communities Leigh Marine Laboratory Marine mammals Micro-algal products Marine invertebrates Environmental impact assessment
University of Canterbury	Aquaculture Physiology of Antarctic fish Marine algae Coastal ecology Marine mammals Antarctic sponges Marine biotechnology
University of Minnesota	Modelling and analysis
University of Otago	Air-sea exchange of carbon dioxide Marine ecology Marine mammal population modelling Marine reserve effects Marine algal systematics Marine environment classification Ocean productivity Ocean-atmosphere interactions Sea ice and southern ocean processes Seamounts Marine species evolution

Research Provider	Examples of Project Types
University of Waikato	Bioactive and/or novel compounds Sedimentation Coastal reef fisheries Mangrove distribution
URS New Zealand	Harbour Study
Marianne Vignaux	National aquatic biodiversity information system
Victoria University of Wellington	Antarctic sea ice, algal productivity and global climate change Reef fish Marine ecology Sedimentation Marine reserves Molecular biology Geophysical transect Ocean-climate interactions Aquaculture
Wildlife International Ltd	Seabirds
Working Knowledge Wellington Ltd	National aquatic biodiversity information system
Wellington Regional Council	Contaminants In Shellfish

Annex 6

Marine research funders

Public Funders and Funding Schemes

AgResearch
Auckland Regional Council
Clutha District Council
Department of Conservation
Dunedin City Council
Environment Canterbury
Environment Bay of Plenty
Environment Waikato
Foundation for Research, Science and Technology (FRST) - New Economy Research Fund (NERF)
FRST - Non-Specific Output Funding (NSOF)
FRST - Public Good Science and Technology (PGST)
FRST - Technology for Business Growth (TBG)
FRST - Bright Futures
FRST - Technology in Industry Fellowships (TIF)
FRST - Tech NZ Maori Collectives Scheme
FRST - Tech NZ Technology Assessment Projects (TAP)
Institute of Geological and Nuclear Sciences
Group of 11 Regional Councils
HortResearch
Land Information New Zealand
Ministry of Agriculture and Forestry
Manukau City Water
Marsden Fund
Marlborough District Council
Ministry of Foreign Affairs and Trade
Ministry for the Environment
Ministry for the Environment – Sustainable Management Fund
Ministry of Fisheries
Ministry of Research, Science and Technology
Northshore City Council
New Plymouth District Council
Northland Regional Council
Otago Regional Council
Rodney District Council
South Taranaki District Council
Te Papa Tongarewa
Te Ohu Kai Moana
Transit NZ
University of Auckland
University of Canterbury
University of Otago
University of Waikato
Victoria University of Wellington
Waitaki District Council
Waitakere City Council
West Coast Regional Council
Wellington Regional Council

Private Funders

Auckland Medical Research Foundation
Bluff Oyster Management Company
Cawthron Institute
Contact Energy
Conservation Services Levies on fishing industry
Discovery Channel
Dolphin Explorer
NZ Rock Lobster Industry Council
Marlborough Mussel Co
Mellon Foundation
Meridian Energy Ltd
Methanex
Ministry of Fisheries levies on industry
NZ Mussel Industry Council Ltd
Northland Trust
NZ Squid Fishery Management Co
NZMP Whareroa
New Zealand Seafood Industry Council
Sealord Shellfish
WWF NZ
Wilsons Bay Group
Tourism levies on tourism industry

International

Australian Institute of Nuclear Science and Engineering
Australian Energy Company
Alfred Wegner Institute, Germany
International Fund for Animal Welfare
International Society for Reef Studies
Environment Australia
United States National Science Foundation
Swiss Alinghi Amcup Syndicate
University of California
California Institute of Technology
Lamont Doherty Earth Observatory