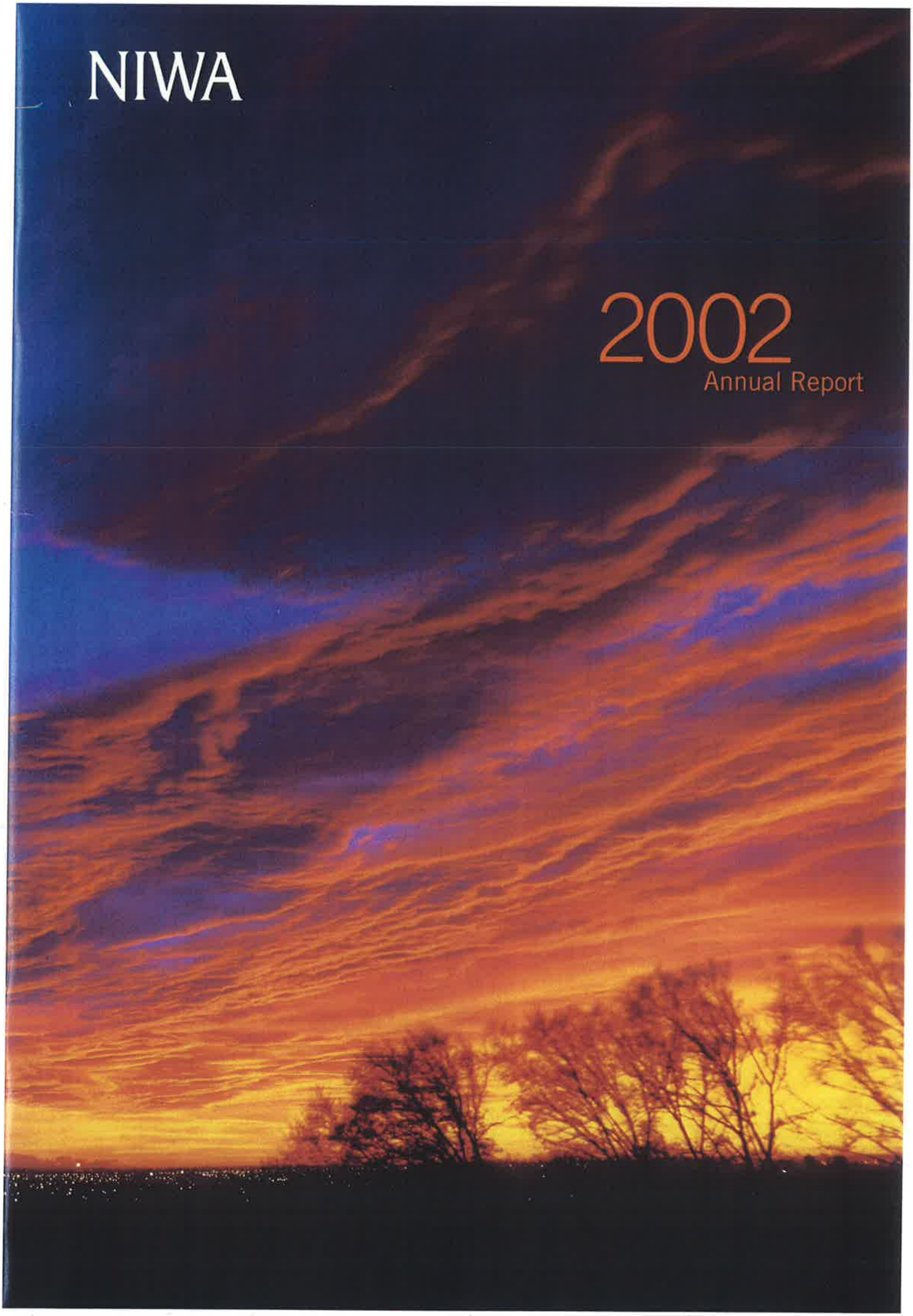
NIWA

2002
Annual Report

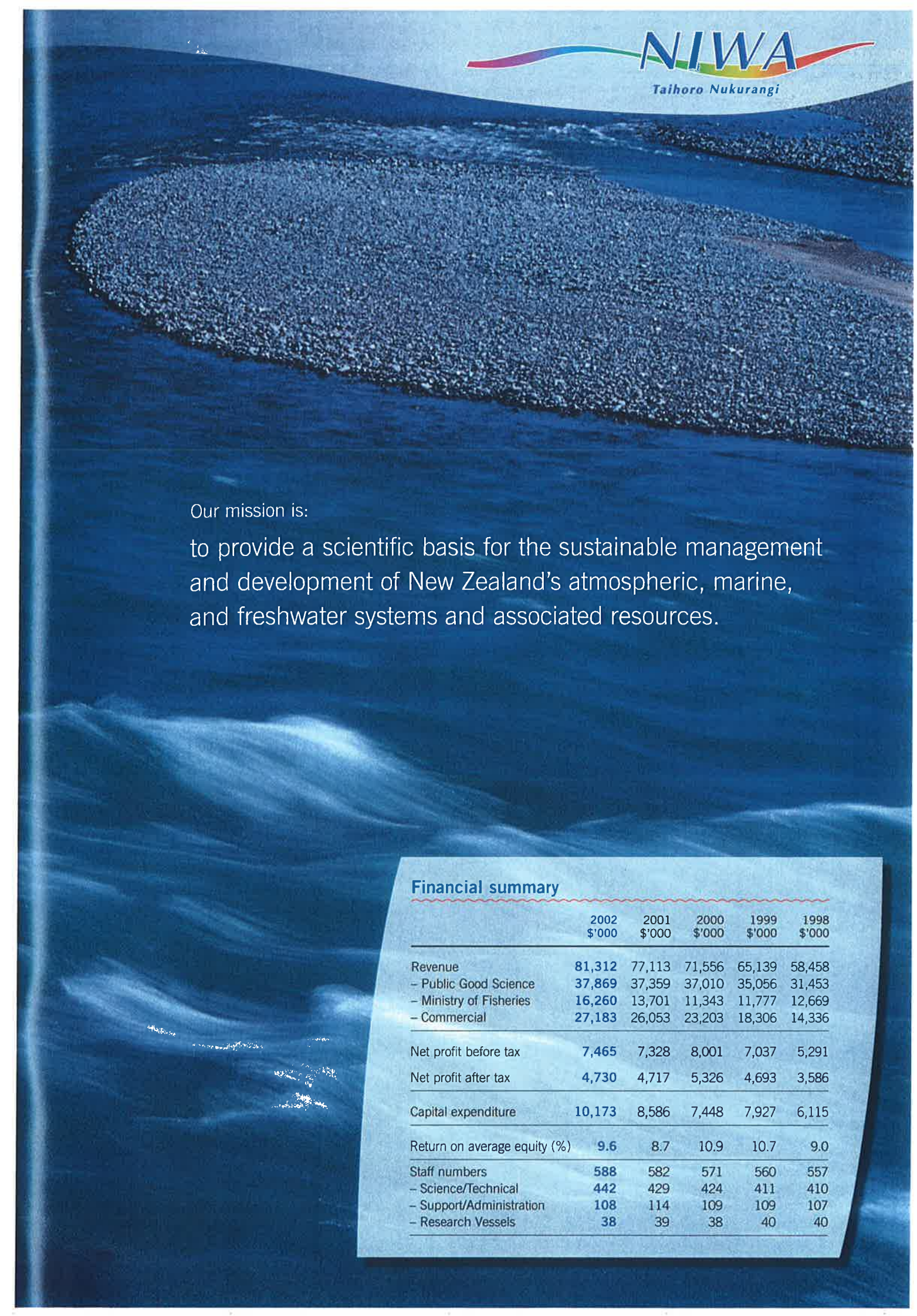


2002 Annual Report

of the National Institute of Water & Atmospheric Research Ltd

Contents

Sunrise over Christchurch.



NIWA
Taihoro Nukurangi

Our mission is:

to provide a scientific basis for the sustainable management and development of New Zealand's atmospheric, marine, and freshwater systems and associated resources.

Financial summary

	2002 $'000	2001 $'000	2000 $'000	1999 $'000	1998 $'000
Revenue	**81,312**	77,113	71,556	65,139	58,458
– Public Good Science	**37,869**	37,359	37,010	35,056	31,453
– Ministry of Fisheries	**16,260**	13,701	11,343	11,777	12,669
– Commercial	**27,183**	26,053	23,203	18,306	14,336
Net profit before tax	**7,465**	7,328	8,001	7,037	5,291
Net profit after tax	**4,730**	4,717	5,326	4,693	3,586
Capital expenditure	**10,173**	8,586	7,448	7,927	6,115
Return on average equity (%)	**9.6**	8.7	10.9	10.7	9.0
Staff numbers	**588**	582	571	560	557
– Science/Technical	**442**	429	424	411	410
– Support/Administration	**108**	114	109	109	107
– Research Vessels	**38**	39	38	40	40

Chair's Report

Sue Suckling

It is 10 years since the Crown Research Institutes were incorporated, and it is timely to reflect on NIWA's performance. Since its establishment on 1 July 1992, NIWA has more than doubled its annual revenues to reach $81.3 million in 2001–02. In that time, pre-tax surplus has increased from $2.72 million to $7.47 million, and permanent staff numbers have grown by over 55%. As a newcomer to NIWA in the past 18 months, I am struck by the quality of our people and our innovative approach to the business of environmental science. NIWA successfully meets its dual commitments of undertaking first-class science for the benefit of New Zealand and operating a financially successful business.

The cash reserves built up from NIWA's successful operation over the last 10 years enabled us to meet the commitment to the Crown as shareholder in 2001–02 by paying the earlier agreed special dividend of $19 million. This was paid in two tranches; $12 million in January 2002 and $7 million in June 2002. It was the first dividend paid to the shareholder since NIWA's formation.

The advancement processes implemented by the Foundation for Research, Science & Technology (FRST) in 2001–02 included 30% of NIWA's public good science programmes, largely in FRST's Global Processes strategic portfolio. The outcome for NIWA was very pleasing, with an increase of $2.55 million in our FRST research funding, mainly for new initiatives in the bioactives and energy research areas. These initiatives include a strong element of providing benefits to Māori, through NIWA's Māori development unit Te Kūwaha. Despite this success, there are currently very limited opportunities to maintain and grow the quantum of public good science in most of the core areas of NIWA's environmental research. This is a key threat to NIWA's future, because FRST-funded science is critical both for the retention and development of our scientists and for the future development of New Zealand.

In addition to the increase in our FRST funding, key achievements during 2001–02 included the investment of more than $2.5 million in NIWA's new aquaculture facility at Bream Bay, which was opened in April 2002; increasing consultancy revenues for the eighth successive year to more than $26 million, which represents an increase of more than 130% since NIWA's first year of operations in 1992–93; winning several new major research contracts in marine biodiversity and biosecurity; and establishing new National Centres in Fisheries and Aquaculture, Climate–Energy Solutions, Water Resources, and Aquatic Biodiversity and Biosecurity, which complement our existing National Climate Centre. We also achieved a very high level of utilisation of our research vessels, which are owned and operated by the wholly owned subsidiary NIWA Vessel Management Ltd. These and other major achievements are described in more detail elsewhere in this Annual Report.

In order to continue NIWA's growth as a successful Crown Research Institute over the next 3 years, we will focus on enhancing our scientific capabilities and developing better products and services in the following key areas: aquaculture, bioactives, hazard forecasting and mitigation, biodiversity, biosecurity, and climate–energy issues related to the reduction of greenhouse gas emissions and energy efficiency and conservation. These efforts will be additional to maintaining NIWA's current position as a market leader in the ongoing core areas of our business; namely, research and high level consultancy services in atmosphere, freshwater, fisheries, coasts, and oceans.

This year sees a major change in the management of NIWA with the retirement of Paul Hargreaves as Chief Executive in August 2002. On behalf of the Board, staff, and our clients, I would like to thank Paul for the major contribution he has made to NIWA, initially as a Board member and then as Chief Executive. Earlier this year the Board commissioned an international search for a successor, which resulted in the selection of Dr Rick Pridmore, NIWA's Deputy Chief Executive (Strategic Development) to succeed Paul. Rick has been a key member of NIWA's top management team over the past 8 years and now has the task of building his new executive team to carry NIWA forward. I am confident that the Chief Executive transition will be accomplished smoothly and successfully. NIWA's achievements over its first decade have been due to the commitment and excellence of the Institute's staff and management, and we are in a strong position to meet the challenges of the future.

Sue Suckling
Chair

Chief Executive's Report

Paul Hargreaves

Financial performance

NIWA has achieved a group operating surplus before tax of $7.465 million in the year to 30 June 2002, against $7.328 million in the previous year. Net surplus after tax was $4.730 million ($4.717 million in 2001). Gross revenue from research, consulting, vessel operations, and all other business activities was $81.312 million ($77.113 million). A further $970,000 has been transferred to the Research Vessel Replacement Reserve in accordance with the Board's policy, building this reserve to $6.790 million. Shareholders' funds at 30 June 2002 stood at $42.115 million after payment during the year of a dividend of $19 million to the Crown as shareholder. NIWA's after-tax return on average shareholders' equity was 9.63%. A total of $450,000 was allocated to NIWA's ongoing staff profit-share scheme before arriving at the surplus before tax.

While overall revenue has grown, our revenue from the Foundation for Research, Science & Technology, at $37.869 million, has remained almost flat for the third successive year because of limited opportunities to grow our public good science. The growth in our total revenue has resulted from substantial increases in commercial consultancy fee-for-service work, augmented by revenue from our research vessels. Although our overall financial performance remains buoyant, the rundown of core public good environmental science investment is a real concern for NIWA and for New Zealand. Within this constraint, NIWA continues to operate as an outstandingly successful environmental research institute, while performing exceptionally well from the shareholders' point of view as a business.

Actual performance versus Statement of Corporate Intent (SCI)

Years ended 30 June	Actual 2002 $'000	SCI 2002 $'000	Actual 2001 $'000
Revenue	81,312	78,689	77,113
Operating expenses and depreciation	73,847	72,269	69,785
Operating surplus before tax	7,465	6,420	7,328
Net surplus	4,730	4,149	4,717
Average total assets	69,403	62,796	70,110
Average shareholders' funds	49,275	49,218	54,055
Profitability			
Operating surplus (%)	8.6	8.2	9.5
Return on average equity after tax (%)	9.6	8.4	8.7
Return on assets (EBIT/average total assets) (%)	10.1	10.5	10.5
Liquidity and Efficiency			
Current ratio	0.8	1.8	1.8
Quick ratio	1.1	2.9	1.7
Financial Leverage			
Debt to average equity (%)	42	38	34
Gearing (%)	9	19	0
Proprietorship (%)	71	78	74

Dollars in thousands.

Public Good Science and Technology

Public Good Science and Technology funding (PGST) represents a little over 46% of NIWA's total revenue. This funding continues to underpin NIWA's success as an environmental research institute, and keeps our staff at the forefront of scientific developments. Through this research we are able to deliver the fundamental science required to support the operational needs of New Zealand's environmental sector, and provide new products for commercialisation by industry. In the past year NIWA has re-applied to the Foundation for Research, Science & Technology (FRST) for funding that supports about 30% of our research programmes. Applications were submitted to FRST in the research areas of bioactives, oceans, atmosphere, climate, energy, and methane mitigation. Although the available funding remained effectively static, NIWA successfully increased its funding through these applications by $2.55 million. There is a strong focus in our newly funded programmes on research which will provide benefit for Māori, provide technologies and a basis for sound policy initiatives to reduce New Zealand's emissions of anthropogenic gases, and enable different sectors of our economy to adapt to climate variability and change.

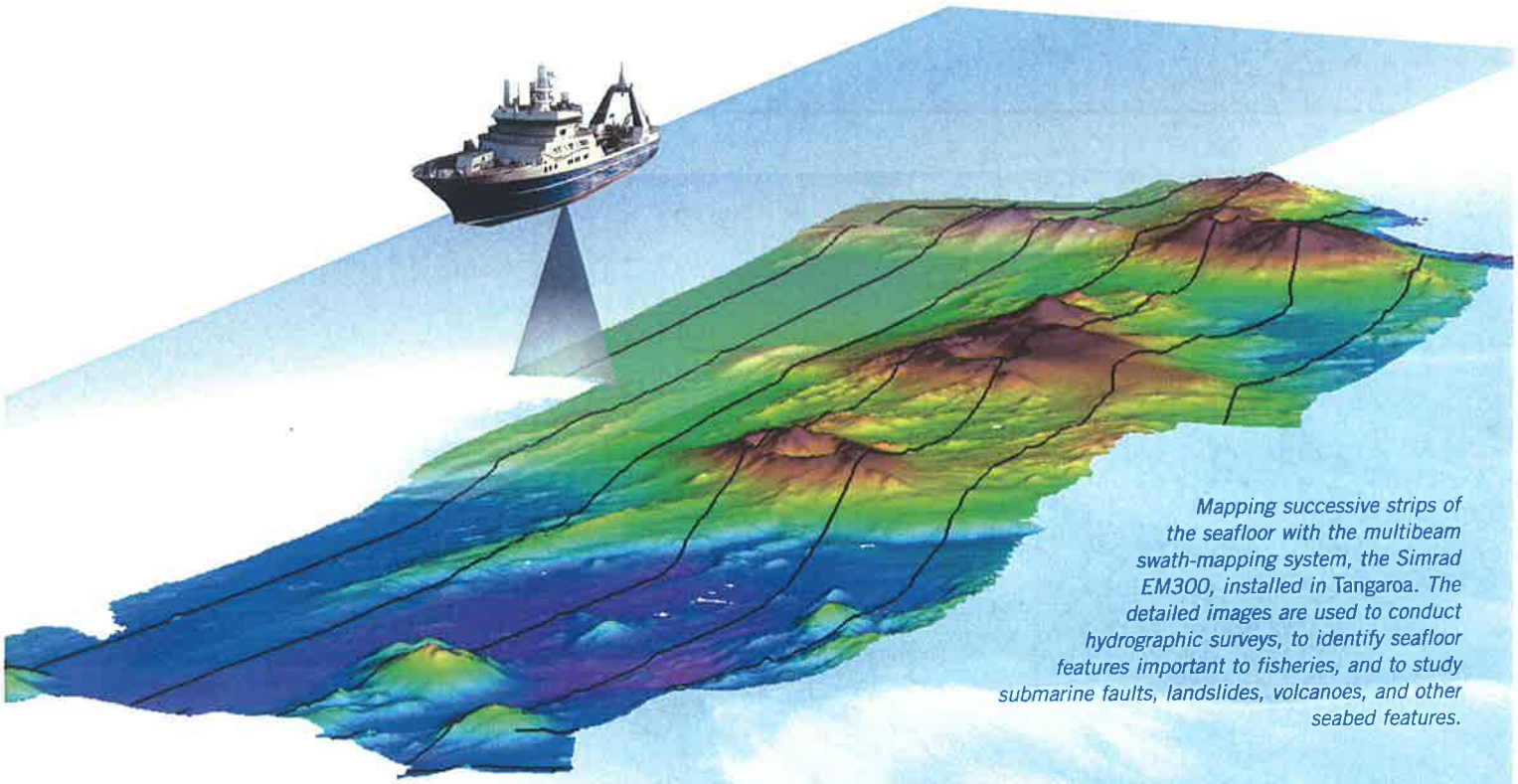
NIWA Executive: (left to right) (standing) Rob Murdoch, Dene Biddlecombe, John McKoy, Clive Howard-Williams, Bryce Cooper; (seated) Rod East, Deputy Chief Executive (Operations), Paul Hargreaves, Chief Executive, Rick Pridmore, Deputy Chief Executive (Strategic Development).

Our new research initiatives include:

- improving rural Māori communities through the utilisation of new energy technologies – a programme, led by NIWA's Māori research unit Te Kūwaha, which will examine the use of wave, wind, and small hydroelectricity generating schemes as energy sources for isolated rural Māori communities;
- the revitalisation and enhancement of mātauranga hauora of aquatic environments – a programme, led by Te Kūwaha, which will work with Crop & Food Research to examine ways to improve Māori health by overcoming barriers to the consumption of kai moana, and re-establishing the central importance of aquatic environments in modern Māori culture (both as a taonga over which Māori exercise kaitiakitanga and as a source of physical and spiritual health); this programme is jointly funded by FRST and the Health Research Council;
- non-steroidal anti-inflammatory drugs from New Zealand biota – a joint research programme with Crop & Food Research and the Malaghan Institute of Medical Research which will capitalise on the significant opportunity that exists for New Zealand to derive wealth through commercialising non-steroidal anti-inflammatory drugs based on novel bioactives sourced from our unique marine and terrestrial organisms;
- Te Whatukura a Takaroa: nutraceuticals from seafood – joint research with Ngai Tahu Seafood to commercialise new bioactives derived from fisheries bycatch and by-product, with particular emphasis on nutraceuticals;
- global drivers and mitigation of global change – fundamental work on global change in the atmosphere and oceans, with an increasing focus on studies which anticipate Government needs (e.g., obligations under the Kyoto Protocol), on the recognition of human drivers of change, and on the need for mitigation of greenhouse gas emissions; this programme includes the development of new lower-cost technologies for measuring methane to enable verification of animal management strategies which reduce ruminant methane emissions;
- adaptation to climate variability and change – research to provide information, predictions, and tools to help New Zealanders make best use of climate-dependent natural resources, adapt to natural variations in climate, improve efficiencies in energy generation and use, and identify and manage expected regional impacts of global climate change;

Measuring methane emitted (belched) from livestock to estimate the national annual emissions and help develop strategies to reduce them.

- consequences of Earth-ocean change – environmental research to provide knowledge and tools which will lead to improved environmental management, hazard analysis, and resource evaluation of the vast ocean floor around New Zealand, from the coast to the abyssal ocean;
- transport emissions mitigation – work to establish a framework by which changes in technology and behaviour, such as vehicle and fuel types, human behaviour, work patterns, urban design and lifestyles, can be quantitatively related to changes in transport emissions; this framework will provide a basis for developing methods to curtail the rapid growth in transport sector greenhouse gas emissions.



Mapping successive strips of the seafloor with the multibeam swath-mapping system, the Simrad EM300, installed in Tangaroa. *The detailed images are used to conduct hydrographic surveys, to identify seafloor features important to fisheries, and to study submarine faults, landslides, volcanoes, and other seabed features.*

Non-Specific Output Funding

NIWA was allocated $4.243 million (exclusive of GST) of Non-Specific Output Funding (NSOF) in the 2001–02 financial year.

NSOF provides Crown Research Institutes with funding equivalent to 10% of the value of public good science contracts awarded by FRST in the previous year, and it plays a major role in fostering NIWA's strategic science, innovation, and staff morale. Without NSOF, we would have little control over how we wanted to develop as an institute, and would struggle to bring new staff on board and ensure that existing staff stayed at the forefront of their fields of expertise. NSOF also allows us to import new ideas and skills from other research organisations (both here and abroad) through extended visits and secondments.

Without NSOF, many of our most significant scientific advancements would not have occurred or would have been greatly delayed. Services such as our National Centres would not exist. Major technology-transfer programmes, such as Sea and Learn and the Institute of Aquatic and Atmospheric Sciences, would cease. Many end-user manuals and handbooks would not have been written without support from NSOF, because substantial staff time would have to have been taken from major research initiatives. Wise use of NSOF has allowed NIWA to become a respected research organisation with a worldwide reputation for quality and multidisciplinary innovation.

The principal ways in which NSOF is used in NIWA are:

- developing new public good research programmes in response to a wide range of end-user demands; these programmes include management of aquaculture structures, joint research with Māori on tuna (eels), restoration of whitebait fisheries, identifying coastal regions at risk from tsunamis, cage culture of lobsters, and industrial applications through marine biotechnology;
- supporting new or developing public good research programmes which have received insufficient funds to achieve desired outcomes (e.g., effects of pollution on estuaries, freshwater biodiversity, kingfish broodstock development, shellfish disease, sustainable management of dairy shed effluents);
- funding "high risk" strategic research (e.g., development of coastal ecosystem models, biomedical applications from marine invertebrate fibres);
- developing new technologies (e.g., high-resolution seabed mapping, surveillance tools to detect incursions of exotic marine species);
- responding rapidly to environmental issues of importance to New Zealand (e.g., Antarctic coastal biodiversity, marine biosecurity, control of exotic freshwater weeds, effects of mussel farm debris on marine ecosystems).

Within each of these categories, NSOF supports not only the efforts of our own staff, but also those of visiting scientists, postdoctoral fellows, and postgraduate students.

During the 2001–02 financial year, eight international experts were given research grants to fill important skill and knowledge needs in New Zealand, covering such areas as:

- high-resolution seabed mapping;
- developing measures of marine biodiversity in New Zealand;
- coupled chemistry–climate modelling of the atmosphere;
- mapping soil moisture across New Zealand;
- estimating the abundance of reef fish;
- quantifying atmospheric bromine.

Swapping the classroom for the sea

In an extension of the Sea and Learn programme, NIWA and Te Ohu Kai Moana, with sponsorship from the Ministry of Education, developed a special project aimed at increasing the interest of Māori students in the fishing industry – and in marine sciences in general.

Our 2001–02 postdoctoral fellowship programme assisted 29 young scientists in developing careers in New Zealand. As with our visiting scientists, they bring skills and recently developed insights which are invaluable when solving many of the complex environmental issues we are asked to address. Many of our postdoctoral fellows have become permanent staff. Our new recruits are contributing to such important research areas as freshwater biodiversity, weather and climate forecasting, greenhouse gases, ozone and UV radiation, restoration of degraded freshwater ecosystems, catchment management, improved satellite technology, habitat management to improve wildstock fisheries, sediment impacts in streams and estuaries, and marine ecotoxicology.

NSOF was also used to support 14 PhD and 2 MSc research projects, and to run 16 Sea and Learn classes for New Zealand secondary school students on our research vessel *Kaharoa*. This marine education programme provides an opportunity for senior secondary school students to experience hands-on, "real-life", marine multidisciplinary science through a day trip on *Kaharoa*. More than 200 students participated, and there were three voyages specifically for Māori students, jointly funded with Te Ohu Kai Moana. NSOF also supported the education of thousands of young New Zealanders through our marine biodiscovery room at Kelly Tarlton's Underwater World in Auckland.

Fisheries science

Over the last year NIWA has continued to maintain and develop New Zealand's core fisheries science expertise. The Ministry of Fisheries (MFish) is still the major agency commissioning fisheries research, although the demand for fisheries science from fishing industry stakeholders is steadily increasing. This has been evident in studies on aspects of the oyster, paua, scallop, hoki, and orange roughy fisheries.

The major focus of fisheries research in New Zealand continues to be the management of sustainable fisheries. Projects aimed at stock assessments for the key commercial species, such as snapper, rock lobster, hoki, and orange roughy, form the bulk of the fisheries research portfolio. NIWA provides more than 90% of the research tendered by MFish. With the initiatives to include a much greater number of species in the Quota Management System, NIWA has been able to support MFish by providing analyses for a wide range of small fisheries, ranging from knobbed whelks to octopus. This task has, however, highlighted for many ecosystems the great shortage of information for well-informed management.

The development of research into aspects of fisheries dealing with the environmental principles in the Fisheries Act has also continued. NIWA staff have made major contributions in areas such as the evaluation of bycatch from commercial fishing, the impacts of fishing activities on benthic habitats, and the relationships between fisheries and aquaculture developments. In 2001–02 we have also contributed to the development of the capability of Māori groups to evaluate coastal resources, mainly through MFish contracts.

NIWA has maintained its contribution to international fisheries organisations through involvement in the Commission for the Conservation of Antarctic Living Marine Resources and various tuna and billfish organisations in the Pacific. We have maintained our links with fisheries research organisations in Chile and Australia, and are playing a major role in a consortium conducting a year-long acoustic and trawl survey of fisheries in the United Arab Emirates. Here, NIWA will provide technical advice and training in design, implementation, and analysis of the surveys, plus training and advice in fish ageing techniques.

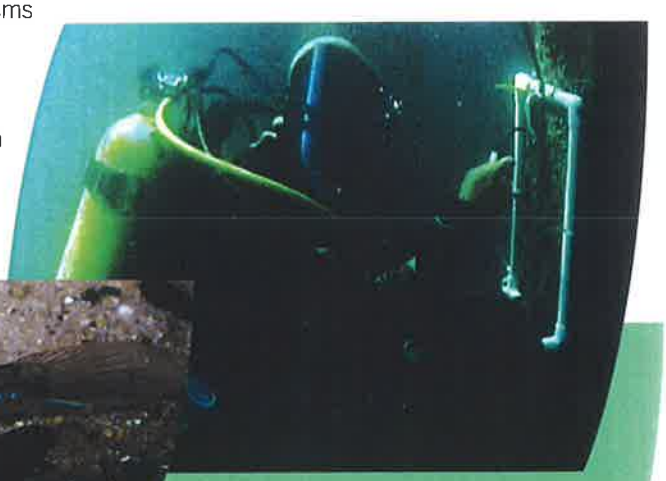
Kai moana monitoring kit

Coastal communities, hapu, and iwi increasingly want to take on more responsibility for the management of kai moana in their local area. One of the main problems facing them is the need to assess and monitor the stocks on local reefs. To help with this, NIWA, with funding from the Ministry of Fisheries, has developed guidebooks and a field kit for communities to use to assess stocks such as paua, kina, rock lobsters, and reef fish. Hui and 2-day workshops were held to develop and test the guidebooks and field kit, and, although most participants had never counted or measured paua or kina before, they quickly got the hang of it.

Tupu Gregory measuring kina at Maketu.

Marine biodiversity and biosecurity

Over the year, NIWA continued to expand its research activities in marine biodiversity and biosecurity, especially that component funded by the Ministry of Fisheries (MFish). There were 11 MFish projects, worth almost $1 million, running during the year. In addition, NIWA won new biodiversity/biosecurity research contracts totalling $3.3 million. These will start in the next financial year. Research topics included surveillance for exotic marine organisms in New Zealand, studies on marine encrusting algae, Ross Sea (Antarctica) benthic ecology and biodiversity, and seamount biodiversity. Collaboration with a number of other institutions and universities is a feature of several of these projects. Exciting research possibilities are opened up by some of these new initiatives; for example, development of incidence prediction tools for invasive marine species, and increased understanding of the roles of the very important but poorly known marine crustose coralline algae.



Aleki Taumoepeau scraping fouling organisms from pilings in the Port of Tauranga.

Acentrogobius pflaumii, the second invasive species of goby recently discovered by NIWA staff during research on estuarine and coastal fish habitats.

Commercial revenue

Commercial science and consultancy revenue (i.e., from sources other than the Foundation for Research, Science & Technology, the Ministry of Fisheries, and the research vessels) was $26.737 million in 2001–02, about $1.4 million more than last year.

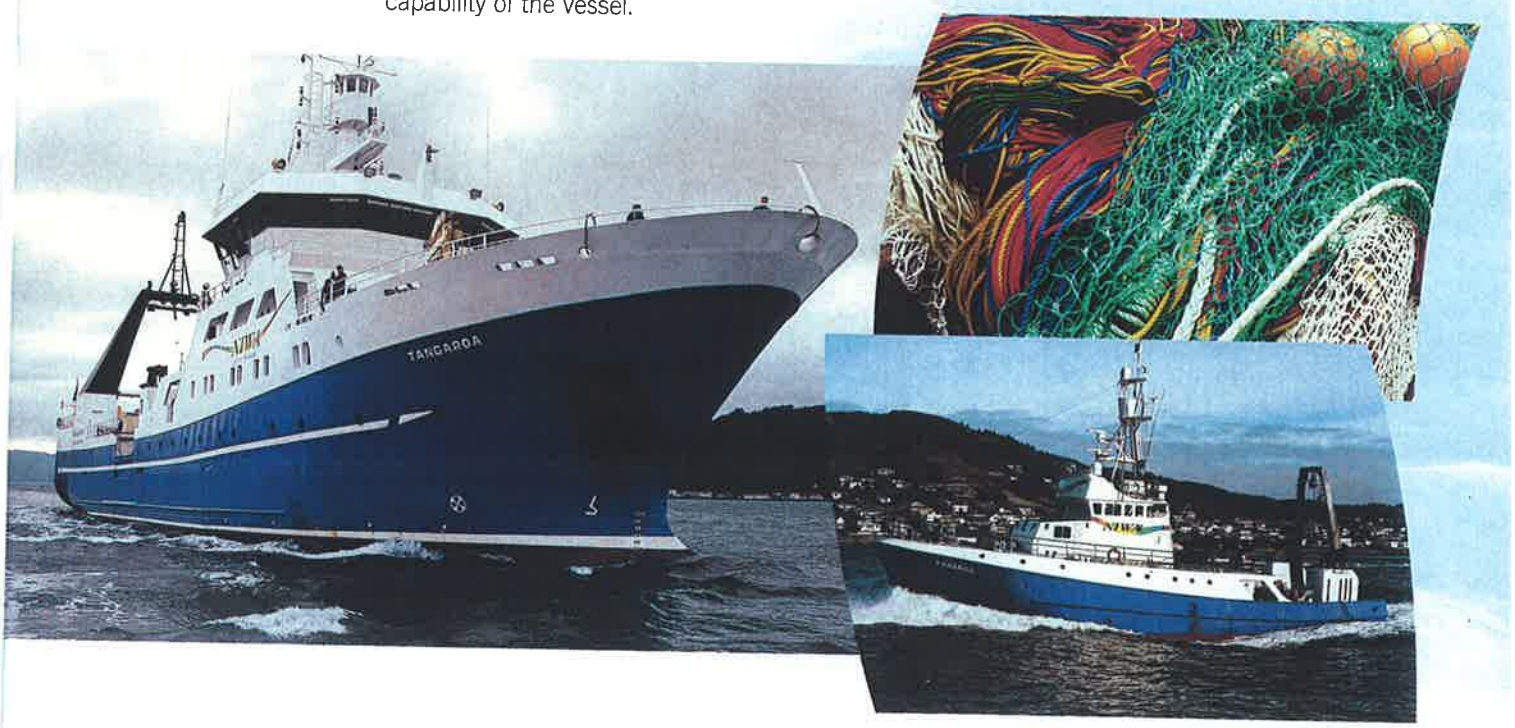
NIWA's commercial revenue is largely derived from providing fee-for-service advice to a wide range of public and privately owned entities. These clients include the hydroelectric energy industry, regional and local councils, the aquaculture industry, and Government agencies. The continuing strong demand for our services shows the relevance of NIWA's core science skills when addressing the sustainable use of resources. A particular strength is our ability to assemble multidisciplinary teams and associated equipment to provide a comprehensive solution for the client. Recent advances in the usability of computing software has facilitated a growing trend for us to package our knowledge of ecosystems into computer-based tools which can be interrogated directly by the client or wider end-user groups. Examples include a decision-support system for water allocation and a classification system for river environments, both of which provide scientific underpinning for resource management decisions.

The keys to our success continue to be the commitment of our staff to providing a high quality service, delivered on time and within budget. Raising awareness of new capabilities is achieved through client-focused newsletters and brochures, participation at selected conferences, workshops, and trade shows, and direct presentation to clients. A particular initiative during 2001–02 has been the establishment on our website of the National Centres (www.niwa.co.nz/nc), identifying our capabilities in addressing critical issues facing New Zealand.

Research vessel operations

NIWA has owned and operated the research vessels *Tangaroa* (deep water) and *Kaharoa* (inshore and coastal) for the past 7 years. The vessels undertake a wide variety of work covering NIWA's ocean science programmes funded through contracts from the Foundation for Research, Science & Technology, fisheries stock assessment contracted by the Ministry of Fisheries, and many different maritime projects for other organisations, such as seabed surveys to delineate New Zealand's Continental Shelf, and hydrographic surveys for Land Information New Zealand (LINZ). Demand for RV *Tangaroa* has grown to a level where the vessel was deployed for 344 days at sea in the past year. This has led to very tight turnarounds in port and placed considerable strain on the operation, but despite this all our commitments have been met.

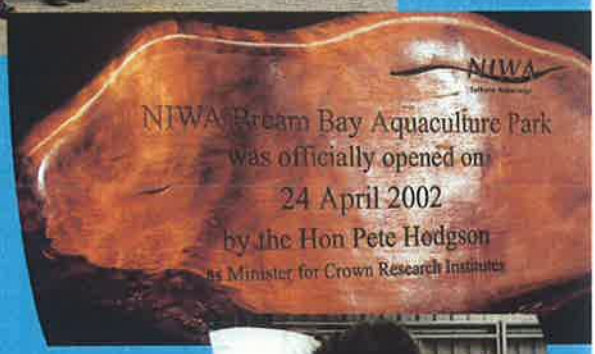
Tangaroa returned to Antarctica for the fourth successive year, this time to undertake a 30-day voyage for the Japanese National Institute of Polar Research. Negotiations are currently taking place for a further voyage for the Japanese in February–March 2003. At the conclusion of the Japanese Antarctic voyage in Hobart in March, a day aboard *Tangaroa* was arranged for a number of senior Australian representatives from the Australian Antarctic Division, the National Oceans Office, and the Commonwealth Scientific & Industrial Research Organisation to familiarise them with the capability of the vessel.



The final segment of the survey of New Zealand's Continental Shelf was completed for LINZ in June. This completes a major project in which NIWA played a leading part, with the Institute of Geological & Nuclear Sciences, and which will result in claims being submitted to the United Nations for the extension of New Zealand's undersea boundaries.

Kaharoa was at sea for 209 days in the past year, which included the continuation of the hydrographic survey in Foveaux Strait, and a further Sea and Learn programme for senior high school students, which operated out of North Island ports during June.

During the year the Ministry of Defence commissioned a review of New Zealand's hydrographic survey capability. The major providers of hydrographic survey work in New Zealand are the Royal New Zealand Navy and NIWA. The review recommends a "provider panel" of hydrographic survey providers for a 5-year period and notes the presence of both the Navy and NIWA as Government-owned providers. It also notes that by undertaking a wide range of marine studies, including hydrographic surveys for the Government, NIWA uses its research vessels in an efficient and cost-effective manner.



Bream Bay Aquaculture Park

The Hon Pete Hodgson officially opened NIWA's new $2.5 million aquaculture facility at Bream Bay, south of Whangarei, on 24 April 2002. The ceremony was attended by more than 200 guests and included a pōwhiri, official speeches, a seafood lunch, and a tour of the facilities. It was particularly pleasing to see the diverse representation of our guests because the opportunities offered by the facility will be maximised through wide involvement of the seafood industry, Māori, venture capitalists, and local and central Government agencies.

With the increasing global demand for seafood unable to be met from wild fisheries, there is a substantial opportunity for New Zealand to grow its export revenues from aquaculture by diversifying into new, high-value species. The main aim of Bream Bay Aquaculture Park is to bridge the gap between small-scale research into these new aquaculture species and their commercial-scale production. The world-class facilities have been specifically designed with this aim in mind, and include a large-volume seawater pumping and filtration system, live-feed production rooms, specialised finfish and shellfish hatchery and nursery areas, and a pathology unit.

The facility is up and running, with staff on site, a variety of shellfish and finfish projects underway, and further projects coming on-stream. Our desire to have the seafood industry closely involved in developments at Bream Bay is being realised through these projects. Sealord Shellfish has been the first industry partner to locate staff on site to take advantage of the facilities and the opportunity to work on projects alongside NIWA staff. We anticipate further partnership arrangements occurring at Bream Bay as the economic opportunities arising from new-species aquaculture become increasingly apparent.

The Minister of Fisheries and Crown Research Institutes, Pete Hodgson, looks at some of the kingfish with NIWA Regional Manager Gerda Kuschel. The opening ceremony included students from Bream Bay College supporting the tangata whenua, the Putuharakeke iwi.

National Centre for Fisheries and Aquaculture

NIWA has very strong capabilities in fisheries and aquaculture planning, development, and research that benefit from the wide blend of scientific skills available within New Zealand's second largest Crown Research Institute. We have established the National Centre for Fisheries and Aquaculture to enhance access to this expertise. Although fisheries and aquaculture research can be seen as very different disciplines, they are closely linked in practice because the technical, biological, and ecological understanding required is similar. The Centre is now supported by a newsletter, *Fisheries and Aquaculture Update*, and a webpage, bringing fisheries and aquaculture developments to the attention of stakeholders across the industry.

Fisheries and aquaculture contribute greatly to the New Zealand economy. Our goal is to use the unique set of skills within NIWA to help New Zealanders with the further development and sustainable management of marine resources.

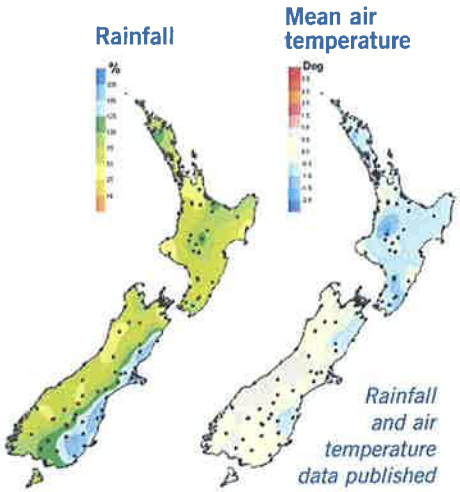
see: www.niwa.co.nz/ncfa

Orange roughy over a bed of coral at a depth of about 1000 metres on Gothic seamount, northwest Chatham Rise – one of the seamounts closed to bottom trawl fishing by MFish to safeguard the marine life and habitats they support.

National Climate Centre

Helping New Zealanders manage for climate variations, including droughts, is the focus of NIWA's National Climate Centre, which was established in 1999. The Centre's newsletter, *The Climate Update*, is published each month, and (like all NIWA's newsletters) is available free in printed form or through NIWA's website. *The Climate Update* summarises the previous month's air temperatures, rainfall, soil moisture, and river flows, provides regional seasonal climate outlooks, and updates the public on matters of interest, such as the development of El Niño conditions across the Pacific. The Centre also prepares the monthly *The Island Climate Update* in collaboration with staff from weather and climate agencies from Australia and the Pacific Islands.

Climate Centre staff also produce regular media releases to the general public on climate conditions and outlooks, and these are widely reported. Experts from the Centre travel regularly through the country, giving talks to groups of farmers, local government officials, and others. A regular climate slot is presented on "No. 8 Wired" on TV3, and quarterly climate briefings are provided to agricultural sector representatives and Government officials through the Ministry of Agriculture and Forestry. We are addressing a growing demand from local government officials for regional assessment of climate hazards and advice on how these might vary in the future because of climate change.



Rainfall and air temperature data published each month in The Climate Update.

The climate affects productive enterprises ranging from farming to energy generation, and Centre staff are kept busy responding to requests for data and advice. A specialist service we are particularly proud of is the detailed mapping of climate conditions (e.g., growing degree-days or strong winds) and the frequency of climate hazards (e.g., the earliest frost). These maps can be combined with soil and crop information to help people manage their land sustainably and identify new crops and other land-use opportunities. We are collaborating with soil scientists and agricultural specialists from other Crown Research Institutes and universities in several studies for regional and local government. These include a large-scale, climate-mapping project for the Otago Regional Council (GrowOtago) as well as studies for Tararua District Council and the Kaipara and Far North District Councils.

see: www.niwa.co.nz/ncc

National Centre for Climate–Energy Solutions

The Centre was established in March to create new economic, social, and environmental opportunities associated with climate change and energy reform. It has attracted considerable attention through public presentations and newsletters. Although debate has centred on climate change, the main driver for global warming is the release of carbon dioxide into the atmosphere through the burning of fossil fuels. Because of this adverse environmental impact and the finite lifetime of this energy source, we need to look closely at alternative sources of energy as well as maximise the efficiency of national energy use, particularly in transport.

We have established a series of initiatives in collaboration with the Energy Efficiency and Conservation Authority, the Building Research Association of NZ, and CRL Energy Ltd. One example is an integrated study of the economic and environmental barriers to the generation and uptake of energy from renewable sources. Another is developing tools for New Zealand companies to take advantage of the "Kyoto Cross Border and Joint Implementation Projects". The Centre has also provided guidance and information for the New Zealand Business Council for Sustainable Development report on Climate Change Opportunities.

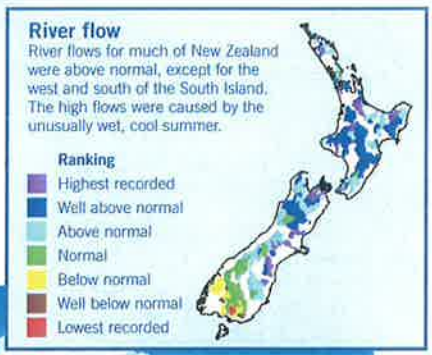
see: www.niwa.co.nz/ncces

Alternative sources of energy – wind and wave power generators, with small hydroelectricity generating schemes, are seen as part of local energy solutions.

National Centre for Water Resources

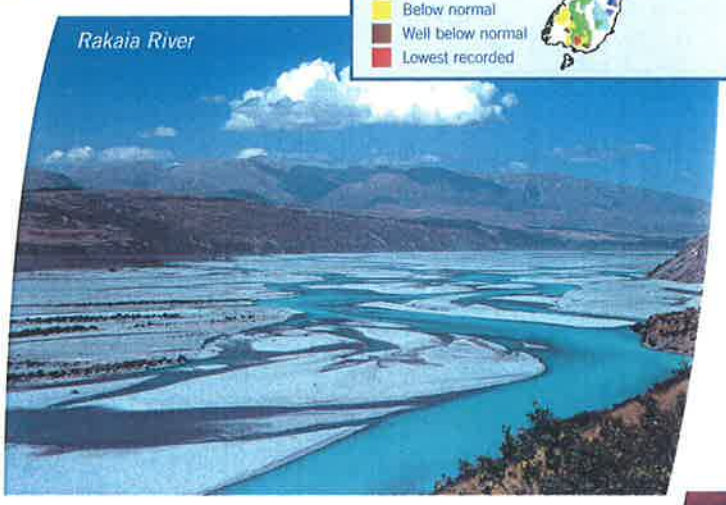
NIWA launched the National Centre for Water Resources in April 2002 to help bridge the gap between science and the community in the field of water resources. The Centre publishes quarterly summaries of river flows, groundwater levels, and river water quality, in collaboration with the Institute of Geological & Nuclear Sciences, the Ministry for the Environment, and regional councils. It operates as a focal point for media and resource managers to contact scientists with technical queries and problems relating to water resources.

New organisations are continuing to approach NIWA with offers to work with the Centre, making it a truly collaborative effort. The Centre is using a quarterly newsletter, *Water Resources Update*, as well as webpage updates, to disseminate water quality and quantity summaries, and to publish short articles on topical issues and summaries of recent research results.



The Centre is also developing two new projects; one to unify New Zealand's diverse freshwater databases, and one to build a national flood-forecasting capability. The Freshwater Information New Zealand project builds on the River Environment Classification, and will allow freshwater data from a wide variety of sources to be linked to a common map database, allowing easy access using the internet and geographic information systems. The national flood-forecasting project is producing daily flood forecasts, up to 48 hours ahead, by combining forecasts from atmospheric models and catchment models. A pilot project is underway in 12 catchments around New Zealand, with the eventual aim of covering the whole country.

see: www.niwa.co.nz/ncwr



National Centre for Aquatic Biodiversity and Biosecurity

On 27 June 2002, NIWA launched the National Centre for Aquatic Biodiversity and Biosecurity, the fifth of its national centres. The new Centre will provide research to support the Government's new Biodiversity Strategy and the emerging Biosecurity Strategy by addressing aquatic biodiversity and biosecurity issues around New Zealand and in the Southern Ocean and the Ross Sea. Several NIWA research projects already address these topics. The Centre will help bring research results to the community, including industry, iwi, councils, and Government agencies. It will enhance access to NIWA's aquatic biodiversity and biosecurity expertise, increase awareness of any issues facing New Zealand, foster collaboration and cooperation between organisations here and overseas, and provide new tools and services.

A new quarterly newsletter, *Aquatic Biodiversity & Biosecurity*, and a new website, have been launched to help provide information to stakeholders about new research, not only from NIWA, but also from other research providers and funders. The tools and services include the Freshwater Fish Database; web-based, species/habitat, map-based tools such as Freshwater Information New Zealand; and identification guides to help equip central and local government, communities, and other sectors protect and restore biodiversity. We are also developing ways to complement mātauranga Māori in biodiversity/biosecurity management.

see: www.niwa.co.nz/ncabb

Dubbed the "killer alga", this strain of Caulerpa taxifolia *has spread from an initial clump of about 1 square metre in Monaco to cover more than 6000 hectares, and there are now populations in France, Italy, Spain, Croatia, Tunisia, California, Florida, and Australia. It is one of the key species MFish is targeting through its biosecurity research contract with NIWA on the surveillance of ports and harbours around New Zealand.*

Relationships with universities

The Institute of Aquatic and Atmospheric Sciences (IAAS), which was established as a joint initiative with the University of Auckland in 1999, has continued to flourish. The Institute is run by a Board of Studies and has links to the Schools of Biological Sciences, Engineering, and Environmental and Marine Science. There are also links to the Geography, Mathematics, and Physics Departments. A plan for a physical location of IAAS on the University campus is now underway with the likelihood of further expansion of the Institute. Currently, the NIWA and University staff involved supervise PhD, ME, and MSc projects in various multidisciplinary fields, including fisheries, hydrology, marine and freshwater ecology, aquaculture, and climatology.

The Institute's student roll has continued to increase over the last year, and 18 PhD and 4 MSc students were registered in June 2002. In addition, three further PhDs were awaiting registration. Student study grants were obtained from various sources (e.g., Commonwealth Scholarships, Foundation for Research, Science & Technology (FRST) Tūāpapa Pūtaiao Māori Fellowships, FRST Enterprise Scholarships (Bright Future scheme), University of Auckland postgraduate grants, and NIWA scholarships). IAAS is gaining an international reputation in multidisciplinary science and provides a significant contribution to the young scientist pool in targeted areas where there are clear national needs. It is anticipated that IAAS will continue to grow over the next year.

Postgraduate Centres of Excellence continue to operate successfully with the University of Canterbury (Aquaculture and Marine Ecology), the University of Otago (Chemical and Physical Oceanography), and Victoria University of Wellington (Atmosphere and Climate Research).

Working with Māori

NIWA is committed to its policy of building strong relationships with Māori, and conducting research of relevance to the exercise of kaitiakitanga and new economic opportunities for Māori (for example, in aquaculture). This policy is implemented through our Māori development unit, Te Kūwaha o Taihoro Nukurangi (Te Kūwaha), which can be literally translated as "The Gateway to NIWA". Te Kūwaha comprises Māori researchers within NIWA with the mandate to conduct environmental research with a Māori focus, to develop strong relationships at a "flax-roots" level with Māori organisations, to raise awareness of the Māori perspective within NIWA, and to facilitate collaborative research between NIWA and Māori.

NIWA's interactions with Māori are frequent, varied, and extend throughout the country. During 2001–02, Te Kūwaha played an active role in ensuring new research programmes being advanced by NIWA delivered outcomes to Māori. A particular emphasis of Te Kūwaha in this past year has been to extend their activities to developing specific proposals for research "by Māori, for Māori, with Māori". This has seen the success of collaborative proposals on energy sources for remote Māori communities, investigating the relationships between Māori health and access to seafood, the development of eel fattening technologies, aspects of mussel aquaculture, and sourcing bioactives from the marine environment. By securing funding for these projects, the foundations have been laid for NIWA's skills to contribute directly to the aspirations of Māori. I look forward to hearing of the success of these initiatives in the future.

Erina Watene with an albino eel. Erina has just joined NIWA's aquaculture team in Auckland, and will be working on eel culture, particularly in saltwater.

Te Kūwaha has grown in strength of purpose and capability, becoming an important part of the "NIWA fabric" and increasingly influencing what we do and how we do it. Its long-term success will rely on our ability to recruit suitably qualified Māori researchers. This highlights the need to encourage young Māori into careers in environmental science. We currently have two Māori PhD Fellows supported within Te Kūwaha, and, in association with Te Ohu Kai Moana, run a Māori-centred marine experience for young Māori involving our research vessel *Kaharoa*. These initiatives represent part of our commitment to the development of future Māori research capacity.

NIWA International

A strong business alliance has been established in the United States with Limno-Tech Inc. of Ann Arbor, a nationally recognised leader in developing cutting-edge technology to assess, model, and manage environmental problems affecting surface water, ground water, and sediments. Established in 1975, with a staff of more than 90, Limno-Tech has worked on over 800 high-impact projects throughout the USA and has assisted clients in more than 300 watersheds. NIWA and Limno-Tech are combining resources in joint bids in the USA. Our particular skills and experience are highly relevant to that market.

In Australia we have been bidding for a variety of jobs through our office in Brisbane. By drawing on a combination of our Australian and New Zealand skill bases, with Australian collaborators, we are picking up contracts from significant clients. We have also established formal and informal relationships with several Australian research organisations, including Griffith University (Queensland) and the Cooperative Research Centre for Catchment Hydrology.

NIWA Australia staff examined the effects of road runoff on aquatic ecosystems in South East Queensland. Here, Ngaire Phillips samples macroinvertebrates in Logan River, and snail cages are set out to assess heavy metal bioaccumulation.

Chief Executive Paul Hargreaves with his successor Dr Rick Pridmore and Chair Sue Suckling.

Time of change

After 8 years I am stepping down as Chief Executive, to be succeeded by Dr Rick Pridmore, hitherto Deputy Chief Executive (Strategic Development). Rick has made a major contribution to NIWA's success, firstly as Research Director, and latterly in his present strategic role.

At the end of its first decade, NIWA is in a very strong position, with a high reputation for its science, a strong demand for its very wide range of services, and a considerable depth of managerial talent. I have no doubt that, under Rick Pridmore and his Executive, NIWA will continue to flourish and grow in strategic importance to New Zealand.

The 10 year old corporate science experiment undertaken in New Zealand is unique in the world and has brought benefits of freedom to invest and form external associations. This freedom has been tremendously important for an environmental research institute such as NIWA, which undertakes work in the oceans and the atmosphere, requiring large-scale science assets.

NIWA has achieved real success in fulfilling the key principles set out in the Crown Research Institutes Act of undertaking research for the benefit of New Zealand, pursuing excellence, and at the same time operating as a very successful business. The strong uptake and growth of our consulting services by a wide range of organisations, both in New Zealand and internationally, to resolve a wide variety of environmental issues, confirms the relevance of our public good science. Increasingly, through our new National Centres, we are moving into the field of environmental prediction. The push into these new areas is being driven through our public good science, without which these developments would not take place. Our current business plan emphasises the strong science push into new areas, such as aquaculture, bioactives, natural hazards, biodiversity, biosecurity, and climate–energy issues. Further opportunities exist for NIWA to increase its contribution to New Zealand Inc. through greater input into the Government policy process.

Staff

Over the past 8 years, 90 new positions have been created, and we now have 588 permanent staff. The stability of our science and support teams has been a key factor in NIWA's success. At its heart, NIWA is a first-class environmental science organisation which undertakes high level consultancy off the back of its science. The people who undertake much of this work are themselves senior scientists, usually working very long hours. It is their ability to be able to maintain their science commitment that gives NIWA its special value to our clients. It remains a deep concern that our core public good science funding is declining in real terms over time.

In this past year our staff have been at full stretch with an unprecedented range and level of large-scale consulting work. We have met all our commercial obligations alongside our science commitments, and maintained our high reputation among a very wide and diverse range of clients. I am privileged to have served such an outstanding and committed team of people as Chief Executive over the last 8 years.

Paul Hargreaves
Chief Executive

NIWA's Research Focus

Atmosphere and Climate

research and consultancy on the physical and chemical processes affecting the atmosphere and climate, including global effects, stratospheric research, and atmosphere–ocean interactions

- weather
- climate
- air quality
- greenhouse gases and ozone
- environmental monitoring
- remote sensing
- renewable energy sources
- databases and software
- ocean climate
- Antarctic research

Fisheries

fisheries assessment and impacts

- fish abundance and productivity
- population modelling and risk analysis
- estimation of sustainable harvest levels
- fish biology and ecology
- biodiversity
- disease management
- genetics and stock separation
- impact of fishing on non-target species
- assessment of highly migratory species
- assessment of non-commercial catches

Freshwater

research on the chemistry, physics, and biology of lakes, rivers, and wetlands; the complex interactions influencing these ecosystems; and their response to environmental disturbances

- hydrology and hydraulics
- aquatic pollution control and prediction
- biodiversity and biosecurity
- freshwater fish and fisheries
- fish population genetics
- aquatic plants and birds
- floods and scour in rivers
- rainfall runoff
- riparian management
- impacts of wetland development and river flow or lake level variation
- effects of land-use change in catchments
- national monitoring and databases – river flow, water quality, and sediment

Aquaculture

research on breeding, early life history, growth and survival, hatchery technology, field technology, disease management, and stock enhancement – practical research designed to lead to commercial development

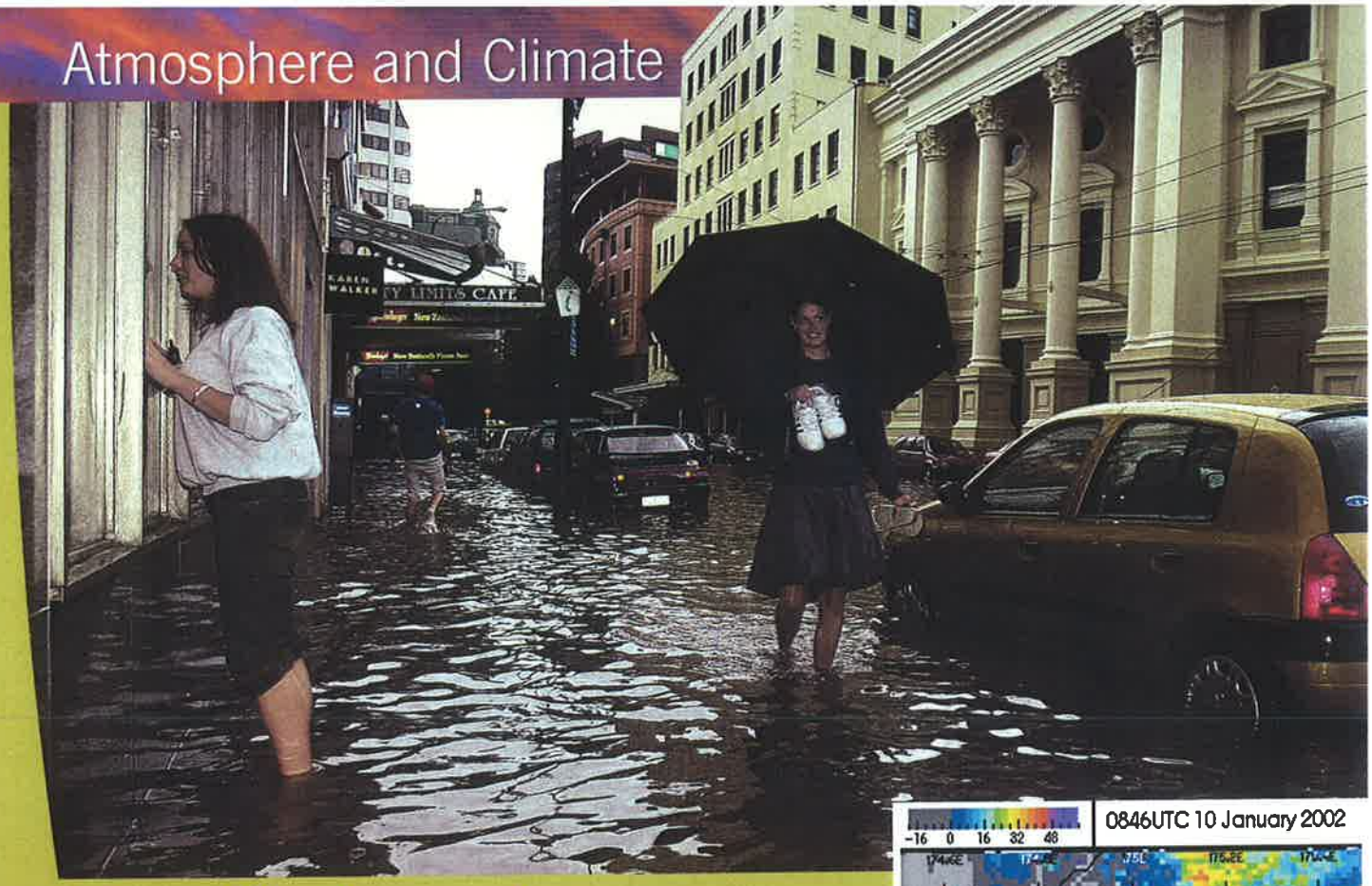
- culture of abalone, eels, kingfish, mussels, oysters, rock lobsters, salmon, scallops, seahorses, seaweeds, snapper, sponges, surf clams, turbot
- research and technology for commercial application developed for, and in partnership with, industry
- hatchery techniques and equipment
- ecological surveys and site selection, feasibility studies for new aquaculture ventures, water quality assessment and diagnosis
- sustainability and carrying capacity of shellfish aquaculture
- salmon ova and smolt supply to industry
- genetic improvement and disease diagnosis
- training and troubleshooting

Coasts and Oceans

research on the geological, biological, and physical properties of oceans, coastal waters, estuaries, and harbours

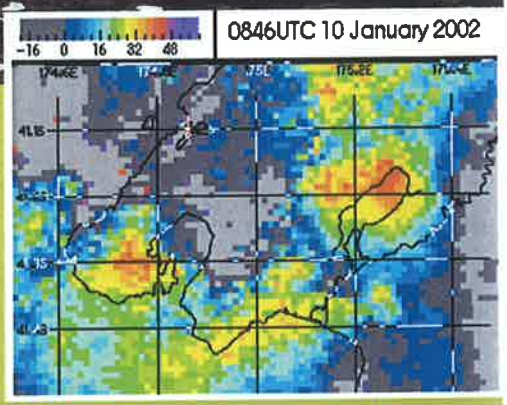
- current, tide, and wave analysis and modelling
- ecological surveys and environmental assessments
- seafloor mapping and seismic surveys
- coastal erosion and marine sedimentary processes
- oceanography
- palaeoceanography
- ocean productivity and food chain processes
- biodiversity and biosecurity, taxonomy
- marine invertebrate museum and databases
- seabird biology and ecology
- biotechnology and marine natural products
- control and remedy of coastal/estuarine pollution
- restoration of coastal environments
- outfall dispersion and modelling

The following pages illustrate some of the highlights of NIWA's scientific research and consultancy during 2001–02

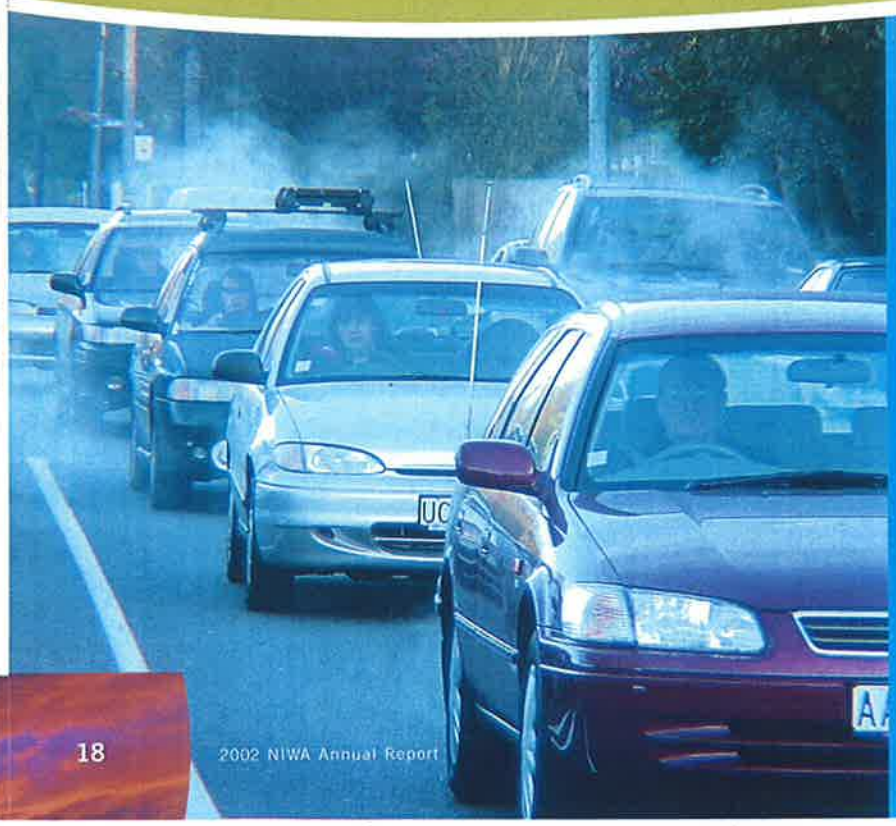


Deluge could have been worse!

The exceptionally heavy downfall that inundated Wellington's central business district on 10 January 2002 could have been significantly worse. The storm consisted of several small thunderclouds, and generated up to 50 millimetres of rain, most of which fell in an hour (in comparison, daily rainfalls in Wellington for the same month averaged between 0.1 and 15 mm). Yet, a similar complex over Wairarapa generated more than 65 millimetres. The extreme rain occurred as rapidly developing thunderclouds passed over the city, but they broke up quickly as the clouds moved out over the cooler waters of Cook Strait. Had they moved more slowly, or been more intense, like the Wairarapa thunderstorm, Wellington could have experienced even greater rainfall. Events like this are being researched under NIWA's Foundation for Research, Science & Technology-funded hazards research programme, with the aim of understanding more about the processes that cause our most extreme weather. This, in turn, will improve both the skill and detail of weather forecasts.



About 50 mm of rain fell over the city, but there was a much larger area of rainfall in excess of 65 mm over Lake Wairarapa.



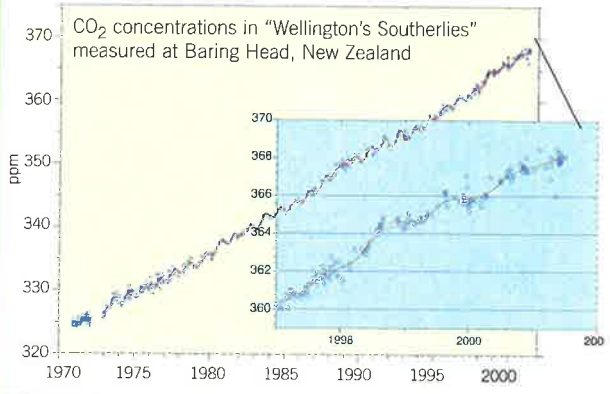
Motor vehicle emissions

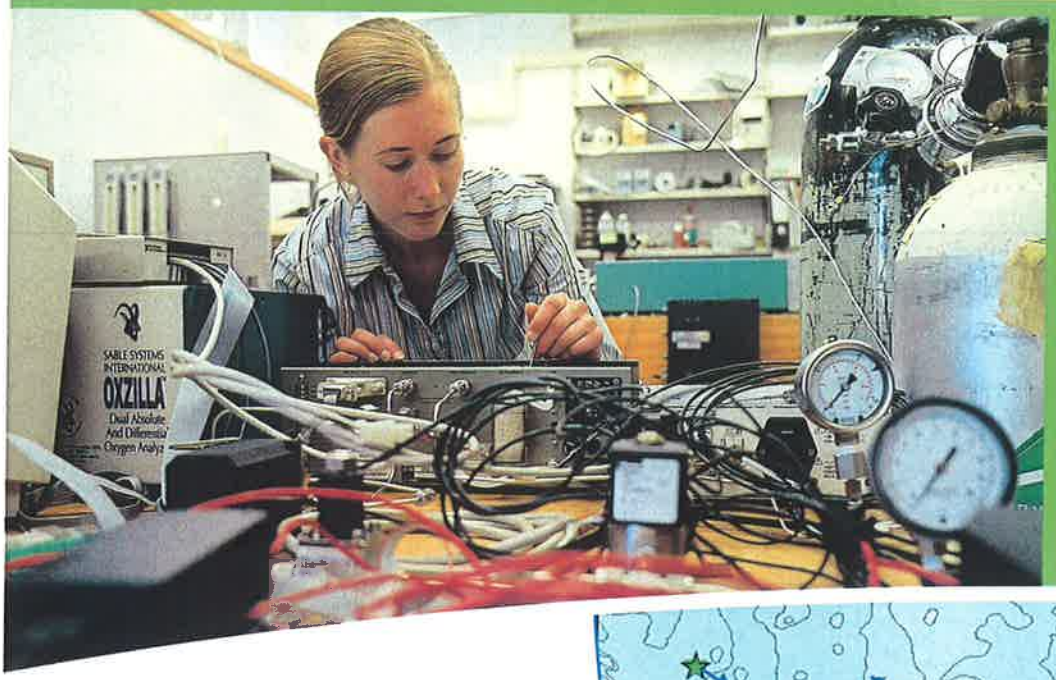
Motor vehicle use is generally recognised as the source of more air pollution than any other single human activity. In urban areas, where more than 70 percent of the population in OECD countries live, levels of motor vehicle pollution frequently exceed internationally agreed air quality guidelines. The situation is no different in New Zealand. Transport also adversely affects the environment in other ways. Vehicles are major contributors to greenhouse gas emissions, for example, and they deposit emissions on and around roadways, some of which run off to affect life in aquatic and estuarine environments.

NIWA is directly involved in studies of urban air pollution, and in developing tools to help both central Government and local authorities better manage vehicle emissions. There is one area where all motorists can help – simply keeping their vehicle in good running order has a greater effect than any emission control technology or vehicle age.

Where does all the carbon dioxide go?

Life on earth depends on the circulation of carbon dioxide (CO_2) between the atmosphere, the oceans, and the terrestrial biosphere. However, during the last 250 years the flow of CO_2 between these reservoirs has changed dramatically. The main change has been the rapid increase in excess CO_2 from human activities, including the extensive burning of fossil fuels and the large-scale clearing of forests. So where does all this extra CO_2 go? NIWA scientists are working with the Max Planck Institute of Biogeochemistry in Germany, and the Scripps Institution of Oceanography in the USA, to develop a new technique to answer this question based on high precision measurements of atmospheric oxygen. The first measurements made at NIWA's clean air measuring site at Baring Head, near Wellington, show that as CO_2 increases in the atmosphere, oxygen is slowly decreasing.





PhD student Rona Thompson makes some adjustments to the new portable oxygen and CO_2 analysis equipment that NIWA is developing with Victoria University. The new device, which will be taken onboard Tangaroa *and a commercial container ship, will enable us to greatly improve estimates of the amount of atmospheric CO_2 absorbed by the oceans. It will also provide vital clues to the fate of the extra CO_2 derived from industrial and agricultural processes.*

In quest of the Golden Fleece

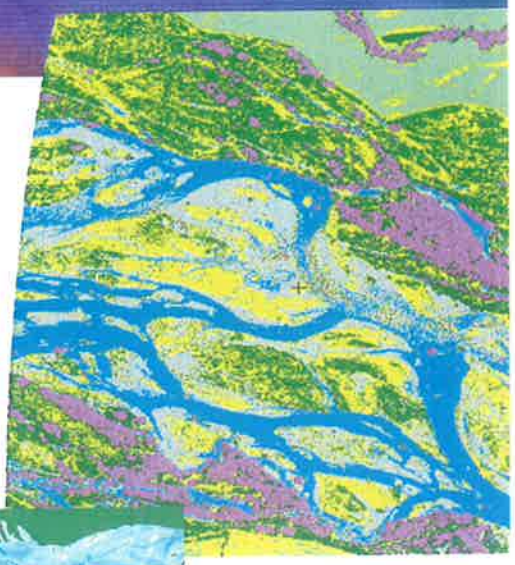
Argo was the name of the ship in which Jason sailed in quest of the Golden Fleece. It is also the name of the worldwide project which aims to collect information from the upper layer of the oceans to help us understand the processes that influence our global climate. *Argo* aims to deploy and maintain 3000 drifting floats in the world's oceans, and NIWA is an active participant in the *Argo* project.

Each float cycles between the surface and a depth of 1600–2000 metres. The float sinks to the depth where it remains for 9–10 days, being carried by the ocean currents, before it rises to the surface, measuring the temperature and salinity through the water column as it ascends. Once on the surface, the float transmits this information and its location via satellite. All the information from the floats is freely shared internationally, and will be invaluable for monitoring the state of the ocean, predicting weather and cyclones, assimilating into ocean models, and studying global climate.

NIWA deployed two floats north of New Zealand from Tangaroa. *One of these was carried along the northeast coast in the core of the East Auckland Current.*

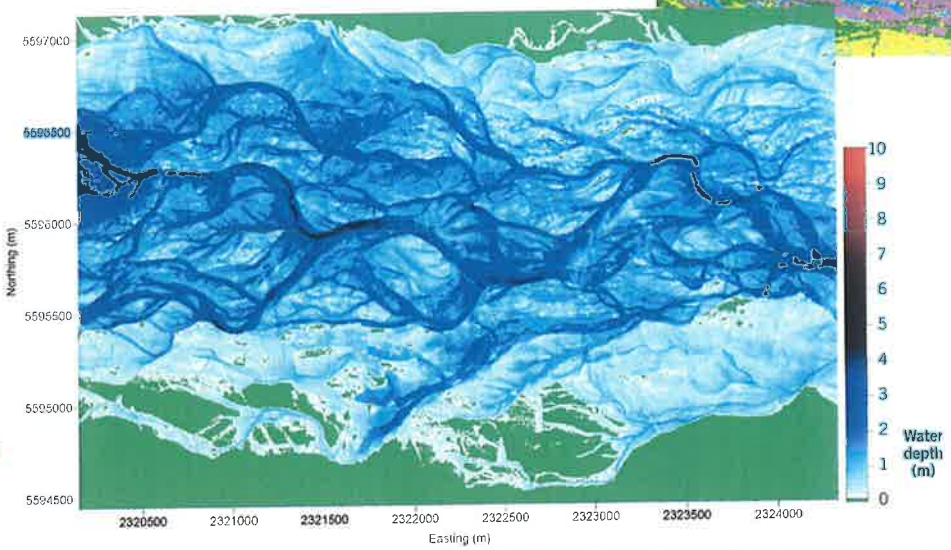
Laser scanners help predict floods

Just how prepared are we for the next big flood? How stable is the bed of a particular river, and how much gravel does it transport? Is the river suitable for jet boating? These are just some of the questions that we can help to answer by using the latest hydrodynamic models. But how do we get the information to put into these models in the first place? NIWA Principal Scientist Murray Hicks and his colleagues have been using new state-of-the-art airborne laser scanners (ALS) to collect data on riverbed and floodplain topography from the Waitaki River in Canterbury. The ALS laser pulses reflect off both the ground and the vegetation, so the scanner can also be used to classify the type of riverbed ground cover. This is important because floodplain vegetation, especially willows and scrub, can result in higher flood levels unless it is controlled regularly.



Topography and vegetation over part of the Waitaki River.

Water
Grass
Pasture
Willo
Scrub
Grave



Map of modelled floodwater depths along a segment of the Waitaki Valley for the record flood of December 1995.

Pump sampling: Jane Halliday drives a pipe into the streambed to pump out a known volume of interstitial water along with the associated invertebrates.

Sticky trapping: a transparent sheet coated with a sticky substance to catch adult aquatic insects.

Freeze coring: Mike Scarsbrook drives a pipe into the streambed and pours in liquid nitrogen, or dry ice, to freeze a core of streambed, which is then removed to extract invertebrates.

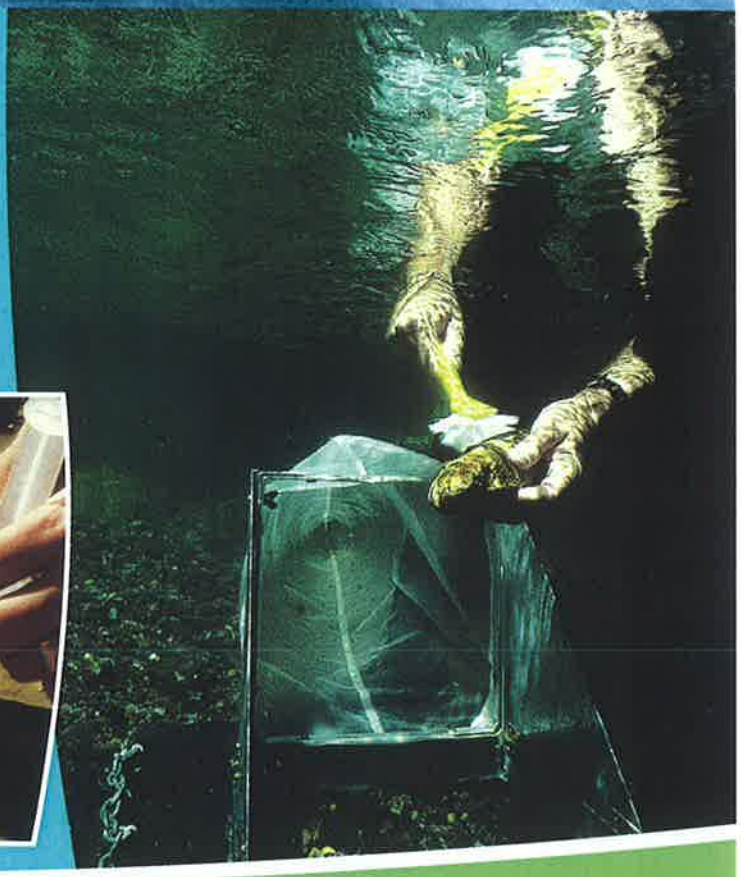
Malaise trapping: Kevin Collier uses a Malaise trap to catch emerging adult aquatic insects.

Waikato stream sets biodiversity record

At first glance, Mangaotama Stream near Hamilton may look just like any other forest stream in New Zealand. But there is one important feature that makes it stand out from the rest. It now holds the New Zealand record for stream invertebrate biodiversity in one catchment – 188 taxa! This record count came after NIWA Principal Scientist John Quinn and colleagues had taken samples from the stream over 7 years using several collection methods. They found that the best method of measuring total stream invertebrate biodiversity was to conduct one-off streambed surveys in summer, coupled with adult aquatic insect sampling. A single day surveying streambed invertebrates in the catchment uncovered 132 taxa, 70% of the record count. The results of this Foundation for Research, Science & Technology-funded "River ecosystems and land use interactions" programme reflect the diverse range of habitats in the Mangaotama catchment, and provide valuable insights into the best collection methods for measuring stream invertebrate biodiversity.

Protecting aquatic ecosystems

The health of our aquatic ecosystems depends on the quality of our waters. Decision-makers are often forced to make difficult choices about the nature of environmental risks and how to manage them safely, while industries are often required to test for such things as toxic substances as a condition of their resource consents. To help manage and protect our aquatic ecosystems more effectively, the Ministry for the Environment and NIWA have worked closely with a number of Australian environmental agencies to revise the old Australian and New Zealand Environment and Conservation Council (ANZECC) water guidelines. The new guidelines give a detailed breakdown on how to develop site-specific advice using local species and chemical contaminants. NIWA's substantial experience in aquatic risk management, including biological monitoring and ecotoxicological and chemical testing, enables us to help decision-makers and industries effectively implement the new guidelines.



Sampling for stream invertebrates and chemical contamination of estuarine mud.

Plants hold clues to lake health

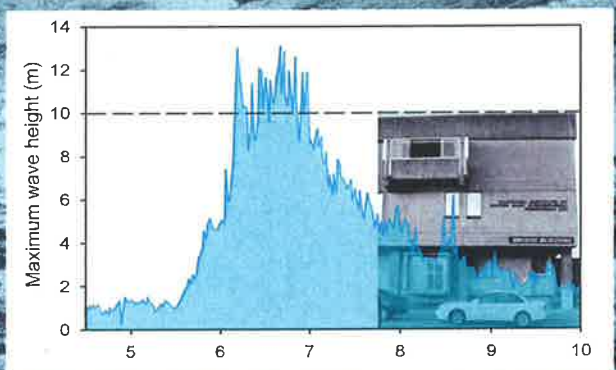
Do you need to know about the condition of a particular lake or the consequences of a lake being invaded by an introduced weed? Then check out its plant life. Submerged plants are excellent indicators for detecting changes in the water quality, hydrology, or aquatic biodiversity of lakes and other water bodies. Plants respond to influences over time frames of months to years, so any significant changes in their composition and distribution mirror changes in the condition of a lake. To improve access to information on submerged plants in New Zealand's waters, NIWA has developed a comprehensive aquatic plant database which currently holds over 12 000 plant records from 113 lakes. Invasive, introduced waterweeds out-compete native submerged plants and can have devastating effects on the diversity of lake habitats. This database is helping water managers and researchers assess the risk to our lakes from New Zealand's worst invasive waterweeds, and identify the appropriate responses if they do invade.

Chris Tanner swims from the shore down into the spring recording each plant species as well as its depth, abundance, and height for the NIWA Aquatic Plant Database. This information provides an overall picture of vegetation, and it can be used for inventories of local flora, state-of-the-environment reporting, and assessing weed risk.

Waitangi Day waves the biggest in 25 years

Blue skies and just a stiff breeze gave no hint of the giant waves that were battering Wellington's south coast on Waitangi Day in February 2002. The waves, which disrupted ferry traffic and forced the closure of some roads around the coast, were among the largest waves to hit central New Zealand in over 25 years. NIWA's wave buoy moored off Baring Head (just outside the entrance to Wellington Harbour) recorded waves of up to 13 metres on the morning of Waitangi Day, and waves continued to fluctuate between 10 and 12 metres for the rest of the day. It took a full 4 days before the waves returned to their pre-storm height. The huge waves were caused by an intense depression centred 800 kilometres southeast of Wellington which moved slowly eastward, generating large waves that travelled north to Cook Strait. Computer model simulations by NIWA scientists show that the waves at Wellington on Waitangi Day 2002 were similar in height to the waves generated by the storm that sunk the interisland ferry *Wahine* on 10 April 1968.

Weather satellites and computer models for weather and waves, sea-level measurements, and local wave measurements, such as those collected by NIWA off Baring Head for the past 6 years, will help us prepare for the next big surf.

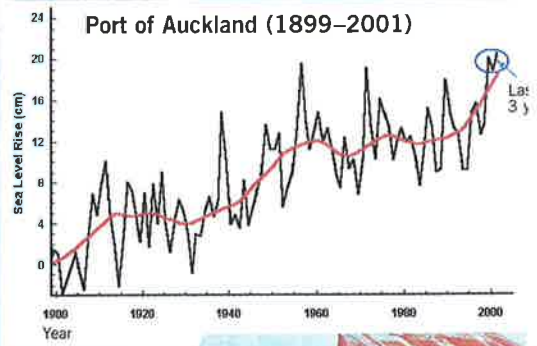


Wave heights on Waitangi Day 2002 measured against NIWA's three story Brodie Building at Greta Point, Wellington.

Foreshore Road, Colac Bay, Southland, awash after a storm surge event.

Rising tides threaten our coasts

Global sea levels will most likely rise a further 30 to 50 centimetres by 2100, predicts the Intergovernmental Panel on Climate Change. In the medium term, this is likely to mean increasingly severe storm damage and flooding of coastal properties, roads, telephone lines, and other infrastructure. Tectonic movement is raising some parts of the New Zealand coastline and lowering others, but overall sea levels have been rising steadily around New Zealand since measurements started in the late 19th century. Although NIWA has not so far observed any long-term acceleration in sea-level rise, our network of 11 open-coast, sea-level gauges shows that for the past 3 years the annual mean sea levels around New Zealand have been the highest on record. Our measurements over the next two decades and beyond will enable us to say with certainly whether sea-level rise is accelerating, or whether recent increases are just the result of other natural climate variations such as the El Niño-Southern Oscillation and the Interdecadal Pacific Oscillation.

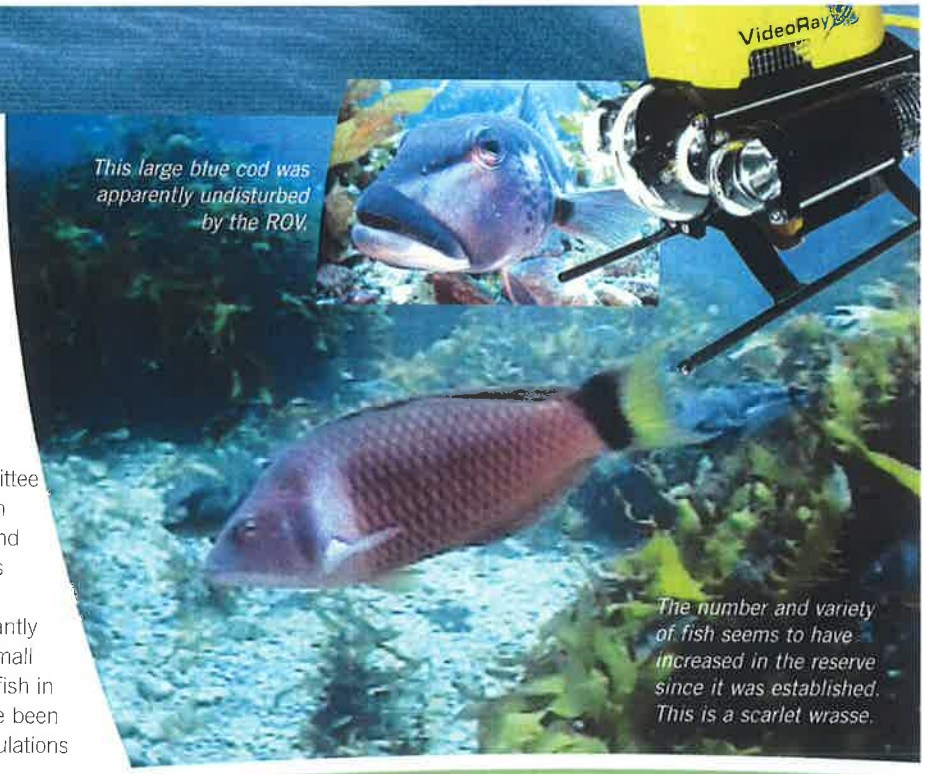


Although records of tide measurements from the ports of Auckland, Wellington, Lyttelton, and Dunedin show only a gradual small rise (up to 20 centimetres) in sea level throughout the 20th century, this rate of increase may accelerate and become more noticeable. NIWA can assist emergency managers and district planners with long-term contingency plans for coastal areas to help reduce the damage and cost of increases in coastal erosion and flooding. The graph shows sea level rise at the Port of Auckland (data from: Ports of Auckland Ltd., Professor J. Hannah (University of Otago), NIWA).

Rifle Range stopbank overflows after a storm surge at Invercargill Estuary.

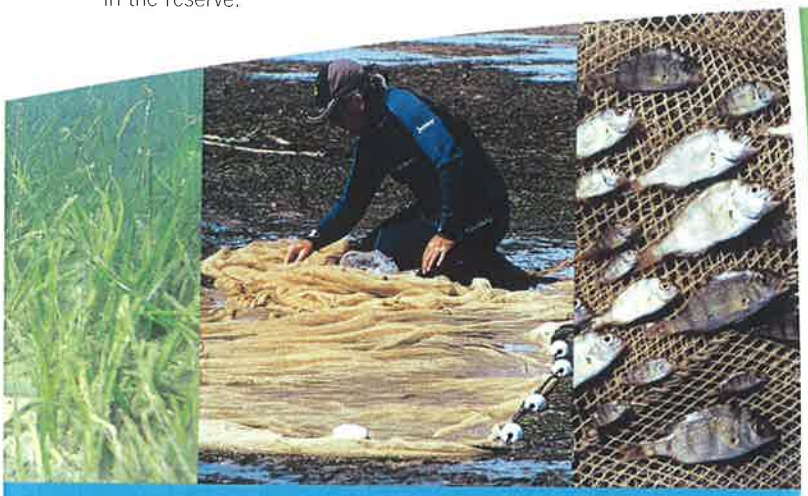
ROV spies on fish haven

A NIWA Remotely Operated Vehicle (ROV) has been used to introduce non-diving visitors to the underwater world of the Kapiti Marine Reserve. VideoRay is a small, very manoeuvrable unit, with a high-resolution camera capable of operating at depths of 150 metres. Ten years after the marine reserve was established, the Kapiti Marine Reserve Committee asked NIWA to assist with a public awareness day. NIWA Regional Manager and Committee Chair Ken Grange suggested a site visit during which committee members, Department of Conservation and Ministry of Fisheries staff, and media representatives could observe underwater life from ROV-transmitted footage to a screen on the boat. Viewers were constantly amazed by the variety and numbers of fish. Being small and inconspicuous, the ROV appears not to disturb fish in the same way that divers do. Video footage has since been used to inform the public of the recovery of fish populations in the reserve.



This large blue cod was apparently undisturbed by the ROV.

The number and variety of fish seems to have increased in the reserve since it was established. This is a scarlet wrasse.



In search of small snapper

Snapper are one of the most widespread and common fish in northern New Zealand coastal waters. They support valuable commercial and recreational fisheries. They are also one of the most intensively studied species in the country, and much effort has gone into managing snapper stocks. Yet there are many unanswered and important questions about snapper. One of these is "Where do you find small snapper, and what habitats are important to them?"

As part of the Foundation for Research, Science & Technology-funded programme "Fish usage of estuarine and coastal habitats", led by Mark Morrison and Malcolm Francis, NIWA has sampled 320 sites this year and obtained information on more than 40 species of fish. Small snapper were caught at 48 sites, and 60 percent of the fish were associated with seagrass beds, showing how important these habitats are to small fish.

Estuaries are very sensitive to changes caused by human activities, including pollution, reclamation, and sedimentation. Pristine estuaries and seagrass meadows have declined substantially over the last century, and this may have had a significant effect on the health and productivity of some fish stocks. We need to understand more about the types of habitats that are important to different fish species, and if we can protect, or even enhance, important habitats, we may help ensure fish populations remain productive and sustainable in the future.

The biggest octopus

Sixty-one kilograms of frozen octopus was delivered to NIWA's museum laboratory in Wellington in November 2001 after being collected from a depth of 920 metres southeast of the Chatham Islands during a *Tangaroa* research survey. Not only did it dwarf every other octopus known from New Zealand waters, but it also dwarfed all known octopods worldwide – and it was incomplete! The specimen was 2.9 metres long, and, if it were intact, it probably would have been up to a metre longer.

The frozen lump was identified by NIWA's museum curator Steve O'Shea as the first confirmed South Pacific record of the very rare gelatinous octopus *Haliphron atlanticus*. Little is known of the biology of this species. Most known *Haliphron* are juveniles, caught at depths less than 33 metres, although a few larger animals have been found at depths exceeding 250 metres, where they are thought to live on or near the seafloor. This animal brings to 42 the number of octopus species known from New Zealand waters.

One of the aims of the New Zealand Biodiversity Strategy, launched in 2000 by the Prime Minister, is to make an inventory of our living aquatic resources. Nearly 12 000 marine species have been described, but that's only about 50% of the estimated 22 000 to 23 000 species in New Zealand waters. NIWA aims to have completed an inventory of most of the macrofaunal groups in our region by 2020.

Steve O'Shea with the giant octopus in NIWA's Wellington laboratory.

Coping with mud

What happens to the marine life on mudflats when mud and silt are deposited there by human activities or storms? We need to understand what is happening so we can help manage and conserve these important soft-sediment environments. Some of the species that live in them are responsible for the structure and function of their habitat. These organisms are bioturbators – they constantly disturb the sediment by burrowing and feeding. Their activities mix the sediment layers and cause substantial resuspension of the sediment and its transport by waves and currents. At the same time, they help break down and redistribute organic matter, recycle nutrients, and oxygenate the sediment. In other words, they carry out some of the important functions that earthworms have on land.

In Okura Estuary, just north of Auckland, NIWA researcher Katrin Berkenbusch and Principal Scientist Simon Thrush reported how burrowing by mud crabs, the only surviving benthic animals after layers of clay up to 9 centimetres thick were deposited in the estuary, reworked the clay layer to provide traps for natural sediment which enhanced the recovery of the macrofauna.

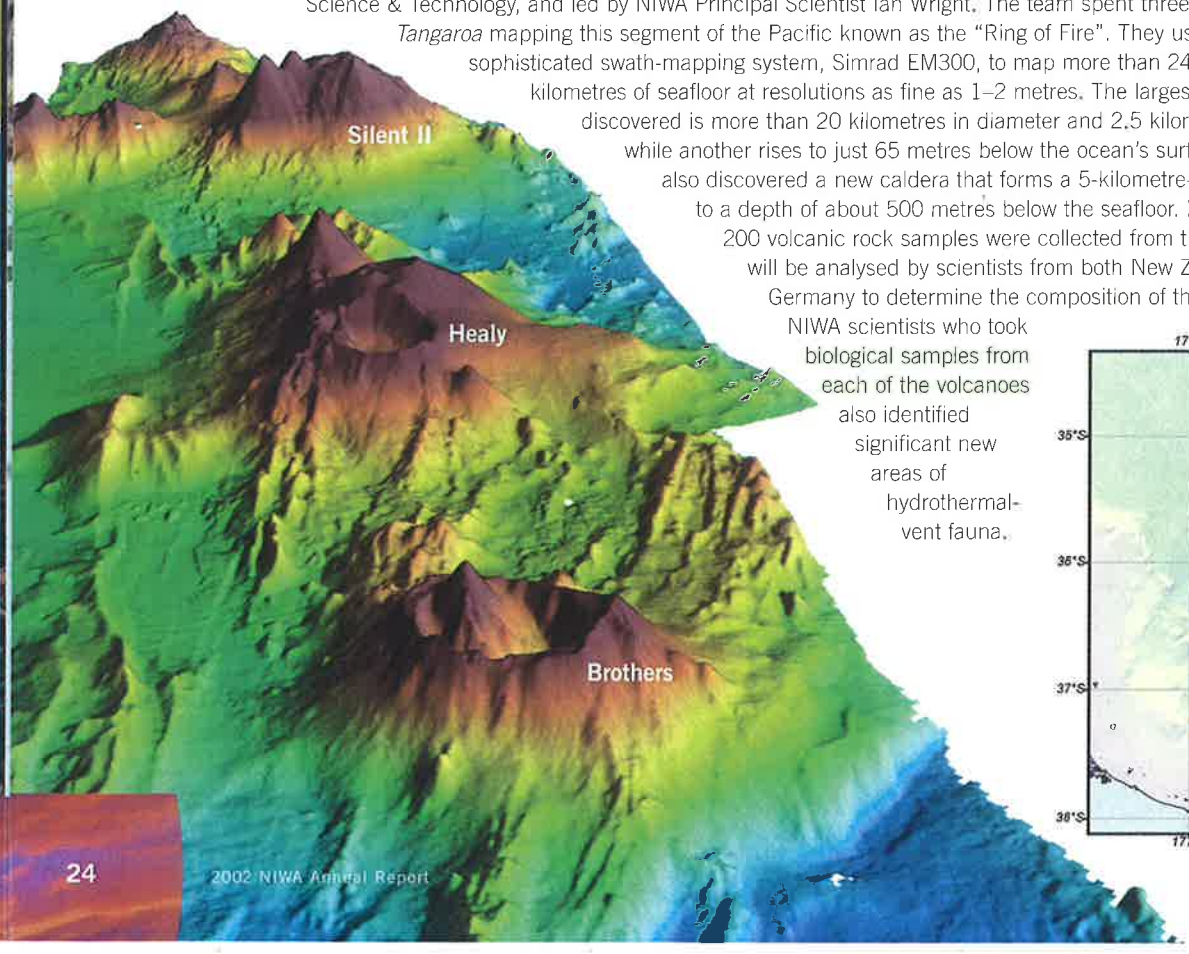
Mounds of sediment expelled from ghost shrimp burrows on an intertidal mudflat.

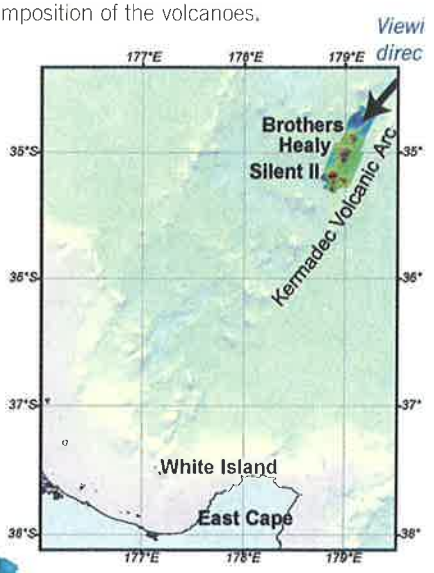
Some crustaceans, like this scampi, build temporary or permanent burrows in seafloor sediment.

More fire power discovered in "Ring of Fire"

NIWA scientists discovered more than fifty underwater volcanoes between the North Island and the Kermadec Islands in February and May 2002. Six of them are as big as Mt Taranaki. The research was conducted under the joint NIWA–Institute of Geological & Nuclear Sciences programme "Active seabed processes", funded by the Foundation for Research, Science & Technology, and led by NIWA Principal Scientist Ian Wright. The team spent three weeks on *Tangaroa* mapping this segment of the Pacific known as the "Ring of Fire". They used the sophisticated swath-mapping system, Simrad EM300, to map more than 24 000 square kilometres of seafloor at resolutions as fine as 1–2 metres. The largest volcano they discovered is more than 20 kilometres in diameter and 2.5 kilometres high, while another rises to just 65 metres below the ocean's surface. They also discovered a new caldera that forms a 5-kilometre-wide hole to a depth of about 500 metres below the seafloor. More than 200 volcanic rock samples were collected from the seafloor and will be analysed by scientists from both New Zealand and Germany to determine the composition of the volcanoes.

NIWA scientists who took biological samples from each of the volcanoes also identified significant new areas of hydrothermal-vent fauna.





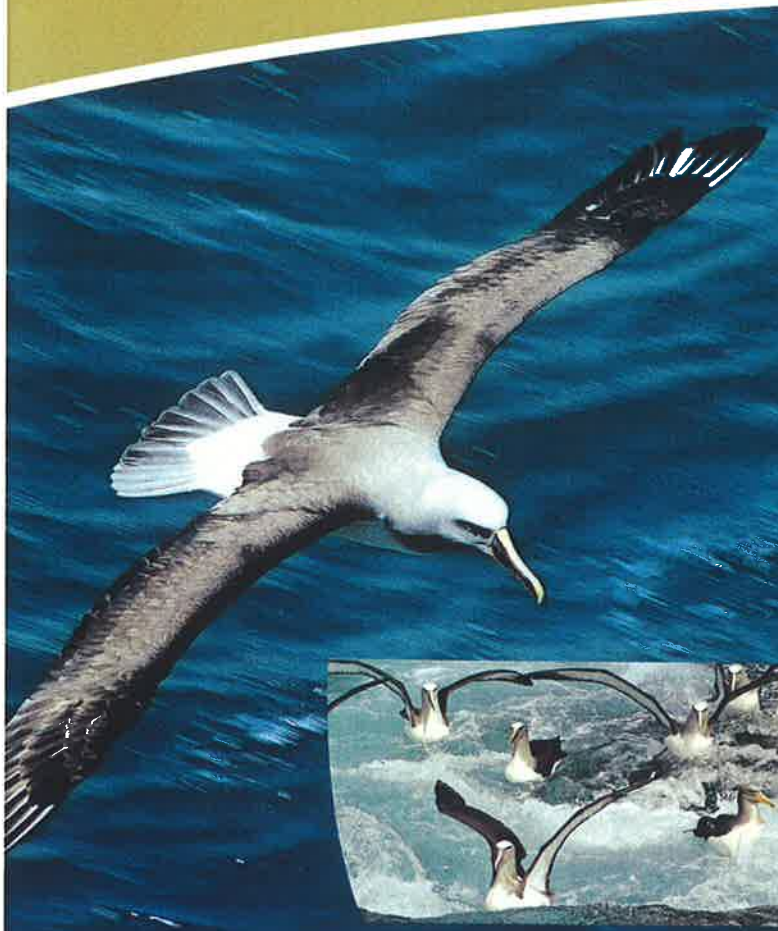
Second chance for snapper

Some 22 000 snapper caught along the west coast of the North Island in February 2002 must have thought their time was up. However, they were among the lucky ones. Instead of ending up on someone's dinner plate, these snapper were tagged and released live from chartered commercial trawlers with NIWA scientists onboard. NIWA charted the vessels to help assess the size of the west coast snapper stock as part of a major snapper-tagging programme commissioned by the Ministry of Fisheries. The size of the stock will be estimated from the number of tags recovered from future commercial catches. This stock has a combined annual commercial harvest of about 1800 tonnes, and accounts for about one-third of New Zealand's total snapper catch. The last time this stock was tagged to estimate its size was in 1990. This latest estimate will help to determine the effectiveness of rebuilding measures (including quota reductions) put in place by the Ministry of Fisheries over the last 10 years.

Electronic tags, each carrying a unique code that can be read only by a special scanner, were injected into the gut cavity of the snapper. NIWA scientists developed the tags, which are 10 mm long and 3 mm wide, specifically for snapper, and trials show that the fish suffer no ill effects from them. The tags have a plastic "food safe" coating which is designed to be safe for humans or pets if a tag is accidentally bitten or swallowed.

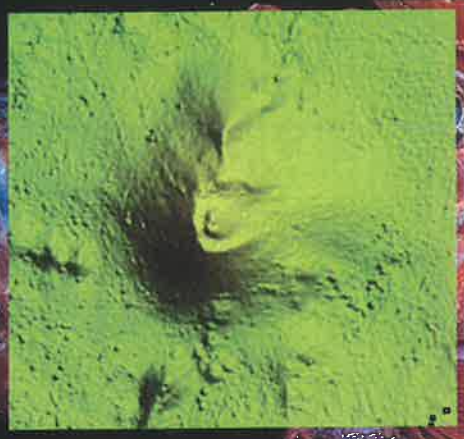
Are fisheries helping seabirds?

Albatrosses, petrels, and shearwaters can get tangled in fishing nets or be snared while attempting to take baits set for fish. The incidental mortality of some species of albatrosses from trawl and longline fisheries has led to major declines in some breeding populations. However, a collaborative Foundation for Research, Science & Technology-funded programme between NIWA and the Museum of New Zealand Te Papa Tongarewa has found a less obvious effect of marine wildstock fisheries on seabird populations – fish discards from some fisheries are providing up to about 65% of the total food fed by adult seabirds to their chicks. Further research will examine whether access to this novel food source may help the birds breed and survive more successfully by enabling them to overcome variations in the supply of their natural prey. A model developed to predict the numbers and distribution of Southern Buller's albatrosses at sea by using population and satellite-tracking information will also be used to estimate when and where the fisheries and albatrosses overlap. Eventually this model may be used to predict the potential impact of any fishery on all species of albatross or large petrel within New Zealand's Exclusive Economic Zone. This work complements the study of patterns of seabird mortality in New Zealand fisheries carried out by NIWA for the Ministry of Fisheries.



The spawning behaviour of orange roughy

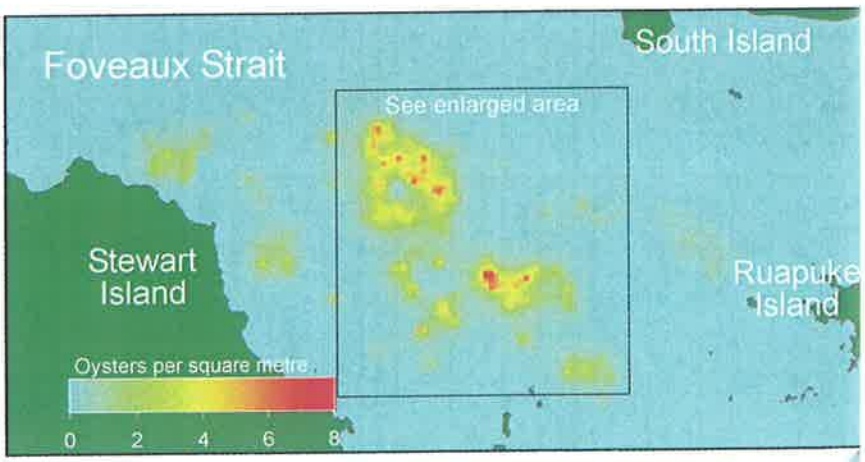
The name "Graveyard seamount" is something of a misnomer because, although it suggests a barren seascape, devoid of life, the reality is much different. Between mid June and mid July the 150 metre high Graveyard seamount on the Chatham Rise becomes a hub of activity as a major spawning ground for orange roughy. Up to a month before the spawning begins the resident orange roughy population will be inundated by other orange roughy from as far as 70 kilometres away. The spawning fish – together weighing about 2600 tonnes – form a "football" on top of the seamount and will stay that way for most of the spawning period. NIWA research on this population includes surveying the spawning fish for biomass estimation, mapping the migration of spawned fish out of the area, and investigating the relationship between the spawning aggregation and the low density of fish on the flat area around the seamount.

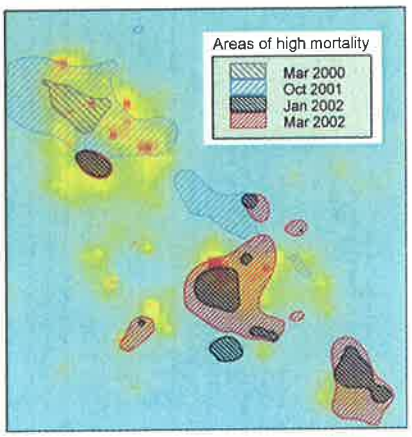


Graveyard seamount, as revealed by the EM300 swath-mapping system in Tangaroa.

The battle against *Bonamia*

In early 2000 NIWA and the Bluff Oyster Management Company discovered an outbreak of *Bonamia exitotis* in the important commercial fishing beds in Foveaux Strait. The news was a blow to the fishery that was only just recovering from an outbreak of *Bonamia* in the early 1990s, which reduced oyster numbers to a point where some predicted the fishery would never recover. Surveys by NIWA in January and March 2002, to map the spread of the epidemic and the course of *Bonamia* infection, suggested that this recent outbreak may have reduced the number of legal-sized oysters in the main fishing beds by up to 50% over the past year. With backing from the Ministry of Fisheries and the Bluff Oyster Management Company, NIWA is researching the dynamics of the oyster population, the Foveaux Strait environment, and the links with *Bonamia*. This will help the development of tools to assess different management options aimed at minimising the impact of *Bonamia* and ensuring the sustainability of the fishery.

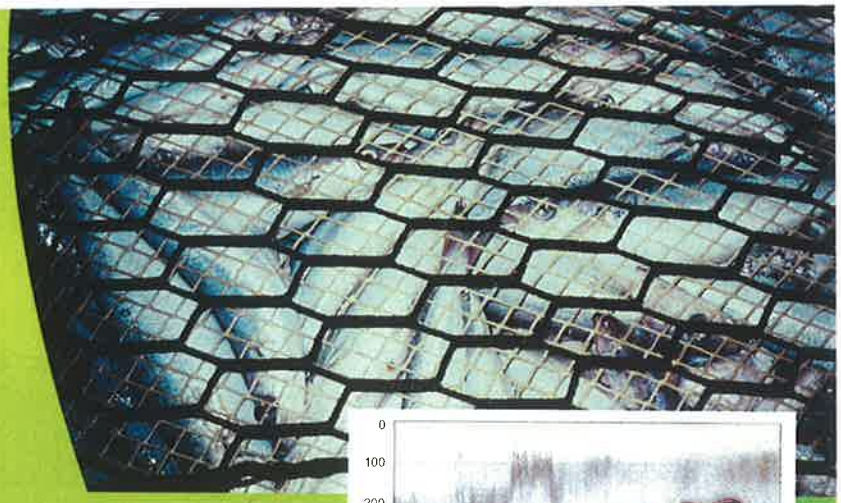


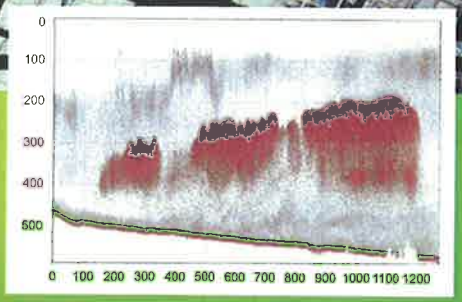


Oyster density in October 1999 (top), and regions where there was recent evidence of high oyster mortality in March 2000, October 2001, January 2002, and March 2002.

The Bounty Platform is an ancient volcanic seamount that rises up from depths of more than 1000 metres. The southern blue whiting which migrate to the Platform each spring have been a major focus of the fishery in the past, with catches peaking at almost 60 000 tonnes in 1992. However, recent research shows that this stock has declined to low levels.

Bounty Is.





Southern blue whiting can form very large dense spawning aggregations. This echogram shows a large aggregation (over 100 000 tonnes) on the southern Campbell Island Rise extending from a depth of more than 500 metres to within 200 metres of the surface. The Campbell stock appears to be in good shape, with recent annual catches of 30 000–40 000 tonnes.

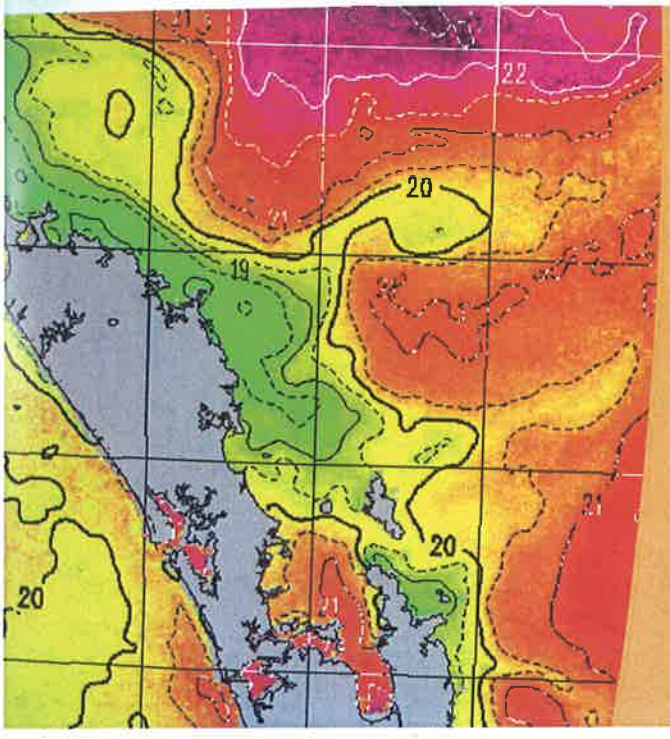
From surimi to fish fingers

The southern blue whiting fishery is one of the largest in New Zealand – last season's catch exceeded 30 000 tonnes. About 60% of southern blue whiting is turned into surimi, and the rest is filleted and processed for the convenience food market (for example, into fish fingers and battered fillets). Each spring the fish come together to spawn on the Campbell Island Rise, Bounty Platform, and Pukaki Rise. NIWA research shows that the size of these stocks can vary greatly. NIWA carries out regular surveys of these spawning grounds for the Ministry of Fisheries to estimate the size of the stocks by use of acoustic technology. The results of these surveys are then incorporated into sophisticated population models, which are used to evaluate different management options for the fishery.

Well managed hoki

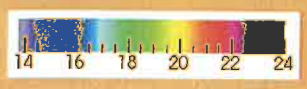
New Zealand hoki is one of the world's best managed fisheries, and it has a certificate to prove it. To achieve Marine Stewardship Council certification, a fishery is assessed against three key criteria: the state of the stock, the impact of the fishery on the ecosystem, and the management systems in place to safeguard these things. New Zealand hoki is one of only a handful of fisheries in the world to have met these standards.

Recent cooperation between the Hoki Management Company (HMC) and NIWA is further improving the quality of hoki research as a basis for this certification. Vivian Haist (University of Washington, funded by HMC through the SeaFIC Science Unit) has joined forces with Chris Francis (NIWA, funded via the Ministry of Fisheries) to provide a joint stock assessment for hoki. This provided a clearer picture of the status of the stocks than had been available in previous years, and this cooperative research was made much easier because they used CASAL — NIWA's new, and very flexible, computer program for stock assessment.

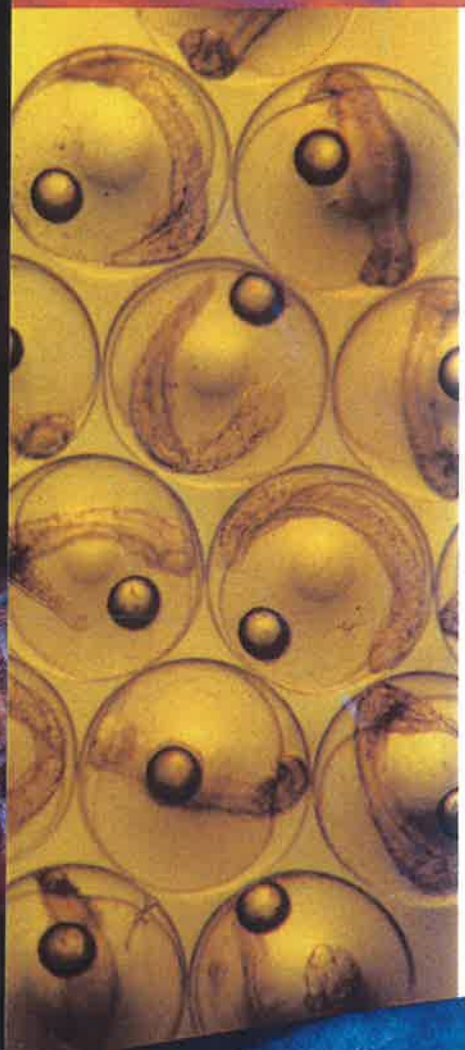


Targeting fish via satellite

Fishers wanting to know the best place to catch pelagic fish such as tuna are increasingly turning to sea surface temperature (SST) data for help. More than 800 individuals and companies have registered to use NIWA's satellite data services web pages which allow users to access real-time sea surface temperatures derived from US National Oceanic and Atmospheric Administration satellite data. The service provides coverage to fishers operating in New Zealand's Exclusive Economic Zone, along the east coast of Australia, and around Fiji and Tonga. Sat-View technology has been recently added to the service, so skippers can now easily update their SST data while at sea, and monitor ocean conditions anywhere within the regions covered.



Sea surface temperatures off northern New Zealand from 18 to 22 January 2002 (showing complex, and significant to fisheries, oceanographic structures in the waters of the East Auckland Current).



Bream Bay Aquaculture Park

The successful rearing of mussels, oysters, and finfish in the few months that Bream Bay has been operating shows just how good the site is for aquaculture. NIWA invested more than $2.5 million in this new aquaculture production and research facility to assist in the development of New Zealand's growing seafood industry.

A key constraint to the development of the aquaculture industry had been the lack of a warm-water R&D facility to complement NIWA's cold-water facility at Mahanga Bay in Wellington. The very high-quality warm water at Bream Bay allows scientists and industry partners to research and produce species that are better suited to warm water without the added expense of heating large quantities of seawater.

The main aim of the facility is to bridge the gap between small-scale research and commercial production. The collaborative research has already produced highly promising results with kingfish, snapper, mussels, oysters, and paua, and a project to ongrow eels has just begun.

Bream Bay Aquaculture Park will help ensure New Zealand stays at the forefront of aquaculture development, to the benefit of the entire economy, but with particular promise for regional and Māori economic development.

Millions of very healthy mussels and oysters have been produced already at Bream Bay. This spectacular success in breeding and culture shows that the shellfish are very happy with their environment. NIWA and Sealord Shellfish have successfully spawned mussels and oysters through to settlement, at a large settlement size, with high survival rates, and faster than usual.

Kingfish are one of the most important species at Bream Bay. The aim is to culture them from fertilised eggs through the larval and juvenile stages to adults for ongrowing in seacages. This work, being carried out in partnership with a commercial fishing company, is highly promising from both biological and commercial perspectives.

Paua seed sale starts

As the number of paua farms increases, and the fishing industry calls for reseeding to replenish wild populations depleted by overfishing and poaching, demand for paua seed (juveniles) has increased substantially. NIWA has established a paua seed production unit at its Mahanga Bay aquaculture research facility, and the first batch of 10–15 mm juvenile paua was sold in June 2001. Other clients have been sold batches of ready-to-settle larvae (7–8 days old). The seed production unit can now produce batches of 100 000 to 120 000 paua seed up to three times a year.

The NIWA scientist overseeing the paua production, Bob Hickman, with one of the racks of settlement plates.

Up close and personal with some of the paua – these are about 6 months old.

Report of the Directors to the Shareholders

The Directors take pleasure in presenting the NIWA Group Annual Report for the financial year ended 30 June 2002.

Business activities

The NIWA Group provided scientific research and consultancy services in New Zealand and overseas during the financial year. In New Zealand, services were provided to the Foundation for Research, Science & Technology, the Ministry of Fisheries, and a range of other public and private sector customers. Internationally, services were provided by NIWA and its subsidiaries to public and private sector customers in the USA and Australia.

Results

This financial year the NIWA Group has exceeded its Business Plan objectives with a net surplus of $4.730 million (2001: $4.717 million) against a budgeted net surplus of $4.149 million. This was achieved on a turnover of $81.312 million (2001: $77.113 million), against a budget of $78.689 million.

Shareholders' equity at 30 June 2002 totalled $42.115 million (2001: $56.435 million), a decrease of 25.4%. Total assets decreased 16.9% to $62.998 million (2001: $75.807 million).

Donations

No donations were made during the year (2001: nil).

Dividends

During the financial year a dividend was paid to the Government of New Zealand (the Crown) as shareholder. The agreed dividend was $19 million, and it was paid in two tranches. An interim dividend payment of $12 million was made on 7 January 2002, and a final dividend payment of $7 million was paid on 28 June 2002. At this stage there is no indication of a regular dividend based on yearly earnings, but this option has not been ruled out by the shareholder.

Directors

Changes to Directors during the financial year were as follows:

- The appointments of Peter Nicholas, Miranda Cassidy, and David Sharp on 1 July 2001;
- The appointment of Graham Hill on 27 May 2002;
- The appointment of Troy Newton on 18 June 2002;
- The resignation of Peter Nicholas on 31 May 2002;
- The retirement of Brian Rhoades on 31 December 2001;
- The retirement of Paul Morgan (Deputy Chair) on 30 June 2002.

Remuneration of Directors

Directors' remuneration received, or due and receivable during the year, is as follows:

	Parent	
	2002 $'000	2001 $'000
Directors of the National Institute of Water & Atmospheric Research Ltd and NIWA Vessel Management Ltd		
S H Suckling (Chair)	42	6
P T Morgan (Deputy Chair)	28	23
B L Rhoades	9	18
J D Hercus	24	12
C W Burns	18	11
New appointees during the 30 June 2002 year		
M K Cassidy	20	–
D C Sharp	20	–
P A Nicholas	17	–
G Hill	1	–
T W Newton	–	–
Retired during the 30 June 2001 year		
D Sollitt	–	32
J C Montgomery	–	19

No fees were paid in respect of directors of the subsidiaries NIWA Vessel Management Ltd, NIWA Environmental Research Institute, NIWA (USA), Incorporated, and NIWA Australia Pty Ltd.

Remuneration of employees

The numbers of employees (not including Directors) whose remuneration exceeded $100,000 is as follows:

	Group	
$	**2002**	2001
100,000–109,999	6	5
110,000–119,999	7	3
120,000–129,999	–	2
130,000–139,999	2	1
140,000–149,999	–	–
150,000–159,999	2	3
160,000–169,999	3	1
170,000–179,999	–	–
180,000–189,999	–	–
190,000–199,999	–	–
200,000–209,999	–	–
210,000–219,999	–	–
220,000–229,999	1	1
230,000–239,999	–	–
240,000–249,999	1	1
250,000–259,999*	1	1

** Chief Executive's remuneration band*

Auditors

In accordance with Section 21(1) of the Crown Research Institutes Act 1992, the auditor, Mr A G Burgess, of Deloitte Touche Tohmatsu, on behalf of the Auditor-General, continues in office. Audit remuneration and fees paid for other services are detailed in note 4 of the "Notes to the Group Financial Statements".

NIWA Board: (left to right) John Hercus, Graham Hill, Sue Suckling (Chair), Carolyn Burns, Chief Executive Paul Hargreaves, David Sharp, Paul Morgan (Deputy Chair). Inset: Miranda Cassidy. (Troy Newton joined on 18 June 2002.)

Directors' profiles

Sue Suckling *(Chair)*, OBE, BTech (Hons), MTech, is a Christchurch-based director and consultant. She is Chair of Agriquality New Zealand Ltd and a director of several other private companies, including WestpacTrust Investments Ltd. Previously, she was Deputy Chair of the Institute of Geological and Nuclear Sciences Ltd. Sue Suckling was appointed NIWA Chair in July 2001.

Paul Morgan *(Deputy Chair)* is of Ngati Rarua, Te Mahurehure, Nga Ruahine, and Te Atiawa tribal descent. He is Deputy Chair of the Federation of Māori Authorities and of Wakatu Incorporation and Chair of the Ngati Rarua Atiawa Iwi Trust (Māori food and land-based organisations based in Nelson and Motueka). He is also a Director of Landcorp Farming Ltd, Port Nicholson Fisheries Ltd, Tohu Wines, and HKM Associates Ltd.

Professor Carolyn Burns is Head of the Department of Zoology at the University of Otago and is a distinguished limnologist. She holds a doctorate from the University of Toronto, was awarded the CBE in 1984, and is a Fellow of the Royal Society of New Zealand. She has held visiting research professorships in US universities and was a research scientist at the Max-Planck Institute for Limnology. In 1999 she was honoured with the University of Canterbury distinguished Alumni Award.

Miranda Cassidy, BA in sociology, MSc (Hons) in resource management, is an Auckland-based company director, consultant, trainer, and professional speaker. She is a former customary fisheries manager of Ngai Tahu Development Corporation and is currently director of FOLKUS Ltd, an environmental consulting company, and Futures by Design Ltd, a provider of training programmes using neurolinguistic techniques.

John Hercus has an MSc in physics from Victoria University and has been a leading figure in polytechnic, technology, and science education, serving as Director of the Christchurch Polytechnic from 1974 to 1993. He has worked with the UN Development Programme in higher education and training, and on projects with UNESCO and the Asian Development Bank. He has held directorates with several companies involved in international education and technology development. He was appointed to the Board of the Meteorological Service of New Zealand in July 2002.

Dr Graham Hill is an astronomer and astrophysicist currently lecturing at the University of Auckland and the Auckland University of Technology. From 1967 to 1996 he was a research scientist at the National Research Council of Canada – Dominion Astrophysical Observatory in Victoria, BC, and has also been a scientific computer software consultant for several overseas universities since 1990. He is an invited member of the International Astronomical Union and holds a PhD in astronomy from the University of Texas, an MA from the University of Minnesota, and a BSc from the University of Auckland. He is a Director of the Meteorological Service of New Zealand.

Troy Newton is a Director of KPMG Corporate Finance, where he advises clients on mergers and acquisitions, valuation, regulatory reform, and financing matters in New Zealand, Australia, and the Pacific Rim. He is a chartered accountant and was a Director of Industrial Research Limited from 1997 until September 2002 and Acting Chief Executive pending the arrival of the new CE. He has particular industry experience in telecommunications, information technology, and energy and transport operations.

David Sharp, BSc, is Chairman of the New Zealand Seafood Industry Council, and holds a number of other positions in the seafood industry. He was previously executive director of a major New Zealand primary produce exporting and seafood company.

Interests Register

The following are transactions recorded in the Interests Register for the year.

(a) Parent Company

Interested Transactions
Any business the Company has transacted with organisations in which a Director has an association has been carried out on a commercial "arms-length" basis.

Directors' Remuneration
Details of the Directors' remuneration are provided above.

Use of Company Information by Directors
No Directors have disclosed, used, or acted on information that would not otherwise be available in their capacity as Directors.

Share Purchases
There were no share purchases by Directors during the year.

Directors' Loans
There were no loans by the Company to Directors.

Directors' Insurance
The Group has arranged policies for Director's Liability Insurance which, with a Deed of Indemnity, ensures that generally Directors will incur no monetary loss as a result of actions undertaken by them as Directors. Certain actions are specifically excluded; for example, the incurring of penalties and fines which may be imposed in respect of breaches of the law.

(b) Subsidiary Companies

Interested Transactions
Any business the subsidiaries have transacted with organisations in which a Director has an association has been carried out on a commercial "arms-length" basis.

Directors' Remuneration
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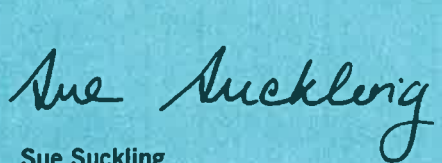
The Directors are satisfied that the state of affairs of NIWA and Group are adequate.

For and on behalf of the Board:



Sue Suckling
Chair
28 August 2002

Carolyn Burns
Director

Corporate Governance Statement

The Board of Directors of the National Institute of Water & Atmospheric Research Ltd (NIWA) is appointed by the shareholding Ministers to guide and monitor the business of NIWA and its subsidiaries NIWA Vessel Management Ltd, NIWA Environmental Research Institute, NIWA (USA), Incorporated, and NIWA Australia Pty Ltd, which constitute the NIWA Group.

The Board comprised up to eight Directors (including the Chair) during the financial year ended 30 June 2002 and formally met ten times during that period.

Responsibility for the management and administration of the Group is delegated to the Chief Executive, who is responsible to the Board.

The Board has established two standing committees, for audit and for executive remuneration. The Audit Committee during the financial year comprised Messrs Paul Morgan, John Hercus, Peter Nicholas, and Sue Suckling (Chair). The Remuneration Committee comprised all members of the Audit Committee. During the financial year the Audit Committee met formally twice and the Remuneration Committee did not formally meet.

The Chief Executive recruitment committee comprised Sue Suckling, Paul Morgan, and Dr Carolyn Burns. The committee met as required, starting in February 2002, and ending with the announcement in June 2002. The role of this committee was to manage the recruitment process, making recommendation to the full Board for consideration and final approval of a new Chief Executive.

The function of the Audit Committee is to assist the Board in carrying out its responsibilities under the Crown Research Institutes Act 1992, the Public Finance Act 1989, the Companies Act 1993, and the Financial Reporting Act 1993 in respect of the Group financial accounting practices, policies, and controls and to review and make appropriate enquiry into the audits of the Group Financial Statements by both internal and external auditors.

The function of the Remuneration Committee is to review and approve executive remuneration arrangements.

Statement of Management Responsibility

The following statement is made in accordance with Section 42 of the Public Finance Act (1989):

1. The management of the company is responsible for the preparation of these Financial Statements and the judgements used therein.
2. Internal control procedures are considered to be sufficient to provide reasonable assurance as to the integrity and reliability of the Financial Statements.
3. In the opinion of management, these Financial Statements fairly reflect the financial position and operations of the National Institute of Water & Atmospheric Research Ltd and Group for the year ended 30 June 2002.

Sue Suckling

Sue Suckling
Chair
28 August 2002

Carolyn A. Burns

Carolyn Burns
Director

Statement of Financial Performance

for the year ended 30 June 2002

	Note	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2002 Budget $'000	Group 2001 Actual $'000
Revenue	3	78,550	77,903	81,312	78,689	77,113
Operating surplus before taxation	4	**5,762**	**5,371**	**7,465**	**6,420**	**7,328**
Taxation expense	5a	1,885	1,783	2,735	2,271	2,611
Net surplus		**3,877**	**3,588**	**4,730**	**4,149**	**4,717**

The accompanying "Notes to the Financial Statements" are an integral part of, and should be read in conjunction with, this "Statement of Financial Performance".

Statement of Movements in Equity

for the year ended 30 June 2002

	Note	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2002 Budget $'000	Group 2001 Actual $'000
Equity at the beginning of the year		**49,074**	**45,486**	**56,435**	**56,643**	**51,675**
Net surplus		3,877	3,588	4,730	4,149	4,717
Foreign currency translation reserve movement	6b	–	–	(50)	–	43
Total recognised revenues and expenses		**3,877**	**3,588**	**4,680**	**4,149**	**4,760**
Dividends paid	7	(19,000)	–	(19,000)	(19,000)	–
Total contributions to shareholders		**(19,000)**	**–**	**(19,000)**	**(19,000)**	**–**
Equity at the end of the year		**33,951**	**49,074**	**42,115**	**41,792**	**56,435**

The accompanying "Notes to the Financial Statements" are an integral part of, and should be read in conjunction with, this "Statement of Movements in Equity".

National Institute of Water & Atmospheric Research Ltd and Group

Statement of Financial Position

as at 30 June 2002

	Note	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2002 Budget $'000	Group 2001 Actual $'000
Equity						
Share capital	6a	24,799	24,799	24,799	24,799	24,799
Equity reserves	6b	9,152	24,275	17,316	16,993	31,636
Total equity		**33,951**	**49,074**	**42,115**	**41,792**	**56,435**
Non-current liabilities						
Employee entitlements	8a	1,982	2,090	2,096	2,176	2,194
Intercompany	17	5,136	5,059	–	–	–
Total non-current liabilities		**7,118**	**7,149**	**2,096**	**2,176**	**2,194**
Current liabilities						
Payables and accruals	9	7,864	10,332	8,310	5,664	12,295
Survey and repair provisions	11	–	–	267	579	497
Short-term advance facility	10	4,300	–	4,300	9,554	–
Employee entitlements	8b	5,710	4,138	5,910	3,185	4,386
Total current liabilities		**17,874**	**14,470**	**18,787**	**18,982**	**17,178**
Total equity and liabilities		**58,943**	**70,693**	**62,998**	**62,950**	**75,807**
Non-current assets						
Property, plant, & equipment	12	30,484	26,783	46,978	47,475	44,980
Investments in subsidiaries	16	12,421	12,421	–	–	–
Future income taxation benefit	5b	2,957	2,655	767	592	627
Total non-current assets		**45,862**	**41,859**	**47,745**	**48,067**	**45,607**
Current assets						
Cash and short-term deposits		463	14,212	887	4,141	14,392
Receivables and prepayments	13	9,974	12,798	10,901	7,479	13,117
Taxation receivable		61	70	450	2,212	447
Contract work in progress		1,898	1,153	1,946	–	1,153
Inventories	14	685	601	1,069	1,051	1,091
Total current assets		**13,081**	**28,834**	**15,253**	**14,883**	**30,200**
Total assets		**58,943**	**70,693**	**62,998**	**62,950**	**75,807**

For and on behalf of the Board:

Sue Suckling
Chair
28 August 2002

Carolyn Burns
Director

The accompanying "Notes to the Financial Statements" are an integral part of, and should be read in conjunction with, this "Statement of Financial Position".

National Institute of Water & Atmospheric Research Ltd and Group

Statement of Cash Flows

for the year ended 30 June 2002

	Note	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2002 Budget $'000	Group 2001 Actual $'000
Cash flows from operating activities						
Cash was provided from:						
Receipts from customers		82,026	75,009	83,081	77,049	74,034
Interest received		446	737	447	–	774
		82,472	75,746	83,528	77,049	74,808
Cash was disbursed to:						
Payments to employees and suppliers		(68,495)	(63,913)	(68,362)	(63,430)	(57,542)
Taxation expense paid		(2,178)	(1,634)	(2,879)	(2,271)	(2,915)
		(70,673)	(65,547)	(71,241)	(65,701)	(60,457)
Net cash inflow from operating activities	15	**11,799**	**10,199**	**12,287**	**11,348**	**14,351**
Cash flows from investing activities						
Cash was provided from:						
Sale of property, plant, & equipment		204	180	394	–	180
Loans advanced from subsidiary company		181	1,118	–	–	–
Cash was applied to:						
Purchase of property, plant, & equipment		(11,233)	(5,987)	(11,486)	(10,985)	(8,854)
Net cash outflow in investing activities		**(10,848)**	**(4,689)**	**(11,092)**	**(10,985)**	**(8,674)**
Cash flows from financing activities						
Cash was provided from:						
Proceeds from short-term advance facility	10	4,300	–	4,300	12,000	–
Cash was applied to:						
Dividends paid to shareholders	7	(19,000)	–	(19,000)	(19,000)	–
Repayment of short-term advance facility		–	–	–	(2,376)	–
Net cash inflow/(outflow) from financing activities		**(14,700)**	**–**	**(14,700)**	**(9,376)**	**–**
Net increase/(decrease) in cash held		**(13,749)**	**5,510**	**(13,505)**	**(9,013)**	**5,677**
Add opening cash balance		14,212	8,702	14,392	13,154	8,715
Closing cash balance		**463**	**14,212**	**887**	**4,141**	**14,392**
Made up of:						
Cash		463	1,722	887	541	1,902
Short-term deposits		–	12,490	–	3,600	12,490
Closing cash balance		**463**	**14,212**	**887**	**4,141**	**14,392**

The accompanying "Notes to the Financial Statements" are an integral part of, and should be read in conjunction with, this "Statement of Cash Flows".

Notes to the Financial Statements

1 Nature of activities

The National Institute of Water & Atmospheric Research Ltd (NIWA) and Group conducts research in water and atmospheric sciences in New Zealand and internationally.

2 Statement of accounting policies

The NIWA Financial Statements and Group Financial Statements are presented in accordance with the requirements of the Crown Research Institutes Act 1992, the Public Finance Act 1989, the Companies Act 1993, and the Financial Reporting Act 1993. The NIWA Financial Statements are for the Parent Company as a separate entity. The consolidated or Group Financial Statements are for NIWA and its wholly owned subsidiaries, NIWA Vessel Management Ltd, NIWA (USA), Incorporated, NIWA Environmental Research Institute, and NIWA Australia Pty Ltd.

Measurement base

The Financial Statements have been prepared in accordance with Generally Accepted Accounting Practice (often called GAAP) in New Zealand. The measurement and reporting of financial performance, movements in equity, financial position, and cash flows is based on historical cost. The reporting currency used in the preparation of these Financial Statements is New Zealand dollars.

Specific accounting policies

The following specific accounting policies, which materially affect the measurement of financial performance, movements in equity, financial position, and cash flows, have been established and consistently applied.

(a) Basis of consolidation

The Group Financial Statements have been prepared using the purchase method of consolidation. This involves adding corresponding assets, liabilities, revenue, and expenses on a line-by-line basis. All intercompany transactions, balances, and unrealised profits are eliminated on consolidation.

(b) Revenue recognition

Contract revenue is recognised based on the lower of the stage of completion of the contract or the value of work done. The amount of revenue unbilled is represented by "Contract work in progress" in the Statement of Financial Position. Revenue received but not earned is recognised as revenue in advance in "Payables and accruals" in the Statement of Financial Position.

(c) Goods and Services Tax (GST)

These Financial Statements are prepared on a GST-exclusive basis, except for receivables and payables, which are stated with GST included.

(d) Taxation

Taxation expense is charged in the Statement of Financial Performance in respect of the current year's operating surplus after allowing for permanent differences. The provision for taxation for the year includes both current and deferred tax on income after taking into account all available deductions.

Deferred tax arising from timing differences in recognition of income and expenditure for tax purposes has been accounted for using the liability method on a comprehensive basis. A debit balance in the deferred tax account (hereafter called "future income taxation benefit"), arising from timing differences or taxation benefits from taxation losses, is recognised only if there is virtual certainty of realisation.

Future income taxation benefits and provisions for deferred taxation are not offset if they arise in different taxation jurisdictions.

(e) Property, plant, and equipment

Property, plant, and equipment are valued at historical cost less accumulated depreciation to date. Property, plant, and equipment purchased from the Crown at 1 July 1992 and 1 July 1995 are stated at the transfer price at those dates, adjusted for subsequent disposals and depreciation.

Property, plant, and equipment with a cost price less than $2,000 and computer software are fully depreciated in the year of purchase.

Expenditure incurred on property, plant, and equipment is capitalised where such expenditure will increase or enhance the future economic benefits provided by the assets' existing service potential. Expenditure incurred to maintain future economic benefits is classified as repairs and maintenance.

(f) Depreciation

Property, plant, and equipment, except for freehold land, are depreciated on a straight-line basis at rates estimated to write off the cost (or transfer cost) of the property, plant, and equipment over their estimated useful lives. Maximum useful lives used are as follows:

RV *Tangaroa* hull	26 years
RV *Kaharoa* hull	16 years
Small boats	5 years
Buildings	40 years
Leasehold improvements, freehold property	10 years
Leasehold improvements, rented property	5 years
Supercomputer	5 years
Scientific equipment	4 years
Plant & equipment	10 years
Other EDP equipment	3 years
Furniture & fittings	10 years
Office equipment	5 years
Motor vehicles	4 years

(g) Receivables

Receivables are stated at their estimated realisable value after providing for doubtful and uncollectable debts.

(h) Inventory

Inventory is stated at the lower of cost and net realisable value. Cost is calculated on the weighted average basis for consumables and first in first out (FIFO) for finished goods and work in progress.

(i) Foreign currencies

Transactions

Transactions in foreign currencies are converted at the New Zealand rate of exchange ruling on the date of the transaction. Monetary assets and liabilities are converted to the New Zealand rate of exchange ruling at balance date, and any exchange gains or losses are taken to the Statement of Financial Performance.

Translation of independent foreign operations

Revenues and expenses of independent foreign operations are translated to New Zealand dollars at the exchange rates in effect at the time of the transactions, or at rates approximating them. Assets and liabilities are converted to New Zealand dollars at the rates of exchange ruling at balance date. Exchange rate differences arising from the translation of the independent foreign operations are recognised in the foreign currency translation reserve.

(j) Leases

The Group has not contracted for any leases which would be classified as finance leases.

Operating lease payments are recognised evenly over the expected period of benefit to the Group.

(k) Statement of cash flows

Operating activities comprise the provision of research services. Investing activities comprise the purchase and disposal of property, plant, and equipment and advances to subsidiaries. Financing activities are those which result in changes in the size and composition of the capital structure of the Group.

(l) Provision for dividends

Dividends are recognised in the period in which they are authorised and approved.

(m) Changes in accounting policies

There have been no changes in accounting policies this year.

3 Revenue

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2002 Budget $'000	Group 2001 Actual $'000
Public Good Science and Technology					
– Contract funding	33,626	33,549	33,626	33,550	33,549
– Non-Specific Output Funding (NSOF)	4,243	3,810	4,243	3,680	3,810
Ministry of Fisheries	16,260	13,701	16,260	16,000	13,701
Commercial	23,975	26,106	26,737	24,978	25,309
Interest income	446	737	446	481	744
	78,550	**77,903**	**81,312**	**78,689**	**77,113**

All revenue was derived from continuing activities.

4 Operating surplus before taxation

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
The operating surplus before taxation is stated after charging/(crediting):				
Depreciation	7,515	6,123	9,318	7,681
Rental and operating lease costs	843	783	883	797
Remuneration of Directors	173	122	173	122
Net loss/(gain) on sale of property, plant, & equipment	(188)	47	(187)	47
Bad debts written off	5	8	5	8
Net realised foreign currency loss/(gain)	(116)	3	(97)	(22)
Survey and repair provisions	–	–	(184)	100
Donations	–	–	–	–
Interest expense	–	–	–	–
Remuneration of the auditors of these Financial Statements:				
– Audit fees	54	47	59	52
– Other services	37	3	47	48

5 Taxation

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
5a. Taxation expense				
Operating surplus before taxation	**5,762**	**5,371**	**7,465**	**7,328**
Prima facie tax @ 33%	1,901	1,772	2,463	2,418
Add/(less) tax effect of permanent differences	18	12	18	12
Adjustment for tax losses not recognised	–	–	254	178
Under/(over) provision in previous year	(34)	(1)	–	3
Income taxation expense	**1,885**	**1,783**	**2,735**	**2,611**
The income taxation expense is represented by:				
– Current taxation	2,144	2,047	2,818	2,667
– Deferred taxation/(FITB)	(259)	(264)	(83)	(56)
	1,885	**1,783**	**2,735**	**2,611**
5b. Future Income Taxation Benefit (FITB)				
Balance at the beginning of the year	2,655	2,298	627	443
Prior period adjustment	43	(56)	57	(21)
Current year movement	259	264	83	56
Payment of tax in dispute	–	149	–	149
Balance at the end of the year	**2,957**	**2,655**	**767**	**627**

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
5c. Taxation losses				
Unrecognised taxation losses available for set-off against future assessable income:				
– Taxation losses	–	–	770	538
– Taxation savings thereon	–	–	**254**	**178**

The ability to utilise these taxation losses depends on the generation of sufficient assessable income in the respective taxation jurisdictions.

6 Equity

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
6a. Share capital				
Issued and fully-paid capital				
24,798,700 shares	**24,799**	**24,799**	**24,799**	**24,799**
6b. Equity reserves				
Equity reserves include:				
Retained earnings	9,152	24,275	10,533	25,773
Vessel replacement reserve	–	–	6,790	5,820
Foreign currency translation reserve	–	–	(7)	43
Total equity reserves	**9,152**	**24,275**	**17,316**	**31,636**
Movements in reserves during the year were as follows:				
Retained earnings				
Balance at the beginning of the year	**24,275**	**20,687**	**25,773**	**22,026**
add net surplus	3,877	3,588	4,730	4,717
	28,152	24,275	30,503	26,743
less dividend payment	(19,000)	–	(19,000)	–
less transfer to vessel replacement reserve	–	–	(970)	(970)
Balance at the end of the year	**9,152**	**24,275**	**10,533**	**25,773**
Vessel replacement reserve				
Balance at the beginning of the year	–	–	**5,820**	**4,850**
add transfer from retained earnings	–	–	970	970
Balance at the end of the year	–	–	**6,790**	**5,820**

Provision has been made within equity of NIWA Vessel Management Ltd for replacement of the vessels RV *Tangaroa* and RV *Kaharoa* at the end of their useful lives. The amount provided is based on the current replacement cost of the vessels, less residual value and depreciation on a straight-line basis over the vessels' economic lives. The Directors have no reason to believe that *Tangaroa* and *Kaharoa* will not ultimately be replaced by similar vessels.

Foreign currency translation reserve				
Balance at the beginning of the year	–	–	**43**	–
add foreign exchange gain/(loss) on translation of independent foreign operations	–	–	(50)	43
Balance at the end of the year	–	–	**(7)**	**43**

Foreign currency translation occurs as a result of the incorporation of the net assets of the international subsidiaries into the Group Financial Statements. The subsidiaries are NIWA (USA), Incorporated, NIWA Environmental Research Institute, and NIWA Australia Pty Ltd.

6c. NIWA Group valuation

Section 16 (3) of the Crown Research Institutes Act 1992 requires the NIWA Group to furnish an estimate of the current commercial value of the Crown's investment in the Statement of Corporate Intent. The Directors believe that the best indication of the fair value of the NIWA Group is its current equity of $42.115 million as at 30 June 2002.

7 Dividend payments

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
Two payments were made on the following dates:				
7 January 2002	(12,000)	–	(12,000)	–
28 June 2002	(7,000)	–	(7,000)	–
	(19,000)	**–**	**(19,000)**	**–**

These dividend payments were made to the Government of New Zealand (the Crown) as the sole shareholder. The dividend payments have been able to be paid out of an accumulation of prior year surpluses and a small loan (refer note 10). This represents the first dividend payment made to the shareholder since the inception of NIWA in 1992.

8 Employee entitlements

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
8a. Non-current				
Long service leave	450	491	455	519
Retirement leave	1,346	1,404	1,455	1,480
Annual leave	186	195	186	195
	1,982	**2,090**	**2,096**	**2,194**
8b. Current				
Long service leave	65	24	66	27
Retirement leave	121	123	121	123
Annual leave	3,170	2,861	3,317	3,044
Accrued salaries	2,354	1,130	2,406	1,192
	5,710	**4,138**	**5,910**	**4,386**

Full recognition of employee entitlements is adopted for long service and retirement leave by use of actuarial valuations.

9 Payables and accruals

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
Trade payables	4,426	5,380	4,872	7,343
Revenue in advance	3,438	4,952	3,438	4,952
Total	**7,864**	**10,332**	**8,310**	**12,295**

10 Short-term advance facility

A short-term loan was drawn down from The National Bank of New Zealand Limited, as follows:

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
Advance facility	**4,300**	–	**4,300**	–

The loan was drawn against the New Zealand dollar short-term advance facility for an initial period of 90 days from 28 June 2002, fixed at an interest rate of 6.40%. The loan is unsecured, but subject to various covenants such as EBIT/funding cost ratio, shareholders' funds, and net tangible assets. All covenants were complied with during the period of the loan.

11 Survey and repair provisions

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
Balance at the beginning of the year	–	–	**497**	**542**
Amount utilised	–	–	(46)	(145)
Additional survey provision made	–	–	100	100
Unused repair provision reversed	–	–	(284)	–
Balance at the end of the year	–	–	**267**	**497**

The remaining provision represents the survey provision. The survey provision is committed and will be utilised when the RV *Tangaroa* goes into dry dock in 2002. A survey is required at least every 3 years for the vessels of NIWA Vessel Management Ltd.

The repair provision is related to emergency repairs and maintenance carried out on the vessels, but will no longer be provided for.

12 Property, plant, and equipment

	2002 Cost $'000	2002 Accum Depn $'000	2002 Book Value $'000	2001 Cost $'000	2001 Accum Depn $'000	2001 Book Value $'000
Group						
Land	2,217	–	2,217	2,283	–	2,283
Buildings & improvements	20,466	4,105	16,361	15,916	3,245	12,671
Vessels	18,868	5,190	13,678	18,869	4,433	14,436
Plant & equipment	33,404	23,546	9,858	29,651	18,726	10,925
EDP equipment	14,630	11,697	2,933	12,915	10,264	2,651
Office equipment	4,747	4,469	278	4,108	3,784	324
Furniture & fittings	1,877	1,516	361	1,855	1,366	489
Motor vehicles	2,696	1,815	881	2,508	1,750	758
Small boats	1,199	788	411	1,111	668	443
Total	**100,104**	**53,126**	**46,978**	**89,216**	**44,236**	**44,980**
Parent						
Land	2,217	–	2,217	2,283	–	2,283
Buildings & improvements	20,246	4,047	16,199	15,823	3,204	12,619
Vessels	–	–	–	–	–	–
Plant & equipment	28,122	20,572	7,550	24,267	16,641	7,626
EDP equipment	14,293	11,418	2,875	12,586	10,038	2,548
Office equipment	4,585	4,320	265	3,958	3,653	305
Furniture & fittings	1,497	1,250	247	1,475	1,138	337
Motor vehicles	2,599	1,767	832	2,459	1,710	749
Small boats	973	674	299	900	584	316
Total	**74,532**	**44,048**	**30,484**	**63,751**	**36,968**	**26,783**

The latest depreciated replacement cost for land and buildings, dated 11 June 2002 from Tse Wall Arlidge Limited, totalled $33.376 million (2001: $28.634 million). Market-based evidence is available to assess the fair value of land and buildings; however, because NIWA does not revalue assets on a cyclical basis, it has not been deemed cost-effective to do so.

13 Receivables and prepayments

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
Trade receivables	9,217	12,149	10,100	12,424
Provision for doubtful debts	(21)	(21)	(21)	(21)
Prepayments	778	670	822	714
Total	**9,974**	**12,798**	**10,901**	**13,117**

14 Inventories

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
Consumables	–	–	384	490
Work in progress	593	549	593	549
Finished goods	92	52	92	52
Total	**685**	**601**	**1,069**	**1,091**

No inventories are pledged as security for liabilities, nor are any inventories subject to retention of the title clauses.

15 Reconciliation of net surplus after taxation to net cash inflow from operating activities

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
Net surplus	**3,877**	**3,588**	**4,730**	**4,717**
Add/(less) items classified as investing activities				
Net loss/(gain) on disposal of property, plant, & equipment	(188)	47	(187)	47
Add/(less) non-cash items				
Depreciation	7,515	6,123	9,318	7,681
Unrealised changes in the value of subsidiaries	–	–	(87)	43
Increase/(decrease) in employee entitlements	(108)	215	(98)	83
Increase/(decrease) in survey and repair provisions	–	–	(230)	(48)
(Increase)/decrease in future income taxation benefit	(302)	(357)	(140)	(184)
	7,105	5,981	8,763	7,575
Add/(less) movements in working capital items				
Increase/(decrease) in payables and accruals	(2,571)	5,093	(3,985)	6,656
Increase/(decrease) in employee entitlements	1,572	(236)	1,524	(57)
(Increase)/decrease in receivables and prepayments	2,824	(4,819)	2,216	(4,967)
(Increase)/decrease in inventory and contract WIP	(829)	39	(771)	500
(Increase)/decrease in taxation receivable	9	506	(3)	(120)
	1,005	583	(1,019)	2,012
Net cash inflow from operating activities	**11,799**	**10,199**	**12,287**	**14,351**

16 Investments in subsidiaries

The investments represent shareholdings the parent company (NIWA) has in its 100% owned subsidiaries as follows:

	Parent 2002 Actual $'000	Parent 2001 Actual $'000
NIWA Vessel Management Ltd (Principal activity: vessel charters for scientific research)	12,421	12,421
NIWA (USA), Incorporated (Principal activity: scientific research with a commercial focus in the USA)	–	–
NIWA Environmental Research Institute (Principal activity: scientific research with a Federal or State focus in the USA)	–	–
NIWA Australia Pty Ltd (Principal activity: scientific research and consultancy services in Australia)	–	–
	12,421	**12,421**

NIWA has an A$100 equity investment in NIWA Australia Pty Ltd, and a US$1 equity investment in NIWA (USA), Incorporated. NIWA has no equity investment in NIWA Environmental Research Institute (non-stock corporation). NIWA Environmental Research Institute is a not-for-profit entity which has been classified as a publicly supported organisation, in an advance ruling of the Internal Revenue Service, and as such is exempt from US Federal income tax. This advance-ruling period is valid until 30 June 2004.

17 Intercompany

	Parent 2002 Actual $'000	Parent 2001 Actual $'000
NIWA non-current liability	**5,136**	**5,059**

Most of this balance relates to funds held by the parent company (NIWA) on behalf of NIWA Vessel Management Ltd. This is consistent with the Group policy that all investments are managed by NIWA.

During the year NIWA contracted vessel charters from its subsidiary NIWA Vessel Management Ltd totalling $9.804 million (2001: $11.257 million) and purchased workshop services totalling $84,191 (2001: $55,208).

NIWA subcontracted revenue of $633,548 from NIWA Vessel Management Ltd during the financial year (2001: nil).

NIWA also charges its subsidiaries for administration expenses and management services based on an independently prepared formula. This charge totalled $1.107 million during the financial year (2001: $1.273 million).

There were no other significant transactions between any of the companies in the Group. All transactions with the subsidiaries are carried out on an arms-length basis.

18 Related party transactions

The Government of New Zealand (the Crown) is the ultimate shareholder in the Group. All transactions with other Government-owned entities are carried out on an arms-length basis.

Research activities revenue includes amounts received from the Crown as follows:

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	Group 2002 Actual $'000	Group 2001 Actual $'000
Public Good Science and Technology				
– Contract funding	33,626	33,549	33,626	33,549
– Non-Specific Output Funding (NSOF)	4,243	3,810	4,243	3,810
Ministry of Fisheries	16,260	13,701	16,260	13,701

19 Guarantees

Guarantees have been given by the National Bank of New Zealand Limited on behalf of NIWA. The National Bank of New Zealand Limited holds $885,933 (2001: $1.049 million) relating to Ministry of Fisheries contracts. There is a further $360,000 held in relation to a Land Information New Zealand contract (2001: $360,000). These monies are received by NIWA on completion of milestones to contract specifications.

20 Segment information

The Group operates predominantly in the environmental science research industry in New Zealand.

21 Financial instruments

(a) Currency and interest rate risk

Nature of activities and management policies with respect to financial instruments:

(i) Currency

Currency risk is the risk that the value of a financial instrument will fluctuate due to changes in foreign exchange rates.

The Group undertakes transactions denominated in foreign currencies from time to time, and, resulting from these activities, exposures in foreign currency arise. It is the Group's policy to hedge foreign currency risks as they arise, except for foreign currency risks authorised by the Board. To manage these exposures, the Group uses forward foreign exchange contracts.

There were no outstanding forward foreign exchange contracts at balance date.

(ii) Interest rate

Interest rate risk is the risk that the value of the financial instrument will fluctuate because of changes in market interest rates. This could particularly affect the cost of borrowing and the return on investments.

The interest rates on NIWA's borrowings during the year were:

	2002	2001
Short term	5.3–6.4	–

The interest rates on NIWA's investments during the year were:

	2002	2001
Cash (on call)	4.5–5.6%	5.6–6.4%
Short term	4.8–5.8%	5.7–6.8%

Short-term deposits have maturity dates less than 6 months. The Directors do not consider there is any significant exposure to interest rate risk on its investments. All investments are managed by NIWA on behalf of the Group.

(iii) Concentration of credit risk

Credit risk is the risk that a third party will default on its obligations to NIWA and the Group, causing a loss.

In the normal course of business, the Group incurs credit risk from trade receivables and transactions with financial institutions (cash and short-term deposits). The Group has a credit policy that is used to manage this risk. As part of this policy, limits on exposures with counter parties have been set and approved by the Directors and are monitored on a regular basis.

The Group has no significant concentrations of credit risk. The Group does not require any collateral or security to support financial instruments because of the quality of financial institutions and trade receivables dealt with.

(b) Fair values

The estimated fair values of the Group's financial assets and liabilities approximate their carrying values as disclosed in the Statement of Financial Position. Refer to the NIWA Group valuation (note 6c).

22 Commitments

	Parent 2002 Actual $'000	Parent 2001 Actual $'000	**Group 2002 Actual $'000**	Group 2001 Actual $'000
22a. Operating lease obligations				
Obligations payable after balance date on non-cancellable operating leases:				
Within 1 year	703	654	703	654
Between 1 and 2 years	667	572	667	572
Between 2 and 5 years	860	1,054	860	1,054
Over 5 years	2,945	2,559	2,945	2,559
22b. Capital commitments				
Commitments for future capital expenditure:				
Approved, but not contracted for	100	3,180	334	3,180
Contracted, but not provided for	893	345	893	345
	993	**3,525**	**1,227**	**3,525**

23 Contingent liabilities

The Company has a contingent liability in respect of the Accident Compensation Corporation's residual claims levy. The levy will be payable annually from May 1999 for up to 15 years. The Company's future liability is a function of ACC's unfunded liability for past claims and future payments to employees by the Company. There are no other significant contingent liabilities that require disclosure in the Financial Statements.

Deloitte Touche Tohmatsu

REPORT OF THE AUDITOR-GENERAL TO THE READERS OF THE FINANCIAL STATEMENTS OF NATIONAL INSTITUTE OF WATER AND ATMOSPHERIC RESEARCH LIMITED AND GROUP FOR THE YEAR ENDED 30 JUNE 2002

We have audited the financial statements on pages 33 to 43. The financial statements provide information about the past financial performance of National Institute of Water and Atmospheric Research Limited ("the Company") and Group and its financial position as at 30 June 2002. This information is stated in accordance with the accounting policies set out on page 36.

Responsibilities of the Board of Directors
The Crown Research Institutes Act 1992, the Public Finance Act 1989, the Companies Act 1993 and the Financial Reporting Act 1993 require the Board of Directors ("the Board") to prepare financial statements which comply with generally accepted accounting practice in New Zealand and give a true and fair view of the financial position of the Company and Group as at 30 June 2002 and of the results of their operations and cash flows for the year ended 30 June 2002.

Auditor's Responsibilities
Section 15 of the Public Audit Act 2001, Section 43(1) of the Public Finance Act 1989 and Section 21(1) of the Crown Research Institutes Act 1992 require the Auditor-General to audit the financial statements presented by the Board. It is the responsibility of the Auditor-General to express an independent opinion on the financial statements and report that opinion to you.

The Auditor-General has appointed Mr A G Burgess of Deloitte Touche Tohmatsu to undertake the audit.

Basis of Opinion
An audit includes examining, on a test basis, evidence relevant to the amounts and disclosures in the financial statements. It also includes assessing:

- the significant estimates and judgements made by the Board in the preparation of the financial statements, and
- whether the accounting policies are appropriate to the Company and Group's circumstances, consistently applied and adequately disclosed.

We conducted our audit in accordance with the Auditing Standards published by the Auditor-General which incorporate the Auditing Standards issued by the Institute of Chartered Accountants of New Zealand. We planned and performed our audit so as to obtain all the information and explanations which we considered necessary in order to provide us with sufficient evidence to give reasonable assurance that the financial statements are free from material misstatements, whether caused by fraud or error. In forming our opinion, we also evaluated the overall adequacy of the presentation of information in the financial statements.

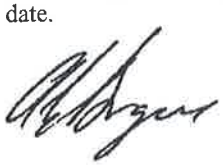
Other than in our capacity as auditor acting on behalf of the Auditor-General, we have no relationship with or interests in the Company or any of its subsidiaries.

Unqualified Opinion
We have obtained all the information and explanations we have required.

In our opinion:

- proper accounting records have been kept by the Company and Group as far as appears from our examination of those records; and
- the financial statements of the Company and Group on pages 33 to 43:
  - comply with generally accepted accounting practice in New Zealand; and
  - give a true and fair view of:
    - the financial position as at 30 June 2002; and
    - the results of their operations and cash flows for the year ended on that date.

Our audit was completed on 12 September 2002 and our unqualified opinion is expressed as at that date.



A G Burgess
DELOITTE TOUCHE TOHMATSU
On behalf of the Auditor-General
Auckland, New Zealand

New Zealand's international obligations

NIWA's expertise is made available to various Government departments to provide policy advice and meet New Zealand's obligations to international conventions to which this country is a signatory. Examples include:

- The Intergovernmental Panel on Climate Change (IPCC) Bureau Working Group II Vice-Chair for the World Meteorological Organization Region V, whose role is to help coordinate and disseminate climate change information relevant to the southwest Pacific and to provide the scientific backdrop against which domestic and, in particular, international climate change policy is developed;
- Chair of the Regional Steering Committee for UNESCO's International Hydrological Programme for Southeast Asia and the Pacific;
- Authors and reviewers of chapters of the United Nations Environment Programme/World Meteorological Organization *Scientific Assessment of Ozone Depletion*, which must be lodged with the United Nations by the end of 2002 as part of the terms of the Montreal Protocol;
- New Zealand Coordinator of the Global Climate Observing System (GCOS).
- Co-Chair of the Scientific Planning Group of the Asia Pacific Network for Global Change Research;
- Member of the International Ozone Commission of the International Union of Geodesy and Geophysics;
- Member of the Steering Committee of the International Network for the Detection of Stratospheric Change;
- Chair of the Stock Assessment Group of the Commission for the Conservation of Antarctic Marine Living Resources;
- New Zealand's representative on the International Science Steering Committee for the International Geosphere-Biosphere Programme (IGBP) Surface Ocean Lower Atmosphere Study (SOLAS);
- New Zealand's representative on the Coordinating Committee for the IGBP Aerosol Characterisation and Process Studies;
- Southern Ocean reviewer for the joint International Oceanographic Commission/International Hydrographic Organisation General Bathymetric Chart of the Oceans (GEBCO) Programme;
- New Zealand representative on the International Union for the Conservation of Nature (IUCN) Sharks Specialist Group;
- New Zealand representative at the United Nations Food and Agriculture Organization (FAO) meeting on Management of Deepwater Fisheries Resources;
- President of the International Bryozoology Association;
- Member of the New Zealand Royal Society Biodiversity Subcommittee;
- Member of the International Committee of Ocean Biogeographic Information System (OBIS);
- Member of the Species 2000 Asia-Oceania Working Group and Taxonomy Group;
- New Zealand representative at the Scientific and Technical Advisory Group Workshop of the Global Biodiversity Information Facility (GBIF);
- Member of the Steering Committee for the European Commission Framework V CYCLOPS Programme;
- New Zealand representatives at the 13th session of the Commission for Climatology of the World Meteorological Organization;
- Member of the World Meteorological Organization's Expert Team on Infrastructure for Long Range Forecasting;
- Convenor of the Royal Society of New Zealand Climate Committee, whose responsibility is to advise Government and the general public on climate issues;
- Two members of the National Science Strategy Committee on Climate Change, whose responsibility is to advise Government on national research needs and progress;
- New Zealand's representative to the IGBP Ecosystems Dynamics (GLOBEC) Programme;
- Personnel to supply advice on climate issues to the New Zealand Permanent Representative to the World Meteorological Organization;
- Co-Chair of the IGBP Global Atmospheric Methane Synthesis Project;
- New Zealand's representative to the Joint Global Ocean Flux Study (JGOFS);
- New Zealand's Hydrological Advisor to the Permanent Representative of the World Meteorological Organization;
- Member of the Advisory Working Group of the World Meteorological Organization's Commission of Agricultural Meteorology;
- Chair and Secretary of New Zealand's National Commission for the UNESCO International Hydrological Programme.

In some of the above examples, travel and some other costs for NIWA staff have been met from sources such as the International Science and Technology Linkages Fund and the International Technical Input Programme, but NIWA has borne the cost of staff time involved in attending the meeting, report writing, and the provision of policy advice. Our records of staff time show that the total costs of such activities to NIWA in 2001–02 was more than $300,000. This is a cost which NIWA willingly bears to ensure that the best advice is available to the Crown on these key scientific and technical issues.

NIWA staff routinely contribute to various intergovernmental treaties, processes, and agreements; for example:

- Montreal Protocol on substances which deplete the ozone layer
- United Nations Framework Convention on Climate Change
- Kyoto Protocol
- Vienna Convention for the Protection of the Ozone Layer
- United Nations Convention on Biological Diversity
- Commission for the Conservation of Antarctic Marine Living Resources
- Antarctic Treaty
- Madrid Protocol to the Antarctic Treaty
- United Nations Convention on Law of the Sea

Research output

NIWA's research output for 2001 included 269 papers in international, externally refereed, scientific journals, series, or books; 184 papers in local, internally, or editor-refereed journals, series, or books; 583 conference papers and abstracts; 91 research monographs or books; 3 popular books; and 723 scientific and technical reports. Full details of these publications are published separately from this Annual Report.

Application and promotion of science

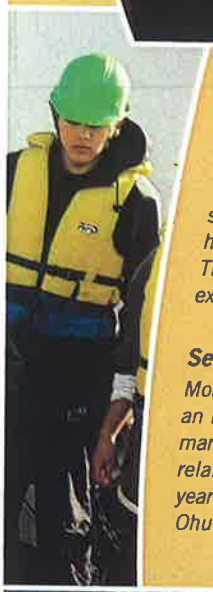
In the 2001–02 financial year, NIWA supplied information to New Zealand users (excluding the Foundation for Research, Science & Technology and the Ministry of Fisheries) through consultancies and contracts to the value of more than $24 million. In addition, we achieved 100% of the technology transfer objectives in our PGSF contracts during this period and commenced Technology for Business Growth and Technet contracts to the value of more than $115,000. The availability to end-users and degree of use of NIWA's three Nationally Significant Databases continued at similar levels to previous years. We serviced more than 2000 requests for information from the National Climate Database (which also has more than 120 registered online users), over 300 requests for information from the Water Resources Archive, and more than 380 requests for information from the New Zealand Freshwater Fisheries Database. During 2001, 189 magazine and newspaper feature articles written by NIWA staff were published. NIWA staff made 24 science-related television appearances, and were involved in 52 radio interviews during the year.

Education

NIWA is strongly committed to the advancement of science education and knowledge. Our commitment is aimed at schools and universities, and in some cases the wider public. The school sponsorship programme in 2001–02 again targeted three areas: the Sea and Learn programme, regional school science fairs, and Kelly Tarlton's Discovery Room.

- The 2001–02 Sea and Learn programme took place in May and June 2002. NIWA provided pupils from each of 13 schools with a 1-day hands-on science voyage on our coastal research vessel *Kaharoa* from the ports of Wellington, Tauranga, and Auckland. In addition to the direct schools programme, we ran 3 days of courses for Māori students in conjunction with, and under contract to, Te Ohu Kai Moana. The teaching resource for the programme was developed jointly by NIWA scientists and school science teachers and is linked to the New Zealand science curriculum. The teacher on board the vessel was supported by a Royal Society Science, Mathematics and Technology Fellowship.

- NIWA continued its sponsorship of the marine educational facility at Kelly Tarlton's Underwater World in Auckland. This is known as the "NIWA Discovery Room" and is aimed largely at primary and intermediate age children. It provides interactive marine science in varied formats, such as a touch pool, hands-on experiments, and life under the microscope. In addition, in 2001–02 NIWA supported the national exhibition "Earth's Fury" which travelled to five major New Zealand cities. The exhibition was staged by Science Alive. The NIWA exhibit involved an interactive model of flooding rivers.



Science Fairs

Chelsea Leadbetter, from Marsden College, was one of the winners of the Wellington Regional Science Fair with "Hidden forces", her aids for arthritis sufferers. Here, Chelsea demonstrates her inventions to NIWA's Murray Poulter. The Arthritis Foundation has already expressed interest.

Sea & Learn

More than 30 high school students gained an insight and hands-on experience into marine biology and other sea and fisheries-related careers during an extension of this year's Sea and Learn programme run by Te Ohu Kai Moana and NIWA on Kaharoa.

- NIWA has continued to strengthen and expand links with New Zealand universities. The postgraduate Centres of Excellence with three universities and the joint NIWA-University of Auckland Institute of Aquatic and Atmospheric Sciences continued to operate successfully. Overall, NIWA staff acted in a supervisory role for over 90 postgraduate students across seven universities during last year, and we currently provide 10 NIWA PhD scholarships in skill areas that we have identified as priorities for the future. These cover a wide range of topics, including coastal ecology, aquaculture, greenhouse gas production, and the ecology of eels linked to Māori cultural values. Many of our supervised students have received funding from the Foundation for Research, Science & Technology's Enterprise Scholarships (Bright Future scheme).

"NIWA Discovery Room"

This interactive marine discovery room at Kelly Tarlton's Underwater World in Auckland was designed to help children discover the magic of science.

- NIWA is the major sponsor of the Auckland City, Waikato, Bay of Plenty, and Wellington Regional Science Fairs, and provides additional sponsorship of the Central Northland, North Harbour, Taranaki, Nelson, Marlborough, Central South Island, South Canterbury, and Otago Regional Science Fairs. These sponsorships promote science in secondary and intermediate schools and to the community at large. NIWA staff helped judge at the fairs, and were consistently impressed by the high standard and innovation of the entries.

Staff composition

Staff numbers, turnover, and age composition for the year ended 30 June 2002

Category	No. of staff	No. of FTEs	Turnover (%)	Average age (years)
Research teams	428	424	2	38.9
Research support	49	48	0	47.2
General support	84	80	15	40.7
Marketing, promotion, and liaison	5	5	0	46.2
Management	22	22	0	49.7
Total	**588**	**579**	**3**	**44.5**

Age breakdown (%) by 10-year age groups

	20–29	30–39	40–49	50+
Research teams	9	31	31	29
Research support	8	12	29	51
General support	19	27	25	29
Marketing, promotion, and liaison	0	0	60	40
Management	0	14	41	45
Total	**10**	**27**	**31**	**32**

Good employer

NIWA has put in place a performance management system and remuneration policy that pays for the range, depth, and type of skills of our staff, recognises an individual's worth to NIWA and the value of each staff member's contribution, and allows for career development of staff. We also provide superannuation and life insurance schemes for staff.

NIWA has implemented a comprehensive Health and Safety Plan, which has met the requirements of all site inspections by the Occupational Health Service of the Department of Labour. The number of work-related accidents in 2001–02 was 100, of which only 4 required staff to take time off work. These are slightly below the levels of the previous year. The number of days (38) lost due to work-related accidents in 2001–02 represented a very low level of total working days.

Our Human Resources Policy and Procedures Manual, which was developed, and is added to as required, by a staff working group, addresses a wide variety of issues from staff training and equal employment opportunity to recruitment and remuneration. This manual is available online to all staff.

Retention of key staff through facilitation of effective science is a major objective of NIWA's management. This includes such aspects as a strong capital investment programme to purchase state-of-the-art science equipment, a project management system which gives staff the opportunity to lead and direct research projects with a high level of responsibility for scientific and financial performance, and a substantial overseas travel programme for staff. In addition, we operate Technical Training and Sabbatical Awards for staff and a Visiting Scientist Programme.

Photography

Cover: Photosource. IFC: Nelson Boustead. 2,4: NIWA. 5: (top) NIWA; (bottom) Keith Lassey. 7: Alan Blacklock. 8: (top) Neil Bagley; (bottom) Rob Stewart; (inset) Alan Blacklock. 9: (top) Graeme Inglis; (middle) Rudie Kuiter. 10: (left) NIWA; (right) Neil Bagley, Chris Howell. 11: Alan Blacklock. 12: Malcolm Clark. 13: (top) Alan Blacklock; (bottom) Nelson Boustead. 14: AIMS, A. Meinesz. 15: (top) Jacques Boubée; (bottom) NIWA. 16: NIWA. 18: (top) The Evening Post; *(bottom) Anne Wignall. 19: (top) Alan Blacklock; (bottom) Basil Stanton. 20: Kevin Collier, Mike Scarsbrook. 21: (top) Chris Hickey; (bottom) John Clayton. 22: (top)* The Evening Post; *(bottom)* The Southland Times. *23: (top) Ken Grange; (middle) Malcolm Francis, Mark Morrison; (bottom) Alan Blacklock; (inset) Chris Thomas. 24: Simon Thrush. 25: Jeremy McKenzie, Kirsty Russell; (bottom) Suze Baird. 26: Neil Bagley. 27: (top) Neil Bagley; (middle) Ali MacDiarmid. 28: (top left) Mike Tait; (top right) Anon.; (middle) Carolyn Poortenaar; (bottom) Alan Blacklock. 30: NIWA. 46: (top) Alan Blacklock; (middle) Kelly Tarlton's. 47: Alan Blacklock.*

Concept and design

Geoff Baird, Science Communication, NIWA

Directory

Directors

Sue Suckling *(Appointed Chair 1 July 2001)*
Paul Morgan *Deputy Chair (Retired 30 June 2002)*
Dr Carolyn Burns
John Hercus
Miranda Cassidy *(Appointed 1 July 2001)*
David Sharp *(Appointed 1 July 2001)*
Dr Graham Hill *(Appointed 27 May 2002)*
Troy Newton *(Appointed 18 June 2002)*
Peter Nicholas *(Appointed 1 July 2001, Resigned 31 May 2002)*
Dr Brian Rhoades *(Retired 31 December 2001)*

Executive

Dr Rick Pridmore
Chief Executive (Appointed 16 August 2002)

Dr Rod East
Deputy Chief Executive (Retires December 2002)

Dr Bryce Cooper
Director, Strategic Development

Dr Mark James
Director, Operations

Dr Rob Murdoch
Director, Research

Dene Biddlecombe
General Manager, Finance & Company Secretary

Dr Neil Andrew
General Manager, Marine & Aquaculture

Dr Clive Howard-Williams
General Manager, Freshwater & Education

Dr John McKoy
General Manager, Fisheries & Bioactives

Dr Murray Poulter
General Manager, Atmosphere

Dr Don Robertson
General Manager, Biodiversity, Biosecurity, & Information Systems

Dr Charlotte Severne
General Manager, Māori Development

Paul Hargreaves retired as Chief Executive on 16 August 2002

Registered Office and Address for Service

269 Khyber Pass Road
Newmarket
Auckland
New Zealand

Corporate Office

369 Khyber Pass Road
Newmarket, Auckland
Private Bag 99 940
Newmarket, Auckland
New Zealand
Tel +64-9-375 2090
Fax +64-9-375 2091

National Institute of Water & Atmospheric Research Ltd

National Centres

Aquatic Biodiversity and Biosecurity
Dr Wendy Nelson (w.nelson@niwa.co.nz)

Climate
Dr David Wratt (d.wratt@niwa.co.nz)

Climate–Energy Solutions
Gavin Fisher (g.fisher@niwa.co.nz)

Fisheries and Aquaculture
Dr Simon Hooker, Aquaculture
(s.hooker@niwa.co.nz)
Dr John McKoy, Fisheries
(j.mckoy@niwa.co.nz)

Natural Hazards
Dr Murray Poulter (m.poulter@niwa.co.nz)

Water Resources
Dr Ross Woods (r.woods@niwa.co.nz)

NIWA Vessel Management Ltd

General Manager:
Clive Glover
301 Evans Bay Parade, Wellington
Tel +64-4-386 0550
Fax +64-4-386 0555

NIWA in the USA

President:
Dr Rick Pridmore
Limno-Tec
501 Avis Drive, Suite 120
Ann Arbor
Michigan, 48108
USA
Tel +1-734-332 1208
Fax +1-734-332 1212

NIWA Australia Pty Ltd

Manager:
Dr Jim Cooke
j.cooke@niwa.com.au
Tel +61-7-3257 0522
Terrace Office Park, 527 Gregory Tce, Bowen Hills, Brisbane
P O Box 359, Wilston, QLD, Australia 4051
www.niwa.com.au

Auditor

Mr A G Burgess of Deloitte Touche Tohmatsu on behalf of the Auditor-General

Bankers

The National Bank of New Zealand Limited

Solicitors

Bell Gully Buddle Weir
Edmonds Marshall Burcher

Insurers

Marsh Limited

Regional Offices

Auckland

Manager:
Dr Gerda Kuschel
g.kuschel@niwa.co.nz

Cnr Mountain Road & Khyber Pass Road, Newmarket
Private Bag 109695, Auckland
Phone +64-9-375 2050
Fax +64-9 375 2051

Hamilton

Manager: *Dr David Roper*[1]
d.roper@niwa.co.nz
Assistant RM: *Dr Terry Hume*[2]
t.hume@niwa.co.nz
Gate 10, Silverdale Road, Hillcrest
P O Box 11115, Hamilton
Phone +64-7-856 7026
Fax +64-7-856 0151

Wellington

Managers: *Dr Rosie Hurst*[1]
r.hurst@niwa.co.nz
Dr Andrew Laing[2]
a.laing@niwa.co.nz
301 Evans Bay Parade, Greta Point
P O Box 14901, Wellington
Phone +64-4-386 0300
Fax +64-4-386 0574

Nelson

Manager:
Dr Ken Grange
k.grange@niwa.co.nz

217 Akersten St, Port Nelson
P O Box 893, Nelson
Phone +64-3-548 1715
Fax +64-3-548 1716

Christchurch

Manager: *Dr Barry Biggs*[1]
b.biggs@niwa.co.nz
Assistant RM: *Dr Charles Pearson*[2]
c.pearson@niwa.co.nz
10 Kyle Street, Riccarton
P O Box 8602, Christchurch
Phone +64-3-348 8987
Fax +64-3-348 5548

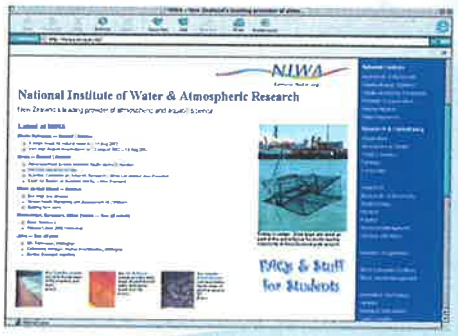
Lauder, (Central Otago)

Manager:
Dr Andrew Matthews
a.matthews@niwa.co.nz

State Highway 85, Lauder
Private Bag 50061, Omakau, Central Otago
Phone +64-3-447 3411
Fax +64-3-447 3348

NIWA on the Web

http://www.niwa.co.nz



National Institute of Water & Atmospheric Research Ltd