

# NIWA

NIWA  
Year In Review  
2020

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## SCIENCE FOR A RESILIENT FUTURE

NIWA YEAR IN REVIEW  
2020



NIWA  
Taihoro Nukurangi

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**NIWA**

Taihoro Nukurangi

# SCIENCE FOR A RESILIENT FUTURE

NIWA YEAR IN REVIEW  
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# THE NEW WAVE

Chairman and Chief Executive

In the two days before Aotearoa New Zealand entered Alert Level 4 lockdown in late March, we instructed NIWA staff to take whatever they needed from the office to enable them to work from home for the foreseeable future.

They walked out carrying monitors, keyboards, chairs – and, occasionally, even their desks. It was impossible to forecast what would happen in the extraordinary days and weeks to come, but there was one thing we were certain of – our people would be committed to ensuring NIWA continued to provide the freshwater, climate and ocean science the nation needed.

Our transition to Level 4 lockdown status was almost seamless. NIWA's environmental science focus means we have always had a strong commitment to ensuring our staff are well-equipped technologically to carry out their work wherever they need to be. This gave us a considerable head start in adapting to working from home, and that advantage was enhanced by an outstanding technology support team.


All essential services continued to operate – in Wellington our supercomputers remained under continuous supervision, and in Ruakaka our kingfish and hāpuku still had to be fed. Field work, however, was put on hold, and our research vessels returned to port.

The ease with which our people shifted to working from home was reflected by NIWA managing to maintain a high level of productivity throughout lockdown. Although some projects simply could not continue, we nonetheless had a springboard from which to launch our post-lockdown strategy.

In our 2019/20 Statement of Corporate Intent (SCI) we identified that the biggest opportunity for NIWA lay in the rapid advances of digital technologies. We remain committed to prioritising this, but, of course, no one foresaw what was to come. Our 2020/21 SCI, therefore, refreshes our strategic priorities to ensure NIWA remains well positioned to help the nation build resilience to, and advance recovery from, the impacts of the COVID-19 pandemic. We will prioritise the application of our knowledge, expertise and services to help accelerate the recovery of the New Zealand economy and society.

We are grateful for the funding boost for Crown Research Institutes (CRIs) from the COVID-19 Response and Recovery Fund, which is earmarked to help retain capability and ensure the continuity of critical science services and advice.

In the past year, the essential role of CRIs in New Zealand's science system was recognised by an independent review commissioned by the Ministry of Business, Innovation & Employment. However, the Te Pae Kahurangi review also reported that some structural elements of the science system were not working well. We look forward to being part of the discussion on how best to resolve these as we all work together for the benefit of New Zealand.



*NIWA's award-winning Ruakaka kingfish sashimi as served by Mt Eden eatery Xoong during Taste of Auckland. The gold medal winning kingfish were described by the chef as "the best fish in the country, hands down".*  
[Stuart Mackay]



Meanwhile, demand for our services continues to grow, and with staff movements and market shifts we are constantly reappraising where we focus our resources. A reflection of this was the creation of 17 new permanent positions during the year, taking our total staff to 702.

Restricted working arrangements during lockdown, and lower spending by our customers, resulted in revenue being \$14.7 million lower than budget.

This impact was partly offset by the COVID-19 Response and Recovery Fund payment, resulting in an overall revenue shortfall to budget of \$6.5 million.

This shortfall was partially offset by careful cost control, resulting in our full year earnings before interest, tax, depreciation and amortisation (EBITDA) of \$31.2 million and net profit after tax of \$7.4 million. Both these results would not have been achievable without the support from the Government's COVID-19 Response and Recovery Fund.

# 17

new permanent positions during the year.

## Financial summary for the year ended 30 June 2020

In thousands of New Zealand dollars	2020	2019	2018	2017	2016
Revenue and other gains	158,860	161,292	151,416	142,618	130,309
– Research	93,800	94,901	91,516	81,417	68,896
– Commercial science	65,059	66,390	59,899	61,200	61,412
– Other income	1	1	1	1	1
Profit before income tax	9,982	8,708	9,074	5,950	5,492
Profit for the year	7,370	6,247	6,472	4,250	4,011
Capital expenditure	14,757	21,460	33,573	13,053	12,592
Adjusted return on average equity (%)	6.9	6.2	6.9	4.8	4.7
Return on average equity (%)	5.7	5.1	5.5	3.8	3.7

The 'adjusted return on average equity' uses a valuation basis comparable to that used by other Crown Research Institutes. This valuation basis arose from the transition to New Zealand Equivalents to International Financial Reporting Standards in 2006/07 and reverses the effect of the revaluation of certain land and buildings.



NIWA was a major contributor to the scientific expertise guiding the freshwater reform.

*One of the jewels in New Zealand's freshwater crown, Purakaunui Falls in the Catlins, Otago.  
[Rebekah Parsons-King]*



## Science highlights Climate, freshwater and ocean science

Overall, we achieved 51 of the 55 research and applied science Key Performance Indicators we set for the year. The four not fully achieved were disrupted by science problems detected at the review stage needing revision, and COVID-19 preventing international collaboration and a planned face-to-face hui.

### Freshwater science

The quality, quantity and management of freshwater remains an issue of high concern for New Zealanders. Another summer of record-breaking temperatures led to widespread drought and culminated in severe water shortages for our largest city, demonstrating that the effects of climate change will require long-term, evidence-based planning.

The Government announced its freshwater reform package in May, aimed at reversing the decline of New Zealand's waterways. NIWA was a major contributor on the Science and Technical Advisory Group established to provide scientific expertise to the policy.

We also contributed through scientific reports, peer review, and an extensive submission on the technical merits of the package. There are 59 NIWA authors in the reference list for the Ministry for the Environment and Statistics New Zealand report 'Our Freshwater 2020'. Our scientists also served on the Science Advisory Group for this report.

NIWA experts in mitigation systems produced national guidelines for the design and evaluation of constructed wetlands and riparian buffers. These systems can substantially reduce contaminant loss from agricultural landscapes, and the guidelines set out

design standards to ensure effective operation under a wide range of conditions.

A key highlight was a special issue of the New Zealand Journal of Marine and Freshwater Research paying tribute to the late NIWA Chief Scientist for Freshwater Dr John Quinn. The papers in the journal address one of Dr Quinn's areas of expertise – the effects of land-use on aquatic ecosystems. NIWA scientists contributed many of the articles – on topics including the impacts of land-use change on stream hydrology, methods for incorporating Māori values in land-use decisions, and national assessments of the evidence for land-use effects.

### Climate science

It has been a characteristically busy year for our 230-strong climate science team as we continue to respond to heavy demand for our expertise from every sector.

In March, NIWA's research vessel *Tangaroa* left Wellington hosting an international collaboration called Sea2Cloud – a research project funded by the European Research Council studying the connection of marine biology to clouds and climate. Although the voyage was truncated because of COVID-19, a range of valuable measurements increased our understanding.

Several NIWA climate scientists were involved in producing New Zealand's first National Climate Change Risk Assessment. The assessment, released by the Ministry for the Environment, identified 43 priority risks, including the 10 most significant that require urgent action in the next six years to reduce their impact. We will now contribute to the next phase – a National Adaptation Plan to guide the way climate change adaptation measures are evaluated.



*Climate scientist Dr Andrew Lorrey using an infrared camera to measure ice, meltwater and debris cover on Tasman Glacier during the annual NIWA glacier survey. [Dave Allen]*

## 3,000 tonnes

A full-scale 3,000 tonne operation within five years creating about 75 new jobs.

NIWA's CarbonWatchNZ programme is developing a top-down view of carbon emissions and uptake, including working closely with iwi to establish ongoing measuring programmes. This world-first programme also led to carbon-cycling expert Dr Sara Mikaloff-Fletcher being appointed to lead a team of New Zealand scientists as part of MethaneSat, an international space mission tackling climate change.

NIWA's annual survey of the state of the nation's glaciers took place in March, shortly before lockdown. As well as recording the receding snowline, the team saw large amounts of ash deposited as a result of the Australian bush fires.

Our air quality scientists extended their innovative monitoring programmes to towns across the country and were particularly prominent during the national lockdown, reporting on the significant improvement in air quality.

Special mention must be made of Dr Rob Bell, who received numerous awards for his research and seminal advice on climate change and sea-level rise throughout the year, culminating in being

part of the team named as the winners of the Prime Minister's Science Prize for work on Antarctic ice melt sea-level rise.

This year we also published climate change education resources and videos for school students and teachers. This initiative followed requests by stakeholders at our highly successful 'Climate Matters' forum in June last year.

### Marine science

Building is well under way at NIWA's Northland Marine Research Centre on a recirculating aquaculture system capable of producing up to 600 tonnes of Ruakaka kingfish annually. The recirculating aquaculture system is a sustainable, land-based venture which aims to prove the technical and economic feasibility of farming kingfish in tanks at commercial scale. This is the realisation of years of research and development, and we anticipate huge market demand for what top chefs have confirmed is a premium product. We expect the venture will lead to a 3000-tonne operation within five years and will help the aquaculture industry achieve its aims of being a \$3 billion industry by 2035.

After almost two years of planning, the new Antarctic Science Platform, focused on understanding Antarctica in a +2°C world, is set to go (COVID-19 permitting). NIWA scientists are key players in projects studying ice sheets and shelves, oceanic and atmospheric heat transport, human impacts, marine ecosystems, sea-ice variability, and changes in the carbon uptake of the Southern Ocean.

We have also been working closely with Emirates Team New Zealand in their campaign to retain the America's Cup. Our cutting-edge science is producing exciting results, although the finer details are, of course, under wraps for now.

NIWA continues to deliver biosecurity surveillance at 11 major ports and marinas at highest risk for the introduction and establishment of marine pests. This programme has been particularly successful in the past year, exceeding survey targets and detecting several new non-indigenous species.

In another biosecurity achievement, NIWA was part of a collaborative team recognised at the New Zealand Biosecurity Awards for our work on the spread and control of the invasive myrtle rust plant disease. We provided weekly maps of infection and sporulation risk (when new fungal spores are produced), based on aerial dispersal.

A four-year coastal acidification study identified that pāua are more sensitive to projected future pH changes than other key New Zealand species such as greenshell mussels and snapper, and we developed models, projections and techniques for managing coastal acidification.

During the year, several senior NIWA scientists were honoured for their significant contributions to various areas of marine research. Dr Philip Barnes was made a Fellow of the Royal Society of New Zealand, and Dr Barb Hayden was made a Companion. Dr Wendy Nelson was made a Fellow of Auckland Museum, and Dr Rosemary Hurst received the inaugural Minister of Fisheries Award at the 2020 Seafood Sustainability Awards.

*NIWA is providing marine dynamics and high-resolution forecasting expertise for Emirates Team New Zealand in its 2021 defence of the America's Cup. [James Somerset, ETNZ]*





## Advancing technology and innovation

**One step in our digital technology strategy was the introduction of a new Data Science Platform and the recruitment of a world-leading expert to head the integrated High Performance Computing and Data Science function.**

We have also established technology and innovation hubs to support cross-science development and a digital learning hub to further advance digital literacy. These hubs focus efforts on each major step of science development and delivery – data/sample capture and transmission, sample analyses, data quality assurance and storage, modelling, and forecasting and information delivery.

Our data scientists are further enhancing innovations, including environmental insights, time-series pattern recognition, data error detection, and correction and image analyses.

## Partnering with Māori

**NIWA's Te Kūwaha National Science Centre continues to strengthen partnerships with hapū and iwi, culminating in a Memorandum of Understanding between NIWA and Wakatū Incorporation.**

Te Kūwaha works at the junction of mātauranga Māori, policy, and freshwater, marine, and climate science. This included an assessment of the vulnerability of taonga freshwater species to climate change, using international guidelines developed for a wide range of species. This study was the first of its kind to use this methodology for freshwater taonga species in Aotearoa New Zealand.

Te Kūwaha also worked collaboratively with Maniapoto Māori Trust Board to support Ngāti Maniapoto whānau



*Ngāpera Keegan (Waikato – Maniapoto, Ngāti Porou, Ngāti Raukawa ki Te Kaokaoroa-o-Pāterere) is one of the first participants in NIWA's new Māori Internship Programme to create more visible career pathways for Māori science graduates. [Tracey Burton]*

reconnecting with and actively participating in the assessment of their waterways according to their values for freshwater. A series of marae-based wānanga have allowed the collaborative team to work with whānau to co-design a Maniapoto freshwater values-driven Cultural Assessment Framework. Our videographers have documented a tuna wānanga and developed a video showcasing kaitiaki exploring, learning and reconnecting with this taonga species.

A series of educational booklets and online content focusing on taonga species – including tuna, kākahi/kāeō, kōura/kēwai and pātiki – aims to introduce an intergenerational audience to the complex and interesting life cycles of these species.

We have been delighted with the first intake of our Māori Graduate Internship Programme, which was established to create more visible pathways for Māori science graduates into postgraduate opportunities and career pathways beyond study.

In November, Te Kūwaha environmental scientist Kelly Ratana won the NIWA Science New Zealand Award for Early Career Researcher for her advocacy of the value of mātauranga Māori and indigenous knowledge in areas such as ecosystem-based decision making and marine biosecurity.



## Collaborating in the Pacific

**Of all NIWA's diverse operations, it was perhaps our work in the Pacific that stood to be most disrupted by COVID-19.**

With ingenuity and careful planning, however, we developed alternative approaches to delivering projects – even if travel proves impossible into the new year. We developed virtual training resources that are available via our Digital Learning Hub, and we are assessing the use of technology, such as video headsets, to remotely support Pacific technical staff with equipment installation and maintenance.

Our collaborative work in the Pacific ranges from fisheries management, water security, and sanitation to baseline environmental, weather, climate and hydrological monitoring.

Our natural hazard resilience support continued with a new flood impact warning system being developed for the Vaisigano River in Samoa with the Ministry of Natural Resources and Environment as part of Samoa's Green Climate Fund Vaisigano Catchment Project.

We are extending our support to develop country-led climate services and early warning to 14 Pacific Island nations with support from the Ministry of Foreign Affairs and Trade (MFAT) and in collaboration with the Australian-funded Climate and Oceans Support Programme.

In Nauru, work is under way to inform long-term adaptation pathways with support from MFAT, and in the Republic of the Marshall Islands we are part of the World Bank Team in delivering Phase 1 of the Building Resilience in the Pacific Atoll Island Countries Study.

*NIWA scientists provide more than 80% of the fisheries stock assessment advice each year as the cornerstone of the nation's highly praised Quota Management System. For major species such as hoki, our research takes many forms, including annual trawl and acoustic surveys, conducted from NIWA research vessels. Such independent scientific advice is integral to sustainable fisheries and a seafood industry which employs more than 13,000 workers and produces almost \$2 billion in annual export earnings. [Rebekah Parsons-King]*



NIWA Principal Scientist, Coastal and Estuarine Physical Processes, Dr Rob Bell (back row, third from left), was part of the Ice and Rising Seas team which won the 2020 Prime Minister's Science Prize.



## Science for a resilient future

**NIWA is committed to operating in an environmentally responsible manner and providing leadership and guidance for our nation's sustainable future.**

Our Organisational Sustainability Charter embraces the United Nations Sustainable Development Goals and the New Zealand Treasury Living Standards Framework. We achieve organisational sustainability by responsible investment in our people, technology and infrastructure; appropriately sustainable operations; providing the best advice and services; and partnering with iwi, local communities and the wider society.

This is a pathway, as we continually strengthen these initiatives. This year, for example, through our commitment to the purchase of electric vehicles and a pan-CRI initiative to encourage the entire science community to significantly reduce travel – in our case, to target a 50% reduction in air travel.

Through our research and services, we enhance the sustainable management of New Zealand's aquatic resources and environments, improve understanding of the climate and atmosphere and increase resilience to weather and climate hazards to enhance the safety and wellbeing of New Zealanders.

## An additional focus to our safety and wellbeing practices

**NIWA has stringent safety management practices for the protection of all staff, many of whom often work in demanding environments.**

From January, we also began to monitor the COVID-19 pandemic internationally, and modified our staff travel guidelines. We activated our pandemic response plan ahead of the March lockdown, and, with some essential staff remaining on site in several locations, focused on maintaining healthy and safe workplaces. We retained this focus as we transitioned between alert levels, and staff adjusted smoothly and quickly to new ways of working.

The wellbeing of our dispersed staff was a high priority, and regular contact was maintained within and between teams. We also implemented additional special and paid leave for staff whose family commitments during lockdown prevented them from working normal hours.

We are continually adjusting to the changing situation, and we are well prepared to respond to further movements in alert levels.

Meanwhile, our workforce continues to change to reflect a more diverse team, with increased female participation across our work – more than half our new appointments in the past year were female.

## Tomorrow's scientists today

**NIWA continues to encourage a new generation of scientists by investing substantially in initiatives at secondary and tertiary level.**

We sponsor seven main city science and technology fairs and eight regional fairs, helping raise the constituency of science by attracting thousands of entries from secondary students. Our staff often serve on the judging panels, and provide an insight into the science world and the variety of scientific careers open to students. This year, several science fairs opted for virtual participation, but they continued to attract a high level of interest.

We are the principal science partner with BLAKE and sponsor the environment category of their annual awards. Our BLAKE Ambassador Programme annually supports up to six outstanding young New Zealanders into work on NIWA research programmes.

In addition to the collective CRI sponsorship of the Sir Paul Callaghan Eureka Awards, NIWA provides an annual scholarship for the secondary or tertiary student who delivers the best presentation on climate, freshwater or ocean science.

This year NIWA staff supervised 116 PhD, MSc or Hons students from universities around the country – a significant increase on last year. We also hosted 30 students from New Zealand and overseas as they undertook work experience and paid summer internships.

## Building a transformational future

**In a year of unprecedented disruption, it is heartening to report that our plans for a multi-site building redevelopment programme remain largely on track.**

Site layout and building parameters have been confirmed for our Wellington and Hamilton sites, and we have moved into the detailed design phase for these projects.

Negotiations are continuing for a new site in Christchurch, designs have been completed for a new field office in Tekapo, and the new office and administration building at our Northland Marine Research Centre is nearing completion.

This programme of work will result in contemporary and environmentally sustainable facilities with the flexibility required to meet the future needs of our researchers and their science. The capital cost of this new building programme in Wellington, Hamilton and Christchurch is projected to be \$170 million, and building work is expected to begin in 2021.

Meanwhile, it was gratifying to see NIWA ranked in the top 10 of the Colmar Brunton Public Sector Index for the second year running. NIWA's

rating was classified as 'Superior Strength', the highest category, and ratings for the attributes that feed into each of the four pillars assessed – trust, social responsibility, leadership and fairness – generally improved over last year's ratings. This was an outstanding reflection of the effort everyone at NIWA puts in to ensure our science is working for the benefit of the nation.

We would like to thank the NIWA Board and Executive Team for their work and support, especially their tireless efforts in response to COVID-19. We would also like to acknowledge the retirement of Dr Barry Biggs after 43 years' service. During the last 12 years, Barry was an instrumental part of NIWA's Executive Team and has made an enormous contribution to NIWA, and to science in general.

While the immediate future presents many challenges, we are confident our science will continue to play a critical part in guiding a resilient future.

One of NIWA's strengths is that we put together the very best multidisciplinary teams to ensure our customers get the answers they need. By way of example, our fisheries science – which provides the stock assessment advice that is the foundation for New Zealand's

internationally recognised Quota Management System – is strengthened by our expertise in oceanography, climatology, environmental forecasting, biodiversity and biosecurity, taxonomy, modelling and data analysis. These disciplines are, in turn, supported by our comprehensive fleet of research vessels – world-class platforms equipped with the latest, most sophisticated technology. This internal connectivity and multidisciplinary support recognises the myriad pathways that exist in every environment we study – our atmosphere and climate, our freshwater and our coasts and oceans.

It has been a challenging year for every sector of New Zealand society. However, what has become more apparent throughout the COVID-19 pandemic is the crucial role of science, and how it underpins almost every facet of our lives. Innovative science can provide the essential information in times of upheaval and uncertainty, and it can also provide the foundation for a new world.



**Barry Harris**  
Chairman



**John Morgan**  
Chief Executive



*NIWA's planned new building at Greta Point, Wellington is one of three new builds designed with a common look, feel and functionality to enhance the delivery of excellent, efficient, cost-effective science.*



**Richie Hughes surveys  
invasive fanworms**

The judges were entranced by what they said was a beautifully lit and composed shot that displayed technical excellence. “The balance between the ambient, flash and torch light sources is perfect,” they said. Crispin Middleton took this shot in Auckland Harbour during a survey for invasive species.

NIWA PHOTOGRAPHY AWARDS  
Our People Award Winner  
**Crispin Middleton**



# NIWA SCIENCE

## OUR MISSION

To support the wellbeing of Aotearoa New Zealand people and business through

- improved management of the environment
- sustainable use of natural resources
- effective responses to global change

## OUR AIM

To deliver the science that will enable Aotearoa New Zealand to meet its environmental challenges and thrive in a rapidly changing world

We will innovate, generate new knowledge, and apply our science to

- provide industry opportunities
- transition to a low carbon economy
- adapt to a changing climate
- improve the health of our waterways and oceans
- care for our unique biodiversity

To achieve these advancements

- we will partner with Māori
- embrace new technologies
- support major science infrastructure
- collaborate with other science organisations and the sectors that apply our science products and services

## OUR SCIENCE

Will support the realisation of these national outcomes by applying innovative technology across multidisciplinary teams.

### CLIMATE

New Zealand's pre-eminent provider of atmospheric and climate science

- Climate change and variability
- High-precision weather forecasting
- Weather-related hazard forecasting
- Adaptation and mitigation

#### 230 Science staff

New Zealand's largest team of climate scientists

#### \$42M Annual investment

In weather and climate research

#### 7,500 Climate stations

The National Climate Database with information from 7,500 climate stations covering New Zealand, South-West Pacific and Antarctica

#### \$18M Supercomputer

Enabling precise, highly localised forecasts

### FRESHWATER

Supporting the sustainable management of our freshwater resources

- Freshwater quality and quantity
- Biodiversity and biosecurity
- Sustainable use
- Flood forecasting

#### 240 Science staff

New Zealand's largest team of freshwater scientists

#### \$40M Annual investment

Increasing knowledge of water quantity and quality

#### A national flood forecasting service

Providing river flow forecasts for 66,000 catchments nationwide

#### 500 Hydrological monitoring stations

A nationwide network of water and soil moisture monitoring stations

### OCEAN

Understanding, managing and maximising the benefits of our marine estate

- New Zealand's Marine Estate
- Fisheries stock assessment
- Sustainable use of marine resources
- Biodiversity and biosecurity
- High-value finfish aquaculture

#### 260 Science staff

New Zealand's largest team of ocean scientists

#### \$67M Annual investment

In coast and ocean, fisheries and aquaculture science

#### Northland Marine Research Centre

New Zealand's leading science facility for finfish aquaculture

#### State-of-the-art research vessels

Supporting the New Zealand science community

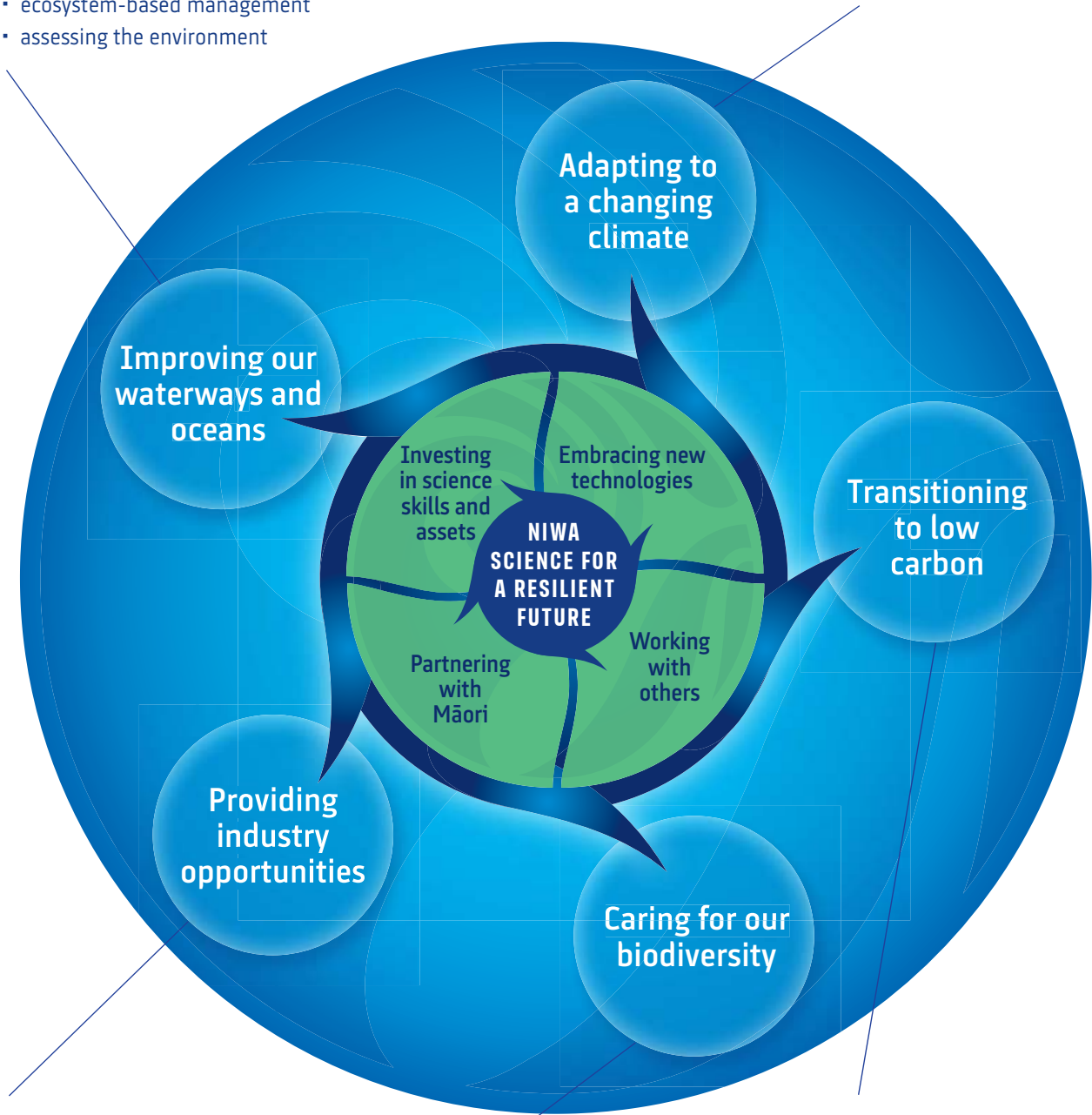
# NIWA CLIMATE FRESHWATER & OCEAN SCIENCE

## Healthy waterways

- improving water quality
- ecosystem-based management
- assessing the environment

## Climate change adaption

- planning for climate change
- improving resilience
- reducing impacts



## Growing industry

- advancing sustainability
- growing regional economies
- diversifying aquaculture
- allocating water better

## Low carbon future

- supporting a just transition
- exploiting renewable energy
- mitigating emissions

## Caring for biodiversity

- enhancing protection
- restoring ecosystems
- combating invasive species



# PROVIDING INDUSTRY OPPORTUNITIES

## Advancing sustainability

- High-resolution environmental forecasting
- Climate projections to inform land use
- New tools to monitor fish populations and ecosystems

## Growing regional economies

- Forecasting for weather-sensitive industries
- Climate projections for regional planning
- Forecasting to improve tourism operations

## Diversifying aquaculture

- Recirculating Aquaculture Systems (RAS)
- Commercial-scale trials of kingfish
- Improved mussel and oyster productivity

## Allocating water better

- Effect of climate change on water use
- Flow forecasting
- Tools to increase water-use efficiency





These NIWA kingfish reach marketable size of 2.5–4kg within 12 months.

*[Stuart Mackay]*

## A growing opportunity

Ruakaka kingfish is poised to become a premium product on the menus of restaurants in New Zealand and overseas.

At our Northland Marine Research Centre, building is under way on a recirculating aquaculture system that can produce up to 600 tonnes of Ruakaka kingfish a year. This sustainable, land-based venture aims to prove the technical and economic feasibility of farming kingfish in tanks at commercial scale.

With investment from NIWA, the Provincial Growth Fund and Northland Regional Council, it is expected the venture will lead to a 3,000-tonne operation, creating 75 new jobs for the region, within five years.

The recirculating system allows water to be renewed and recycled, making it practical to filter incoming water to exclude diseases and parasites. The temperature can be adjusted to optimise growth rates, and the water being discharged can be treated to minimise environmental effects.

This technology opens the opportunity to introduce aquaculture to any coastal area around New Zealand.

## Selecting which fish you catch

We are working with the commercial fishing industry to improve fishing methods by optimising trawl net mesh size or shape, for example, to enhance selectivity. And, we are looking beyond passive methods to reduce unwanted bycatch, by developing an active fish-selection system.

Underwater video cameras could allow immediate decision making about which fish you retain and which fish you release live during the capture process. And, that selection process could be automated using artificial intelligence or computer vision. This highly targeted approach has the potential to enhance the economic and sustainable future of fishing industries worldwide.



*We are developing a system to actively identify, measure and select fish during fishing, and to eventually automate this through artificial intelligence.*



## Improving irrigation

The NIWA-led Irrigation Insight programme focuses on understanding the environmental and economic aspects of irrigation.

Three management tools have been developed to improve water-use efficiency by integrating high-resolution weather forecast data with on-farm soil moisture measurements.

- Helping farmers make strategic irrigation decisions, such as alternative scheduling or infrastructure development (HydroEcon).
- Incorporating soil properties, current soil moisture, future rainfall and evapotranspiration into a farmer-friendly tool to help farmers decide when and how much they should irrigate (IrriMate).
- Combining soil water measurements from a mobile soil moisture sensor and NIWA's high-resolution weather-forecast data in an app to provide a site-specific, 6-day, soil moisture forecast (SoilMate).

*Twenty Canterbury dairy farmers are trialling the prototype tools during the final year of this MBIE Endeavour programme. [Stuart Mackay]*

# TRANSITIONING TO LOW CARBON

## Supporting a just transition

- Tools and advice to support climate change adaptation and mitigation
- Measure and understand greenhouse gas sources and pathways
- Communicate the science of climate change

## Exploiting our renewable energy sources

- Customised data and tools for optimal electricity generation
- Minimise potential environmental impacts from renewable energy
- Small-scale, multi-source power for self-sufficiency and resilience

## Mitigating greenhouse gas emissions

- Determine local to global sources and sinks of greenhouse gases
- High-precision, long-running measurement series to understand the drivers of climate change
- Assess the effectiveness of measures aimed at reducing greenhouse gas emissions



## Forest measurements supporting low carbon transition

In a busy year for CarbonWatchNZ, results incorporating new greenhouse gas monitoring sites and a finer-scale weather forecasting model revealed just how vital our native and planted forests are for reducing New Zealand's net greenhouse gas emissions.

CarbonWatchNZ is an ambitious, NIWA-led programme that aims to build the world's first complete national-scale picture of a country's carbon balance, based on measurements of greenhouse gases in the atmosphere.

The programme is halfway through its five-year term. Forest measurements and iwi partnerships have expanded, including new partnerships with Te Whānau-ā-Apanui and Ngāti Porou to monitor carbon uptake alongside restoration of the badly degraded Raukumara forest. Forest research also continues in Fiordland and with the Lake Taupo and Lake Rotoaira Forest Trusts. CarbonWatchNZ also involves extensive greenhouse gas monitoring and modelling around New Zealand cities and farmland.



*CarbonWatch NZ's greenhouse gas monitoring facility at Maunga Kakaramea in the central North Island. [Dave Allen]*



Releasing water from canal gate 18 at Lake Pūkaki. The canal feeds Meridian's Ōhau hydro stations. [Marty Flanagan]

## The future of hydroelectricity

More than 50% of New Zealand's electricity is generated by water.

NIWA scientists, funded by the Deep South National Science Challenge, are working with hydroelectricity generators to understand the resilience of this renewable resource to the increasing pressures of user demand and climate change. Using the New Zealand Water Model, a hydrological modelling tool co-developed by NIWA, our hydrologists have provided analyses of hydroelectricity generation capacity, floods, droughts and water reserves to help predict future generation capability and climate-driven hydrological shifts.

## Urban air quality research expands nationwide

Winter 2019 was a defining time for our urban air quality team.

As a result of their research, more residents in Arrowtown, where the work was centred, took up subsidies to change their home heating from older wood burners to more efficient, lower pollution sources. Every year the team sets up outdoor sensor networks that transmit daily air quality data, and pollution animations for participant towns are published on our website.

The team works with households to measure indoor air quality as well as with local schools under an MBIE Unlocking Curious Minds project. These projects explore the science behind air quality, why it is an issue in some New Zealand towns in winter and how we might improve it.

In 2020, the team took the project nationwide – setting up simultaneous sensors in Invercargill, Arrowtown, Reefton and Masterton – and plans to open it up to other towns in the future.



NIWA's Dr Ian Longley fends off newspaper balls designed to represent air pollution particles thrown by students at Lakeview School in Masterton. He spent two days with the students exploring air quality and carrying out interactive activities and experiments, providing insights into why air quality is important in their community. [Caroline Beamish]



# ADAPTING TO A CHANGING CLIMATE

## Planning for climate change

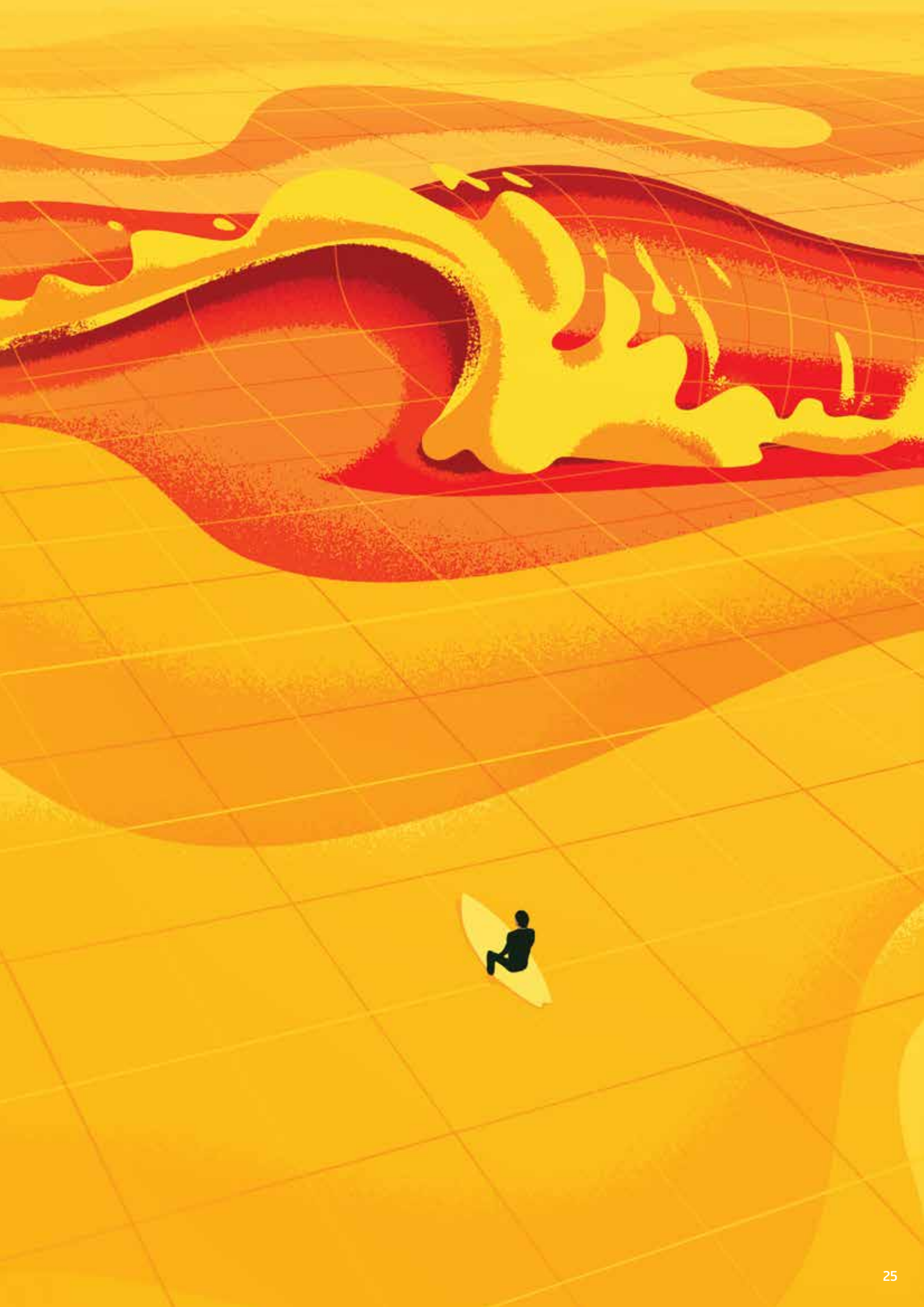
- High-resolution projections of climate and ocean state
- Increased understanding of the impacts of climate change
- Guidance and tools to support better planning for climate change

## Improving resilience to natural hazards

- 24/7 multi-hazard forecasting system
- Enhanced tools and guidance to help mitigate weather and climate hazard impacts
- Work with international partners to advance weather, climate and hazard forecasting

## Reducing adverse effects of climate change

- Hydrological models to inform changes in water flows and storage
- Predict the effects of sea-level rise on coastal ecosystems and infrastructure
- Increase understanding of the effects of ocean acidification on ecosystems, including in Antarctica



# ADAPTING TO A CHANGING CLIMATE



Lower Nihotupu Reservoir in Auckland in May 2020, when Auckland's dams were 43% full. [Stuart Mackay]

## Communicating drought risk to inform decision making

In early 2020, New Zealand saw one of our most extreme droughts in modern times.

Auckland was particularly hard hit, with 78 consecutive days in drought. During this time NIWA provided Watercare in Auckland with monthly updates on drought severity by comparing reservoir rainfall data with historic data. Our research, data, and monthly and seasonal outlooks also informed decision making for the National Adverse Events Committee, convened by the Ministry for Primary Industries. We recorded an almost three-fold increase in traffic on our web-based New Zealand Drought Monitor compared with 2019, indicating that our information about drought is used widely by a range of people.

## Partnering for Pacific resilience

NIWA is working alongside the Australian Bureau of Meteorology and other Pacific partners to support modernisation of equipment, products and services for sea level, data management, climate and ocean monitoring and prediction in the Pacific.

This work is part of the Australia Pacific Climate Partnership to deliver climate and disaster resilience with NIWA's climate services component funded by

the New Zealand Ministry of Foreign Affairs and Trade. This three-year programme is targeting 14 Pacific countries, and after one year is already operating in nine.

Alongside this work, NIWA is also continuing to build the capacity of our Pacific partners as we continue to support the installation of weather stations. We are also implementing new ways of working with and supporting our Pacific partners as travel restrictions continue.

*Learning by doing is a key component of NIWA's competency-based training activities. Principal Technician Andrew Harper working with VMGD Meteorological Technician Bradley Bani at Whitegrass Airport, Tanna, Vanuatu. [Dave Allen]*



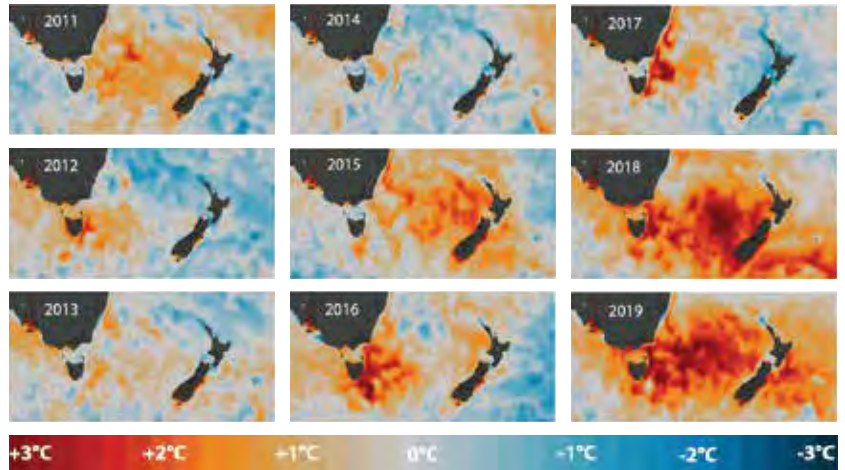
# Predicting ocean heatwaves

Our research revealed in 2019 that surface waters in the oceans around New Zealand are significantly warmer than they were 30 years ago.

This is affecting not only our climate, but also our marine ecosystems, especially sedentary species that can't easily move or adapt.

Our researchers study marine heatwaves using temperature records from satellites and Argo floats – a network of instruments that continually rise and sink between the surface and 2000m deep throughout the world's oceans. The satellite data show us how the temperature varies across the surface of the oceans, and at different times, while the Argo floats measure the temperature through the water column.

Complementing this monitoring is modelling work that helps us understand more about how marine heatwaves occur and even how to predict them. Our researchers work with the New Zealand Earth System Model (as part of the Deep South National Science Challenge), which incorporates the changes we expect in the future due to greenhouse gas emissions and a warming Earth. Looking at how well the model simulates current heatwaves helps the researchers improve model predictions of future change.



Sea-surface temperatures this decade show a clear increase in marine heatwaves. [NIWA]



[Malcolm Francis]

## Understanding the effects of climate change on the snapper population

Anthropogenic CO<sub>2</sub> emissions are warming and acidifying Earth's oceans, which is likely to lead to a variety of effects on marine ecosystems.

Fish populations will be vulnerable to this change, and there is now substantial evidence of the direct and indirect effects of climate change on fish.

Snapper have been thought to be a climate change 'winner', because they seemed to respond positively to warmer summers. However, experiments at our Northland Marine Research Centre on the direct impacts of warming and acidification show both positive and negative effects. These results highlight our commitment to developing research programmes that will lead to a better understanding of the effects of climate change on our highly valued fish stocks.



# IMPROVING THE HEALTH OF OUR WATERWAYS & OCEANS

## Reversing decline in water quality

- Modelling tools to predict the impact of contaminants
- Contaminant mitigation systems
- Quantify the occurrence and distribution of microplastics

## Ecosystem-based approaches to resource use

- Enhanced understanding of ecosystem processes and interactions
- Coupled models to link catchment land use and contaminant dispersion
- Models to predict degradation and potential recovery of aquatic ecosystems

## Measuring the state of our environment

- Measurements and forecasting to meet or exceed national and international standards
- Best practice data management, analysis, visualisation and accessibility
- Curation of internationally significant collections and samples



## IMPROVING THE HEALTH OF OUR WATERWAYS & OCEANS

## Assessing the scale of the plastic problem

We have provided a valuable first look at how much plastic lies on the seafloor in New Zealand's Exclusive Economic Zone.

Funded by the Ministry for Primary Industries, the research analysed imagery from our Deep Towed Imaging System surveys since 2006. The results show a higher plastic concentration closer to the coast (up to 50km), although plastic has been recorded even on remote seamounts, far from the New Zealand coastline.

On land, we have been looking at how and which plastics are transported in rivers and streams to the sea. Using Wellington's Kaiwharawhara Stream as a testbed, our researchers and community volunteers have been collecting, identifying and weighing plastic rubbish found throughout the stream to quantify plastic pollution in the water and sediments. The aim is to identify ways to reduce plastic pollution in Wellington Harbour and provide a tested approach that can be used nationwide.



*Dr Amanda Valois with the "Rubbish Taniwha" collection device designed in conjunction with NIWA Waikato Science and Technology Fair winner Lauren Geer. [Rebekah Parsons-King]*

## Informing our freshwater future

Freshwater legislation reforms have been a key part of the government's agenda.

Our freshwater scientists have advised the government on the 'Essential Freshwater' reform package through technical reports and memos, peer-review of reports from other science providers, an extensive submission on technical merits, service on the Science and Technical Advisory Group, and Ministerial briefings.



*The remotely controlled Q1250 is not only more accurate than traditional methods for gauging river flow, it is also significantly safer. [Elliot Bowie]*



*SCENZ is a collaborative NIWA and MBIE Envirolink Tools project with regional councils. [Rosemary Hurst]*

## Mapping the state of our coastline

We have developed a prototype for an online portal for satellite imagery of the coastal zone – called ‘Sea, Coasts and Estuaries New Zealand’ (SCENZ).

SCENZ will be updated monthly, and includes observations such as water colour, water clarity, surface temperature, and the concentrations of phytoplankton and suspended sediment. This kind of satellite imagery, along with SCENZ’s interactive analysis tools, can help users such as regional councils study patterns in productivity, coastal water quality and long-term change as a result of climate change and land-use development.

## Combining mātauranga Māori and science

We have been collaborating with the Maniapoto Māori Trust Board to deliver freshwater assessment training for kaitiaki.

Three, two-day wānanga introduced kaitiaki to assessment tools including the NIWA Stream Health Monitoring Assessment Kit methods, *E. coli* testing, invertebrate identification, as well as fish and tuna monitoring. These hands-on experiences contributed to the development of a cultural assessment framework derived from Ngāti Maniapoto values, incorporating Ngāti Maniapoto ways of assessing the state of these values as well as assessment tools and approaches that draw on mātauranga Māori, community and scientific knowledge.

*Ngāti Maniapoto kaitiaki and NIWA researchers measure a longfin tuna during a tuna education and monitoring wānanga. [Stuart Mackay]*





# CARING FOR OUR UNIQUE BIODIVERSITY

## Enhancing biodiversity protection

- Improved understanding and quantification
- Innovative approaches to ecosystem monitoring, protection and management
- Tools and products for sustainable management and restoration

## Restoring degraded aquatic ecosystems

- Identify and quantify environmental stressors
- Tools and strategies to restore and rehabilitate
- Tools and strategies to reduce the impact of extractive industries such as fishing and mining

## Protecting aquatic environments from invasive species

- Understand emerging threats and develop best practice management
- Models to predict future impact of aquatic pests
- Strategies for eradication and control of established pests



## CARING FOR OUR UNIQUE BIODIVERSITY



Freshwater ecologist Tracey Burton recording the growth and impact of the invasive weed lagarosiphon in Lake Rotomā. [Rod Budd]

## Removing barriers for our native fish

Many of New Zealand's native freshwater fish species are under threat from habitat loss and degradation.

NIWA freshwater scientists work closely with the Department of Conservation and the Ministry for the Environment to protect and manage these vulnerable species. Our scientists developed the New Zealand Fish Passage Guidelines and Fish Passage Assessment Tool, which have been instrumental in determining minimum standards for fish passage. These standards have been set out in national regulations, to prevent the creation of new barriers to fish passage and ensure that existing barriers are remediated.

*A ramp and interior spoiler baffles have been added to this culvert on the Waikato River to help native fish navigate the barrier and swim upstream. [Jacques Boubée]*



# Marine & freshwater biosecurity surveys

Invasive marine and freshwater pests and diseases represent a significant threat to New Zealand.

We are partnering with central and regional government and local organisations to conduct biosecurity surveys in harbours, lakes and other vulnerable water bodies. The National Marine High-Risk Site Surveillance programme provides marine surveillance at 11 major ports and marinas deemed to be at high risk. In 2019/20, four secondary target species were detected. Our LakeSPI programme surveys aquatic plants and in 2019/20 divers conducted intensive surveys at more than 80 sites in 17 lakes, as well as additional surveillance at 169 sites, for invasive weeds, their impacts and management outcomes.

# Following whales and dolphins

New Zealand waters are home to half of the world's cetacean (whale and dolphin) species, but their distributions are poorly known because of their pelagic and often highly migratory nature.

This NIWA project, funded by Fisheries New Zealand, filled an important gap in the modelled distributions of 30 cetacean taxa by use of an extensive at-sea sightings records dataset (more than 14,000 data points) and high-resolution environmental data layers.

*The study included 629 at-sea sightings of humpback whales passing through New Zealand's Exclusive Economic Zone. [Rod McKay]*

# Chronicling our taonga species

Iwi and hapū are becoming increasingly more involved in the management and restoration of freshwater and estuarine environments, including supporting the taonga species that live within.

NIWA researchers, through the MBIE-funded Cultural Keystone Species programme 2016/20, have developed a series of booklets and online resources to share science knowledge and provide a simple overview about what we know and

what we don't know about selected taonga species - tuna (eel), kākahi/kāeo (freshwater mussel), kōura/kēwai (freshwater crayfish).

This series originally focused on freshwater taonga species, and there is now demand for similar products about estuarine and marine taonga species. With co-funding from NIWA, the Cultural Keystone Species team are producing new resources for the series, including inanga (galaxiid fish), piharau/kanakana (lamprey), pātiki (flounder), tuangi (cockles) and toheroa.

*The engagement booklets were developed to share science knowledge to support species management strategy. [Lana Young]*



# OUR PEOPLE

A large school of blue maomao fish swimming in a cave, with a diver visible in the background.

## Long Cave

This winning image was taken at Long Cave in the Poor Knights Islands Marine Reserve. Diving with colleague Crispin Middleton as the sun was low in the sky, the light was perfect in the cave with beams penetrating the cavern which was full of blue maomao and two-spot demoiselle. As he turned and looked back, Richie could see the perfect silhouette of Crispin. The public loved the shot and Richie's chosen charity, the Safe Waters Education and Environment Trust, has benefited from his \$1000 win.

NIWA PHOTOGRAPHY AWARDS  
People's Choice Award Winner  
Richie Hughes

Our people are focused on innovative science and its application to meet our customers' requirements.

That necessitates a culture of continuous learning, development and collaboration. NIWA has a strong and ongoing commitment to staff health, safety and wellbeing. We also have well established processes for recognising and rewarding staff achievement.

#### **Developing science leadership**

Our leadership development has many prongs, including the annual NIWA Leaders' Forum, which this year concentrated on 'Enhancing our Natural Capital'. How do we enhance NIWA's pivotal role in the sustainable management of New Zealand's natural resources, ensure our knowledge benefits society, and continuously innovate and refine our operations?

#### **Good relationships and engagement**

NIWA recognises the importance of meeting the good employer requirements under Section 118 of the Crown Entities Act 2004 and ensures that our policies and practices are consistent with the fair and proper treatment of staff in all aspects of their employment.

Managers regularly engage with employees and employee representatives regarding workplace policies and practices and during employment negotiations. During this year, for example, staff union representatives and non-union staff engaged to provide timely and effective two-way communication on the development of the Future Property Programme.

#### **Acquiring and retaining talent**

Throughout the year 17 new permanent positions were approved to help meet the demand for our science services and the required operational support. These included four new Te Kūwaha positions to strengthen the integration of mātauranga Māori and science for the benefit of iwi, hapū and whānau.

The application of best practice in recruitment and selection is a key focus in the talent acquisition process.

NIWA's strong employer brand enables us to attract and retain a high calibre workforce. The ongoing stability of our high-performing workforce is a key strength – retention this year remained high, at 93.8%.

#### **Supporting staff development**

The annual workforce planning process provides the framework to identify anticipated demand for our science and services, succession pathways for our staff, and associated professional development requirements. The annual performance and development review process gives managers the opportunity to work with each of their team members to plan and implement individual development activities that are aligned with the workforce plans.

Our People and Capability team facilitates a suite of in-house workshops designed to address key leadership and management development needs (Crucial Conversations, Recruitment and Selection, Developing Others) and offers a range of workshops to all staff on topics

## 4

New Te Kūwaha positions to strengthen the integration of mātauranga Māori and science.

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# OUR PEOPLE



NIWA scientific divers Susie Elcock and Aleki Taumoepeau surveying submerged plants in Lake Otamangakau. [Tracey Burton]

such as Rainbow Community and Family Violence Awareness, Challenge of Change – Resilience, and Unacceptable Behaviour Awareness and Prevention.

A digital learning hub was launched this year as a comprehensive resource kit for all staff.

We invest significantly in conference participation and other professional development to help ensure our people are at the forefront of their profession – this year we spent about \$330,000 on such activities.

## \$330k

Spent on professional development for staff.



NIWA Wellington staff volunteer in the South Coast Clean-up each year. Pictured are marine biologist Dr Kareen Schnabel and PhD student Francois Thorat with cigarette butts gathered from Lyall Bay during the 2019 event. [Lana Young]

### A diverse and inclusive workplace

We recognise the benefits and importance of a diverse and inclusive workplace, and continue to heighten awareness and ensure all policies, guidelines and practices are based on the principles of fairness, equity and non-discrimination.

As part of our programme of prevention of unacceptable behaviour, Regional Managers and People and Capability staff attended a workshop on informal interventions, designed to upskill third-party early intervention in situations of conflict, relationship issues or communication difficulties between staff. This initiative sits alongside the provision of Unacceptable Behaviour contact people at our main locations and a robust Unacceptable Behaviour Policy and Resolution Procedure.

NIWA's work over the last two years was rewarded in February with Domestic Violence Free certification (DVFFree) from SHINE – a specialist family violence support organisation. This recognises the important role that employers have in raising awareness of family violence, creating a safe working environment for staff experiencing family violence, and providing support for these staff to become safe outside work.

Over the year, we implemented a Rainbow community training programme across the organisation and scheduled focus groups for staff, including members of the NIWA Rainbow community. A range of Rainbow community information and resources has been collated and made available via our staff intranet and this site will continue to be developed and enhanced.

We facilitated a re-collection of demographic data from all staff to ensure the data we held was up-to-date and



*Tekiteora Rolleston-Gabel (Tūhoe, Ngāti Kahu, Ngāi Te Rangī, Ngāti Awa) is one of the young researchers learning about the delivery of Māori environmental research as part of NIWA's newly established Māori Internship Programme. [Tracey Burton]*

aligned with national census data. As we anticipated, in refreshing this data, we recorded a much larger proportion of staff who identified with two or more ethnicities.

Also under development this year by our Te Kūwaha team is a Māori cultural competency app that staff will be able to access on their mobile phones.

### Employee wellbeing

Mental health and wellbeing were identified as an important part of our response to the COVID-19 pandemic. Managers maintained regular communication with their teams, and a holistic range of resources was made available to help staff with the rapid changes arising as a result of the pandemic. Three new COVID-19 leave codes were introduced to cover any time staff were unable to work because of pandemic-related disruption, and we emphasised that staff should make

their best endeavours based on their circumstances and work flexibly.

In recognition of our ageing workforce, we offered an all-encompassing retirement workshop to support staff with retirement planning and transitioning. The workshop covered financial and lifestyle planning aspects for those within 15 years of retirement.

As part of our all-inclusive approach to wellbeing, we continue to offer benefits such as skin checks and flu injections to all staff. Our ongoing commitment to flexible working practices helps staff effectively manage both their work activities and non-work responsibilities in a sustainable way. This includes temporary or ongoing non-standard work hours, part-time arrangements and a very accommodating approach to the use and timing of leave. Last year 14% of our staff worked part-time.



# OUR PEOPLE

## Recognising talent

We have a strong commitment to recognising and rewarding staff, and our remuneration framework includes regular internal and external benchmarking. The Living Wage is applied as the minimum wage for any NIWA staff member.

During the year, 27 science staff were awarded a level promotion for years of consistent, high quality science and after rigorous peer review.

Our prestigious Excellence Awards programme continues to ensure outstanding achievements are recognised. Every year, the peer-reviewed selection process highlights just how many exceptional contributions have been made by staff. The winners and runners-up in 11 categories were celebrated at an awards ceremony held at the September 2019 Leaders' Forum.

## Fostering future talent

Enabling the next generation of science talent is key to NIWA's long-term success. We foster the development of our future science workforce by providing young New Zealanders, students and graduates with opportunities to develop invaluable skills and acquire knowledge by working alongside experts in the field. We sponsor Science & Technology Fairs to encourage engagement and promote science careers for young New Zealanders.

Our staff supervised more than 100 PhD and MSc students from New Zealand universities, and welcomed 30 students from New Zealand and overseas universities to undertake research alongside our experienced staff during the year. We support students by offering PhD and postgraduate scholarships, in addition to postdoctoral fellowship positions.

In most years we host interns as part of a Summer Internship Programme, and we recently developed a Māori Graduate Internship Programme. This programme, driven by the increasing need for Māori knowledge in science, gives interns the chance to learn and engage in the delivery of Māori environmental research as part of NIWA's Te Kūwaha team. We also partner with BLAKE in creating environmental leadership opportunities for 18–25-year-olds who work alongside leading scientists to understand and answer some of the big questions and challenges facing our environment.

We sponsor Science & Technology Fairs to encourage engagement and promote science careers for young New Zealanders.



*Our annual Excellence Awards celebrate outstanding achievements by NIWA staff across the organisation. [Stuart Mackay]*



NIWA scientific diver Richie Hughes underneath a thick swarm of jellyfish at the Poor Knights Islands. [Crispin Middleton]



**A continuous safety-first focus**

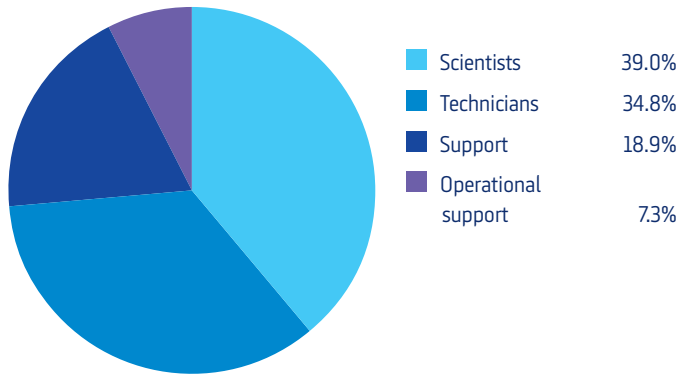
Work safety is of paramount importance to NIWA. Throughout the COVID-19 pandemic, our fundamental health and safety practices remained in place and active. Significant health and safety initiatives delivered during the year were:

- An expanded core Health and Safety Team was established.
- We implemented a Permit to Work System, providing a formal written system to manage work safely.
- We launched Trip Planner for use by all fieldworkers as an online safety tool for remote or restricted work activities.
- Online training modules were developed to support improved awareness of health and safety practices. Online training resources now include Permit to Work Awareness, Respirator Use, Chemwatch Level 1 and Safety Data Sheet Awareness.

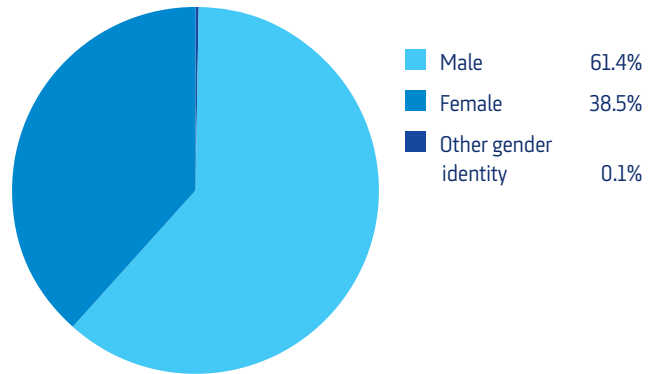
Our staff supervised more than 100 PhD and MSc students

# NIWA BY THE NUMBERS

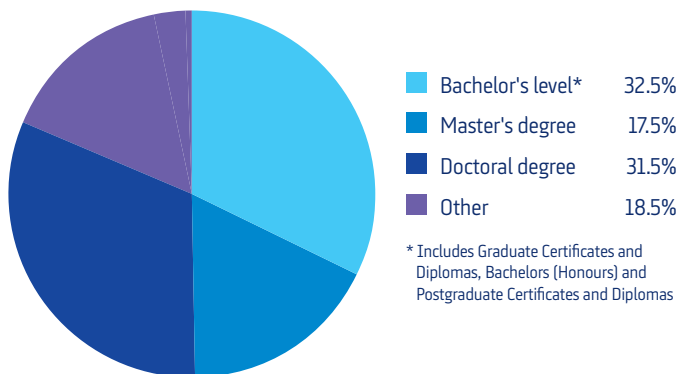
## Roles



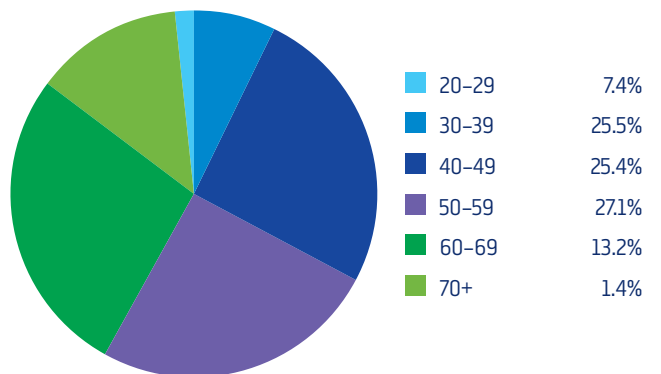
## Gender



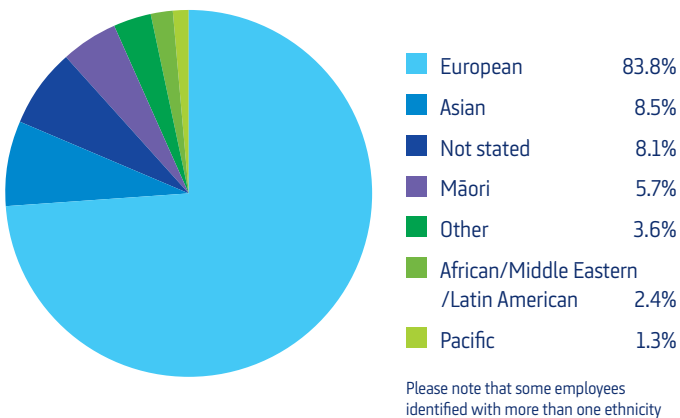
## Highest Qualification



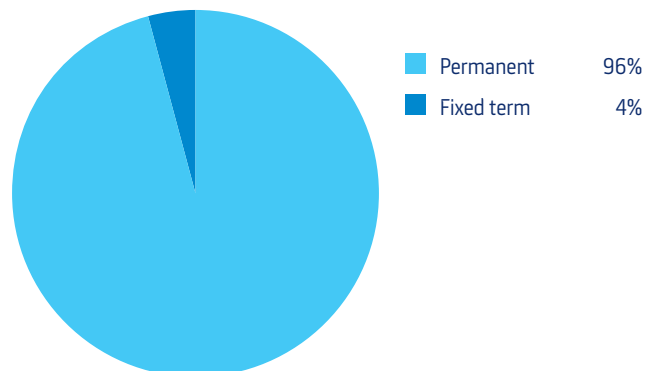
## Age



## Ethnicity



## Employment status



# NIWA GROUP BY LOCATION

As at June 2020

## 702

NIWA staff

## 86%

Full-time staff

## 14%

Part-time staff



### Recruitment

17 approved new permanent positions

26 approved permanent replacement positions

18 approved fixed-term positions

### Turnover

Turnover to the end of June for the NIWA Group was 6.12%.

### Disabilities

8.1% of staff have a form of disability

### Personal development leave (NIWA science)

3 days of personal development leave is provided for staff members, excluding those on management employment agreements.

### PSA membership

312

### Remuneration reviews (in addition to annual rating process)

Operations relativity reviews	97
Support relativity reviews	32
Level promotions	27
Performance rating appeals	4
Salary appeals	9
<b>Total</b>	<b>169</b>

# 2020 NIWA EXCELLENCE AWARDS

Our Annual Excellence Awards celebrate the achievements of staff who have made an extraordinary contribution.

Staff are nominated by their peers, and finalists are then selected by a representative panel of staff, for ratification by the Executive Team.

## Gamming southern royal albatrosses

These albatrosses on Campbell Island were photographed against the dark sky which the judges said really brings out the birds' beauty. "This is a cool photo showing bird behaviour. It's photographically strong with two birds directing the point of interest to the displaying bird. It's a lovely tight crop with great timing and sharpness."

NIWA PHOTOGRAPHY AWARDS  
Our Work Award Winner  
Rob Murdoch



# EXCELLENCE AWARD WINNERS



**Mike Harvey**  
Research

Mike is a globally renowned expert on agricultural greenhouse gases – conducting process studies, setting the agenda for New Zealand's world-leading research consortia, leading a pillar of an ambitious Endeavour project, defining international standards for analytical procedures and exploring new tracer techniques. He also established a new research field at NIWA on marine aerosols to address major unknowns in climate models. His performance and achievements have been consistently outstanding over a broad range of research fields.



**Paul Champion**  
Applied Science

Paul is arguably New Zealand's foremost authority on aquatic and wetland plants. His impact crosses pest management, environmental restoration, conservation and policy. His expertise in the management of aquatic weeds means his advice is sought by agencies such as regional councils, DOC, MPI, LINZ and hydroelectric power companies. He is an excellent communicator, mentor and educator, always happy to share his skill and knowledge and to do so with great enthusiasm.



**Erik Behrens**  
Early Career Science

Erik is one of NIWA's climate science leaders with a global to regional awareness that spans model mechanics, the real world, policy and evidence-based action. He already has 30 papers to his name, and has grown his role from technical expertise with the global coupled atmosphere and ocean modelling system, to one including both scientific and technical excellence sought by researchers nationally and internationally and across disciplines (in particular from physics to biology).



**Nava Fedaeff**  
Science Communication

Nava is a highly skilled communicator of NIWA science to a wide audience using many different communication tools. She is continually developing new and exciting ways to communicate climate and weather data, her high quality interactive infographics have been widely reproduced by media and attract significant interest on social media, and her data visualisations are extensively used in outreach activities.



**Lee Rauhina-August**  
Leadership

Working with her fellow Pou Ārahi, Lee has brought Te Ao Māori to life within NIWA, teaching her colleagues at all levels, from senior management to researchers, the importance of interconnectedness and interrelationship – concepts fundamental to our multi-disciplinary science. Lee has highlighted the importance and strength of collaboration with Māori, in particular how NIWA's science and our people can be enriched by respecting Te Ao Māori and mātauranga Māori.



**Shannan Crow**  
Project Delivery

Shannan displayed outstanding leadership, science quality and customer focus in successfully delivering a three-year programme for an important client. This enhanced NIWA's reputation with key government customers and critical iwi/hapū partnerships, in what was just one example of his excellence in securing key work opportunities and delivering projects that provide excellent client-focused analysis and solutions at the regional and national level.



**Helen Brider**  
Customer Focus

Helen takes the lead in customer service for our Algal Services, communicating with 22 major clients – councils, energy companies, consultancies and one-off clients such as landowners. She is on call during blooms and throughout Christmas-New Year, and volunteered to be the sole Algal Services worker on site during COVID-19 Level 4 to conduct testing so clients could ensure drinking water standards were maintained.



**Simon Griffiths**  
Operational Innovation

Simon optimises and invents systems that have helped take Recirculating Aquaculture System (RAS) technology from an idea to practical reality. He led the design, fabrication and commissioning of the second RAS system at the Northland Marine Research Centre. In addition to design innovation, he takes responsibility for critical staffing systems and is always investigating and applying improvements and efficiencies.



**Annabelle Watson**  
Support

Annabelle provides outstanding service as NIWA's Senior Legal Counsel. Our operations are subject to numerous statutes and legal obligations that demand NIWA's counsel is highly experienced and has the versatility to work across many branches of the law. Annabelle delivers high quality advice to our Board, Executive and science teams that includes addressing matters as diverse as complex contracting negotiations, resource management law and meeting health and safety obligations.



**Greg Foothead**  
Health & Safety

Greg shows exemplary dedication to safety across the NIWA vessel fleet and the wider organisation. He displayed exceptional leadership during COVID-19 Level 4 when faced with the challenge of *Tangaroa* returning to port. He worked tirelessly to ensure that the crew and science staff, including overseas scientists, were able to return home as quickly and safely as possible. His safety leadership was further demonstrated by the COVID-19 Vessel Management Plan to guide the safe return of our vessels to sea.

### Team Excellence Awards – three winners

#### Catch Sampling Team – Helena Armiger, Keren Spong, Anna Bradley, Michael O'Driscoll, Julian Sykes, Derek Kater

NIWA undertook an unprecedented number of catch sampling projects in 2019/20; sampling 450 landings across five species obtained from 12 fish sheds across the country. Catch sampling requires excellent communication with fishing sheds and vessel skippers to avoid disrupting operations, while coordinating multiple sampling teams and adhering to workplace safety requirements, especially during COVID-19 restrictions.

#### Team Supporting COVID-19 Stranded Trainees – Graham Elley, Evan Baddock, Marty Flanagan, MS Srinivasan, Alexandra Pride, Carrienne Brown

The team provided outstanding support for visiting international hydro-engineers, initially in Christchurch for a three-week training course, but unable to leave New Zealand for three months during the worldwide COVID-19 lockdown. The group was looked after with accommodation, per diem payments and regular communications and visits, ensuring their morale remained high.

#### IT Team – Jen Sigley, Dylan Baars, Josh Bean, Rayna Ramsay, Renderson Ferreira, Rob Torrance

The team kept NIWA operating through the unprecedented disruption of the COVID-19 pandemic. Staff encountered negligible IT issues in the move from site-based to distributed working. They were proactive, responded rapidly to problems, and were innovative and flexible. All critical functions, including data supply, were maintained, and the rapid rollout of MS Teams greatly facilitated crucial collaborations.



# EXTERNAL AWARD WINNERS



## Rob Bell a co-winner of the 2019 Prime Minister's Science Prize

Principal Scientist, Coastal & Estuarine Physical Processes, Dr Rob Bell was one of the team who won this year's Prime Minister's Science Prize. The Ice and Rising Seas team found that Antarctic ice melt due to climate change could contribute to global sea-level rise of 1.4 metres by 2100, rather than the 1 metre predicted in 2013 by the Intergovernmental Panel on Climate Change.

Rob was also elected Fellow of Engineering New Zealand for significant contributions to his field. He has blended his civil engineering skills with NIWA's sciences and is internationally recognised for his expertise in ocean outfalls, coastal-hazard risks (including tsunami) and latterly in sea-level rise impacts and implications for adaptation.



## Barb Hayden inducted as a Companion of the Royal Society of New Zealand

The honour, awarded to only 54 people since it was introduced in 1999, recognised Chief Scientist, Coasts & Oceans, Dr Barb Hayden's many, varied and pioneering contributions to marine science, including spat, shellfish sanitation and vessel biofouling research. Also noted was her leadership, high international regard, infectious enthusiasm and lasting legacy.

Barb also won the NZ Marine Sciences Society Award, recognising her continued outstanding contribution to marine science in New Zealand and her work as a science communicator, mentor to young scientists and a zealous member of the Society.



## Rosie Hurst wins inaugural Minister of Fisheries Award

Chief Scientist, Fisheries, Dr Rosemary Hurst won the Minister of Fisheries Award at the 2020 New Zealand Seafood Sustainability Awards. Rosie is one of New Zealand's leading fisheries research and science management experts. Her lifelong commitment has helped develop policies and procedures for deepwater fisheries and the Quota Management System. She developed the inshore fishery trawl surveys, the first estimates of stock yields, and standardised monitoring approaches for hoki. She is also an inspiration for many female scientists in a heavily male-dominated industry.



## Karen Thompson and Drew Lohrer – 2019 Kudos Awards

Environmental chemistry and toxicology technician Karen Thompson was awarded the Hills Laboratories Laboratory Technologist Award at the 2019 Kudos Awards for her skill, leadership and expertise in areas including phytoplankton and ecotoxicology. Principal marine ecologist Dr Drew Lohrer was awarded the Waikato Regional Council Environmental Science Award for his contribution to our understanding of the New Zealand and Antarctic marine ecosystem functioning, particularly his new insights that guide the management of our coastal resources.



## Alan Porteous honoured with Pacific Meteorological Council Long Service Award

NIWA climate scientist Alan Porteous was recognised for his long service, perseverance, leadership and dedication to the development of meteorological services at the Pacific national and regional level. Alan is well known for his tireless work helping ensure Pacific Met Services get the best service.



## Myrtle rust consortium biosecurity award winners

A consortium of research organisations including NIWA was recognised at the 2019 New Zealand Biosecurity Awards for its work in understanding more about the spread and control of the invasive plant disease myrtle rust. NIWA has been providing weekly high-resolution maps of infection risk and modelling the spread of the disease.



**Philip Barnes** inducted as a Fellow of the Royal Society of New Zealand

Principal Scientist, Marine Geology, Dr Phil Barnes is an internationally recognised marine scientist who uses geophysical and geological methods to unlock the secrets of the Earth beneath the seabed. Over the past three decades, his expansive research into New Zealand’s undersea environment has revolutionised our perspective of fault lines and active tectonic processes.



**Brett Mullan** – Honorary Life Member of the Meteorological Society of New Zealand

The late Brett Mullan was recognised for his many and highly significant contributions to meteorology and climate science in New Zealand and beyond. Brett was a mainstay of the Society and at the forefront of developing climate change scenarios for New Zealand, leading two major reports for the Ministry for the Environment, which are widely used as the basis for climate change adaptation and mitigation planning in New Zealand.



**Wendy Nelson** - Fellow of the Auckland Museum

Principal Scientist, Marine Biology, Dr Wendy Nelson MNZM, is a world expert on phycology and New Zealand’s leading authority in that field. Wendy was made a Fellow of the Auckland Museum for “exceptionally significant contributions to the museum sector in Aotearoa New Zealand”.



**Spatial Excellence Awards**

NIWA, alongside Land Information NZ and Marlborough District Council, won the Environment and Sustainability category at the Spatial Excellence Awards for their partnership to map Queen Charlotte Sound, one of the most comprehensive science mapping projects ever undertaken around New Zealand’s coastline.



**Communications Team** win PRINZ award & Sarah Fraser inducted as PRINZ Fellow

The NIWA Communications Team won the 2019 Special Project/Short Term Campaign PRINZ Award for “Glaciers don’t lie”, the story of NIWA’s annual end of summer glacier survey. NIWA Communications Manager Sarah Fraser was also made a Fellow of the Public Relations Institute in recognition of her significant contribution to public relations.



**2019 Science New Zealand National Awards**

NIWA was recognised at the Science New Zealand National Awards across three categories. Environmental scientist Kelly Ratana won the Early Career Research Award for her advocacy of the value of mātauranga Māori and indigenous knowledge in areas such as ecosystem-based decision making and marine biosecurity. The climate early warning systems (CLEWS) team received the Teams Award for its long-term programme of upgrading weather and hydrological monitoring stations and developing climate early warning capability across the Pacific Islands. Coastal engineer Rob Bell received the Individual/Lifetime Achievement Award for nationally significant contributions to environmental management over many years.



### Lockdown Blues

When diver and underwater photographer Crispin Middleton was unable to carry out his favourite activity because of the COVID-19 lockdown, he turned his lens on a stream running through his property. The judges said this image of a kōura resting on a fallen nīkau palm frond won for its intriguing and unique perspective. They agreed it was a challenging photo to take and the split above and below the water's surface beautifully done.

NIWA PHOTOGRAPHY AWARDS  
Freshwater Award Winner  
Crispin Middleton



# BOARD OF DIRECTORS



**Barry Harris**  
Chairman

Barry is a company director with extensive governance and executive experience. He has held several chief executive roles, including Environment Waikato, Greater Wellington Regional Council and Hamilton City Council. He was also a senior executive with Fonterra for five years. Barry is currently chair of Food Innovation Waikato, McFall Fuels, OSPRI and Hamilton Airport and is a director of WEL Networks Limited and Ultra Fast Fibre. Previous boards include Wintec, Waikato River Authority, AgResearch and DairyNZ. Barry has a Master of Agricultural Science (Honours). He was appointed Chairman of NIWA in July 2018.



**Nick Main**  
Deputy Chairman

Nick is a Chartered Accountant and was CEO and later Chairman of Deloitte in New Zealand. More recently, he was Deloitte's Global Managing Partner of Sustainability and Climate Change Services and Global Chief Sustainability Officer, based in London. He has also served as Deloitte's Global Chief Ethics Officer. Nick currently chairs the Middlemore Foundation for Health Innovation, chairs the Westpac New Zealand Sustainable Business External Advisory Panel, and is a member of the Westpac Australia Stakeholder Advisory Council and a trustee of BLAKE.



**Dr Helen Anderson**

Helen chairs the BRANZ Board, Scion and Studio Pacific Architecture. She is an independent director of DairyNZ and Antarctica NZ and is on the Risk and Assurance committees for MPI and Statistics NZ. She was Chief Executive of the Ministry of Research, Science and Technology for six years, preceded by six years as Chief Science Adviser. Helen chairs or is a member of advisory boards for DIA, MBIE, NZ Police and ClearPoint Ltd. She has a PhD in geophysics from Cambridge University and enjoys keeping up-to-date with the latest science developments.



**Dr Tracey Batten**

Tracey has 15 years' experience as CEO for large healthcare organisations in both Australia and the UK and has worked closely with businesses in the hospital, aged care and medical research sectors. Tracey was Chief Executive of Imperial College Healthcare NHS Trust in the UK. Prior to that she was Chief Executive of St Vincent's Health in Australia. She has held governance positions with private and public organisations and is a director of Abano Healthcare, Medibank Private Limited (Australia) and ACC. Tracey qualified as a doctor at the University of Melbourne and has a Master of Health Administration from the University of New South Wales and an MBA from Harvard.





### **Prof. Gillian Lewis**

Gillian is a Professor of Environmental Microbiology and Associate Dean for Sustainability in the Faculty of Science and University Proctor at the University of Auckland. She was formerly Associate Dean of Research, Head of the School of Biological Sciences, held a leadership role in the Joint Graduate Schools between the Faculty of Science and CRIs or research organisations. Gillian is a former President of the New Zealand Microbiological Society. She has a PhD in Microbiology from the University of Otago. Her research focuses on the interactions of complex microbial communities and their response to natural and anthropogenic impacts in freshwater environments.



### **Mary-Anne Macleod**

Mary-Anne is an independent director for the Bay Venues Limited and the Environmental Protection Authority. She has previously held governance roles with House of Science, Quayside Holdings Limited, Priority One and the Bay of Plenty Local Areas Shared Service organisation. She was the Chief Executive of the Bay of Plenty Regional Council for seven years and has also held other senior positions in local and central government agencies. Mary-Anne has also worked at a senior level in international consultancies where she specialised in environmental management. She has a Master of Science (Hons) in Earth Sciences and Geography.



### **John Morgan** Chief Executive

John joined NIWA as CEO in April 2007. He has extensive senior executive and governance experience in public and private sector organisations covering a range of markets and activities, including business, science, education and sport. His science sector roles have included Chairman of Science New Zealand, CEO of AgriQuality Ltd, Executive Director of Orica New Zealand Ltd, and Chairman of New Zealand Pharmaceuticals Ltd. John is passionate about the role science can play in transforming New Zealand's economy, environment, society and global reputation.



# EXECUTIVE TEAM



**John Morgan**  
Chief Executive

John joined NIWA as CEO in April 2007. He has extensive senior executive and governance experience in public and private sector organisations covering a range of markets and activities, including business, science, education and sport. His science sector roles have included Chairman of Science New Zealand, CEO of AgriQuality Ltd, Executive Director of Orica New Zealand Ltd, and Chairman of New Zealand Pharmaceuticals Ltd. John is passionate about the role science can play in transforming New Zealand's economy, environment, society and global reputation.



**Geoff Baird**  
General Manager, Communications & Marketing

*BSc Hons (Ecology),  
Victoria University of Wellington*

Geoff has extensive experience in science publishing and communication from working with the Ministry of Agriculture and Fisheries, MAF Fisheries and NIWA. He became NIWA's Communications Manager in 2003 and General Manager, Communications and Marketing in July 2007, with a focus on reinforcing the values underlying the NIWA brand, enhancing communication and uptake of NIWA's science and demonstrating how NIWA enhances the benefits of New Zealand's natural resources.



**Patrick Baker**  
Chief Financial Officer

*MEng, Brunel University, London; BBus (Accounting and Management), GDip (Professional Accounting), Open Polytechnic of New Zealand; CA*

Patrick is a Chartered Accountant. He began his career as an engineer with Ford Motor Company in the UK before moving into financial management. He served in senior country finance management positions in Europe and the Middle East before joining Ford New Zealand in 2004. After choosing to settle permanently in New Zealand in 2012, he was appointed CFO of The Network for Learning Limited, a Crown company established to deliver managed internet services to New Zealand's schools. He joined NIWA as CFO and Company Secretary in May 2014.



**Dr Rob Murdoch**  
General Manager, Research

*PhD (Marine Science), University of Otago*

Rob has a specialist interest in oceanography and marine ecology, and has been a practising scientist on projects associated with the Southern Ocean, aquaculture, oil and gas exploration and marine conservation. He has overseen the planning and direction of NIWA's research and the operation of the research vessels since 1999, and helps manage NIWA's relationships with key stakeholders and collaborators. Rob has been seconded part time to the Ministry of Business, Innovation & Employment as a Departmental Science Advisor since 2017.



**Dr Helen Neil**  
General Manager, Operations

*PhD (Earth Sciences), University of Waikato*

Helen is an experienced geologist with interests in seabed mapping, oceanography, and stable isotope geochemistry. Her expertise has been applied to the management and delivery of large-scale, multidisciplinary projects and research voyages. Helen previously led the Ocean Sediments Research Group, joined the Operations Management Team in 2016 as National Projects Manager, and was appointed General Manager, Operations in July 2018.



**Marino Tahī**  
General Manager, Māori Strategy & Partnerships

*MBA, Massey University, BA (Māori Resource Management) and BCA (Management and commercial law), Victoria University of Wellington*

Marino provides strategic leadership for NIWA's research and applied science services for Māori, with the aim of maximising the transfer of environmental and natural resource scientific knowledge to whānau, hapū, iwi, Māori entities and communities – for the economic, social, cultural and environmental benefit of the nation. He joined NIWA in 2015 from Landcare Research, where he was the Māori Partnerships Manager – Business Development since 2006. His tribal affiliation is Ngāi Tūhoe, and he comes from Ruatahuna, a small settlement in Te Urewera.



**Dr Bryce Cooper**  
General Manager, Strategy

*PhD (Microbiology), University of Waikato*  
Bryce is a graduate of the London Business School Senior Executive Programme. He has held research leader and regional manager roles in NIWA, and currently oversees NIWA's strategy development, including initiatives to transfer research to end users and the building of partnerships with businesses and central and local government.



**Dr Mary-Anne Dehar**  
General Manager, People & Capability  
*PhD (Psychology), PGDipPsych (Comm), University of Waikato*

Mary-Anne is a registered psychologist, specialising in industrial/organisational psychology. Before joining NIWA in 2008, she practised as a consultant psychologist for 15 years, both in private practice and for several large consulting firms. Prior to that she worked in evaluation research with a range of community, justice, public health and health promotion programmes. Mary-Anne has extensive experience in psychological assessment, learning and development, executive coaching, leadership development, and organisational change and performance improvement initiatives.



**Warrick Johnston**  
General Manager, Technology & Innovation

*BSc Geology, Otago University*  
Warrick has more than 20 years' experience in strategy, product development, service creation and delivery, and niche technologies. He has the ability to understand complex technology combined with a practical nature and the experience to understand the market and business needs. Warrick possesses expertise in all things spatial, with many years' experience working in developing the GIS market. He developed his skills through a career in start-ups, ISVs, niche technology companies and product companies such as Microsoft and Esri. He joined NIWA as General Manager, Technology and Innovation in 2020.



**Jules Maxey**  
Executive Assistant to the NIWA Board and Chief Executive





## Taranaki

Lake Managamahoe and Mt Taranaki feature in a very moody shot with a dramatic sky and almost painterly look to the bush. The judges said it reminded them of a period painting and remarked it was great to see a photo like this where the photographer “has not succumbed to the temptation of over-processing the colour”.

NIWA PHOTOGRAPHY AWARDS  
Our Places Award Winner  
**Shannan Crow**



# SCIENCE MANAGEMENT TEAM



**Andrew Forsythe**  
Chief Scientist, Aquaculture  
*DVM, University of Prince Edward Island*

Andrew joined NIWA in 2005, after more than 20 years' experience in North American and European aquaculture. He has extensive expertise in the design and operation of recirculating aquaculture systems and has managed freshwater production for a major salmon farming company. Andrew took up his current role in 2007.



**Dr Andrew Tait**  
Chief Scientist, Climate, Atmosphere & Hazards  
*PhD (Climatology), University of Colorado*

Andrew joined NIWA in 2000. His research areas of interest are climate change impacts and implications, adaptation to climate change, spatial modelling of climate, and sector and business applications of climate data. He was seconded to MPI in 2017 to contribute to the Primary Sector Science Roadmap and to DOC from 2017 to 2019 to work on their Climate Change Adaptation Action Plan.



**Petra Pearce**  
Manager, Climate, Atmosphere & Hazards  
*MSc Hons (Geography), University of Auckland*

Petra joined NIWA in 2008. Her research background is in historic climate and climate data rescue. She provides climate change advice to regional councils, government agencies, and businesses, and she regularly engages with the public, media, businesses and other organisations about climate change in New Zealand.



**Dr Barb Hayden**  
Chief Scientist, Coasts & Oceans  
*PhD (Marine Biology), University of Otago*

Barb has a research background in marine biosecurity and the environmental sustainability of aquaculture. Today she leads NIWA's coasts and oceans research, which focuses on ecosystem-based approaches to managing activities in New Zealand's marine estate, so that economic and social benefits are realised while vulnerable components of the ecosystem are protected.



**Graeme Inglis**  
Manager, Marine Environment Platform  
*PhD (Marine Ecology), University of Sydney*

Graeme has a background in coastal ecology, environmental assessment, marine tourism and biosecurity. He has led national and international programmes of research on risk assessment, surveillance and control of invasive marine species and has provided technical training and advice on marine pests and their management around the world.



**Dr Jochen Schmidt**  
Chief Scientist, Environmental Information  
*PhD (Geography), University of Bonn*

Jochen has a cross-disciplinary research background in hydrology, geomorphology, soil science, geo-informatics, and hazards and risk assessment. He joined NIWA in 2003 and since 2010 has led NIWA's environmental information research and developments, ensuring that systems for collecting and managing NIWA's data are robust and meet best-practice standards.



**Dr Rosemary Hurst**  
Chief Scientist, Fisheries

*PhD (Zoology), Victoria University of Wellington*

Rosemary has worked in fisheries research since 1979. She is a specialist in middle-depth and inshore fisheries resource surveys and stock assessment and has also conducted research on fish communities, ocean climate effects on fisheries, and trawl catchability and selectivity. She was a regional manager at NIWA Wellington for eight years and has been in her current role since 2010.



**Dr Scott Larned**  
Chief Scientist, Freshwater & Estuaries

*PhD (Ecology and Evolution), University of Hawai'i*

Scott is an ecosystems ecologist with expertise in freshwater and marine water quality and algae. He has carried out research in settings including coral reefs, rivers, rainforests, estuaries, lakes and aquifers. At NIWA, Scott has led research in water quality, environmental flows, and surface water-groundwater science since 2001 and took up his current role in 2018.



**Dr Neale Hudson**  
Manager, Freshwater & Estuaries

*PhD (Environmental Chemistry), Queensland University of Technology*

Neale is an organic chemist with a research background in natural product chemistry and organic synthesis, odour emission and mitigation research and water quality assessment. Recently he has focused on understanding information hidden within high-frequency water quality data and evaluating the efficacy of devices used for mitigating agricultural contaminants.



**Kameron Christopher**  
Chief Scientist, High Performance Computing & Data Science

*PhD (Engineering and Computer Science), Victoria University of Wellington*

Kameron has a research background in artificial intelligence (i.e. ML, DL, and RL), digital signal processing (i.e. image, audio, and sensors), and cognitive and affective neuroscience. He has extensive experience leading data and data science across a range of industries including the financial and science sectors, and joined NIWA in 2019.



**Erica Williams**  
Pou Whakarae - Te Hiringa Taiao  
Chief Scientist, Māori Environmental Research

*PhD (Biological Sciences), University of Auckland*

Erica joined NIWA in 1995 and has been a member of NIWA's Te Kūwaha team since 2001. She has been involved in a wide range of research areas including bioaccumulative contaminants in mahinga kai species, understanding the values and priorities of Māori communities for the restoration of their freshwaters, taonga species-related research, and capacity building and monitoring frameworks for Māori communities.



**Douglas Ramsay**  
Manager, Pacific Rim

*MSc (Water Engineering), University of Strathclyde*

Doug is a chartered engineer. He joined NIWA in 2003, following roles with HR Wallingford in the UK and the Government of Kosrae in the Federated States of Micronesia. He specialises in coastal hazard management and coordinates NIWA's international commercial work, focusing on the Pacific and Asia regions.

# SCIENCE MANAGEMENT TEAM



## Greg Foothead

General Manager, Vessel Operations

*NZCE (Mechanical),  
Central Institute of Technology*

Greg is a certified automotive engineer. Before joining NIWA Vessels as Engineering Manager in 2004, he managed a marine and industrial supply and repair company. He has also worked for Mitsubishi Motors, in various technical roles, in New Zealand, Australia and Europe. Greg has managed NIWA's research vessels *Tangaroa*, *Kaharoa* and *Ikatere* since December 2010.



## Rob Christie

Manager, Marine Resources

*BSc (Hons) (Environmental Science  
& Technology), Middlesex University*

Rob is a chartered scientist with more than 26 years' international experience. He has held senior management positions in environmental consultancy and science sectors in the UK, Australia and New Zealand. Rob joined NIWA in 2013 and has oversight of the NIWA vessel fleet and the application of marine science.



## Dr Mark Bojesen-Trepka

Manager, Marketing & Industry Engagement

*PhD (Marketing and Technology Management),  
University of Waikato*

Mark is an industrial marketer, and has led the marketing, product development, technology transfer and business-development effort for firms in the plastics, steel and primary sectors. Past roles include National Marketing Manager for BHP Steel Building Products, National Marketing Manager for ICI Resins and Adhesives Division and General Manager for NorthFert.



## Chris Daughney

Principal Science Advisor

*PhD (Environmental Geochemistry),  
McGill University, Canada*

Chris joined NIWA as Principal Science Advisor in 2020. Most recently he held roles as Principal Science Lead at the Ministry for the Environment, and as Director of the Environment and Materials Division at GNS Science. He has research interests in groundwater quality, geomicrobiology and numerical flow and transport modelling of hydrological systems.



## Alan Grey

Manager, MBIE Research

*MSc Hons I (Geology), University of Canterbury*

Alan has a background in ecology and earth sciences. He has extensive experience in research administration and science and technology programme evaluation. He oversees NIWA's obligations to government funding agencies and responsibilities for undertaking research for the benefit of all New Zealanders, and evaluation of the impact and value of NIWA's research.



## Dr Alex Thompson

Manager, Research Development & Engagement

*PhD (Atmospheric Chemistry),  
York University of Canada*

Alex joined NIWA in 2017 after a decade in government in climate policy advice and as a science investment manager. Before returning to New Zealand, Alex was a founding editor of *Natural Geoscience*, and previously held scientist roles at British Antarctic Survey in Cambridge UK, University of California at Berkeley, and Forschungszentrum Jülich in Germany.



### Football octopus catches a ride inside a salp

It's the photo the judges say has it all – lovely light, amazing sharpness, exquisite detail, humour and brilliance. Crispin Middleton has dived the Poor Knights more than 1000 times and spotted the football octopus last November. He hadn't seen the elusive species before that day and hasn't seen them since. It's a photograph that has also earned him a finalist spot in the New Zealand Geographic Photographer of the Year.

NIWA PHOTOGRAPHY AWARDS  
Special Award Winner  
Crispin Middleton

# OPERATIONS MANAGEMENT TEAM



## Ken Becker

Regional Manager, Bream Bay

*BSc Hons (Marine Biology), University of Liverpool*

Ken has nearly 40 years' experience in marine science. Before joining NIWA as a regional manager in 2005, he worked for Auckland Regional Council on resource management regulation, planning and policy development in water quality, wastewater treatment, stormwater management and water resource allocation.



## Jonathan Moores

Regional Manager – Auckland

*MSc (Hydrology for Environmental Management), Imperial College, University of London.*

Jonathan joined NIWA as an urban aquatic scientist in 2005, where he led applied research and consultancy studies to inform improved stormwater management in our towns and cities, and became Group Manager of the Urban Aquatic Environments team. He has been Regional Manager of NIWA's Auckland office since 2019.



## Dr Michael Bruce

Regional Manager, Hamilton

*PhD (Aquaculture), University of Stirling*

Michael joined NIWA in 1999, and he has more than 25 years' experience in aquaculture research and working with industry. In 2011 he was appointed Assistant Regional Manager for Auckland, managing our Northland Marine Research Centre at Bream Bay. In 2019 he was appointed Regional Manager for the Hamilton region.



## Dr Scott Stephens

Assistant Regional Manager – Hamilton

*PhD in Earth Sciences, University of Waikato*

Scott is a coastal hazards scientist who joined NIWA in 2001. He specialises in extreme sea-level and wave analysis and assessment of coastal hazards for adaptation to sea-level rise. Before becoming Assistant Regional Manager in 2019 he was the Coastal and Estuarine Physical Processes Group Manager in Hamilton.



## Dr Alison MacDiarmid

Senior Regional Manager, Wellington

*PhD (Zoology), University of Auckland*

Alison has broad experience in marine behavioural ecology, reef ecology and management, marine ecosystem risk assessment, closed area management, and historical marine ecology. Alison leads the Wellington Regional Management Team, with a particular focus on the Future Property Programme. She also chairs NIWA's Emergency and Crisis Management Critical Risk Team.



## Steve Wilcox

Regional Manager, Wellington

*NZCE Electronics and Computer Science*

Steve has worked within the marine geotechnical and hydrographic community for the last 36 years. During this time Steve has been on over 120 scientific and commercial voyages as well as over 30 land-based nearshore and lake surveys. Prior to his appointment as Regional Manager in 2019, Steve was the Group Manager Marine Technology.



**Dr Judy Sutherland**

Assistant Regional Manager, Wellington  
*PhD (Biochemistry), University of Otago*

Judy is a molecular biologist specialising in phylogenetics and systematics. Since joining NIWA in 2015 she has led the NIWA Molecular Biology team, which works across several areas including biodiversity, biosecurity, aquaculture and fisheries. She was Group Manager, Environmental Isotopes and Molecular Biology before her appointment as Assistant Regional Manager in 2020.



**Dr Darren Ngaru King**

Regional Manager – Nelson  
*PhD (Applied Geology), University of New South Wales*

Darren is a research scientist with experience spanning the earth and human-system sciences. In addition to being the Regional Manager for Nelson, he leads NIWA's Māori Environmental Research Programme 'Hazards, Climate and Māori Society' and holds a joint position on the Kāhui Māori for the Deep South National Science Challenge and the Antarctic Science Platform.



**Dr Helen Rouse**

Regional Manager, Christchurch  
*PhD (Physical Geography), University of Hull*

Helen trained as a coastal geomorphologist. She joined NIWA in 2007, first as a resource management scientist, then from 2014 as National Projects Manager. She has been Regional Manager of the Christchurch region since January 2016 and was also Nelson Regional Manager from April 2017 to February 2020.



**Dr Phillip Jellyman**

Assistant Regional Manager, Christchurch  
*PhD (Ecology), University of Canterbury*

Phil is a freshwater fisheries scientist specialising in freshwater resource management and conducting research on freshwater fisheries and food webs. He currently leads large freshwater consenting projects for NIWA's hydropower clients. Prior to becoming Assistant Regional Manager in 2018 he was the Freshwater Ecology Group Manager in Christchurch.



**Charles Pearson**  
National Manager, Environmental Information Operations

*MSc Hons (Engineering Hydrology), National University of Ireland*

Charles is a hydrologist specialising in the analysis of hydrological and other data for purposes such as estimating flood risks. He is also the World Meteorological Organization's Hydrological Adviser for New Zealand. Charles has extensive staff and operations management experience and was appointed to his current position in January 2016.



**Brian Bell**  
National Projects Manager

*MA Hons (GIS/Geography), State University of New York*

Brian has a background in geospatial science and technology, including over 20 years of operational and innovation management in the environmental science domain. He is certified in programme management, product management and design thinking. Brian relocated to New Zealand from America in 2015 and was the GM of Products & Partnerships with MetService before joining NIWA as National Projects Manager in 2019.



# DIRECTORY

## Directors

Barry Harris  
Chairman

Nicholas Main  
Deputy Chairman

Dr Helen Anderson

Dr Tracey Batten

Prof. Gillian Lewis

Mary-Anne Macleod

Michael Pohio  
(until 31 January 2020)

## Executive Team

John Morgan  
Chief Executive

Geoff Baird  
General Manager, Communications & Marketing

Patrick Baker  
Chief Financial Officer

Dr Barry Biggs  
General Manager, Technology & Innovation  
(until 31 July 2020)

Dr Bryce Cooper  
General Manager, Strategy

Dr Mary-Anne Dehar  
General Manager, People & Capability

Warrick Johnston  
General Manager, Technology & Innovation  
(appointed 1 August 2020)

Dr Rob Murdoch  
General Manager, Research

Dr Helen Neil  
General Manager, Operations

Marino Tahī  
General Manager, Māori Strategy & Partnerships

## Registered office and address for service

41 Market Place  
Auckland Central 1010  
New Zealand

## Auditor

Troy Florence with the assistance of  
PricewaterhouseCoopers on behalf of  
the Auditor-General

## Bankers

ANZ Bank New Zealand Ltd

ASB Bank Ltd

Westpac New Zealand Ltd

## Solicitors

Meredith Connell

Atkins Holm Majurey

## Insurance broker

Marsh Ltd

## Head office

41 Market Place  
Auckland Central 1010  
Private Bag 99 940  
Newmarket 1149, Auckland  
New Zealand

Tel +64 9 375 2050

Fax +64 9 375 2051

## Website and social media

[www.niwa.co.nz](http://www.niwa.co.nz)

[weather.niwa.co.nz](http://weather.niwa.co.nz)

[facebook.com/nzniwa](https://facebook.com/nzniwa)

[twitter.com/niwa\\_nz](https://twitter.com/niwa_nz)

[twitter.com/niwaweather](https://twitter.com/niwaweather)

[linkedin.com/company/niwa](https://linkedin.com/company/niwa)

[instagram.com/niwa\\_science](https://instagram.com/niwa_science)

### Taihoru Nukurangi

NIWA's Māori name Taihoru Nukurangi describes our work as studying the waterways and the interface between the Earth and the sky. Taihoru is the flow and movement of water (from tai 'coast, tide' and horo which means 'fast moving'). Nukurangi is the interface between the sea and the sky (i.e., the atmosphere). Together, we have taken it to mean 'where the waters meet the sky'.

### Reflections from the forested foreshore of Lake Matheson

This iconic scene has the judges' approval, with them calling it a gorgeous landscape shot that was very well presented. "It's a great example of landscape photography with beautiful 'golden hour' light enhanced by a thin line of mist rising from the lake." The symmetry and the framing, they said, was lovely.

NIWA PHOTOGRAPHY AWARDS  
Emerging Photographer Award Winner  
Dafei Wu

Presented to the House of Representatives pursuant to section 44 of the Public Finance Act 1989.

The NIWA Annual Report for 2020 is presented in two parts - the Year in Review and the Annual Report (Reports and Financial Statements). Collectively, these two documents fulfil our annual reporting responsibilities under the Crown Research Institutes Act 1992.

The Year in Review is an illustrated document containing the Chairman and Chief Executive's report, descriptions of our research capabilities and performance, including our work with Māori and other collaborators and stakeholders, and an overview of our people.

Both reports are available digitally at [www.niwa.co.nz/about/annual-reports](http://www.niwa.co.nz/about/annual-reports)

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# Science working for New Zealand

The Crown Research Institutes (CRIs) proudly work, individually and collectively, to create a more prosperous, sustainable and innovative New Zealand



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3,600

SMART AND  
PASSIONATE PEOPLE

50

SITES ACROSS  
NEW ZEALAND

6,000

SCIENCE PROJECTS  
EACH YEAR

40

NATIONALLY SIGNIFICANT  
DATABASES & COLLECTIONS



**NIWA**

Taihoro Nukurangi

Climate, Freshwater & Ocean Science