

## Aquaculture Team



Alan Blacklock, NIWA

*Dr Phil Heath and Graeme Moss hold some of NIWA's prized paua broodstock at NIWA's cold-water facility at Mahanga Bay, Wellington. NIWA's warm-water facility is at Bream Bay, Northland. The team works together with industry partners to develop new aquaculture species and compare their suitability for different conditions.*

## Aquaculture north and south: we have it covered

With aquaculture research facilities at Bream Bay (Northland) and Mahanga Bay (Wellington) we're able to develop new aquaculture species suitable for both warm and cool water conditions. Scientists and industry partners at these sites combine their expertise in fish husbandry, nutrition and health, recirculation systems, and selective breeding.

Aquaculture breeding expert Dr Jane Symonds has initiated selective breeding programmes for paua, kingfish, and hapuku (groper). NIWA's paua expert Graeme Moss and aquaculture scientist Dr Seumas Walker have helped to establish 48 paua family lines from which we'll select the best quality broodstock. Along with industry partners OceanNZ Blue Ltd, we're comparing the performance of paua family members in the different environments at Mahanga Bay and Bream Bay.

The finfish rearing team at Bream Bay, led by Steve Pether and Yann Gublin, have achieved a world first in kingfish selective breeding: crossing a single male and female in captivity. Meanwhile, Mahanga Bay manager Dr Phil Heath and scientist Dr Phil James are leading comparisons of kingfish growth and survival rates between the two sites. So far, the warmer waters of Northland appear to be more suitable for rearing kingfish. Hapuku may prove more suitable for rearing in cooler southern waters.

## Climate Change Monitoring Team

### Monitoring greenhouse gases in all their forms

NIWA's climate change monitoring team has an international reputation for precision measurements of greenhouse gases and their isotopes. About 40 staff spread between Wellington, Lauder (Central Otago), and Dunedin work together to monitor greenhouse gases at various locations from Japan to Antarctica. This work is key to understanding the processes driving climate change.

We have the capability to measure greenhouse gases at a wide range of scales. From emissions of nitrous oxide – a potent greenhouse gas – above pastures, emitted at the rate of one billionth of a gram per square metre per second, to carbon dioxide measurements representing a large part of the southern hemisphere. The latter have been taken at Baring Head, on Wellington's windswept south coast, since the 1970s – the second longest record in the world.

We measure carbon dioxide concentrations from the bottom of the ocean to the top of the atmosphere. At Lauder, we operate one of only four instruments in the world capable of measuring all the molecules of carbon dioxide in an entire air 'column', from the ground to the top of the atmosphere.

Few groups in the world can boast this range of capabilities and synthesise them to understand New Zealand's carbon budget.



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*Tony Bromley, Ross Martin, and Gordon Brailsford in a trace gas monitoring lab at Baring Head, Wellington. They are part of NIWA's climate change monitoring team: about 40 staff measure greenhouse gases from Japan to Antarctica.*

## Environmental Forecasting Team



Alan Blacklock, NIWA

Scientists and IT specialists form the backbone of NIWA's environmental forecasting team. Pictured here are Dr Hilary Oliver, Phil Andrews, Chris Edsall, Dr Michael Uddstrom, Stuart Pigneguy, Matthieu Castellazzi, Colin Tinker, Bernard Miville, and Dr Trevor Carey-Smith.

## Our multi-talented forecasting team

The team that drives NIWA's new environmental forecasting system, EcoConnect, combines backgrounds as diverse as theoretical physics, supercomputing, graphics, and marketing. Together, they aim to deliver the most accurate, high-resolution environmental forecasts possible, 24/7.

At the heart of the system is a weather prediction model, NZLAM, which feeds into a network of models predicting waves, storm surge, sea level, river flow, and floods. "There is nowhere else in the world where these models are integrated together like this," says EcoConnect's science leader Dr Michael Uddstrom. An independent review panel concluded that this could be achieved only at NIWA because of our unique combination of disciplines.

Behind this impressive platform is a core team of fourteen staff. In collaboration with international partners, its scientists are developing and implementing computer codes that turn the complex physics of fluids and gases into high-resolution forecast models.

The IT delivery is equally revolutionary. It uses advanced software to provide a Windows-like environment over the web, where the forecasts can be viewed as interactive maps and graphs. "It's the next generation of getting information to users, who include everyone from farmers to regional councils, energy companies, and port authorities," says EcoConnect operations manager Bernard Miville.

## Water Resources Team

### How much water is there in New Zealand?

Water is one of our most precious resources, and keeping tabs on water quantity and quality is vital to human health and New Zealand's prosperity. NIWA's water resources and catchment processes team monitors and predicts the availability of water in waterways throughout New Zealand.

They analyse climate data (including rain and snow accumulation), soil moisture and river flow data collected through national monitoring networks to predict river flows in places where there are no data. This requires a high degree of analytical capability from a range of disciplines, including mathematics, engineering, and geography.

In order to understand the complex catchment processes that affect how much water ends up in New Zealand's rivers, they also undertake detailed field studies of certain catchments. These investigate influences such as climate, topography, vegetation cover, geology, soil type, riverbed characteristics, and processes of snow accumulation and melt. "It's very important to see how things happen in the real world in order to understand the limitations of the models, so you don't apply them to the wrong situations," says acting group manager Roddy Henderson.

The ten-member team also works with NIWA freshwater biologists and river sedimentologists to advise on the likely impacts of water extraction, dams, and discharges.



Dennis Jamieson, NIWA

Hydrologists Dr Richard Ibbitt and Dr MS Srinivasan measure the scale of the flow channel in the normally dry bed of the Eyre River, Canterbury. Our Christchurch-based water resources & catchment processes team monitors and predicts the availability of water throughout New Zealand.