Increasing knowledge about our seas

Aotearoa New Zealand has one of the world's largest Exclusive Economic Zones (EEZ) compared to its land area. However, we know relatively little about our oceans, particularly the coastal and shelf areas that are most important to our blue economy (including fishing, aquaculture, and tourism). The Moana Project aims to change this by making existing data available for all to use, and by working with Aotearoa's ocean community to collect new subsurface ocean observations. These observations are incorporated into hydrodynamic ocean models that allow us to better understand ocean temperature, salinity and currents, and the reasons they change.

We have increased the amount of ocean data available by obtaining and quality checking observations (of temperature, salinity, sea level height, current flow) from many organisations around New Zealand. When possible, those measurements are shared through the [New Zealand Ocean Data Network](), managed by NIWA, so they are available for anyone to use.

Crowd-sourcing ocean observations

We're also generating new subsurface observations through the Mangōpare sensor programme. The small, lightweight and rugged sensor, developed by Nelson company ZebraTech, attaches to commercial fishing gear. Once installed, the sensor and data pathway are fully automatic, with no intervention required from the fisher. While the gear is submerged, the sensor records temperature and depth very accurately, and when it surfaces, the data is automatically sent to the cloud via a solar-powered deck unit. From there, the data is quality checked and emailed back to the fisher within three hours and is available for incorporating into the Moana ocean models in near real-time. These observations help make the models much more accurate, and provide fishers with more information to understand the ocean they work in.

The Mangōpare Sensor

Millions of new observations

The sensor programme has had an amazing uptake from the New Zealand fishing industry (and others), and thanks to many skippers and crew, and the backing of industry bodies like the Deepwater Group, Fisheries Inshore NZ, Southern Inshore Fisheries, Rock Lobster Industry Council, Paua Industry Council and Seafood NZ, we have achieved a nation-wide, coastal ocean observing system with fishing vessels as ocean observing platforms - something that has never been done before in the world. We've distributed around 300 sensors to commercial fishers, as well as to education, research, industry, recreational, and waka groups. These tireless ocean observers have collected 10s of millions of measurements and are adding 100s of observation profiles daily. Where in 2020 we had next to no near-real-time ocean observations in coastal regions, at the end of 2022 we had more than 40 million, and the number of vessels and fishing deployments continues to grow.
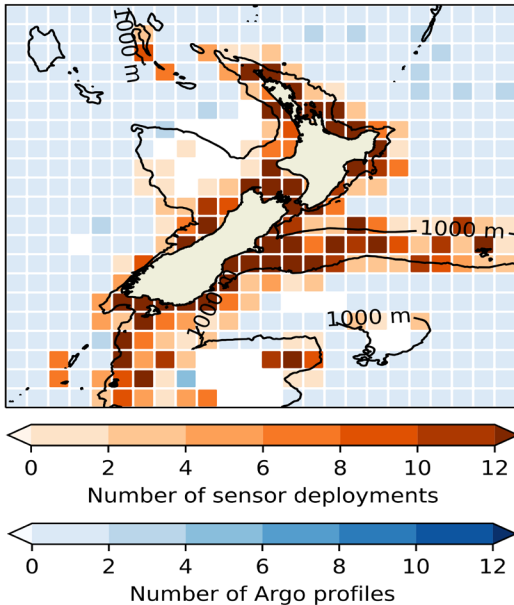
The Mangōpare sensor ocean observations (June 2020-2023) cover coastal and shelf areas where international programmes like Argo drifters don't easily go. For the first time, we are getting near-real-time data from the area we use the most in the blue economy.

New Zealand leading the way

Countries around the world are trying to get more data to help them better understand how and why the ocean is changing. New Zealand is leading the way: the Mangōpare programme is one of the most advanced and successful attempts at crowd-sourcing ocean measurements in the world, and we are collaborating closely with agencies overseas. The sensor is used in the Atlantic, under the ice in Greenland, and in the Southern Ocean, and others want to learn from our experience to establish similar observing programmes globally.

A nation of oceanographers

Mangōpare observations are available to be incorporated into the Moana ocean models in near-real-time – this means that a fisher collects data in the spot fished, and that same data will be incorporated into tomorrow's forecast for that location, making the forecast much more accurate for the fishing sector and others to use. Fishers are excited to use their observations to better understand fishing patterns and how their local regions are changing. Through close co-design efforts between fishers and oceanographers, the programme is connecting New Zealand's ocean community by developing a new, innovative ocean-observing sensor system.

Understanding our seas

Measurements improve ocean forecasts, and create a picture of our ocean in the past. By comparing today's temperature below the surface with the average temperature for that day and location in the past, we can understand the health of the ocean. Ocean temperature helps us understand ocean and weather extreme events, plan for the future of our blue economy, and make informed decisions.
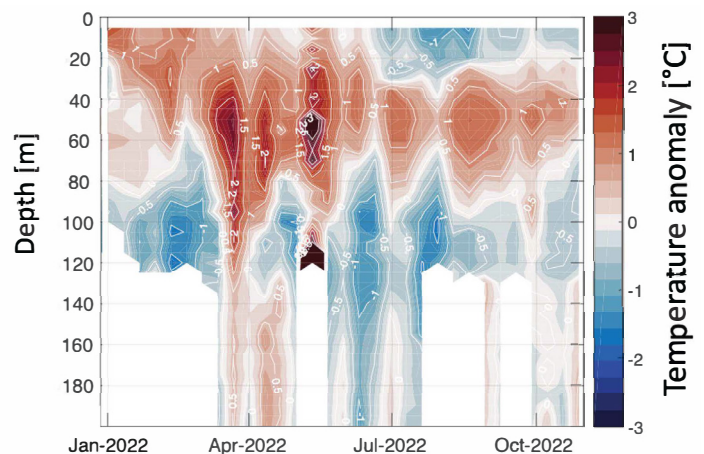
Ocean temperature from the Mangōpare sensors in the Bay of Plenty area compared to normal ocean temperature for each depth and day of the year. Temperature anomaly is the difference between observed and normal ocean temperatures. Red shading indicates that the observed temperatures are warmer than normal; blue that they are colder. Temperatures much warmer than average are seen near 60 m depth from March through October 2022.