

Our oceans are changing and we need measurements to model the future

Recently, marine heatwaves have hit New Zealand waters leading to temperatures well above normal. These higher temperatures may impact fish populations, and currently we do not know how deep they extend or how they affect fished species.

As part of the NZ-government funded [Moana research project](#), MetService is working with fishers to collect real-time observations from the seas around New Zealand to improve ocean forecasts.

Just like weather stations help increase the accuracy of atmospheric weather forecasting, getting more ocean observations helps us improve ocean models. Through the Moana Project, we have developed New Zealand's most accurate ocean models yet, forecasting current strength and direction, temperature, and salinity from the surface to the sea floor, and sea surface height.

Sensor attaches to commercial fishing gear

For the Moana Project, Nelson-based ZebraTech has developed a compact, low-cost temperature sensor (the Mangōpare sensor) that can be attached to many types of commercial fishing gear.

The Mangōpare sensor is the marine version of a weather station. By getting near real-time observations into our ocean models, we can improve our ocean forecasting of temperature, salinity and current speed immensely.

Fishers collect ocean temperatures

Fishers have always been ocean experts. The Mangōpare sensor puts ocean data collection back into the hands of those who work on, and depend upon, the sea.

We need subsurface marine measurements within New Zealand's EEZ to understand how the ocean is changing below the surface. International ocean observing programmes such as Argo (www.argo.net) provide some deepwater profiles offshore but our subsurface coastal waters are not well monitored. Fishing vessels operate in areas where we have few ocean measurements, such as below the surface, in coastal waters, and offshore seas.

In New Zealand's waters, we have approximately 300 fishing events per day, compared to about 3 daily profiles from existing ocean monitoring programmes. A network of fishing vessels can collectively provide cost-effective, real-time data profiles in our vast EEZ.

What we are asking fishers to do?

We have started large-scale roll-out of the sensors and are looking for participants who want to deploy temperature sensors on their fishing gear New Zealand-wide. Participating fishers install the sensor on fishing gear and a standalone, solar-powered deck unit on the vessel. After the installation, the system needs no intervention.

What do fishers get in return?

You will own and be able to access your individual vessel temperature data, along with Moana Project forecasts and hindcasts. Sensor measurements are emailed back to the vessel that obtained them within 24 hours and will potentially be available via FishServe in the future.

The Moana Project also produces accurate 3D ocean temperature hindcasts (past 30 years) and forecasts (5-7 days) for New Zealand's seas, using the sensor data to improve the Moana Project models. Temperature, salinity, and current information from the ocean surface to ocean floor will be available online as downloadable files, via email, and via our ocean forecast viewers, Swellmap (<https://swellmap-website.vercel.app/>) and MetOceanView (<https://metoceanview.com/>). The seafood sector can compare sensor and model data with their catch information and understand changes in catch based on temperature.

The data will benefit NZ fisheries & fishers



Small and lightweight: the sensor measures 14.5 cm by 4 cm.

We are working with industry bodies FINZ and the Deepwater Group to further the understanding of the link between water temperature at depth and fish distribution. The fishing industry can provide very valuable ocean observations on an unprecedented scale, which can be used to answer a range of questions. For example, better ocean data will improve our understanding of general ocean warming, marine heatwave events, temperature impacts on the relative or total abundance of species, species range shift, and the impact of this on fisheries productivity.

Frequently Asked Questions

What data are collected?

Temperature, depth, time and position at regular intervals. Detailed vertical temperature profile measuring every 1m depth between the surface and 200m, every 4m between 200m and 1000m on the way up and down, and data every 5 mins while at a constant depth (such as in a pot, or on a line).

What about catch information?

No catch information is collected. Vessel position is recorded by the Zebra-Tech deck unit but is not released publicly. This is your private information and data security protocols are in place to protect it.

How are the data offloaded?

When the Mangōpare sensor comes out of the water, it automatically offloads its data via Bluetooth to a small, standalone, weather-proof, deck unit. You do not need to do anything during this process. Data are then automatically transferred to our secure, cloud-based servers.

Where are the measurements stored?

Data are stored on Zebra-Tech's proprietary cloud server, then transferred to a secure MetService database for aggregation and assimilation into the ocean model. All data are confidential, remain the property of the participants, and will not be shared with any third party unless agreed in writing.

Can I attach the sensor to any type of fishing gear?

Commercial fishers from all over New Zealand are joining the programme, and we have successfully attached sensors to longlines, netting, pots, and trawling equipment. We have a range of protective housings and brackets to simplify sensor mounting.

What if I lose the sensor?

We understand that you have enough to look after on a busy fishing vessel, and while we ask that you attach it securely, you are not liable for loss of the sensor. We provide detailed mounting guidelines which will help you attach it.



The deck unit.

Will you send details of my fishing to others?

No – as part of joining the programme, we sign an agreement that gives you full ownership of the temperature and location data recorded by the sensors. In the agreement, you permit MetService to use the anonymised data in our forecasting models. If you want to share the data publicly for scientists to use, we can facilitate that, but we will never share your data without your permission. And from looking at our models and forecasts, nobody can distinguish where individual measurements were made.

What does it cost?

The Moana Project is fully funded by the New Zealand government and there is no fee to participate. If the deck unit is using the vessel's Wi-Fi to send the data back to MetService it uses around 150-500 kB of data a month. If the deck unit is using the mobile network, the data transmission cost is covered by us.

How long will the sensor be on my vessel?

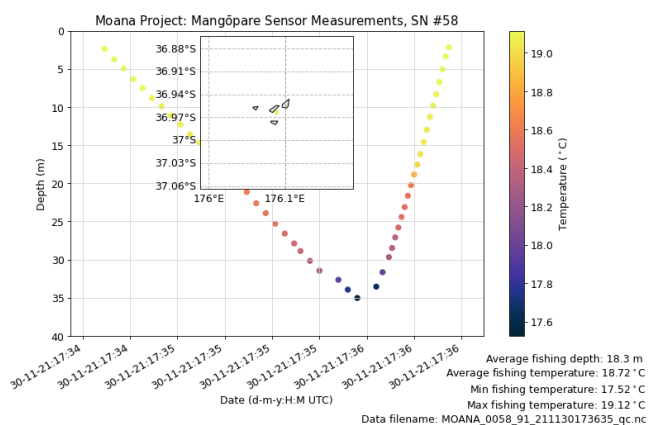
The sensor's battery lasts for two years, after which you will need to send it back to us for battery change and recalibration. The Moana Project finishes in September 2023, but we are currently trying to find ways to continue the sensor programme. The more vessels participate, the higher our chance of demonstrating that it has value.

What does Mangōpare mean?

Named Mangōpare by Whakatōhea Iwi, our Moana Project partners, the sensor is named after the hammerhead shark. The name is apt because the Mangōpare is exceptionally skillful at detecting everything in the ocean around it.

How do I get involved?

Please contact Julie Jakoboski (MetService) at info@moanaproject.org for more information on installing a Mangōpare ocean temperature and pressure sensor on your vessel.



Measurements collected by the sensor are emailed back to the vessel that collected them within 24 hours as a plot (left) and in spreadsheet format. Reproduced with permission from the Spirit of Adventure.