

Warmer waters and climate change - a challenge to fisheries

The world is warming – by an average one degree Celcius since the late 19th century – and the oceans are feeling it.

Ocean temperatures are rising more rapidly than previously calculated, according to Princeton University geoscientist Laure Resplandy in a study published in Nature journal.

More than 90 percent of the excess energy trapped within the world's atmosphere is absorbed by the oceans.

Scientists have found that ocean heat has increased at all depths since the 1960s, while surface waters have also warmed.

There was certainly evidence of that in our waters last summer to an unusual degree.

Parts of the Tasman sea were like a bath. Warmer water species like snapper and kingfish extended their range well south, as far as Fiordland and Southland.

In Australia, increasing drought on land (except in Melbourne on Cup day) is impacting on the oceans as well.

Catches of popular species like prawns, bream, swimmer crabs and mud crabs which spend part of their life in estuaries, which in turn rely on good rains and flushes of freshwater, are down in NSW.

“Drought and climate change also impact the ocean; it's just not as visible when it's at sea,” Seafood Industry Australia (SIA) chief executive Jane Lovell said.

The SIA has called on the Federal Government to extend financial support available to land-based farmers to wild catch fishers.

In the US, dramatic shifts in some species' distribution are having a profound impact on livelihoods and cultures.

The summer flounder fishery in North Carolina has all but disappeared, not as a result of overfishing but of the fish moving north to cooler waters.

Long established fishing communities have become ghost towns as a result.

An epic dislocation appears to be under way.

In the US North Atlantic, at least 85 percent of the nearly 70 species tracked by federal authorities have shifted north or deeper, according to a Reuters analysis of fisheries data.

Striped bass have disappeared too from North Carolina but are now routinely found in Canadian waters, which was unheard of a generation ago.

So what to expect for our climate this summer?

The National Institute of Water and Atmospheric Research (NIWA) is predicting the slow emergence of a moderate to weak El Nino climate system, which could persist through autumn and even into the following year.

El Nino typically produces more rain in the west of the country, more westerly wind and drier conditions on the east coast. In winter, colder southerlies tend to prevail.

The last such pattern was in 2015-16.

Last year's unprecedented marine heatwave is not expected to be repeated.

Even so, seas are up to a degree above average along our coastlines, with December ocean temperatures expected to be near where they would typically be in January.

Over the past month, sea surface temperatures in the central Pacific have warmed notably, increasing from 0.25C warmer than normal in September to 0.75C above normal.

Such fluctuations can have a marked impact on fish spawning and distribution.

NIWA has some powerful new tools to help assess climate changes in the form of three new supercomputers capable of assessing massive amounts of data in seconds.

A \$23 million high performance computing facility was opened this week, with two supercomputers at NIWA in Wellington and a third at the University of Auckland.

Whether the fisheries management system is nimble enough to respond to ocean changes and possible resultant altered distribution of stocks is another matter.

Processing water a valuable source of protein

A research team in Sweden have discovered that seafood processing water contains valuable nutrients that could be used as an alternative source of protein.

Led by professor Ingrid Undeland of Chalmers University, the three-year project analysed the composition of processing water and found it contained 7 percent protein and 2.5 percent omega-3 fatty acids. Water from shrimp processing also contained astaxanthin – a natural antioxidant that supports skin, eyes and joint health and the immune system.

Seven to eight thousand litres of water are used to prepare a tonne of marinated herring and 50,000 litres for a tonne of peeled shrimp, explained Undeland.

As much as 15 percent of herring protein leaches out into the water during this process and is then pumped out as waste and lost. Recovering these nutrients and repurposing them was a core part of the project, said Undeland.

Using a two-step process, researchers treated shrimp water in a way that caused the proteins and fats to clump together, forming a semi-solid biomass. When exposed to air bubbles, these clumps float to the surface for researchers to retrieve.

The treatment recovered 99 percent of the fats and 98 percent of the protein contained in the water. Post-dehydration, the biomass contained 66 percent protein and 25 percent fat.

University of Gothenbyrg and Skretting ARC tested the by-product as an ingredient in salmon feed and found it to be an effective type of aquaculture feed.

The liquid by-product was effective at cultivating microalgae and preventing frozen fish from spoiling when used as a protective glaze.

Researchers are likening the water to a “ready-made stock” that, if recycled, could help put valuable nutrients back into the food chain.

“The backbone of our project is a circular approach. In the past, we had a more holistic view on the handling of food and raw materials, but today so much is lost,” said Undeland. “We are in the middle of a protein shift, and there’s a huge demand in society for alternative protein sources.”

“It’s very important to help the industry understand that these side streams don’t need to be wasted. Instead, they should be treated as really exciting raw material.”

The next step will be implementing processes in the seafood industry for recycling the nutrients.

“I am quite positive on the fact that related industries, sooner or later, will be implementing these techniques. With ever increasing awareness on the value of recycling nutrients, this facilitates industrial processes to adopt feasible approaches towards a circular economy.”



Seafood processing, Norway.

Scientists size-up snapper

As part of a five-year research project, NIWA scientists ventured out to the Hauraki Gulf this week to expand their knowledge of snapper nurseries.

As a key species in the Hauraki Gulf, the number of snapper and their size are good indicators of how the marine environment is faring.

Researchers will be investigating what keeps them healthy and how they survive from infancy to adulthood. Fisheries scientist Mark Morrison will also be examining whether human impact reduces the marine ecosystem's ability to support fish nurseries.

Phase one of the project identified the locations of juvenile snapper nurseries and examined them in finer detail to understand what makes a healthy nursery.

Phase two will further that research by using multibeam echo sounder technology to map the seafloor habitat of juvenile snapper.

The multibeam works by emitting a 'fan' of sound waves downwards from NIWA's research vessel, *Ikateri*. As the beams reflect off the seafloor, they map the habitat's features in high detail. The mapping differentiates between habitat types (i.e. mud, reefs, sand) and shows the wider seafloor landscape.

When researchers mapped East Northland nurseries, they found an abundance of subtidal seagrass meadows which had largely disappeared from the Gulf in the 1930s. Juvenile snapper were 100 times more abundant in these seagrass nurseries compared to non-seagrass habitats.

Analyses of the otoliths found that juvenile snapper from subtidal seagrass areas were heavier and grew significantly faster too.

Results included snapper from the seagrass meadows of Whangarei Harbour, which were lost 50 years ago. The area is now recovering, as is the growth rate and weight of these snapper which have improved compared to the 1960s.

Morrison believes the study will provide new options for managing snapper in the Hauraki Gulf and East Northland and hopes the research will be applied to other species like juvenile blue cod in the Marlborough Sounds.

Once the mapping is complete, habitat maps will be developed, incorporating local knowledge and innovative technology. The maps will be made publicly available for the community to view.

The next research phase will fit juvenile snapper with tags to analyse how many fish survive, how fast they grow and how far they travel. Tagging is expected to take place next year.



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Fisheries New Zealand is seeking input on proposed rule changes that would allow recreational fishers to assist with rebuilding the CRA2 fishery. Manager of inshore fisheries Steve Halley said under the proposals the number of spiny rock lobsters recreational fishers can take per day would be reduced from 6 to 3. "As part of the consultation, we also want feedback on introducing telson (tail fan) clipping as a tool to assist with minimising the illegal black market sales of rock lobster," Halley said. "These proposed changes are designed to double the number of rock lobster in the area over the next 4 to 8 years." Consultation closes on 19 December 2018 and any rule changes

will come into effect by mid-2019.

The proposal to create three ocean sanctuaries in Antarctica was opposed by China and Russia at the Antarctic Ocean Commission in Hobart last week. The head of New Zealand's delegation, Amy Laurenson from the Ministry of Foreign Affairs and Trade, said she was disappointed by the outcome, but hoped one or all of the sanctuaries would be created when the commission met next year. "The commission works by consensus so we really have to get to the point where all members of the commission are able to support it and all members need to see their interests reflected in the final outcome. Unfortunately that was not possible at this meeting," she said. The largest of the proposed sanctuaries would have covered 1.8 million square kilometres in the Weddell Sea.

Licence-holders are now able to fish in Western Australia's new Marine Aquarium Fishery. The state's newest fishery is the first where online catch reporting is mandatory for its licence-holders who are permitted to collect coral, live rock, clams, fish and seagrass for the aquarium trade. The resource potentially includes more than 950 species of marine aquarium fishes and is expected to generate up to \$5 million annually. Fisheries Management Officer Paula Kalinowski said quotas for key species along with 100 percent online catch reporting by licence-holders would be the cornerstones of the fishery's management. "The new Marine Aquarium Managed Fishery structure reduces red tape, strengthens access rights for licence-holders and provides for economic growth opportunities," she said. Mandatory online catch reporting will also provide valuable data to Australian federal environment authorities.

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