2023 SYMPOSIUM ON SEAFOOD PRODUCTION

WELLINGTON, 16 FEBRUARY 2023
PROCEEDINGS REPORT

"Fish is the perfect protein"

Seafood New Zealand
DEEPWATER COUNCIL

SEAFOOD NEW ZEALAND LTD - DEEPWATER COUNCIL

A non-profit organisation delivering the vision of New Zealand's deepwater quota owners to be trusted as the best-managed deepwater fisheries in the world and mission to ensure New Zealand's deepwater fisheries resources are managed to optimise their long-term sustainable yields.

We work closely with scientists and in partnership with the Ministry for Primary Industries

ACKNOWLEDGMENTS

SNZ-Deepwater Council would like to extend our appreciation to all those who supported and contributed to the Symposium and this report.

CITATION

Irving, A., Wisselink, I., (2023) 2023 Symposium on Seafood Production - Proceedings Report (Seafood New Zealand Ltd - Deepwater Council, Auckland, New Zealand.)

Scan the QR code to view the Symposium website
https://deepwatergroup.org/symposium

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Introduction

New Zealand's economy and the well-being of many New Zealanders depend upon food production. While all forms of food production necessitate environmental effects, these effects are often discussed in isolation.

The Symposium on Seafood Production, held in Wellington on 16 February 2023, traversed seafood production in context, addressed the environmental, scientific, economic and Māori perspectives of seafood production in New Zealand.

The seafood industry invited independent specialists to address a range of matters about contemporary issues associated with food production in New Zealand, and seafood production in particular.

The sustainability credentials of seafood production in New Zealand waters are being questioned. The symposium welcomed informed dialogue as to the basis of these questions and provided valuable international and domestic information to promote and underpin dialogue with respect to the environmental effects and economic benefits of seafood production in relation to other forms of food production within New Zealand and internationally.

The symposium attracted 70 attendees from government agencies, industry, media and NGOs.

Pan-fried Hoki with wholemeal, bacon & herb crumb

Opening remarks
Tom McClurg, Director, Toroa Strategy

This symposium is about seafood production in context; bringing together fundamental issues including fisheries use, fisheries management, ecosystem approach to fisheries management, aquatic ecosystem effects management as well as the social and economic contribution of the deepwater fisheries in New Zealand.

A central question is the relationship between people and the natural world: whether we should view an ecosystem from within or from the outside.

Drawing on various philosophies, McClurg presented perspectives on resource usage and management from Genesis in the Old Testament, Greek and Roman mythology, and Te Ao Maori.

"The overall purpose of the symposium is to support effective and open dialogue and to facilitate discussions on resource use, management, and ecosystem management."

McClurg noted that the Māori perspective is one shaped by the idea that people are related to other living things by genealogy. Within this comprehensive framework of kinship, living creatures are able to meet their respective needs. In the case of humans, this places us squarely within the ecosystem but our use of nature is associated with the values and responsibilities of kaitiakitanga.

Common to all of these perspectives is a duality or dichotomy, which portrays human beings as both subject to and dependent on nature while also being users and managers of it, not only for survival but also for benefit and profit.

McClurg discussed the psychological promise of environmentalism, which seeks to resolve the dichotomy by restoring the balance between humans and nature.

However, as environmentalism can be both anthropocentric and ecocentric, adding the label of environmentalism does nothing to resolve age-old philosophical questions or advance our ability to identify agreed costs and benefits of resource management choices.

Without clarification of whether our underlying perspective is ecocentric or anthropocentric discussions or debates about resource use, can never be a productive dialogue.

McClurg reiterated that the overall purpose of the symposium is to support effective and open dialogue and to facilitate discussions on resource use, management, and ecosystem management.

The recent report from the Office of the Prime Minister's Chief Science Advisor noted that a "strength of the MSC standard is that fisheries have to maintain certification, not just achieve it once".

Image: Sanford and Sons

Ecosystem Approach to Fisheries Management

Aaron Irving, Seafood New Zealand GM Deepwater Council

New Zealand's deepwater fisheries are important, annually producing over 700 million servings of sustainable seafood, contributing about $2.7 billion to the New Zealand economy and employing 8500 people. Deepwater fisheries produce about 80% of New Zealand's entire Exclusive Economic Zone (EEZ) catch, with a relatively light footprint.

Currently, 19 deepwater fisheries are independently assessed and certified sustainable against the Marine Stewardship Council (MSC) science-based sustainability standards, the world's highest standards of fisheries and fisheries ecosystem management.

Within New Zealand waters, the Fisheries Act 1996 expressly provides for the utilisation of fisheries resources and by extension any associated impacts on the aquatic environment. The Act also expressly obliges management intervention when the effects of fishing activity are adverse at an aquatic environmental level, requiring any adverse effects to be avoided, remedied, or mitigated.

Aaron Irving discussed the implementation of an Ecosystem Approach to Fisheries Management (EAFM) in New Zealand's deepwater fisheries, which balances the utilisation of fisheries with ensuring their sustainability and highlighted the economic and employment contributions of New Zealand's fisheries, as well as the relatively low environmental impact.

All forms of food production require some degree of environmental change or modification. It is always a question of balance. In deepwater fisheries, we achieve that balance by applying a world-leading ecosystem approach to fisheries management.

Irving discussed the environmental impact of deepwater fisheries and how the New Zealand Fisheries Act 1996 balances the utilisation of fisheries and their sustainability. The Act provides a range of tools for managing fisheries resources sustainably and recognises the impact of fishing on the aquatic environment. With impact associated with fishing activity being a component of utilisation that is provided for by the Act.

In 1996 the New Zealand Fisheries Act was state of the art and is still far ahead of other Acts around the world

Section 8 of the Act accommodates the social policies of utilisation and sustainability, and the New Zealand courts have clarified that the Act pursues sustainable utilisation, finding that: "..it exploits the potential of fisheries resources to meet human needs over time; and it interests itself in the aquatic environment, because that sustains the fisheries resources."

Sections 9 and 10 of the Act provide environmental and information principles for decision-makers to take into account species viability, biodiversity, maintenance of the aquatic environment, and habitat protection.

When providing for the utilisation of fisheries resources while ensuring sustainability, the Act recognises that fishing may have a range of effects on the environment but the obligation, in order to ensure sustainability, is to avoid, remedy or mitigate adverse effects.

All forms of food production require some degree of environmental change or modification. It is always a question of balance. In deepwater fisheries, we achieve that balance by applying a world leading ecosystem approach to fisheries management.

Irving discussed how the principles of the Fisheries Act of New Zealand are derived from international obligations under UNCLOS (United Nations Convention on the Law of the Sea), CBD (Convention on Biological Diversity), and the fishstocks agreement. The Act requires a species-based management approach along with environmental and information principles to enable an ecosystem-based approach to fisheries management. This approach requires managers to balance wider environmental objectives, consult stakeholders, and make informed decisions based on the best available science. Acknowledging that fishing can have a range of effects on the environment, the Act requires managers to avoid, remedy or mitigate adverse effects of fishing on the aquatic environment, including any aquatic habitat and/or ecosystem,

Any assessment of New Zealand's fishing activity which looks to assess the nature and extent of fishery interactions within the aquatic environment, in terms of effects is not only consistent with the Fisheries Act, but also anticipated by it. The Act anticipates the implementation of a risk-based framework which enables managers to qualify management decisions in terms of identifying effects and potential effects, determining whether these effects are adverse and providing requisite qualification to support the avoidance, remedying, or mitigation of these adverse effects.

This framework does not restrict utilisation beyond what is necessary for sustainability. The distinction between effects and adverse effects of fishing is reflected in the Act's environmental principles which acknowledge that a certain level of effect may be permissible (e.g., an effect on associated and dependent species that does not compromise the long-term viability of the species) whereas other effects may not be acceptable.

In terms of the management of adverse effects, it is worth noting, that if the Minister has taken the steps necessary to avoid, remedy, or mitigate any adverse effects of bottom trawling, it is not open to the Minister to then further restrict utilisation (e.g., in response to some general view as to wider societal expectations about the "acceptability" of impacts. To do so would be contrary to the obligation to provide for utilisation except to the extent necessary to ensure sustainability).

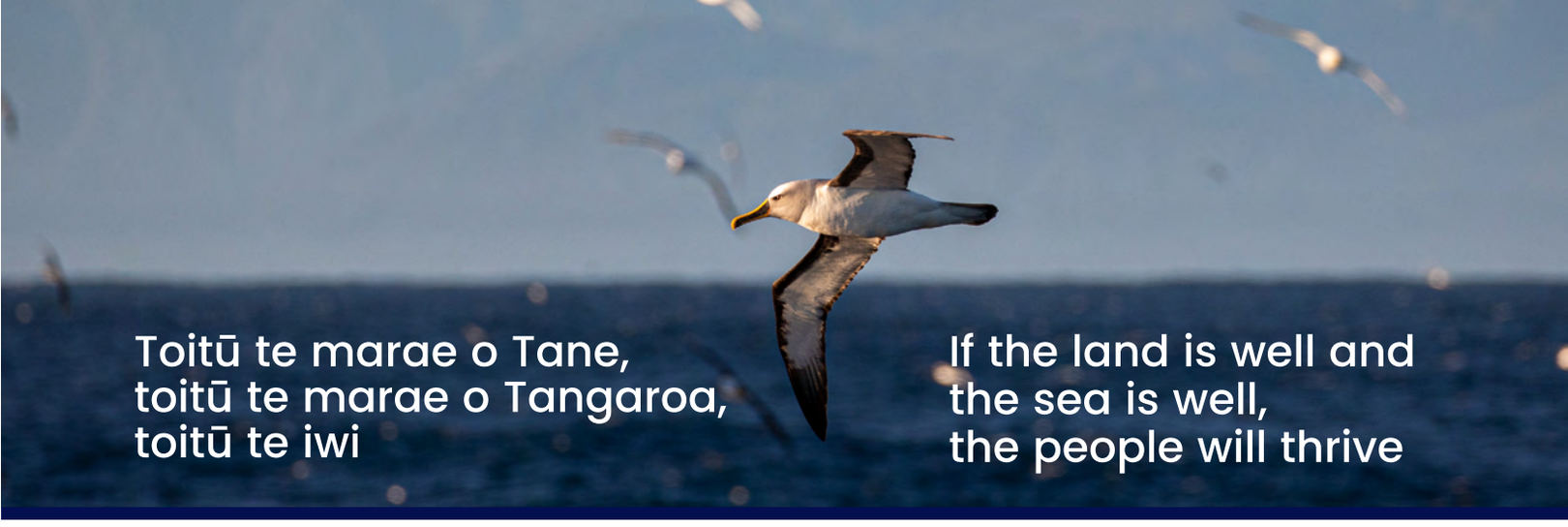
In 1996 The New Zealand Fisheries Act was state of the art, and in terms of its ability to navigate the two policies of utilisation and sustainability, and deliver EAFM, it is still far ahead of other Acts around the world.

Overall, the Act is considered innovative and ahead of other Acts around the world in terms of balancing utilisation and sustainability and delivering ecosystem-based fisheries management.

Irving acknowledged that New Zealand's deepwater fisheries are continuously managed according to a comprehensive multifaceted EAFM framework. He provided two examples of EAFM in action at an operational level, the deepwater fisheries MSC certification program and interactions with benthic habitats.

The MSC Standard is a robust global science-based normative standard considered to be the global gold marine sustainability standard. Fisheries that meet the standard are transparently and openly assessed by a team of fishery and environmental experts who are independent of both the fishery and MSC. Only the very best fisheries are able to meet the MSC standard.

When providing for the utilisation of fisheries resources while ensuring sustainability, the Fisheries Act 1996 recognises that fishing may have a range of effects on the environment but the obligation, in order to ensure sustainability, is to avoid, remedy or mitigate only adverse effects.



Toitū te marae o Tane,
toitū te marae o Tangaroa,
toitū te iwi

If the land is well and
the sea is well,
the people will thrive

New Zealand deepwater fisheries are demonstrably among the top 5% of the best-managed fisheries in the world.

Currently, 19 New Zealand fisheries (hake, hoki, ling, orange roughy, and southern blue whiting) are certified sustainable in conformance with the MSC Fishery Standard, others will follow. Save orange roughy, New Zealand's MSC certified fisheries are certified without any conditions of certification. This places them in the top 5% of the world's best managed independently assessed fisheries.

One of the key aspects of MSC certification is the monitoring of the environmental impacts of fishing activities, especially on the benthic habitats and the epibenthic biota. Some of the initiatives that New Zealand deepwater fisheries have undertaken to reduce their benthic effects and to improve their knowledge of the benthic biodiversity include:

- Monitoring areas of the trawl path to better understand the extent and severity of benthic disturbance caused by fishing gear.
- Implementing mitigation measures to reduce incidental interactions with ecobenthic biota, such as corals and sponges, and to minimize the damage to these vulnerable marine ecosystems.
- Conducting quantity surveys of benthic biodiversity to assess the status and trends of benthic communities and to identify areas of high conservation value.
- Further and ongoing reduction of incidental interactions with marine mammals and seabirds, which are also affected by fishing activities.

These initiatives demonstrate the commitment of New Zealand deepwater fisheries to achieve and maintain MSC certification, which is a rigorous and independent verification of their sustainability performance.

The recent report from the Office of the Prime Minister's Chief Science Advisor noted that a "strength of the MSC standard is that fisheries have to maintain certification, not just achieve it once".

New Zealand deepwater fisheries are demonstrably among the top 5% of the best-managed fisheries in the world.

Other areas where we're implementing EAFM is in our interactions with the benthic environment and monitoring these interactions. To these ends we have partnered with the Commonwealth Scientific and Industrial Research Organisation (CSIRO), and together we are using innovation and technology to better implement EAFM.

One development is a net headline camera system called SMART-Cam. These will be deployed on commercial tows, and they'll quantitatively assess footage using CSIRO's advanced AI capabilities to determine the nature and extent of the benthic environment.

The deepwater fisheries EAFM framework has also resulted in reduced interactions with seabirds and marine mammals. Since 2006, the estimated annual captures of albatross by deepwater trawlers have reduced by 74%, and for seabird captures, there is a 30% reduction. There has also been a 90% decrease in the estimated number of fur seals captured annually and an 80% decrease in the number of sea lions captured annually. Fleet wide operational procedures and dolphin dissuasive devices have been successful in reducing interactions. But there is still more to do.

Irving also mentioned New Zealand's efforts to incorporate reducing their carbon footprint into their EAFM program. AgResearch conducted a carbon lifecycle assessment of the deepwater fleet, with preliminary analysis showing low and declining carbon emissions in the past 30 years for the same catch volumes.

Irving ended his presentation with a Māori whakataukī - Toitū te marae o Tane, toitū te marae o Tangaroa, toitū te iwi meaning if the land is well and the sea is well, the people will thrive, concluding that this is what it is all about.

Jack mackerel sashimi

KEYNOTE ADDRESS – FISH IS THE PERFECT PROTEIN

Seafood, a winner in low environmental food production impacts

Professor Ray Hilborn, School of Aquatic and Fishery Sciences, Center for Sustainable Seafood, University of Washington

Seafood production has lower environmental impacts than almost all other forms of food production as measured by greenhouse gas (GHG) emissions, carbon footprints, usage of water, soil erosion and biodiversity loss. If you care for the environment and our planet, seafood is the perfect protein as fishing has much lower impacts on biodiversity and the environment than the impacts caused by farming livestock or crops. It is untrue that the oceans are being emptied of fish. Fisheries in New Zealand are internationally recognised as being amongst the best managed.

In his presentation on seafood environmental impacts, Professor Ray Hilborn highlighted a pivotal moment in his career when he was asked by an environmentalist friend, if he should stop eating fish. His friend wasn't a vegetarian, so suggested he would eat more meat instead. This led Hilborn to compare the environmental consequences of catching fish to other forms of food production.

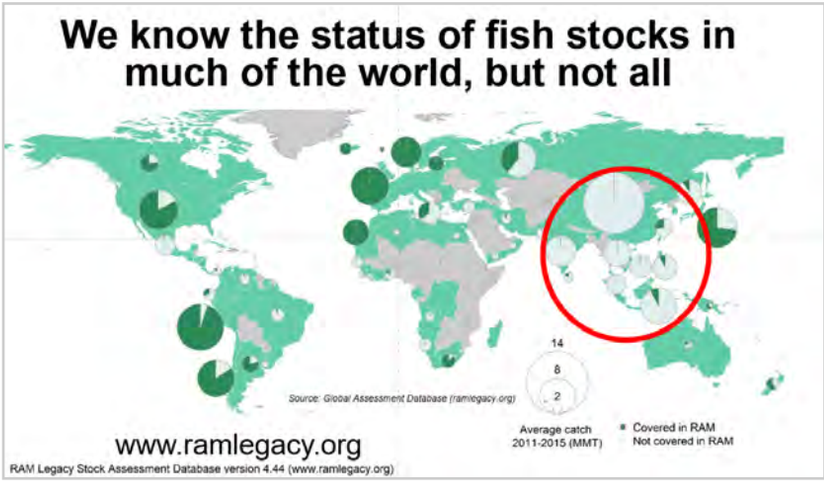
He noted that all forms of food production have environmental costs, including water use, pollution, fertilizer, pesticides, antibiotics, soil erosion, petroleum use, greenhouse gases, and biodiversity loss.

Hilborn recounted how in response to the 2006 paper that claimed all fish stocks will be collapsed by 2048, he worked with a team of people to build a database on the trends in fish stock abundance. This database also showed that many countries, particularly in South and Southeast Asia, do not have scientifically rigorous assessments of their stocks.

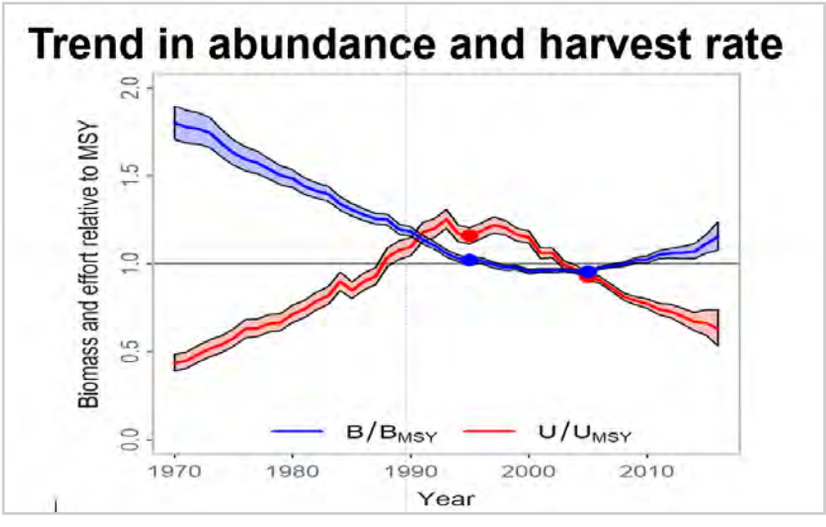
Nevertheless, for the stocks that are assessed, fishing pressure has decreased markedly since the 1990s, and the abundance of fish stocks is generally increasing, with half of the world's catch being fished well below the level to produce maximum sustainable yield.

Some regions have never been overfished, such as New Zealand and Alaska, while others, like the Mediterranean, are in poor condition. South and Southeast Asia have enormous fishing pressure, and some well-managed places still have stocks in poor condition (see slides on next page). But the poor condition of these stocks is due to either ineffective management, or natural variability. People have to remember that fish stocks will be called "overfished", even if they aren't fished, with it being just due to natural variability for many fish stocks.

Hilborn emphasized that his research is the work of teams of people, representing all aspects of the science community and highlighted one of his frequent collaborators is on the International Board of Directors of The Nature Conservancy (TNC).



Above and below: slides from Ray Hilborn's presentation



Hilborn moved on to discuss environmental costs and the paper by Halpern *et al*., Recent pace of change in human impact on the world's ocean[i]. The paper was an important but largely ignored study on the recent human impact on the world's oceans. Researchers from Lincoln University conducted a survey of Kiwis' opinions on the environment and found that fishing was considered the biggest threat to the marine environment.

This study examined a range of marine habitats, from inshore mangrove salt marshes mudflats to coral reefs, rocky reefs, kelp forests, and then to the continental shelves and their stressors, including fishing, temperature, ocean acidification, sea-level rise, shipping, nutrient pollution, organic chemicals, direct human, and light pollution. Results demonstrated that the majority of the threats they identified to marine ecosystems were from climate or coastal impacts, typically terrestrial impacts, with fishing having a minimal impact on the oceans' ecosystems (see "Leading threats' image next page.)

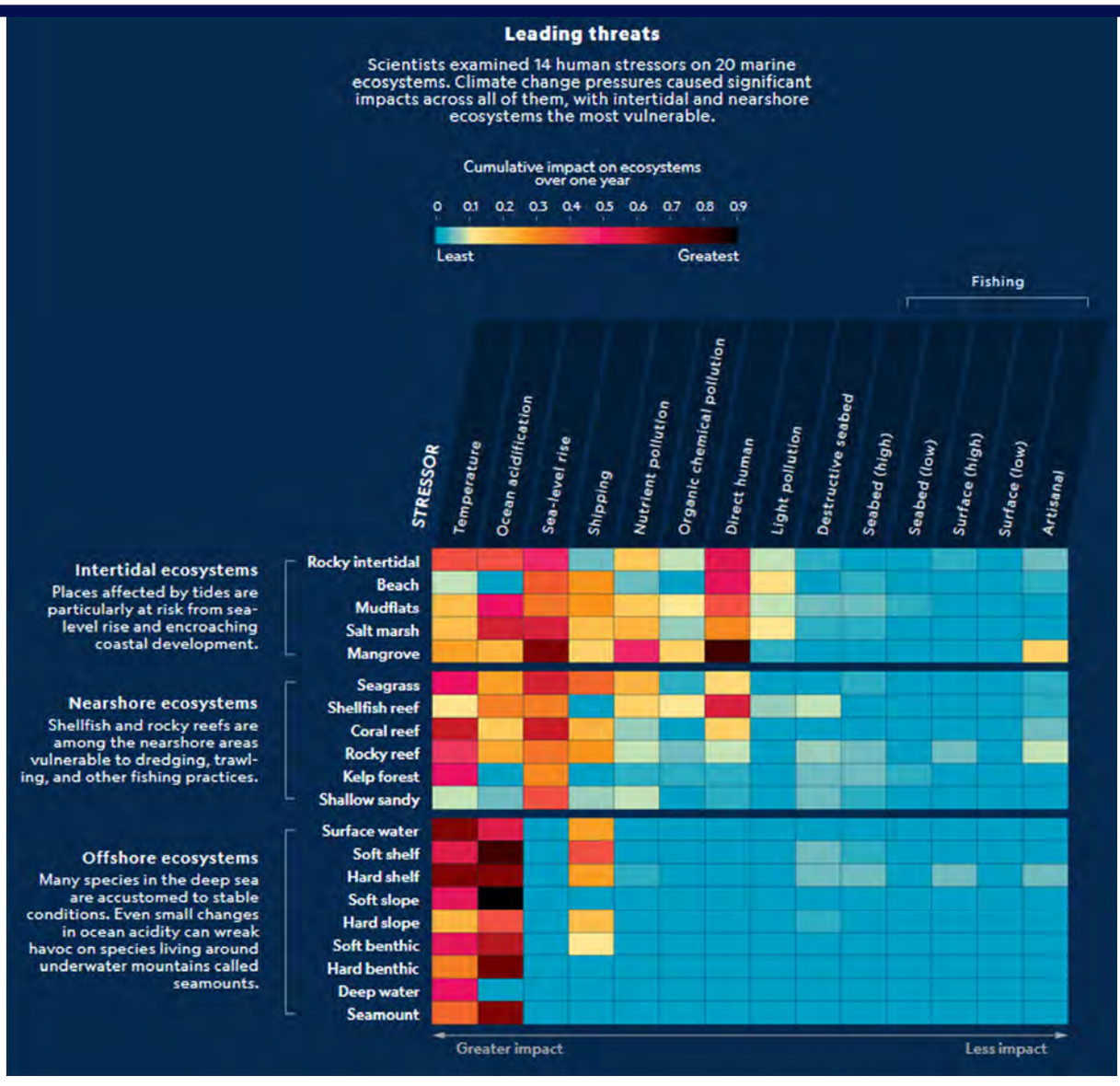
Another paper by the same authors found that fishing was a more target threat to particular species; a finding that accords with the other research, where from an ecosystem perspective, fishing hardly changes the oceans. It changes some specific species.

Hilborn noted that the threat from terrestrial impacts has been almost totally ignored in the marine conservation community. The report from the New South Wales Marine Estate Management Authority[ii] ranked recreational fishing as the 13th biggest threat and commercial fishing as the 17th. The Great Barrier Reef Marine Park Authority received a yellow card from IUCN for not addressing threats from the land, despite having 30-40% of marine protected areas (MPA).

The Department of Conservation 2020 Biodiversity in Aotearoa[iii] report also identified land-based threats as the most significant to the country's marine habitats. Ocean acidification and rising sea temperatures were considered the most significant threats to the marine ecosystem. The bottom line is that to save coastal marine ecosystems, it is essential to address land-based threats and climate change.

Hilborn, recounted, that although he is an academic, he has an extensive background in farming and agriculture. Farming is how we feed the world, but it is essential that we acknowledge the environmental impacts of growing crops and raising livestock.

To save the coastal marine ecosystems, look to the land and the global climate.



Professor Tony Sinclair – University of British Columbia

Hilborn introduced his friend and colleague Tony Sinclair, a professor at the University of Columbia in Vancouver, who conducted a biodiversity project comparing the abundance of plant and animal life inside and outside Serengeti National Park.

Hilborn's interview with Sinclair looked at a project that explored changes in biodiversity in areas adjacent to the Serengeti National Park in East Africa.

The project showed that small-scale subsistence farming outside the park had significantly reduced biodiversity, with fewer types of grass, trees, ungulates, insects, birds, mammals, and raptors; noting that one of the primary drivers behind the decline in biodiversity may be the loss of the trophic level one plants that form the ecosystem's structure and energy.

The study was specifically looking at the impact of agriculture on the Serengeti savanna ecosystem in East Africa and how it affected the food web and resulted in trophic cascades. The study found that

agriculture, which removes native grasses and trees and replaces them with monoculture crops, had a significant impact on the ecosystem. The disappearance of native grasses led to the disappearance of insects, which in turn led to the disappearance of insectivorous birds, mammals, and raptors, and the proliferation of rodents. The study found that the disruption caused by agriculture worked its way up the food chain, affecting every trophic level.

Hilborn compared the finding from Sinclair's Serengeti study with fisheries, noting that fisheries typically don't do anything to the primary productivity level (equivalent of trees and herbs or the second trophic level). Noting that in some areas around the Serengeti, there's hunting for ungulates which for the most part, doesn't affect the food chain very much. This may be the closest analogue to what fishing does.

Ray Hilborn discussed the impact of human activity on biodiversity in both terrestrial and marine ecosystems. He highlighted the issue of comparing intact native ecosystems to farm ecosystems, where most studies include crops and exotic pests as part of biodiversity, but not native biodiversity.

The key point that Hilborn wanted to make is that trophic level one in the Serengeti - that's equivalent to the grasses and trees in the ocean - is the phytoplankton. Trophic level two - the grazers - the equivalent is zooplankton; they are essentially unchanged. In fact, in aggregate their total biomass (this is tons per square kilometre across all these 26 models) there's a little bit more because of fishing. Trophic level three, the forage fish is essentially unchanged. It's trophic level four or five and six, where the fish in the ecosystem has a lower abundance. But if you say what's the abundance of the native ecosystem fish vs unfished it's exactly the same. In fact, it's a little higher. If you just focus on fish, it's actually 3% lower.

Experts have identified ocean acidification as the greatest threat to the country's marine habitats, with rising sea temperature the second.

Department of Conservation 2020
Biodiversity in Aotearoa report

In marine ecosystems, fishing does not affect the first three trophic levels (phytoplankton, zooplankton, and forage fish), but has lower abundance in higher trophic levels. However, the abundance of native ecosystem fish is similar to unfished ecosystems, and trophic level one is unaffected by fishing.

Hilborn then turned to a recently published paper by Enric Sala *et al*, in Nature[iv], which claimed that bottom trawling generates more carbon than airline travel. Subsequently Nature published a critique by Hilborn and Kaiser[v], with two other critiques to be published soon. Professor Jan Hiddink was the lead author of a paper that critiqued the carbon footprint calculation[vi] (published 2 May 2023.)

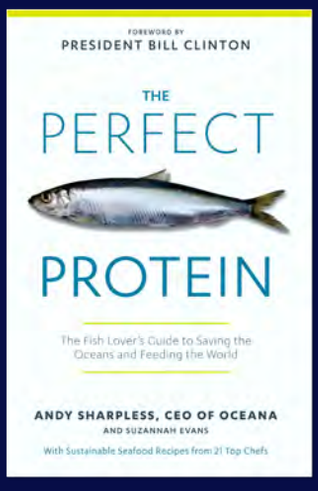
Professor Jan Hiddink - Bangor University, Wales

Hilborn introduced Jan Hiddink, an academic at Bangor University, who discussed the impact of bottom trawling on carbon sequestration in marine sediments. He explained how bottom trawling can disturb the seabed and disrupt natural carbon flows, which can lead to the release of CO_2, but noted that the release of CO_2 has been significantly overestimated as referred to the 2021 Sala *et al* paper.

Hiddink examined the 2021 Sala *et al* paper, which modelled seafloor disturbance by bottom trawlers results up to 1.47 Pg of CO_2 being released annually owing to increased organic carbon mineralisation. Hiddink noted that this is a very large figure and equivalent to global air travel.

Hiddink noted that this led to questions as to:

- If the releases were so significant then one would expect there to be very clear differences in the organic carbon content in the sediments in areas that are trawled versus areas that are less trawled and areas that are not trawled. Studies found that there were no significant differences in organic carbon stocks with and without trawling.
- If there are no differences, was there a problem with the model? Analysis found that the model incorrectly relied on some incorrect assumptions, about the nature of the carbon (i.e., the rate at which organic material becomes mineralised organic material was overestimated by a factor of 1000) and that all the carbon was accessible (i.e., applying the reactivity of fresh organic carbon in that same way as stored organic carbon).



In his 2013 book The Perfect Protein, Andy Sharpless, CEO of the ocean conservation organisation Oceana, wrote: ***"imagine there was a healthy animal sourced protein that could be enjoyed without draining the life from the soil, without drying up our rivers, without polluting the air and the water and without causing the planet to warm even more and without plaguing communities with diabetes, heart disease and cancer."***

That perfect protein is, of course, wild-caught fish. Fish can be caught with almost no water, no herbicides or pesticides, no antibiotics, and no soil erosion. The two major environmental impacts of fishing are greenhouse gases primarily from fuel use, and impacts on biodiversity.

Hiddink also highlighted the limitations of current research and emphasized the need for long-term studies to track changes in sediment carbon content over time, as well as the importance of considering the effects of climate change and other stressors on carbon sequestration.

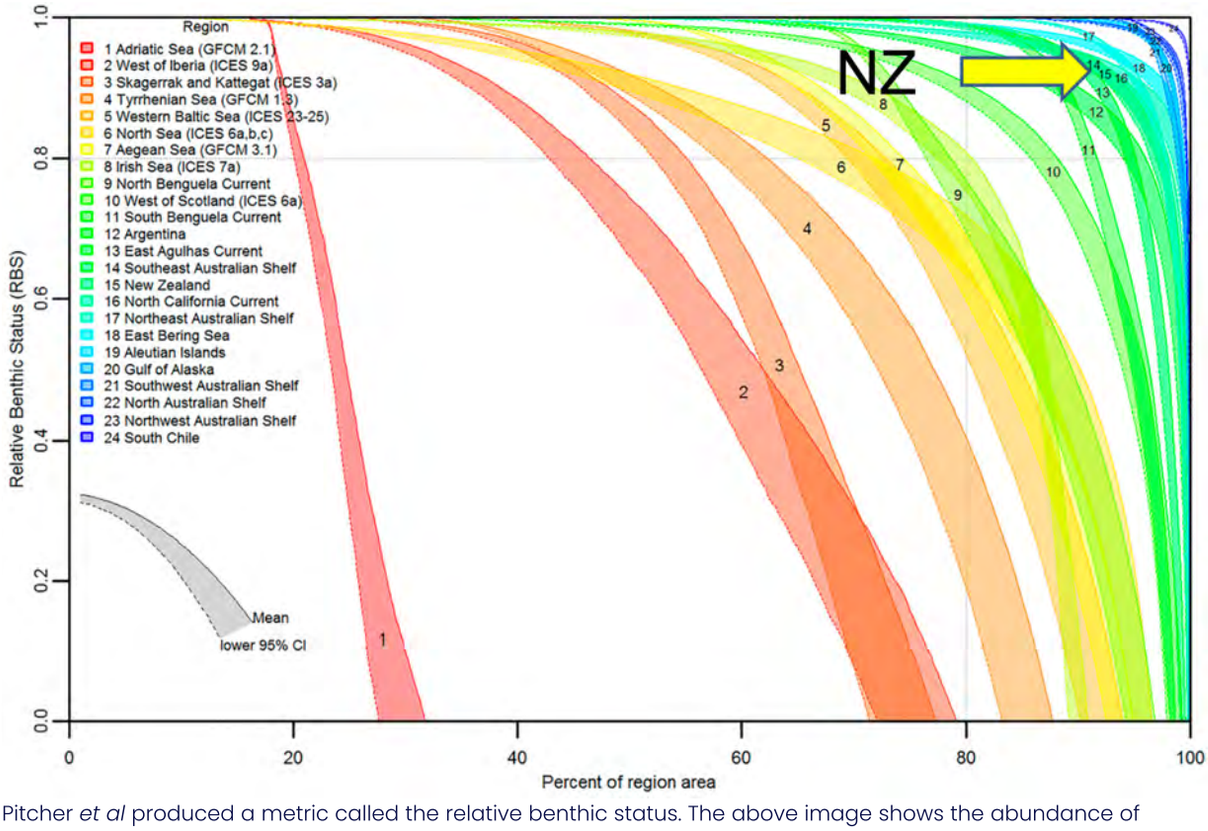
Hilborn also compared the environmental impact of livestock, aquaculture, and capture fisheries and concludes that fisheries have a lower environmental impact than livestock. The impact of bottom trawling on benthic biota was also discussed, where a review of data from 24 regions of the world showed that about 90% of the benthic area of New Zealand (looking at continental shelves down to 100 meters) has at least 90% of its native benthic abundance (see slide from Ray Hilborn's presentation on next page, showing graph from Pitcher *et al* paper Trawl impacts on the relative status of biotic communities of seabed sedimentary habits in 24 regions worldwide [vii]).

Hilborn noted that the effects of bottom trawling on native epi-benthic ecosystems, depend primarily on two things:

1. what's the substrate, and
2. what's the intensity of trawling

Globally most trawling takes place on mud and sand and the species that live there are pretty robust, they come back pretty rapidly. He mentioned that sensitive habitats, weather, and large macro flora and fauna are highly vulnerable to trawling and occur mostly on hard substrates which are rare globally.

Principle two of the Marine Stewardship Council says you can't be certified unless you can show you do not alter more than 20% the structure and function of the ecosystem. No form of large-scale land production can meet that standard.



Pitcher *et al* produced a metric called the relative benthic status. The above image shows the abundance of the native benthic fauna in an ecosystem and looking across it shows the percent of the region. New Zealand is number 15.

Hilborn ended his presentation, with a discussion on the environmental cost of replacing fish with plant-based foods, referencing the plant-based Impossible Burger.

He noted that while plant-based diets may be more environmentally friendly in some ways such as greenhouse gas emissions they have their own environmental costs, such as the use of fertilizers, pesticides, and large amounts of water. He argued that fisheries have a lower environmental impact than livestock and that the most sustainable solution is to consume a mix of plant-based and seafood-based foods.

"All food production has environmental consequences. The biggest focus of the last 20 years in fisheries management is that fisheries can be and are being sustainably managed to produce food".

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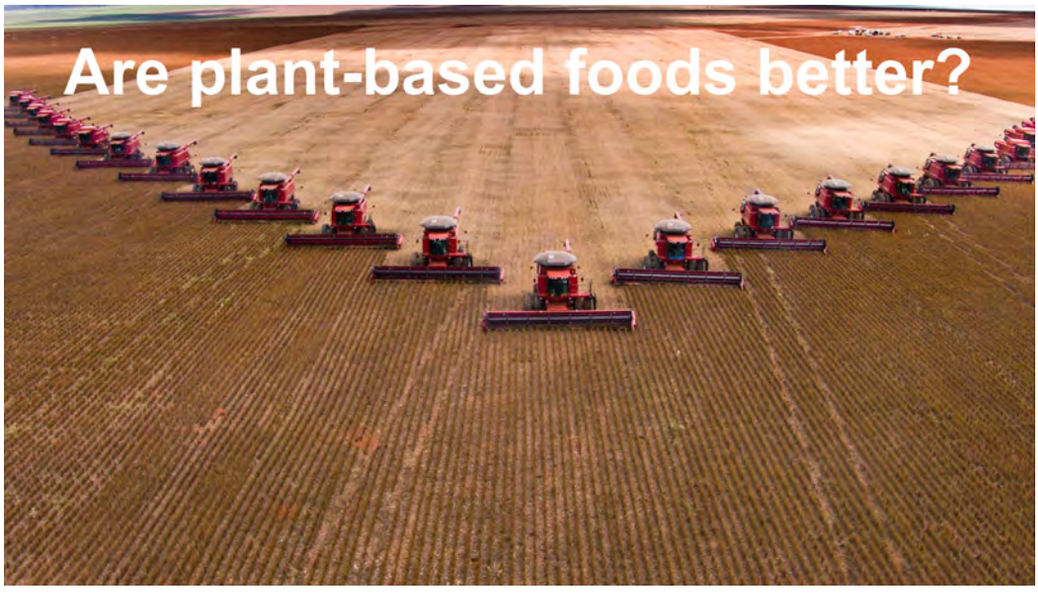


Slides from Ray Hilborn's presentation

Vietnamese-style pho soup with hoki fillets
Image: Sealord

The evolving nature of Māori fisheries and challenges for the future

Dion Tuuta, Pou Whakahaere (Chief Executive), Te Kotahitanga o Te Atiawa

Dion Tuuta highlighted the structural impact of the Māori Fisheries Settlement in 1992, how this has shaped active engagement by Iwi in the fisheries sector, the traditional Māori views of the relationship with the ecosystems that we live in and that sustain us, and how those traditional Iwi views are being reconciled with the QMS (Quota Management System), the Fisheries Settlement, modern commercial fishing and modern fisheries management.

Dion Tuuta presented to the symposium on the traditional Māori worldview of resource use, which sees human well-being as inseparable from the natural environment. He shared his non-scientific experience as a historian, treaty advocate, former seafood company director, former CEO of a national Māori Fisheries Trust, casual observer of human nature, and current iwi CEO to shed light on the topic.

Tuuta explained that the sustainable use of natural resources enabled Māori society to flourish in pre-colonial times, while the over-exploitation of natural resources resulted in suffering. Māori authority systems were put in place to ensure the correct balance between use and sustainability, and this contributed to the development of a unique Māori identity where kaitiakitanga (protection and guardianship) of resources was a key societal principle. This interdependence between humanity and the environment ultimately contributed to the personification of kinship bonds with te taiao (the environment) itself. Every iwi has an expression which connects them to te taiao. *Ko Taranaki taku maunga, ko Urenui taku awa*, Taranaki is my mountain, Urenui is my river, and the Whanganui Iwi whakatauki, *Ko Au te Awa, Ko te Awa Ko au,* I am the river and the river is me.

However, the colonisation of Aotearoa New Zealand in the mid-19th century interfered with the ability of tangata whenua to maintain control of the resources which sustained their various tribal societies, economies, and identities. The settler government and private hands took control of the vast majority of Māori resources, and Māori perspectives and approaches towards balancing resource use were largely ignored.

Ironically, this changed in 1986 with an idea imported from offshore, the Quota Management System. It was introduced to place more necessary controls around commercial fishing. The QMS was needed to restore that essential balance between te tai tangata - people - and te tai moana - the oceans, and this was achieved by limiting what can be taken from the ocean through creating a fisheries property right in the form of quota.

Ngai Tahu, Muriwhenua, Waikato Tainui and the New Zealand Māori Council immediately challenged the Quota Management System, not because of its intent to create a more sustainable fisheries management system, but because of the Crown's presumption that it could determine who owned the quota, without reference to treaty-guaranteed Māori property rights to fish.

An interim settlement was agreed in 1989, which saw 10% of existing

QMS quota species transferred through to a newly created Māori Fisheries Commission, and a final settlement agreed in 1992 provided funds to acquire 50% of Sealord and provide Māori with 20% of all quota for new species brought into the Quota Management System. The QMS does something very rare in Aotearoa, as Sir Tipene O'Regan, one of our chief negotiators of the settlement articulates, it blends a treaty right with a conservation system to achieve the outcome of sustainable use, which is a very Māori approach to resource management. So, by virtue of the 1992 settlement, the Quota Management System is the only fisheries management system mandated by Māori.

"The QMS is now 37 years old, and to me that continues to represent kaitiakitanga in action at a national level. It is generally misunderstood, it is maligned by those who oppose commercial fishing, but it has been a tremendous success for New Zealand in moderating unregulated fisheries pressure."

Tuuta outlined the modern Māori fisheries challenges, such as the issue of "fishing from the boardroom." The settlement facilitated iwi participation in commercial fisheries and set off an explosion in Māori economic and political development.

"The QMS is now 37 years old, and to me that continues to represent kaitiakitanga in action at a national level."

The quota assets transferred to the Māori Fisheries Commission were ultimately distributed amongst the tribes via the 58 mandated iwi organizations in accordance with an allocation methodology, which the Māori Fisheries Commission developed, and from 2004 Te Ohu Kaimoana was responsible for implementing.

However, getting Māori to agree on the allocation of the quota was a difficult process, and it fragmented the Māori quota base into smaller parcels that were too small to sustain commercial fisheries activities in their own right. Additionally, before the fisheries settlement, very few iwi collectives were engaged in commercial fisheries. Individual Māori and whanau were involved, but the tribal collectives representing the majority of its members were not. The fisheries settlement provided key organizing principles and infrastructure for iwi to receive and manage the quota parcels, which provided economic income to pursue their collective aspirations, which most then used in order to fund the land based historic Treaty claims.

So, the model provided significant benefits. But this has not necessarily facilitated Māori participation in commercial fisheries in the way that many may have originally envisioned. The model has been iwi separation from the actual activity of commercial fishing at the local level, and therefore, continuing a severing of the relationship with Tangaroa (a piscatorial ignorance).

In conclusion, Tuuta highlighted the success of the Quota

Management System in moderating unregulated fisheries pressure and achieving sustainable use. He emphasized the need to balance economic development with sustainability and to continue to recognise the inseparable relationship between human well-being and the natural environment.

A generation on from the fisheries settlement, Tuuta noted the key risk for Māori and to the continued Māori support of commercial fisheries is our distance from the industry, combined with the overwhelming messages of fear promoted by those opposed to it, or those who see it as a threat to the environment. The entities which govern Māori commercial fishing are predominantly political in nature.

"[The QMS] blends a treaty right with a conservation system to achieve the outcome of sustainable use, which is a very Māori approach to resource management"

Hoki & chips

Image: Independent Fisheries

Carbon footprint of fish from the New Zealand deepwater fishing fleet

Dr Stewart Ledgard, Principal Scientist, AgResearch

Globally food production is a significant contributor to human-generated sources of global greenhouse gases (GHGs), estimated to be 30% of the total. A study of the carbon footprint of New Zealand's deepwater trawl fisheries shows their GHG emissions are substantially lower than those for beef, sheep production. The main source of carbon usage and emissions is the fuel used by trawlers.

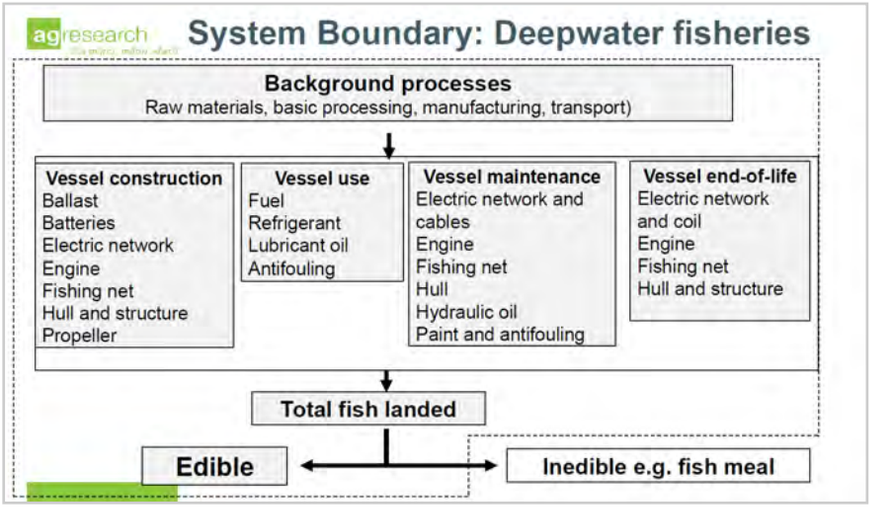
Dr Stewart Ledgard, principal scientist at AgResearch, and expert on carbon footprinting discussed the application of lifecycle assessment (LCA) to the New Zealand deepwater trawl fleet. LCA is a method of accounting for emissions from all contributing parts of a product's lifecycle, from the extraction of raw materials to the product's disposal.

Ledgard noted that there are quite strict international standards on how to calculate carbon emissions at a very high level. However, there are some variations in the way that LCA methodology is applied, which can make it difficult to compare results from different studies.

The European Commission has been heavily involved in product environmental footprinting, which seeks to label products based on their environmental impact. Emissions labelling is also becoming more common for larger multi-national companies like Unilever and Walmart.

Dr Ledgard discussed his previous work with the dairy, sheep, and beef sectors, where understanding the emissions from livestock production was important due to the costs being placed on emissions and environmental labelling becoming an issue. He noted the opportunity to apply these learnings to the seafood industry, and he discussed the results from his team's early analysis of the carbon footprint of the deepwater fishing fleet.

Dr Ledgard's presentation focused on the carbon footprint of fishing vessels and the seafood industry as a whole. He highlighted the various components that contribute to the carbon footprint of fishing, such as the construction of the vessel, the fuels used, and the fishing nets. The LCA system boundary of the study is from the cradle to the 'farm' gate (in the case of a fishing vessel, it is caught whole fish or catch on board the vessel.)



Ledgard also discussed the value of inedible products such as fish meal, which have a commercial value and contribute to the overall carbon footprint of the industry. An LCA is used to determine the total emissions from the whole system and allocate those emissions according to different co-products.

The study found that the carbon footprint from 1 kg of New Zealand deepwater catch was 1.19 kg CO_2e/kg catch. This is at the lower end of the range of global results where the average was 2.3 kg CO_2e/kg catch.

Ledgard provided data on 21 representative deepwater trawl vessels, including information on the annual fish catch, fuel use, and processed fish and fish meal. Where there were gaps in information, published data were used. For example, a detailed study on the carbon emissions of the different components that comprise a ship and how long they last. The study found that the carbon footprint from 1 kilo of deepwater catch was 1.19 kg carbon dioxide equivalents (a range of 0.38 to 3.28 kg CO_2e/kg catch).

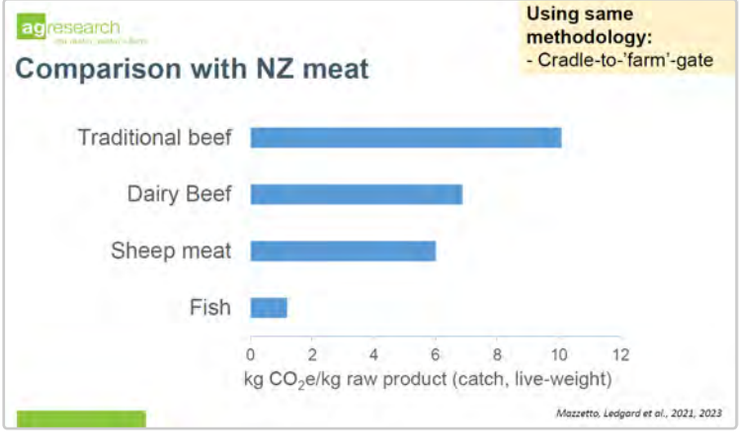
The study found that the carbon footprint of the landed fish on the ship was dominated by fuel emissions, which made up 95% of the total emissions, while refrigerants accounted for 4%. It was noted that although there are significant emissions involved in the production of a large deepwater fishing vessel, they last a long time and they catch a lot of fish – and in terms of ongoing emissions, when spread over the vessel's lifetime its emissions are relatively small.

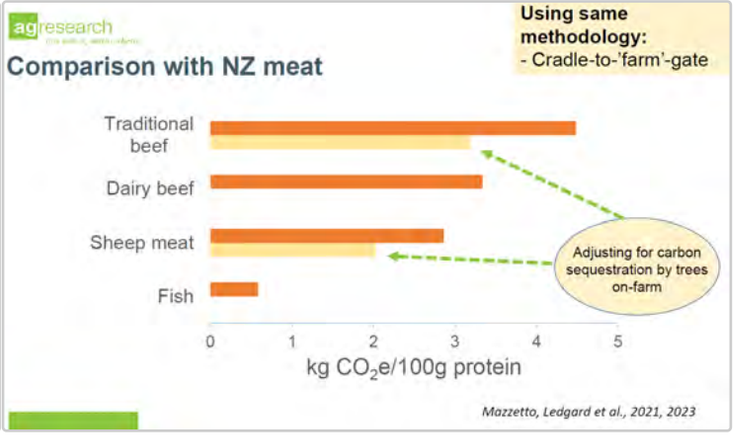
Ledgard explained that there was some variability in the data, but there were opportunities for efficiencies. He noted that for LCA analyses such as this, where there is some data uncertainty, sensitivity analysis is undertaken to test data assumptions. He also noted that there was no correlation between the total annual fuel used across different vessels and the carbon footprint per kilo of catch, but there was a strong relationship between the total annual catch per vessel and the carbon footprint.

The study also compared data from this study with published data for consistency and found that his data was consistent with other studies, with New Zealand deepwater carbon footprint results being at the lower end of the range of global results where the average was 2.3 kg CO_2e/kg catch.

Ledgard discussed the comparison in carbon footprint in units of 100 grams of protein, showing fish compare favourably to New Zealand meat even after taking carbon sequestration by trees on farms into account (see below slides). However, he warned that a more valid comparison requires accounting for conversion to edible fish and meat, and the co-products during fish/animal processing

Overall, the presentation highlighted the importance of reducing the carbon footprint of the seafood industry and the potential for the industry to become more sustainable through the adoption of circular economy practices.





Slides from Stewart Ledgard's presentation

The economic and social contribution of seafood to New Zealand's economy

Hugh Dixon, Data Manager, Business and Economic Research Ltd (BERL)

The commercial fishing industry is a significant contributor to the New Zealand economy, with fish exports alone worth approximately $2 billion in the year ending September 2022. Using data from 2016 to 2020, a study analysed the direct and indirect economic impacts of commercial fishing, including upstream businesses that supply inputs to the industry. The study found that the average annual direct economic contribution of commercial fishing was $2.3 billion in output, $820 million in GDP, and the employment of 6,300 full-time equivalents (FTEs). When including indirect and induced economic impacts, the total annual economic contribution increased to $5.2 billion in output, $2.2 billion in GDP, and the employment of 16,530 FTEs, representing around one percent of the New Zealand economy and workforce.

Hugh Dixon, Data Manager at BERL, discussed the wider economic contribution of commercial fishing in New Zealand. The research he presented was completed in 2022 and focused on the economic impact of capture fishing and seafood processing on the New Zealand economy. Dixon provided a global overview, citing data from the Food and Agricultural Organisation which showed that 1.7 million tonnes of capture fish were produced in Oceania, with New Zealand contributing 0.4 million tonnes.

He then provided data on the economic impact of fishing in New Zealand, including the total impact of fishing, which was $5.2 billion, with $2.2 billion of that being GDP. Fishing also supported 16,530 FTEs, which is about 1% of New Zealand's employment. Dixon also discussed the annual exports of New Zealand, which totalled $1.8 billion in 2020, just behind wine at $1.9 billion and kiwi fruit at $2.4 billion, with the main export countries being China, Australia, USA and Japan.

The methodology used to determine the value of the fish caught in New Zealand involved sourcing five years of commercial catch data from the Ministry for Primary Industries, adjusting this data to account for all fish caught, and using monthly export data from Statistics New Zealand to determine the level of exports for each fish species and the average export price per kg.

Dixon and his team allocated catch to the Australia and New Zealand Standard Industrial Classification (ANZSIC) based on fishing method and determined which fish species were export driven and which were not. Using the export price or port price they determined the overall value of the fish species.

They also checked their data against published data from Statistics New Zealand to ensure that their calculations matched.

Dixon provided a breakdown of fishing sectors, such as deepwater and inshore, with the deepwater sector providing an average catch value of $564m (with hoki comprising $166m and squid $92m).

Calculations of value per tonne showed the deepwater sector ($1,900) as a high-volume lower price sector, contrasting with other high value low volume sectors like rock lobster ($57,500) and shellfish ($24,600).

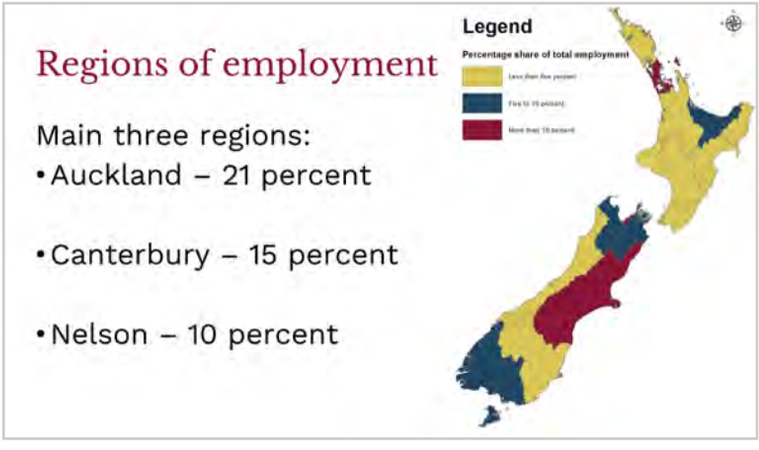
Dixon provided information on employment within the seafood sector and support industries, noting that there are 10,060 people directly employed within the seafood sector, with an additional 1,350 people employed in fish and seafood wholesaling and 552 employed in shipbuilding and repair services.

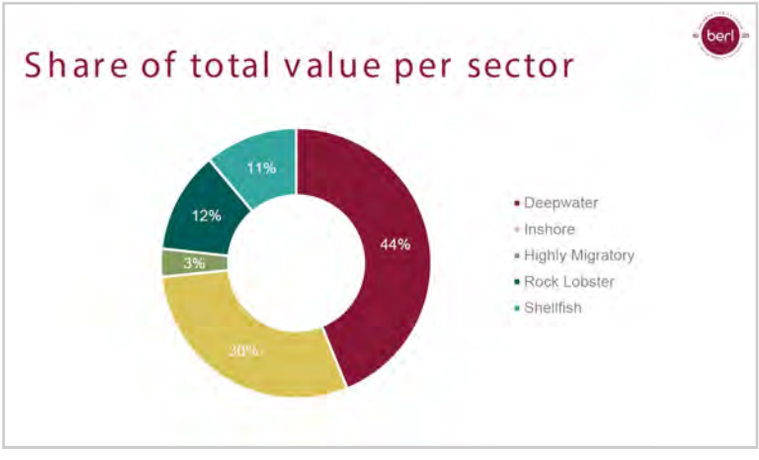
In terms of where this employment occurs regionally, the main three areas of employment were Auckland, which had 21% of employment, Canterbury 15% and Nelson 10%.

Overall, Dixon's presentation provided an in-depth look at the economic impact of commercial fishing in New Zealand, as well as the methodology used to determine the value of the fish caught.

The focus of the study was based on the economic impact and contribution. Dixon noted that there was room for the broadening of this study to include impacts and contributions of the seafood sector from a social and cultural and environmental context as well.

The seafood industry contributes $5.2 billion to the New Zealand economy and contributes to the full time employment of 16,530 people.





Slides from Hugh Dixon's presentation

Panel discussion

The symposium concluded with a panel discussion. From left to right: Tom McClurg, Ray Hilborn, Volker Kuntzsch, Stewart Ledgard, Aaron Irving, and Hugh Dixon.

During the panel discussion, the participants discussed how to present the seafood industry in a positive light to the general public, who often view it negatively due to past environmental damage caused by the industry. They suggested various ways to achieve this, including engaging with stakeholders in honest and meaningful dialogue, creating common ground with people through the sharing of knowledge, and bringing people together. However, some participants expressed concern that the public would not be receptive to information that is inconsistent with what they believe. We should be relying on effectively extended science and objective fact-based information.

The group also talked about the importance of highlighting the positive aspects of the seafood industry. It was agreed that we need to bring people closer so that they can see the good work that we do. We need to move beyond past environmental damage and highlight what the seafood industry is doing well going forward.

The speakers discussed topics such as the challenges of obtaining reliable data, the need for transparency and better reporting in the industry, the importance of listening to and engaging with the public, and the value of showing the industry the benefits of data collection. One speaker expressed the desire to see the seafood industry move away from talking solely about fishing and instead embrace its role as a sustainable food producer with strong environmental credentials.

Another speaker commented on the difficulty of countering negative portrayals of the industry in the media, while others discussed the need for positive messaging and reaching different audiences, including the general public. Overall, the discussion centred around ways to improve the seafood industry's image and promote its strong ethos of sustainability, its ocean stewardship and our positive contributions as food producers.

Several individuals spoke about the importance of engaging with the younger generation to bring the seafood industry and its potential for growth into the future. One speaker suggested the idea of creating a high school program focused on the fishing industry to inspire and educate students about the opportunities available in this field. Another speaker mentioned a program called Blue Tomorrow, which was designed to give international students an overview of different sectors in the blue economy, including fishing, agriculture, and engineering, and encourage them to pursue careers in these areas.

Another topic of discussion was the relationship between the seafood industry and non-governmental organizations (NGOs). One speaker emphasized the importance of understanding the differences between NGOs and developing relationships with them to work on common issues. They gave an example of a tuna convening group that brought together various NGOs, including Greenpeace, to identify sustainable tuna fisheries that commercial supply companies could buy from.

Another speaker stressed the need for the seafood industry to focus on positive actions, such as investing in the re-establishment of mussel beds. They suggested that the seafood industry continue its commitment to EAFM, noting that issues like seabird bycatch can undermine hard work and can turn public opinion. Again, it was agreed the seafood industry must do better in extending the science and research and telling our story.

Another speaker reiterated that all forms of food production necessitate environmental change, but our story is a good one. The comparative work that we have seen today attests to that. The people that we need to convince are the people in the government who make the decisions, they should value and cherish us as a part of the New Zealand economy.

Overall, the panel discussion highlighted the need for the seafood industry to engage with a variety of stakeholders, especially young people and the general public. We need to celebrate our seafood, our people and our stewardship. We are an exciting, progressive industry that is on the forefront of global sustainability management.

Closing remarks
Tom McClurg

Tom McClurg's closing address took us back to the definition of environmentalism that he used at the beginning of the symposium which was concern for the environment or concern for adverse human impacts on the environment.

While NGOs owe their existence to the maintenance or enhancement of concerns regarding adverse human effects on the environment, the seafood industry aims to reduce or eliminate the reasons for such concerns.

NGOs and the industry therefore have somewhat different interests.Successful ecosystem management will oblige NGOs to find another type of concern to focus on.

Luckily, we live in an age of concern, and there are millions of other things that we can be concerned about.

The problem with concern is that, by itself, concern changes nothing. Actions change the world, not concerns. McClurg noted that it was therefore appropriate that we finished with Volker's address, because he started to talk about action, basically taking responsibility for problems and trying to address them, pursuing opportunities, doing things, owning mistakes and learning from them.

If NGOs think that their purpose is to translate concern into actions that eliminate concern then there are prospects for common ground between NGOs and the seafood industry. Discussions would necessarily revolve around facts, the dynamics of natural processes, hypotheses about the effects of management actions and priorities for what we should try to do.

" ...there is a lot of common ground to be found through dialogue and different cultural perspectives are not necessarily inconsistent with scientific knowledge or modern technology."

McClurg recollected that many of the issues that were traversed are much bigger than the seafood industry and perhaps have more to do with the kind of mass psychology of the 21st century where the correct posture is more important than effective action. However, what is the encouraging thing about the symposium is that there is a foundation for positive action, not simply having to be concerned about it.

McClurg thanked the presenters for their insightful contributions. Summarising the day, he noted that in the presentation from Aaron Irving, the legal framework we work in is a sound one that provides for fishing to meet human needs over time, acknowledging effects that are short of adverse which we should avoid.

Ray Hilborn's address demonstrated how human needs can be sustainably and responsibly met from the production and consumption of seafood. Compared to other food production options, seafood from well-managed fisheries such as New Zealand's compares very well environmentally with other forms of food production.

Dion Tuuta spoke about seafood production from a Te Ao Māori perspective. He noted the importance of Matauranga Māori and how it is not inconsistent with scientific knowledge and with the use of modern technology.

Dr Stewart Ledgard and Hugh Dixon provided two presentations on the impacts of fishing and the economic state of the sector.

They fleshed out the critical factual information base that we need to make informed choices.

Volker Kuntzsch reinforced the need for comprehensive and comparable information to make informed choices, emphasizing that good information is critical for meaningful action.

Moreover, McClurg discussed the significance of the event's broader theme, which explored the duality and tension that exists between different cultural views of the relationship between humans and nature. He suggested that once these underlying perspectives are declared, there is a lot of common ground to be found through dialogue and that different cultural perspectives are not necessarily inconsistent with scientific knowledge or modern technology.

In conclusion, he expressed his hope that the account of the day would serve as a foundation for ongoing dialogue and further exploration of the symposium's themes.

Dion Tuuta, Hugh Dixon, Ray Hilborn, Stewart Ledgard, Aaron Irving, Tom McClurg (facilitator), and Volker Kuntzsch

Steamed scampi with pumpkin tortellini

References and resources

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Resources

Videos of all the presentations including the Q&A sessions, the opening and closing remarks as well as the panel discussion can be viewed on the symposium website. You can also find the PDFs of the presentations there: deepwatergroup.org/symposium/

Ray Hilborn's *Net Gains* opinion piece (February 2023) can be read here: deepwatergroup.org/net-gains/

Download the April 2023 issue of the Seafood Magazine to read Tim Pankhurst's cover story on the symposium and interview with Ray Hilborn
seafood.co.nz/detail-3/seafood-magazine-april-2023

May 2023

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