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FISHERIES RESEARCH & DEVELOPMENT CORPORATION NEWS

Stewardship for recovery

VESSEL INVESTMENT

COVID-19 IMPACT REPORT SURPRISE OYSTER FINDS

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The FRDC plans, invests in and manages fisheries research, development and extension activities throughout Australia. It is a statutory authority within the portfolio of the Federal Minister for Agriculture, jointly funded by the Australian Government and the fishing industry.

FRDC

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Snapper (Chrysophrys auratus) Photo: Marc Ainsworth The FRDC acknowledges the traditional custodians of the lands on which FISH magazine is produced, and pay our respects to their Elders past and present. We acknowledge the special relationship that Indigenous Australians have with their traditional lands and waters.



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States align to raise Snapper from the depths

Bringing communities together in the care and management of Snapper stocks could prove the key to the future of the species

By Brad Collis

Snapper Photo: Al McGlashan

MORE INFORMATION

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ollective stewardship of the iconic Snapper (*Chrysophrys auratus*) among sectors has emerged as the most likely framework to coordinate efforts addressing troubling declines in the species around the country.

The FRDC has funded two stakeholder workshops to develop a proactive national approach that may bridge differences in statebased fisheries management and resourcing, and in the status of the stocks themselves.

Snapper is an iconic species for commercial, recreational and Indigenous fishers around Australia. There are 12 independent stocks: six in Western Australia, one in Queensland, one in New South Wales, one in Victoria, two in South Australia and a common stock shared by South Australia and Victoria.

The workshops have highlighted differences between state approaches and available management capacity, while also identifying management initiatives that have successfully supported healthy stocks.

In the quest for a national strategy, however, workshop participants agreed a broader community approach, extending beyond the specific management and regulatory interventions of a particular state or place, offered the greatest promise for the future of the species.

All workshop participants also agreed on a fundamental first step: to establish community trust in fisheries management by building inclusive partnerships within and among stakeholder groups.

It was recommended that a national and collaborative approach to community-based Snapper stewardship be progressed. This is intended to provide a platform for relevant interest groups – commercial, recreational and Indigenous – to better communicate with each other and collaborate in the recovery of local Snapper resources. Such approaches have already been applied successfully at the state level (see breakout 'The Snapper Guardians approach', page 6) and for other species, such as Southern Bluefin Tuna (SBT).

These stewardship programs encourage fishers to place a high value on the stock, to only catch what is needed for consumption or for using best practice release methods. They also provide a platform to inform stakeholders and demystify fisheries research and management actions, and ultimately improve trust among all stakeholders.

Common ground

It was the near collapse of the South Australian stocks that galvanised more recent efforts to develop a national proactive management approach, says Canberra-based fisheries management consultant Nick Rayns.

He was among the participants at the national Snapper workshops that were coordinated by Primary Industries and Regions South Australia (PIRSA) in Adelaide in November 2019 and online in December 2020.

"Having a forum that gets all of these people in the same room is quite rare. But the FRDC has funded this process because it saw an opportunity for a national approach to managing Snapper rather than state by state or jurisdiction by jurisdiction," he says.

"The workshops have allowed people to see what others have tried around the country and to set up a collective information repository. Building common ground in areas such as data collection, stock assessment and harvest strategies have proven elsewhere to be the means by which jurisdictions can work successfully together towards sustainability goals. Snapper could benefit greatly from such an approach."

To this end, he says the workshops have started the process of using the Status of Australian Fish Stocks (SAFS) reports data and the science behind this to get conversations started with fisheries managers and fishers, both commercial and recreational. An update of SAFS data is expected to be released later this year.

One of the workshop organisers, Keith Rowling from PIRSA, says the challenge with Snapper is the multiple jurisdictions, each with different regulations and histories. Below Juvenile Snapper about to be released in last year's Snapper Guardians community day at Cockburn Sound, WA. Photo: Craig Wells





"Also Snapper, unlike Southern Bluefin Tuna (SBT) for example, is not one stock. SBT is a single stock that spawns below Indonesia, migrates around Australia and up into the Pacific. The Snapper population, by comparison, comprises multiple stocks around western, southern and eastern Australia. In some places they overlap and in other places they are quite separate, and that adds another layer of complexity for any national management plan," he says.

6

He makes the point that even with an overarching national management approach, there will be subtle differences in each jurisdiction based on the stock's biology, its biomass levels, its history and so on, because all these factors can vary. "That's our challenge," he says.

An example of reproductive biological inconsistency in Snapper is that some populations do not always have fish entering the fishery on an annual basis.

"For example, we have not had a significant recruitment of fish in the Spencer Gulf stock since 1999. That's 21 years of not having the recruitment needed to carry the fishery through. We have a lot of research investment studying this, but ultimately, a fishery without recruitment reaches a point where it can't sustain itself.

"And the answer to why recruitment is being impaired is likely to be a complex combination of factors. It could be a change in temperature or changing water flows in and out of the Gulf, or something else like a food chain disruption. And then we have to find out if these changes are affecting the eggs and sperm stage or the larval stage. There's just so many different stages of the life cycle where Snapper are vulnerable until they grow."

FRDC-funded research shows Snapper is sensitive to changing climatic conditions such as rising water temperatures. Recent years of low recruitment, which affects stock replenishment, may also be compounded by climate change-related impacts and other changes within marine ecosystems.

One result of this is that Snapper is extending its range further south; it is encountered more frequently, for example, in Tasmanian waters, but such range shifts are not recognised in current management arrangements.

To help refine strategies, managers have identified the need for further research into the factors that influence Snapper recruitment, egg production and larval survival for different stocks, as well as a closer account of total fishing mortality, including commercial and recreational catches.

It is planned to hold a National Snapper Workshop every three years for researchers, managers and stakeholders to measure progress, compare approaches and share information. **F** Recfishwest CEO Dr Andrew Rowland (left) and WA Fisheries Minister Peter Tinley at the release of juvenile Snapper. Photo: Craig Wells

THE SNAPPER GUARDIANS APPROACH

The Snapper Guardians program is run by Western Australia's peak recreational fishing body, Recfishwest, and centres around an annual or biennial release of juvenile (pink) Snapper into the waters south of Fremantle.

The program was initiated in response to community concerns that followed a Snapper fish kill in 2015 in Cockburn Sound – a popular local fishing area.

Recfishwest promoted a crowd-funding appeal to raise funds to launch the first Snapper Guardians release of juveniles into the Sound – successfully raising \$36,000 in 36 hours. This helped to fund the grow-out and release of 50,000 Snapper into Cockburn and Warnbro sounds in December 2015 and February 2016.

Snapper Guardians has become an effective partnership between fishers, the Department of Primary Industries and Regional Development (DPIRD) and the community generally. The program is seen as a successful model for establishing community stewardship over a fisheries resource.

Young Snapper are hatched and reared at DPIRD's Fremantle aquaculture facility from eggs collected in the Cockburn Sound from spawning schools in early summer.

Collecting and rearing the juveniles in a protected environment significantly improves the chances of the Snapper making it through to adulthood.

Recfishwest holds an annual Snapper stocking event with state government support, which allows the fishing community to be part of the solution in securing the future of the Snapper fishery.

An estimated 100,000 juvenile Snapper have been reared and released since the program started. **F**

Australia Day Honours

Russell Reichelt (Queensland) has been named as an Officer of the Order of Australia for distinguished service to marine conservation, to ecosystem management of the Great Barrier Reef and to climate change research. He was chair of the Great Barrier Reef Marine Park Authority from 2007 to 2018, a member of the Independent Expert Panel for the Great Barrier Reef since 2016 and a non-executive director of the Great Barrier Reef Foundation since 2004.

Other roles include serving on the board of the Australian Maritime Safety Authority as a non-executive director from 2007 to 2019 and as an independent director since 2019. Russell Reichelt has also been a board member of the Climate Change Authority since 2019, and Australian Sherpa to the High Level Panel for a Sustainable Ocean Economy since 2018.

Michael (Rusty) Ellis (WA) has been awarded the Emergency Services Medal for his efforts over more than a decade with Volunteer Marine Rescue Western Australia (VMRWA) and the Exmouth community. He has been involved in several critical search and rescue missions at sea, often in extreme conditions. He has also led large-scale searches conducted over multiple days. As well as serving as commander of the rescue service, he has helped to secure funding for an additional rescue vessel and expanded and diversified the volunteer membership base. He is a long-time member of Recfishwest, has contributed to FRDC-funded projects, and is a Reef Vision volunteer, monitoring the marine life around Exmouth's King Reef.

Helene Marsh (Queensland), a professor at James Cook University's Centre for Tropical Water and Aquatic Ecosystem Research, has been named an Officer in the Order of Australia. This recognises her distinguished service to the biological and environmental sciences, to the conservation of marine mammals, and to tertiary education. With a particular focus on dugongs and manatees, she has worked with the International Union for the Conservation of Nature and the Society for Marine Mammalogy, and has been a member of the Land and Sea Management Scientific Advisory Committee since 2006.

Daryl Quinlivan (NSW) has been named as an Officer of the Order of Australia for distinguished service to public administration through leadership roles in the areas of agriculture, water and the environment. He was Secretary of the Department of Agriculture from 2015 to 2020, and Deputy Secretary of the Department of Agriculture, Fisheries and Forestry from 1999 to 2010. **F**





New national marine research hub

The Australian Government has announced \$45-million investment in a new national Marine and Coastal Hub as part of the second phase of its National Environmental Science Program (NESP) from 2021 to 2027.

The hub will be hosted jointly by the University of Tasmania and Queensland's Reef and Rainforest Research Centre.

The six original NESP hubs will transition into four new hubs during the year. The original hubs were: Clean Air and Urban Landscapes; Marine Biodiversity; Threatened Species Recovery; Earth Systems and Climate Change; Northern Australia Environmental Resources; and Tropical Water Quality.

The four new hubs are: Marine and Coastal; Resilient Landscapes; Sustainable Communities and Waste; and Climate Systems.

Research across the four hubs will focus on pressing environmental management and policy needs, with an emphasis on climate adaptation, threatened species, protected places and waste impacts. They are expected to work collaboratively, while researching practical environmental science strategies within their own field. **F**

ECOSYSTEMS



SEAGRASSES HELP FIGHT PLASTIC

Spanish researchers have found that seagrass beds may have a role to play in helping to remove plastics from inshore marine environments.

The grasses trap plastic fibres, often aggregating them into balls, which are then washed onto the shoreline.

The researchers investigated the seagrass *Posidonia oceanica*, known as Neptune grass, which forms extensive meadows in the Mediterranean Sea.

They found beached seagrass remains, including vegetative balls known as aegagropilae, had trapped up to 1470 plastic items per kilogram of plant material. The plastics were mainly composed of negatively buoyant polymer filaments and fibres.

They estimate the total extent of *P. oceanica* may be capable of trapping nearly 900 million pieces of plastic debris from the Mediterranean Sea each year, although the meadows are in decline in some areas as a result of climate change, pollution, dredging and other stressors.

The findings were published in the journal <u>Scientific Reports</u> on the Nature website. **F**

OCEAN KNOWLEDGE



Support for ocean literacy

The United Nations has declared 2021– 2030 as the Decade of Ocean Science for Sustainable Development. The aim is to support efforts to reverse the decline in ocean health and gather ocean stakeholders worldwide behind a common framework that will ensure ocean science can fully support countries in creating improved conditions for sustainable development of the ocean.

In conjunction with this, the United Nations Education, Scientific and Cultural Organization (UNESCO) has established an online Ocean Literacy Portal (<u>https://</u> <u>oceanliteracy.unesco.org</u>) to share resources to build ocean literacy and networks. Programs include the OceanTeacher Global Academy (<u>https://classroom.oceanteacher.org</u>), which provides a comprehensive, professional-level, web-based training platform to support classroom training (face-to-face), blended training (combining classroom and distance learning), and online (distance) learning. These courses have been developed by 16 international regional training centres.

Other organisations that have developed ocean literacy materials, primarily for school students, include the Australian Marine Environment Protection Association (<u>www.ausmepa.org.au</u>) and the US-based National Marine Educators Association (<u>www.marine-ed.org</u>). **F**

WORD-WISE

POINT OF ORIGIN

Endemic: specific to a particular people or locality; a native animal or plant indigenous to a particular region.

Ecdemic: denoting or relating to a disease that originates outside the area in which it occurs. F

A life dedicated to the study and concernation of Australian freshwater fist

Codfather

Cover design Andrea Schutz

IN PRINT

THE CODFATHER

In this new book, long-time fisheries scientist and conservationist Stuart Rowland tells the story of his life and career, dedicated to the conservation of Australian freshwater fish.

His connection to the Murray Cod dates back to the early 1900s when his family owned farms on the Peel River, downstream of Tamworth in New South Wales.

Stuart Rowland studied native fish in the Murray–Darling and Clarence river systems for more than three decades. Working with NSW Fisheries, he developed hatchery techniques, described the biology of Murray Cod, identified, described and named Eastern Freshwater Cod and Mary River Cod, ran one of Australia's first fisheries conservation projects, identified infectious diseases of native fish and developed farming techniques for Silver Perch.

The Codfather provides new scientific information and examines the history of freshwater fish and fishing in the Murray– Darling and Clarence river systems, including Aboriginal culture, the explorers and early settlers.

Stuart Rowland comments on the environmental degradation and an unprecedented ecological disaster in the Darling River in 2018–2020, with a plea for improved river management before our native fish are gone forever. **F**

Publisher: Stuart Rowland Details: 621 pages, softcover Price: \$50 plus postage To order: contact Stuart Rowland, stuthecodfather@gmail.com





Veterinarian Tara Needham travelled to the US to learn new skills in aquatic animal health treatment and management. Meeting specialists in the field and building her network was a valuable part of the experience. Photos: Supplied by Tara Needham

International training targets aquatic animal health skills

From surgery on fish to biosecurity plans, aquaculture is expanding, and there is increasing demand for the skills of aquatic animal health experts

By Melissa Marino

eing an aquatic vet involves more than just diagnosing and treating disease. It is also about maximising animal welfare by preventing health problems and minimising the introduction of disease into enterprises in the first place.

Happy, healthy animals that do not encounter stress in their lives grow better and taste better, and this ultimately makes aquaculture more profitable, says Tara Needham. One of Australia's few aquatic vets, she honed her skills through an FRDC-funded placement in the 2019 AQUAVET program in the US.

The role of aquatic medicine in maintaining herd health and combating biosecurity risks is increasingly important as antibiotic resistance in farm animals and humans grows, says Tara Needham.

"The prevention of disease not only takes into account biosecurity with disease entering a property, but also includes the health of the animals in the enterprise, because animals with good nutrition have better immune systems so they're less likely to get sick," she says.

Aquatic veterinarians bring a unique skillset to aquaculture enterprises, she says. On one hand,

they diagnose and treat disease. But they are also trained, from a herd health perspective, to see the big picture.

"In terms of a healthy herd, it's about the unit as a whole. You're not considering just one animal in a unit," she says. "You've got a 'whole-farm' perspective, and you're also thinking about the external environment so you can identify possible areas where disease could come in, and look at how to manage that."

Australia's Atlantic Salmon producers have long appreciated this, employing their own in-house veterinarians, she says. Emerging aquaculture industries are increasingly also seeking insights from those trained in aquatic animal health.

But veterinary science university degrees offer limited aquatic training and this is why a course such as AQUAVET is important.

The four-week intensive "experience of a lifetime" at Cornell University, New York, provides hands-on training in diagnostics and surgery. It also addresses biosecurity risk management and public health issues in aquatic mammals, crustaceans, shellfish and finfish. Three weeks of the course is dedicated to aquaculture. Tara Needham applied these lessons to her work at aquaculture consultancy Panaquatic, where she worked with Abalone, Barramundi and Murray Cod, and in reviewing white spot disease in prawns for the Queensland Government.

From the development of biosecurity plans to the management of fish health and honing basic skills in diagnosing disease, including in autopsies, the training has proved very valuable, she says.

"I learnt how to do a full general anaesthetic for fish at AQUAVET (using anesthetised water flowing over their gills) and I've now done a number of surgeries removing lumps and bumps, as well as an ovariectomy – removing fish ovaries," she says.

While she is now using her skills as a veterinarian with the Bird and Exotic Animal Clinic in Melbourne, in ornamental fish such as koi and goldfish, she expects to return to aquaculture in the longer term.

The AQUAVET course gave her the grounding to deliver an anatomy workshop as part of an annual lecture series for University of Melbourne veterinarian students run by Panaquatic managing director Paul Hardy-Smith.

It has helped her to build connections with world leaders in fish health who are driving advances in the field.

"The value of AQUAVET is not just about the knowledge and practical skills gained, it is very much the meeting of people and the creation of ties and working relationships that will go on for years," says Tara Needham.

The networks she has developed through the program will help her keep up to date with the new viruses and bacteria that are continually being discovered, as well as the the latest disease control and prevention techniques. **F**

Insights from the seafood supply chain

The FRDC finds business confidence in the seafood sector remains positive, although there is more it can do to engage stakeholders

By Annabel Boyer

10

he FRDC's latest survey of stakeholders engaged in the commercial supply of seafood has found businesses, governments and researchers involved in this aspect of fisheries remain "cautiously optimistic" about the future, despite the challenges of the past year. The business sentiment survey seeks feedback on the level of commercial confidence in the future of Australian fisheries and aquaculture. It also identifies how effective the FRDC is perceived to be in its investment of industry and government funds, and in communicating its activities.

While the FRDC's stakeholders are diverse and include commercial fishing, aquaculture, Indigenous fishing and recreational fishing, this 2020 survey only targeted those involved in the seafood supply chain. Intuitive Solutions used online and telephone interviews to collect feedback from 347 participants across the country in November and December.

Supply chain stakeholders

Targeted stakeholders were grouped according to their role in the seafood supply and production chain as:

- active seafood businesses, working in aquaculture or commercial fishing;
- supply chain businesses, working as exporters, processors, retailers or wholesalers; and
- non-business resource management stakeholders, working in government, research or Indigenous organisations.

Director of intuitive solutions Michael Sparks says the 2020 stakeholder survey was undertaken at an unusual time, with a confluence of different factors creating a unique operating environment for seafood businesses. "There was, at the start of 2020, confidence in both domestic and export markets," he says. "However, the social, operating and trading environments have been significantly impacted by COVID-19, with restrictions of movement creating challenges for seafood businesses and creating uncertainty about 'business-as-usual' practices."

The continuing uncertainty and ongoing impacts of COVID-19 have also been compounded by recent export challenges into Chinese markets.

Survey results

The survey shows the impact of COVID-19 has been a mixed one.

Unsurprisingly, the feedback indicates COVID-19 has impacted the profitability of a large proportion of active businesses, with 58 per cent reporting a decline or significant decline in profitability. In the supply chain, 47 per cent of businesses reported a decline or significant decline.

A smaller number of seafood businesses reported performing as usual and, in some cases, were in a stronger position than they were prior to the pandemic. For more details on the impacts of COVID-19 across the seafood sector see pages 18–22.

Despite the challenges of 2020 and the COVID-19 pandemic, the feedback indicates there is a cautious optimism about the future of the fishing and aquaculture industries. "Of the stakeholders we surveyed, more were positive than negative about the future of fishing and aquaculture in Australia," Michael Sparks says.

The nett sentiment – the percentage positive sentiment minus the percentage negative sentiment – was +34 for active seafood businesses and

hoto: Rafael

+31 for supply chain businesses. Confidence among non-business stakeholders, which includes fisheries managers, the researcher community and consultancy service providers, was significantly higher, at +66. This reflects confidence in the health and management of Australia's fishery resources.

A new R&D Plan

A new and refreshed FRDC Research and Development (R&D) Plan was launched in mid-2020 and the survey provided an opportunity to assess stakeholder awareness of the plan.

The plan has five target R&D outcomes, with enabling strategies designed to build capability and provide foundational support. The feedback suggests that awareness of, and familiarity with, the new R&D Plan is modest.

Across the three key stakeholder cohorts, 40 per cent of active businesses, 21 per cent of supply chain businesses and 56 per cent of non-business stakeholders indicated they were at least somewhat familiar with the plan. This indicates that further effort is needed to engage stakeholders and connect them with the R&D outcomes underpinning the plan.

Michael Sparks notes that for active seafood businesses and supply chain businesses, the R&D outcome of 'fair and secure access to aquatic resources' is identified as likely to have the most impact on their business operations. "While other outcomes remain important, this was consistently identified as the one that will deliver the most direct impact to businesses," he says. Non-business stakeholders identified 'growth for enduring prosperity' as the most urgent R&D outcome in the new plan.

For more information on the target R&D outcomes, view the plan on the FRDC's website: <u>http://rdplan.frdc.com.au</u>

Getting the message out

Stakeholders reported a high level of trust and confidence in the information about research provided by the FRDC.

When asked 'How important is it for the Australian fishing industry to have an organisation like the FRDC?', the average score from respondents was 8.5 out of 10, in line with the result of a similar survey in 2015; in 2011 the score was 7.8.

When asked how satisfied they were that the FRDC was investing government and industry funds wisely for the benefit of industry – on a scale of 1 to 10 – the score from active businesses was 6, with 6.1 from supply chain businesses and 7.1 from non-business stakeholders.

A major challenge for the organisation remains ensuring stakeholders are made aware of the huge diversity of research investments made by the FRDC.

The results indicate stakeholders are using at least one of the FRDC's channels (social media, e-newsletter, website or *FISH* magazine) to access information. It was evident from the feedback that use of the FRDC's social media channels was well below that of the other channels.

FISH magazine

FISH magazine received the highest score as a communication channel, referenced by 93 per cent of active seafood businesses, 94 per cent of supply chain businesses and 93 per cent of non-business respondents. More than 50 per cent of seafood producers and suppliers and 88 per cent of non-business stakeholders indicated they learned something new or made changes to their operations as a result of the magazine's content.

While stakeholders reported a strong readership of, and satisfaction with, *FISH* magazine, the challenge continues to be in satisfying the wide range

Rey metrics from the 2020 FRDC searood supply chain stakeholder report			
METRIC	ACTIVE SEAF00D- PRODUCING BUSINESSES	SEAFOOD SUPPLY CHAIN BUSINESSES	NON-BUSINESS STAKEHOLDERS
Mean satisfaction that contributions to the FRDC are being invested wisely/ for the benefit of industry	6/10	6.1/10	7.1/10
Mean agreement that it is important for Australian fishing and aquaculture industries to have an organisation like the FRDC	8.6/10	8.8/10	9.2/10
Took up at least one engagement opportunity with the FRDC in the past two years	79%	71%	88%
Have at least some understanding of the new R&D Plan	40%	21%	56%
Used at least one FRDC communication channel	97%	94%	100%
Received/read <i>FISH</i> magazine	93%	94%	93%
Learned something new or introduced something to the business	54%	56%	88% SOURCE: FRDC

of needs and interests of stakeholders coming from the many and various sectors and interest areas.

"Stories which illustrate on-the-ground, lived experiences of fishers, researchers and other businesses appear to be an important ingredient for attracting readership," Michael Sparks notes. Stakeholder suggestions for magazine content include more articles featuring diverse viewpoints, including those critical of current practices, opportunities to connect with investors, features on sustained success in the industry, industry and environmental non-government partnerships and the FRDC services.

The survey also sought user experiences and needs around the FRDC website to inform and assist with the current redevelopment of the site into a more user-centred version.

The full report from the 2020 FRDC stakeholder survey will be available soon on the FRDC website, www.frdc.com.au ${\rm \ F}$

Management and technology deliver fishery confidence

Australian Longline's new \$40 million, state-of-the-art fishing vessel makes a bold statement about the company's confidence in the future of fishing

By Brad Collis

hen Malcolm McNeill looks through the panoramic bridge windows aboard the *Antarctic Aurora*, he is seeing far beyond its base on the River Derwent in Hobart. He is looking to the future – to the long-term fortunes of the Patagonian Toothfish (*Dissostichus eleginoides*), which this glistening new ship will hunt.

Beyond his own particular fishery, he hopes the investment and the technology embedded into the new ship's design will inspire confidence in the Australian fishing sector as a whole.

The Antarctic Aurora is a \$40-million investment in a 40-year outlook for the Patagonian Toothfish fishery. Malcolm McNeill is managing director of Australian Longline, the company that owns the new ship. He says it is a measure of the company's faith in the fishery's sustainability.

It is a confidence, he says, shaped by modernday resource management and by some of the new technologies embedded into the vessel's advanced design. The decision to build, not buy, was based on the company's determination to future-proof the vessel to make a substantial investment in a fishery with a long-term future.

"We needed a ship that could operate safely and efficiently for four-and-a-half months in some of the roughest conditions in the world and, on returning to port, be unloading a premium quality product already prepared and packaged for market," he says.

Purpose-built

On a tour through the vessel – 62 metres long, 13.5 metres wide – Malcolm McNeill explains that most longline vessels catching toothfish around the world were built for other species and modified for catching toothfish.

The *Antarctic Aurora* has been built specifically for toothfish and for safely navigating Antarctic conditions, which swing from calm waters strewn with sea ice to months on end of freezing gale-force winds and 10-metre swells.

"Starting from scratch enabled us to incorporate compliance with the rules and regulations that we operate under into the design, along with safety features like increased hull strength."

The vessel has a hull classification of Ice 1B, an international rating that allows it to navigate through sea ice.

One of the vessel's major environmental features, as a consequence of this 'from-scratch' approach, is its seabird protection – a critical licence requirement. The fishing lines, which are deployed as deep as 2000 metres, are fed into the ocean up to two metres below the stern to prevent seabirds getting to the baited hooks.

When the lines are retrieved, they are hauled into a moonpool through the bottom of the vessel's hull; again, deep beneath the surface. From the moonpool the caught fish are pulled up inside the boat and straight into an adjoining processing room. No waste is discarded overboard, with all offal retained in a 170,000 litre storage tank.

The vessel has more than 900 cubic metres of freezer capacity, which allows up to 400 tonnes of frozen fish to be stored over the four months at sea.

"In addition to compliance and safety features, there's a lot of new technology on this vessel for preparing and maintaining the catch in pristine condition," says Malcolm McNeill. "When we →

Below New longlines set up and ready for use. Photo: Brad Collis



Below The new diesel-electric motors designed to reduce fuel consumption. Photo: Brad Collis



"In addition to compliance and safety features, there's a lot of new technology on this vessel for preparing and maintaining the catch in pristine condition."

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Malcolm McNeill, pictured with the Antarctic Aurora, Hobart, Tasmania

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Below Patagonian Toothfish is a premium product; it is fished sustainably and has a rich flavour and succulent flesh. It is known as the seafood equivalent of Wagyu beef. Photo: Shutterstck



dock, the fish will already be processed, packaged, barcoded, shrink-wrapped and ready for transfer directly into freight containers for markets around the world.

"This allows the vessel to remain at sea for longer, and we don't need skilled shore labour, which lowers costs."

Another cost saving that also lessens the vessel's environmental footprint is a new dieselelectric propulsion system.

"We haven't gone down the battery packs route like Austral Fisheries, whose new boat has that technology, but we have set up the *Antarctic Aurora* so that it needs minimal power to hold its line. We are able to use the engines and motors at the minimum needed to keep the boat moving and for the freezers. It's all automatic and significantly reduces our fuel consumption." The *Antarctic Aurora* carries 770,000 litres of fuel.

Shared goals

This attention to minimising the use of fossil fuels is shared by Australia's other toothfish operator, Austral Fisheries, whose CEO, David Carter, predicts an imminent consumer backlash against any primary producer – on land or at sea – still burning diesel at current consumption rates.

David Carter says alternative propulsion systems are a major area of R&D investment for Austral. He concurs with Malcolm McNeill about technology and vessel investment being a sign of confidence in the fishery.

"Generally, there has not been a lot of new investment in replacing boats around Australia because of squeezed profitability and lack of clear direction for the sector," he says.

"The toothfish business, however, has seen strong investment because there's been good money being made. Where there's profit there's confidence to invest."

David Carter says Austral has come to see avoiding investments such as new boats as a false economy. "The legacy position was to buy any old piece of iron, develop a fishery and try and keep it going with bailing twine and fencing wire ... metaphorically speaking. But when we look at the numbers, it's not the cheapest way to run boats, as the Europeans will tell you. They change their boats every five to 10 years.

"It means replacing the emphasis on fuel and maintenance with depreciation and interest, and as interest rates lower, these sorts of investments more easily stack up economically."

He says the investment by both of Australia's toothfish operators reflects confidence in the fishery's management and the prevention of illegal fishing, which had previously plagued the fishery.

"Added to this is the profit inherent in a highdemand luxury food product that we believe will endure well into the future," David Carter says.

Consumer activism

That said, he is keeping a close eye on global consumer trends. He points to the development of plant-based meat alternatives and the increasing environmental stipulations being imposed on food production generally.

"The past has become a pretty poor guide to our future," he says. "Our fisheries management

FISHING FOR RESEARCH

The Antarctic Aurora departed Hobart on 5 January for its shakedown cruise to the Prydz Bay area of east Antarctica.

Australian Longline has a 60-tonne research catch allocation there, which managing director Malcolm McNeill says takes about 20 days to fill – slower than the usual rate of catch and processing because the ship also fulfils research responsibilities.

The research permit is provided to the company by the Australian Fisheries

Management Authority (AFMA) allowing it to fish within the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) fishery area, under specific conditions.

This includes the use of standardised longline fishing and providing fish biological measurements, tagging and ageing, which is used to characterise the spatiotemporal structure, biomass and connectivity of toothfish populations and inform stock assessments. In addition, environmental data from conductivity, temperature and depth (CTD) and video loggers contribute to models of toothfish habitat use. These models inform spatial management approaches for Patagonian Toothfish and the conservation of representative areas of benthic biodiversity.

Additional outcomes from the research licence include mapping fishable areas and improved understanding of the distribution, relative abundance and life histories of bycatch species. is good; the big problems were sorted out 15 to 20 years ago.

"It is factors such as the use of diesel that now loom over us. We have to be wide awake to the inevitability that policymakers will eventually price this."

But he acknowledges change will be difficult for many fisheries, such as the prawn fishery in which Austral also operates: "Where we use lots of litres of diesel to produce not that many kilos of prawns it's harder to get excited about a boat replacement program. However, we will need to find fuel alternatives ... one possibility being to modify diesel motors to run on green ammonia."

David Carter says to ignore the reality of consumer pressure on the 'licence to operate' is not an option.

Trust in science

Malcolm McNeill agrees and, like David Carter, is pinning a lot of trust in science.

"For the toothfish fishery we have progressed from a very uncertain future, especially when the pirate boats were operating, to today when we are confident about its long-term sustainability and the science that underpins this," he says.

Australian Longline and Austral Fisheries share the 3000-tonne Patagonian Toothfish quota for the Heard Island and McDonald Islands Fishery – an Australian territory 4099 kilometres south-west of Perth. Austral Fisheries has the largest share at two-thirds. The two companies also share a small 550-tonne quota in a fishery off Macquarie Island, about halfway between New Zealand and Antarctica.

The Antarctic Aurora has 22 crew, although it can accommodate 30 people, and all vessels carry independent government observers to monitor catches and often scientists as part of ongoing Australian and international fish population research.

"We take our corporate social responsibility seriously," says Malcolm McNeill. "And that includes investing in skilled crew. About half of the *Antarctic Aurora*'s crew are newly trained and have never been to sea before, so it is going to be a big adventure for them."

The first big test for the new vessel, its new systems, and its crew will be a full Heard Island season starting on 1 April. The fourmonth voyage will be the beginning of what Malcolm McNeill is banking on being a four decade life for the ship ... and a never-ending life for the Patagonian Toothfish fishery. **F**



Malcolm McNeill on the bridge of the *Antarctic Aurora*, which is fitted with state-of-the-art navigation and ocean monitoring equipment. Photo: Brad Collis

WORLD FIRST FOR AUSTRALIAN COMPANY

In January another Australian Longline vessel, *Antarctic Discovery*, became the first fishing vessel in the world to be certified to the Global Seafood Assurances Responsible Fishing Vessel Standard (RFVS).

The RFVS enables fishing operations to provide assurance of decent working conditions and operational best practice from catch to shore.

The standard was created by <u>Global Seafood</u> <u>Assurances</u>, a spin-off from the longstanding <u>Global Aquaculture Alliance</u> (GAA), to provide end-to-end quality assurance for all seafood by creating standards where gaps exist. GAA partners with some of the world's largest food retailers.

The RFVS is a new certification aimed at assuring consumers that seafood supply chains are free of human rights abuses, and that crews are treated fairly, trained and paid appropriately and work in safe conditions.

The 55-metre *Antarctic Discovery* has a crew of 20 to 25 plus two observers.

The company sees the new certification process as a way to not just "tick the boxes" but to try and exceed accepted best crewing practices, says managing director Malcolm McNeill.

"Being an ex-fisherman, it can be easy to say 'that's how I used to do things back then, so you should be able to do the same now'. But the world has changed, so every now and then it's worth recalibrating the thought process and question: Are we doing it safely? Are we doing the right thing? Are we doing it fairly?

"The people on our vessels are experienced, work hard and are well respected," he says. "But there is a public perception that fishing crews are treated very badly, so it's not enough to say we do the right thing. People want proof.

"This certification will enable us to provide customers with independent assurance that we, as their supplier, engage, employ, pay and treat all our crew equally, fairly, and that they are trained in safety."

Malcolm McNeill says the audit process highlighted "a couple of aspects that we were a bit relaxed on" and which were rectified. "We now have a template for how we should engage and treat all crew now and into the future." **F**



NT builds new fishing experiences

Words Barbara Adam Photos Northern Territory Fisheries

New reef design amplifies habitat for northern marine species and opportunities for recreational fishers

fter little more than a year in the water, the largest single artificial reef deployment in the Southern Hemisphere is already teeming with marine life. Fishing tourism draws many Australians north to cast a line and the four new purposebuilt reefs, located off Darwin, are part of a \$50-million Northern Territory Government project to improve recreational fishing opportunities for locals and visitors alike.

The reefs are part of a 'fishing trail' experience, a connected journey of the new and existing

fishing spots. However, the reefs will also play an important role in aiding the recovery of fish species whose populations are at risk of overfishing, such as Golden Snapper (*Lutjanus johnii*) and Black Jewfish (*Protonibea diacanthus*).

Evan Needham, aquatic resource manager at NT Fisheries, says the artificial reefs were deployed in November 2019 as part of a broader management strategy to help recover at-risk reef fish species.

The aim is to create new habitat on a scale that will increase productivity as opposed to simply attract existing fish stocks and reduce pressure on existing fishing locations. They also provide an opportunity to encourage anglers to become reef guardians and custodians of reef fish in the same way that they have become custodians for the iconic Barramundi.

He says the variety of fish already documented on the new reefs is an exciting result for fisheries managers. "What we are seeing is much higher than our expectations."

Designed for diversity

Designing and positioning artificial reefs to optimise their value as fish habitats has been extensively studied and refined in countries such as South Korea and Japan. Much of this international research is not published in English, but research funded by the FRDC in the mid-2000s was instrumental in bringing sophisticated reef designs to Australia.

This knowledge helped to drive a shift from using 'materials of opportunity', such as car bodies, defunct whitegoods, tyres and other miscellaneous objects for reef construction, towards more effective, purpose-built structures.

The NT's new reefs consist of 118 modules, known as Reef Pyramids, each five metres high, which have been designed by Perth-based company Subcon.

The modules are made from high-strength, reinforced, marine-grade concrete and contain internal caves, vertical surfaces and inclined planes that make the water flow upwards, lifting nutrients to attract forage fish.

They are expected to become home to species that prefer close contact with reef structures, such as Black Jewfish, Coral Trout (*Plectropomus* spp.) and cods (*Epinephelus* spp.), as well as fish that usually live in habitats adjacent to reefs, including snappers (*Lutjanus* spp.) and emperors (*Lethrinus* spp.). The current upwellings in the reef modules that draw baitfish aggregations are also expected to attract pelagic species from the Scombridae and Carangidae families, including multiple mackerel (*Scomberomorus* spp.) trevally, and tuna species.

"We've tried to take all the qualities of a natural reef and fabricate one to basically make a reef on steroids," Evan Needham explains.

Originally the design specifications called for the artificial reefs to have a life span of 30 years, but modifications to the design mean the structures are expected to last for 100 years, or even longer.

They are expected to be productive habitats within three years and Evan Needham says the early results, after a little more than a year, are very encouraging, with more than 40 species of fish identified. **Below** The custom-made Reef Pyramids are designed to enhance the underwater habitat for a broad range of fish.



"We're quite excited about the variety of fish that are now on these and the benthic growth that's actually growing on those modules. We've got barnacles, oysters, algae and sponges and there are at least seven different species of tropical snappers, multiple species of trevally, Black Jewfish, multiple species of mackerel and multiple species of bait fish and sharks."

The development of the reefs is monitored using baited remote underwater video systems (BRUVs), which sink to the ocean floor and record the fish that come to eat the bait. In addition to the six-monthly BRUV recordings, NT Fisheries uses sonar to monitor fish clusters and drifts video cameras through the sites. The FRDC has funded several projects that have been important in developing these innovative techniques and technologies now widely used for monitoring marine species on artificial reefs.

"We've already noticed a few non-target species that anglers wouldn't catch, in terms of little butterflyfish and damselfish, which are already colonising the modules," Evan Needham says. "So, to me, it's a pretty good indication that we've got an artificial reef that is doing its job."

Precision deployment

Placing the Reef Pyramids was a feat of modern engineering. An offshore gas vessel moved the 24-tonne modules to their designated locations, five at a time. A dynamic positioning system, a beefed-up version of the GPS most boaties use, was used to line up a hydraulic claw, which gently lowered the structures into place. Of the 118 modules, 117 of them are within a metre of their designated GPS location. And that one wayward module? It is a few metres out of place because the GPS system cut out as it was being lowered down, Evan Needham explains.

Below NT Fisheries manager Evan Needham heads out with the

into the water.

Reef Pyramids to see them deployed

The artificial reefs are all accessible from the greater Darwin region. The Lee Point Wide and Gutters reefs are accessible from numerous boat ramps in and around Darwin Harbour, the Dundee Wide reef is accessible from Dundee Beach, while the Adelaide River Mouth reef is accessible from the Leaders Creek or Saltwater Arm boat ramps.

It would take a modern boat about half an hour to reach any one of the reefs. But it is not a straight drive out to one of the reefs to fish. The new reefs create a 'fishing journey' that take anglers past multiple fishing destinations, including older artificial reefs.

"We've used FADS, or fish aggregation devices, previously to try and link the reefs together so that people can create a bit of a circuit through known fishing locations," Evan Needham says.

The reefs were fabricated in the Northern Territory by Shorecast NT using nearly 3000 tonnes of local concrete and calling on the capabilities of local cranes, forklifts and labour.

The project, managed by the NT Department of Infrastructure, Planning and Logistics and Harris Kmon Solutions, won two awards at the 2020 Australian Institute of Project Management's (AIPM) Project Management Achievement Awards, including the NT Project of the Year. **F** "We're quite excited about the variety of fish that are now on these and the benthic growth that's actually growing on those modules." Evan Needham, NT Fisheries manager



NT REEF PYRAMID FACTS

Number of Reef Pyramids: 118 Dimensions: 4 metres x 4 metres x 5 metres Reef Pyramid weight: 24 tonnes Quantity of concrete used: 3000 tonnes Volume of each reef: 100,000 cubic metres

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COVID-19 report finds mixed impacts

A report commissioned by the FRDC has found there is no single seafood industry COVID-19 story, but a range of experiences from positive to catastrophic and everything in between

By Annabel Boyer

n 2020, at the height of the COVID-19 pandemic, the FRDC commissioned a report to better understand the pandemic's impact on Australia's seafood industry and the industry's response as the two unfolded together.

The rationale behind the report was that no crisis should be wasted; it could provide fertile ground for insights to deal with other, future challenges. It aimed to gain a broad understanding of the immediate economic impacts to the industry from the early phases of the COVID-19 pandemic.

The team at the University of Tasmania's Institute for Marine and Antarctic Studies (IMAS) put together the report, led by social scientist Emily Ogier.

It focuses on the short-term impacts of the early stage (January–June 2020) of the COVID-19 pandemic on the Australian seafood industry and examines the impacts at a sector level, rather than at an individual business level.

"We assembled quantitative and qualitative evidence from multiple sources including government and management datasets, industry survey data, published market research and stakeholder interviews," says Emily Ogier. "The combination of all this data builds a picture of how the industry, across the entire supply chain, faired during the period.

"The value of Australia's seafood product and its people, and the impacts they experienced, are really challenging to capture through the data that is available. We threaded narratives together from mixed sources.

"We asked: what is the market showing? Is this reflected in what industry leaders and producers are saying? How did that transmit to actual production? What is a sensible



baseline to understand before, during and after COVID-19 lockdowns? What level of change is normal variation and what is impact? How can we measure the uncertainty and personal costs to producers and business sustainability?"

Not all of the impacts recorded can be definitively linked to COVID-19. Nevertheless, the report provides valuable clues as to the vulnerabilities of Australia's seafood industry and what needs to change to make businesses and supply chains more resilient.

Broad impacts

Broadly, the report found impacts have been asymmetric: economically significant sectors that relied on one or two export markets have been badly affected, while other sectors supplying domestic markets have generally prospered. Businesses, irrespective of sector, that have been both willing and able to be innovative and agile have also benefited.

The businesses most negatively impacted were live export and dine-in food service, due to their reliance either on international air freight or on

"We assembled quantitative and qualitative evidence from multiple sources including government and management datasets, industry survey data, published market research and stakeholder interviews."

Emily Ogier, University of Tasmania

people moving about in their communities, both of which were restricted. Businesses most positively impacted were those serving domestic retail and takeaway food service markets, which experienced a rise in demand and, in some cases, prices, too.

During the period examined, export products declined in both value and volume. In contrast, the value of domestic products remained relatively stable and a decline in volume was offset by a rise in prices.

As the crisis progressed, domestic production, which initially fell, rebounded as producers adapted. The report highlights a number of innovative responses to the challenge at hand. Businesses were also crucially helped along by the easing of restrictions halfway through the period examined.

Government support measures provided valuable support to allow for profitability and business continuity during the period of disruption.

In general, the report found COVID-19 has exacerbated the uncertainty caused by other challenges such as drought, bushfires and exchange rate fluctuation being faced by Australia's seafood businesses.

An ongoing learning experience

While the report is a snapshot of a particular time period, the COVID-19 disruption continues and further indirect effects are being experienced.

The seafood industry's recovery and the development of greater resilience is still evolving. Differences in degree of exposure, impact and recovery will continue across sectors of the Australian industry.

Three stages of assessment

The report assesses impacts on the various parts of the industry and along the supply chain from producer to retailer.

It divides the time period examined into three distinct phases: the shock phase (January– March), the lockdown phase (March–May) and the initial easing phase (May–July).

The shock phase (Table 1) is characterised by the initial outbreak in China, the lockdown in Wuhan and the restriction of Chinese New Year celebrations, which impacted certain limited sections of the Australian seafood industry such as the export sector. Figure 1. Shocks, disruptions and impacts experienced by Australian seafood supply chains



Source: Impacts of COVID-19 on the Australian Seafood Industry: January–June 2020 FRDC Report

The lockdown phase (Table 2) starts with the emergence of an Australian outbreak of the virus, the closure of national and state borders, the announcement of lockdowns and physical restrictions.

The initial easing phase (Table 3) starts with the easing of lockdown measures in some states, the return of exports to normal levels, the emergence of secondary outbreaks and the planned reopening of some borders. $\mathbf{F} \rightarrow \mathbf{F}$

To read the full report, including in-depth analyses of the impact on different parts of the seafood production and supply chain, and case studies showcasing industry responses to the crisis, go to: <u>http://www.frdc.com.au/project/2016-128</u>

The report findings were presented at the Outlook 2021 Conference, which was held from 2–5 March. The full program is available at https://www.agriculture.gov.au/abares/outlook



TABLE 1: SHOCK PHASE			F.
SEGMENT	OVERAL	L IMPACT	SPECIFIC IMPACTS
Wildcatch	Volume of export fisheries	Value of export fisheries	Live and fresh export products (lobster, abalone, tuna) volume and value
	Volume of all other fisheries	Value of all other fisheries	Dine-in food service-focused live products (finfish, crabs), value
			Import-competing finfish products value
Aquaculture	→ Volume	→ Value	Export-oriented products (abalone), volume and value
Imports	→ Volume	→ Value	Imported finfish (NZ), volume
Wholesale	→ Volume	→ Value	Wholesalers exporting live product, volume and value
Processing	? Volume	? Value	 Abalone canning, increasing volume Other products that shifted to value adding and/or packaging
Air	Availability	Cost	Unternational airfreight, availability
Road	Availability	↔ Cost	No major effects during this phase as disruptions are to international supply chains
Sea freight	Availability	Cost	World crude oil prices lower, costs
Cold storage	? Availability	? Cost	
Export	Volume	↓ Prices	 Live product (lobster, abalone), volume and process Fresh product (tunas, billfish), volume and price Fresh product (farmed salmonids), volume and price
Food service	→ Volume	↔ Prices	
Retail	→ ^{Volume}	→ Prices	
Direct sales	Volume	1 Prices	 Live lobster, volume Live lobster price Oysters and Barramundi farmed product, volume and price
RATINGS I Negative imp. KEY	act 👴 Substantial 🔥 P negative impact	ositive impact 🛛 Mubstantial positive impa	↔ No impact ? Unknown act

21 COVID-19

TABLE 2: LOCKDOWN PH	HASE		🔒
SEGMENT	OVERALL IMPACT		SPECIFIC IMPACTS
Wildcatch	Volume of export fisheries	Value of export fisheries Value of all other	Live and fresh export products (lobster, abalone, broadbill swordfish, tunas), volume and value Dine-in food service-focused products, live (finfish and crabs), and fresh (calamari, octonus), volume and value
	• Insheries	- lisheries	Import-competing and retail-oriented finfish products, value
Aquaculture	→ Volume	Value	 Exports of Atlantic Salmon products, volume and value Export-orientated products (abalone), volume and value Dine-in food service-focused products (oysters, Barramundi), volume and value
	→ Volume	→ Value	 Imported finfish (NZ), volume and value All other imported products, value
Wholesale	Volume	Value Value	 Shifts in volumes sold through channels maintaining volume Overall price increase due to high domestic demand Wholesalers servicing food service sector, volume and value
Processing	? Volume	? Value	 Farmed abalone, tuna and other typically exported products that shift to value-adding and/or packaging, increasing volumes Large processors changed inventory and packaging orientation to target retail, increasing volumes handled
Air	Availability	Cost	 International border closures reduce inbound tourist flights, availability Requirement for additional charter services in some cases (for example, Western Rock Lobster), cost International Freight Assistance Mechanism (IFAM) introduced, maintaining availability and cost Domestic airfreight for live product and prawn broodstock/PLs, decreased availability
Road	Availability	Cost	Restrictions on travel through native title areas limits road freight services to and from northern Australia, decreasing availability World crude oil prices lower, costs
Sea freight	Availability	Cost	World crude oil prices lower, costs
Cold storage 举	? Availability	? Cost	
Export	Volume Volume	♥ Prices	 Live product (abalone), volume and price Fresh product (tunas, billfish), volume and price Fresh product (farmed salmonids), volume and price
Food service	Volume Volume	♥ Prices	 Takeaway food service-oriented product (fresh and frozen), volume and price Dine-in food service-oriented product (crabs, live fish, oysters, calamari), volume and price
Retail	Volume	→ Prices	 Fresh product (salmonids, prawns, finfish), volume and price Frozen product (salmonids, prawns, finfish), volume and price
Direct sales	1 Volume	Prices	 Live lobster, volume Live lobster price Oysters and Barramundi farmed product, volume and price

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TABLE 3: INITIAL EASING PHASE				
SEGMENT	OVERAL	L IMPACT	SPECIFIC IMPACTS	
Wildcatch	Volume of export fisheries	Value of export fisheries	Live and fresh export products (lobster, abalone, broadbill swordfish, tuna), volume and value	
	→ Volume of all other fisheries	→ Value of all other fisheries	Dine-in food service-focused live products (finfish, crabs), volume and value	
			Import-competing and retail-oriented finfish products, value	
Aquaculture	→ Volume	→ Value	Exports of salmonid products, volume and value	
			 Dine-in food service-focused products (oysters, Barramundi), volume and value 	
Imports	→ Volume	∼→ Value	Imported finfish (NZ), volume and value	
			All other imported products, value	
Wholesale	→ Volume	Value	Shifts in volumes sold through channels maintaining volume	
•			Overall price increase due to high domestic demand	
Processing	? Volume	? Value	Farmed abalone, tuna and other typically exported products that shifted to value-adding and/or packaging, increasing volumes	
			Large processors changed inventory and packaging orientation to target retail, increasing volumes handled	
Air	Availability	Cost	→ International Freight Assistance Mechanism (IFAM) continues, availability	
Road	↔ Availability	↔ ^{Cost}	Removal of restrictions allows road freight service to return to close to normal	
Sea freight	↔ Availability	Cost	Shipping companies managed capacity through cancellation of entire trip or some port visits, maintaining availability	
			1 And increasing costs	
Cold storage *	? Availability	? Cost		
Export	→ Volume	↓ Prices	Uive product (lobster, abalone), price	
			markets as other competing exporters were hit by biosecurity restrictions, increasing volume	
			And decreasing value as prices available in new markets lower	
Food service	Volume	→ Prices	Takeaway food service-orientated product (fresh and frozen), volume and price	
X			Dine-in food service oriented product (crabs, live fish, oysters, calamari), volume	
			1 And price	
Retail	Volume	Prices	Fresh product (salmonids, prawns, finfish), volume and price	
•			Prozen product (salmonids, prawns, finfish), volume and price	
Direct sales	Volume	→ Prices	Uysters and Barramundi farmed product, volume and price	
7 + 1				

MORE INFORMATION Jennifer Marshall, jennifer.marshall@frdc.com.au

Support in the workplace

The FRDC has actively promoted workplace wellbeing to support staff through a difficult year



By Ilaria Catizone

year like no other, 2020 was scarred by bushfires, a global pandemic and an economic crisis, resulting in disruption, uncertainty and loss that has taken a heavy toll on many people's mental and physical wellbeing. Early in the COVID-19 lockdown, the FRDC recognised the cumulative effects and that our new reality had the potential to threaten the wellbeing and performance of our own staff. Widespread declines in wellbeing in Australia and internationally were already a fixture in the news.

With great upheaval also comes opportunities to explore new ways of doing things and to reflect on what is most important to an organisation. For the FRDC, this is our people.

To safeguard the wellbeing and productivity of the FRDC staff, we established two groups: the COVID-Safe Working Group (CSWG) and Wellbeing Working Group (WWG). These groups meet regularly to establish safety planning, policies and tools to ensure everyone in the organisation is safe, supported and informed. Each group has members representing the FRDC's different business units.

The CSWG and WWG have created a COVID-Safe Plan and a corporate Wellbeing Policy, which outline the FRDC's commitment to creating safe and supportive working environments for all employees. We have also created a Wellbeing Toolkit that contains a variety of resources for self-help and contacts for staff seeking further support. All are accessed via the staff intranet.

The toolkit includes details of the FRDC's counselling service, a roster of staff trained in mental health first aid, and practical tips from experts on various aspects of mental and physical health relating to the workplace.

It also provides a place where staff can share other resources they have found helpful, such

as exercise programs, meditation apps and healthy eating plans, as well as common social interests, hobbies, sports and other personal activities. This is helping to create a deeper sense of community within the organisation, fostering meaningful relationships among employees to support each other in the longer term.

As the spread of COVID-19 becomes less of a concern in Australia and restrictions ease, the FRDC's WWG will continue to meet regularly, although likely less frequently. The focus will be on keeping abreast of how employees are feeling and ensuring adequate support is offered if necessary. The long-term benefits of a focus on employee wellbeing include improved staff performance, job satisfaction and productivity. **F** *Contact Jennifer Marshall at the FRDC if our approach offers a model you would like to consider in your own organisation. Email: jennifer.marshall@frdc.com.au*



MENTAL HEALTH SUPPORT FOR THE SEAFOOD INDUSTRY

Fishers endure psychological distress at a level almost double the general population, according to FRDC research, with the top three stressors being government red tape, uncertainty about future access regulations and changes to access regulations.

For these reasons, the fishing industry's peak body, Seafood Industry Australia (SIA), has made it a priority to address this issue. Stay Afloat Australia is the national mental health pilot program for the Australian seafood industry, run by SIA and supported by funding from the Australian Government Department of Health's Mental Health Program. The Stay Afloat website provides access to a wealth of resources and advice in the event of psychological distress. Stay Afloat also has Community Resilience Grants available, providing up to \$2000 to assist with the cost of hosting events that have a focus on mental health for seafood communities. The grants program is open until all funds are allocated, or until the grants program closes in 2022, whichever occurs first. MORE INFORMATION: www.stayafloat.com.au

Healthy fish, healthy harbour

By Gio Braidotti

Shaun Adlam (of CQUniversity) and Darren Hodges (a Gidarjil sea ranger) setting a gill net in Gladstone Harbour. Photo: CQUniversity

Detailed health assessments on a range of popular recreational and commercial fish species are now a regular part of annual reporting on the health of Queensland's Gladstone Harbour

ith spectacular natural beauty and rich marine resources, Gladstone Harbour is home to Queensland's largest multi-commodity port, as well as significant commercial and recreational fishing activities.

Recently, following strong interest in fish health from the local recreational fishing community, new metrics have been added to the report card that provides an annual assessment of the harbour's health. The new metrics cover the health of a range of fish species important to both recreational and commercial fishers.

The addition reflects the responsiveness of the <u>Gladstone Healthy Harbour Partnership</u> (GHHP) to stakeholder feedback in monitoring harbour operations. An FRDC-funded project has provided support to the endeavour by identifying what information to include and how to collect it.

The growth and sustainability of Australian fisheries are constant themes in the FRDC's strategic plans. This project was funded under the FRDC's 2015-2020 R&D Plan, but continues to align with the strong sustainability focus in the current R&D Plan.

The GHHP is an organisation that works to understand and balance the multifaceted needs of the harbour's many stakeholders.

It has no regulatory power but instead focuses on accurately tracking and reporting on the harbour's health. It is funded by contributions from its partners, which include industry, government, community groups and research organisations.

The senior science officer at the GHHP, Mark Schultz, says the inclusion of fish health assessments came as a response to consultation that asked community members what they'd like to see monitored in the report card.

Each year the GHHP undertakes assessments across four spheres: environmental, economic, social and cultural.

Data on each sphere is captured annually, with assessments made across 108 measures. This data is used to calculate scores for 33 indices that reflect various aspects of the harbour's health. The tallied information is then provided back to industry, government and communities in the form of an annual report card.

"In 2013 we held a workshop to ask communities what they valued most about the Gladstone Harbour and what they most wanted to see monitored in the report card,"Mark Schultz says.

"The health of recreational fishing activities consistently ranked as the most cited response. For that reason, we became interested in expanding our monitoring from a focus on stock-related issues – based on fish recruitment measures – to include direct measures of fish health, weight and length."

Assessing fish health

With support from the FRDC, the GHHP ran a project to develop a new indicator of fish health for inclusion in the Gladstone Harbour Report Card.

It is called the Health Assessment Index (HAI) and was successfully piloted, along with

Below Mark Schultz is the senior

Harbour Partnership (GHHP).

science officer at the Gladstone Healthy



Nicole Flint, n.flint@cqu.edu.au Mark Schultz, mark.schultz@fba.org.au Gladstone Healthy Harbour Partnership, <u>www.ghhp.org.au</u> **FRDC RESEARCH CODE:** <u>2017-109</u>

a range of other possible indicators, by a team headed by Nicole Flint at CQUniversity's Coastal Marine Ecosystems Research Centre (CMERC).

The HAI uses gillnets to sample target fish species and analysis is undertaken during a detailed dissection. Nicole Flint explains that observations of multiple organs and tissues – including the presence of parasites – are then integrated to derive a composite metric.

"The premise of the HAI is that scores will cumulatively reflect the acute and chronic stressors present in the fish's environment, with poorer anatomical condition resulting in higher HAI scores, indicative of a more stressful environment," she says.

The monitoring process involves scoring skin, eyes, fins, gills, spleen, kidney, hindgut, liver and parasite load. The scores for each individual fish are then combined and standardised to derive a score and grade for each monitored species, and then an overall score and grade for the harbour. The HAI is monitoring the following species:

- Barramundi (*Lates calcarifer*);
- mullet (including both Sea Mullet (Mugil cephalus) and Diamondscale Mullet (Liza vaigiensis);
- Barred Javelin (Pomadasys kaakan);
- Blue Catfish (*Neoarius graeffei*); and
- bream (including both Pikey Bream (Acanthopagrus pacificus) and Yellowfin Bream (Acanthopagrus australis).

The HAI was adopted within the Gladstone Harbour Report Card system in 2018, with Nicole Flint's team contracted to carry out the annual monitoring ever since. So far there have been no findings to indicate a systemic problem with fish health in Gladstone Harbour.

In <u>2019</u>, the overall score for fish health was a 'B'. Critical to HAI's successful adoption was the diligence done to ensure the new index is based on protocols that are cost-effective, but not overly complex technically. The FRDC research project also developed a framework for selecting fish health indicators for ports and estuaries in northern Australia.

Fishers add data

Concurrent to the adoption of the HAI, the GHHP has developed a mobile phone app that allows recreational fishers to crowdsource data about the weight and length of caught fish and to upload photos that provide visual indicators of fish health. Mark Schultz says the crowdsourced data is also finding its way into the report card. Below Nicole Flint with a Diamondscale Mullet ready for health assessment Photo: CQUniversity





"The app means we can involve the Gladstone community directly in data collection activities about an issue they care about deeply," he says.

These innovations mean there are now three indices related to fish health in the Gladstone Harbour Report Card: fish recruitment, the HAI and the crowdsourced data.

Port Curtis Coral Coast Indigenous communities are also involved in the Gladstone Harbour reporting. This includes the Bailai, Gurang, Gooreng Gooreng and Taribelang Bunda people. Nicole Flint says the CQUniversity CMERC team works with traditional owners when carrying out ongoing fish health monitoring activities, partnering with the Gidarjil Development Corporation to incorporate traditional ecological knowledge into the monitoring. Mark Schultz says the benefit of broadening the monitoring goes beyond providing industry, government and stakeholders with an annual score: "Over time, as data accumulates, we will start to detect emerging and long-term trends and patterns in the health of this working harbour," he says.

"That means we are setting up the report card system to mature and provide deeper and more sophisticated insights into the future." **F**

INDIGENOUS HERITAGE Port Curtis Coral Coast Indigenous communities are also involved in this research. This includes the Bailai, Gurang, Gooreng Gooreng and Taribelang Bunda people.



Genetics reveals secrets of oyster diversity



Molecular analysis is proving vital in revealing the diversity of Queensland's native oysters as the development of a new aquaculture initiative accelerates

By Catherine Norwood

survey of Queensland's intertidal oysters has identified surprising diversity, finding 14 distinct species, including one entirely new discovery, and another exotic species reported in Australian waters for the first time.

It has also found five distinct species of tropical oysters, at least one of which is a favoured candidate for new aquaculture initiatives in the state.

The Queensland Government and the FRDC funded the survey and analysis of intertidal oysters, which was led by Griffith University and the Queensland Museum. The three-year project is part of a larger research program funded through an Advance Queensland Fellowship to help reinvigorate Queensland's once-substantial oyster industry.

Griffith University molecular biologist and mollusc specialist Carmel McDougall led the oyster survey. Sampling was carried out in 2018 and 2019, with assistance from Queensland oyster growers.

She used DNA analysis to identify species, using the international GenBank database as a reference, and says she was surprised by the diversity the survey revealed. "The number of different species we found was much higher than we anticipated. It is difficult to distinguish many of them visually, because they do look pretty similar," she says. "But the DNA analysis is unambiguous in its results."

DNA identification

The 14 species identified includes the wellknown Sydney Rock Oyster (*Saccostrea glomerata*), Blacklip Oyster (*Saccostrea lineage J*), Spiny Rock Oyster (*Saccostrea lineage B*) and Milky Oyster (*Saccostrea scyphophilla* – which appears to be two distinct species).

Of the remaining species, one is an entirely new discovery, which is yet to be officially named. Another is Black Scar Oyster (*Magallana bilineata*), known to be exotic to Australia and discovered for the first time in Australian waters during the survey (see breakout story page 28).

The DNA analysis revealed that Queensland hosts eight species within the *Saccostrea* genus. While the Sydney Rock Oyster has



Below Some of the 14 species identified include: 1. Spiny Rock Oyster, 2. Milky Oyster, 3. Blacklip Oyster, 4. Saccostrea lineage F Photos: Griffith University

Below Carmel McDougall Photo: Griffith University



"The use of lineage to distinguish species reflects ongoing debate in the scientific community about the genetic heritage of different species based on DNA analysis, which can conflict with historically assigned scientific names."

been widely recognised, Carmel McDougall says it seems likely the Milky Oyster and the Blacklip Oyster have previously been grouped together as *Saccostrea cucullata*, which is now recognised as a 'superspecies'.

Australian researchers have been cautious about naming the exact species within this group, preferring instead - at least for the moment - to use the term 'lineage' to distinguish between them. This is an established practice in scientific circles.

The use of lineage to distinguish species reflects ongoing debate in the scientific community about the genetic heritage of different species based on DNA analysis, which can conflict with historically assigned scientific names.

Those identified in Queensland are Saccostrea *lineage B, F, G, I* and *J*. Other lineages are found elsewhere in the Indo-Pacific region, including lineage A, which is native to Western Australia and is the focus of aquaculture trials there.

Carmel McDougall says applying the right taxonomic naming is critical to the progress of the aquaculture sector because the names are incorporated into the legislation that allows aquaculture of a particular species to occur. It also restricts the movement of genetic material, from hatchery to farm or from one growing region to another, to address biosecurity risks. This can restrict business development.

The oyster survey has mapped the natural distribution of each species within the survey area, which stretched along 2000 kilometres of Queensland coastline from Moreton Bay north to Cooktown. Range information is included in the new online publication produced as part of the project, the Guide to Queensland's *intertidal oysters* (<u>http://bit.ly/oysterbkt</u>), which provides identifying images and descriptions.

Advancing aquaculture

In Queensland, permission to grow a particular oyster will only be granted within the natural range of that species, to prevent 'genetic pollution' of local populations. This makes species identification and distribution mapping essential. Oysters are also likely to perform better within their preferred natural environmental range, says Carmel McDougall.

Blacklip Oysters (lineage J) are the favoured candidate for aquaculture because they grow quickly, to a large size, and have good consumer acceptance. They are also tolerant of fluctuating conditions in their growing environments, which is reflected in their wide distribution north of Stanage Bay.

To date, Queensland's aquaculture efforts have focused on Saccostrea lineage J, including an established farm at Bowen in northern

Queensland. The Darwin Aquaculture Centre in the Northern Territory is also culturing this species for grow-out trials, working with Indigenous communities. However, poor larval survival in culture and poor settlement rates have proven a barrier to production.

Using *lineage J* as the focus for further work, Carmel McDougall has developed a suite of molecular resources to adapt molecular techniques developed for Sydney Rock Oysters for use on Blacklip Oyster larvae.

This includes identifying markers for genetic traits that might help to improve production and accelerate hatchery processes, such as the readiness of spawn to settle and disease resistance.

She says subtle genetic differences in nervous system genes between the two species indicate further research into settlement conditions specific to Blacklip Oysters may be needed.

While the settlement of Sydney Rock Oyster larvae can be chemically triggered, Blacklip Oyster larvae did not show the same response despite their general genetic similarities.

Larval settlement remains an important focus of hatchery efforts, with best settlement rates reported at 10 per cent, compared to between 40 and 70 per cent for Sydney Rock Oysters. Hatchery trials led by Sam Nowland at the Darwin Aquaculture Centre have provided some

Right The dark muscle scar on the inside of the oyster shell and its large size distinguishes the Black Scar Oyster from native species. Photo: Griffith University

improvement in Blacklip Oyster settlement rates.

Based on her molecular analysis, Carmel McDougall suggests further research to identify the influence of factors such as water salinity, temperature and larval density may help identify how to further improve this. Hatchery and grow-out trials comparing *Sacosstrea lineage B, G* and *J* would also be valuable in assessing the potential of all three species as aquaculture candidates, she says.

Food safety

The FRDC also has several other projects underway to support the development of tropical oyster aquaculture in northern Australia.

One project (2020-021) will adapt the Australian Shellfish Quality Assurance Program to include tropical oysters, providing guidance to northern growers on shellfish food safety and risk management.

The quality assurance program provides guidance on bivalve food safety across Australia, developed largely through the knowledge and experience of the temperate edible oyster industry and adaptation of international guidelines.

Tropical Australia has unique challenges: temperature, environment, limited infrastructure and remoteness. The emerging tropical oyster industry requires an assessment of the risks and options to manage the sale of an initial small-scale production of farmed bivalve shellfish from northern Australia.

Adapting the program for northern conditions will involve developing recommendations on appropriate growing area classification systems (based on water or meat results, or a mix of both), monitoring and risk management protocols for oyster farming in tropical Australian environments and remote contexts. Potential models for a shellfish food safety program in tropical Australian conditions will also be developed.

Another project (2020-043) will develop cold chain transport and storage guidelines for tropical rock oysters to maintain food safety.

The focus of this project is on the management of naturally occurring *Vibrio* bacteria found in warm waters, which can affect tropical rock oysters and result in food poisoning. This work will also support remote and Indigenous communities in the development of new aquaculture businesses, providing advice on cooling and handling requirements to prevent bacterial growth and maintain food safety. **F**



EXOTIC OYSTER INVADES QUEENSLAND WATERS

A survey of oyster populations in Queensland has identified the presence of the exotic Black Scar Oyster, which has not been found before in Australian waters.

The Black Scar Oyster (*Magallana bilineata*) has been found at three Far North Queensland locations.

The first discovery in Cairns occurred during a survey of oyster biodiversity being conducted as part of an FRDC-funded project. A commercial fisher in Port Douglas also collected samples from a boat while it was being cleaned and Indigenous rangers discovered a population of the oysters at Cooktown.

Molecular diagnostics of samples from all three locations were performed at Griffith University, in conjunction with Queensland Biosecurity's Seaports eDNA Surveillance (Q-SEAS) marine pest surveillance program.

The species is abundant in the western Pacific Ocean from the Philippines to Tonga and Fiji, where it was introduced as an aquaculture species.

Biosecurity Queensland is investigating the extent of the incursions and possible control measures. Little is known about this species and its potential impacts, but fisheries managers are keen to minimise its spread in Queensland waters.

Most Black Scar Oysters are difficult to distinguish visually from native counterparts until they reach their distinctive size; they grow to 18 centimetres long, which is much larger than native species. This makes identification in the early stages of the life cycle difficult and significantly limits control options. The Black Scar Oyster has a distinctive muscle scar on the inside of the shell that is much darker than other oysters.

It is found on submerged and floating infrastructure including pylons, pontoons and boats, and can occupy disturbed habitats including shallow subtidal sites.

Boat owners are urged to maintain regular maintenance and cleaning of their vessel to prevent spread, by:

- applying anti-fouling paint;
- cleaning boats in a dry dock or slipway (out of the water); and
- checking and cleaning gear including pots, nets, fishing or diving gear, anchors and ropes, before moving between locations.

A recent increase in exotic marine species detected in Queensland highlights the ongoing threats they may pose and the importance of ongoing marine surveillance activities, including Biosecurity Queensland's Q-SEAS program.

If you have suspicions about a marine organism contact Biosecurity Queensland on 13 25 23. **F**

MORE INFORMATION

Available at <u>qld.gov.au/environment/coasts-</u> <u>waterways/marine-pests</u>. A report detailing the discovery of Black Scar Oyster in Australia will be published in the Australian journal *Molluscan Research*.

Trawling international research for better fishing practices

Excess fuel use and unwanted bycatch are ongoing challenges for trawl fishing in Australia and around the world

By Matt Broadhurst, Steve Kennelly and Ian Knuckey

round the world, research teams, including fishers, scientists and managers, have strived to improve the process of trawling for fish to reduce unwanted catches and improve fuel efficiency by reducing drag from nets.

A recently completed systematic review of more than 200 scientific reports, encompassing about 40 fisheries and 147 species, has identified lessons Australian fisheries can take advantage of and identified gaps that future local research can help to address.

It is part of a larger project that aims to improve and promote fish-trawl selectivity and efficiency in two important Australian fish-trawl fisheries: the Commonwealth Trawl Sector (CTS) and the Great Australian Bight Trawl Sector (GABTS) of the Southern and Eastern Scalefish and Shark Fishery (SESSF).

The review marks the completion of phase one of the project, which is funded by the FRDC and NSW Department of Primary Industries (DPI). Phase two will involve working with local industry participants to identify research priorities.

Key findings

The international review describes numerous technical modifications to fish trawls and the positive and negative aspects of their testing and adoption.

- Much of the research (nearly 75 per cent) has been restricted to European fisheries and especially those targeting cod and haddock, and this has strongly influenced the choice of modifications tested elsewhere.
- Most efforts have focused on the back end of trawls, by increasing or varying mesh openings in codends to match the sizes of unwanted catches via larger, diamond-shaped mesh, or turning meshes 45 degrees or 90 degrees, either throughout or as strategically placed

windows. In some fisheries, different grids have also been shown to work well at either excluding some undersize fish or large unwanted animals (for example, sharks and rays).

- Relatively few studies have modified the front sections of trawls. Some changes to panels and rigging have realised selectivity benefits depending on the species, and this area has the greatest potential for reducing drag and, therefore, fuel and operating costs.
- The successful adoption of modifications has required very close industry consultation throughout all stages of development.

The review also found a large amount of repetition between studies, attributed in part to problems with scientific replication and uncontrolled or confounded factors in experimental designs. This suggests rigorous, standardised, scientific assessments combined with close stakeholder liaison are almost as important as the modifications being tested.

Specific modifications for fish trawls used in the CTS and GABTS will be identified and progressed through industry consultation.

The review identifies a framework for resolving key issues in the research and testing process, depending on the options tested or available in a particular fishery, which allows for modifications to address the unique biological, environmental and technical factors of specific fisheries.

A 'toolbox', or suite of possible modifications, that might be applied depending on specific issues in a fishery has been developed from the review.

Available modifications can be assessed with a focus on either simple or more complex options. Simply reconfiguring codend mesh could improve trawl selectivity. A more complex modification might involve changing the front end of the trawls to improve overall efficiencies.

The results of the review have been presented to fishers through the South East Trawl Fishing Industry Association and the Great Australian Bight Industry Association. The review has also been submitted to an international scientific journal for publication.

During the next phase of the project, the research team will work with SESSF trawl fishers to further investigate and support the widescale voluntary adoption of appropriate best practice technologies to reduce bycatch and improve efficiency in Australia's fish-trawl fisheries. **F**

Specific modifications for fish trawls used in the CTS and GABTS will be identified and progressed through industry consultation.



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Rod and reel challenge to capture boutique market

Southern Bluefin Tuna is a premium fish, and it is backed by a good news story of species recovery, but bringing the best of the catch to market requires a concerted effort to meet highly focused quality requirements

By Catherine Norwood

he weather and the water are wild off the south-eastern coast of Tasmania; it is also where the Southern Bluefin Tuna (*Thunnus maccoyii*) (SBT) are in prime condition – fat and well fed on an abundance of small pelagic fish in local waters.

For skilled fishers, these tuna represent the chance to bring a premium wild product to discerning consumers, backed by a rich story of a species in recovery, good fisheries management and a fastidious level of care in the catch.

Their aim is to create a boutique Tasmanianbranded product that highlights both the story of the fish and the unique flavour and quality attributes of rod-and-reel-caught SBT from Tasmanian waters.

SBT are fished internationally from a single, global stock that is managed through the Commission for the Conservation of Southern Bluefin Tuna. Australia's share of that stock is managed commercially by the Australian Fisheries Management Authority (AFMA) as a Commonwealth fishery. In 2020-21 Australia's commercial quota is 5926.5 tonnes.

Most of this quota is held by fishers in South Australia, who purse seine the fish and tow them to inshore pens at Port Lincoln, where they are fattened in ranching operations that are more akin to aquaculture than wild-capture fisheries. There is also a growing SBT longline fishery off the NSW coast.

And for the past three years, a handful of fishers in Tasmania, with 'minor line' permits from AFMA, have leased some quota to try their hand with an SBT rod and reel troll fishery.

Among those championing Tasmania's boutique SBT catch are rock lobster fisher Chris Hanson, boat owner Rocky Caccavo and international marketer Thomas de Kock, founder of TunaSolutions.

Based at Margate, south-east of Hobart, Chris Hanson says he has been "prospecting" for SBT for the past decade, working out where and when the fish are to be found. SBT numbers peak in Tasmanian waters in February, March and April, but he has found it is possible to catch SBT all year round – if you know where to look.

After finding the fish, catching them to optimise quality is the next challenge. In SA's ranching operations, many of the variables around the catch and dispatch of the fish are undertaken



quickly and in controlled conditions that make it easier to maintain a consistent quality.

On the open water, with a rod and reel, the conditions are less certain and more challenging for fishers targeting a premium product.

"There's a particular skill required to catch fish on the troll and not everybody can do it," says Thomas de Kock, whose family has long been involved in tuna fishing in South Africa, and rod and reel fishing in particular.

"If you slug the fish onto the boat as fast as you can, it will be full of adrenaline and lactic acid, it will be burnt and the meat will turn brown within a day. You'll get maybe \$3 or \$4 a kilogram, which is an absolute waste for this fish." He has been working with Tasmanian fishers to implement best practice in catch and handling processes. 'Swimming' the fish to the boat with an even effort is the primary tactic to prevent the adrenaline rush, and the fish are landed onboard onto mattresses. However, Chris Hanson says even then the results are not guaranteed, and factors that may have stressed the fish, such as predators nearby, are not always obvious.

The next phase of quality enhancement begins as soon as the fish is onboard and brain spiked. The three minutes between killing the fish and getting it into an ice slurry are critical to quality, explains Thomas de Kock.

"It's the difference between getting \$8 or \$25 a kilogram for the fish," he says, the higher price being the target of a premium Tasmanian wildcaught brand.

Businessman Rocky Caccavo committed one of his vessels to SBT and agrees it is a fishery that needs the right skippers, targeting the right fish, with a focus on quality. He says this may require some additional training for crew to meet the requirements of boutique buyers, such as high-end fishmongers and restaurants.

The approach requires essentially fishing to order, rather than flooding the market with as many fish as can be caught. Buyers in Melbourne and Sydney have different size and fat requirements; the Japanese market wants something different again.

The result is that many fish hooked – sometimes more than half – are released before they are even brought onboard because they do not meet market requirements. Chris Hanson says the preferred size ranges from 30 to 60 kilogram fish; anything over 60 kilograms becomes increasingly difficult to transport as a whole fish.

"You have to have everything lined up, from the orders to the fishing, all the way to market; the logistics from Tasmania can definitely be a challenge."

Thomas de Kock says the aim is to perfect the product–market fit and give buyers exactly what they want. "We're also only taking from the water

RESPECT THE CATCH

Australia provides five per cent of its total Southern Bluefin Tuna (SBT) quota for recreational fishing, and this catch is managed by the respective state jurisdiction. In 2020-21 this equates to 311.9 tonnes.

The FRDC helps to fund the Tuna Champions stewardship program, providing information for recreational fishers about the best practice handling and care of SBT. This includes the best equipment to use and techniques needed to give fish the best chance of survival if they are released.

Thomas de Kock of TunaSolutions has worked with Tuna Champions, sharing his knowledge about how to maintain the quality of the meat. FRDC-funded research has also played an important role in understanding and supporting the recovery of the international SBT stock from overfishing, promoting responsible fishing and respect for species at all levels. what we need for the market, offering a handselected product from a unique part of the ocean that provides a diverse diet for the fish, which is reflected in the flavour of their meat."

One of TunaSolutions' most successful marketing initiatives in 2019 and 2020 was a series of tuna cutting exhibitions with experienced chefs, which offered equal parts entertainment, education and culinary experience.

The continued development of this boutique fishery, whether targeting domestic or international markets, will rely on consistent supply, high-quality fish, reliable logistics and consumer demand. "To make it work you need fishers to really commit properly to quality and the buyers keen to support the product, and the fishery, year-round." **F**

Below Tuna cutting exhibitions allow chefs to demonstrate how Southern Bluefin Tuna is dissected, while explaining every element of the fish and how the fish stock has rebounded with good management. Photos: TunaSolutions







Study puts a value on Victoria's seafood sector

Research into the contribution of Victorian fisheries to the state's economy and community wellbeing highlights opportunities for stronger supply chains and community links

By Nicole Baxter



KEY FINDINGS

During 2016-17, the Victorian seafood industry:

 injected
 \$323 million into local regions across the state (comprising
 \$112 million from state professional fisheries, \$111 million from Commonwealth professional fisheries and \$100 million from aquaculture);

generated \$186 million in household income;

provided 3101 fulltime jobs; and

produced more than 18,000 tonnes of seafood.

Processing of Victorian-produced seafood contributed:

■ \$37 million of added value (the wider economic contribution beyond just landed catch); and

■ 645 full-time jobs.

new study shows the Victorian wild-catch fishing and aquaculture industry injects more than \$320 million into local regions across the state.

The report shows the sector supports a range of business and job opportunities, from on-theboat or farm-based work through to businesses that service the industry, along with tourism and hospitality operations. These jobs require diverse and often high-level skills, but also provide entry-level jobs.

The three-year study led by social scientist Kate Barclay, at the University of Technology Sydney, is the first of its kind to document the economic and social contributions of the Victorian seafood industry (see Table 1).

The findings of the FRDC-supported study were published in a report entitled *Victoria's fisheries and aquaculture: economic and social contributions.*

The Victorian seafood industry generates jobs in places where there are few alternatives, and the study found those employed in the sector are active throughout the year, whereas some other economic activities, such as tourism, are seasonal.

In a survey undertaken in May and June 2019 as part of the project, 85 per cent of respondents indicated Victoria's seafood and processing sectors helped to create economic diversity.

However, nearly 70 per cent were 'very or extremely' concerned about job losses that might eventuate with increasing restrictions on, or the closure of, commercial fisheries.

Kate Barclay says in fishing communities affected by the COVID-19 pandemic and the bushfires of early 2020, the report demonstrates commercial fisheries have the potential to contribute to community recovery.

"For the first time, seafood advocates have comprehensive information showing the contributions their sector makes to community wellbeing," she says.

"Victoria has had a professional seafood industry for more than 170 years, yet we found there is often a poor understanding of the fishing and aquaculture industries among Victorians, both in metropolitan areas and in fishing and aquaculture communities themselves.

"Our findings show why it is important to support and grow the sustainable development of seafood production in the state."



Food supply

Kate Barclay says Victoria has a reputation as a 'foodie', state with 90 per cent of those surveyed saying it was important to produce local seafood and reduce the reliance on imports.

"Although Victorians want to eat local seafood, there was a jarring disconnect between this and their lack of understanding about Victorian fishing and aquaculture industries," she says.

Seafood Industry Victoria (SIV) is the state's peak body for commercial fishers, and executive director Jonathon Davey says efforts are underway to increase the supply of local seafood following the closure of some fisheries and subsequent catch reductions.

He says SIV wants to encourage Victorian consumers to value and buy their own locally produced seafood.

"The opportunities for growth of wildcatch fishing and aquaculture are really exciting. We're looking at product placement and how we can encourage consumers to buy Victorian seafood," he says.

Tourism and recreation

Another finding from the report was that 81 per cent of Victorians said eating local seafood was an important part of their holiday experience.

International visitors, particularly those from Asia, were identified as the group most interested in eating local seafood.

However, Kate Barclay says it was concerning that 54 per cent of tourism business owners said regional tourism suffers from lack of access to local seafood.

The report also found that 69 per cent of Victorians surveyed enjoy watching commercial fishers at work while on holiday. "For the first time, seafood advocates have comprehensive information showing the contributions their sector makes to community wellbeing."

Kate Barclay

Kate Barclay says the data shows the seafood industry has an opportunity to build closer relationships with those in the tourism and hospitality sectors to offer activities and experiences while people are holidaying in regions near fishing and aquaculture businesses.

"People see the seafood industry as an important part of the tourism and hospitality industries and care about where their seafood comes from," she says.

"If the relationships between people working in the seafood, tourism and hospitality industries could develop such that we could see more joint local activities, such as seafood festivals or tourism drives, we may see demand for locally produced seafood increase."

Jonathon Davey says viewing platforms next to co-operatives and at commercial fishing wharves, allowing the public to see fishing boats unloading, are popular with tourists.

"They give people a sense of local seafood in your belly while you're in a regional area on a holiday, allowing them to relate to the people who have caught their fish," he says. "It's something that is sometimes lost in metropolitan areas when you walk into a restaurant."

This point emerged during the research with 96 per cent of hospitality business owners surveyed stating that customers wanted to know the origin of their seafood.

Kate Barclay says some chefs are willing to work around the issues of fresh and local by

stating to customers that supply is weather dependent or seasonal, but others in the hospitality industry found it easier to use prepared and frozen fish that could be put on the menu year-round.

"There is certainly a need to build the capacity of the hospitality industry to be willing and able to cope with fresh local seafood and then have the supply chain to be functional," she says. "Fostering links between aquaculture and wildcatch suppliers may support both diversity and continuity of supply locally."

Supply chain challenge

One of the challenges Kate Barclay identifies is poor connectivity between parts of Victoria's seafood supply chain.

"This was highlighted during the COVID-19 pandemic when businesses previously focused on the export market were left with an oversupply of product during 2020," she says. "These operators needed to start selling to the domestic market but did not have a supply chain set up."

Jonathon Davey says further work is underway to build on the study's findings and support industry growth.

"We're looking to better understand consumer needs in Victoria and determine how the industry can better position itself," he says. **F**

The report is available for download via <u>https://bit.ly/3rkNpsc</u>

Table 1: Domains of community wellbeing and contributions of Victorian seafood production to each domain

ECONOMIC DIVERSITY AND RESILIENCE	FOOD SUPPLY	TOURISM AND RECREATION	ENVIRONMENTAL SUSTAINABILITY	SOCIAL FABRIC OF COMMUNITIES
Revenue Employment	Fresh local seafood Nutritious food	Local seafood for visitors Experiences and aesthetics for visitors Supporting other activities, including recreational fishing	Supporting fishery monitoring and research	Local sense of place and identity as 'fishing town'
Synergies with connected industries: service, post- harvest, tourism, and so on	Food safety		Improving practices that enhance sustainability of production Supporting other research and environmental work	Participation of fishers and aquaculturists in important parts of community life Support for vulnerable young men

Device trials underway to keep sharks from the catch

A range of shark deterrent devices using acoustic, electronic and electromagnetic technologies is being put to the test in Western Australia's shark hotspots

By Catherine Norwood

esearchers in Western Australia are trialling deterrent devices designed to prevent sharks feasting on line-caught fish before fishers can land their catch. Shark depredation, or 'bite-off', has been an issue affecting recreational and commercial fishers in WA, particularly in the north-west of the state, for as long as people have been fishing.

However, there has been a noticeable increase in reports of depredation for more than a decade. This is attributed to a range of factors, including tropical shark species moving further south following the marine heatwave of 2010-11 and flow-on effects of management changes implemented since the early 1990s to rebuild commercially fished shark stocks.

WA's Recreational Fishing Initiatives Fund (RFIF) is supporting the trial of shark deterrent devices, which was initiated following calls from the state's peak recreational fishing body, Recfishwest, for projects to address the issue. This current project began in February 2020 and is expected to be completed by June 2021.

Department of Primary Industries and Regional Development (DPIRD) researchers undertaking the work include Gary Jackson and Peter Coulson.

Gary Jackson says since about 2015, DPIRD and the University of Western Australia (UWA) have undertaken research to better understand where and when shark depredation is occurring, the rates at which it is occurring and which shark species are involved.

To date, sharks identified as involved in depredation include Dusky Whaler (*Carcharhinus obscurus*), Milk (*Rhizoprionodon acutus*), Pigeye (Carcharhinus amboinensis), Sandbar (Carcharhinus plumbeus), Australian Blacktip (Carcharhinus tilstoni), Greynurse (Carcharias taurus), Lemon (Negaprion acutidens), Tiger (Galeocerdo cuvier) and Sicklefin Houndshark (Hemitriakis falcata). Two of these species, the Dusky Whaler and Sandbar Shark, are commercially fished in WA. The Greynurse Shark is a protected species.

Previous research by DPIRD scientists has used DNA analysis of swabs taken from shark bites in fish landed to successfully identify species involved. DPIRD and UWA researchers have also used analysis of underwater video to identify shark species responsible for bite-off.

Fisher experiences

The current RFIF-funded project has focused on identified hotspots in northern WA, using phone and online surveys to assess recreational fishers' attitudes to sharks and shark depredation. The surveys are also identifying what recreational fishers do, if anything, to mitigate the problem.

Surveys conducted last year found one in two recreational and charter boat fishers who fished north of Lancelin had experienced shark depredation. Two-thirds of those that had experienced depredation had tried to reduce or avoid shark bite-offs in various ways, most commonly by changing their fishing location. One in 10 fishers had tried using electronic or magnetic shark deterrent devices.

"The comments and opinions that fishers gave at the end of the survey highlight that shark depredation is a highly polarising issue," Gary Jackson says. "Some called for urgent action to reduce shark bite-offs by reducing shark numbers. Others argue that sharks taking fish is just 'part and parcel' of fishing in the ocean."

A common concern among surveyed fishers was the loss of a large number of fish and the perceived impact this has on the sustainability of fish stocks in regions where depredation is highest.

"The amount of fish wasted by shark depredation negates the benefits of bag limits at times, as you can have many fish taken before you reach your bag limit and have actually removed well over a bag limit of fish from the environment," said one respondent.

From another: "I lose seven fish to sharks to the one fish I get in my boat, so if 20 boats do that a day the fish population is going to decrease rapidly because of the shark overpopulation."

The phone and online surveys also helped to identify one of the devices that is being tested in the current project; several fishers say they use the US-made Sharkbanz. These devices generate a strong electromagnetic field that interferes with the sharks' highly developed sensory system, potentially deterring them from getting closer to the target fish.

The two other devices being tested are the Australian-made Ocean Guardian FISH01, which uses an electronic approach, and SharkStopper, also from the US, which uses acoustic technology.

The Ocean Guardian device creates a threedimensional electrical field that also interferes with the sharks' sensory system, resulting in uncomfortable sensations for the shark, which causes them to turn away.

SharkStopper broadcasts the call of the killer whale – one of sharks' few predators – on frequencies that sharks are particularly attuned to.

All three devices are commercially available and the technologies used by each device have been developed primarily with personal use in mind, to protect surfers and divers from large sharks, which are not necessarily the ones involved in the shark depredation.

"So we are asking the devices to do something a bit different, which is to protect the area around a boat, where people are line fishing for reef fish," says Gary Jackson.

The gear is tested by going fishing in locations along WA's coast between the Abrolhos Islands and Broome where recreational fishers have identified that they have problems with sharks at certain times of year. Underwater cameras are used to monitor the behaviour of sharks relative to the gear being used and the fish on the line.



Researcher Peter Coulson with the shark deterrent devices being tested in Western Australia, from left, Ocean Guardian's FISH01, Sharkbanz (in hand) and Shark Stopper. Photo: Gary Jackson

COVID-19-related travel restrictions in WA delayed the start of the trials in 2020. "Once these restrictions lifted, we were able to get out on the water and begin testing the deterrents and the underwater camera set-ups firstly at the Abrolhos Islands in July, then soon after off Shark Bay," says Gary Jackson.

"We learnt a lot from these two trips about how to effectively test the deterrents within the experimental design. When we visited the Montebello Islands in August, the trials in waters between 35 metres and 55 metres were very successful and we collected plenty of useful video footage."

By the end of 2020, researchers had collected 36 hours of footage from 272 camera drops, which are being analysed to identify the sharks and to characterise shark behaviour relative to the deterrent devices used. More field trials will occur at Exmouth and Montebello Islands in March and April 2021. Once the testing and analysis is complete, a roadshow is planned for June 2021, visiting regional centres to discuss the findings and talk about the issue of shark depredation more broadly with recreational fishers.

Recfishwest will publish the results of the research once they are finalised. Follow Recfishwest on social media or visit the Recfishwest website to subscribe to its monthly newsletter to learn more. **F**

SHARK DETERRENT DEVICES TRIALLED

Ocean Guardian FISH01 (Australia) https://ocean-guardian.com/collections/fish Sharkbanz (USA) https://www.sharkbanz.com/ SharkStopper (USA) http://www.sharkstopper.com/



Pipis harvested in South Australia.



Crowded out: Pipi dynamics revealed

Words Melissa Marino Photos Goolwa PipiCo

New fishery management options emerge from a better understanding of the boomand-bust Pipi life cycle in South Australia

ew analysis around Pipi (*Donax deltoides*) populations in South Australia has provided insights into the natural processes that cause fluctuations in harvestable populations.

The research pulled together 10 years of recruitment and biomass work in that state's commercial Pipi fishery to inform a current review of the fishery's harvest strategy.

The data dates back to 2008 and an FRDCfunded project initiated in 2009 after a period of decline in SA's Pipi population. That project also evaluated performance indicators in the fishery and their potential for inclusion in a harvest strategy that was being developed, and which was finalised in 2012. "Past research told us how the overall stock changes from year to year and across the entire fishing ground," says Greg Ferguson, a long-time Pipi researcher at the South Australian Research and Development Institute (SARDI) and lead author of the paper* detailing the latest analysis.

"This recent research looks at changes in biomass and sizes across time and space at smaller scales and helps us understand why it changes."

He says the decade's worth of data analysed also reveals the recovery of the fishery under the careful management of fishers and South Australia's Department of Primary Industries and Regions (PIRSA).

It provides a better understanding of how natural mechanisms affect levels of harvestable Pipi stocks and that Pipis can be their own worst enemy.

Population dynamics

The analysis compares populations between two periods: 2008–12, when biomass was low to moderate and 2013–17, when biomass was higher.

Greg Ferguson says results suggest that where Pipi biomass is high, growth rates are slower. This means Pipis, which have an average life span of 4.8 years, could mature at a smaller size than expected, if age is the determining factor in maturity. Or they could mature at an older age, if size is the determining factor. This has implications for lifetime egg production and, therefore, management.

The analysis also found that when there was a lot of older mature Pipis, the number of young recruits was lower.

"We now know that when the biomass is really high, there's a cost and the cost is that growth is suppressed and the recruitment is suppressed," Greg Ferguson says. "This is something that fishers have long suspected."

Left to their own devices, Pipis repeat a boom-and-bust cycle as young pipis are crowded out by mature stock. "Understanding the mechanisms underlying this cycle helps build confidence in our understanding of the resource and supports the continued growth of the fishery," Greg Ferguson says.

Management tools

It also raises the potential for management interventions and fishing effort to stabilise populations, promote growth and increase the abundance of smaller Pipis.

"You've got the potential to use, for instance, refuges for reproduction, or to rotate the harvest between different times and areas to optimise sizes for the markets. Or potentially to even relocate the smaller pre-recruits to the edge of the high biomass areas to get established."

The report shows that in years of high biomass, Pipi populations spread across the 60-kilometre beachfront fishery. But that spread contracts with lower numbers, as Pipis cluster in the central part of the fishing ground.

In parallel with this finding, a real-time Pipi harvesting project involving the FRDC, PIRSA, SARDI and industry partner Goolwa PipiCo is looking, in part, at how smaller Pipis develop if relocated from the high-density fishery centre to the less-crowded periphery.

Results from the recently published study were used during the recent PIRSA review of the fishery's harvest strategy. With clarity around biomass fluctuations, there will be more confidence around assigning annual total allowable commercial catches (TACCs) to different levels of the biological indicators, Greg Ferguson says. Insights into distribution could be used to inform finer spatial management.

Value-adding

SA's Pipi fishery stretches south-east from the mouth of the River Murray towards the Victorian

border and has been certified as sustainable by the Marine Stewardship Council since 2008, as part of the multi-species Lakes and Coorong Fishery. The analysis shows biomass in the fishery doubled between 2008 to 2017.

At the same time, Pipis have increased in value as fishers transitioned from the traditional bait market to an emerging human consumption market. This, says Greg Ferguson, is a result of industry working closely with PIRSA and researchers over time to ensure biological and economic factors are carefully considered in management.

Harvest strategies, for example, use biological data to determine upper TACC, alongside economic information to indicate whether the market will cope with that amount.

These economic indicators have seen the emphasis in the fishery shift from maximising catches to maximising value. TACCs based on biomass and recruitment, for example, can be adjusted downwards if industry does not believe there is an adequate market for the product, minimising pressure on the stock.

When the initial 2009 FRDC project (2008-008) got underway, the Pipi resource had declined steeply over the previous decade as a result of subsequent years of 1200-tonne hauls.

After a conservative 300-tonne TACC was implemented, stocks began to climb.

"That increase in value was achieved by expanding the human consumption market, which is now about 65 per cent of the catch, rather than being sold as bait," Greg Ferguson says.

"And that's another reason our recruitment and biomass work is useful, because fishers will be targeting certain sizes and we'll start to understand how that affects the stock."

The new Pipi harvesting project underway, based on real-time biological and economic data, is expected to provide important fine-scale information on where catches are coming from. It is part of the long-term and ongoing research in the fishery with the FRDC and other partners that shows how industry, government and scientists can work together to achieve outcomes that meet economic and biological objectives.

"The really nice thing about the project and the way we do these surveys is really close collaboration between the SARDI researchers and PIRSA and industry," Greg Ferguson says. "And what that means is that we all trust the data. Industry has helped collect the data, so they own it – they believe in it." **F** INDIGENOUS HERITAGE South Australia's Pipi fishery is part of the Lakes and Coorong Fishery and the lands of the Ngarrindjeri people.



Below Pipis are graded after harvest at Goolwa PipiCo.





* 'Temporal and spatial variability in the lifehistory of the surf clam Donax deltoides: Influences of density dependent processes' was published in *Estuarine, Coastal and Shelf Science* 249(5).

Australia's international ocean action agenda

Oceans connect us all and the High Level Ocean Panel of government leaders has set a course to share the work needed and the benefits to flow from sustainable ocean environments and economies

By Catherine Norwood

ustralia has formally launched its involvement in and commitment to an international action agenda for sustainable oceans and a sustainable ocean economy by 2050. The agenda is an initiative of the High Level Panel for a Sustainable Ocean Economy (Ocean Panel), which is made up of the heads of government from 14 nations, including Australia's Prime Minister Scott Morrison. Other leaders are from Canada, Chile, Fiji, Ghana, Indonesia, Jamaica, Japan, Kenya, Mexico, Namibia, Norway, Palau and Portugal.

These countries represent almost 40 per cent of the world's coastlines, 30 per cent of the exclusive economic zones in the global marine estate, 20 per cent of the world's fisheries and 20 per cent of its shipping fleet.

Transformations for a Sustainable Ocean Economy: A vision for Protection, Production and Prosperity was launched globally in December 2020. It calls for a rapid transition to sustainable policy and practices across five areas: ocean health, wealth, equity, knowledge and finance.

The Ocean Panel is seeking to have its action agenda framework adopted by the United Nations General Assembly as part of the UN's Sustainable Development Goals program.

In a webinar launching the panel's plan, Prime Minister Scott Morrison outlined the ocean's contribution to the Australian lifestyle and economy, with a projected annual economic value of \$100 billion a year by 2025.

He also highlighted challenges facing the oceans, including climate change, pollution and overfishing, and committed to preparing a national Sustainable Ocean Plan by 2025, aligned with the Ocean Panel agenda, to guide Australian actions.

Specific actions will focus on improving waste management, marine park management, sustainable fisheries, safe and efficient maritime transport, marine biosecurity and offshore energy production.

The webinar included presentations and discussions from six panellists and addressed the five themes of the agenda: ocean health, ocean wealth, ocean equity, ocean knowledge and ocean finance. Australia's Sherpa to the Ocean Panel, Russell Reichelt, first provided context for Australia's involvement and examples of Australian initiatives already underway: the Blue Economy Cooperative Research Centre and Australia's National Hydrogen Strategy.

Minister for the Environment Sussan Ley discussed ocean health,

highlighting priorities to protect and restore reef systems and reduce plastic pollution, sharing initiatives with neighbouring countries.

Addressing ocean wealth, Austral Fisheries CEO David Carter says healthy oceans go hand in hand with wealth from oceans. As the world's first fishing business to go carbon neutral, he sees climate change as presenting the greatest risk to fisheries. He sees opportunities for Australia in technologies to decarbonise energy, particularly fuels used in transport and at sea. David Carter also painted an ambitious picture of a future vision that includes goals such as total traceability, no illegal fishing and full use of all the catch.

The managing director of Six Seasons Advisory, Joe Morrison, who has Dagoman and Torres Strait Islander heritage, spoke about ocean equity, saying the continuous connection of Australia's Indigenous people over more than 65,000 years is an asset to the country.

The Indigenous perspective is that people, land and water are intrinsically entwined. Participation in management and access to resources provides the opportunity to share knowledge and culture; integrating this with modern management and science will underpin a sustainable future for all.

On the topic of ocean knowledge, Andrew Johnson, CEO and director of the Australian Bureau of Meteorology, says the oceans play a critical role in weather and climate systems. A better understanding of our oceans will make weather and climate forecasting more accurate and will also be critical for the transformation now occurring in global energy systems and the use of wind, waves and sunlight as the renewable power sources of the future.

Rich Gilmore, founding principal of investment firm 7030 Capital, spoke about ocean finance and the "mindbogglingly enormous" investment and productivity opportunities of Australia's ocean estate.

He says this estate is between 2000 to 10,000 times larger than the country's agricultural estate – depending on how it is measured. With US\$550 trillion of investable wealth in the world, there is enough to move the needle towards a sustainable ocean economy – we just need some smarter tools and the will to do that.

Question time

In the question-and-answer session following the presentations, opportunities for carbon capture in marine environments were identified, with Minister

OCEAN TRANSFORMATION 2030 OUTCOMES

OCEAN WEALTH

Sustainable ocean food Wild fish stocks are restored and harvested at sustainable levels, aquaculture is sustainably

grown to meet global needs, and waste is minimised and managed throughout the value chain.

Sustainable ocean energy

Ocean-based renewable energy is fast-growing and on the path to becoming a leading source of energy for the world.

Sustainable ocean-based tourism

Coastal and ocean-based tourism is sustainable, resilient, addresses climate change, reduces pollution, supports ecosystem regeneration and biodiversity conservation, and invests in local jobs and communities.

Sustainable ocean transport

Shipping investments have effectively accelerated the shift towards zero-emission and lowimpact marine vessels.

Sustainable new ocean industries Innovation and investments in new ocean industries have boosted environmentally responsible and inclusive economic growth.

A precautionary approach to seabed mining

Sufficient knowledge and regulations are in place to ensure any activity related to seabed mining is informed by science and ecologically sustainable.

OCEAN HEALTH Reduce greenhouse gas emissions

Ambitious climate action has set the world on track to achieve the goals of the Paris Agreement and restore ocean health.

Protect and restore marine and coastal ecosystems Marine and coastal ecosystems are healthy, resilient and solutions are key elements in developing coastal infrastructure.

Reduce ocean pollution

The ocean is no longer a sink for pollution and ocean dead zones are minimised.

OCEAN EQUITY

Promote equal opportunity for people to benefit from the ocean

People have equitable access to ocean resources, benefits are fairly distributed and the most vulnerable are protected from the risk of harm.

OCEAN KNOWLEDGE Build ocean literacy and skills

Through the UN Decade of Ocean Science for Sustainable Development, ocean literacy has been enhanced worldwide. People understand the value of the ocean and have acquired the skills and knowledge to participate in the sustainable ocean economy.

Account for the value of the ocean Decision-making affecting the ocean reflects the value of and impacts on the ocean's

Harness ocean science, technology and data

A globally shared data revolution has contributed to sustainable ocean management worldwide.

OCEAN FINANCE

Sustainable ocean finance is accessible for all and drives ecologically sustainable and socially equitable economic growth.

For details of the agreed priority actions for each of the five elements in the framework visit https://www.oceanpanel. org/ocean-action/files/ transformations-sustainableocean-economy-eng.pdf

Sussan Ley saying she is keen to learn more about the quantifying of sequestration by seagrasses and mangroves.

Financial incentives to encourage behaviours that support better environmental outcomes were also mooted, including penalties for pollutants.

Russell Reichelt suggested aquaculture would be the focus of increased fisheries production and supported increased production of non-fed aquaculture, such as seaweeds and shellfish, which draw their nutrients from the ocean itself.

Joe Morrison suggested the inconsistent and disjointed fisheries management across Australia's fisheries jurisdictions could be addressed with a collaborative and partnership approach and by involving Indigenous people in managment, who bring perspectives that are fundamentally focused on ensuring sustainable environments.

Andrew Johnson supported the call for increased ocean literacy, saying there was huge opportunity to improve Australians' understanding of the ocean when more than 80 per cent of the population lives within 30 kilometres of the coast.

"There is a close physical connection, but it doesn't often extend beyond the horizon ... so it's really a connection with our coast, which is different to a connection to our ocean," he says. He agreed that with social media and mobile technologies there was a huge opportunity for citizen science to contribute to and extend the reach of ocean monitoring, as it already does for weather data for the Bureau of Meteorology.

Addressing a question on the potential role for ocean energy as part of a renewable energy portfolio, Rich Gilmore says the scale of the energy and economic transformation underway means every option will be tapped into. Developments in ocean wind energy are already significant globally, although there is only one active proposal in Australia. Development and adoption of new technology do not happen in a linear way, but he is confident "ocean energy's day will come ... it will get to scale when the market is ready". **F**

You can watch the full webinar at

https://www.youtube.com/watch?v=YegDjuXC-gc

Taking sustainable seafood – and its story – to the people

The story of Andrew and Renae Tobin's romance is a tale that involves science, seafood, sustainability ... and a semi-trailer

Words Barbara Adam Photos Phill Copp

muddy estuarine creek in steamy North Queensland is not a typical backdrop for romance, but for Andrew and Renae Tobin it is where their love story began. The first time Andrew remembers meeting Renae was on a James Cook University field trip in 1996 to Blacksoil Creek, about 40 kilometres south of Townsville. Renae was in her third year of a marine ecology degree, and Andrew was doing his PhD in marine biology.

"She stood out to me because she got involved in the dirty hard work," Andrew Tobin says. Fastforward 25 years, and both Andrew and Renae Tobin are still involved in "dirty hard work".

Since leaving the world of academia, that work now involves running one of Australia's

Below Andrew and Renae Tobin with their pupose-built seafood truck that takes fresh fish to 32 townships in Queensland.



"We find the best seafood we can, reward the fishers for their excellent product and then take it out west to sell it." Andrew Tobin

best fish and chip shops and operating a purpose-built seafood truck that visits 32 townships in central and western Queensland.

Tobin Fish Tales is their Townsville-based fish-and-chippie that took out 2019's Australian Fish and Chips Award, beating more than 2000 other fish and chip shops from around Australia.

The couple, who now have two teenage children, bought a small, sporadically operating fish and chip shop in 2015 as a "blank slate" to create a new business designed to connect the local community with local, sustainably sourced seafood.

ANDY'S SPANISH MACKEREL

Tobin Fish Tales sources its Spanish Mackerel from Bramble Cay, at the northernmost end of the Great Barrier Reef, in waters belonging to the Torres Strait Islanders. Egon Stewart leases the fishing rights to the area and fishes in the treacherous waters with his father and grandfather. Andrew Tobin has joined the Egon's fishing expeditions in the past, as a researcher and as a fisher.

Spanish Mackerel is Tobin Fish Tales' signature fish and Renae Tobin says it is popular among the shop's Torres Strait Islander clientele, who call it "their" fish. It's a mild-flavoured and affordable fish that retains its moisture if cut and cooked well. It's also one of the few local fish available in the high volume the Tobins require. Much of this seafood is caught by the fishers they identified during their research as being proactive in providing a high-quality product and championing their industry.

"We noticed there was a really negative view of commercial fishing," Renae Tobin says. "The public – while they wanted to support local fishing – they didn't know what they could and couldn't buy, what was sustainable and what information to trust, and even where to get information from."

Tobin Fish Tales uses the slogan "every fish has a story", friendly shorthand for the importance of provenance in the seafood sector.

New directions

While maybe not the most obvious career progression for two researchers, both with PhDs in fisheries science, the fish and chip shop and seafood truck build on the work the Tobins were doing in science.

Andrew Tobin has also fished commercially on and off since 1994. Even while working full-time as a research fellow at James Cook University, he kept his commercial fishing licence.

"If I wasn't full-time fishing, I was parttime fishing in the background," he says.

The Tobins wanted to move away from the increasingly cut-throat world of academia and were on the lookout for other opportunities, transitioning away from research over several years.

"Funding streams were reducing in volume and the environment was becoming more competitive," Andrew Tobin said. "People you used to work with collaboratively before were starting to become competitors for funds. And that was no fun at all.

"More importantly, we were finding the research we were doing, which was supposed to inform better fisheries management for all stakeholders, just wasn't happening because of political hurdles.



The Tobins say they were doing research projects where they were building relationships with stakeholders, including, most importantly, fishers, and selling them a story about what they might achieve and what they might benefit from by being included in the research for the next two or three years.

At the end of those research projects, they basically felt like they had been telling stakeholders a lie, because there was not the political will to pick up the outputs of the research. "It's really disappointing. We felt we were wasting taxpayers' money, wasting our time and wasting fishers' time. That really stung us both."

The couple began brainstorming ways to move out of academia while still supporting their family. They considered a seafood-based business as a "portal" to educate the community about sustainable fishing and connect potential customers with commercial fishers.

"For [commercial fishers] to do it themselves is extremely difficult, because just doing the fishing and the running the business side of things is hard enough," Andrew Tobin said. "That's the opportunity we saw, though we weren't the first to do it by any stretch." They put their scientific training and inquisitive minds to work learning about business – and eating their body weights in fish and chips as research. Since stepping into their own business in 2015, Tobin Fish Tales now has a staff of about 20, including three full-time employees.

Out west

The expansion of the business to include the inland 'fish run' also evolved from the Tobins' network in the seafood sector. While Andrew Tobin was fishing full-time, he met Jim and Viv Peady.

"They used to invite me over to their boat at the end of the day of fishing, and we'd have dinner and Jim would crack out his home brews and we'd have a couple of drinks and laughs," Andrew Tobin says. The Peadys had set up a business delivering fresh-caught seafood to inland Queensland with their own semi-trailer.

When the Peadys were ready to sell up three years ago, Andrew Tobin bought their business, All Wild Seafood, and continued their philosophy of distributing high-quality, sustainably caught seafood to regional Queensland towns.

Andrew Tobin now does regular runs of the All Wild Seafood truck, with his longest trips lasting 19 days and a starting stock of 10 tonnes of seafood. "The idea is to carry enough stock so that we still have a full range for the last few days," he says.

The Tobins' teenage children Elliot and Charlotte have both joined the truck's runs out west. Elliot, in particular, loves the busy pre-Christmas runs, where everyone is extra grateful for their local Christmas seafood supply.

"We find the best seafood we can, reward the fishers for their excellent product and then take it out west to sell it," Andrew Tobin says. "Out west a lot of people appreciate quality, and a lot of people appreciate local." **F**

SIENNA'S WILD-CAUGHT BARRAMUNDI

Sienna Green is a 21-year-old commercial fisher who works alongside her partner Dale and parents Neil and Leanne in the salt pans and muddy creeks around Townsville. Calling themselves the Green Team, they fish, fillet, trim, cryovac and pack the Barramundi they catch overnight, and deliver directly to Tobin Fish Tales. Andrew and Renae have known the Greens since 1998, when Leanne was pregnant with Sienna.

Interested in an FRDC final report?

For a copy of an FRDC project final report go to <u>www.frdc.com.au</u> or contact the FRDC on 02 6122 2100, or email frdc@frdc.com.au

Final reports

Evaluating community engagement 2018-201

Recognising the importance of strategic community engagement to ensure the fishing and aquaculture industry's social licence to operate is sustained, this project designed and piloted a monitoring and evaluation (M&E) framework and toolkit for fisheries and aquaculture to assess the outcomes of their community engagement activities. The M&E framework will support a more systematic approach to community engagement activities by the industry. The toolkit will provide industry organisations with practical resources for planning, conducting and learning from the evaluation of community engagement processes. More information: Victoria Pilbeam, victoria@clearhorizon.com.au

Toxic algae management 2017-225

The accumulation of paralytic shellfish toxins (PST) of microalgal origin in Abalone tissues causes a trade and human health risk that requires active management. Toxic algal blooms of the genus Alexandrium have recently caused several Abalone harvest closures on the east coast of Australia. Risk management is hampered by a scarcity of knowledge. A collaborative effort by researchers from the South Australian Research and Development Institute (SARDI), the Institute for Marine and Antarctic Science (IMAS) and Cawthron Institute saw field studies conducted on the east coast of Tasmania during toxic blooms in 2018 and 2019, and experimental studies in South Australia in 2018 to investigate uptake and depuration of PST.

More information: Alison Turnbull, alison.turnbull@utas.edu.au

Indigenous fisheries research 2018-183

This project synthesised key messages from a number of studies produced through the FRDC's Indigenous Reference Group to produce materials for use in developing policy and stimulating community engagement. Topics include Indigenous cultural fishing and fisheries governance, the development of Indigenous scientific capability, building the capacity and performance of Indigenous fisheries, improving access to and involvement in Australia's fisheries resources for Indigenous Australians, understanding the values inherent in Indigenous customary fisheries, and the characteristics and barriers for successful Australian Indigenous fishing and aquaculture enterprises. More information: Leila Alkassab,

leila@landtoseaconsulting.com

Best practice for Southern Rock Lobster fisheries 2017-082

This report provides the most in-depth analysis of bycatch across the entire Southern Rock Lobster Fishery (SRLF) to date, involving researchers, stakeholders and managers across South Australia, Victoria and Tasmania. It uses information from independent scientific observer programs and scientific research cruises collected over a period of greater than 15 years to explore the important bycatch species in each state and management zone; conduct a critical appraisal of the current monitoring programs by comparing them to international best practice; help inform a risk assessment for all bycatch species through workshops held in each state involving key stakeholders including researchers, fishers, fisheries managers, scientific observers involved in the monitoring programs, scientific experts and ecologists; and explore quantities and trends in bycatch for species deemed to be at moderate risk from fishing activities.

More information: Rafael Leon, rafael.leon@utas.edu.au

Social and economic contributions study 2017-210

This project has produced estimates of the contribution to the Australian economy of total commercial fisheries and aquaculture activities, using standard measures of economic contribution. It also estimates that contribution within each separate Australian state and territory individually and has developed a robust and nationally consistent framework to support data collection and estimation of contributions in the future. **More information: Emily Ogier**,

emily.ogier@utas.edu.au

Non-market impact valuation for fisheries 2019-091

In order to assess the impact of its research, development and extension investments in the future, the FRDC commissioned a compilation of non-market impact valuation studies, along with a gap analysis of available non-market information related to the environmental and social impacts of fisheries research, development and extension. This study produced a database of existing nonmarket valuation studies as a resource for future impact assessments/evaluations of fisheries and aquaculture RD&E investments. **More information: Talia Hardaker,**

talia.hardaker@gmail.com

Carp virus modelling 2017-135

As the modelling work has progressed as part of the National Carp Control Plan, the need to understand transmission as a critical factor to be included in the model has emerged. This was investigated through two discrete projects to understand, first, the relative amounts of virus in the skin and mucus of infected fish versus the amount of virus shed in the water and, second, the relative importance of direct versus indirect transmission of CyHV-3 between fish. **More information: Nick Moody,**

nick.moody@csiro.au

Fisheries and aquaculture statistics 2019-093

Statistics on Australian fisheries production and trade seek to meet the needs of the

fishing and aguaculture industry, fisheries managers, policymakers and researchers. Statistics can assist in policy decisions, industry marketing strategies and the allocation of research funding or priorities. The gross value of production for specific fisheries is used for determining the research and development levies collected by government. The neutrality and integrity of gross value of production (GVP) estimates are therefore important due to their forming the basis for research levies for each fishery. At the international level, the Department of Agriculture, Water and the Environment, through the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), contributes to several of international databases. More information: Robert Curtotti,

robert.curtotti@awe.gov.au

SRL ownership workshop 2018-205

Southern Rocklobster Limited (SRL) recognises there is diversity in the composition of the Southern Rock Lobster industry's structure and the receipt of benefits from the fishery varies between user types. The organisation held a workshop to assess other similar examples and if there were appropriate management options to address them. The purpose of the workshop was to gain insight and provide information to inform strategies, policies and options around areas the industry could improve towards its desired direction.

More information: Tom Cosentino, tom@margoconsulting.com.au

Markets for Torres Strait fisheries 2016-244

Commercial fishing is an economically important activity in the Torres Strait, providing financial opportunities for the traditional inhabitants of the region. A key barrier to development of this fishery has been identified as the additional cost of reaching markets and the cost of doing business from a remote location. This project set out to develop a viable marketing and brand strategy as well as an implementation strategy that may improve the profitability of Torres Strait fisheries' products. It also took the stakeholders of the Torres Strait on a marketing and branding learning journey and assessed the feasibility of exporting fisheries products directly from the Torres Strait. More information: Emily Mantilla, emily@honeyandfox.com.au

Movers and ...

appointments at the federal Department of Agriculture, Water and the Environment, effective from February 2021 include Emma **Campbell**, taking over from Mel Brown as first assistant secretary, and the official appointment of George Day as assistant secretary, Fisheries Branch. He has been acting in this role for a vear.

New senior staff

Alison Curran has been promoted to the role of assistant secretary, Levies Policy and Crops Branch. Anthony Bennie has been appointed as assistant secretary, Natural Capital and Markets Branch.

Alison McMorrow

is now assistant secretary of the Biodiversity Policy and Water Science Branch, moving from the same role at the Innovation and Consumers Branch, which will be filled by Christine Mulhurn.

Courtney Bryant has been appointed as assistant secretary, Bushfires Response Branch, and Declan O'Connor-Cox is assistant secretary, Environment Protection Reform Branch.

Geoff Richardson, assistant secretary of the Protected Species and Communities Branch, has retired. Stepping into this position is Ilona Stobutzki, who has returned from a posting in Thailand. Steve Hatfield-

Dodds, the executive director of ABARES, will be moving across to lead a joint modelling team in the Department of Industry, Science, Energy and Resources (DISER) to undertake modelling and analysis of strategic climate policy.

The FRDC senior portfolio manager Josh Fielding has accepted a position at the Australian Fisheries Management Authority, assisting with the management of tropical tuna fisheries until October 2021.



Jude Tyzack is the new head of the Aquaculture Council of Western Australia, replacing Paul Beeson.

Aaron Irving, executive officer of the Pearl Producers Association, has left to take up a position with Deepwater Group in New Zealand.

John Sansom has retired from the Tasmanian Rock Lobster Fishermen's Association. Rene Hidding has taken his position as executive officer.

lan Cartwright has resigned from the position of chair of the Abalone Council Australia. Adrian Cuthbertson

is the new acting chair

02 6122 2128 ilaria.catizone@frdc.com.au of the Tasmanian Abalone Council.

PLEASE SEND INFO TO: Ilaria Catizone

MOVERS WE'VE MISSED?

after the resignation of Joey McKibben. Dean Lisson has

resigned as the Tasmanian Abalone Council chief executive. Thomas McNab is the new president of Abalone Industry Association of South Australia, taking over from Jonas Woolford.

Don Bromhead has accepted a secondment to the Australian Bureau of Agricultural and Resource Economics and Sciences from the Australian Fisheries Management Authority.

Another mover,

Johnathon Davey has resigned from the role of Seafood Industry Victoria's executive director

Robert Gratton is the new Clean Seas Seafood Limited managing director and CEO taking over from David Head.



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