FISH

FISHERIES RESEARCH & DEVELOPMENT CORPORATION **NEWS**

VOLUME 28
NUMBER 1

MARCH 2020

NATIONAL AWARD WINNERS

TRACKING FISH MOVEMENTS

GENETIC TECHNOLOGIES

Surviving the odds

ICWL 2020

12th International Conference and Workshop
Lobster Biology and Management

18-23 Oct, The Esplanade Hotel, Fremantle | WESTERN AUSTRALIA

REGISTRATIONS OPEN!

The 12th International Conference and Workshop on Lobster Biology and Management 2020 is returning to Fremantle, Western Australia where it all began.

The conference theme is 'Ecosystem-Based Fisheries Management (EBFM)' with a focus on lobster and crab fisheries.

To join researchers, scientists, managers and industry members or to just find out more, register your interest at www.icwl2020.com.au.

Abstract Submissions Close 30 March 2020

GOVERNMENT OF WESTERN AUSTRALIA

Department of **Primary Industries and Regional Development**

Western Rock Lobster

World leading sustainable fishery

FRDC

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MARCH 2020

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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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FRDC RESEARCH CODES: 2017-210, 2017-242

Below Senator Jonathon Duniam, Assistant Minister for Forestry and Fisheries signs 'Our Pledge', a commitment from Australia's seafood sector to the people of Australia. Photo: Damian Brierty, Melbourne Seafood Centre

People power

By **Nicole Baxter**

Research on the human dimensions of fisheries is integrating the social and economic aspects of the sector with environmental considerations

Emily Ogier
Human Dimensions Research subprogram leader

"We line up the expertise [needed] to answer some of the trickier issues involving people, benefits and markets that are connected to the production and ecological aspects of the industry."

Central to the success of Australia's wild fishery and aquaculture sector are the people who harvest, regulate, manage, process, deliver, sell, buy and eat seafood, as well as the broader Australian community.

The Human Dimensions Research (HDR) subprogram helps to ensure the industry is thriving socially and economically.

HDR subprogram leader Emily Ogier, from the University of Tasmania, says research under the subprogram focuses on social and economic factors of the sector, as well as the people, markets, institutions and behaviours these affect.

"We line up the expertise [needed] to answer some of the trickier issues involving people, benefits and markets that are connected to the production and ecological aspects of the industry," she says.

"We either co-invest and partner with another project to enhance the social or economic research skills within the project, or we initiate our own stand-alone projects."

Some of the HDR subprogram's clients are fisheries management agencies who may be looking at what management changes would support a fishery or aquaculture operation to better meet economic productivity and profitability goals.

"We might be involved to help understand how the mix of operators' behaviours and management settings impact on productivity and on people themselves," Emily Ogier says.

Ian Dutton, marine resources director at Tasmania's Department of Primary Industries, Parks, Water and Environment values the insight the HDR subprogram provides.

He says research into the human dimensions of fisheries management has lagged behind investment in the biological and physical sciences for too long.

"The interdisciplinary work being done at the Institute for Marine and Antarctic Studies (IMAS), supported by FRDC and industry, on the economic and social values of fisheries provides critical insight into wild fisheries and aquaculture supply chains," he says.

"From fisher/processor/retailer understanding of stocks and their investment behaviours, to what factors influence seafood consumption decisions, to broader community acceptability of fisheries and aquaculture production practices, we need to better understand the attitudes and behaviours that drive fisheries as a social enterprise."

Ian Dutton says those insights are essential to setting appropriate fisheries policy over the near and longer-term.

Net benefits

One of the HDR subprogram's recent projects has been to quantify, for the first time, the economic contribution of the seafood industry to the nation's economy. The *National Fisheries and Aquaculture Industry Contributions Study 2017-18* estimates this to be $5.3 billion.

The project report shows the sector generated 41,253 full-time jobs, and documents its importance in the economic resilience and diversity of regional coastal communities.

IMAS led the project, which lays the groundwork for ongoing monitoring of the sector's economic performance and showcasing its contribution to the wider Australian community.

The project was undertaken as part of the FRDC's RD&E National Priority 2: Improving the productivity and profitability of fishing and aquaculture. FRDC managing director Patrick Hone says understanding the economic and social values of fishing and aquaculture is going to be critical

for both government and industry planning, given the sector has significant potential for growth over the next decade.

He says quality economic data is also vital to ensuring the fisheries and aquaculture sectors are fully recognised for their contribution to the $100 billion by 2030 target that the National Farmers Federation has proposed for primary production. In 2019, this total, including fisheries, was estimated at $60 billion.

Project researcher Julian Morison from BDO EconSearch says the project results provide a much-needed baseline dataset that will allow the seafood sector's contribution to the national economy to be tracked over time.

The project has tailored a data framework and guidelines for fisheries, aquaculture and associated processing industries in Australia, establishing a cost-effective and consistent approach for future data collection.

The data gathered will also be useful for other types of economic analyses used in management decision-making, such as bio-economic modelling.

A summary of the report is available from the FRDC website, www.frdc.com.au.

Community trust

Another HDR subprogram research project is being undertaken by the sector's peak national body, Seafood Industry Australia (SIA).

SIA chief executive officer Jane Lovell says the research project, called 'Our Pledge', was established to understand how to help build trust within the community about how the seafood industry operates.

Decreasing trust can lead to increased regulation, limited market access and disincentives to invest in infrastructure, leading to consequences for the industry that include reduced productivity, profitability and sustainability.

Through the project, Jane Lovell's research shows the community's main concerns centre on the sustainability of fish stocks, the impact of wild-catch fishing on non-target species, animal welfare, the safety of workers at sea, and the way the industry responds to community concerns.

"The community wants us to engage with them more frequently and develop a relationship of trust," she says.

Research was also undertaken to understand the seafood industry's concerns about its profile in the community, with a view to making a series of statements about the industry's values under the banner of 'Our Pledge'.

These statements seek to respond to community concerns and to acknowledge the industry's responsibility for the future.

Jane Lovell says the sector's concerns are aligned closely with those of the broader community.

After 12 workshops and input from 150 seafood industry stakeholders during 2019, 'Our Pledge' has received support from more than 95 per cent of those attending workshops.

To ensure 'Our Pledge' was up to date, SIA held further community consultations involving surveys and focus groups. Pleasingly, there was strong support for 'Our Pledge'.

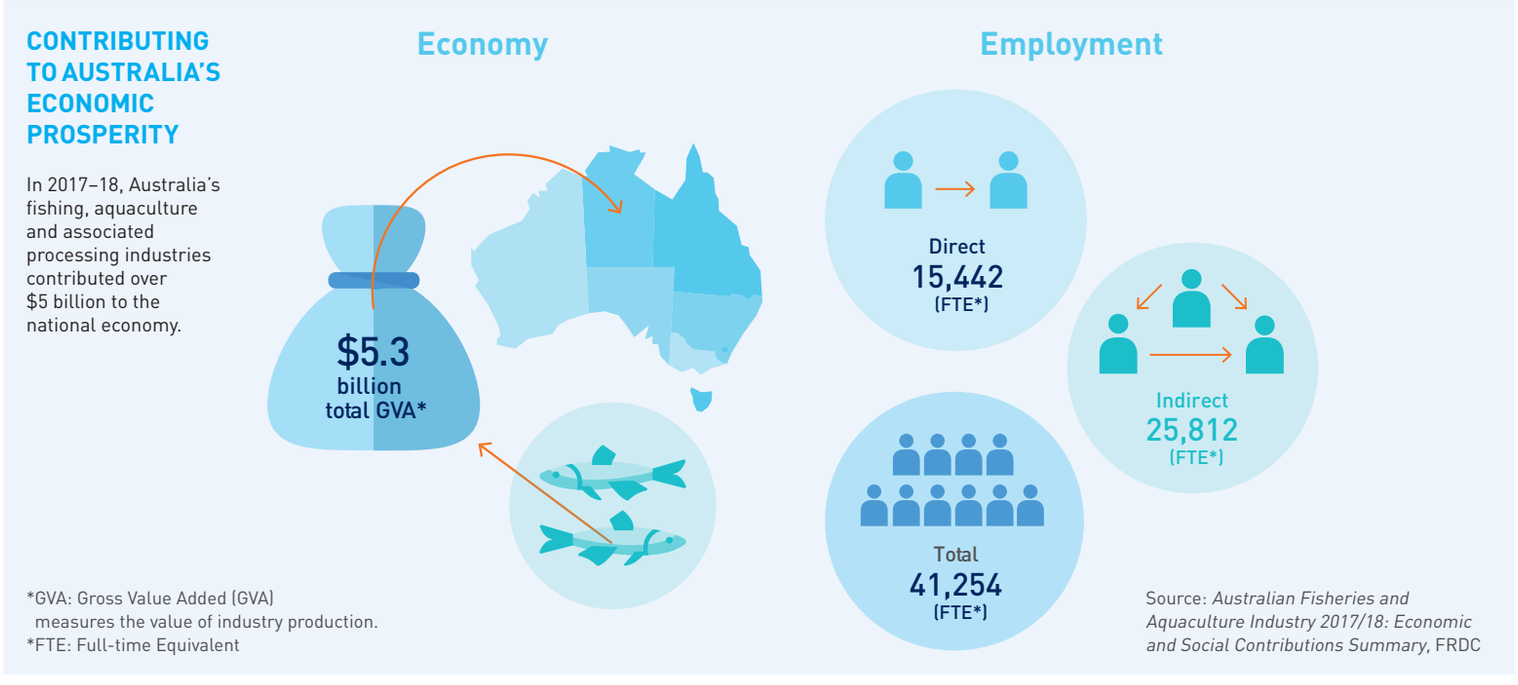
"Members of the community want to meet fishers and hear them tell their stories about what they do and how they do it," Jane Lovell says.

Case studies of fishers will also demonstrate how fishers have listened to concerns raised and have changed in response to issues highlighted.

Jane Lovell says the sector needs to communicate with more than just the science when the community raises concerns about issues such as the sustainability of fish stocks, for example.

"When the supertrawler became an issue, people weren't hearing our message that 'there are plenty of fish in the sea' because we were appealing to their heads," Jane Lovell says.

"We weren't connecting to their hearts in an authentic way, but the social science research we've done and are doing through the HDR subprogram is allowing us to do that." F



MORE INFORMATION
littlefilms.fish

Schools film their fish futures

Students are diving into action to produce short films documenting what fisheries mean to them and their communities

By **Ilaria Catizone**

A community's appetite for fresh, sustainable seafood, an afternoon spent angling, or steps to reduce plastics in our oceans – these are all potential subjects for the FRDC's Little Fish Films Competition for school students aged nine to 13 years.

It is a global competition and, in October 2020, the best entries will be screened before an international audience at the World Fisheries Congress in Adelaide.

Entries opened on 1 March and will close on 30 June, giving students four months to put together short films between 60 and 120 seconds long.

Community connections

As part of this challenge, students are encouraged to explore the significance of fish and fishing in their own communities, and in other communities worldwide. For as long as there have been people, there has been fishing. Today, the fishing industry accounts for 59.6 million jobs and represents $362 billion of the global economy. Millions of people, particularly small-scale fishers and poorer communities, rely on fishing as a primary source of income and protein.

This competition aims to raise the younger generation's awareness of the cultural, economic and environmental significance of fishing and the aquatic environment.

The FRDC will partner with international organisations, such as Seafish (UK) and the National Fisheries Institute (USA), to encourage entries from other countries.

Entries will be coordinated through schools and students submitting the best movies will be rewarded with an exclusive seafood adventure in their area, such as visiting an aquaculture facility or their nearest marine discovery centre, or perhaps a visit from a seafood hero like a fisher or filmmaker.

The winners will be announced at the World Fisheries Congress 2020 in Adelaide, which has the theme 'Sharing our oceans and rivers – a vision for the world's fisheries'.

The Little Fish Films Competition aims to harness students' creativity and love for technology to engage them in conversations about the future of fisheries.

Future views

Using film (including animation) as their medium, students will explore:

- what are fisheries to your community?
- the future of seafood; or
- looking after our aquatic world.

In making their films, students will be able to explore how the marine environment influences their lives culturally, economically and as a source of food. They will also be able to imagine what the future of seafood might look like, and in doing so understand how important it is to look after our aquatic world to ensure its ongoing health and productivity.

Little Fish Films will run from an online platform that has been created specifically to engage a younger age group.

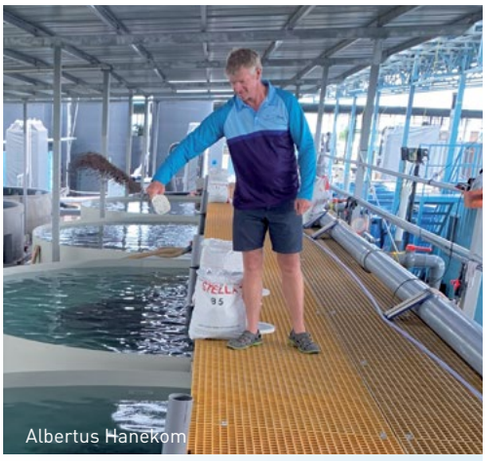
Online tools will help schools and their students share ideas and learn from each other, thus building a sense of community. This will include discussion of FRDC projects, lesser-known fish species and important concepts related to the aquatic world, such as plastics, sustainability and pollution.

Subscribers to the Little Fish Film Competition newsletter will receive regular updates about the competition, including topics for classroom discussions and resources on filmmaking, storytelling styles and the competition's themes. F

SPREAD THE WORD!

More information and sign up at **littlefilms.fish**

2020 KEY DATES
Competition opens
1 March
Competition closes
30 June
Winners announced
11-15 October


Albertus Hanekom

NUFFIELD SCHOLAR

Albertus Hanekom from Kununurra, Western Australia, has been awarded an FRDC-funded Nuffield Scholarship to investigate how Barramundi aquaculture can grow more seafood and better manage stock levels.

He is a nursery manager for Marine Produce Australia's Cone Bay Ocean Barramundi operation in the Kimberley, which produces 3000 tonnes of prime Barramundi per year to supply Coles supermarkets and other Australian markets.

Albertus Hanekom plans to explore the viability of replicating Atlantic Salmon industry practices for Barramundi, such as more effectively using on-land nurseries to grow stock before transferring them to sea cages.

"Seed stock security is vital for every aquaculture industry, and a better understanding of the methods of on-land nursery rearing of Barramundi fingerlings will allow us to better control stock, be able to time nursery stock transfers and monitor performance more effectively," he says.

"At present, Barramundi farmers avoid producing fingerlings at certain times due to poor performance in colder months, which creates a gap in production for large-volume producers. If we can more effectively use on-land nurseries as seed banks, we will unlock better surety of supply and grow more fish in a shorter time frame."

He will explore on-farm nursery systems in Atlantic Salmon farms in Tasmania and South America and Barramundi farms in the Middle East to observe how larger stock is grown on-land and to gather insights on best management practices and associated technology uses. F

More information: Albertus Hanekon, albertush@icloud.com, www.nuffield.com.au

Sea Rogue screening

In February the FRDC hosted the NSW screening of the short film *Sea Rogue* – a collaboration between the SeSAFE project team and Millstream Productions, funded by the Australian Maritime Safety Authority and the FRDC.

The film captures the powerful story of the loss of the *FV Sea Rogue* off Ballina, NSW in 2008, where deckhand Michael Williams swam 15 nautical miles to shore in an attempt to find help and save the crew's lives. Sadly, the skipper Charlie Picton was lost at sea as a result of the incident.

The launch of the movie was held in Yamba on the 12th anniversary of the loss of the *FV Sea Rogue* on 27 February, and is part of a larger national marine safety initiative known as the SeSafe Project (www.sesafe.com.au). The goal of this initiative is to raise awareness and improve safety performance in the fishing and aquaculture industry Australia-wide. F

Farewell to outgoing chair Ron Boswell

Following Ron Boswell's resignation as chair of the board after a three-year term, the FRDC and community bids him farewell and acknowledges his commitment and contribution to the Australian fishing industry.

During his long-serving career in the Australian Senate, Ron Boswell had a well-known passion for the agriculture and fishing industries. And in 2016 he joined the FRDC Board, where he has worked actively with the fishing industry sectors – commercial, recreational and Indigenous – overseeing significant improvements, growth and change. During his time as FRDC chair Ron Boswell has overseen a number of significant milestones for the FRDC, helping the industry respond to white spot disease in Moreton Bay and taking an active interest in commercial fishers and amateur anglers.

"Ron Boswell has been a staunch supporter of fishing in Australia and has mentored and supported recreational fishing at the highest level," says Colin Tannahill, managing director of Shimano Australia Fishing.

"Within AFTA [Australian Fishing Trade Association] we have enormous respect for the 'legend' that is Ron Boswell and value the legacy he has created for fishers in Australia."

Ron Boswell's resignation was announced in January and the FRDC's deputy chair, Colin Buxton, will act as the chair until a new appointment is made by the Minister. The FRDC board will agree on a deputy chair at each board meeting and for the period up to the next board meeting. F

DOWNLOAD

DISEASE FIELD GUIDE REVISED

An essential resource for those working in the fisheries and aquaculture sector, the fifth edition of the *Aquatic animal diseases significant to Australia: identification field guide*, has now been released.

This edition incorporates new and updated information gathered from an extensive review of the fourth edition. It includes 53 aquatic animal diseases of significance to Australia that affect species of finfish, crustaceans, molluscs and amphibians.

The field guide has been published by the Australian Government Department of Agriculture and aims to help people recognise diseases significant to aquaculture and fisheries in Australia.

It is available as either a free PDF or Word document download from www.agriculture.gov.au or as a smartphone app from the App Store or Google Play. F

MEDICINE

SEA SNAIL COMPOUND REDUCES CANCER RISK

A small Australian sea snail has a remarkable ability to produce a colourful purple compound to protect its eggs. Now, the compound is proving even more remarkable for its potential use in a new anti-cancer pharmaceutical.

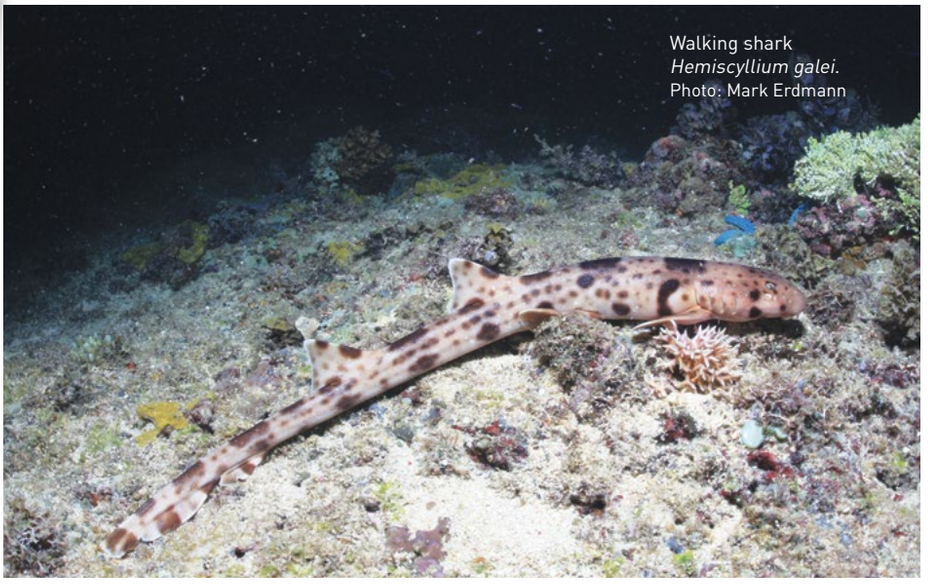
Researchers at Flinders University, Southern Cross University and Monash University have isolated one compound in the gland secretions from the Australian White Rock Sea Snail (*Dicathais orbita*), which has not only antibacterial and anti-inflammatory qualities, but also important anti-cancer properties.

The research shows a specific snail compound derived from the secretions can prevent the formation of tumours in a colon cancer model.

Colorectal cancer is the second leading cause of the 9.6 million cancer deaths every year, with the World Health Organization reporting 862,000 deaths in 2018.

Sophisticated technology tracing the metabolism of the compound inside the body has helped to demonstrate the absence of potentially toxic side effects. F

ECOLOGY



Walking shark *Hemiscyllium galei*. Photo: Mark Erdmann

Evolution of walking sharks

The evolution of walking sharks has been reported in a new study from an international science consortium, which has also described four new species of walking sharks over the past 12 years.

The new species of walking sharks, officially known as epaulette sharks, were identified in waters around Papua New Guinea. Five other species of walking sharks were already known to science.

Lead researcher Christine Dudgeon, at the University of Queensland, says the ornately patterned sharks are the top predator on reefs during low tides, when they use their fins to walk in very shallow water.

"At less than a metre long on average, walking sharks present no threat to people but their ability to withstand low oxygen environments and [to walk] on their fins gives them a remarkable edge over their prey of small crustaceans and molluscs," she says.

Detailed genetic analysis has identified the new species, suggesting the sharks have continued to evolve in separate, geographically limited populations, adapting to dynamic local reef environments. Many other shark species remain virtually unchanged from their predecessors of 180 million years ago.

"Data suggests the new species evolved after the sharks moved away from their original population, became genetically isolated in new areas and developed into new species," Christine Dudgeon says.

The research has been conducted with Conservation International, the CSIRO, Florida Museum of Natural History, the Indonesian Institute of Sciences and Indonesian Ministry of Marine Affairs and Fisheries.

The most recent study was published in the CSIRO's *Marine and Freshwater Research* journal. F

WORDS

'BIOMASS' AND 'ABUNDANCE'

These definitions can be applied to any living organisms, but in a fisheries sense they are used in the following way.

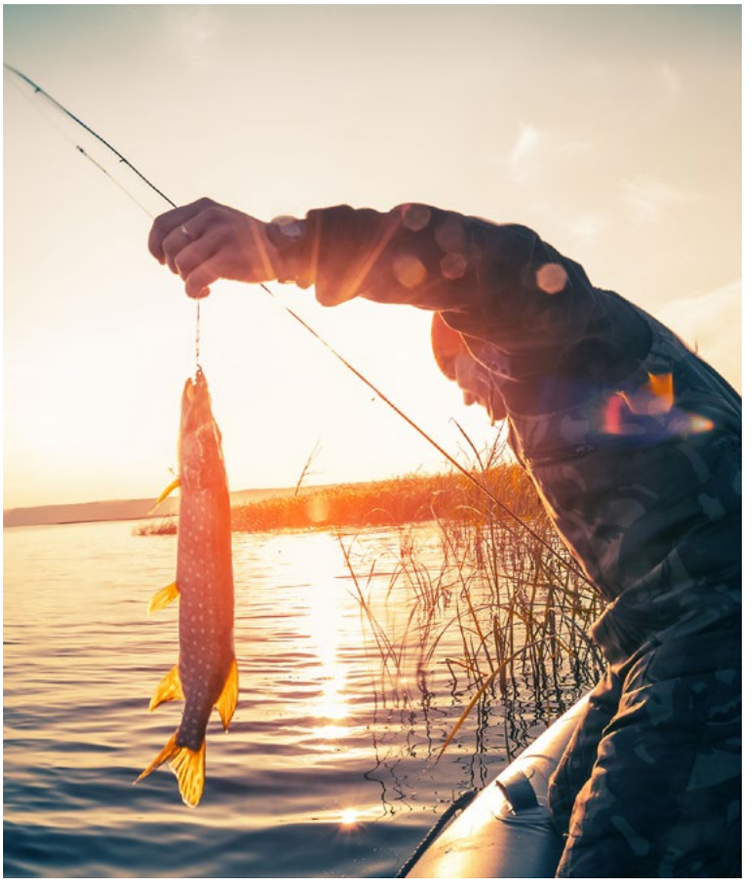
BIOMASS: The total weight of a fish population.

ABUNDANCE: A measure of how many fish are in a population or fishery.

Fish abundance is a measure of the number or amount of a fish in a given area. Scientists usually collect data about how many fish there are, and their size. Abundance is then presented in terms of fish biomass (total weight of fish per unit area). F

MORE INFORMATION
Stefan Sawynok, stefan@info-fish.net
www.infofishaustralia.com.au
FRDC RESEARCH CODE: 2017-141

New technology is helping anglers track the health of their fish and fisheries. Photo: 123rf



Fish, photo, health check

By **Melissa Marino**

Smartphone apps help rec fishers capture photos of their catch, simultaneously monitoring the health of their favourite fisheries

The power of recreational fishers is being harnessed to build an extensive database to monitor and track fish health across the country.

Thousands of photographs taken by fishers and uploaded from smartphones are building the backbone of the Track My Fish platform, a database being used to identify disease and injury among fish populations.

"This is a community data collection project being used for proper science," says Stefan Sawynok, director of Infofish Australia, who developed the visual recognition machine learning technology behind the platform. "It allows people to get involved in citizen science just simply by doing the activity they love."

Using specially designed algorithms, Track My Fish diagnoses healthy fish as well as particular illnesses, or injuries that can occur when fish are reeled in too quickly from depth, such as barotrauma. Since 2017 some 40,000 images have been uploaded to the platform.

"We are providing a growing and long-term resource for the fishing community and researchers," says Stefan Sawynok.

Infofish is a family business that has been committed to citizen science for more than 30 years, and has a long involvement in fisheries research using AI and machine learning. Being involved in its collection means fishers trust in the data – a critical factor in cooperative, successful fisheries management, he says.

"Fishers are really excited to see their information being used for a bigger purpose. And that ownership is building change. They are thinking more about their fishery and, in the end, that sense of stewardship is probably the biggest benefit of all of this."

The support of fishing competitions has been hugely instrumental in this successful community uptake, says Stefan Sawynok. More than 100 tournaments already use tailored and rebranded versions of Infofish Track My Fish apps for registration, for judging and for competitors to photograph and record their catch. And now they have the added benefit of helping to build the Track My Fish database, which will be used to monitor fish health nationwide.

"We're adding value to something fishers were already doing and they have an interest in the health of their fish, whether it's because they're going to eat them or they're concerned about issues like water quality," Stefan Sawynok says.

The platform will ultimately be available as a website where fishers can identify and monitor the health of fish stocks at particular locations; it will also enable their participation in further research.

He says the platform can be used as an educational tool to improve fish-handling techniques, particularly if clusters of injuries are identified at certain locations. For instance, it has already identified that barotrauma can be an issue for fish in inland lakes and rivers, not just those in deeper ocean waters.

Resource managers can also use the data to monitor fish health. Real-time alerts can be provided if illnesses are detected in particular fish populations, or if other changes to those populations occur over time.

The technology will have growing application as the climate changes and water management becomes even more critical, he says, such as when heavy rain reduces water quality and affects fish health. It will enable fast and accurate identification of disease, should there be an outbreak.

FRDC helped fund development of the Track My Fish technology and initial extensive fish sampling in and around Gladstone, Queensland, which provided the inspiration for the project after a 2011 marine disease outbreak. Visual data was correlated with data from studies by the University of Central Queensland to ensure diagnoses were accurate.

Although the technology is still being refined and its scope increasing, it is already analysing data from 40 sites across Australia and New Zealand.

"I'm pretty proud of this project because we have essentially created a useful dataset for very little cost, and that to me is where citizen science hits the mark," Stefan Sawynok says. F

Stefan Sawynok
Director, Infofish Australia

"Fishers are really excited to see their information being used for a bigger purpose. And that ownership is building change. They are thinking more about their fishery and, in the end, that sense of stewardship is probably the biggest benefit of all of this."

MORE INFORMATION
www.arff.net.au/nrfc

Rec fishers take to the science

Recreational fishers are proving to be increasingly proactive in assisting research and gathering data to improve the management and health of fisheries resources

By **Catherine Norwood**

Recreational fishers as citizen scientists and important contributors to fisheries management was the theme connecting presentations at the 2019 National Recreational Fishing Conference, hosted by the Australian Recreational Fishing Foundation (ARFF), held in Hobart in December.

The conference drew an audience of more than 300, including many who attended as 'virtual delegates', viewing the live stream of the event as it unfolded. The live streaming allowed those unable to travel to take part and attracted viewers from most Australian states, New Zealand and the US.

ARFF chair Brett Cleary says the citizen science theme has struck a chord with recreational fishers, as well as with fisheries managers.

"There are a number of projects that rec fishers have been involved in for many years, as well as more recent programs such as the Tuna Champions. Grassroots anglers are starting to become more involved in these kinds of programs and to understand the importance of their role," he says.

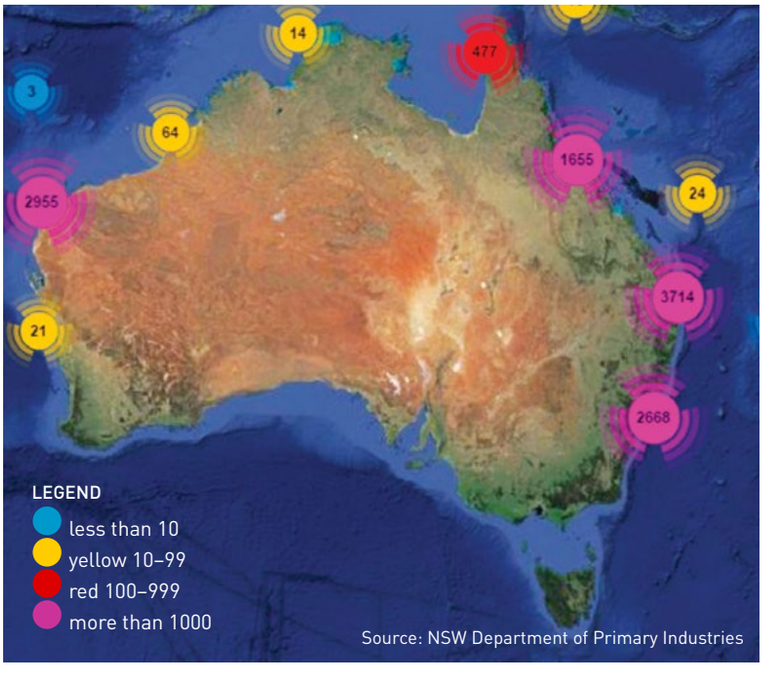
"Taking part also gives them a sense of ownership of the resource, to know that they can make a difference. With that also comes a sense of obligation to take care of it."

Long-term approach

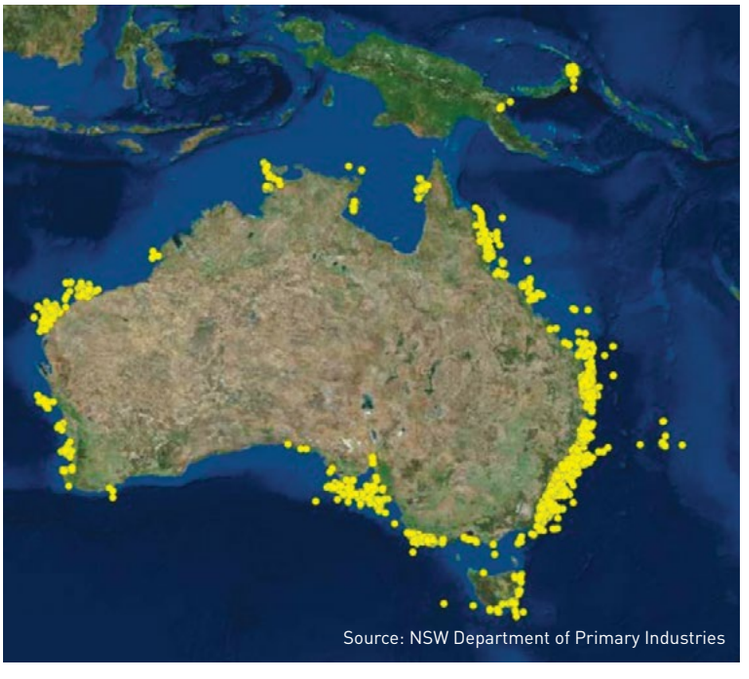
In his opening keynote presentation, marine biologist Julian Pepperell outlined the fishing community's successful engagement in the New South Wales Game Fish Tagging Program and the benefits that have come from it. The program has been running since 1973 and is operated by the NSW Department of Primary Industries in conjunction with the national Game Fishing Association of Australia.

It is the largest saltwater tagging program of its kind in the world and provides information on the biology (distribution, movement, growth, exploitation, stock structure) of billfish, tunas, sharks and sport fish around the country.

Black Marlin tagged July 2010 to June 2015



Positions of releases of tagged game fish during 2017–18



Right The RecFish SA team with FRDC managing director Patrick Hone (right). Photo: Australian Recreational Fishing Foundation

NSW DPI provides tags to anglers across the country, who voluntarily tag their catch, and provide records of the tags and catch to the program manager. Since it began, more than 460,000 fish have been tagged and 8000 fish recaptured.
In another presentation, Dean Jackson outlined the SCF Australia Research and Sustainability Competition, an initiative he has established on Queensland's Sunshine Coast (www.scfaustralia.com). The annual event is designed to collect detailed information about the 35 target species in the competition area, using the SCF smartphone app developed by Infofish Australia. Participation in the SCF event doubled after the inaugural competition in 2018 and is expected to double again in 2020.

The focus on data collection is what makes this a "new breed of fishing competition". Dean Jackson says it's specifically about maintaining the health and wellbeing of local waterways, fish stocks and surrounding catchments.

"Fishers are keen to be part of it," he says. "The information collected will help determine what impact recreational and commercial fishing currently have on our waterways and the steps we need to take to improve or sustain them."

Dean Jackson says he is working to bring this kind of event to more locations, expanding efforts to understand and protect fisheries.

Other presentations at the conference included an update on the FRDC-funded Tuna Champions program. Recreational fishers have been leaders in this program, implementing and promoting best practice as stewards of the Southern Bluefin Tuna (SBT) fishery and contributing to SBT tagging efforts.

OzFish Unlimited outlined several of its initiatives, which include expanding its chapters around the country with a focus on re-establishing habitat to support the productivity of local fisheries. It also has projects to map rivers for snags to support re-snagging initiatives for improved fish habitat, and is mapping sea grasses in some areas.

Another Ozfish project is working to restore oyster reefs in Pumicestone Passage, Queensland, which includes helping to coordinate oyster shell recycling centres to provide the substrate for new oyster reefs.

Director of the Centre for Marine Socioecology at the University of Tasmania, Gretta Pecl, presented the latest findings from Redmap – the Range Extension Database and Mapping project – which she initiated in 2009. This national citizen science project invites people to record and share sightings of marine species that are uncommon in their local areas, uploading images via Redmap.org.au or via the Redmap smartphone app.

With 10 years of data, she says, Redmap clearly shows an underlying extension in the range of various species. She notes this corresponds with changes in the marine environment, mostly related to temperature. The recreational fishing sector has contributed about half of Redmap's 3000-plus entries, which again demonstrates the ability of recreational fishers to contribute to a better understanding of changes in Australia's aquatic systems.

The FRDC was a major sponsor of the national conference and, in a closing presentation, its managing director Patrick Hone identified several major challenges for the recreational fishing sector. These include:

- Providing more clarity about who is fishing, when and where. This might be most efficiently achieved through fishing licences or participant registers.
- Improving the abundance of fish in order to improve the recreational fishing experience and fisher satisfaction. Habitat is key in improving fisheries abundance and should be a focus of future initiatives.
- Collecting data in ways that allow the sector to retain ownership of it and to optimise the support given to the sector. The approach to data collection often needs to be established before data collection even begins.

Gala dinner

The conference also included a gala dinner, where the SBT documentary *Life on the Line* was screened, and where the national Recreational Fishing Awards were presented.

Awardees included Sam Williams, for Innovation and Leadership; Tuna Champions, for Excellence in Research Outcomes; and VRFish, for Excellence in Recreational Fishing Communication.

RecFish SA was awarded the Project of the Year, for a reservoir restocking initiative; Matt Hansen was named Volunteer of the Year; and Fishcare Victoria was awarded the Best Project Encouraging Participation by Women and Children, for its Creating Sustainable Anglers VFA project.

Braeden Lampard was named the most successful future leader graduate, while the Mal Ramsay Lifetime Achievement Award went to Bruce Schumacher. F

More information about the 2019 National Recreational Fishing Conference, including recordings of the presentations, can be found at the ARFF website: www.arff.net.au/nrfc. The next national conference will be held in 2021.

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FRDC RESEARCH CODE: 2017-098

Tuna story to inspire new generation of fishers

The remarkable story behind the recovery of Southern Bluefin Tuna from an endangered species to a globally sustainable fishery is told in a recently released Australian documentary

By **Brad Collis**

The combined efforts of Australian science, industry innovation and community education have been showcased in the documentary *Life on the line – The story of the Southern Bluefin Tuna*, which tells the story of how these highly prized, temperate ocean dwellers were brought back from the brink of commercial extinction.

Produced and narrated by photojournalist and ardent fisher Al McGlashan, the documentary tells of how the Southern Bluefin Tuna (SBT) (*Thunnus maccoyii*) stocks went into freefall due to overfishing and how the fish was rescued from its near demise. It also explains how the strategies and science that saved the SBT now stand as a sustainability model for fisheries worldwide.

Al McGlashan gives the narration a personal perspective that also resonates with the scientists and fishers – commercial and recreational – who are central to the story: "My father used to tell me about this amazing tuna, but I'd never seen one as a child," he says.

"It's long been a dream of mine to tell the story of the SBT, about how the stocks are recovering … and to see fishers appreciating and respecting these athletes of the sea."

Life on the line provides an engrossing insight into this warm-blooded marine species and its decade-long lifecycle that sees it reaching 200 kilograms and two metres in length by the time it has traversed the Southern Ocean. The film details the commercial pressures that decimated the SBT population and the extraordinary individuals who led its recovery, in the process creating a new, sophisticated industry worth more than $100 million annually in Australia alone.

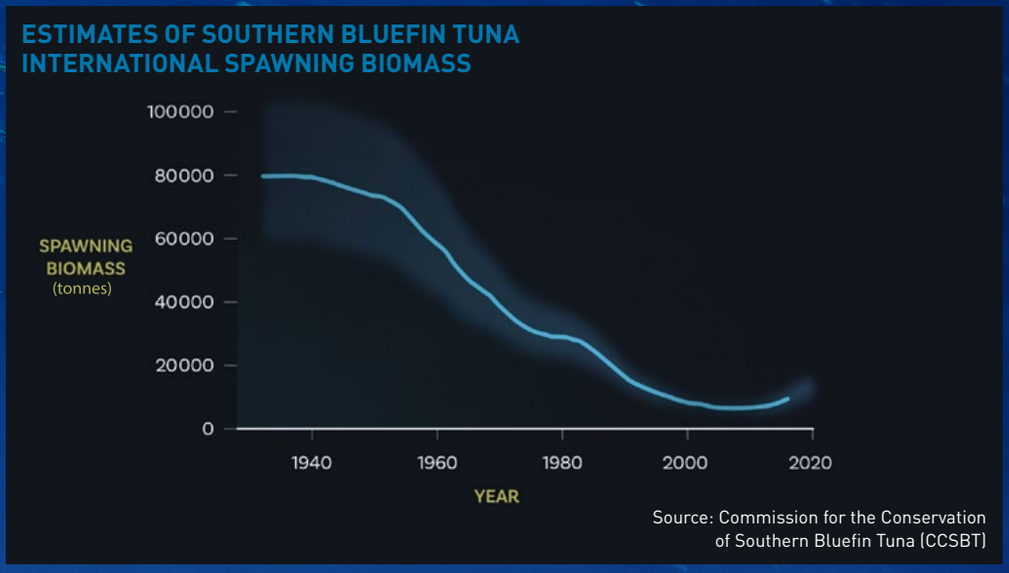
The documentary was funded by the Australian Government through the Australian Fisheries Management Authority (AFMA) and the FRDC, both of which were instrumental in the SBT success story, along with the CSIRO.

Two technological developments were particularly critical in the recovery of the species. First, Australia's SBT fishers took the lead in developing a new approach, learning how to catch juvenile fish to grow them out in ocean pens off the coast of Port Lincoln, South Australia. The fishers became farmers.

The second was the advent of genetic 'fingerprinting' and satellite tagging for population monitoring and management. Given SBT begin life in waters off Java and north-west Australia before they traverse the Southern Ocean beneath Australia and South Africa, these technologies remain crucial for setting evidence-based quotas that are now respected by all countries and markets with commercial interests in the species.

The beginning

The SBT story starts in the early 1980s when the species' red meat was so prized in markets such as Japan – which consumes 80 per cent of the global catch – that a single fish could fetch tens of thousands of dollars. But this boom time



for fishers was followed quickly by diminishing catches. By the time the market was peaking, the SBT population was already in terminal decline.

"By the early 1990s, SBT was on the road to extinction," says Al McGlashan.

At the time, Japan was still catching more than 40,000 tonnes of SBT a year and Australia about 21,000 tonnes, but the population was estimated to be at barely five per cent of 1960s levels.

Something drastic needed to be done and, according to Al McGlashan, AFMA CEO Glenn Hurry was the one to do it, taking a leading role in setting up the Commission for the Conservation of Southern Bluefin Tuna.

The commission allowed the three main catching countries, Japan, Australia and New Zealand, to manage the fishery cooperatively.

Data gathering

Without access to any reliable population data, the three countries estimated that a combined annual catch of 11,750 tonnes would allow stocks to recover. Instead, stocks kept falling. By 2004, the situation was critical and perplexing. A US scientist on the conservation commission said it was clear that the quota was not being adhered to.

Confident in the records being kept by Australian fishers, Glenn Hurry arranged for a team led by Southern Australian Bluefin Tuna Association CEO Brian Jeffriess to visit Japan and calculate how much SBT tuna was being sold.

It was soon apparent there was far more fish on the market than was possible under the quota. When the Japanese denied any overcatching, Glenn Hurry offered to foot the bill – $1 million – for Japan to undertake a comprehensive audit. This found the overcatch in Japan to be as high as 178,000 tonnes over the previous two decades.

For Glenn Hurry, the numbers finally started to make sense and they gave fisheries management data that would allow a scientifically based approach to getting the fishery back to a biologically safe level. Critically, he resisted calls to close the fishery, arguing it needed to be kept open to help fund the necessary research.

"We needed to save the fishery to save the fish," he says.

This also gave the Port Lincoln-based industry the impetus to rethink its entire operation.

"Nothing focuses the mind like receivership," says Brian Jeffriess.

Collaborative action

The answer the industry came up with was tuna farming, but no one had ever before attempted to 'ranch' wild SBT, an apex ocean predator that has to swim its body length every three seconds to stay alive.

The technique developed was to net juvenile tuna in the ocean, then tow them to inshore pens that are large enough and deep enough to allow the young fish to grow under free-range conditions until ready for harvest. Feeding the penned tuna also led to the development of a massive industry supplying locally caught pilchards, the tuna's natural food in the wild.

Port Lincoln fisher Tony Santic, principal of Tony's Tuna International Pty Ltd, says the endeavour succeeded where similar 'farm' efforts overseas have not because everyone saw the need to be innovative and to work together.

The need to collaborate is one lesson learned, says Al McGlashan, and the other is the critical role of science. The documentary highlights, in particular, the research undertaken by the CSIRO in Hobart and by the Institute for Marine and Antarctic Studies (IMAS) at the University of Tasmania.

Principal CSIRO research scientist Richard Hillary has been monitoring SBT populations through an advanced mark and recapture model. This uses each tuna's unique genetic 'fingerprint' for an identify-and-release program.

The technology takes advantage of high-throughput robotic DNA sampling adapted from human diagnostics and is able to compile a database of tens of thousands of fish. This is supplemented by satellite tagging of a representative sample of fish as they round the south-east corner of Australia.

The resulting population database enables an evidence-based approach to setting quotas. It has also facilitated a community education push that has seen recreational SBT fishers, too, become a part of the overall SBT research and management effort.

Principal investigator with IMAS Sean Tracey says recreational fishers and game fishing operators have become champions of SBT, with some also being involved in tagging as part of an increased emphasis on catch-and-release. With the recreational sector operating in different areas to commercial fishers, this wider community engagement has significantly extended researchers' coverage.

Al McGlashan believes the SBT recovery is an inspiring story that needs to be better known in the wider community for the lessons learned and for creating a shared sense of responsibility towards what he describes as an iconic marine species.

Importantly, Glenn Hurry notes the SBT recovery in Australian waters is being mirrored in other international marine jurisdictions, as the SBT community is a worldwide one.

SBT is officially assessed as 'recovering' in the Status of Australian Fish Stocks Reports (SAFS) at www.fish.gov.au. F

To view the movie, visit https://youtu.be/hjdb1AVUnVI

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Below Long-nosed fur seal.
Photo: Shutterstock

Revealing seal impacts

By Bianca Nogrady

New research shows that as fur seal populations recover, the male 'teens' in the seal community are creating challenging operating conditions for South Australia's fishing and aquaculture sectors

SIMON GOLDSWORTHY
Principal scientist,
South Australian Research
and Development Institute

Researchers did satellite tracking of fur seals to study their movements, and combined that with dietary studies to learn how they interacted with key sectors of SA's seafood industry.

From an ecological perspective, the booming populations of long-nosed fur seals (*Arctocephalus forsteri*) off the South Australian coastline are a welcome, good news story.

The seal's numbers were decimated by early European sealers in the early 1800s and remained at critically low levels for the next 150 years or so. In the 1970s, the species – formerly known as the New Zealand fur seal – was granted protection under state and Commonwealth legislation, and conservation efforts have since contributed to its steady recovery.

Much of Australia's commercial fishing sector developed through the 1900s, when fur seal populations were at very low levels. However, with the recovery of many populations over the last 30 to 40 years, interactions between fishers and seals have increased.

Fur seals are now causing major headaches for fishers, particularly in SA's Lakes and Coorong districts. They are stealing catch, damaging nets and gear, and pushing some operators to the brink.

"They're tearing the fish out of the nets," says Zane Skrypek, of Skrypek Fisheries. "If there's a lot of fish in the net, they'll just chew every tail off every fish, but the biggest seals will grab the whole fish and rip it out of the net."

The trouble began around 10 years ago, according to Neil MacDonald, executive officer for the Southern Fishermen's Association in Adelaide.

"[The seals] started to turn up during the Millennium Drought and so it was a double whammy, having to deal with reduced productivity because of flow regulation in the river system, and then progressively we had to deal with increasing pressure from seal populations," he says.

With fishers increasingly concerned, the FRDC commissioned a study, championed by the Southern Bluefin Tuna industry, into interactions between seals and the seafood industry. They sought to understand what was

Below Chewed, but not eaten – seals damage a fisher's catch.
Photo: Southern Fishermen's Association

happening, where, why and how it might be managed. The final report – *Assessment of the impacts of seal populations on the seafood industry in South Australia* – was published in June 2019. It included information from surveys of stakeholders, including fishers and the aquaculture industry, about how they thought seals impacted both their own industries and the wider ecosystems.

Researchers also did satellite tracking of fur seals to study their distribution and movements, and combined that with dietary studies to learn what the seals were eating, when and from where, and how they interacted with key sectors of SA's seafood industry.

Stakeholder survey

The most significant impacts of seals were reported by finfish aquaculture fisheries off Port Lincoln, and by gillnet fishers in the Lakes and Coorong districts.

In one survey of 15 members of the finfish aquaculture industry in and around Port Lincoln, about half reported daily interactions with seals, 47 per cent of respondents said seals posed a major risk to their business, and 20 per cent said they posed an extreme risk to their business.

Aquaculture respondents estimated the economic impact of seals on their businesses as ranging from one to five per cent of income, which represented potentially hundreds of thousands of dollars lost. The greatest issue was in damage to stock, including lost productivity due to stress on the fish and increased susceptibility to disease.

However, the dietary studies did suggest that, despite perceptions of significant impacts on aquaculture cages, the seals were mainly feeding on other species such as wrasse and trevally, which were drawn to the food falling from the cages.

"Pens are huge fish-attracting devices, and the dietary work we did on animals feeding in association with pens indicated the majority of the fish consumed were not tuna or Yellowtail Kingfish or even sardines, which they feed the tuna," says Simon Goldsworthy, principal scientist with the South Australian Research and Development Institute.

In a survey of Lakes and Coorong fishers, estimated losses were much more significant, at up to 50 per cent of fishers' profit and catch in the previous five years, which the report described as an "acute and immediate stress and economic impact" on the industry.

A significant negative impact from seals' direct interactions with the Lakes and Coorong fishers was the need to constantly replace damaged nets.

Zane Skrypek says damaged nets mean fishers are not fishing to their full capacity: "It's like being a race-car driver with bald tyres."

Young, male seals

The study showed that while the vast majority of the fur seal population (adult females and males and most juveniles) forages in outer shelf and oceanic waters many hundreds of kilometres from shore, a portion of the subadult male population comes into coastal waters, especially during winter months. It is this part of the population that is responsible for almost all interactions with the seafood industry.

"These animals aren't tied to breeding colonies, they don't have dependent young like adult females, and they can travel thousands of kilometres, are highly mobile, and many of them have worked out how to benefit from interactions with fisheries and aquaculture," Simon Goldsworthy says.

But the study also determined that the total wild fish biomass being consumed by these subadult male seals in coastal waters was relatively insignificant within the marine ecosystem as a whole; around one per cent of all the finfish – and only about 0.5 per cent of the total commercially targeted finfish – were consumed, and two to three per cent of the cephalopods.

"These animals aren't tied to breeding colonies, they don't have dependent young like adult females, and they can travel thousands of kilometres ... many of them have worked out how to benefit from interactions with fisheries and aquaculture."
Simon Goldsworthy

Even with the increased seal population in recent decades, ecological modelling shows the relationship between numbers of seals and fish biomass is not linear; more seals does not mean fewer fish.

"We found more than 95 per cent of the fish and squid out there are consumed by other fish and squid, so the seal numbers are not impacting on overall fish stocks," Simon Goldsworthy says.

In fact, the study found no evidence that the increasing populations of long-nosed fur seals were having any impact on commercial fish biomass or on the broader coastal marine ecosystem. The increased presence of seals has even benefited some, like marine tourism operators.

Living with fur seals

For the bigger aquaculture operators, the impacts of seals are mostly just factored into the cost of doing business. Operators implemented measures early in tuna farming to avoid interaction and have continued to improve these measures; however, that is less of an option for gillnet fishers. They tend to leave nets in overnight, providing a tempting and predictable target for seals.

Neil MacDonald says sea-scaring devices or crackers that use noise to deter seals were trialled in an FRDC-funded project, but were not widely adopted because of their cost and unsuitability for gillnet fishers.

"They're quite good if you're standing on your boat next to your net and you see one coming, [then] you're able to target them and it has some effect," he says. "If you're not there at the time, then they have no effect."

There is a range of opinions about how interactions with long-nosed fur seals should be managed. While the most favoured management option among seafood industry respondents was culling, there is uncertainty about the feasibility and effectiveness of culls as a management tool, and this strategy is not in line with current government policy or public opinion.

A new project supported by the FRDC aims to measure the ecological and economic impact of seals in the Lakes and Coorong districts, to help quantify and evaluate the costs and benefits of alternate management strategies. But it will not be easy, Simon Goldsworthy says.

"No clear winners. No easy solutions. These are the hallmarks of a wicked problem." F

South Australian Greenlip Abalone. Photo: Ben Stobart, SARDI

Wider view builds resilience into abalone stocks

An appetite for change is guiding Australia's abalone industry into a new era of sustainability, with stakeholders from different zones and states sharing ideas and strategies

By **Liz Wells**

The abalone industry is taking an increasingly collegial approach to managing its stocks, which span five jurisdictions in Australia's southern waters.

Abalone Council Australia (ACA) chief executive officer Dean Lisson says the strengthening national perspective is not expected to alter the state-based fishery-management system, but it is encouraging stakeholders to head out of their bunkers to share insights, ideas and experiences.

Recent examples of this include short workshops in South Australia and Western Australia, and a two-day abalone fisheries management and assessment workshop in Melbourne. There was also the Australasian Abalone Convention in Hobart, in July 2019 – the pinnacle event for researchers, industry and managers engaged in a wide-ranging discussion about how to achieve sustainability in a changing marine environment.

Stock challenges

In FRDC's latest abalone stocks report, the combined 'depleting' and 'depleted' abalone stocks outnumber those assessed as 'sustainable'. While serial depletion from fishing may be part of the problem, some stocks are recovering from specific, severe setbacks.

In 2005-06, an abalone viral ganglioneuritis (AVG) outbreak killed 90 per cent of stocks in Victoria's western zone. In WA, a warm-water event in 2010-11 caused significant mortalities, as did a similar event in Tasmania in 2016.

Meanwhile, the strengthening southward movement of the East Australian Current brings another threat to Tasmania, in the form of the invasive *Centrostephanus rodgersii*, the long-spined sea urchin, which eats out abalone kelp habitat, creating denuded underwater rock barrens.

"The current has gotten stronger, and *Centrostephanus*' range is extending south from NSW," Dean Lisson says. "Its footprint is now overlapping abalone habitat in Tasmanian waters and it's one of the big challenges the industry is facing."

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FRDC RESEARCH CODES: 2005-024, 2007-066, 2008-076, (TRF No.) 2012-236

Logging change

Depending on the location and species, abalone can take up to eight years to reach a harvestable size of 110 to 155 millimetres, meaning they are particularly vulnerable to overfishing.

While temporary closures, reduced quotas and under-catching all help to rebuild stocks, ACA director and chair of Victoria's Western Abalone Divers' Association (WADA) Craig Fox says data logging has been the cornerstone in recovery for eastern Australia's hardest-hit zone.

"Since we first started using it in 2004, it's given us time, depth and location data about the dive and linked it to fish biomass data that the deckhand collects," he says. This has improved transparency in the government decision-making process around total allowable commercial catches.

"It allows science to be validated by observation and vice versa. I can get maps that show me the average size of the fish I'm catching, and if it's dropping by a millimetre or two, I'll talk to other divers about it, and to the researchers.

"If we need to react, we can do it overnight. Each year our stock numbers are growing and we're pretty proud of that."

Knowledge exchange

WADA is also driving a knowledge-exchange project funded by FRDC and ACA, which began in September 2019 and involves divers from all states taking part in dives, culminating with a workshop.

Craig Fox says WADA's workshops enable the group to share its recovery experience, which started with research into Victoria's western zone abalone, co-funded by FRDC. The research was completed in 2008 and the research report laid the foundations for information on biomass, modelling and predicted trajectories of recovery. It helped inform industry and government responses to the decline in abalone populations.

Based in Esperance, WA, abalone diver Kerry Rowe also holds abalone licences in Victoria's western zone, which has allowed him to see firsthand how data can help rebuild stocks. It encouraged him, along with Augusta-based diver Nathan Adams, to initiate WA's first abalone-recovery workshop in June 2019.

Abalone populations in the Augusta sub-area were hard hit by a warm-water event in 2010-11 and the workshop provided an opportunity for WA divers to connect with those from Victoria's western zone to discuss recovery strategies.

"We are currently using three-year rolling averages in WA as an indicator for our quotas and we need to be able to react quicker than that," Kerry Rowe says. "In WA, we're looking at blocks of 10 square nautical miles and that management area is too big to give us anything more than crude data."

Above Craig Fox, ACA director and chair of Victoria's Western Abalone Divers' Association (WADA).
Photo: Craig Fox

He says the workshop helped to encourage Augusta's divers to invest in data-logging technology that will help better monitor changes in fish stocks and in formulating and enacting appropriate management responses.

Stock enhancement

Also in WA, and with industry and state government endorsement, Steve Beres and his father George Beres are trialling the efficacy of building stocks off Hopetoun, where they have exclusive fishing rights to defined 'paddocks'. This allows abalone to be shifted to new areas to increase their spawning range. "It's been going for three years and the results are spectacular," says Kerry Rowe.

Another initiative in WA is the 'ranching' facility Ocean Grown Abalone, developed by the Adams family. Ranching abalone involves growing hatchery-bred juveniles on artificial reefs in the Augusta sub-area. "It's an interesting production model to look at and weigh up the pros and cons of potentially increasing the future productivity of wild abalone coastline," Dean Lisson says.

In Tasmania, the merits of larval seeding to produce fertilised spat that are pumped on to the ocean floor are also under investigation. "We can cut quotas and lift size limits, but there may be a case to consider augmentation using stock enhancement," says Dean Lisson.

Stock rebuilding and fishery productivity is the primary focus of ACA's research and development investment, through its industry partnership agreement with the FRDC. Dean Lisson says the partnership makes the most of the limited funds available, as it prevents duplication and invests in outcomes that can be applied across all states.

FISHERIES CO-MANAGEMENT

The Victorian Fisheries Authority (VFA) has fully delegated the abalone stock assessment of the Victorian fishery's Western Zone. In an Australian first, the Western Abalone Divers Association (WADA) has undertaken the stock assessment for Blacklip and Greenlip Abalone in their zone. This development reflects VFA's commitment to co-management.
https://vfa.vic.gov.au/commercial-fishing/abalone

Diver input

Primary Industries and Regions South Australia (PIRSA) fishery manager Belinda McGrath-Steer says a close relationship between management, researchers, divers and fisheries themselves is significant.

"Diver feedback on conditions of stock is a resource for the industry," she says. "'Ab' divers know their patches well. We all talk regularly and we're able to do blue-sky thinking about what the industry will look like in five or 10 years. It comes down to leadership from management and industry, and we've got industry leaders who are committed to the industry's long-term sustainability."

As with most jurisdictions, SA's commercial quotas are reviewed regularly and independent scientific surveys are coupled with catch data and diver observations to inform the decision-making process.

She says data from surveys, loggers and observations all help to create a picture of stock health and help make any reduction in quota when stocks of "appropriately sized" animals drop.

"Once you see that decline, the question is: how big a cut do you need to take? It can vary from 10 to 70 per cent, and if you understand the fishery, you're more likely to choose the right figure," she says. F

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Left Robert Harcourt prepares to dive, retrieving data from acoustic receivers. Photo: IMOS

Sound analysis expands its reach

By **Catherine Norwood**

An extension of the acoustic network around the Australian coastline is set to provide new information about tagged fish and other marine species, helping to improve fisheries management

ROBERT HARCOURT
Animal Tracking Facility leader

Acoustic tracking can help explore population-level patterns of habitat use, which are often outside the scope of a single study.

Dotted around Australia's extensive coastline are hundreds of acoustic marine receivers – listening stations that form part of a national network, tracking the progress of tagged marine animals as they travel to feed, breed and play.

The acoustic receivers are part of Australia's Integrated Marine Observing System (IMOS), which supports oceanographic research by collecting data that includes currents, weather and water quality.

The receivers have also been the focus of a one-year FRDC-funded study designed to optimise their location, encouraging more researchers to tap into the IMOS network and generate information to improve fisheries management.

The project has also taken a new approach to analysing acoustic network data, revealing new information about the movement and connectedness of fish populations.

Pinged in motion

Acoustic tags attached to marine animals emit pings detected by underwater receivers as the animals swim by. That ping creates a record of travel that is logged with the IMOS Animal Tracking Facility (ATF).

Through the ATF, IMOS provides the backbone for the national marine acoustic telemetry network. This includes a control centre and database in Hobart, 14 fixed major oceanographic recording installations and almost 250 permanent acoustic receivers deployed around the country.

Anchored to the ocean floor, the IMOS receivers are often deployed in lines, some up to 35 units long, creating a gateway that can extend from the shore out to the edge of the continental shelf.

A major strength of the ATF is its ability to exponentially increase its listening capacity through collaborations with the owners and operators of other acoustic receivers.

These operators – universities, public and private research organisations and government agencies – can choose to link their receivers into the ATF by putting their receiver data into the IMOS database.

By contributing their data, these researchers gain access to any records of the animals they are studying on the IMOS receivers, as well as records from other research groups using the database. The combination of researcher and IMOS receiver data effectively amplifies the information available about the movement of animals, especially if they travel long distances.

By tapping into the network, individual researchers can expand the receivers available for a specific research project to the many hundreds operating around the country at the same time their project is running. Some projects run just a year or two; others span decades.

Since the ATF was first established in 2007, there have been almost 10,000 receivers linked into it at some point, recording the movement of 137 species including sharks, rays, fish, rock lobsters and even dugong.

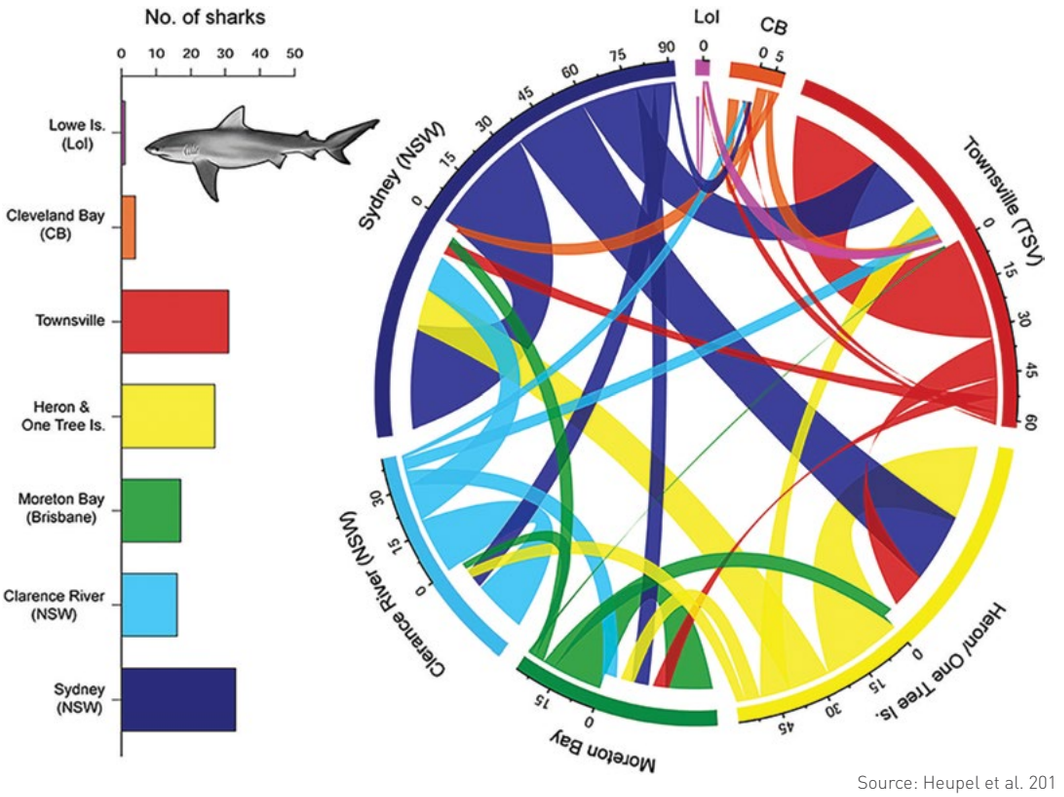
Extended range

Marine scientist Michelle Heupel has been a long-time supporter and advocate of the ATF and has made extensive use of its network as a researcher with the Australian Institute of Marine Science (AIMS).

She points to a recent Bull Shark (*Carcharhinus leucas*) tracking project as demonstrating the network's value. Her research involved tagging and tracking Bull Sharks on the central Great Barrier Reef to study where they went. In an unconnected project, researchers at the New South Wales Department of Primary Industries (NSW DPI) had also been

FIGURE 1 CONNECTIVITY PLOT INDICATING MOVEMENT OF INDIVIDUAL BULL SHARKS BETWEEN ACOUSTIC RECEIVER ARRAYS

(The thickness of lines represents the level of connectivity, or number of movements)



Source: Heupel et al. 201

tagging and tracking Bull Shark movements in Sydney Harbour. Both AIMS and NSW DPI had separately deployed acoustic receivers at their selected locations. By linking into the ATF, they were able to use IMOS and other receivers to track sharks tagged in Queensland and Sydney.

They discovered sharks from both locations were travelling long distances, across state boundaries. Sydney Bull Sharks were pinged heading north to the southern and central Great Barrier Reef and back again, while those on the central reef were travelling south, below Brisbane, and sometimes into NSW (Figure 1).

"We knew these sharks were travelling big distances, but we hadn't realised quite how far," Michelle Heupel says. "Without the IMOS network, both research projects would have reported just on their own locations, instead of being able to jointly draw on this amazing, bigger picture of shark movements and connectivity." These results reveal how acoustic telemetry data can identify cross-jurisdictional movements and help inform management of species.

Last year Michelle Heupel was appointed as the new director of IMOS and is now overseeing the final stages of its recently approved $250,000 expansion of the ATF, which is expected to optimise tracking for high-priority fish species.

This reconfiguration and expansion of the network followed from FRDC-funded workshops held with the national Fisheries and Aquaculture Research Providers Network (RPN), a government-level committee that supports national research priorities.

RPN members helped to identify gaps in the ATF's acoustic tracking capabilities and supported an optimised configuration of the IMOS permanent receivers to best fill those gaps, with target commercial and recreational fish species in mind (see breakout right). →

HIGH PRIORITY

The Integrated Marine Observing System (IMOS) has reconfigured its national Animal Tracking Facility (ATF) to optimise tracking of the following priority species:

Snapper (*Chrysophrys auratus*)
Yellowtail Kingfish (*Seriola lalandi*)
Sand Flathead (*Platycephalus bassensis*)
Bluespotted Flathead (*Platycephalus caeruleopunctatus*)
Black Bream (*Acanthopagrus butcheri*)
Yellowfin Bream (*Acanthopagrus australis*)
Spanish Mackerel (*Scomberomorus commerson*)
Southern Bluefin Tuna (*Thunnus maccoyii*)
Tiger Shark (*Galeocerdo cuvier*)
White Shark (*Carcharodon carcharias*)
Bull Shark (*Carcharhinus leucas*)
School Shark *(Galeorhinus galeus*)

"These studies using acoustic tracking are helping to give us a handle on what fish stocks are actually doing in the oceans, year by year."

Robert Harcourt

Right Anchored to the ocean floor, one of the acoustic receivers used extensively in the national network to track fish movements. Photo: IMOS

This reconfiguration has included redeploying inactive IMOS receivers along Queensland's central and north-eastern coast and in South Australia. IMOS also approved new receivers at 'gateway' locations at Stradbroke Island, Queensland; Seal Rocks, NSW; and Cape Bridgewater, Victoria. Locations for new receivers in Western Australia are still to be determined.

IMOS relies on its collaborating partners to help deploy and maintain receivers and to collect the data they record, which is usually done at six-monthly or yearly intervals. Through its bulk purchasing power, IMOS helps researchers with discounts on receivers and the receiver battery packs. However, individual research projects are responsible for buying the acoustic tags and tagging fish.

Network analysis

As part of the FRDC project, a network analysis of existing ATF data for high-priority fish species was undertaken. ATF leader Robert Harcourt says the network analysis was a new approach and demonstrated the connectivity of fish stocks – or lack of it – in new ways.

For example, Snapper (*Chrysophrys auratus*) data identified three independent stocks in NSW, Victoria and SA.

Yellowfin Bream (*Acanthopagrus australis*) data identified several populations of the species, one larger and highly interconnected with two smaller, apparently independent, populations. The tracking data also confirmed the importance of estuaries along the NSW coast for the bream, which moved in and out of them as they travelled along the coast.

Robert Harcourt says the acoustic tracking is limited by location of receivers; if there are no receivers, then there's no information. But he sees it as valuable in complementing existing genetic tools.

Genetic data identifies how populations broadly connect over multiple generations, on an evolutionary scale. However, it can be influenced by just a few highly mobile, fecund individuals, rather than being representative of large interactions between populations.

The acoustic data follows the movement of fish populations over a shorter timeframe – an everyday, ecological scale that more closely aligns with fisheries management and fishing cycles.

The acoustic tagging also complements traditional methods of mark–recapture studies, where fishers put a tag on a fish and record where it was released; recapture data is provided when another fisher later catches the same fish. Such methods reveal movement between two locations, but no indication of where the individual fish moved in between these points.

Acoustic tracking can also help explore population-level patterns of habitat use, which are often outside the scope of a single study.

With changing ocean conditions, such as the southward movement of the East Australian Current, long-term tracking data is already revealing changes in the movement patterns of species.

"These studies using acoustic tracking are helping to give us a handle on what fish stocks are actually doing in the oceans, year by year," Robert Harcourt says.

And as research agencies and fisheries managers invest in further tagging programs for priority species, the IMOS ATF is expected to contribute information that will be crucial in helping to adapt fishing practices and conservation management to the changing ocean environment. F

THE RECEIVING END

The Integrated Marine Observing System (IMOS) uses three types of receivers all anchored to the ocean floor in some way.

The VR2W model is about as big as a one-litre drink bottle and comes at cost of about US$1500. They are quite robust, says Robert Harcourt, leader of the IMOS Animal Tracking Facility Tracking Facility, although Cyclone Yasi did take a few out. The VR2Ws are deployed by divers, who replace the batteries and data packs six-monthly or yearly.

Robert Harcourt says he tries to keep diving to a minimum, particularly in remote locations and where sharks might be a risk.

That is where the second tier of receivers, the VR2ARs, come in. These are attached to a modified sub-surface collar float that sits about 20 metres below the surface of the water, anchored via a chain to the ocean floor. (They occasionally get caught in trawler nets.) From a data-gathering viewpoint, they have an acoustic release system that helps to reduce the amount of diving needed to gather the data, but they cost about US$9000.

The most expensive and robust of all are a new design, the VR4, which sits on the ocean floor. It comes with a modem that allows data to be remotely collected from a boat, without retrieval, for as long as the battery lasts – usually about five years. These Canadian-designed receivers cost US$18,000 and are only used where there are strong currents or other dangerous elements. F

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FRDC RESEARCH CODE: 2019-144

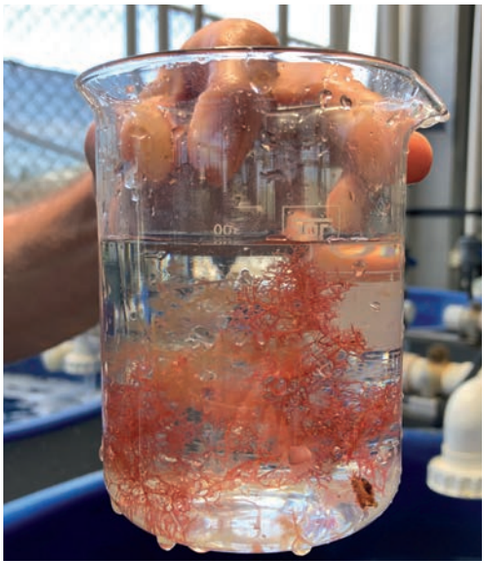
South Australia takes on red seaweed trials

Sea trials have started as part of South Australia's strategy to commercialise seaweed aquaculture as quickly as possible

By **Catherine Norwood**

Below clockwise from left: PIRSA general manager of Aquaculture Adam Main, SARDI researcher Sasi Nayar and CH4 Global co-founder Steve Meller. Photo: SARDI

Below Red seaweed
Photo: SARDI



South Australia is accelerating the development of seaweed aquaculture in the state, with plans to establish itself as a global centre for the production of a red seaweed that helps to reduce methane emissions from cattle.

A pilot trial underway is focused on *Asparagopsis armata* and *Asparagopsis taxiformis*, both native to Australia. Project partners with the South Australian Government are the international aquaculture firm CH4 Global and the FRDC, with joint funding of $175,000 for the pilot.

Since the discovery of *Asparagopsis*' methane-reducing properties, a global race has begun to establish commercial farming operations – initially to be first to market, but also to make a dent in greenhouse gas emissions and address climate change.

With 1.3 billion cows globally, even in full production, South Australia would meet only a small portion of the potential demand.

Project partner CH4 Global is based in the US, but was founded by former South Australian Steve Meller. He estimates red seaweed could be worth $140 million to SA within three years if commercial production systems and processes can be established. Revenue from processing the seaweed could add a further $250 million per year to the state's economy and support 1200 jobs.

General manager of Aquaculture for Primary Industries and Regions South Australia (PIRSA) Adam Main says a whole-of-government approach is helping to facilitate research and development as quickly as possible, underpinning what will be a new industry for the state. This includes ensuring appropriate regulations and policy are in place, and undertaking proactive engagement with community and marine stakeholders as plans unfold.

In preparation, strategic locations within existing underutilised aquaculture zones have been identified and approved for seaweed production. Adam Main says additional areas may also be released once the most appropriate growing conditions are identified.

Finding these 'Goldilocks zones', where ocean conditions are 'just right' to optimise the growth and quality of farmed seaweed, is one aim of the pilot trial.

Farmed abalone and tuna operators have made lease space available for the first trial plots in the Port Lincoln area and the first seaweed-related infrastructure was installed in February. Aquaculture operators will help monitor the plots in coming months, in conjunction with staff from the South Australian Research and Development Institute (SARDI), the research arm of PIRSA, which is leading the trial. Mussel, oyster and kingfish farm operators are also considering how they might be involved.

New technology is also being developed for use in Australian waters that draws on techniques used in both the mussel and the oyster industries.

"We won't be using the traditional technique of manually seeded ropes – that's just way too labour-intensive," Adam Main says. "There will be a new way of doing it.

"There is an opportunity here to develop new technology, from growing to harvest, processing, packaging and feed manufacture – all new intellectual property.

"We are already looking for more partners and tapping into local and international expertise for the skills, investment and services we'll need to build a vertically integrated supply chain." F

COWS AND METHANE

If the world's 1.3 billion cattle were combined as a 'country', it would be the second-largest emitter of greenhouse gases, behind China. In environmental terms, methane is 28 times more detrimental than carbon dioxide.

In Australia, cattle and other ruminant animals account for about 12 per cent of the national greenhouse gas emissions.

Australia is leading international research in this field. CSIRO livestock scientist Rob Kinley and his team in Queensland found that *Asparagopsis* contains chemicals that inhibit fermentation in the gut of ruminant animals. As a feed supplement, it can reduce methane emissions from cattle by 90 per cent or more.

MORE INFORMATION
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FRDC RESEARCH CODE: 2018-183

Below Access to fisheries resources is an important part of cultural practices and self-determination for Indigenous communities.
Photo: Brad Collis

Deepening Australia's connection to fisheries

By **Gio Braidotti**

The Indigenous people's valuable contribution to the fishing sector is being integrated into Australia's fishing policy and practices

Leila Alkassab
Land to Sea Consulting

"I think Australia has come a long way in recognising Indigenous peoples' interests in environmental management in terms of their knowledge, cultural practices and livelihood needs."

When seen through the eyes of Indigenous people, Australia is a different country to the one inhabited by the mix of more recent arrivals that today calls Australia home.

Both segments of Australian society have a connection to 'country'. But these connections are culturally, linguistically, socioeconomically and environmentally quite different.

The more recent arrivals have a new sense of connection; they are racing to understand the continent. The Indigenous connection to country is ancient and integrated with the ecologies, biodiversity and cycles of change that make Australia unique.

Within the fisheries sector, the FRDC and the Indigenous Reference Group (IRG) want to bring about a faster rate of recognition and respect for the holistic understanding contained in traditional fishing knowledge.

Clear directions

In 2019, Leila Alkassab of Land to Sea Consulting took an important step in this endeavour, leading research designed to clarify the steps needed to more quickly effect change.

In her most recent work, she has been trawling through the hundreds of pages of research findings produced by eight previous FRDC-funded IRG projects to extract and synthesise the key research findings.

Her work involves processing information from the technical reports to create easy-to-understand, relevant messages that raise awareness about actions needed.

"I think Australia has come a long way in recognising Indigenous peoples' interests in environmental management in terms of their knowledge, cultural practices and livelihood needs," Leila Alkassab says.

"The research that is coming out of the FRDC–IRG further develops these understandings and provides a platform to share knowledge within and between fisheries stakeholders, including Indigenous communities, researchers and policy makers." She reports the work is progressing well.

She has already identified five key messages, or objectives, from the very detailed reports she is reviewing. These relate to findings that repeatedly cropped up across different research topics (see Figure 1).

These five key messages are centred on recognising cultural fisheries as a distinct sector that already has its own management practices. These practices reflect Indigenous peoples' distinct connections to land and sea territories, connections that balance the economic and sociocultural aspects of fishing.

Self-determination

Reflected in all of the messages Leila Alkassab has identified is the need for self-determination in Indigenous fisheries, which is also a key priority area for the FRDC–IRG.

"Decisions regarding the Indigenous fisheries must be driven by Indigenous communities themselves, because their livelihood security and their cultural continuity depend on these aquatic resources," she says. "This is why the key messages coming out of these projects are so very significant."

Indigenous woman Hanna Gallagher, of the Kamilaroi nation, agrees. Completing her third year of a Bachelor of Science, she is working on this FRDC–IRG project to build her professional skills while contributing in an area she is passionate about.

Her involvement in the project is part of the IRG's goal to build capacity of Indigenous people by providing mentorship opportunities with research projects.

Below Crocodile, Dugong and Turtle
Artwork: Beau Pennefather Motlop

FIVE KEY MESSAGES
for the development of Australia's Indigenous fisheries

1 CULTURAL FISHERIES

RECOGNISE
Recognise cultural fisheries as a distinct sector by all states, territories and the Commonwealth.

RESPECT
Respect Indigenous rights, values, world views and knowledge that are essential to cultural fishing.

ACKNOWLEDGE
Acknowledge that cultural fisheries encompass complex systems of ecological knowledge, ownership, management, preservation and trade of aquatic resources (in addition to ceremonial and subsistence practices).

ADDRESS
(1) the barriers to cultural fishing;
(2) the impacts of non-Indigenous sectors on cultural fisheries; and
(3) the diverse views within Indigenous communities about including commercial activities within the definition of 'cultural fisheries'.

2 GOVERNANCE AND MANAGEMENT

INCLUDE
Include Indigenous aspirations and priorities in fisheries governance and management for greater Indigenous decision-making.

INCORPORATE
Incorporate representatives of Aboriginal and Torres Strait Islander people on fisheries departments, boards and organisations, as a path to joint management.

3 LEGISLATION AND POLICY

ADDRESS
Address the disjointed policy context regarding Indigenous fisheries across states, territories and the Commonwealth, potentially through a national Indigenous fisheries framework.

4 ECONOMIC EMPOWERMENT

ACKNOWLEDGE
Acknowledge that trade and barter have always been and continue to be a part of cultural fishing.

RECOGNISE
Recognise that the economic values of fishing do not take priority over the social and cultural values of fishing, and therefore maximum utilisation may not be a priority for Indigenous fishers.

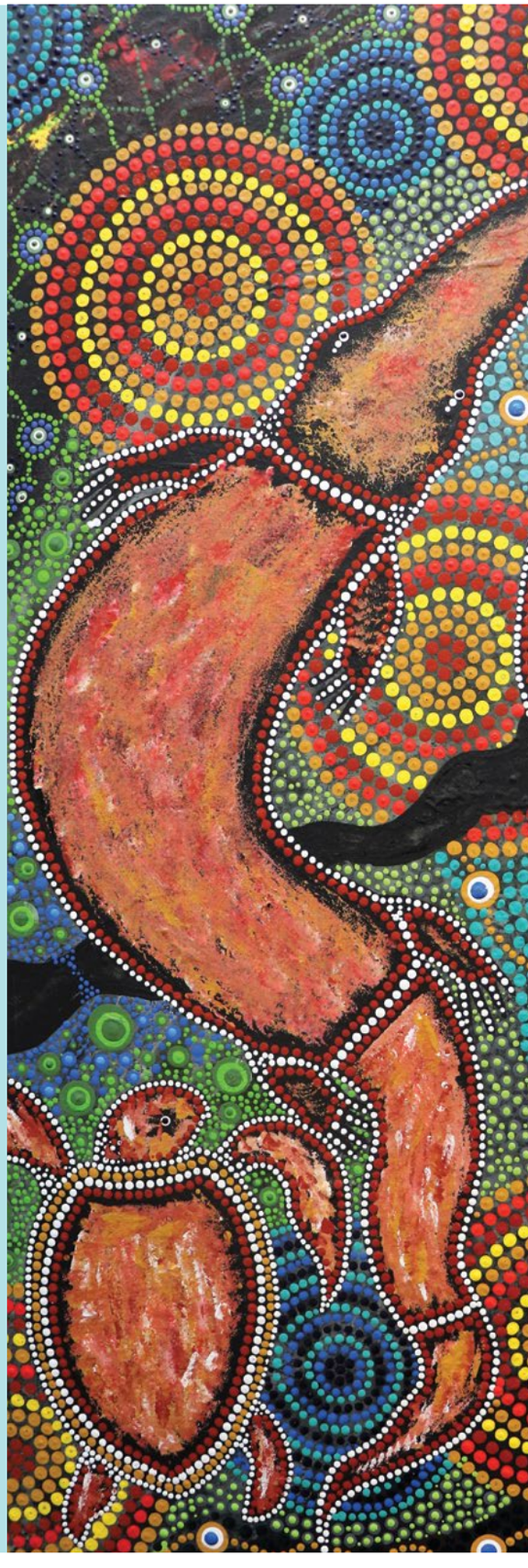
CREATE
Create space for a sector that supports the interconnected values of Indigenous fishers and reflects the cultural economies of Indigenous peoples in Australia.

5 CAPACITY BUILDING

INVEST
Invest in capacity-building initiatives that are identified by Indigenous peoples.

SUPPORT
(1) upskilling Indigenous fishers;
(2) opportunities for decision-making;
(3) knowledge sharing to facilitate proactive engagement with Indigenous fishing communities.

EDUCATE
Educate non-Indigenous fisheries stakeholders through cultural awareness training programs.



Below Crocodile, Dugong and Turtle
Artwork: Beau Pennefather Motlop

"More than just improving cultural fishery rights, the project also creates the opportunity for representation of Indigenous worldviews in policy, especially our unified view of land and sea," Hanna Gallagher says.

"It's also exciting for me because at every level the project involves capacity building with Indigenous Australians, which will help to increase the voices of Indigenous communities in future policy decisions."

One of the clearest links between self-determination and the messages Leila Alkassab has identified is in fisheries policy (Message 3). She says disjointed Indigenous fisheries policy context across states, territories and the Commonwealth tiers of government has limited Indigenous self-determination, and this needs to be addressed.

Particularly problematic are holdovers from state policies and practices that often restrict Indigenous peoples' ability to use fisheries resources to maintain their cultural practices and their knowledge systems.

"Indigenous fishers historically became barred from directly managing their lands and waters by stringent government policies that took away the very resources Indigenous communities relied on for their livelihood security," Leila Alkassab reports.

"Decision-making in the fisheries became something that belonged to government agencies and scientific managers." Redressing this imbalance in decision-making will also help in achieving another of the objectives Leila Alkassab has identified: economic empowerment.

Below Leila Alkassab has spent time among Indigenous fishing communities in the Torres Strait Islands, where she learnt to fish. Photo: Ted Nai

Mutual benefits

The information being compiled in Leila Alkassab's project points to the emergence in the fishing sector of a fully-fledged third arm, encompassing both 'subsistence' and 'economic' fishing activity. This may catch some unaware and the prospect of additional claims to limited resources, or of joint management regimes, may cause consternation.

Additional RD&E may be required to resolve issues of access, impacts and capacity, but Leila Alkassab sees far more opportunities for mutual benefit for various stakeholders in the fishing sector than for disagreement.

The mutual benefits would include better-informed overarching fisheries management protocols. Already such protocols are moving towards ecosystem-based fisheries management (EBFM), an integrated model that encompasses social and economic considerations. Such integrated models can only benefit from the inclusion of Indigenous values and priorities via joint management arrangements.

"Through scientific and social science research, the FRDC–IRG is creating channels to understand and communicate Indigenous fishers' sociocultural and economic priorities, values and challenges in their own words," Leila Alkassab says.

She says the initiative holds "opportunities to unlock unrealised benefits" for Indigenous communities, for the state and for the environment in the fisheries, moving forward into the future.

The five key messages developed to date may be further refined as the project continues. It is expected to be completed by the end of the year. **F**

> "Decisions regarding the Indigenous fisheries must be driven by Indigenous communities themselves, because their livelihood security and their cultural continuity depends on these aquatic resources."
>
> Leila Alkassab

World-class speakers to lead global debate in Adelaide

Leading fisheries experts across research, industry and management will come together in a dynamic and comprehensive program to address the future of fisheries

The World Fisheries Congress 2020 (WFC2020) will welcome an inspiring range of Australian and international speakers to share global perspectives under the theme 'Sharing our oceans and rivers – a vision for the world's fisheries'.

The congress will be held in Adelaide from 11 to 15 October 2020, bringing together Australia's largest gathering of research, industry and management representatives across commercial, recreational and Indigenous fisheries.

Their aim: to discuss key developments needed to ensure a sustainable future for the world's oceans, lakes, estuaries and rivers.

Chair of the WFC2020 committee Gavin Begg is also executive director of Fisheries and Aquaculture for Primary Industries and Regions South Australia (PIRSA). He says the plenary speakers taking part will deliver insightful, engaging presentations, offering something of value to every delegate.

"WFC2020 aims to foster cooperation and engagement in commercial, recreational and Indigenous fisheries," he says.

"We have brought together world leaders in research, industry and international fisheries policy to speak across the four key themes: sustainable fisheries; fish and aquatic ecosystems; fisheries and society; and the future of fish and fisheries."

Excitement for the congress is continuing to build; Gavin Begg is encouraging people from the local and international fisheries community to take part and expects more than 1500 attendees.

Registrations are now open – to register, visit wfc2020.com.au/register.

WFC2020 PLENARY SPEAKERS

Manuel Barange, the director of the Fisheries and Aquaculture Policy and Resources Division at the Food and Agriculture Organization in Rome, Italy, has expertise in physical and biological interactions; climate and anthropogenic impacts on marine ecosystems; fish ecology, behaviour and trophodynamics; and fisheries assessment and management.

Meryl Williams has more than 40 years of experience in fisheries, aquaculture, conservation and human development, including as director general of WorldFish, director of the Australian Institute of Marine Science and executive director of Bureau of Rural Resources (Australia). In recent years, Meryl Williams has focused on trends in fish value chains, impacts of aquaculture and fisheries on women and gender equality, and public knowledge for responsible fish production.

Beth Fulton, principal research scientist with CSIRO Oceans and Atmosphere, focuses on sustainably managing potentially competing uses of marine environments and adaptation to global change, including effective means of conserving and monitoring marine and coastal ecosystems.

Olaf Weyl, a principal scientist at the South African Institute for Aquatic Biodiversity, researches how to better conserve Africa's aquatic biodiversity and freshwater ecosystems. Olaf Weyl's work is multidisciplinary and his interests include fisheries, native fish conservation and aquatic invasions. His research includes natural systems and processes, and understanding how humans alter and benefit from aquatic systems.

Ratana Chuenpagdee, from the Memorial University of Newfoundland, St John's, Canada, is leading a major global research partnership, 'Too Big To Ignore', which aims to elevate the profile of small-scale fisheries and rectify their marginalisation in national and international policies.

Martin Exel, of Austral Fisheries, is also the managing director of SeaBOS, a collaborative venture between 10 of the world's largest seafood businesses and the Stockholm Resilience Centre in Sweden. SeaBOS aims to transform wild capture and aquaculture fisheries across the world into sustainable seafood producers and promote a healthy ocean.

Matthew Osborne is a Kaurna and Narungga man who has extensive experience in Indigenous fisheries. He is the program leader, Aquaculture and Regional Development in Northern Territory Fisheries and in this role oversees a range of Aboriginal and industry development programs, including those supporting small-scale fishing and aquaculture operations in remote Aboriginal communities.

Further information about these plenary speakers, and others as they are announced, is available at wfc2020.com.au/speakers.

Social media helps sell the fish, and the story

One of Western Australia's newest fishmongers is using new approaches to make an impact with some of the state's lesser-known species

By **Bianca Nogrady**

Western Australia's Fins Seafood is on a mission to broaden consumers' palates and seafood interests, but sometimes even its staff are amazed by the strange and wonderful creatures that turn up in their catch.

"We had a Pink Tilefish pulled out of Exmouth about three weeks ago," says Lachlan Boyd, business development manager for Fins Seafood. "I reckon there would be less than three of them caught in WA in the last couple of years."

In the past, a rare catch like this would have been hard to sell, most probably ending up on the reject heap along with all the other lesser-known species that fishers catch.

But thanks to Fins Seafood's use of social media – in particular, its very active Instagram account – the unusual catch caught the eye of a chef who had fond memories of eating Pink Tilefish when working in Taiwan, and he bought the fish to eat himself.

Social media provides valuable, direct marketing opportunities for the business, with videos and images of the catch being unloaded tapping into a growing interest in the traceability and sustainability of food.

The business has only been operating since 2017, and last year claimed the National Seafood Award for the best small business in the industry (see story page 28 for the full list of award winners). With a restaurant, wholesale and retail business based at Hamilton Hill, south of Fremantle, its mission is to "shake things up".

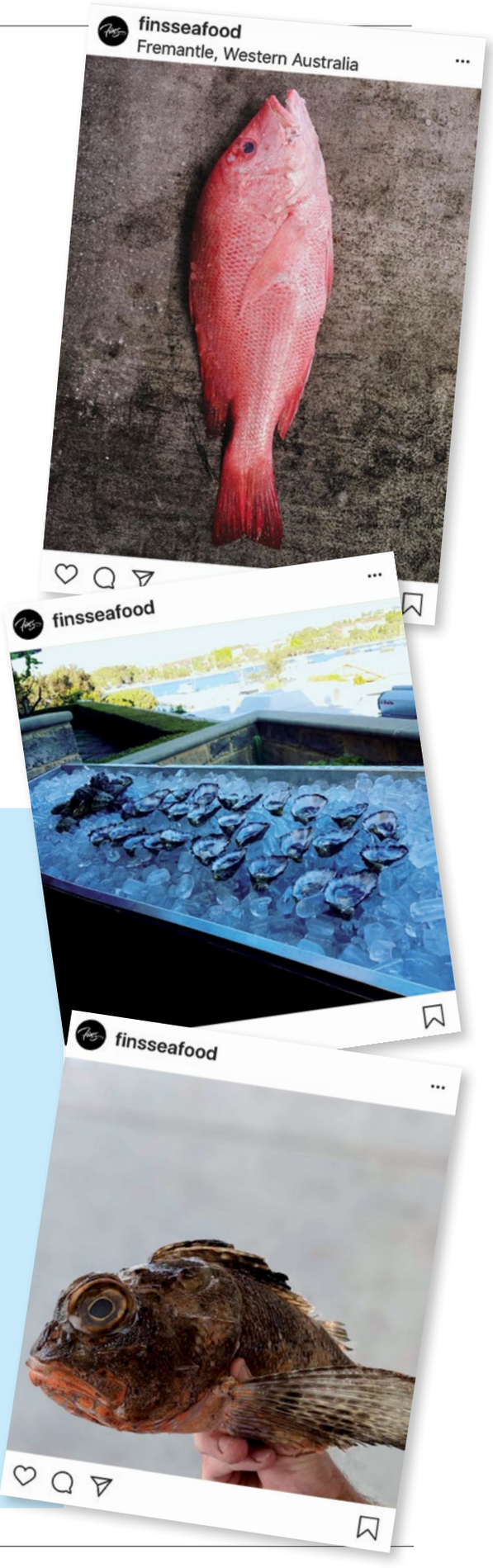
The business saw the opportunity to introduce practices being used in other industries into its operations, particularly around traceability, sustainability, educating consumers and using social media to communicate with buyers, consumers and the broader community.

Chef connections

As an example of this practice, the company is supplying product to chefs who are interested in introducing consumers to novel seafood experiences.

"Our goal is to try and promote the lesser-known and underutilised species and, by doing that, we are able to associate with like-minded chefs," says Phillip Clark, who co-owns the business with John Cordin. Both have a long history working in the seafood industry and they came up with the idea for the business on a long road trip together.

MORE INFORMATION
Fins Seafood,
www.finsseafood.com.au,
@finsseafood



Left The Fins Seafood team, from left, Phillip Clark, Lachlan Boyd, John Cordin and Asher Flynn.
Photo: Fins Seafood

They focus on traceability and telling the story of each catch, which helps to connect with chefs, who often ask for specific fish seen on the business's Instagram feed.

This new focus also reflects some major shifts happening in the seafood industry in Australia in response to consumer demand for more sustainable harvesting and more information about where the food they are eating comes from. The fact consumers can find out exactly who farmed or fished the local product on their plate is also helping the local industry to compete with cheaper imported products.

"The big thing we've done with our fishers and farmers is to [help them] develop a brand," says Lachlan Boyd. "So rather than just saying these oysters are from Smoky Bay, we say 'this is Jeff and Colleen, a husband and wife team who were previously wheat farmers in South Australia but had a sea change and wanted to start producing oysters on the coast'.

"Then the restaurants can put that on the menu and the consumer can say 'how awesome, I've been to Smoky Bay' or 'I love the idea that they're farmers and want to work the land but be closer to the ocean'."

Fins Seafood currently has around 10 fishers who supply them directly with fish, rock lobster and octopus, as well as selling produce for two prawn boats and one scallop boat. They even have their own fishing boat – the *Sabea II*. They sell product around Australia and even into Singapore and the US.

Zero waste

The business was also awarded a $4000 sustainability grant from the City of Cockburn to develop a new filleting bench that is helping it move towards a zero-waste operation.

The bench has three openings at either end, to allow more careful and efficient sorting and recovery of waste products. For example, fish heads can be used for rock lobster bait, fish frames and guts sold for stock, and wings sold to restaurants, where they are so popular with diners the business sometimes cannot keep up with demand. Even waste that cannot be reused as food or bait is sold as fertiliser.

The business is still working to find a use for fish scales and salmon offcuts, but it is determined to progress from 95 per cent waste reuse, its current figure, to 100 per cent.

"We're really good at trying to use every part of what the ocean gives us," Lachlan Boyd says. F

LEADERSHIP IN ACTION

Two of the leading players in the Fins Seafood business – co-owner John Cordin and senior manager Asher Flynn – are both graduates of the FRDC-funded National Seafood Industry Leadership Program (NSILP).

Asher Flynn says his experience with the program underpins his commitment to providing full traceability of catches, which is crucial to the Fins business model. He took part in the NSILP in 2016, while John Cordin is a 2013 alumnus.

"It made me value the whole supply chain," says Asher Flynn, who was working with another local business, Fremantle Octopus, when he undertook the program.

"There are research people [taking part], fisheries people, Indigenous fisheries people – different parts of the industry from different parts of Australia, so it really opened up my scope," he says.

"It made me realise the value of telling the story of traceability and how you can support your local fishers and create a brand for these products."

He says the network of participants in the program has also helped him understand the scope and diversity of people and roles in the seafood industry as a whole.

The NSILP is the only national, industry-specific leadership program designed in consultation with the seafood industry for people wishing to take up leadership roles.

The NSILP has been running since 2000, initially with one group a year, but expanding to two intakes from 2018. In 2020 there will be 36 participants in two groups.

The Port Lincoln, South Australia, cohort includes Adam Radford, Anthony Tennant, Basia Littlejohn, Bianca Dubber, Cassandra Pert, Ciara Farrell, Daniel Chien, Darci Wallis, Dene Rodd, Hika Rountree, Jaime McAllister, Luke Cordwell, Meaghan Dodd, Natalie Manahan, Patrick Cavalli, Rattana Wiriyakiat, Sally Bolton and Sean Larby.

The Cairns, Queensland, cohort includes Amie Steele, Amrik Singh Aulakh, Andrew Rowe, Ben Stobart, Cindy Manu, Geovanny Danilo Gomez Rios, James Baker, Jay Shoesmith, Katrina Jakes, Kirsten Rough, Kurt Glass, Lewis Christensen, Maxwell Bayly, Natalie Chee, Rebecca Wilson, Sam Bock, Sara Ronald and William Conn.

Celebrating seafood's national leaders

Long-term contributors, along with newcomers to the seafood scene, are among those to receive national recognition for their industry-leading efforts

By **Catherine Norwood**, Photos **Seafood Industry Australia**

More than 400 delegates attended the biennial Seafood Directions conference in Melbourne late last year, which included the National Seafood Industry Awards, showcasing the industry's professionalism and commitment to supplying some of the finest seafood in the world.

The awards recognise and celebrate the positive contributions of individuals, partnerships, businesses and organisations towards a sustainable and profitable Australian seafood industry. Winners are as follows.

■ The **Primary Producer Award** went to Yumbah, Australia's largest abalone aquaculture producer and processor. The company was established in 1999 and now operates seven farms across four regions. Yumba produces 700 tonnes of abalone a year, most of which is exported.

Other finalists: BP Fishing (Western Australia), Mures Fishing (Tasmania).

■ Winner of the **Business Award (Large)** was MainStream Aquaculture Group, based in Victoria, which produces premium, sustainable Barramundi. It operates Australia's largest land-based warm water aquaculture facility and the world's largest Barramundi hatchery, producing and selling Barramundi juveniles globally and growing fish to market size.

Other finalists: Coffs Harbour Fishermen's Co-operative (New South Wales), Mures (Tasmania).

■ Perth-based Fins Seafood collected the **Business Award (Small)**. This small, socially conscious business provides high quality fresh and frozen seafood to restaurants around Australia, and also exports to the US and Singapore. It supports its small-scale fishers with advice on branding, social media and improved production methods.

Other finalists: The Fish Shoppe (Victoria), TomKat Line Fish (Queensland).

■ The **Safety Award** went to Paspaley Pearling Company, WA, which has introduced a new training program for staff in its remote workplaces that has helped reduce medical evacuations by 56 per cent and lost-time injuries by 75 per cent.

Other finalists: Alex Thomas Pty Ltd and Limestone Coast Fishermen's Co-operative (South Australia), Professional Fishermen's Association (NSW).

Below Hall of Fame inductee Dawn Jordan with WAMSI Research Director Jenny Shaw.

■ Australian Seafood Industries won the **Research, Development and Extension Award**. This industry-owned company has been researching and breeding oysters with improved resistance to Pacific Oyster Mortality Syndrome (POMS). It has been progressively commercialising these oysters, to the point where commercial stock losses as a result of POMS are now minimal.

Other finalists: Professor Kate Barclay (Victoria), Food Sciences, South Australian Research and Development Institute in collaboration with the Institute for Marine and Antarctic Studies, University of Tasmania, and Cawthron Institute, New Zealand.

■ The **Environment Award** winner was Mendolia Seafoods from WA, which has developed a plastic-free, biodegradable Burley Brick for recreational fishers, addressing the issue of ocean plastics. The Burley Brick uses only WA fish species, to ensure any biosecurity risk is kept to a minimum.

Other finalists: Centrostephanus Collaboration (Ralph's Tasmanian Seafood, PauaCo, Tasmanian Commercial Divers Association, Tasmanian Abalone Council); The Nature Conservancy Australia.

■ **The People Development Award** went to Flora Warrior, a traditional owner and community advocate and mentor from Mabuiag Island in the Torres Strait. She is working to develop the seafood industry, mostly Tropical Rock Lobster, for the Goemulgal people on her home island.

Other finalists: Indian Ocean Fresh Australia (WA), Jill Briggs (National Seafood Industry Leadership Program).

■ Australian Barramundi Farmers Association (ABFA) won the **Promotion Award** for the Ask

Collecting two awards, Jim Mendolia.

Young Achiever Justine Arnold.

Seafood Industry Ambassador Bryan Skepper.

Hall of Fame inductee Greg Jenkins.

for Aussie Barra campaign, conducted in partnership with Papaya PR, targeting restaurant and retail markets. With showcase events, a recipe book and high-profile media coverage of 'country of origin' labelling, the Ask for Aussie Barra campaign has reached some 423,000 people.

Other finalists: Coorong Wild Seafood (SA), Tasmanian Seafood Industry Council Eat More Seafood display at the Australian Wooden Boat Festival (Tasmania).

■ **The Restaurant Award** went to Fins Restaurant, NSW, which has been trading for 28 years, with a focus on sustainable local seafood, sourcing whole fish and seafood and finding a purpose for every part of the fish they use.

Other finalists: Cook & Mason (WA), The Lobster Shack (Tasmania).

■ The national winner of the **independent Judges' Choice Take-away Fish and Chips Award** was Tobin Fish Tales from Queensland. Andrew and Renae Tobin are both fisheries scientists and their business is about quality fresh seafood; fish and chips; local seafood sources; sustainability; and stories about fish, fishers and fisheries.

■ The **Young Achiever Award** was presented to Justine Arnold. She is currently production manager at Indian Ocean Fresh Australia, a commercial aquaculture operation in the regional town of Geraldton, WA, and has already made a significant contribution to the aquaculture industry in the mid-west of WA.

Other finalists: Joshua Cook (NSW), Scott Mactier (Tasmania).

■ The **Industry Ambassador Award** is presented to a person who has made a substantial positive difference to the seafood industry over at least 20 years, and who has been a highly effective and respected seafood industry leader. The awardee in 2019 was Bryan Skepper, the retiring general manager of the Sydney Fish Market.

Bryan Skepper worked his way up at Sydney Fish Market from assistant accountant to general manager over 44 years and has contributed enormously to the seafood industry as a whole. He has long championed environmental sustainability as it relates to the product and livelihoods of the people and communities from around the country who supply the market. He is also passionate about the role the seafood industry plays in protecting oceans and about the industry's social licence.

Other finalists: Bob Richards (NT), David Ellis (SA).

■ **Inductees to the National Seafood Hall of Fame** this year are Dawn Jordan (Tasmania), Greg Jenkins (WA), Jenny Shaw (WA) and Jim Mendolia (WA).

Inductees are people who have made a substantial positive difference to the seafood industry over at least 20 years, normally at a national level and often beyond the bounds of their enterprise or employment, on a voluntary basis. They have outstanding personal and leadership qualities, and are highly respected throughout the seafood industry. F

MORE INFORMATION
Australian Office of the Gene Technology Regulator,
www.ogtr.gov.au

Advancing aquaculture's adaptability

By **Gio Braidotti**

A new technology offers a fast and cost-effective way to make the most of sought-after traits within a fish population's natural diversity

ABIGAIL ELIZUR
Chair of Aquaculture Biotechnology,
University of the Sunshine Coast

"We may see additional environmental, conservation, productivity and animal welfare benefits with this technology."

Gene-editing technology and its ability to make subtle genetic changes has been hailed as a game changer for applications in human medicine and in agriculture for plants, fish and livestock.

Late in 2019 Australia's Office of the Gene Technology Regulator ruled that gene editing need not be subject to genetic modification (GM) regulations, if the DNA edit resembles the subtle variation that occurs naturally within populations and no new genetic material is introduced.

This new status allows the commercialisation of valuable agricultural traits that were produced with gene editing to get underway without the need for the costly regulation associated with GM technology.

And with aquaculture evolving as an essential asset in future food security, tweaking genomes with gene editing is expected to be a major focus of research in the sector.

Applications include enhancing the ability of farmed species to adapt to changing climatic conditions and increasing their productivity to help meet demand from a global population expected to reach 10 billion by 2050.

A new technique

Gene editing effectively provides a fine set of tweezers that allows individual gene sequences to be altered in ways that mimic naturally occurring genetic variation that is inherent to the biodiversity of wild populations.

It is this variation that endows populations with important resilience traits, such as differences in disease, heat or drought tolerance.

Scientists increasingly want to include valuable gene variants in cultivated species, but transferring them using conventional breeding or GM technology is hugely time-consuming and costly.

Gene editing, however, is able to make subtle changes in the DNA sequence of existing genes quickly and cheaply. It involves making a cut at the targeted gene, with the modification happening when the cell naturally repairs the cut.

The most versatile form of the technology is called CRISPR-Cas9, after the two molecules used to cut the gene. Cas-9 functions like the molecular scissor at a target gene. CRISPR is the guide molecule that directs Cas9 to the gene of interest. Once cut, the targeted gene is repaired by the cell's own innate DNA repair machinery. Different impacts on the targeted gene are possible depending on where the gene is cut, whether additional DNA is added at the cut site, and how the cut is repaired.

With gene editing, breeders can finally apply years of accumulated knowledge about biodiversity into improving food security, a development that has caused great excitement among frontline aquaculture researchers.

Aquaculture applications

Among these researchers is Abigail Elizur, chair of Aquaculture Biotechnology at the University of the Sunshine Coast, who is keen to see the gene-editing technology progress.

She focuses on fish reproductive biology and has already developed reproductive tools for use in aquaculture using traditional breeding techniques.

"Gene editing has immense potential in aquaculture, but realising that potential will depend on the regulatory frameworks that are built around this technology across global market chains," she says.

"I think Atlantic Salmon will be at the forefront of gene-editing applications, with the Norwegian salmon industry already exploring possibilities."

Likely to lead the way are gene edits that induce sterility in fish as a way to shunt energy away from reproduction and into accelerated growth. Sterility is a trait already exploited by the salmon industry, which uses pressure shock manipulations to render fish triploid (meaning they contain an extra copy of the genome).

"I can envision a scenario where gene editing is used to reversibly induce the required sterility in salmon without the need to produce triploid fish, which then also bypasses disadvantageous animal health impacts associated with triploidy," Abigail Elizur says.

"We may also see additional environmental, conservation, productivity and animal welfare benefits with this technology, including engineering plants to provide fish with a mix of nutrients ideally suited to their needs."

Canola connection

In other aquaculture-related applications, the more highly regulated gene modification technology has produced a sustainable source of non-fisheries feed ingredients containing omega-3 oils.

Feed ingredients are a source of ongoing environmental concern for aquaculture, specifically the need for nutritionally important long-chain omega-3 oils EPA and DHA.

These oils typically originate in ocean microalgae and accumulate in the marine food chain. The fish in aquaculture facilities on land, or in ocean pens, don't have ready access to this supply of omega-3 oils. Instead, farmed fish are fed smaller wild-caught fish, and the quantities of these 'feed fish' harvested globally has been increasing as aquaculture has grown, putting pressure on wild stocks.

More than a decade ago, a global race began to engineer a more sustainable solution to aquaculture's omega-3 dilemma. That race was won by Australia's CSIRO, with a project led by Surinder Singh and coordinated by James Petrie.

Their solution started with a terrestrial plant, canola. This plant naturally makes a short form of omega-3 called alpha-linolenic acid (ALA). The scientists sourced genes from microalgae that produce EPA and DHA, adding them to the canola genome. These extra genes give canola the ability to extend the ALA molecule into the long-form omega-3 oils.

"I think the sustainability and environmental credentials of the crop are significant factors supporting the use of GM technology in this particular case," James Petrie said when announcing the breakthrough.

"When you do the calculations, DHA levels of 12 per cent in the canola oil means one hectare of this crop can meet the same levels produced by 10,000 ocean fish. And we couldn't have achieved this using conventional plant-breeding methods."

Regulatory approvals to commercialise omega-3 canola have now been granted to Nuseed Ltd for cultivation in Australia and the US for both aquaculture applications (Aquaterra™) and human nutrition (Nutriterra™).

Global role

These kinds of genetic capabilities are seen as crucial in meeting the food security challenges of the future.

Speaking at the recent International Tropical Agriculture Conference in Queensland, Mark Howden, director of the Climate Change Institute at the Australian National University, said with the global population increasing at a rate of 1.7 per cent per year, food production is under pressure to increase at an equivalent rate. Increases in temperature over land were already affecting the agricultural productivity in many parts of the world, he said.

"I think we are going into an environment where we need to be much more strategic about the management of our food supply. That will mean making transformational, as well as incremental and systemic, change to drive productivity and climate adaptation."

High-end genetic technologies producing advanced high productivity, but low-impact, aquaculture will be part of the changes needed to position the sector as a global leader in sustainability, productivity and climate resilience. F

Below Developing omega-3 canola, CSIRO researchers James Petrie and Surinder Singh. Photo: CSIRO

MORE INFORMATION
www.tekfishaustralia.com, www.hatch.blue
FRDC RESEARCH CODES: 2018-199, 2019-174

Brainstorming the future at evokeAG 2020, from left: Crispian Ashby, Christine Pitt, Rob Hulme, Cal Foulner, Wil Taing and Patrick Hone.

In pursuit of new solutions

Finding new ways of doing things to help make fisheries more efficient, safer and more profitable will be the focus of a new FRDC investment strategy

By **Catherine Norwood**

The relevance of a fisheries research stand at an agricultural innovation event may not be immediately obvious, but there are synergies to be found between the two sectors, says the FRDC's managing director Patrick Hone. Both are involved in meeting global food production challenges, and the operational and consumer issues that come with that.

This is part of the thinking behind the FRDC's participation in February in evokeAG, an agricultural innovation event run by AgriFutures in which emerging production and market tends, investment opportunities and technological developments are discussed.

More than 1300 people attended the two-day event held in Melbourne, including international and local speakers, innovators and potential investment partners.

Patrick Hone says solutions developed for agriculture may well prove a fit for fisheries, particularly aquaculture, and the FRDC, for one, is actively seeking initiatives with the potential to improve fisheries operations and profitability.

"Business as usual will not solve the wicked problems facing the fishing and aquaculture sector," says Patrick Hone. "We require new ways to solve complex problems together."

He acknowledges this may well involve a different approach to the funding systems the FRDC currently has in place for research, development and extension.

Research that provides new knowledge and a greater understanding of fisheries will continue to be an essential part of the FRDC's focus. However, in a move supported by the FRDC board of directors, it will also set aside a funding pool to invest more quickly and in a less-structured way in industry innovation initiatives.

These types of projects typically focus on continuous improvement – finding ways to undertake tasks and processes more quickly and efficiently, increasing flexibility and agility. It might, for example, involve capturing the information of business operations in a way that can be shared more easily or analysed to provide 'actionable information' and better decision-making.

The FRDC has already supported two such industry-driven data-capture software initiatives – Deckhand for wild fisheries, and SmartOysters for oyster and other aquaculture operators – both of which are continuing to evolve.

On the market development front, it is also an investor in Easy Open Oyster, now being trialled in South Australia. Easy Open is a robotic system that has been developed to eliminate the need for consumers to shuck oysters. It mechanically opens oyster shells, which are then resealed with wax, keeping the live oysters safe inside. If the trial is successful, a barrier to increasing oyster consumption will be removed, allowing more people to enjoy a fresher oyster experience.

Asking the right questions

For the FRDC, a crucial part of innovation investment is asking the right questions – finding issues that are common across businesses or industry sectors. For example, shucking as a barrier to fresh oyster consumption is an issue that affects all oyster producers. While the FRDC might provide seed funding, industry buy-in to the solution will be essential. The planned innovation investment is not about creating a tech product and trying to sell it, but about developing a solution to an existing industry need.

As part of the 'question finding' process prior to evokeAG, the FRDC held a workshop in Melbourne in which business and industry sector representatives trialled the TEKFISH platform. Led by Christine Pitt, TEKFISH has been adapted from experiences in the red meat sector, and helps to match existing or developing innovators with products and services to help solve the relevant issues. One-on-one interviews with industry and fisheries leaders are also being undertaken to identify common issues in the sector.

Attending the workshop as well as evokeAG was co-founder of the Hatch aquaculture accelerator Georg Baunach, who outlined his company's investment portfolio (www.hatch.blue), which has the potential to either provide investment or match tech projects within its portfolio.

The FRDC and TEKFISH also shared space at evokeAg, with the FRDC sponsoring the session 'Who is investing in the deep blue?'. This included Australian seaweed aquaculture pioneer Pia Winberg, CEO of Austral Fisheries David Carter and founding partner of the US venture capital firm AgFunder Michael Dean, discussing trends and opportunities for innovation in the fisheries and aquaculture space. F

MORE INFORMATION
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FRDC RESEARCH CODE: 2018-004

A decade of SafeFish

By providing crucial research and advice on food standards and practices, an innovative project continues to ensure Australia's seafood is safe to eat

By **Leigh Dayton**

Pull out the party hats and open the bubbly: SafeFish is celebrating its 10th anniversary.

SafeFish has its headquarters at the South Australian Research and Development Institute (SARDI), the research arm of Primary Industries and Regions South Australia. For the past decade, this innovative project has delivered continually on its goal: to provide robust food safety research and advice to industry and regulators to boost Australia's reputation for producing safe and high-quality seafood.

Led by Alison Turnbull, SafeFish forms partnerships with industry, government and scientists to improve responses to current and emerging issues within the seafood industry.

This collaborative approach is critical, Alison Turnbull says, as history has shown a food safety incident in any one seafood group impacts the sales of all seafood.

Addressing risk

In its 10 years of operation, SafeFish has assisted with reopening closed export markets, built capability in the development of standards and laboratory testing procedures, and facilitated technical research projects to address issues affecting seafood.

It has also assisted with emergency incident response. For example, in 2018 SafeFish brought industry and researchers together to develop and advance protocols after a 2012 incident in which Japan detected toxins in a shipment of Tasmanian mussels, traced to a novel algal bloom.

In a series of projects with researchers, the SafeFish team developed new management strategies and validated a testing kit to minimise the impacts from toxic blooms. This kit is now used by shellfish producers and regulators, and is being investigated for use by the lobster and abalone industries.

"The SafeFish input into the risk mitigation and management of harmful algal blooms affecting Southern Rock Lobsters is invaluable," says Tom Cosentino, chief executive officer of Southern Rocklobster Limited.

The algal bloom projects highlight another SafeFish goal: maintaining and enhancing market access for Australian seafood. This work is critical.

Why? The *National Fisheries and Aquaculture Industry Contributions Study 2017-18* concluded the seafood industry contributes $5.3 billion to Australia's economy. It also generates more than 40,000 full-time jobs, making it an important source of economic resilience and diversity for many regional coastal communities.

Market access

Improved market access for this valuable industry was, in fact, central to the creation of SafeFish. The seafood industry recognised that, as a relatively small player globally, it must be involved in developing internationally agreed safety standards and regulations.

This meant bringing the nation's experts together to participate effectively in the international standard-setting body Codex Alimentarius. So, with funding from the Australian Seafood Cooperative Research Centre, the Seafood Trade Expert Panel was established.

Renamed SafeFish in 2011, the project is now funded primarily by the FRDC, with co-funding from seafood industry partners. Current funding runs until 2021.

SafeFish interacts closely with key governmental partners such as the Department of Agriculture and Food Standards Australia New Zealand (FSANZ). According to FSANZ deputy section manager Glenn Stanley, SafeFish provides "a key network to the seafood industry, researchers and regulators" – a resource that was previously difficult to tap.

As well as providing technical advice on seafood incidents and supporting international delegations, SafeFish adds to industry knowledge through technical reports, factsheets on seafood hazards and workshops on topics such as extending seafood shelf life.

Future issues

As to future directions, Alison Turnbull points to the potential bacterial and micro-algal threats to seafood associated with climate change, such as Vibrio and ciguatera, and the need for a coordinated national approach to them.

Over the decade, the team has enjoyed driving the SafeFish engine and watching it grow and evolve into the successful resource it is today. They acknowledge the partners, colleagues and past and present stakeholders for their assistance and input, and hope to continue this successful project well into the future. F

MORE INFORMATION
www.dinkotuna.com

From adverse beginnings to influential industry pioneer

An unexpected champion drives innovation to bring premium, Australian-harvested tuna to more markets

By **Sue Neales**
Photos **Robert Lang**

Think of Australia's prized Southern Bluefin Tuna (SBT) fishery, its macho capital of Port Lincoln, South Australia, and high-profile tuna tycoon families; it's an unlikely idea that one of its leaders could be a slight but steely Thai-born woman.

Yet today Lukina Lukin, 54, is the only female owner and chief executive of a major SBT company, and her $5 million business Dinko Tuna has a reputation for producing some of the highest-quality tuna in the world.

She has come to be regarded as one of the brightest and most innovative leaders in Australia's $150 million tuna industry.

It is an extraordinary journey that began in 1997, when young Lukina – on a teacher exchange to Port Lincoln from her homeland – married Dinko Lukin, one of the then-millionaire giants of the tightly held wild-catch SBT industry. He was also the inventor of the pioneering net system for catching wild young tuna at sea and bringing them back alive to Port Lincoln to be 'ranched', fed and fattened in net cages closer to shore.

When Dinko Lukin died in 2011, he left his business to his wife to run as best she could, armed with the years of expert training he had given her.

Few of the tough Port Lincoln tuna industry kings believed Dinko Tuna would last and many offered to buy out the business, along with its valuable SBT allocation.

At the time, even Lukina Lukin was not sure whether she could turn the enterprise around. The farm's ranching nets were old, allowing seals into the tuna pens and there were high levels of fish mortality. The 30-year old fish processing plant had leaky refrigeration and expensive power needs, and there was a $32 million debt. It was a big ask.

Above Dinko Tuna's SBT loins have been developed to provide year-round supply to Australian restaurants.

Dinko Tuna also had the smallest SBT quota of all the Port Lincoln companies, which collectively hold 90 per cent of the national allocation for the species.

"I might be the smallest tuna farmer but because Dinko taught me everything before he passed away, from net mending and fish feeding to running the business and meeting with the banks and buyers, I have always been determined to give it 100 per cent," Lukina Lukin says.

"I gradually upgraded all the equipment [at Dinko Tuna], replaced the nets, reduced fish deaths, sold some assets, got rid of all the debt and made the business profitable, and I'm still farming the same quota today."

Based on the current national SBT allocation she can catch just 223 tonnes a year of the prized fish. Fattening the fish in cages for four to six months until they reach about 30 kilograms each results in just 360 tonnes of SBT to sell annually.

In the past nine years Lukina Lukin has established herself, against the odds, as one of the leading figures in Port Lincoln's male-dominated tuna industry, and in the broader seafood and fishing world.

For several years, she was the only woman on the board of the powerful Australian Southern Bluefin Tuna Industry Association (ASBTIA); in January, she was joined by another female director. Every innovation she has introduced at Dinko Tuna – and there are many – is closely watched and often followed.

Increased global competition has seen the prices Japanese buyers pay for frozen whole Australian SBT drop in recent years from ¥2500 per kilogram to the current ¥1450 per kilogram (A$21 per kilogram).

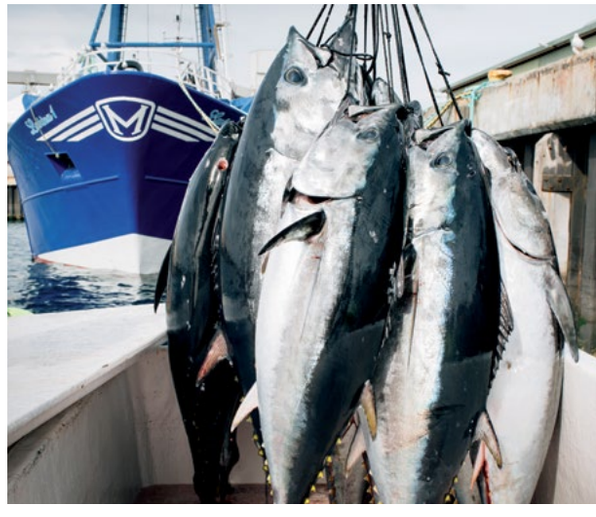
However, Lukina Lukin has been leading the search for new markets, innovative tuna products and value-adding opportunities. She has pioneered entry to markets in China and into the luxury Australian market, which currently relies on imported Indonesian-caught Yellowfin Tuna for year-round supplies.

To tap into this market, last year Dinko Tuna invested more than $1.2 million in a new processing facility to value-add a greater proportion of its 10,000 fattened fish production. The equipment includes several cutting-edge $100,000 snap-freezing cabinets that use liquid nitrogen to freeze tuna portions down to –60°C in 45 minutes.

This process results in flesh that, when thawed, is almost indistinguishable in quality, texture and taste from fresh fish.

Lukina Lukin's strategy is to cut the freshly harvested whole fish into smaller, more manageable portions, with the head and tail removed. This

Lukina Lukin.



Above Harvesting of SBT underway–grown to 30 kilograms on a diet of local sardines, to ensure premium quality and provenence.

results in four SBT 'loins' – deboned and skinned prime cuts of about three kilograms each.

Despite the higher labour costs involved in processing the loins, she is certain growing sales will follow; Australia's top chefs, hotels and restaurants, previously unable to handle or portion out an entire SBT every week, can now buy the loins and add the delicacy to their high-end dining menus, either as sashimi or cooked.

Already restaurants in Melbourne, Sydney, Adelaide and Perth have embraced the product, including Del Giorno's Café in Port Lincoln, La Luna in Melbourne and Wills Domain in Margaret River.

"Eventually I'd like to balance my Japan market with 50 tonnes going annually to China and 25 tonnes into Australia. My dream is to one day be able to supply ready-to-eat tuna cut as sashimi in a pack, together with wasabi, chopsticks and wine, as a special treat anyone can grab and enjoy sitting in a park or at home."

Despite the downturn in prices, Dinko Tuna has been able to maintain prices at $57 a kilogram wholesale, with a focus on quality, which includes feeding the SBT local sardines rather than imported pellets.

She is also experimenting with improving fish colour and shelf life. For the past three years she has added vitamins to her sardine feed, which extends the shelf life of freshly harvested tuna by up to five days.

Lukina Lukin continues to pursue the latest innovations to help keep Dinko Tuna ahead of the game, with a focus on delivering premium, high-priced, sustainable SBT that tastes as fresh as when it was plucked from the sea.

"For me, the next step is not to grow [Dinko Tuna] any bigger; I am going to concentrate even further on premium quality, local provenance and value-adding because, while I don't want Dinko ever to be the biggest [tuna producer], I do want it to always be the best." F

Lukina Lukin has been selected to participate in the National Seafood Industry Leadership Program in 2020.

Final reports

Monitoring abalone juvenile abundance 2017-049

Abalone populations throughout south-east Australia continue to come under increasing environmental pressures, particularly the loss of productive habitat resulting from the range expansion and destructive grazing of algae by the sea urchin species *Centrostephanus rodgersii*. Subsequent attempts to rehabilitate reefs through urchin culling have proven successful in restoring algae communities, yet have not translated to a detectable recovery in the abalone population.

This project supports the application of Abalone Recruitment Modules (ARMs), proven to be successful in Tasmanian waters, for collecting information on juvenile abalone. This design was subsequently transferred to the Eastern Zone, Victoria, where Institute for Marine and Antartic Studies staff and Eastern Zone Abalone Industry Association members installed ARMs at four sites with contrasting abalone populations.

Although the results of this project provide evidence of abalone recruitment, to properly evaluate the benefits of urchin culling versus abalone translocation versus natural recruitment in recovery efforts, a better understanding of the spatial and temporal patterns of recruitment across all sites is required. Ongoing monitoring of the ARMs is also expected to provide a greater understanding of the stock recruitment relationships and the suitability of this as a technique in more broadly forecasting recruitment.

More information: Jaime McAllister, jaime.mcallister@utas.edu.au

Social Matters workshop 2017-152

Running over two days, the Social Matters workshop brought together seafood industry social scientists from around Australia. In addition to Australian scholars from all states and the ACT, the project invited Ratana Chuenpagdee, who leads the international network of small-scale fisheries, 'Too Big To Ignore', based out of Memorial University, Newfoundland, Canada. Ratana Chuenpagdee provided expert global perspective and strategic network-building advice.

The workshop produced agreement on a shared goal to grow the visibility and influence of seafood industry social science in Australia through more structured, collaborative efforts.

While the exact form and title of the network was not settled upon, there was agreement to continue the discussions under the place-holder title of the 'Social Matters Initiative' (SMI).

More information: Tanya King, tanya.king@deakin.edu.au

Sustainable Fishing Families project 2016-400

In recent years, concern for the health, safety and wellbeing of the professional wild-catch fishing industry has been growing in Australia. In response, this project conducted the first national survey of the health, safety and wellbeing of the Australian professional fishing industry. The results of the survey in 2017 provide a baseline for the state of wild-catch industry members across a range of indicators, including reported physical and mental health; factors affecting health and safety; factors affecting levels of stress; health and safety behaviours; and access to health services and information.

The project also conducted and evaluated an intensive pilot program specifically tailored for fishing families. The program was modelled on an existing and highly successful program, Sustainable Farm Families™, developed and delivered by the National Centre for Farmer Health at the Western District Health Service, Victoria. The materials and presentations were reviewed and modified to reflect the specific strengths and challenges of the fishing industry. This award-winning program is now available for use by fishing communities across the country.

The Sustainable Fishing Families project was a collaboration of academic and practical expertise and included participants from Deakin University, the National Centre of Farmer Health (NCFH), University of Tasmania and University of Exeter.

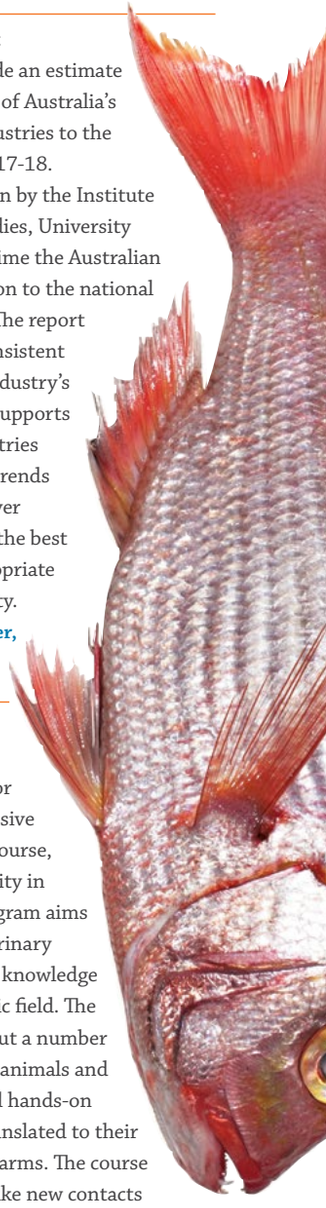
More information: Tanya King, tanya.king@deakin.edu.au

Economic and social contributions 2017-210

The FRDC, on behalf of the Australian Government, funded the National Fisheries and Aquaculture Industry Social and Economic Contributions Study to provide an estimate of the economic contribution of Australia's fisheries and aquaculture industries to the Australian community for 2017-18.

The project was undertaken by the Institute for Marine and Antarctic Studies, University of Tasmania, and is the first time the Australian seafood industry's contribution to the national economy has been reported. The report demonstrates a nationally consistent approach to estimating the industry's economic contributions and supports the ability of individual industries and jurisdictions to monitor trends in the size of contributions over time. Estimates are based on the best available data and most appropriate methods given data availability.

More information: Emily Ogier, emily.ogier@utas.edu.au



AQUAVET program 2018-192

This project allowed the author to attend AQUAVET, an intensive aquatic veterinary medicine course, conducted by Cornell University in Massachusetts, USA. The program aims to equip members of the veterinary profession with the skills and knowledge required to work in the aquatic field. The author gained knowledge about a number of different groups of aquatic animals and disciplines, as well as practical hands-on techniques that have since translated to their own practice on aquaculture farms. The course also enabled the author to make new contacts with international aquaculture veterinarians, providing valuable opportunities to share knowledge to solve common problems, as well as enabling collaborative efforts and discussions to solve new problems. The author's new knowledge and skills have equipped them with the ability and confidence to take their services into new areas and to further strengthen their capabilities in the aquaculture sector.

More information: Tara Needham, tara@panaquatic.com

Safe work practices 2017-046

This project, undertaken by a team of researchers, workplace health and safety specialists, industry association and Australian Maritime Safety Authority (AMSA) representatives, responded to a call to research how barriers to the adoption of safe(r) workplace health and safety practices could be identified and addressed.

The objective of the project was to identify why fishers' behaviours and attitudes were not changing positively, despite training, information and coronial pressure to adapt existing workplace health and safety approaches. The project had a three-stage approach including a literature review, safety climate survey and focus group discussions.

Identifying a number of issues, the findings provide a clear pathway and opportunity to change how we approach safety and the development of workplace health and safety culture in the fishing industry, and to achieve significantly improved outcomes for fishers and their families.

AMSA has been working on generating changes to approaches and engagement regimes, fully detailed in the 'Extension and adoption' section of this report. These initiatives will help to establish more effective relationships between regulators and industry, with the result of assisting industry to develop a stronger safety culture.

More information: Kate Brooks, kate@kalanalysis.com.au

Eastern Australia snapper management 2015-216

This report presents the results of the first joint fishery modelling of the east coast snapper stock, informing inter-jurisdictional snapper management in eastern Australia. Fisheries scientists, biologists, managers and stakeholders from New South Wales, Queensland and Victoria collaborated in this research, which first aimed to define the spatial limits of the east coast snapper stock structure using the latest microsatellite genetic techniques. The next step was to collate all relevant data, including archival records, to model the east coast snapper stock to inform on the utility of the dataset and to inform on cross-jurisdictional hypothetical snapper management strategies.

Assembling all available east coast snapper data resulted in newly available information, the improvement of the interpretation of existing data, greater understanding of commercial and recreational perspectives, and better engagement with stakeholders. These factors work towards enhancing the quality of future management.

However, work in this project does not overcome cross-jurisdictional management difficulties, different legislation and different reference points. More collaboration and engagement is needed before these issues can be resolved, including: defining operational objectives for the fishery; selecting and monitoring key indicators of the fishery performance; defining target, trigger and limit reference points for judging indicators and fishery performance; monitoring programs with an agreed funding base to collect data; agreement of methods of stock assessment; agreement on harvest control rules; and setting target levels of fishing.

More information: Michael O'Neill, michael.oneill@daf.qld.gov.au

Australian Salmon workshop 2016-121

This project was developed in order to convene a targeted, national, whole-of-chain Australian Salmon workshop. The workshop, held in Melbourne in February 2019, sought to understand collaborative intent and, if possible, develop strategies to take potential new market opportunities forward. Participants were from all states harvesting the species – Western Australia, South Australia, Tasmania, Victoria and New South Wales – and represented all stages of the supply chain, including fishers, processors, pet food representatives, marketers, exporters, retailers, industry associations and researchers.

It was recognised that Australian Salmon harvesting regulations and practices differed between states. Participants agreed to collaborate on a national basis, with an emphasis on increasing the value of fish, rather than harvesting greater volumes. Three overarching priorities were identified for action to help lift the value of the industry as a whole.

More information: Janet Howieson, j.howieson@curtin.edu.au

Seabird interactions: Shy Albatross 2016-118

Seabirds are attracted to fishing vessels through the availability of fishery discards, increasing the risk of injury or mortality from interactions with fishing gear. This project used novel DNA dietary analysis methods, seasonal seabird foraging ranges and fishery catch data to establish a baseline of data from which to evaluate the impact and efficacy of future management/operational or other changes to fisheries with regard to seabird interactions. Shy Albatross (*Thalassarche cauta*) scats were collected from Albatross Island in Bass Strait every three months from 2014 to 2018 and the food DNA identified in each. A total of 1655 Shy Albatross scats were collected during the project, for which DNA were extracted and sequenced.

The results provide a range of end users with data and supporting information for a variety of management and conservation applications, including sustainable fisheries management, ecological risk assessments, and continued conservation and management of Shy Albatross populations.

More information: Rachael Alderman, rachael.alderman@dpipwe.tas.gov.au

China seafood market development 2016-173

The FRDC, the Sydney Fish Market and the Australia–China Agricultural Cooperation Agreement (ACACA) program agreed to fund the Professional Fishermen's Association (PFA) to conduct a trade mission to China to explore the concept of supplying mixed seafood between NSW commercial fishers and China using an e-commerce tool.

The program was developed in consultation with the PFA, Gfresh, Sydney Fish Market, Austrade and the Department of Agriculture and Water Resources.

The report found there is an undoubtable opportunity in the concept and in developing this market to China, with significant positive benefits to the Australian seafood industry. The creation of a more stable market that can handle the substantial fluctuations in the supply of specific Australian seafood species as well as the willingness of the Chinese market to pay for high-quality products linked strongly to providence marketing and tourism. As of February 2018, the PFA has been trialling the supply of live eels to China via

→

Gfresh (FRDC 2018-087), an agreement that was explored and discussed through the trade mission conducted as part of this project.

More information: Tricia Beatty, ceo@pfai.com.au

NCCP: National estimate of carp biomass 2016-153

In Australia, the Common Carp (*Cyprinus carpio*) dominates many aquatic ecosystems, where they can form up to 90 per cent of the fish biomass (that is, the total weight of fish in a given area) and have a severe impact on aquatic plants, invertebrates, water quality, native fish and social amenity.

The aim of this project was to develop and apply transparent and robust methods to estimate the biomass of carp in Australia. The project provides data vital to evaluating the feasibility of Cyprinid herpesvirus 3 (CyHV-3) release under the National Carp Control Plan (NCCP). It provides a quantitative understanding of the location and magnitude of carp biomass across a range of spatial scales, from whole-of-continent to specific river reaches and individual wetlands. In many locations, particularly for lowland rivers and wetlands, the biomass densities of carp are well above the accepted threshold levels (that is, 80 to 100 kilograms per hectare) at which detrimental ecological impacts may occur, thus highlighting the spatial extent to which detrimental impacts may occur in ecosystems across large areas of Australia.

This study not only provides a national estimate for carp biomass in Australia, but the methods developed could be applied to existing datasets to provide estimates for other vertebrate pests or for populations of native fishes. A reliable estimate of continent-scale biomass provides a baseline from which to focus carp management efforts, help set appropriate management and policy targets, and track ecosystem recovery.

More information: Andrew Bennett, andrew.bennett@delwp.vic.gov.au

NCCP: Cyprinid herpesvirus 3 and human health 2016-183

This report summarises the findings of a systematic literature review that sought to determine the impact on human health of the proposed release of the carp herpesvirus, CyHV-3. The literature review indicated there is no published evidence of a direct zoonotic risk to human health from the virus.

While there is little published in English on how humans react emotively to mass mortality events of carp or other fish, it could be reasonably expected that there will be a public reaction to mass carp mortality events should the virus be released into Australian inland waterways. It is recommended that any plans for release of the virus also include strategies for managing the collection and disposal of the dead fish, together with a plan for communicating with the general public.

More information: Katrina Roper, katrina.roper@anu.edu.au

NCCP: Genetic biocontrol options review 2017-148

Genetic biocontrol technologies were reviewed to help the Science Advisory Group of the NCCP identify suitable technologies that could be combined to control carp populations.

Genetic biocontrol technologies that are based on genetically modified individuals provide potentially powerful options for controlling invasive carp in the Murray–Darling Basin and elsewhere. Most of these technologies are at an early developmental stage and are mostly untested with fish. It remains to be seen if such genetic biocontrol technologies can obtain the social acceptability and the legal support that would be required to implement them on problem populations.

Considering the biological effectiveness of these techniques, the relevant logistical factors of each, the risks involved and their likely public acceptability, the project found the most appropriate technique for deployment against carp in Australia is potentially the Trojan Y chromosome technology. In particular, this technology would involve producing and releasing mirror-type sex-reversed YY individuals, combined with all measures that increase the survival and fecundity of these stocked animals.

More information: Claus Wedekind, claus.wedekind@unil.ch

NCCP: Clean-up procedures 2016-158

This project aimed to conduct a systematic review of methods and procedures adopted worldwide to remove fish carcases during large mortality events. The primary activity was a systematic review of the literature to provide insights of scientifically sound methods, procedures or processes that may have been adopted to clean up waterways after fish kill events. The study was designed to evaluate existing literature related to fish kills in regards to the assessment and development of clean-up methods or strategies worldwide. The protocol used to perform the systematic review comprised seven tiers, in which a series of activities were undertaken to obtain the final results.

The results indicated that clean-up procedures could be developed for the NCCP, although a detailed framework and guidelines could not be developed based on the information gathered. Therefore, clean-up trials would be recommended to further investigate the efficiency of different strategies for various waterway types (lakes, rivers, streams, impoundments and so on) considering the needs of the NCCP to further develop a clean-up strategy. The need for a clean-up trial should be defined based on the NCCP requirements.

More information: Luiz Silva, lsilva@csu.edu.au

NCCP: Communications program 2016-189

Strategic communication company Seftons was engaged by the FRDC in June 2017 to undertake a five-month communications program, managing communications strategies and activities for the NCCP. The program built on recommendations in the national Stakeholder Engagement and Communications Strategy developed by the NCCP in early 2017.

The overarching aim of this program was to inform and communicate to stakeholders about the NCCP, provide opportunities for community input, and build community and industry support and endorsement for the recommendations in the final report.

All NCCP communication activities were aligned and consistent, using the program's key messages. Ninety per cent of media coverage for the program was positive or neutral, stakeholder relationships were established and consultation processes were rolled out successfully.

More information: Jayne Goldring, jayne.goldring@seftons.com.au

Movers and ...

At Oysters Australia **Len Stephens** has taken on the role of chair from **Bruce Zippel**. **Andy Myers** has replaced **Sue Grau** as executive officer and **Graham Marshall** is now company secretary. **Giles Fisher** has also joined the Oysters Australia board, replacing **Trudy McGowan**.

John Whittington has stepped into the role of CEO of Blue Economy CRC. In the interim, **Jason Jacobi**, current Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE) deputy secretary, has stepped into John Whittington's former role of secretary, DPIPWE.

Kim Farrant has stepped into the role of assistant secretary, Australian Marine Parks Branch, replacing **Jason Mundy**.

Others stepping into new roles include **Jen Fry**, who has been appointed as chief advisor to the Tasmanian Salmonid Growers Association, and **George Kailis**, the new chair of the Commonwealth Fisheries Association.

Camilla Thompson is the new R&D manager for the Australian Prawn Farmers Association and **Michelle Heupel** is director of the Integrated Marine Observing System.

Ben Stockwin has stepped down from his role as CEO of Primary Industries Education Foundation Australia.

Danika Gusmeroli has stepped down from her role as communications officer at Western Australian Fishing Industry Council.

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FEEDBACK
FRDC WELCOMES YOUR COMMENTS
frdc@frdc.com.au
MOVERS WE'VE MISSED?
INFO PLEASE TO:
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Calendar of events

DATE	EVENT	MORE INFORMATION
2020		
9 to 15 March	**Sustainable Seafood Week**	www.msc.org/en-au/what-you-can-do/campaign-for-change/sustainable-seafood-week
17 to 20 March	**20th International Conference on Shellfish Restoration, Nelson Bay**	www.shellfishrestoration.org.au/20th-international-conference-on-shellfish-restoration
25 March	**Maori Fisheries Conference 2020, Auckland, NZ**	https://teohu.conference.maori.nz
30 to 31 March	**12th Global Summit on Aquaculture and Fisheries, Hong Kong**	https://aquaculture.global-summit.com
31 March to 3 April	**38th Annual Salmonid Restoration Conference, Santa Cruz, California, USA**	www.calsalmon.org/conferences/38th-annual-salmonid-restoration-conference
2 to 5 April	**Go Fish Nagambie**	www.gofishnagambie.com.au/festival
21 to 23 April	**Seafood Expo Global, Brussels, Belgium**	www.seafoodexpo.com/global
25 April	**World Penguin Day**	

Pacific Labour Scheme

WORKFORCE SOLUTIONS

ARE YOU LOOKING FOR A RELIABLE, STABLE WORKFORCE TO HELP YOU PLAN AHEAD?

The Australian Government's Pacific Labour Scheme (PLS) is open to all industries in rural and regional Australia including fisheries, aquaculture and seafood processing.

The PLS enables Approved Employers to recruit workers from Pacific island countries and Timor-Leste for one to three years, with skills matching the requirements of seafood businesses.

The PLS can provide:

- Aquaculture workers
- Deck and fishing hands
- Post harvest workers
- Cooks and kitchenhands

For more information

Contact the Pacific Labour Facility
Email: enquiries@pacificlabourfacility.com.au Phone: (07) 3557 7750
www.pacificlabourmobility.com.au