FISH

FISHERIES RESEARCH & DEVELOPMENT CORPORATION **NEWS**

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DIGITAL MARKET PLACES

Oyster recovery

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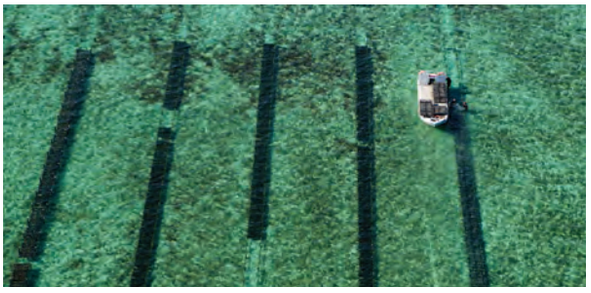

REGULAR

FRDC

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Cover: Pacific Oysters Photo: FRDC

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: 2016-808, 2016-800, 2015-239

POMS: where is the Pacific Oyster industry now?

As oyster production rebuilds to near normal following the devastation of disease in Tasmania, producers continue to focus on research and management that will improve the industry's resilience

By **Bianca Nogrady**

When Pacific Oyster Mortality Syndrome (POMS) all but wiped out southern Tasmania's Pacific Oyster (*Crassostrea gigas*) farms in February 2016, there was a very real fear the industry, nationwide, was facing long years in the wilderness. The devastating impact of POMS on New South Wales growers in 2010 – Australia's first outbreak of the disease – was still fresh in the minds of oyster growers around the country. The French and New Zealand experiences with POMS, caused by the Ostreid herpes virus 1 (OsHV-1), also suggested a five to seven-year recovery period.

And Tasmania was not the only state affected. As the provider of 90 per cent of the oyster spat used in South Australia and NSW (see breakout), the Tasmanian outbreak severely affected growers in these states too. But just three years on, producers in SA and Tasmania are nearing pre-POMS capacity, and production systems are leaner, more efficient and more ambitious than ever.

This comparatively speedy recovery is the result of industry foresight and proactive research efforts, frequently funded by the FRDC, that followed the first outbreak in Sydney's Georges River, NSW.

Tasmanian response

As one of Tasmania's leading oyster hatcheries and producers, Shellfish Culture Ltd, lost about 130 million Pacific Oysters in the 2016 outbreak and the business wrote off several million dollars that year.

But even before the disease hit its hatcheries and farms, it had been investigating what could be done to POMS-proof their holdings, looking at what measures producers in other POMS-affected countries had taken. As a result, when the virus struck, the business was able to move quickly.

Shellfish Culture CEO Greg Bowers says the installation of water processing equipment allowed the business to establish a biosecure facility. By September 2016 it was producing Pacific Oyster spat that could be used by oyster growers across Tasmania, including areas not yet affected by POMS. However, supplies to SA were still quarantined.

The business also began its own breeding efforts to increase POMS resistance in its oysters, using broodstock from industry-owned breeding research company Australian Seafood Industries (ASI). ASI has been working on resistant lines since 2010 and is now in its sixth generation of POMS-resistant breeding.

Shellfish Culture's approach, much like the ASI program, involves deliberately exposing stock to the virus. In the summer of 2018-19 Shellfish Culture oysters had a mortality rate of about 10 per cent – a far cry from the 90 per cent mortality experienced the first year after POMS hit southern Tasmania.

South Australian impacts

The SA oyster industry is still classified as POMS-free. Although the virus was detected in feral

DISEASE-RESISTANT TRIPLOID PACIFIC OYSTERS FOR NSW INDUSTRY

Most Pacific Oysters farmed in Australia are diploid – meaning they have two sets of chromosomes, like humans. But there is increasing interest in triploid oysters, with three sets of chromosomes, because they are sterile and therefore do not spawn. Pacific Oysters are exotic to Australia and are listed as a 'noxious fish' in NSW, where they can outcompete the native Sydney Rock Oyster. For this reason only sterile triploids can be used in aquaculture in the state.

"The reason that Pacific Oyster farming in the Hawkesbury and Georges Rivers in NSW hasn't recovered as well as Tasmania is because they only use triploid oysters in those estuaries and we haven't had a POMS-resistant triploid product available," says Matthew Cunningham, general manager of the industry-owned breeding company Australian Seafood industries (ASI).

With funding from the FRDC, ASI is working on how to transfer POMS resistance to triploid Pacific Oysters. Success could result in a viable oyster for farmers in NSW rivers, where Sydney Rock Oysters cannot be grown due to another disease – QX – having previously devastated production of these native species.

But it's a tricky prospect, says Matthew Cunningham. "We've talked to the French researchers and New Zealanders; they're suggesting that it happens, but we haven't seen hard and fast data around it, hence the research project to see whether it's viable."

Pacific Oyster farming in South Australia is returning to full capacity, following the outbreak of Pacific Oyster Mortality Syndrome in Tasmania which halted the supply of spat from Tasmanian hatcheries.
Photo: South Australian Oyster Growers Association

Pacific Oysters in the Port River in February 2018, it has yet to reach any of the growing areas.

However, SA's near-total dependence on imported Tasmanian spat meant the industry was hit just as hard as Tasmania in 2016, says Trudy McGowan, executive officer of the South Australian Oyster Growers Association.

With funding provided by the SA Government, two small SA hatcheries and the South Australian Research and Development Institute were supported to immediately ramp up their production. Two Tasmanian companies – Shellfish Culture and Cameron of Tasmania – were also supported in establishing hatcheries in SA, and ASI established a breeding centre at the South Australian Aquatic Sciences Centre, using broodstock it had maintained in SA.

Funding to support research to accelerate breeding for POMS resistance in both Tasmania and SA was provided through the $5 million Future Oysters Cooperative Research Centre Project (CRC-P). In June this year, South Australian Minister for Primary Industries and Regions SA Tim Whetstone also announced new research funding ($756,428) for three more years to develop Pacific Oysters resistant to POMS. There are a number of funding partners including FRDC. The project will build on previous work done.

With new sources of spat, production in SA is slowly recovering, although growers have had to rely on much smaller, two millimetre-sized spat for the past few years. These less robust, smaller spat have a higher natural mortality rate and take longer to grow to market size.

Fortunately, spat of four to five millimetres has been available from SA hatcheries this year. Trudy McGowan says the state's Pacific Oyster farms are now full of stock, although not yet at full production: "We're hoping that there will be reasonable quantities by this Christmas, but it's still not back to normal levels."

With the ongoing threat of a POMS outbreak, SA has implemented an active surveillance and education program in conjunction with its own disease-resistance breeding efforts.

"In another couple of years, stocks out there will have really good POMS resistance, so if the disease does get to us eventually, we don't believe it will have the same levels of impact on our stock," she says.

Oyster handling

At the Institute for Marine and Antarctic Studies Fisheries and Aquaculture Centre at the University of Tasmania, senior research fellow Christine Crawford and colleagues have been looking at farm management practices that could reduce POMS-related mortality. Their project is also funded through the Future Oysters CRC-P.

One question they examined was whether handling practices played a role in reducing mortality. When POMS struck, there was a widespread belief that reduced handling would reduce mortality. But the research has showed the opposite is true.

"We found that in most places, if they didn't handle the oysters for several months, then the growth rate was slower and in some places, mortality was higher because of biofouling," Christine Crawford says.

There were also some surprising outcomes from their surveys of Pacific Oyster farmers, with some saying that POMS has ultimately resulted in a more resilient industry.

"They're saying that their survival rates are much higher now, largely because of selective breeding but also because of management practices, such as selling before the warm summer weather [when POMS occurs]," she says. Many farms also had to become much leaner and more efficient during the downtime caused by the lack of spat.

Greg Bowers is one of those with a positive outlook on the industry. "We see a very good future for oysters but you've got to believe in the science," he says. Science and foresight have given Australia's Pacific Oyster industry a two-year head start on recovery compared to what was experienced by French and New Zealand growers, he says.

"If you talk to farmers now, they'll say they didn't think they'd be back here in three years," he says. "It's good news for the industry." F

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FRDC RESEARCH CODE: 2014-023

Left A tagged Western Rock Lobster. Photo: DPIRD

West by north-west

By **Catherine Norwood**

New information about the proportion of Western Rock Lobsters joining the annual migration – and where they go to – has potential implications for management of this high-value fishery

About half of the Western Rock Lobster (*Panulirus cygnus*) population undertakes an annual migration from shallow reefs off Western Australia's coast into deeper waters. Researchers estimate almost 80 per cent of those on the move also undertake a second migration to the north.

The findings are part of a new research project to improve the assessment of rock lobster biomass following significant changes in fishing patterns since the introduction of quotas to the fishery in 2010.

These changes include year-round fishing and greater access to rock lobsters during their migration, says fisheries scientist Jason How from the Western Australian Department of Primary Industries and Regional Development (DPIRD).

Understanding the migration is essential to improving the total biomass assessment, as well as determining the movement of animals between the state's three fishing zones, which may have implications for the management of the fisheries.

"This new research is allowing us to benchmark where we are now, in terms of stock levels under a lower harvest rate, different fishing practices and with a different management strategy," says Jason How.

The project has been funded by the FRDC and included a major tagging effort with a focus on the resident and migratory lobsters.

The migration

Come late November or early December each year, roughly half of the juvenile Western Rock Lobsters in shallow inshore reefs moult their red shells, create new white shells and move en masse. They travel 10 to 20 kilometres to much deeper waters offshore, where they remain and become part of the breeding stock.

"There appears to be a discrete trigger for the 'whites migration' as it's called, although we are not sure exactly what that is," says Jason How. "It can be triggered in different areas at different times. It usually lasts for about a month, but in some areas it goes on for longer. The most likely triggers appear to be a combination of the lunar cycle (either full or new moon), increasing water temperatures and small to medium ocean swells."

Many rock lobsters settle on reefs 40 to 50 metres deep. Others venture much further, to the edge of the continental shelf, up to 150 metres deep, and travel north along the edge before returning to shallower water.

While data from the project is still being analysed, Jason How says migrating animals are young lobsters, not yet sexually mature. Some travel just a few kilometres north, but others have been known to travel more than 400 kilometres, moving at an average speed of about five kilometres per day.

For example, two females released off Fremantle were recaptured three months later – one near Dongara and the other west of the Abrolhos Islands.

Industry involvement

The project has been supported by the Western Rock Lobster Council and by many commercial fishers, who have allowed the research team onboard during fishing trips to tag rock lobsters, and who also return data about any tagged lobsters they catch.

Between 2015 and 2017 researchers tagged 41,877 rock lobsters. By July 2018, fishers had returned information regarding more than 3000 tagged lobsters to the researchers, with the majority of those doing so using a smartphone app or including information with their electronic catch records.

Data analysis and the project's final report will be completed by the end of the year. F

Jason How
Fisheries scientist, DPIRD

"This new research is allowing us to benchmark where we are now, in terms of stock levels under a lower harvest rate, different fishing practices and with a different management strategy."

SEAFOOD DIRECTIONS DRAWS NEAR

Hundreds of seafood producers and enthusiasts from across the country will come together for the biennial industry conference **Seafood Directions** from 9 to 11 October at the Melbourne Convention and Exhibition Centre.

The keynote speaker will be Resilient Futures director David Platt, who is a business strategist, coach and author. The **National Seafood Industry Awards** will be held on Thursday 10 October from noon, at the Boatbuilders Yard, South Wharf, Melbourne. Tickets are $50 for non-conference attendees.

The conference will conclude with a seafood gala dinner on Friday 11 October from 6.30pm at the Melbourne Room, Melbourne Exhibition and Convention Centre, with guest chefs including Nick Mahlook from The Atlantic and Alejandro Saravia from Pastuso. Gala dinner tickets for non-conference attendees will be $200. F

FRDC CHAIR REAPPOINTED

The FRDC's chair, Ron Boswell, has been reappointed to lead the organisation for a second three-year term. His reappointment was announced by Senator Bridget McKenzie, Minister for Agriculture, in August.

Since joining the board in 2016 Ron Boswell has overseen a number of significant milestones for the FRDC. Ron Boswell takes an active interest in commercial fishers and amateur anglers. He makes a significant contribution to helping the industry respond to White Spot Disease in Moreton Bay.

Ron Boswell joined the FRDC after a long and eventful career in the Australian Senate, where he was known as a champion of regional and rural Australians and a supporter of small business. He retired from the Senate in 2014, where he had served for 31 years, making him one of Australia's longest-serving senators. F

Photo: Tim Simpson
BlueWater magazine

Hobart hosts national rec' fishing conference

The 2019 National Recreational Fishing Conference will be held in Hobart, Tasmania, and will focus on how every fisher can help steer Australia's recreational fishing future by taking part in citizen science projects.

'Our Fishing, Our Research, Our Recreational Future' is the theme of this year's event to be held on 10 to 11 December, 2019, and will incorporate the National Recreational Fishing Gala Dinner and Recognition Awards. The conference dates and locations tie in with the World Fly Fishing Championships, being held in Tasmania from 30 November to 8 December.

The conference will be live-streamed, allowing all interested fishers to engage and discover ways that they can contribute positively to the future of the sport. The event is organised by the Australian Recreational Fishing Foundation (ARFF) and sponsored by the FRDC. F

More information: **email conference@arff.net.au; facebook.com/recfishingconference**

QUEEN'S BIRTHDAY HONOURS

New South Wales' Bruce Schumacher has been named in the 2019 Queen's Birthday Honours list, becoming a Member (AM) in the General Division for significant service to the recreational fishing industry.

As a member of the Australian Recreational and Sport Fishing Confederation he has served as a delegate, vice president and chair over the course of more than two decades. He has also chaired and served as a member of the NSW Advisory Council on Recreational Fishing.

Based in Berowra Heights, Bruce Schumacher is well known for his active involvement in the Ku-ring-gai Hornsby Angling and Casting Club, and the NSW Fishing Clubs Association, serving in many executive roles.

He has also contributed to many state government advisory committees related to the management and research of recreational fisheries, and has been active in the media over many decades, as a radio presenter and as fisheries columnist for Sydney metropolitan media and fisheries publications. F

WISA breakfast

Women in Seafood Australasia (WISA) will hold a 'power up' breakfast during the 2019 Seafood Directions Conference, on Friday 11 October from 7.15 to 8.45am at the Melbourne Convention and Exhibition Centre.

The keynote speaker will be mental health advocate Anthony Hart, who will detail his own experiences with mental health and practical solutions.

WISA supports industry mental health initiatives, such as the successful Project Regard. Tickets for the breakfast will be $38.50 for WISA members and $55 for non-members. For membership enquiries contact Barbara Konstas at womensinsc@gmail.com. The breakfast sponsor is the Western Australian Fishing Industry Council.

More information: www.sd2019.com.au

TECHNOLOGY

GHOST NETS RECYCLED INTO PHONE-CHARGING CABLES

Swedish company Le Cord has created a new collection of Apple-certified charging cables for iPhones using recycled plastics from ghost fishing nets. This is the first time recycled plastics from the ocean have been used for certified mobile phone-charging accessories.

Every year more than 640,000 tonnes of fishing gear is lost or dumped at sea, with potentially fatal results for fish and other marine life that continue to be trapped in these abandoned nets. It may take hundreds of years for nets at sea to degrade naturally, breaking down into microplastics.

Le Cord has also replaced all braiding materials for new cables with nylon made of recycled PET bottle plastics and used recycled metal from illegal guns in the connector shells of the cords. F

More information: www.lecord.com

FORENSIC SCIENCE

BARNACLES HELP CALCULATE TIME OF DEATH

Based at Murdoch University in Western Australia, forensic entomologist Paola Magni is researching barnacle growth on shoes and clothing to help detectives figure out how long a body has been in the water.

Studying how barnacles settle and grow on different shoe types – trainers or leather shoes – she has found they can be used to provide information vital to an accurate crime scene reconstruction for bodies found in or washed up from the ocean.

"The species of the barnacles can tell us where the body came from," Paola Magni says. "The size of the barnacle can tell us how long the body has been in the water, [and] the isotopes in the shell can help to backtrack the journey of the body in the ocean."

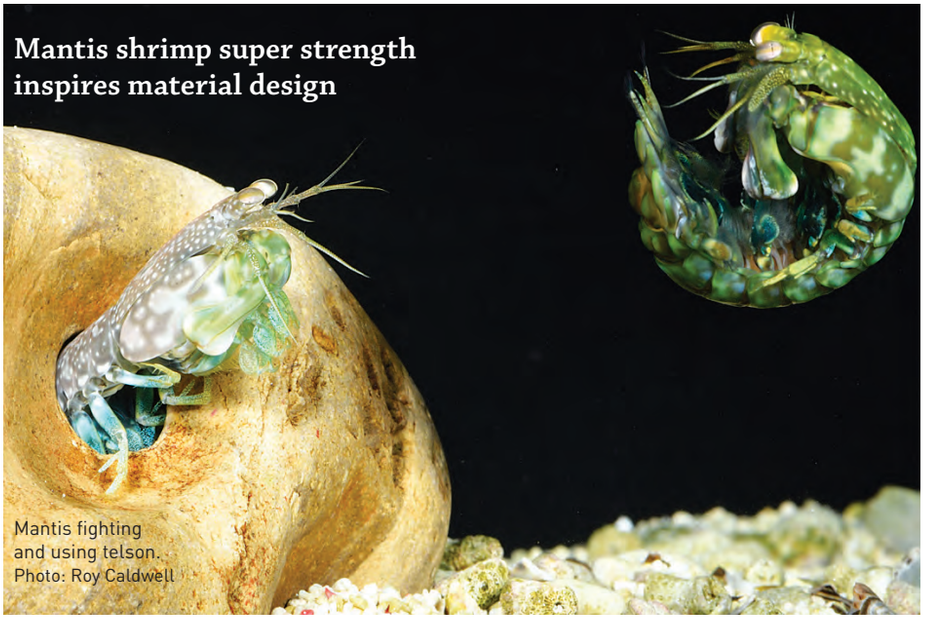
She is now working with an honours student on a similar project with clothes. The pair placed different types of fabric – cotton, velvet, silk and neoprene – in the ocean for six months to see which material barnacles attached to and when. "The crustaceans act differently on different fabrics. We can backtrack with more precision the time [a body] spent in the water."

Earlier this year Paola Magni won the Australian 2019 Australian FameLab title, which is part of an international science communication competition. F

Source: https://particle.scitech.org.au

BIOLOGY

Mantis shrimp super strength inspires material design



Mantis fighting and using telson. Photo: Roy Caldwell

The ability of the mantis shrimp to survive attacks from fellow shrimp without being injured is providing inspiration for the creation of new lightweight protective materials.

The mantis shrimp's secret is its tail appendage, called a telson, which can withstand blows from the dactyl club appendage of other shrimp – blows that can travel at the speed of a .22 calibre bullet.

Engineers have discovered that the telson, shaped as a territorial shield in 'smasher' species of mantis shrimp, prevents impact from reaching the rest of its body.

The telson shield has curved ridges, called carinae, and a helicoidal structure resembling a spiral staircase, which work together to absorb significant energy during a strike without falling apart, and preventing cracks from growing upon impact.

Researchers are continuing to investigate the telson's properties, including how to manufacture these into new materials.

The research is underway in the US, at the University of California, Riverside, and Purdue University, Indiana, with funding from the Air Force Office of Scientific Research, and has been published in the journal *Advanced Functional Materials*. F

More information: https://youtu.be/bXEfWqXyvfA

WORDS

The Bureau of Meteorology's general forecasts of sea conditions have the following specific definitions.

SLIGHT SEAS will rock buoys and small craft, with waves between 0.5 and 1.25 metres.

MODERATE SEAS are furrowed, with waves of 1.25 to 2.15 metres.

ROUGH SEAS are deeply furrowed, with waves of 2.5 to 4 metres.

VERY ROUGH SEAS are highly disturbed, with steep fronts on rolling waves of up to six metres.

HIGH SEAS are likely to cause foreshore damage, with steep fronts on rolling waves of up to nine metres.

TOWERING SEAS have waves up to 14 metres, and phenomenal seas, which occur during events such as cyclones, have waves of even greater heights.

*See page 29 for details of specific wave behaviour that contributes to general forecasts.

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FRDC RESEARCH CODE: 2016-034

Below The social and economic benefits of commercial and recreational Blue Swimmer Crabs fishing are being assessed in Western Australia.
Source: James Tweedley

WA surveys what fishers want

By **Bianca Nogrady**

Fishers and their reasons for fishing are as diverse as the species targeted, but Western Australian research is uncovering common values around restocking estuaries

James Tweedley
Marine biologist
Murdoch University

"I wanted to get a handle on the level of fisher support for this type of management intervention, and the costs and benefits of doing it."

Traditionally the most studied aspect of a fishery is the fish. Take any major commercial or recreational fishery in Australia – chances are its fish species will have been studied extensively. But there's another relatively unstudied creature that is also a key player in fisheries: fishers.

Marine biologist James Tweedley, a lecturer at Murdoch University, is working with colleagues and research students on a three-year study of recreational and commercial fishers, funded by the FRDC. They are focused on two iconic Western Australian fisheries, in the Peel-Harvey and the Blackwood estuaries.

"In Western Australia we have some fantastically well-managed fisheries, but their indicators are mainly based on biology," James Tweedley says.

He has long been interested in estuary management and how to improve fishing through habitat restoration and 'aquaculture-based enhancement' – the release of cultured juveniles to enhance fisheries. But these initiatives cost money.

His aim is to get a better understanding of the social, economic and biological returns of these small-scale fisheries – why people fish, how they fish and, most importantly, whether they are open to new approaches. These questions have serious implications for fisheries management.

"I wanted to get a handle on the level of fisher support for this type of management intervention, and the costs and benefits of doing it," he says.

To do this, he and the team decided to focus on the recreational and commercial Blue Swimmer Crab (*Portunus armatus*) and Black Bream (*Acanthopagrus butcheri*) fisheries in the Peel-Harvey and Blackwood estuaries in WA.

"We're doing this as a case study to develop the science to help predict the social, biological and economic changes that might happen if we restock, and whether it is likely to give us a good return on investment," James Tweedley says.

The first step of the project, which began in mid-2017, has been to understand who uses these fisheries, why, and what these fishers think about the idea of restocking. The team conducted a series of surveys and found a big difference in the motivation of those fishing for Blue Swimmer Crabs compared with those targeting Black Bream.

Commercial fishers were more motivated in their work by lifestyle and a family tradition of fishing rather than being driven to make huge profits in their businesses. In the recreational sphere, crab fishers were almost exclusively foodies who wanted to collect enough crabs to feed their family or friends; recreational bream fishing was seen as a catch-and-release sport fishery.

That also meant recreational fishers' spending on equipment varied between fisheries. Blue Swimmer Crabs can be easily caught walking along the shoreline with a scoop net and bucket; Black Bream requires fishing rods and tackle, and often a dinghy or kayak as well.

The research team also wanted to understand fishers' attitudes towards restocking and, in particular, whether they would support it both as a concept and financially.

They found that, overwhelmingly, recreational fishers in the fisheries were supportive of restocking and were also aware restocking was not a magic bullet for a flagging fishery; it has risks and trade-offs.

The second phase of the research project, which involved surveying fishers during the 2018-19 summer, will evaluate the economics of restocking – whether fishers are willing to support it, for example, by paying a licence fee to fund it, or whether the economic benefits that recreational and small-scale commercial fishers bring to an area compensate for the costs involved. F

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FRDC RESEARCH CODE: 2011-514

Seafood consumers open to options

By **Annabel Boyer**

Recent research from the FRDC sheds light on the consumption habits and experiences of Australian seafood consumers, providing a refreshed understanding of the challenges facing the seafood industry

ABOUT THE RESEARCH

This research involved an online survey of 2002 adult, Australian, main grocery buyers and was undertaken between 18 April 2019 and 9 May 2019.

In an ideal world, seafood producers would have telepathic abilities to help them know exactly what their customers want and need from the industry. But in the absence of such supernatural abilities there are market research companies who do the next best thing by asking consumers about their decisions concerning seafood.

New data from the FRDC's 2019 *Unpacking the Consumer Seafood Experience* survey, undertaken by market research agency Intuitive Solutions, captures a wealth of information on Australian seafood consumer attitudes, what they like and don't like, and what information would be useful to help them overcome the challenges they have in buying, cooking and eating seafood. The survey is the second of this kind the FRDC has undertaken.

"The first survey in 2016 showed that consumers don't like the smell associated with seafood, are often unsure regarding its preparation and are also cautious about trying varieties outside of their regular purchases," says Peter Horvat, FRDC's general manager of communications, trade and marketing.

"These all highlighted a lack of consumer information and education. But what the research did show is that consumers were open to new seafood offerings that made choice and preparation easier.

"The 2019 research update used the same basic survey framework as 2016, but added further questions about consumer behaviour and motivation," he says.

This time, for example, the survey asked where consumers get their information from and broadened the demographic data collected. This has allowed for insights related to the age, location and gender of consumers, which all helps marketers and producers to understand their markets better.

The latest survey also added a range of new questions from the US Food Marketing Institute's *The Power of Seafood* survey. Peter Horvat says this provided a valuable reference point to see how Australian seafood consumers compare to those in the US.

The inclusion of data from the Nielsen Homescan (see page 26), which captures the grocery purchases of Australians, was used to ground the survey results by providing a second dataset from which to compare the findings. It also adds a financial data dimension to seafood consumed in Australia.

Key findings and opportunities

Almost 80 per cent of those surveyed reported that they had consumed seafood in the past 12 months, 12 per cent rarely consumed seafood, seven per cent never consumed it, and one per cent were unsure. This does not reflect frequency or volume of consumption, but provides an overall incidence of consumption (see categories below for frequency).

Of those who eat seafood, almost all indicated they eat fresh seafood (92 per cent), frozen (87 per cent) and tinned (86 per cent).

However, the survey found that consumers fall into one of three consumption segments in relation to the frequency with which they consume seafood, namely:

- **frequent eaters** (once a week or more) represent 33 per cent of consumers, but a whopping 77 per cent of all consumption;
- **regular eaters** (once a fortnight to once a month) represent 32 per cent of consumers and about 20 per cent of seafood consumed; while
- **infrequent eaters** (no more than once every two months) represent another 26 per cent of consumers and consume only three per cent of seafood purchased in Australia.

The survey indicated that supermarkets remain the major outlet for the purchase of seafood. This figure is consistent with Nielsen Homescan data.

DRIVERS OF SEAFOOD CONSUMPTION

FRESHNESS
How long has the seafood been in store? (74%)

SAFETY
How safe is it to eat? (74%)

PRICE
How does the price compare to other meats? (71%)

QUALITY
Is it fresh or has it been frozen?(66%)

PRESENTATION
How long will it last at home? (63%)

Consumer survey responses reported in *Unpacking the Consumer Seafood Experience*

The FRDC commissions these surveys to help seafood producers understand the barriers to the uptake of their product and to see where they should put their resources to improve seafood purchases and consumption. For example, understanding that most consumers purchase their product from supermarkets can direct seafood producers to develop offerings that are available in such stores.

Moreover, Peter Horvat says understanding that frequent eaters account for such a large proportion of consumption can direct producers to where they can get the biggest bang for their buck. "If you try and convert infrequent eaters to double their seafood consumption, you will only make a small gain overall," he says. "But if you target your messaging and marketing to increase the intake by those already eating seafood once a week or more, a small increase in consumption by that group is likely to have a far greater impact."

The 2019 survey results reiterated the 2016 findings that uncertainty about choosing, preparing and cooking seafood remain as barriers to seafood consumption.

Information provision vital

Despite seafood being purchased by most consumers, their confidence in buying and preparing remains moderately weak, scoring 6.4 out of 10 for preparing and cooking seafood and 7.1 out of 10 for confidence in buying seafood. However, the survey also highlights the desire for consumers to consume seafood.

"To overcome this, education and information on the different species, what they taste like and how to cook them could be vital, regardless of whether the seafood is fresh or frozen," says Peter Horvat.

The scores suggest consumers are engaged and enthusiastic, providing seafood producers with the opportunity to encourage consumption of new seafood offerings.

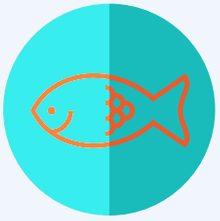
For fishers who catch and supply the most well-recognised and commonly consumed species, the research indicates that the focus should be on packaging, presentation, improving ease of use (meal solutions) and preparation tutorials.

For fishers who catch and supply lesser-known species, investing in consumer education, information and tastings might be better options.

For seafood processers, the results show that consumers are open to new products, but they will need to be educated about what the product is and how to use it. These and more findings will be presented at the Seafood Directions conference in Melbourne in October. F

78%

78% of Australians have consumed fresh, frozen or tinned seafood in the past twelve months
(up from 77% in 2016)



60%

60% of seafood consumers most commonly buy seafood from supermarkets
(up from 57% in 2016)

55% 55% of consumers say the best thing about eating fresh seafood is the delicious/amazing taste

22% 22% of consumers choose seafood for the health and nutritional benefits

AVAILABLE RESOURCES

FRDC resources developed to help seafood producers overcome barriers to consumption of seafood identified in 2016 and 2019 consumer surveys include the following:

Fishfiles consumer website
Provides videos for seafood consumers on how to prepare and handle seafood, along with recipes and species information.
www.fishfiles.com.au

Expert assessment of health benefits
Prepared in partnership with the Dietitians Association of Australia, contains information on the health benefits of eating seafood and access to information on Australian seafood from the Status of Australian Fish Stocks reports. **www.fishfiles.com.au/Experts/HealthProfessionals**

Fresh versus frozen seafood research
Frozen seafood overcomes smell and freshness issues that consumers have identified as barriers to eating more fish. The FRDC commissioned research (2017-179) that has challenged the long-held assumption that fresh seafood is of superior quality, reported in *FISH* magazine (March 2019, 'Seafood quality frozen in time').

Fish, Fresh + Frozen
Cookbook based around frozen seafood, in press, will be launched at the Seafood Directions conference in October 2019.

Modern cuisine meets ancient delicacy

Value-added products provide pockets of growth for fish and seafood, tapping into retail produce convenience trends

By **Brad Collis**

The Goolwa PipiCo harvests its catch from the pristine beaches off the Coorong near the mouth of the Murray River, much the same area where the Ngarrindjeri people have harvested pipis for millennia.

Now a partnership between Goolwa PipiCo and that same Ngarrindjeri community will ensure that ancient story is told. Hopes are high that this will provide diverse gains for both the Indigenous and non-Indigenous communities involved.

Ngarrindjeri Elder Derek Walker says there is potential for social, cultural and economic benefits for his community. "It is enabling our people to get back 'on country' and also provides a pathway to learning about business and investment," he says.

Derek Walker says it was a fortuitous conversation with Goolwa PipiCo chairman Roger Edwards in 2016 that led to the partnership. The Ngarrindjeri community and the Goolwa pipi fishers were both keen to raise the status of pipis to that of a premium food and agreed to work under a single brand, through the Goolwa PipiCo.

"Pipis, or Kuti, have always only been food to us, never bait. So when Goolwa PipiCo reached out to us and we saw they were already a fair way down this track, we were keen to be involved with a group of fishers who shared our own beliefs," Derek Walker says.

"It was a chance to develop a business and employment opportunity from a fishery we have been involved with for many thousands of years. We bought a small quota, just one per cent of the state catch, but with a business plan to grow this we now have six per cent and our goal is to reach 25 per cent."

The Goolwa PipiCo itself was an initiative of four local fishing families, some of which have been fishing in the area for three generations. Tom Robinson, Goolwa PipiCo's managing director, says the fishers first combined their operations as an association, before incorporating as a company in 2014.

This move provided the necessary operational scale, investment and risk management to move forward. It has allowed them to embrace the bigger picture – which now includes the Ngarrindjeri people – to leverage greater opportunities by working together.

Collaboration

The formal partnership between the Goolwa PipiCo and the Ngarrindjeri community was established in 2016. More recently, funding from the South Australian Government through a Regional Development grant has been awarded to help expand the Port Elliot processing facility to accommodate the extra volume brought to the business by the partnership, as well as new product developments.

In December 2017 the Ngarrindjeri Native Title claim was resolved by a 'consent determination' by the Federal Court; the claim includes the beaches from which Goolwa PipiCo fishers harvest, to low water mark.

Tom Robinson says the good relationship with the Ngarrindjeri people has been developed over many years. And while discussions about Native Title determination are pending, he says the company, its fishers and the Ngarrindjeri people are already working together with a spirit of cooperation and teamwork.

MORE INFORMATION
Tom Robinson, tom@goolwapipico.com,
http://goolwapipico.com

Niche marketing

Tom Robinson says a new strategic plan is being developed to look at markets and branding, with a particular emphasis on pipis used as an Indigenous food over many thousands of years, capitalising on the rising interest in 'bush tucker'.

This approach is strengthened by the relationship that the Ngarrindjeri group has built with celebrated South Australian chef Jock Zonfrillo, who runs the Orana Foundation. The foundation was set up to assist Indigenous enterprises research and promote native Australian foods. Its philosophy is to provide

Goolwa PipiCo directors, developing community partnerships to develop their fishery, from left, Tom Robinson, Darren Hoad, Roger Edwards, Derek Walker, John Reeves and Matt Hoad.
Photo: Jacqui Way

social and economic opportunities for Indigenous communities by preserving their cultural heritage, particularly their food culture.

Complementing this will be a marketing strategy to position the cold-water pipis as one of Australia's premium seafood products.

"We compete in some markets where clams are sold for under $2 per kilogram, which is less than what it costs us just to harvest," says Tom Robinson. "As a low-volume fishery, competing in a domestic market that is incredibly price sensitive to volume and an export market with significantly lower labour costs, we have to establish a premium market."

He believes this premium approach is possible because it is not a large fishery. The company only processes about 400 tonnes a year and this represents about 65 per cent of the allowable catch in SA, including quota held by the Ngarrindjeri community.

"But we will need to leverage everything we can – our 'clean, green' credentials and the Indigenous influence, including ancient recipes and cooking methods such as using hot stones as a cooking medium, are all exciting new concepts to be explored. There are restaurants keen to explore this and it will help us keep the product fresh in the eyes of chefs and consumers. We don't necessarily want it to become mainstream. Our challenge, really, is for pipis to stay an exciting discovery for consumers."

The venture is even looking at introducing the Ngarrindjeri name for pipis, Kuti, which Tom Robinson says might help overcome the upset that many South Australians feel about not being able to label them cockles, which is the common name for the species in SA and also Western Australia.

He says many markets, particularly overseas markets such as China, place a premium on strong brands with an interesting story and this will be the focus of the strategic plan. He points out that Goolwa PipiCo pipis are harvested from the same waters as Southern Rock Lobster, which enjoys an ultra-premium status in Asia, not to mention the equally renowned Southern Bluefin Tuna, abalone, prawns, Pacific Oysters, Yellowtail Kingfish and Yelloweye Mullet.

A clear vision could help to take these South Australian Southern Ocean pipis to the finest restaurants in Australia and the world, with a 'Kuti' branding helping to drive a new seafood narrative that embraces both modern communities and ancient traditions. F

MORE INFORMATION
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FRDC RESEARCH CODES: 2017-051, 2017-086

Below As many as 80 Southern Rock Lobsters were used in a single experiment as part of research into the effects of paralytic shellfish toxins on the species.
Photo: South Australian Research and Development Institute

Joint initiative tackles biotoxins

By **Catherine Norwood**

Three Tasmanian seafood sectors have joined forces with national and international researchers to ensure food safety and develop new strategies to minimise the impacts of toxic algae blooms on seafood supplies

Alison Turnball
Food Safety and Innovation Program Leader, South Australian Research and Development Institute

While different algae and toxins are found in all Australian marine waters, Tasmania is the jurisdiction worst affected to date, thanks to ***A. catenella.***

It was a takeover of sorts, when the team leading a multi-species biotoxin research collaboration moved into the South Australian Aquatic Biosecurity Centre (SAABC) at Roseworthy, north of Adelaide last year.

The team rented out half the centre for 12 months, operating seven days a week to research the effects of paralytic shellfish toxins on Pacific Oysters (*Crassostrea gigas*), Southern Rock Lobsters (*Jasus edwardsii*) and Blacklip Abalone (*Haliotis rubra rubra*).

The work specifically focused on the highly toxic dinoflagellate *Alexandrium catenella*. When this marine algae occurs in extended blooms, as it does in Tasmania, the toxins can accumulate in seafood species exposed to or eating the algae, or through the food chain – for example, when rock lobsters eat affected mussels.

Once the toxins reach beyond a particular threshold in affected species, there is a potential risk that people who eat affected animals could suffer from paralytic shellfish poisoning.

At this point, it becomes a food safety issue, with the potential to jeopardise Australia's international seafood markets. *A. catenella* was not a recognised threat before 2012, when Japan first detected paralytic shellfish toxins in a shipment of Tasmanian mussels, which was traced back to an algal bloom.

On discovering the toxin Japan immediately closed its markets to all Australian bivalves and it took more than six months for New South Wales and South Australia to regain access, although neither had been affected by the bloom. It took three years and multiple investigations for Tasmanian shellfish to re-enter the Japanese market. The 2012 bloom led to a temporary fishing closure along the Tasmanian east coast as a safety measure, and led to a direct loss of $8.6 million for the local seafood industry.

The *A. catenella* toxins are known to affect bivalve shellfish including oysters, mussels, pipis, clams and scallops, and to accumulate in parts of abalone, rock lobsters and giant clams; however, they have not been found at concerning levels in finfish.

Heightened surveillance and new protocols introduced in the years since have helped manage the risk of toxic blooms, which have continued to occur at varying intensities in Tasmania from early winter through spring for up to three months at a time.

These management practices mean that seafood purchased from commercial outlets will be safe to eat.

However, three of Tasmania's leading seafood sectors – oyster, rock lobster and abalone – have come together in this latest collaborative research project based in SA to learn more about *A. catenella* and how they can improve their management strategies.

It has been led by Alison Turnbull from Primary Industries and Regions SA's research division, the South Australian Research and Development Institute (SARDI). Alison Turnbull also leads Australia's SafeFish program funded by the FRDC.

She says while different algae and toxins are found in all Australian marine waters, Tasmania is the jurisdiction worst affected to date, thanks to *A. catenella.*

Joining forces

The project brought together research expertise from SARDI, the University of Tasmania (UTAS) and the Cawthron Institute from New Zealand, and has developed new research capabilities that will support the Southern Rock Lobster, Pacific Oyster and abalone industries into the future.

Below Shellfish Culture Ltd, in Tasmania, will conduct a trial depurating oysters in wet storage – a strategy that could potentially allow harvesting to continue during toxic algae blooms. Photo: Shellfish Culture Ltd

The joint approach to the research provides a successful model that has allowed different industry participants to address a shared concern.

Unspent funds remaining from the Australian Seafood Cooperative Research Centre effectively paid for the hire and operation of space at the Roseworthy biosecurity centre, which is one of the few facilities in the country capable of hosting this type of research.

Industry bodies added their own funds, matched by the FRDC, for specific research within the broader operation of the centre. Contributors included Southern Rocklobster Limited, Abalone Council Australia Limited and the Tasmanian Oyster Research Council, as well as two private oyster producers. All up, the 12 months of research was valued at almost $1 million and is part of a larger, overarching project that includes the New Zealand Rock Lobster Industry Council.

As project lead, Alison Turnbull says it was a challenge to bring together experiments for the three different industry sectors, but all relied on the successful production of large volumes of highly toxic alga, initially sourced from Tasmania. While she took on the rock lobster component, Andreas Seger worked on the alga production and led the abalone experiments, and Navreet Malhi oversaw the oyster experiments.

David Stone and Matthew Bansemer at SARDI Aquatic Sciences provided advice on abalone feed and animal husbandry. Gustaaf Hallegraeff and Quinn Fitzgibbon at the University of Tasmania and New Zealand's Tim Harwood contributed biotoxin and animal physiology expertise to the project.

Southern Rock Lobsters

The research evaluated rock lobster haemolymph, or blood, for testing paralytic shellfish toxin levels, but found this was not a suitable approach. It confirmed that testing the hepatopancreas, the equivalent of the liver, is the only way to accurately assess toxin accumulation, although this process requires dissecting the rock lobster, and five animals are needed for a valid test.

The research found there was no uptake of toxins by rock lobsters from direct exposure to *A. catenella* cells alone. This finding indicates there is no risk of toxin accumulation from bloom-affected seawater used in holding facilities on land, or in fishing vessels at sea, or where animals are held in sea cages in algae-affected waters, as may happen in New Zealand.

Initial findings on animal health showed the toxin had no observable negative impact on the feeding behaviour of the adult male rock lobsters used in experiments. However, Alison Turnbull says further work is needed to evaluate whether there are any effects on fecundity, or on juvenile rock lobsters.

In the laboratory experiments, rock lobsters fed a diet of highly toxic shellfish accumulated toxins at levels exceeding safety standards within four days. While such highly engineered diets are unlikely to occur in the wild, Alison Turnbull says the speed of accumulation has implications for the risk management strategies for the rock lobster sector. Further fieldwork focusing on rock lobsters will continue for another two years, and this has already found that residual traces of toxin remain in rock lobster viscera long after blooms have passed. While the traces of toxin are very low – well below the levels that might affect people eating the rock lobster – further research will try to identify what is causing the continued presence of toxins, and how that might affect the accumulation of higher levels of toxins during an *A. catenella* bloom.

The outcomes for the rock lobster experiments were presented to the Tasmanian and New Zealand industry at the Southern Rock Lobster Trans-Tasman biotoxin risk management workshop earlier this year.

In separate work at UTAS Gustaaf Hallegraeff and Juan Dorantes-Aranda were able to use tissue from the biotoxin project to validate the commercially available Neogen paralytic shellfish toxin rapid test kit for use as a screening tool for Southern Rock Lobster. The kit can indicate within 30 minutes whether the rock lobster hepatopancreas contains toxins at levels high enough to be of concern.

In practice, Neogen kits will allow fishers to sample rock lobsters from specific, potentially at-risk sites, and to wait for an all-clear, or further testing, before continuing to fish. Validation of the test kit also allows for 'proof of absence' testing for the Southern Rock Lobster industry as a whole and will underpin market confidence in the safety of the product.

Executive officer for Southern Rocklobster Limited Tom Cosentino says the research is crucial in ensuring Southern Rock Lobsters remain safe for human consumption and has contributed to risk management and response plans for the industry. "In this case we are actively in the game, instead of playing catch-up on biosecurity, thanks to this collaboration," he says.

Below Andreas Seger drying out toxic feed for the abalone.
Photo: South Australian Research and Development Institute

Pacific Oysters

Previous research has validated the Neogen kit for use with Pacific Oysters, as a rapid and accurate indication of toxin accumulation. There has already been widespread take-up of the kits by producers in Tasmania.

The latest research has developed bulk samples of toxin-affected oyster tissue that will help producers to calibrate their equipment and testing protocols from year to year. Oysters Tasmania chief executive Sue Grau says these tissue samples could also support the industry's efforts to have the Neogen tests approved for some regulatory purposes.

In the latest experiments, Pacific Oysters exposed to highly toxic algae exceeded toxin safety limits within only two days. However, a pilot trial has also successfully shown that oysters could potentially depurate toxins within four days. Sue Grau says the potential for oysters to depurate so quickly is a positive outcome for the industry. It could help individual growers remain in the market and for oysters more generally to maintain market share, which is jeopardised when extended blooms affect long-term product supplies.

Two producers on Tasmania's east coast, ACA Aquaculture and Shellfish Culture Ltd are planning commercial depuration trials this year.

Managing director of Shellfish Culture Ltd, James Calvert, says the business has worked with SARDI to establish a trial using its wet holding facility at Clifton Beach, in south-east Tasmania.

The off-the-shelf recirculation system has a 15,000-litre capacity and can hold up to 500 kilograms of oysters. It incorporates biofilters, with membrane, charcoal and ultraviolet filtration of water drawn from nearby Pipe Clay Lagoon to eliminate any potential contamination.

"We're planning to test biotoxin levels in affected oysters every two days, over three weeks, to see how quickly the toxins are flushed," says James Calvert. The testing will begin as soon as oysters are affected by the next bloom of *A. catenella*. He says this could be at the company's Blackmans Bay lease, which has been closed for up to 11 weeks in previous years as a result of toxic algal blooms. "If a bloom occurs somewhere else though, we're happy to travel to collect those oysters for the trial," he says.

Blacklip Abalone

Experiments involving Blacklip Abalone identified that *A. catenella* toxins are accumulated directly from exposure to toxic algae as well as from consumption of toxic feed, and that the toxins accumulate at higher levels in the abalone foot than the viscera. This finding is the reverse of how abalone accumulates toxins from the less toxic algae *Gymnodinium catenatum*, also found in southern Tasmania.

"Knowing this means that when sampling for *A. catenella* toxins, it could be possible to sample only the foot, rather than the foot and the viscera, which will halve the testing and the costs involved," says Alison Turnbull. "At $500 per test, that's a significant saving for industry.

"We've also identified that processing may be an option, as this involves the scrubbing of the abalone foot, which effectively removes the accumulated toxins in the epipodium tissue on the surface of the foot. It's not the industry's preferred option, but it is an option," she says.

The research finding that toxins accumulate from both feed and direct exposure to toxic algae makes it a potential risk for wild-harvested abalone, abalone aquaculture and live abalone holding facilities that draw water from coastal areas during bloom periods.

Work is now underway at SARDI to use the toxin-contaminated tissues to validate the Neogen rapid test kit as an indicator test for abalone.

Chief executive of the Abalone Council Australia Ltd, Dean Lisson, says understanding how abalone accumulates and depurates the *A. catenella* toxins – and the different chemical components that make up the toxin – is essential in refining the industry's risk management plan.

"Having the joint biotoxin facility meant that we could get this work done much more quickly and effectively than trying to do it on our own.

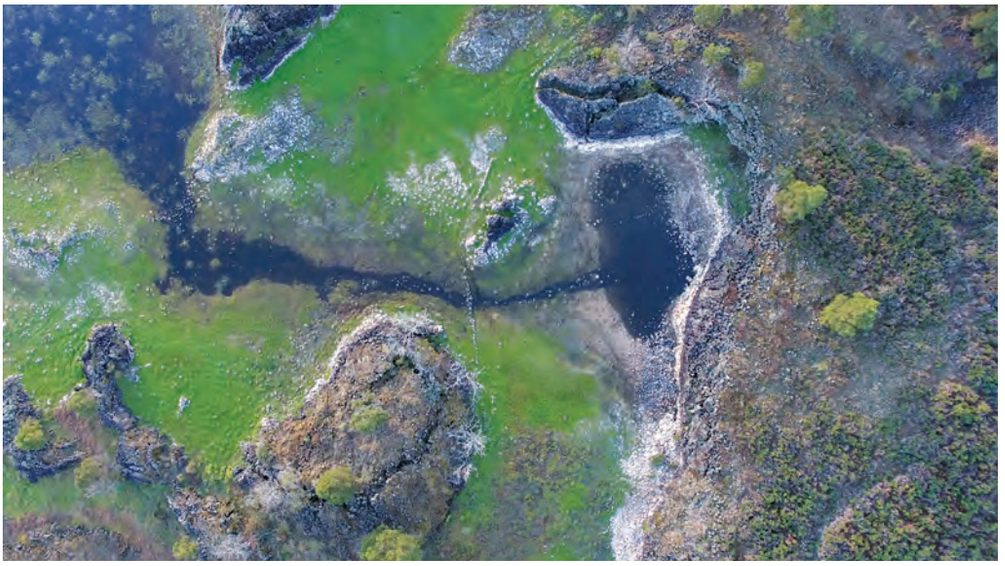
"When there's a bloom of *A. catenella*, we need to know when to close fisheries and for how long. The laboratory experiments have looked at the uptake of the toxins in abalone. Now we are doing further testing of animals from the wild, looking at how long the abalone take to depurate the toxins so that they are safe for human consumption," he says.

Alison Turnbull says the joint approach to the research has provided a successful model that has allowed different industry participants to address a shared concern and will support risk management for the seafood sector nationally.

"Changing ocean currents and environmental conditions, particularly associated with climate change, and transport of algal cysts via ships' ballast waters means that no state is immune to future blooms," she says.

"The knowledge gained can be applied to contingency planning in other states, and the rapid screening processes verified as part of this project, or in related research, are providing effective tools to demonstrate 'free from' status, to underpin confidence in the safety of our seafood and retain access to markets." **F**

Below Tae Rak channel and holding pond



Aquaculture's ancient roots recognised

One of Australia's oldest and most extensive Indigenous aquaculture sites has received World Heritage recognition

By **Gio Braidotti**

A millennia-old aquaculture system set within volcanic lava flows and marshes in Victoria's south-west has joined the Great Barrier Reef, Kakadu National Park and the Sydney Opera House on UNESCO's World Heritage List of sites of significance to all humanity.

Unlike previous Australian listings, however, the Budj Bim aquaculture network is the first to be recognised exclusively for its Aboriginal cultural values.

Created by the Gunditjmara people, the system uses weirs, dams and stone channels – some hundreds of metres long and dug out of basalt lava flow – to divert water, kooyang (Southern Shortfin Eel, *Anguilla australis*) and other fish to holding ponds and wetlands.

The sophisticated engineering means eels and other fish can be ranched and then harvested year-round using woven baskets set as fish traps in gaps in the weirs. Traditionally, excess eels were smoked and traded.

The success of the aquaculture system allowed for permanent settlement, confirmed by the remains of more than 300 round, basalt stone houses also found at the Budj Bim site.

Carbon dating found the settlement and aquaculture enterprise date back an astonishing 6600 years, making it one of the oldest and most extensive aquaculture systems in the world.

The settlement sits within a remarkable landscape that also includes the Budj Bim volcano (Mount Eccles) in the Budj Bim National Park and water flow from Tae Rak (Lake Condah), which are located about 75 kilometres north-west of Port Fairy in Victoria.

Traditional owners of Gunditjmara country were present in Baku, Azerbaijan, when UNESCO made the announcement, adding the Budj Bim Cultural Landscape to the World Heritage List on 6 July this year.

Gunditjmara Elder Denise Lovett said the announcement was a special day in the decades-long quest for recognition.

"This landscape, which we have cared for over thousands of years, is so important to Gunditjmara People," she said. "The decision also recognises Budj Bim's significance to all of humanity. We are so proud to now be able to share our achievements and story with the world."

The FRDC embraces both aquaculture and Indigenous fisheries in its research portfolios and has welcomed the UNESCO announcement.

Managing director Patrick Hone describes Budj Bim as a phenomenal site and its inclusion in the World Heritage List very welcome.

"This is the first listing for an Indigenous cultural site in Australia and with it comes the precedent-setting recognition of Indigenous connection between land and sustainable land use in the creation of the world's oldest continuous culture," he says.

However, he sees many sites across Australia where the observational science of Indigenous fisheries has achieved truly impressive abilities to work with nature to maintain balance over millennia.

Above Gunditjmara land.
Source: The Native Title Tribunal

In the notion of taking only what you need – and preserving what is needed for the future – he sees a principle that is also at the forefront of the FRDC's goals.

"While I celebrate for the Gunditjmara People, I also recognise the significance of Budj Bim in highlighting the need to protect many more Indigenous cultural sites across Australia, especially those related to sea and freshwater country."

The Victorian State Government has invested $13 million to protect the area and develop a world-class tourism destination, with the investment including support for self-determination for the Gunditjmara People via the Gunditj Mirring Traditional Owners Aboriginal Corporation (GMTOAC). F

MORE INFORMATION
www.tunasolutions.com, www.shoretrade.com, www.fergusonaustralia.com

From wetline to online, the digital market takes shape

The business-to-business potential for selling online is showing promise for seafood producers in Australia and around the world

By **Catherine Norwood**

Digital marketplaces, much like their traditional counterparts, can bring together large numbers of buyers and sellers to 'discover' new opportunities and products. But unlike their traditional counterparts, the digital alternative removes the need for the buyers and sellers to be physically present at a specific time and location.

Participants could be based almost anywhere and trading at any time of night or day, coordinating direct delivery of fresh, frozen and even processed product to its final destination.

By reducing the number of times seafood changes hands, these platforms facilitate faster, fresher delivery, which has the potential to improve the final consumer eating experience. Improved traceability, transparency and the prevention of seafood fraud are other potential benefits.

Features that digital platforms may incorporate include confirming the rights of the fisher or seller to sell fish, credit checks on buyers, credit and product insurance, secure payment systems, financing, customs or other regulatory clearances, end-to-end traceability and logistics services to deliver product to the buyer's door. Automation of as many processes as possible is key.

Some of the first commercial digital platforms in the seafood sector, such as FYSH-X in the US, launched almost a decade ago but have failed to gain widespread support. Fishing remains a highly traditional industry built on personal connections from one stage of the supply chain to the next; it has proven difficult to gain traction online.

Digital meets seafood

However, the growing number of digital markets now establishing around the world – including some Australian-based platforms – suggests a step-change may be occurring, with more industry participants taking advantage of digitally mediated opportunities.

Rabobank has valued the global fish and seafood trade at US$153 billion. Estimates for online sales published last year by Russian digital marketplace Yorso suggested that less than 0.7 per cent of this trade is occurring online. However, Yorso's founder, Anton Trantin, says business-to-business online trade is expected to grow by 100 to 300 per cent worldwide in the three years to 2020.

Futurist Brett Wiskar, who presented at an Australian Prawn Farmers' conference last year, says access to new markets is a key benefit to online trading platforms for sellers. He is chief future officer at an international project management company, Wiley, and has been involved in the development of trading platforms himself as digital technologies have matured over the past 20 years.

Digital platforms offer more than just ecommerce ordering and payment programs, although they do incorporate these functions, he says. What they do that is more transformative is build in the capacity to overcome barriers that may otherwise prevent buyers and sellers from entering new markets.

Those barriers could be physical or cultural. For example, fishers may well want to try selling their seafood into new markets, possibly direct to restaurants or overseas. But they may not know how to do this – where to find buyers, how they need to package their product, the availability of cold chain logistics or the paperwork needed.

By connecting buyers and sellers directly, digital marketplaces can remove stages or players in the value chain and create a fundamental shift in the cost of getting a product from its source to a market. Markets that were once inaccessible can be transformed into viable destinations for produce. Furthermore, this can dramatically alter the cost of goods in an existing market, he says.

Dynamic space

Emerging digital seafood marketplaces are dynamic, with several models in the mix. Some offer commissions on trade, fees for service and memberships.

One platform might use anonymous listings and only reveal the parties once the trade is confirmed. Another platform will encourage

Illustration:
Sonia Kretschmar

fishers to brand their product and market their identity to earn premiums for the care they take with their catch.

Some platforms include futures or forward contracts, but others expressly forbid trading any product that is not in the hands of the seller when it is listed. Some are single-destination platforms or single species. Others trade diverse seafood species or across many borders, particularly in Europe. As not all platforms operate the same way, companies using them should do their due diligence to understand exactly how they work – who is responsible for different elements in the transaction, such as transport, and what are the total costs of use.

Australian trade

ShoreTrade is Australia's latest entrant to the digital marketplace, although founder Peter Manettas has been running Manettas Seafood Market as an online consumer-facing business for the past three years.

The new B2B platform launched this year is "an entirely different beast", he says, which aims to provide value to both ends of the supply chain. The business operates on a commission basis and has sellers listing product from Australia and New Zealand. Buyers must be in Australia, but the platform aims to expand this to a range of other countries.

Using the platform's app, fishers can list their catch even as they are returning to shore. Their listing will be pushed to buyers across the country and to an emerging base of international buyers. They can even list product before they have caught it, effectively fishing to order, where they can be certain of their catch.

Buyers could range from restaurants, wholesalers and fishmongers, or even a processer, who can value add in some way and relist the product for sale. The platform integrates logistics, linking in real time to 65 cold freight carriers as well as airlines to organise delivery immediately.

"Each state has its own laws for the sale and delivery of seafood and we've built those laws into the system. From the back end, when we authorise an account, our due diligence includes sighting a fishing licence and incorporating any sales restrictions that might apply," Peter Manettas says.

The process of developing the app, which has taken almost two years, has highlighted possible opportunities to standardise seafood trading laws across Australia, which could improve transparency across the whole industry, online and off. Peter Manettas says improvements in packing materials and processes to hold temperature and maintain product quality could also advance seafood trading in general. "It's something New Zealand is already doing really well."

As not all platforms operate the same way, companies using them should do their due diligence to understand exactly how they work – who is responsible for different elements in the transaction, such as transport, and what are the total costs of use.

In the long term, he says trade data will be combined with seasonal and harvest information to model pricing throughout the year. Once the confidence level in the data is high enough, this information can be made available to fishers to help them plan their fishing effort and income more strategically.

Tuna sales

The other Australia-based platform, TunaSolutions, trades internationally, but only in tuna: Yellowfin, Bigeye, Albacore, Southern Bluefin and Skipjack. Founder Thomas de Kock is a third-generation tuna fisher, originally from South Africa, and says it took two years of research and development to build the TunaSolutions platform, with the assistance of programming experts. →

Having worked in the tuna industry all his life, he says he was familiar with all the steps needed to make a trade work, including the paperwork, and it was a matter of working out how to digitise those processes.

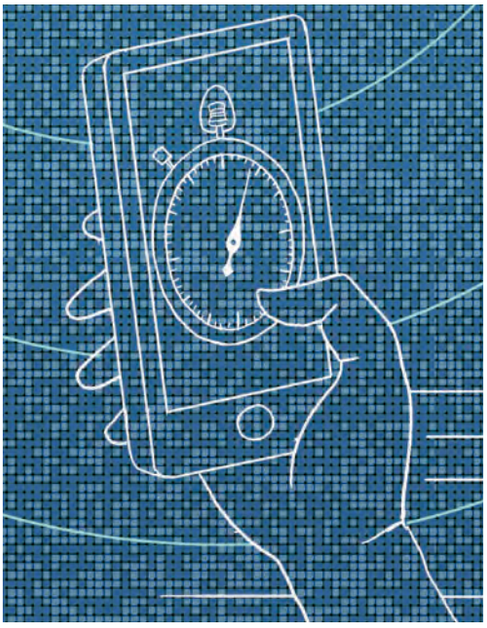
His company initially works with sellers – fishers, exporters and processors – providing training in fish handling and grading techniques to optimise the quality of the product, and establishing processes to meet the standards that buyers can rely on in product listings.

Sellers who cannot meet the platform's basic quality standards for listing are not accepted, although the company often works on longer-term projects to help improve practices, as it is doing in Indonesia.

Thomas de Kock says the right handling practices can increase the value of the product tenfold. For some fishers, this means they can catch fewer fish but still make a good living; the process supports more sustainable fishing and fisheries. The company only works with fisheries where there is good policy and strong regulations to support sustainable management. However, while this approach works for high-value species, it may not apply to volume commodity fishers the same way.

To incorporate full traceability into the system, TunaSolutions has developed and trained fishers to use data capture techniques that do not interfere with fishing operations. This has been possibly the greatest challenge in the whole process, says Thomas de Kock, and smart phones, which most fishers have constant access to, have been crucial in making it happen.

TunaSolutions has sellers in the Maldives, Pacific Islands, the Philippines and Brazil, and



expects Australian fishers will join the platform this year. Diverse international buyers purchase products ranging from the highest-grade sashimi tuna to mid-range quality product for processing. A commission is charged on trades, with fees for services including quality inspections, cold chain storage and logistics management.

Direct-to-consumer challenges

While B2B seafood platforms are still finding their footing, online consumer trading platforms have been growing strongly in recent years. Amazon, Alibaba, eBay, Airbnb, Uber, Menulog, Wotif and Expedia are among the many consumer platforms that are household names.

But when it comes to highly perishable fresh foods such as seafood, logistics that can be trusted remain the fundamental issue for direct delivery to home customers.

Peter Manettas says the online Manettas Seafood Market only delivers within a specific area in Melbourne, Sydney and central New South Wales coast. Different local suppliers in each location are used to pack and deliver orders.

Even giants such as Amazon, which launched AmazonFresh in 2007, have struggled with the problem of delivering perishable food products. While the service offers fresh and frozen seafood among its products, it is only available in limited locations – major cities in the US, England, Germany and Japan.

Australia's major supermarkets Coles and Woolworths have also ventured into the online space with basic order and purchase services in addition to their retail stores, and include shelf-stable, fresh and frozen seafood in their online catalogues.

While 94 per cent of Australian households have bought seafood from 'bricks and mortar' retail outlets during the past year, according to Nielsen Homescan data, only 9.8 per cent of households have bought seafood online, and mostly from the major supermarkets. Supermarket delivery is also not necessarily available to customers in all regions.

In South Australia, Eliza Ferguson at Ferguson Australia says the company has been operating online retail sales for six years with a range of pre-portioned and packaged fresh, frozen and live seafood.

But even with vacuum-sealed product, well-packaged with ice packs and air freighted, delivery to a customer's door has proven particularly difficult. As a result, online orders to destinations outside its home base in Adelaide will only be delivered to airports that offer the correct storage capabilities for chilled or frozen foods. Customers need to collect orders directly from the airport.

While still offering its online service, Eliza Ferguson says marketing efforts today are focused more on increasing the company's products in retail fishmongers and supermarkets, where logistics and quality control can be assured and where people are already shopping for food.

As a business that represents more than 100 fishers, Ferguson is excited about the opportunities of digital wholesale trading. It offers the chance to directly access 'second-tier' buyers such as chefs – ultimately reaching many new consumers in the process. **F**

INTERNATIONAL INITIATIVES

SeafoodX change is a new digital seafood trading platform that launched in Singapore in June 2019. It is an initiative of the country's three main seafood bodies: Punggol Fish Merchants Association, Seafood Industries Association Singapore and Singapore Fish Merchants' General Association. Supported by the government's Enterprise Singapore wholesale digital strategy, SeafoodXchange is expected to reduce the costs involved in seafood trading by 10 to 20 per cent.

Other recent commercial launches include ShoreTrade (Australia), Seafood Souq (United Arab Emirates), Marine Fish Trade (Norway) and Seafoodportal (Norway).

They join longer-established platforms that include Syunzai Circulation System Service (Japan, 2009), Yorso (Russia, 2014), Gfresh (China, 2015), InterFishMarket (Switzerland, 2016), ProcSea (Europe, 2016) and TunaSolutions (Australia, 2017).

In Norway, the industry-operated Norges Sildesalgslag, or centralised electronic auction system for the trading of wild-harvested pelagic fish, has been operating for decades (see story page 30).

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FRDC RESEARCH CODE: 2016-261

Photo: 123rf

Prawn 'fingerprints' prove provenance

By **Catherine Norwood**

A new database that identifies the make-up of different Australian wild and farmed prawns at an atomic level will provide all players in the supply chain with confidence in the integrity of a homegrown product

Janet Howieson
Microbiologist, Curtin University

A three-year research project nearing completion has successfully mapped and catalogued prawn profiles for all of Australia's main commercially harvested prawn species, both farmed and wild-caught.

Australian prawns are part of a very exclusive club and membership can now be scientifically and independently verified by what amounts to a prawn's elemental composition, or 'fingerprint'.

Genetics isn't enough to be recognised as a member of the all-Australian club. But the elements from the specific environment in which Australian prawns grow create a highly distinctive and traceable profile in the prawn, referred to as a 'chemical fingerprint'.

A three-year research project nearing completion has successfully mapped and catalogued these profiles for all of Australia's main commercially harvested prawn species, both farmed and wild-caught. With 98 per cent or greater confidence in the identification tests, if a prawn doesn't match a profile in the database, then it is not likely to be Australian.

The project was led by Janet Howieson at Curtin University, Western Australia, and funded jointly by the Australian Council of Prawn Fisheries, the Australian Prawn Farmers Association and the FRDC.

Proof of provenance

Forensic provenance and supply chain integrity expert Source Certain International (SCI) was commissioned to carry out the analysis using its TSW Trace™ system. This determines the chemical composition of the product and covers most elements in the periodic table.

The company provides proof of provenance services for diverse products – from gold, diamonds, cosmetics and cannabis to honey, eggs, meat, fish and now prawns. Managing director Cameron Scadding says this project has positioned the Australian prawn industry as a global leader in tackling seafood substitution.

In all, more than 12,000 prawn samples collected from 435 locations were analysed to develop a database of prawn profiles from 35 wild-harvest fisheries and 17 prawn farms across Australia.

"There were multiple samples from some fisheries, collected from different vessels," says Janet Howieson. "We also had samples collected in different years, which has allowed us to verify the stability of the profile over time. And we also analysed both raw and cooked prawns."

Consumer confidence

Matt West, Australian Prawn Farmers Association president, says the technology will give consumers certainty that if the product says 'Australian prawns', then they are getting Australian prawns.

The project also supports the industry's $1.8 million collective investment in the 'Love Australian Prawns' marketing campaign over the past six years, which is aimed at encouraging consumers to buy Australian prawns.

Annie Jarrett, chair of the Australian Council of Prawn Fisheries, says robust traceability and provenance systems are increasingly important to consumers. "Our industry wants to be able to scientifically verify the provenance of Australian prawns at any point in the supply chain globally," she says.

Janet Howieson says prawn substitution losses in Australia have not been quantified. However, applying the international estimate of 30 per cent of product misrepresented suggests significant revenue is likely to be taken by unscrupulous operators, at the expense of Australian businesses.

The final stage of the prawn project is considering how the database will be used in the future. Possible options include industry bodies commissioning random in-market sampling for analysis against the database, or industry stakeholders commissioning their own confidential sample analysis. F

Congress to offer global insight and connections

Australia is preparing to host one of the largest gatherings of fisheries stakeholders to discuss the latest advances in fisheries worldwide, with a focus on sustainability and collaboration.

By **Peter Horvat**

More than 1500 stakeholders, including researchers and representatives from key industry sectors and marine science agencies, will come together for the 8th World Fisheries Congress (WFC2020) to be held in Adelaide from 11 to 15 October next year.

The WFC2020 will provide an opportunity to connect and collaborate with fisheries experts from across the world, offering a platform to discuss key developments and concerns facing the fishing industry across the globe. It is held every four years and will be one of the largest displays of fisheries science to be held in Australia.

Austral Fisheries is a major sponsor for the event and CEO David Carter says the congress will provide an important meeting place and forum to learn about the global challenges facing the industry, as well as opportunities for growth, innovation and change.

The theme for WFC2020 is 'Sharing our oceans and rivers – a vision for the world's fisheries', and it encompasses the world's commercial, recreational and Indigenous fisheries, with a focus on four key areas:

- sustainable fisheries (assessment, regulation, enforcement);
- fish and aquatic ecosystems (biodiversity, conservation, ecosystem function);
- fisheries and society (contributions to sustainable development); and
- the future of fish and fisheries (innovations in fisheries).

The aim of the event is to foster cooperation and engagement across all sectors. It will deliver a dynamic and contemporary program that will test current thinking about how best to enhance global fisheries and address the challenges of sustainability and maintaining prosperous fishing communities.

Presentations will provide insight on developments needed over the coming decades to ensure the world's oceans, estuaries, lakes and rivers are managed sustainably for the benefit of current and future generations.

Registrations open in February 2020, with early bird registrations closing June 2020. Student registrations will also be available. F

To keep abreast of key dates and announcements visit www.wfc2020.com.au

GET INVOLVED

The World Fisheries Congress in 2020 (WFC2020) will bring together a large and diverse international audience, representing the many industries and scientific disciplines that work in marine or aquatic environments.

Congress organisers are calling for abstracts and trade stands to bring to this audience. Attendees from around the globe will include fisheries scientists and managers; commercial, recreational and Indigenous fishers; students and educators; and other interested stakeholders.

Call for abstracts

Take the opportunity to be part of the WFC2020 by submitting an abstract. With innovative sessions, symposia and workshops led by industry, researchers and management, as well as student-led sessions, all are encouraged to submit.

"It would be great to see students and early career researchers well represented at the WFC2020, bringing a fresh perspective to discussions, providing an opportunity to develop networks and promoting knowledge transfer to the next generation of leaders," says Gavin Begg, Chair, World Fisheries Congress 2020.

The call for abstracts will open in October 2019. **More information can be found at https://wfc2020.com.au/program.**

Trade exhibition

The WFC2020 will feature one of the largest fisheries trade exhibitions in Australia, showcasing businesses on the world fisheries stage.

It also provides an opportunity for sponsors to deliver their messages directly to stakeholders and demonstrate their support for aquatic research and industries.

To be part of the WFC2020 as a sponsor or exhibitor, please email: Sheila.Woodhart@aomevents.com.

Fishy film festival for kids

From fish and chips to film festivals, new initiatives offer opportunities to engage with more people on the issue of how best to share and conserve our marine and freshwater resources

By **Annabel Boyer**

In the digital age, competition for audiences' attention is fierce and finding ways to engage time-poor, information-rich audiences with complex subjects is a challenge science communicators regularly grapple with.

For this reason science organisations such as the FRDC are always on the lookout for novel ways to engage audiences in the issues they deal with and the research they fund.

The national fish and chips competition, run by the FRDC for the last three years, is an example of one such initiative.

The FRDC has used the fish and chips competition as a vehicle to deliver information about fisheries sustainability and research to those engaging with the competition, be they lovers or makers of fish and chips.

By harnessing participants' competitive spirit, creative competitions can also be a great means of connecting with and educating participants and audiences about particular issues.

Film inspiration

Science-based organisations are similarly engaging people, using events such as film festivals. This year Questacon, the National Science and Technology Centre, is running a competition for films that showcase science in Australian Indigenous languages, to celebrate the International Year of Indigenous Languages. Since 2016 the Australian Society for Fish Biology has run successful video competitions for students and early career researchers to showcase their work using film and animation.

In the UK, Seafish ran a project called Captain Catch's Silent Film Festival in 2016.

It sent professional film crews to capture the creativity and enthusiasm of five primary school classes from around the UK to highlight topics such as safety at sea, seafood sustainability and the health benefits of eating fish. The result was an incredible learning opportunity for the students involved both in filmmaking and in the subject matter of the films. The Captain Catch's Silent Film Festival playlist can be viewed on YouTube.

Inspired by these ventures, the FRDC is planning a short film festival in conjunction with the World Fisheries Congress (WFC2020) to be held in Adelaide in October 2020. It will provide a unique opportunity to focus a global conversation on fisheries and the role they play in the lives of millions of people.

The competition will encourage schools from around the globe to develop and submit a short film of one to two minutes, which engages with the WFC2020 theme of 'Sharing our oceans and rivers – a vision for the world's fisheries'.

While the finer details of the competition are still being developed, the films will allow students to engage with the congress's fisheries-related themes (see page 22) and to illustrate those themes in their own communities. The winning entries will be screened at the WFC2020.

The FRDC will work with partners in Australia and overseas to develop the film festival concept, the judging framework and support materials such as how-to guides. It will also promote the film festival, and organisers are keen to hear from potential sponsors, contributors or anyone who would like to be involved.

For more information contact the FRDC's general manager communications, trade and marketing, Peter Horvat, peter.horvat@frdc.com.au

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FRDC RESEARCH CODE: 2017-158

Below Fishing boats in Hobart harbour.
Photo: Shutterstock

Supported by society

By **Annabel Boyer and Gio Braidotti**

A deeper understanding of societal support can provide the fishing and aquaculture industry with a greater chance of achieving the outcomes they want

Kirsten Abernethy
Karen Alexander
Researchers

"A fishery or aquaculture operation has to actively promote its sustainability and its products, whether that is through the media or directly with stakeholder groups, to make a difference in the level of support."

If having the support of your community could be made to formula, what would the ingredients be? A pinch of visibility, a dash of positive media coverage and half a cup of social capital, perhaps?

Unsurprisingly, the answer is not that simple and while a formula would be nice, in reality the answer is rather more complicated. Instead of prescribing a formula, a recently completed FRDC-funded project, 'Determinants of socially-supported wild-catch fisheries and aquaculture in Australia', has sought to broaden the understanding of what securing societal support – or as many in the fishing and aquaculture industry would understand it, social licence to operate – really entails.

Researcher Karen Alexander says the aim was not to prescribe what people should or shouldn't do. "Rather, it is very much about providing the building blocks for a better understanding of the basis of societal support," she says.

The project was undertaken by marine social scientists Karen Alexander from the Institute for Marine and Antarctic Studies (IMAS) at the University of Tasmania and Kirsten Abernethy of Sea Change Consulting in Port Fairy, Victoria.

It was commissioned as part of the FRDC's Human Dimensions Research (HDR) Subprogram, which oversees the inclusion of social and economic dimensions for all FRDC research proposals, basically broadening the context in which problems are defined and solved.

Marine social scientist Emily Ogier, who is based at the University of Tasmania and who coordinates the HDR Subprogram, says the project will allow for gaps and issues to be more effectively identified, providing a clearer pathway for research investment when tackling what are often wickedly complex issues.

"Identifying the determinants is a pivotal moment for the subprogram," she says. "It means we can be more systematic about what RD&E we invest in to address declining societal support at a time when fisheries and aquaculture are making greater efforts to be more sustainable."

Influencing factors

In order to identify common factors or determinants, the researchers conducted a comparison of case studies that demonstrated societal support, or the loss of it – two of which were representative of wild-catch fisheries and two which represented aquaculture.

While there were differences between wild-catch fisheries and aquaculture, Karen Alexander says that the huge number of commonalities across all four case studies was crucial to the identification of viable determinants. "The fact so many similarities came up across four case studies is one of the core strengths of this study," she says.

Out of this process the researchers identified 16 influencing factors or determinants, which were then combined into the following groups:

- the behaviours of the people working in and representing the fishery or aquaculture farms;
- how industry builds trust with groups they need support from;
- the ability of industry to have influence over how they are perceived; and
- the context or situation they are operating in.

The research revealed some of the complexity involved in achieving societal support and why it is difficult to take a prescriptive, one-size-fits-all approach. For example, researcher Kirsten Abernethy says it is important to recognise that societal support is dynamic. "It is not something that you simply have or don't have. Some groups of people will support a fishery or aquaculture business and others won't, and their level of support can waver and change over time."

The project also revealed that building societal support takes time, is difficult to build in times of crisis and can be lost quickly.

The context for every fishery and aquaculture farm also varies and often there may be parts of a situation that are beyond the control of an operator or business. This could include politics or past experiences with fishing and aquaculture. But Karen Alexander says even in these challenging circumstances, there may be some action that can still be taken.

One solution is, where possible, to call on relationships with stakeholders (including potential adversaries) that have been developed genuinely, over a long period of time. Strong relationships were found to have cascading effects, with stakeholders then spreading positive stories about the fishery or aquaculture activity.

Controlling perceptions

Strong relationships can also be an important tool in relation to how an industry or business is perceived. Kirsten Abernethy says for wild-catch fisheries, actually seeing how the industry fishes, as well as the responsible nature of fishing methods, were identified as being important for maintaining a connection to the local community and gaining its support. Otherwise the fishery is invisible.

On the other hand, the research found that for fish farms, sometimes considered "a blight on the landscape", this kind of physical visibility can be detrimental to building support.

What is clear from these contradictory examples is that fishing and aquaculture operators need to understand the mechanisms that influence how they are viewed and take control of that space. In the same vein, being sustainable or having a great local product is often not enough to build support, says Kirsten Abernethy.

"A fishery or aquaculture operation has to actively promote its sustainability and its products, whether that is through the media or directly with stakeholder groups, to make a difference in the level of support.

WHAT IS 'SOCIETAL SUPPORT' FOR FISHERIES AND AQUACULTURE?

Researchers involved in the project 'Determinants of socially-supported wild-catch fisheries and aquaculture in Australia' drew on expert advice and published works across diverse sectors to develop the following working definition of 'societal support'.

Societal support is a state of acceptance, approval or assistance for fisheries and aquaculture activities granted by stakeholder groups. It is located on a gradient from a low to high level of support.

More specifically, societal support is:

- rooted in the beliefs, perceptions and opinions of stakeholders about a fishery or aquaculture activity;
- perceived differently by separate stakeholder groups, and these groups can grant varying levels of support for a fishery or aquaculture activity;
- not necessarily consistent across geographical scales, and may differ at local, regional and national scales;
- dynamic and changes over time as beliefs, perceptions and opinions are subject to change. Societal support can be slow to gain but lost quickly; and
- determined by the:
  - → context that surrounds the fishery or aquaculture activity and the external circumstances at the time;
  - → behaviours, practices and actions of the people within the fishery or aquaculture operation while fishing or farming;
  - → building of trusting relationships and meaningful engagement with stakeholder groups; and
  - → ability of the people within the fishery or aquaculture operation to have influence with stakeholder groups.

"It's ultimately about building trust, not just as an individual operator or business, but also as an industry," Karen Alexander says. "Being honest, transparent and reliable is really important."

From problems to solutions

From here on, the HDR Subprogram steering committee, which includes eight fisheries and social science experts, will work to build the determinants into future FRDC projects.

Emily Ogier says, looking forward, the subprogram will make the research outcomes accessible to the industry in the form of a self-assessment checklist, which will be refined and tested with industry groups before being formally published. The goal is to help industry participants self-diagnose and understand where they find themselves in relation to societal support.

"We want to move beyond identifying problems and start having positive impacts on outcomes," she says, "with a range of solutions available to better support people in fisheries."

Already in the pipeline is a new project about how to evaluate community engagement as it takes a pragmatic look at how support in the community can be improved.

The FRDC has created a dedicated Building Community Trust webpage that provides access to tools and resources to help Australian fisheries and aquaculture operators take action to improve levels of societal support. This includes resources developed by the FRDC and other stakeholders. **F**

Visit www.frdc.com.au/Issues/Building-Community-Trust

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Beyond fish fingers

Value-added products provide pockets of growth for fish and seafood, tapping into retail produce convenience trends

By **Melanie Norris**
Senior manager, Fresh Analytics team, Nielsen

Consumers are increasingly demanding easy-to-use food options that can quickly create a healthy meal. This trend has translated into the availability of more convenience or value-added fresh and frozen food products.

In the produce department, for example, there has been a rise in the number of salad bowls and kits, and pre-prepared fruit and vegetables such as zucchini spirals and cauliflower rice. In the meat department, shoppers can choose between kebabs, crumbed or marinated, slow-cooked or pre-cooked protein options. Ready-made meals in the freezer enable shoppers to have a meal on the table in minutes.

So how does seafood compare in the area of convenience and is there an opportunity for seafood producers to tap into this growth trend further?

Nielsen Homescan defines value-added or convenience food options as any products that are marinated, crumbed, cooked, ready-to-cook or come with a sauce. Data is collected for both the fresh and frozen value-added or convenience categories.

Nielsen Homescan indicates that these 'convenience' categories are consistent pockets of growth pointing to a positive outlook for seafood producers looking to take advantage of this space.

Over the past year (to 15 June 2019), a third of Australian households have purchased value-added fresh fish and seafood and this number has increased by three per cent compared to a year ago. Value-added products in fresh fish and seafood (excluding smoked) such as Almare Garlic Prawns or John West Lemon and Herb Salmon make up 20 per cent of the fresh fish and seafood category.

Like other fresh categories, value-added seafood is a key pocket of growth within the fish and seafood category with increased spending of 11.5 per cent over the past year. Fish and seafood also have more value-added products than other protein options. Only 14 per cent of fresh chicken is considered value-add compared to 20 per cent of fresh fish. (See Figure 1.)

While convenience options are a burgeoning category in the fresh department, frozen fish and seafood products have long had an association with ready-to-cook options. Fish fingers have been on the market for a long time – they were and still are considered a convenient, go-to option for a child's meal. In frozen fish and seafood, more than two thirds of the products are value-add. Frozen value-added fish and seafood is a relatively mature category and as such, growth is modest. The value of sales remained relatively stable, with 2.8 per cent growth.

So where do the opportunities lie for Australian seafood producers and which areas are ripe for innovation and resources?

Key convenience consumers

When we break down the data into different demographic groups a number of key consumer groups emerge. Senior couples, for example, are key consumers of quick and easy value-added fresh fish and seafood options, accounting for more than a third of spending and 21 per cent of the growth.

Seafood marketers and product developers should also take note of independent singles – households that consist of one adult 35 years old or more and no children. This group may prefer not to cook from scratch for one person and are attracted to pre-prepared, convenient options. While this group represents only 17 per cent of buyers, they contributed 24 per cent of increased spending on value-added fresh seafood during the past year.

Value-added frozen products continue to resonate with families looking for easy dinner options. Families purchase nearly a third of all frozen value-added fish and seafood. However, independent singles and senior couples are driving the dollar growth in this category. (See Figures 2 and 3.)

US trends

Many of the food trends we see in Australia follow those of the US, which suggests there is potential for more growth in value-added fresh seafood in the Australian marketplace.

In the US, this category represents nearly a third of total seafood and the value is growing at a rate of 4.8 per cent (52 weeks ending February 2019). For the past four years Atlantic Salmon, prawn and crab consistently held the top three positions in the US fish and seafood category. Value-added products make up a significant proportion of both dollar sales and growth for all three species. For fresh Atlantic Salmon, value-added products make up a third of spending, driving more than half of the growth seen in the past year. Cedar-planked salmon is trending and has potential for the Australian market where barbecues are a summer staple. For fresh prawns, value-added products make up half of all purchases and accounted for nearly a third of growth in dollars spent.

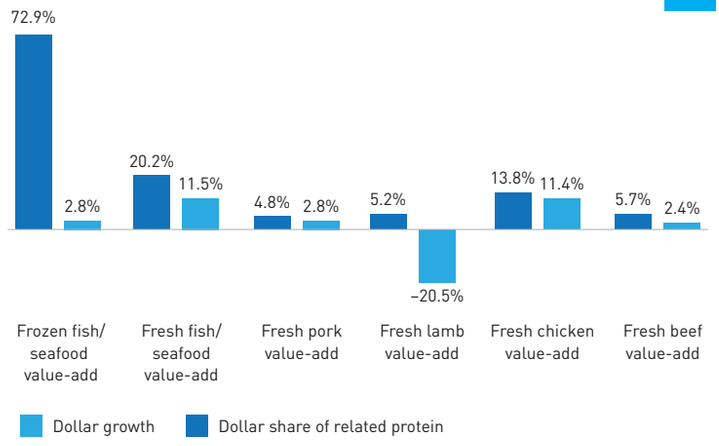
The strong performance of the value-added seafood category in the US highlights that Australia has room to grow in this area and is a clear opportunity for local producers to increase the value of their products here.

Supermarkets dominate

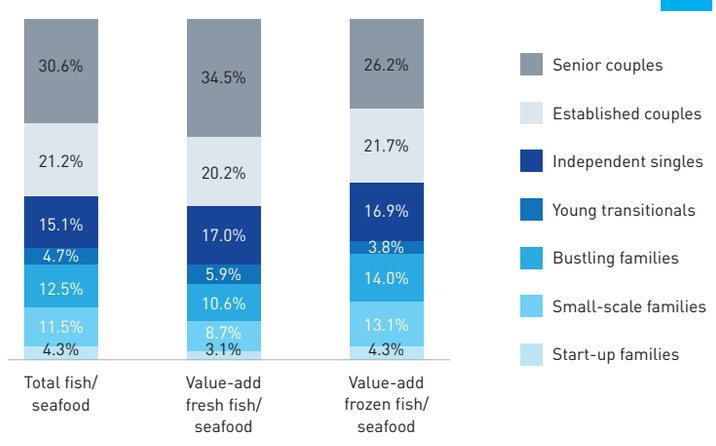
Supermarkets make up 80 per cent of food purchases in Australia. As shoppers continue their quest for maximum convenience,

Source: Nielsen Homescan 52 weeks to 15/06/19

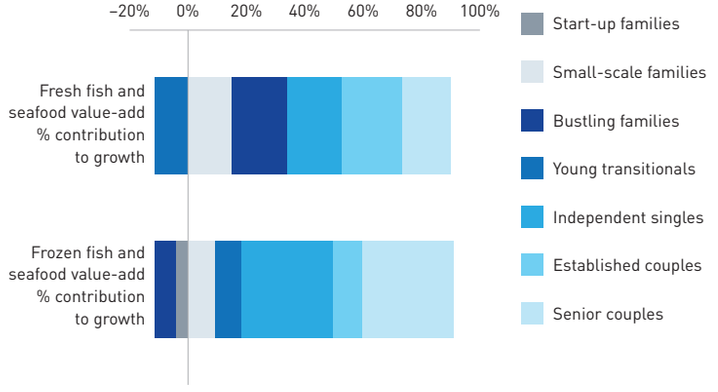
VALUE-ADDED MEAT PROTEIN SHARE OF SPENDING AND GROWTH 1



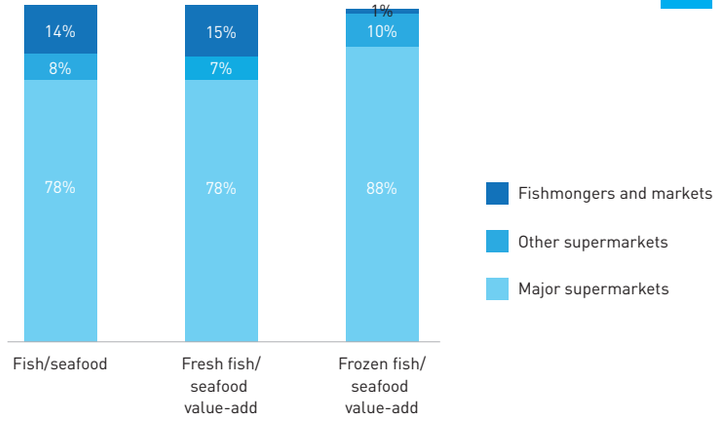
SHARE OF SPENDING ON SEAFOOD BY DEMOGRAPHIC GROUP 2



CONTRIBUTION TO GROWTH IN SPENDING ON VALUE-ADDED FISH AND SEAFOOD BY DEMOGRAPHIC GROUP 3



SHARE OF SEAFOOD SALES BY RETAIL GROUP 4



NIELSEN HOMESCAN HOUSEHOLD CATEGORIES

Start-up families: Households with oldest child < 6 years
Small-scale families: Households with oldest child 6–11 years
Bustling families: Households with oldest child 12–17 years
Young transitionals: Adult households (no children < 17 years), head of household < 35 years
Independent singles: 1-person adult household (no children < 17 years), head of household > 35 years
Established couples: 2 or more adults (no children < 17 years), head of household 35–59 years
Senior couples: 2 or more adults (no children < 17 years), head of household ≥ 60 years

major supermarkets have also become the dominant place for purchasing value-added and convenience seafood products.

Major supermarkets make up 78 per cent of fresh value-added fish and seafood sales and 88 per cent of frozen value-added seafood sales. (See Figure 4.)

Online frontier

Online food shopping is making life easier for many shoppers in Australia and is an area where fresh channels are lagging behind packaged goods.

However, China, one of our largest export markets, demonstrates that growth is also possible in this space. In the past year, 54 per cent of online grocery shoppers in China bought fresh foods, compared with 20 per cent in Australia.

Fish and seafood are less likely to be purchased online than other products. In the past year, only seven per cent of Australian households purchased fish and seafood online, and 40 per cent of this was frozen value-added fish or seafood. These products are given an edge in the online space with the use of protective packaging and portioned amounts that help guide shoppers' selections.

Increasing fresh fish and seafood sales online requires building confidence and trust in the online purchasing process. Enablers such as money-back guarantees or free delivery, as well as innovation in the protective packaging space to safeguard fresh produce, may all help.

Giving shoppers the confidence to purchase value-added fish and seafood products from any channel could help drive sales and consolidate fish and seafood in consumers' minds as a quick, healthy and convenient meal. F

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FRDC PROJECT CODE: 2018-106

Photo: Shutterstock

Sea alert systems assessed

By **Catherine Norwood**

Preparation that includes both emergency beacons on vessels and weather-related risk management training is highlighted in a new report on safety for commercial fishers

Geoff Diver
Consulting marine scientist,
Diversity Sustainable Development

Research shows that EPIRBs remain the best emergency alert system, particularly with new regulations introduced in 2018 that require relevant vessels to fit float-free EPIRBs by 2020.

Emergency beacons are essential to safety at sea, but back-up monitoring systems and improved training, including a better understanding of weather terminology, could improve the likelihood of fishers coming home safely.

These are among the recommendations from fisheries consultant Geoff Diver in his report *Identifying electronic platforms to increase safety at sea in the Australian commercial fishing fleet*.

Funded by the FRDC, the investigation had its genesis in the loss of life at sea in the Australian fishing industry, in particular the *FV Dianne*, lost in Queensland in 2017 and the *FV Returner*, lost in Western Australia in 2015. A total of nine people died in these two incidents.

Geoff Diver says some family members of the crew who died have since advocated for the use of vessel monitoring systems (VMS) as an emergency alert alternative to mandatory emergency position indicating radio beacons (EPIRBs). Both the *Dianne* and the *Returner* were fitted with EPIRBs, but neither was triggered as the vessels foundered.

Despite this, his research shows that EPIRBs remain the best emergency alert system, particularly with new regulations introduced in 2018 that require relevant vessels to fit float-free EPIRBs by 2020. These are automatically triggered at depths of two metres of water, unlike the previous model, which needed to be activated manually. EPIRBs are connected directly via satellite to search and rescue authorities, which respond immediately when an alert is triggered.

Back-up systems

VMS systems and automatic identification systems (AIS) are required by some fisheries managers to monitor fishing activity. Their signal does not connect directly to emergency services, but goes to a third party, the authority or monitoring agency.

VMS and AIS signals may not be continuously monitored, which could lead to delays between signals being lost and action being taken to investigate. In the case of the *Returner*, in WA, all forms of electronic signals had been lost for five days before a search was launched.

For this reason, Geoff Diver says, VMS or AIS are less suitable as a primary distress signal. However, they could be a valuable back-up system to help locate vessels more quickly in emergency events.

He says the loss of a VMS or AIS signal does not immediately represent an emergency. A vessel may have temporarily lost power, or it could be in dock for repairs, or for the off-season.

However, an alert that identified the loss of a signal sent to the management agencies could then allow services such as the water police to be notified and to track down a vessel, ruling out an emergency.

He says this approach could work for all fisheries management agencies that use VMS or AIS tracking. However, there are also resourcing and data privacy issues that management agencies would need to consider. In the case of AIS, there is no ongoing formal monitoring of these signals.

His recommendations also include improved training for the crew on vessels, including induction for new crew and passengers on the location of all safety equipment, including EPIRBs, and how and when to use the equipment.

Weather alerts

Unfavourable weather conditions were identified as contributing to the loss of both the *Dianne* and the *Returner*, and Geoff Diver has included several recommendations on this issue.

He was assisted by Lucie Blom from the Bureau of Meteorology's (BOM) Weather and Marine Forecast Services, who says the BOM is keen to help people make better use of the information it has available and to work with the fishing sector to improve its services. These include:

- coastal waters forecasts and wind warnings;
- MetEye detailed graphical forecasts;
- tidal predictions;
- sea temperature and currents;
- interactive weather and wave maps;
- high sea forecasts and warnings; and
- MarineLite, a marine forecast and warning webpage tailored for use in offshore areas with low bandwidth.

These services are provided via digital channels, as well as on satellite and marine radio.

Lucie Blom says the BOM works closely with the Australian Maritime Safety Authority AMSA to improve access to and use of marine weather services. This includes attending AMSA's Domestic Commercial Vessel and Fishing Industry Advisory Council meetings.

Among recommendations in Geoff Diver's report is continued liaison with the Australian fishing industry, AMSA and the BOM to develop a system for communicating information about rapidly deteriorating, localised weather events.

Lucie Blom says the BOM works continually to improve weather services. However, it also wants to help mariners be better prepared by making greater use of services already available.

Improving knowledge about how to use weather information in decision-making will allow skippers to avoid dangerous conditions when possible, and to be better prepared if conditions do deteriorate. This could include incorporating BOM services into formal weather risk management plans for specific vessels.

Other weather-related recommendations in the report include:

- enhancing training packages such as SeSAFE to understand the weather terminology used in forecasts and warnings;
- distributing the information packages available on the BOM's website outlining the relevant services for mariners and how to use them;
- developing weather-risk matrixes that fishing operations on shore and at sea can use to make weather-related operating decisions; and
- allowing all crew members to contribute to decisions if there are concerns with weather and sea conditions while at sea. **F**

UPDATE YOUR DETAILS

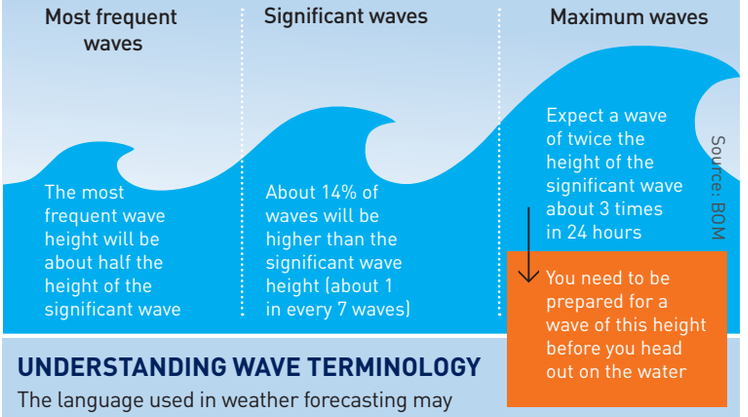
The owners of Emergency Position Indicating Radio Beacons (EPIRB) are urged to review and update the contact details for their beacon to ensure they are correct.

Visit the AMSA website at

http://beacons.amsa.gov.au/registration

WAVE HEIGHT

It is normal for waves to vary in height from one to the next. To give you an idea of the range of waves to expect at a given time, the Bureau of Meteorology provides the significant wave height in its marine forecasts.



UNDERSTANDING WAVE TERMINOLOGY

The language used in weather forecasting may seem relatively general, but in practice, the terminology has clearly defined meanings that can be applied to evaluate a specific vessel's ability to remain at sea.

The Bureau of Meteorology provides forecasts of wave (sea and swell) heights in metres. Wave heights describe the average height of the highest third of the waves (defined as the significant wave height – see diagram above). It is measured by the height difference between the wave crest and the preceding wave trough.

KING or **ROGUE WAVES** are waves greater than twice the total wave height. One of the ways these very large waves occur is when ocean currents run opposite to the prevailing sea and swell, and waves overrun each other. This generates steep and dangerous seas.

SEA WAVES are generated by the local prevailing wind. Their height depends on the length of time and speed the wind has been blowing, the fetch (the distance the wind has blown over the water), and the water depth. They may also be referred to as **seas** in marine text forecasts and **wind waves** in map displays.

SIGNIFICANT WAVE HEIGHT is the statistical basis for all wave heights presented in text forecasts and map displays. Wave heights vary over time. The statistical definition is calculated as the average height of the highest one third of the waves experienced over time.

SWELL WAVES are the regular, longer-period waves generated by distant weather systems. They may travel over thousands of kilometres. There may be several sets of swell waves travelling in different directions, causing crossing swells and a confused sea state. Crossing swells may make boat handling more difficult and pose heightened risk on ocean bars. There may be swell present even if the wind is calm and there are no sea waves.

TOTAL WAVE HEIGHT is the combined height of the sea and the swell that mariners experience on open water. It may also be referred to as the **combined sea and swell** or **significant wave height**. The probable maximum wave height can be up to twice the total wave height.

WAVE LENGTH is the average distance between crests (or troughs) of waves.

WAVE PERIOD and **SWELL PERIOD** is the average time between crests (or troughs) of waves. The larger the time difference, the greater the amount of energy associated with the waves or swells.

MORE INFORMATION
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FRDC RESEARCH CODE: 2015-209

Cultural exposure sparks new ideas

Travel bursaries have provided the opportunity for young seafood leaders to bring home new ideas and inspiration to address local industry issues

Story **Annabel Boyer** and **Catherine Norwood** Photos **Peter Horvat**

Below Tour group with Magner Ottensen at the Skjaergardsfisk Visningssenter (Salmon Discovery Centre) at Marøy, Norway.

It's hard to grasp the sheer volume of seafood traded at international ports when you're accustomed to localised operations in Australia, says Toni Clark, who is operations manager for Petuna Sealord Deepwater Fishing based in Launceston.

As an FRDC bursary recipient, she joined a delegation to Europe and the Seafood Expo Global in Brussels May of this year, but her observation comes from the group's pre-expo visit to the fish markets in Bergen, Norway.

"In Norway, they are dealing with trawlers that could be unloading our entire year's catch all in one day. The logistics of unloading and selling those volumes of seafood is mind-boggling to me," she says.

Others joining the eight-day trip were Prue Spence Davies, a commercial fisher from northern Australia; Thomas Moyle, business development manager for Mainstream Aquaculture Group; and Daniela Schwarz, the supply and national wholesale manager for Blue Harvest. The four bursary recipients were selected as young leaders taking part in the 2018 National Seafood Industry Leadership Program (NSILP).

They were accompanied by the FRDC's general manager of communications, trade and marketing, Peter Horvat, and Allen Haroutonian from X-Lab Ventures, which runs the FRDC's Fish-X innovation program.

Norway

The tour kicked off with four days in Norway, including a wander through the Bergen fish market before the group headed to the Institute of Marine Research to meet with Geir Huse, the research director for marine ecosystems and resources (www.imr.no/en). He provided an overview of reform in Norway following overfishing in the early 1990s. The Norwegian industry is now focused on maintaining sustainability credentials through innovation and research.

> "I am grateful for the opportunity to have attended the tour and expo. Our group included people who had different perspectives and that was also a valuable part of the trip." Toni Clark

Centralised auctions

Liv Holmefjord, the Norwegian Directorate of Fisheries (www.fiskeridir.no), outlined the long history of the Norges Sildesalgslag or Norwegian Fishermen's Sales Organization (www.sildelaget.no/en/fisheries/). It provides a centralised auction point that is owned and operated by fishers to sell fish on a first-hand basis to wholesale buyers.

Information about the vessels' landing catch, where it was caught, species, port location and quantities are included in the auction information. Silent bids are collated and the highest bid for any given listing wins on the day. The sales system also makes it possible for Norwegian

Fisheries to harness an incredible amount of data about what is being caught, where and by whom, as well as market data, giving it an almost real-time perspective on catches and sales.

The group met with Hallvard Møgster, an elder statesman of the Norwegian fishing industry who helped to build one of the first purse seine vessels targeting Southern Bluefin Tuna in Australia, the *Maria Luisa*. Hallvard Møgster provided a fisher's perspective on the changes in the Norwegian industry and the operation of the Norges Sildesalgslag centralised auction system.

Toni Clark says she can see the benefits of the auction system for Australia, with greater transparency on the catch and clearer pricing information. But she says Australian fishers may not want to share the same level of data. "The Norwegian system started almost 100 years ago and has been refined over that time, so the fishers there are comfortable with it," she says.

Innovation centre

Innovation was the theme for day three. Norway has 13 Norwegian Innovation Clusters covering a range of topic areas, including seafood, that are designed to accelerate innovation in that space.

At the Norwegian Centre of Expertise (NCE) Seafood Innovation Cluster, the group heard pitches as part of the centre's aquaculture accelerator program, Hatch. Start-up company Jet Seafood presented on its market data insights platform Seafoodportal (see story page 20), which uses blockchain technology. Another company, Sea Smart, presented its sea drone technologies, which have the capability to monitor aquaculture pens for damage and record conditions such as temperature, and oxygen and nutrient levels.

Left The tour group in Bergen harbour, Norway.

Above The view from Mount Fløyen, overlooking the city of Bergen, Norway.

During a visit to Leroy Seafood Group headquarters in Bergen, Krister Hoaas gave an extensive overview of the diversity and size of the company and its activities. It is one of the world's largest seafood companies and purveyor of both farmed salmonids and wild-caught seafood. On show were Leroy's plans to implement a fully automated processing facility where salmon would be untouched by human hands throughout the process.

The Australians were impressed by the amount of work Leroy does to maintain community support. "It just shows how important social licence and acceptance of the community of the farming operations are, even in Norway, where fishing dates back many centuries," Daniela Schwarz says.

View to tomorrow

The final part of the industry tour in Norway provided an in-depth perspective on Atlantic Salmon farming with a visit to the Skjaergardsfisk Visningssenter (Salmon Discovery Centre) at Marøy. With boundless enthusiasm for salmon and salmon farming, Magner Ottensen, a long-term staff member of the centre, shared his extensive knowledge of the industry, which was officially established in 1963 by Reidar Marøy. At the time, the fish farming concept was met with scepticism.

While at the discovery centre the group was lucky enough to meet Arthur Marøy, the son of Reidar, who explained that his father's story was all about innovation and perseverance – from catching the local Pollock to grind up to make wet food for the fish, to building a framework and net enclosure, and pioneering steel cages. One of Norway's first steel fish enclosures was welded together at Marøy.

Daniela Schwarz says it was a humbling experience to speak directly with Arthur Marøy, who helped to pioneer salmon farming with his father. "He spoke with so much wisdom and passion about their learning process, from the need to initially invent farming to the challenges and mistakes they faced in the day."

The visit to the discovery centre included a trip out to the salmon pens, which provided a view of operations from the feed barge. Technology and cameras are used within the pens to monitor the salmon and their companion Lumpfish, which make fascinating viewing in their role as 'cleaner fish', helping to remove sea lice from salmon as an alternative to chemical treatments.

Below Oysters and their regionality at the Seafood Expo Global, Brussels.

Below Product development The Saucy Fish Company trying new frozen products.

As host for the day, Magner Ottensen also invited the Australians to view his private treasure trove of fishing memorabilia dating back hundreds of years. His collection shows the ingenuity and skill of the industry in developing and making fishing equipment; for example, the hand-twisted longline with individually knotted hooks, or an early fish (cod) trap including its 'codend'– a term still used hundreds of years later.

Brussels expo

The second phase of the tour took the group to the annual Seafood Expo Global in Brussels. This year's event brought together 29,288 buyers and suppliers from around the world and all parts of industry supply chain. The 2019 expo broke records, with 2020 exhibiting companies coming from 89 countries to present their newest seafood products, services, and processing and packaging equipment.

This included innovations such as the Keep-it® indicator, a device on packaging that monitors the temperature of a product over time and indicates the remaining shelf life. Daniela Schwarz says it was a great opportunity to get insight into how other countries use technology to package their products and get them to market. Technology aside, she says she would have liked to see more new approaches in marketing products to customers and end users.

Toni Clark says she has brought home some packaging from the expo, which could provide some inspiration for Petuna Sealord to process more of its catch. "It was also good to see five or six different companies who had processing equipment on show. It gives us more options when we're getting quotes for equipment, rather than just dealing with the single supplier we already know."

In addition to the trade show, the group attended presentations from a range of organisations including the Global Sustainable Seafood Initiative and Marine Stewardship Council. During a breakfast at the famous Atomium venue (a giant replica of an iron unit cell of nine iron atoms constructed for the World Expo 1958), World Wildlife Fund leaders spoke about collaborative partnerships in its Transparency and Traceability presentation. Australian company Austral Fisheries has partnered with WWF on a project to apply blockchain to the seafood supply chain.

The Australian delegation also attended the first global seafood leaders meeting with 20 leaders from the United States, Canada and the United Kingdom. The meeting was supported by the US National Fisheries Institute, Seafish UK and Fisheries Council of Canada, and provided fantastic networking opportunities for the group. Other connections made during expo events included Australian seafood companies and industry members, such as Austral Fisheries' David Carter and Lesley Leyland, Clean Seas CEO David Head and his team including Jamie Angus, John Susman and Miles Toomey.

"It was certainly an experience of a lifetime," Toni Clark says. "I am grateful for the opportunity to have attended the tour and expo. Our group included people who had different perspectives and that was also a valuable part of the trip."

Travelling to learn

The Global Seafood Expo, held in Brussels in May each year, is one of several events for which the FRDC provides travel bursaries, based on expressions of interest from seafood industry members or nominated candidates, such as those who have taken part in NSILP.

Peter Horvat says the aim of the bursaries is to provide opportunities for members of the Australian seafood sector to see how other parts of the world do things and to bring home new insights to tackle issues that also beset Australia.

The bursaries are usually based on attending a major international event, with other related industry visits or meetings organised around this. Other major events include the Seafood Expo North America in Boston in March and the China Fisheries and Seafood Expo in Qingdao, China, in November. F

If you are interested in taking part in an FRDC-sponsored travel bursary program, contact Peter Horvat at ***peter.horvat@frdc.com.au***

THE KEEP-IT®

The Keep-it® indicator is put on the product when the food is packaged. It constantly monitors temperature over time and shows the actual remaining shelf life of a product. The durability indicator consists of two small chambers with different ingredients that respond to time and temperature. The indicator starts when the chambers are opened so that the chemicals react with each other. This activation occurs when the food is packaged by the processor.

MORE INFORMATION
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Expanding Chinese trade opportunities

With no tariffs on Australian seafood exported to China, government and industry groups are working together to expand the list of eligible products

By **Peter Horvat**
General manager communications, trade and marketing, FRDC

Above The list of species approved for export from Australia to China can be viewed at http://114.255.252.130:61115/AP_NameListSearch.aspx?type=%u6c34%u4ea7 (Google Chrome translation)

China is the world's biggest exporter of seafood, in both volume and value, as well as a prominent importer of Australian seafood products. To improve access to this high-value market, the Australian Government continues to work with the Australian seafood industry on a range of trade-related issues.

A notable success has been the negotiation of the China–Australia Free Trade Agreement (ChAFTA), which led to the elimination of all tariffs on Australian seafood exported to China as of 1 January 2019.

However, these tariff-free products are restricted to those named on the Chinese Government's list of approved aquatic species eligible for export from Australia to China. The Chinese Government maintains separate country-specific eligible lists for live and non-viable (not live) seafood products for human consumption. If it is not on the list, it cannot be exported to China. The process to update the China list is also complex in terms of the information required and the time required to list additional species.

Industry priorities

Working with the Department of Agriculture to expand the list is a priority for the Australian seafood industry. In mid-2018 the Department of Agriculture supported an FRDC survey of seafood to identify species of commercial significance to nominate for inclusion on the China list. This reflects the need to have broad and unified industry engagement on the additional species that Australia is seeking to export to China.

The survey asked exporters to outline potential trade volumes, export values and known market interest for nominated species, and whether the species was a sustainable export. It identified 20 potential species, with significant commercial interest demonstrated for two: Stout Whiting (*Sillago robusta*) and Australian Salmon (*Arripis trutta* and *Arripis truttaceus*).

The General Administration of Customs of China (GACC) has previously considered submissions based on a history of trade, but this year it has advised that all submissions will be considered 'new species applications' and must include import risk assessment documentation.

The Department of Agriculture has asked the Seafood Trade Advisory Group (STAG) to build on the FRDC survey and facilitate industry agreement on the two priority species for an initial application for inclusion on China's eligible species list.

This will involve a follow-up survey to update results in August 2019, followed by an industry prioritisation workshop in mid-September. Following the workshop, STAG will assist industry groups involved to prepare the required risk dossier for the two priority species agreed on.

The Department of Agriculture will submit the risk dossier with the applications to China for consideration. The STAG is working with five industry groups that have already signalled their interest to have new species added to the list. The template for the risk dossier can be downloaded from the STAG website (www.seafoodtradeadvisory.com).

The process for getting new species on the China list is complex; the key for industry will be to focus its efforts on the two agreed priorities. The FRDC is optimistic that with combined effort and focus, additional species can be added and trade opportunities enhanced. **F**

For more information on Australia's seafood export requirements to China visit ***https://micor.agriculture.gov.au/Fish/Pages/china/china.aspx***

WHAT'S ON THE CHINA LIST?

To view the Australian non-viable eligible aquatic products list:

1. Open Google Chrome on your computer or mobile device.
2. Visit the page at this link (it is in Chinese) http://114.255.252.130:61115/AP_NameListSearch.aspx?type=%u6c34%u4ea7
3. When the Google Chrome translate option box opens in the top right-hand corner of the screen select 'Translate'.
4. This translate box also has an 'Options' menu. Clicking on this provides an option for 'Always translate Chinese (Simplified)', which will translate all subsequent pages you visit at the website, which might otherwise default to Chinese.
5. On the webpage select the 'List aquatic' link, besides the photo of a crab. The aquatic list opens showing the North America list. Select the Oceania tab (second from left) to view the list of eligible Australian products.

MORE INFORMATION
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FRDC RESEARCH CODE: 2017-058

Dog treats tip the scales on fish waste

Innovation in the seafood sector is turning fish waste into a (literal) dog's breakfast

By **Catherine Norwood**

Mackerel tail fish treats. Photo: Susan Kelly

Getting the most value from every fish caught, and from every bit of that fish, is the philosophy that underpins Glen and Selena Murray's premium pet treat business, All Fish For Dogs. Glen Murray has been a commercial fisher for 16 years, based at Mission Beach in Queensland, and he is all too familiar with the challenges of the sector. Among these are large catches of fish that the market doesn't want and the relatively small proportion of each fish used for human consumption – often only about 30 per cent. This waste of ocean resources has always troubled him and when the Queensland Government offered fishing licence buybacks in 2014, Glen decided to sell his licence and do something about it.

And thus was born All Fish For Dogs, a venture which won the wholehearted support of the Murrays' three canine family members, Kosmo, Rosie and Minty.

The business takes offcuts from fish landed, such as the tails of Spanish or Grey Mackerel, along with further trimmings from seafood processors, and turns them into nutritious dog treats. The pet treats market is worth an estimated $185 million in Australia.

The Murrays also buy fish that are landed despite their low value, which often happens when markets are already flooded with the same species.

"Sometimes when you're fishing for Barramundi, all you get is Queenfish," says Glen Murray, "and so does everyone else. So the fish we use is not being diverted from human food; it is fish that would otherwise end up in liquid fertiliser. We're actually reclaiming it from that and giving it greater value."

He says when fishers can get a bit more for their catch it means they don't have to go back out and keep fishing for low-value product just to survive financially. They can actually fish less often and leave more fish in the sea for next time.

"Anything we don't use is still sent to make organic fertiliser. In that way, we're getting 100 per cent use of the fish, but we're trying to add the greatest amount of value by using as much as we can for the treats."

Product development

Most of their raw material is sourced from Queensland, although shark cartilage and pilchards come from fisheries in southern Australia.

All Fish For Dogs takes these unwanted fish and offcuts and slowly dehydrates them, rather than cooking them. The low temperature preserves the nutritional value of the fish, although it takes four kilograms of fish to produce one kilogram of treats. The treats are aimed at the premium end of the dog treat market, promoted and priced as a wild-caught, organic product.

Fish treats often mirror products that customers are already familiar with, for example, sharkskins are cut into sizes and shapes similar to pigs' ears, and rolled mackerel or sharkskins are an alternative to rawhide rolls.

So far the Murrays have 25 products, from training treats to large chews. Their range is sold wholesale, in bulk, and they have two buyers who supply a national pet shop chain, with possible expansion into a major supermarket chain.

They also now have their own retail brand, Fishtastic Dog Treats, available wholesale or retail,

Below Selena Murray preparing pet treat orders for distribution.
Photo: Susan Kelly

Below Glen Murray with one of his canine taste testers, Kosmo.
Photo:

with pre-portioned retail packs available online. Glen Murray says developing their own brand was the result of strategic planning advice through the Fish-X program, an FRDC-sponsored innovation initiative they took part in. "Creating our own brand helps to develop the value of the business as a 'saleable' venture," he says.

The Murrays were introduced to the Fish-X program through a two-day workshop with other fisheries innovators, to evaluate their business direction and practise their 'pitch'.

Glen Murray says it encouraged them to dream big. "We thought we could use maybe 150 tonnes of waste and produce $1 million worth of dog treats. But we were challenged: why not use 500 tonnes of waste and turn over $10 million? And then they showed us how that could happen, ways to upscale production and also what a joint venture might look like."

Fish-X also encouraged the Murrays to get exposure for their business by entering events such as the Tropical North Queensland Innovation Awards, which they did, winning both the Eco Innovation and the Proven Innovation awards in 2018. They were one of 15 businesses taking part in the Startup Alley as part of the EvokeAg Conference in Melbourne in March, and were also part of a Far North Queensland delegation to the 2019 Queensland innovation conference, called QODE, in Brisbane in May.

These events have brought valuable contacts in government and business, and the ongoing mentoring through the Fish-X program has helped them to "work on the business" as they grow, sidestepping likely dead ends.

Assistance with their business plan has also put them in a sound position to seek finance for their planned expansion later this year. They have recently purchased a fourth dehydrator, which brings their production capacity to two tonnes of raw material a week, producing 500 kilograms of premium dog treats.

"At the rate we are growing, we will need to add a new dryer every four to six months," Glen Murray says. The business is also investigating other forms of product development, such as extruded products that could be formed into different shapes, with further research needed into appropriate formulations, or 'recipes' and equipment.

"In Australia, fish is associated with cats, not dogs. It can be a hard sell on the domestic markets, although we are seeing more people providing specific diets for their pets to address health issues such as allergies, skin and joint conditions."

> "We thought we could use maybe 150 tonnes of waste and produce $1 million worth of dog treats. But we were challenged: why not use 500 tonnes of waste and turn over $10 million? And then they (Fish-X) showed us how that could happen, ways to upscale production and also what a joint venture might look like."
>
> Glen Murray

Health benefits

The Murrays have attributed a seafood diet to improvements in the health of their dog Kosmo, who was diagnosed at an early age with arthritis, but five years later remains relatively active and mobile, despite the condition.

"But in other countries where people eat more seafood, such as Singapore, it's a more natural transition for them to feed fish to their dogs, too. That's a market we're hoping to break into this year." Liaison with potential buyers in Singapore has led to trials with a new product designed specifically for this market.

"This is only year four of All Fish For Dogs, but we have some big plans in terms of where the company can go and what the ocean can offer pets. At the same time, it's really important to us knowing we are helping fishers and conserving resources by making the most of every fish caught." F

** Article contributed by the FRDC's Fish-X innovation program.*

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FRDC RESEARCH CODE: 2017-069

Below Participants in the FRDC's Indigenous Reference Group capacity-building workshop, May 2019. Photo: FRDC

Common ground

The capacity for Indigenous involvement in fisheries and aquaculture is growing through an approach that puts communication at its core

By **Melissa Marino**

Fisheries science and management have many concepts in common with Indigenous community practices, but the lack of a shared language has often made it difficult to bring the two together. Finding ways to do just this was the aim of an inaugural Indigenous fishery capacity-building workshop held in Brisbane earlier this year.

Organised by the FRDC's Indigenous Reference Group (IRG), the three-day event was designed to help Aboriginal and Torres Strait Islander (ATSI) people participate in fisheries management discussions and strengthen their voice in the decision-making process.

Capacity building starts with clear communications, says chair of the IRG, Stan Lui, who is also an environmental program manager with the Torres Strait Regional Authority.

"The concepts around fisheries management among Indigenous and non-Indigenous people are similar, but are just couched in different terms," he says.

When Indigenous communities talk about storylines, this equates to migratory patterns in the equivalent scientific terminology, he says. Management speak, such as biomass limits (BLIMs) and total allowable catches (TACs) have their equivalent in Indigenous practices, learned in childhood. For example, to never take as much as you can, but always leave some behind to regenerate so that there is more to harvest next time.

"This project is about making those linkages and giving ATSI people a broader understanding. So when they're in fisheries meetings or talks they understand exactly what the terminology means and the concepts behind it. We are building bridges between people and pulling down barriers," says Stan Lui.

Fifteen Aboriginal people from around Australia who are passionate about fisheries attended the workshop, gaining greater knowledge about management practices and the terminology used in policies and regulation, as well as sharing issues important to them.

Sessions included understanding the protocols and structures of management meetings, stock assessment methods and fishery management frameworks, among others.

Victorian Fisheries Authority Aboriginal project officer Mike Gilby attended the workshop as both a presenter and participant, and says it provided a two-way learning process helping both sides to better communicate and understand terminology used by ATSI people, and how that aligns with management-speak.

With greater understanding, he says, more opportunities will emerge for Indigenous input, or "buy-in" into management tools such as harvest strategies as they are being developed.

> "It's giving people the skills to participate on-country, in their own jurisdictions or more broadly at the fisheries management, industry or community level."
>
> Mike Gilby

Murrah Keys, a Worimi woman and former physical education teacher who also attended the workshop, says she has responded to the calling of her ancestors – saltwater people from Karuah in northern NSW – and is in the process of acquiring an oyster lease.

She says that in bridging language barriers, the workshop demystified the industry and has helped her negotiate bureaucratic obstacles on her path to a future in fisheries. Connecting with other Indigenous people in the industry from around the country was also a powerful outcome for her.

"As we break down these language barriers our people will be able to step confidently into this space. The program has created pathways for all of us," Murrah Keys says.

Capacity building is a key priority for the FRDC's IRG. The overall aim of the capacity-building program is to have more Indigenous men and women participating actively in fisheries. Ultimately, Mike Gilby says, it is about succession planning for Indigenous communities.

"It's giving people the skills to participate on-country, in their own jurisdictions or more broadly at the fisheries management, industry or community level," he says. "It's inherent within Indigenous people – we have a responsibility to transfer our knowledge and share that with the next generation so they can grow, and get on with it."

Resources developed for the workshop are expected to be available from the FRDC website once the project is completed. **F**

Below Chowdhury Sarowar runs the Biotoxin facility at the Sydney Institute of Marine Science.
Photo: SIMS

Protecting the consumer

By **Gio Braidotti**

Capacity has been built to protect NSW consumers of Spanish Mackerel from the southward migration of ciguatera fish poisoning

Shauna Murray
Marine toxin specialist,
University of Technology Sydney

Erik Poole
Supply and business development manager, Sydney Fish Market

Ciguatoxins (CTXs), which are generated by certain species of marine micro-algae, are responsible for what is the most frequently reported fish-borne illness across the world's tropical regions – ciguatera fish poisoning (CFP).

But in Australia, an increasing number of people in subtropical regions have also started to be confirmed as suffering from CFP. Twenty years ago CFP was unheard of in New South Wales, but the past two decades have seen at least 30 confirmed reports, with many more cases likely to be unreported. CFP symptoms include a combination of gastrointestinal and neurological symptoms, typically a reversal of hot and cold sensation, which can last from days to several months.

CTXs are produced by single-celled *Gambierdiscus* micro-algae, a warm water-loving species, and work their way up the food chain to accumulate in predatory, apex reef fish species. Confirmed cases of CFP in northern NSW relate mainly to the consumption of Spanish Mackerel, with some reports related to Redthroat Emperor and Purple Rockcod in 2015.

Marine toxin specialist at the University of Technology Sydney Shauna Murray says the southern movement of CFP cases may appear slight, but it marks deeper underlying ecological shifts that are not well understood. She is leading two new research projects that she hopes will help identify what is causing those shifts and what can be done to update fisheries management practices to protect seafood consumers.

An earlier project funded by the FRDC and the Sydney Fish Market helped establish a new marine biotoxin facility at the Sydney Institute of Marine Science (SIMS), along with sophisticated ciguatoxin testing capabilities.

The SIMS facility is crucial to the new research projects that aim to identify and map the biological and ecological factors causing CTXs in Spanish Mackerel in NSW.

Fish sampling

Shauna Murray says it is difficult to know which species of *Gambierdiscus* micro-algae in Australia are producing the toxins, or where and how these toxins are entering fish. Working this out will be the focus of an Australian Research Council Linkage project, which will begin sampling of *Gambierdiscus* in Australian waters in September 2019.

Concurrently, Shauna Murray is also part of a team developing a proposal to map the distribution of CTX-affected Spanish Mackerel caught in NSW. This project will involve assistance from the Sydney Fish Market and recreational fishing clubs.

"By combining the *Gambierdiscus* and the Spanish Mackerel CTX information we are trying to understand the ciguatoxins' movement in the food chain: how much toxin is making its way into fish and where the toxin is being ingested," she says.

Supply and business development manager at the Sydney Fish Market Erik Poole says the market is ideally placed to sample Spanish Mackerel catches in ways that provide relevant coverage of NSW coastal waters. As a former skipper and marine scientist, he is also co-investigator with Shauna Murray for the Spanish Mackerel research.

"Our key interest is to determine whether we need to update guidelines used to exclude potentially CTX-affected fish from sale," he says. Current guidelines restrict catches from known CTX-affected sites and also prohibit the catch of certain fish species over 10 kilograms, to reduce the likelihood that fishers or consumers will eat fish that have a bioaccumulation of the toxins. F

MORE INFORMATION
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Focused on fish for the future

As a leading fisheries 'knowledge broker' and scientist, Ian Knuckey says the active involvement of fishers from all sectors is essential to improve resource management and ensure a sustainable future for fisheries

Story **Elisabeth Howie**
Photo **Craig Watson**

What does it mean to fish well? For long-time fisheries scientist and consultant Ian Knuckey, the heart of 'fishing well' is about ensuring that future generations can enjoy the abundance of seafood as much as we do.

It is also a principle that has driven his career for more than 30 years, working on diverse projects to reduce bycatch, improve stock assessments, empower industry research and development and, crucially, partner directly with fishers to improve practices.

Knowledge broker

Early in his career Ian Knuckey realised the shared benefits that science extension brings to researchers, managers and fishers.

During a six-year stint in the Northern Territory he led a mud crab research program with the NT Department of Fisheries. It earned him a PhD in fisheries population dynamics and a taste for communicating fisheries science to fishers. He spent weeks on end with his 4WD and a dingy, working on the mud crab fishery at the isolated crabbers' camps around the Gulf of Carpentaria and the Roper and McArthur rivers. Most fishers then were Vietnamese and Cambodian, so he ensured that everything the department produced on mud crabs was translated from English and published in newsletters for the fishers.

Being out in the field required Ian Knuckey and his team to get even more creative, often with the assistance of a white ute and a little Honda generator.

"There we were," he says, "12 to 18 hours' drive out of Darwin, a thousand kilometres from anywhere in the remotes of the Northern Territory, projecting slideshows about the science of mud crab population dynamics onto the side of our ute for the fishers. It flavoured where I went from there on, in terms of getting science out to people."

The pivotal moment came from a conversation with his technician, Paul Johnson, during his time in the NT. "He said to me, 'You know Knucks, even though you work for the department, your real clients are the fishers'. And that has stuck with me."

Following many government research positions, Ian Knuckey says he has no regrets about branching out on his own 17 years ago to start Fishwell Consulting, basing himself and his family in the Victorian coastal township of Queenscliff. "It was a big thing at the time, moving away from the security of a government job to the 'dark side'. I simply couldn't have done it without the support of my wife, Jane, and overall it has benefited both my career and family life."

His work has taken him and his family all around Australia and to many overseas destinations, from the wild oceans of Tasmania to the tropical waters of Indonesia, dealing with fish, sharks and crustaceans, with inshore fisheries and those in deep waters.

"I really enjoy the variety," he says. "One week I'll be doing a survey on scallops in Bass Strait, another working with snapper up off the Northern Territory, tropical rock lobsters in the Torres Strait, and then trawl fisheries off Tasmania after that."

Sustainable practices

Ian Knuckey says projects that improve the sustainability of commercial fishing practices have been very rewarding. Over his years in fishery research he has run various projects that have led to increased size limits for mud crabs, reduced bycatch in trawlers through small changes in net codends (the end bags of trawl gear), and improved handling of shark bycatch.

Other projects have resulted in changes to net material in haul seines to reduce catches of small fish 'gilled' in the net, the transition of shark fishers from gillnet to longline to reduce interactions with threatened sea lions, and reductions in the incidence of bird strikes on trawl warps.

"Across all of these projects though, one of the learnings is that industry has to be in a good financial position to enable these changes to happen," he says.

The economics are a major consideration in fisheries management, as commercial fishers increasingly pay for the management of resources on a cost-recovery basis. Part of Ian Knuckey's contribution in this sphere has been to lead the design and implementation of lower-cost fishery surveys.

"Fisheries managers are now asking for detailed information on what's out there in terms of stock abundance," he says. "We try to implement cost-effective ways of getting this information, often organising support from industry vessels."

The stock assessment process gives managers and fishers an annual index of the fish biomass. This information feeds directly into harvest strategies and management decisions, including the setting of total allowable catches.

"We've done surveys for scallops, fish, sea cucumbers and crabs. And we try to make sure that industry is directly involved in the work so that they have a better appreciation of what's required, and are supportive of the work being done and the results it produces."

Road to empowerment

Giving fishers – whether Indigenous, commercial

> "Fisheries managers are now asking for detailed information on what's out there in terms of stock abundance," he says. "We try to implement cost-effective ways of getting this information, often organising support from industry vessels." Ian Knuckey

or recreational – the knowledge and power to get involved in fisheries management and make a difference is an important part of what he does. "When fishers understand what scientists and managers are talking about, and vice versa, assessments and the sustainability of fisheries can be greatly improved," he says.

To help address this, Ian Knuckey has developed a series of videos explaining aspects of the biology and population dynamics of fish, as well as fisheries data, stock assessments, harvest strategies and economics (www.youtube.com/user/FishwellConsulting/featured).

He sees an ongoing need for fishers in all sectors to be more actively involved in decisions about fisheries' access and allocation, particularly for Indigenous communities. One of his recent projects, with the FRDC's Indigenous Reference Group, is providing capacity-building workshops to help support Indigenous Australian involvement in fisheries management and fisheries management forums (see page 36).

"I'm finding it really rewarding in terms of what participants are getting out of it and the opportunities for them to have a greater involvement in different fisheries and fishery jurisdictions," he says.

"There needs to be a proper balance of fisheries management across the different sectors. When you're just working with commercial fisheries, you're all speaking the same sort of language and generally that's related to money and economics.

"But one of the difficulties when you start working with the different sectors is that you've got social, spiritual and a lot of other metrics to consider that don't just relate to economics."

He says as our population increases, balancing all those different metrics and expectations will be quite challenging for fisheries managers and for the Australian community in general. However, it will be essential to the future of these finite resources that must be managed and fished well to prosper. F

Final reports

Ecosystem-based solutions 2016-053

Significant investments have been made in researching steps towards ecosystem-based management in Australian fisheries and in tools to support those efforts. However, many gaps remain and much can be learnt from applications in other jurisdictions, especially one as data-rich as the European Union (EU). Australian researchers were invited to be advisers on (and participants in) the European MareFrame project. The report summarises the major products and experiences about supporting ecosystem-based fisheries management (EBFM) from the MareFrame project.

Although the MareFrame work has an EU focus, the broad lessons are directly applicable to Australia and will be of direct benefit to several ongoing initiatives around the implementation of EBFM. These include multispecies harvest control rules, cumulative impact assessments, review of Ecological Risk Assessment of the Effects of Fishing and the adaptation of Australian fisheries for the effects of climate change.

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Integrated management 2017-214

The need for integration of management of diverse marine activities is increasing. In 2017 and 2018, a team of researchers associated with the Centre for Marine Socioecology (CSIRO and UTAS) and partners (South Australian Research and Development Institute and Department of Fisheries and Oceans Canada) collaborated to develop a framework for implementation and a 'lens' for evaluation of integrated management (IM). The research team convened two workshops to test the framework with a broader group of subject matter experts and to apply the lens to Australian IM case studies.

Workshop participants found the framework to be a useful evaluative tool. It was considered to be comprehensive in its key features and major phases of implementation of IM. It builds on existing management, represents incremental change, and prescribes nine key features and five important phases of implementation that are suggested as being relevant in all cases. Use of this framework should result in successful IM and should overcome the key common failings of existing sector-based management.

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Determinants of social support 2017-158

Australia's wild-catch fisheries and aquaculture are increasingly attentive to the importance of having support from communities and stakeholders to ensure their future sustainability and prosperity. This project aimed to identify determinants of socially supported wild-catch fisheries and aquaculture in Australia.

The research used a mixed-method approach and involved iterative analysis of international and Australian-focused academic and grey literatures, elicitation of expert and stakeholder knowledge through a survey and interviews, an in-depth case study analysis, and the development of a self-assessment tool.

The team developed 16 determinants of societal support that should be considered by all those working in Australian wild-catch fisheries and aquaculture-related activities. However, some of the findings of this study engender recommendations specific to three key groups: the fishers/aquaculture companies themselves, fisheries/aquaculture associations and peak bodies, and fisheries/aquaculture managers. It is also recommended that all three groups use the self-assessment tool – comprising a list of indicator statements for each determinant of societal support – to critically and honestly reflect on their role in achieving societal support for wild-catch fisheries and aquaculture.

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Review of fishery access and allocation 2017-122

In 2010, the Australian Fisheries Management Forum (AFMF) listed fisheries access and allocation as one of the top-priority policy issues to be addressed. Subsequently, the FRDC formed a working group to examine possible approaches to access and allocation issues to assist fisheries managers as they undertook their associated policy development about allocation matters.

The working group produced a report on the principles and guidelines for fisheries resource access and allocation, highlighting impediments to optimising fisheries resource access and allocation in Australia and the RD&E issues requiring investment.

Seven years on, there have been a lot of developments in this area in the various jurisdictions. To assist and guide the FRDC's future RD&E investment on these issues, the Board requested a review of the state of fishery resource access and allocation across the various jurisdictions.

One of the main challenges for intersectoral access and allocation is the different access arrangements between sectors. These differences create significant hurdles to managing sectoral allocations where access is not controlled or restricted.

All jurisdictions achieving similar levels of policies and practices remains a realistic and worthy long-term goal. In the interim, it is important to develop national guidelines that outline an agreed cross-jurisdictional framework and tools for sound access and allocation policies and processes.

More information: Ian Knuckey, ian@fishwell.com.au

Retrospective assessment of ITQs 2017-159

The use of transferable fishing rights has increased internationally over recent decades with most industrialised countries now using some form of individual transferable catch quota (ITQ) or individual transferable effort (ITE) system for at least some of their fisheries.

Perceptions of the success or otherwise of ITQ and ITE fisheries vary, but the key factors underlying success or failure have not been examined in a systematic way. This project examined how ITQs and ITEs in Australia have performed relative to sustainability, economic and social criteria to determine what may be underlying these successes or failures.

The study involved several components. The first phase was a review of international experiences of ITQ management to determine sustainability, economic and social outcomes; the second stage involved cataloguing ITQ and ITE fisheries in Australia.

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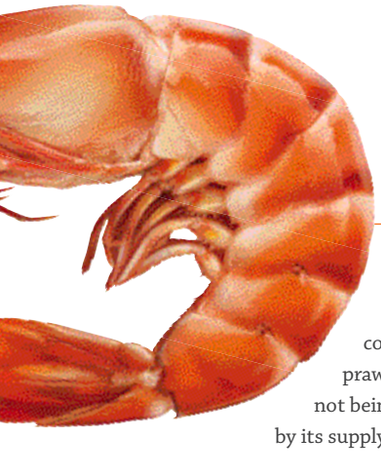
Post-harvest quality of prawns 2016-207

This project was led by the Queensland Department of Agriculture and Fisheries with the aim of improving the post-harvest quality of prawns landed from the multi-jurisdictional Royal Red Prawn fishery. The research team determined that the Royal



Red Prawn has a clear point of difference to the majority of commercial species of prawns in Australia: it is not being adequately utilised by its supply chain. It was also determined that this prawn's unique and distinctive qualities would be worth investigating further with a view to directing this prawn to the fine dining and food service sector.

Preliminary cooking protocols and methods were developed then refined by an executive chef and a range of food service applications. These recipes were presented to a select group of Sydney-based chefs in a focus group session held at the Sydney Fish Market in December 2018.

The most significant finding was that if chefs could receive this prawn product in the form that they required, the price premium they would be prepared to pay would be four to five times the current market price for Royal Red Prawns.

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Extending biotoxin capability 2017-051

Biotoxins are an ongoing issue across a broad range of seafood types, presenting public health and market access risks. There are critical knowledge gaps in understanding uptake pathways for the toxins, the use of rapid test kits, the effects of processing and access to contaminated materials.

A short-term experimental biotoxin contamination facility was set up in Roseworthy, South Australia, at the South Australian Aquatic Biosecurity Centre (SAABC). The goal was to examine the uptake and depuration of marine biotoxins from one of the most toxic dinoflagellates known: *Alexandrium catenella*. The development of the facility enabled several sectors – Southern Rock Lobster, Pacific Oyster and Blacklip Abalone – to conduct studies concurrently, providing a cost-effective use of resources.

This project has built capability in Australia in the biotoxin field, particularly in areas of direct application to the seafood industry.

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Abalone assessment workshop 2018-193

This workshop sought to establish a commitment from all stakeholders – industry, managers and researchers – to work towards rationalisation and consolidation between jurisdictions in the areas of research, monitoring and management of abalone fisheries. A national commitment to achieving this would be a positive step towards addressing longstanding issues of duplication among sectors, as well as lost opportunity for collaboration and the leveraging of resources. In addition, it will be integral to improving the sustainability of abalone stocks while enhancing economic outcomes for industry.

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Association for fisheries managers 2015-405

Recent workshops on fisheries management and bio-economics have highlighted the use and value of increasing professional exchange and engagement between jurisdictions to improve understanding and uptake of innovative solutions to fisheries management.

There was convincing support from workshop attendees for the formation of a professional association of Australian fisheries managers, a strong willingness to pay for membership and keen interest in the association organising and facilitating future workshops and meetings on key focus areas.

This project led to the establishment of the Australian Society for Fish Biology (ASFB) Fishery Management Committee for regular and coordinated exchanges between fisheries managers around Australia to address common fisheries management challenges and national priorities.

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Investigating social acceptance 2017-012

Gaining a social licence to operate (SLO) needs a long-term commitment to demonstrating good environmental stewardship, leadership capacity, and effective engagement and communication to inform and garner support from stakeholders.

This project aims to build on the considerable research and guidance about developing SLO by the FRDC and others. Core research components include understanding self-identified values, the capacity and need for engagement of fishers and key stakeholders, and identifying areas of common ground as a basis for improvement of relationships and perceptions of legitimacy, credibility and trust.

The engagement strategy, developed in collaboration with Queensland Seafood Industry Association EO, suggests ways that the fishing industry can build broader support. Unless the Queensland Government's fisheries management is considered best practice and sustainable, it will be difficult for south-east Queensland fishers to build the credibility and trust necessary for a high level of SLO.

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Abalone stock enhancement 2016-407

Australia's wild-harvest abalone production remained relatively stable from when the commercial dive fishery started in the 1950s until 2010. Despite controlled fishing pressure, production has decreased at an alarming rate. This project, as part of an FRDC-supported Nuffield Scholarship, allowed the author to visit the world's wild-harvest abalone fisheries, providing insight and an overview of how they are managed and what stock enhancement has been occurring. The countries explored were Australia, New Zealand, Japan, the US and the Republic of South Africa. Hong Kong and the People's Republic of China were also visited to explore the market for abalone and customers' perceptions of hatchery-spawned, but wild-raised, abalone.

Abalone stock enhancement is in its infancy everywhere except for Japan, where 30-plus years of stock enhancement sees 30 per cent of its total annual harvest consisting of seeded abalone that achieves a survival rate of 10 to 15 per cent of what is released. All other countries have undertaken experiments, some for decades with varying results.

Further research, particularly about the ecology of release areas, and large-scale projects are needed to determine and improve success. Protection for the reseeded abalone from any external factors that may interfere with survival will need to be provided.

The project findings were that stock enhancement, combined with resting areas, would be the best way to rebuild the biomass of abalone on reefs and therefore commercial production. Utilising technology in a fully transparent commercial fishery could be the way to monitor and manage harvesting pressure to find optimum efficiency, quality and reef production.

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Building resilience in fisheries 2013-210

Change is inevitable, whether it be management, environmental or economic. Improving how industries cope with and adapt to change becomes increasingly important as rates and cumulative effects of change escalate. A collaborative team from James Cook University, CSIRO, Fisheries Queensland (within the Department of Agriculture and Fisheries), and the Queensland Seafood Industry Association worked together to explore how different types of fishing businesses adapted to different types of change within Queensland's east coast fisheries. The team documented the diversity of Queensland's east coast commercial fishing businesses and developed innovative typologies of business models. It then explored whether there were key characteristics within these business types that improved access to adaptation options, and whether there were common challenges or constraints to adaptation across the industry and between business types.

The findings highlighted the complexity of the industry and the individual nature of responses to change, with no clear 'recipe for success' or predictor of failure. Communication and shared learning were critical, and managers as well as representative bodies and industry leaders need to develop communication mechanisms that are currently lacking. Within the industry, fishers feel a lack of security, which seems to stem from uncertainty in future management plans. This leads to an incapacity to plan, experiment and adapt successfully to change in the long term.

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Impacts of SA seal populations 2013-011

In the past 25 years there has been a 3.5-fold increase in the population of New Zealand fur seals in South Australia, which now number more than 85,000 individuals. This recovery may continue for a further 15 to 30 years and the level at which populations may stabilise is unknown. New haul-out sites and breeding colonies are establishing across the state, some in close proximity to finfish aquaculture and major commercial and recreational fishing areas. In addition, an Australian fur seal population has recently established in SA and has more than doubled in the past five years. There is also growing concern of the impact on Little Penguins and Giant Cuttlefish, and that fur seals are overabundant and that their populations and impact need to be managed.

The project investigated the diets and foraging distributions of seals in SA's gulf and shelf waters to assess the importance of commercial fish and finfish aquaculture species in their diet. Trophic modelling was used to assess the impact of consumption on current and future seafood production, and industry questionnaires and consultation were used to assess the economic impact and the degree and nature of interactions between seals and finfish aquaculture, fisheries and marine ecotourism industries.

The study confirmed that direct interactions with seals (e.g. loss of feed, damage to nets and gear) can cause significant economic impact, but these are largely restricted to two marine sectors: the finfish aquaculture industry in Spencer Gulf and the gillnet sector of the Lakes and Coorong Fishery.

It also found no evidence to support claims that seals are having potentially catastrophic impacts on commercial fish biomass or on the integrity and health of the broader marine ecosystem. This mismatch between the perceived and actual impact of seals on fish biomass and the broader marine ecosystem represents one of the key findings of the study.

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'Western' snapper management 2013-201

The western stock snapper resource is a shared resource harvested by recreational fishers, mostly in Victorian waters, and commercial fishers from both state (i.e. Victoria and SA) and Commonwealth management jurisdictions. Over the past decade, increased growth in catches by all sectors/jurisdictions has been met with concerns over fishery and resource sustainability and security of access. These concerns have raised the importance of developing a harvest management system that involves all sectors and jurisdictions, and developing resource-sharing and governance arrangements to facilitate implementation of harvest management recommendations.

The project demonstrated that internet protocol (IP) cameras can be a cost-effective approach for monitoring trends in recreational boat fishing effort. When combined with creel survey data, IP cameras can be used to monitor trends in targeted snapper fishing effort, harvest from individual access points (boat ramps) and to derive a recreational 'harvest index' for monitoring trends in recreational snapper harvest across the fishery.

The first Management Strategy Evaluation (MSE) model framework for a Victorian finfish fishery was successfully developed. Further structured application of the MSE framework is required to inform and develop management planning for the western Victorian snapper stock and test robustness to other uncertainties.

Application of a bag and size limit management advice tool, SnapMAT, showed that 'realistic' regulation changes would have clear potential to reduce recreational retained catches, based on recent stock conditions. Choice of the size or bag limit changes, or combined approaches, will depend on the objectives of catch reduction.

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Movers and ...

Alex Ogg has been appointed as the new CEO of Western Australian Fishing Industry Council (WAFIC).
Dan French is taking on the role of project coordinator for Seafood Industry Australia's 'Marketing the Australian seafood industry' project, funded by the Australian Government through the first round of 'Our Marine Parks' grants.
Anton Krsinich has stepped down from his role as general manager at Jade Tiger Abalone.
Braeden Lampard has stepped down from his role at Mallee Catchment Management Authority and taken on a management position at Ozfish Unlimited.
Mel Brown has been appointed assistant secretary for the Department of Agriculture's Fisheries branch.
Terry Bailey has been appointed executive director of the Institute for Marine and Antarctic Studies (IMAS) to replace **Chris Carter**, who is stepping down to focus on research.
Martin Exel has been appointed managing director of Seafood Business for Ocean Stewardship (SeaBOS).
Michelle Heupel, currently a principal research scientist with the Australian Instutute of Marine Science, has been appointed as the next Director of the Integrated Marine Observing System (IMOS).

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Calendar of events

DATE	EVENT	MORE INFORMATION
2019		
9 to 11 September	**World Seafood Congress, Malaysia**	https://wsc2019.com
9 to 12 September	**Fine Food Australia, Sydney**	https://finefoodaustralia.com.au
14 September	**San Remo Fishing Festival**	www.srfishfest.com.au
16 to 20 September	**Ocean Obs 19, Hawaii**	www.oceanobs19.net/#main
9 to 11 October	**Seafood Directions 2019, Melbourne**	www.sd2019.com.au
14 to 17 October	**Australian Society for Fish Biology Conference 2019, Canberra**	www.asfb.org.au
30 October to 1 November	**China Fisheries and Seafood Expo, China**	http://chinaseafoodexpo.com
4 to 8 November	**International Larviculture Workshop 2019, Thailand**	www.aquaculture.ugent.be//larvi/index.htm
18 to 21 November	**International Symposium on Fisheries Sustainability, Italy**	www.fao.org/about/meetings/sustainable-fisheries-symposium/en
21 November	**World Fisheries Day**	
19 to 22 November	**LACQUA 2019, Costa Rica**	www.was.org/meeting/code/lacqua19
27 to 28 November	**FRDC Board meeting, Canberra**	02 6285 0400
10 to 11 December	**2019 National Recreational Fishing Conference, Hobart**	www.arff.net.au/nrfc

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