

FISH

FISHERIES RESEARCH & DEVELOPMENT CORPORATION **NEWS**



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The best fish 'n' chipper



NATIONAL AWARDS

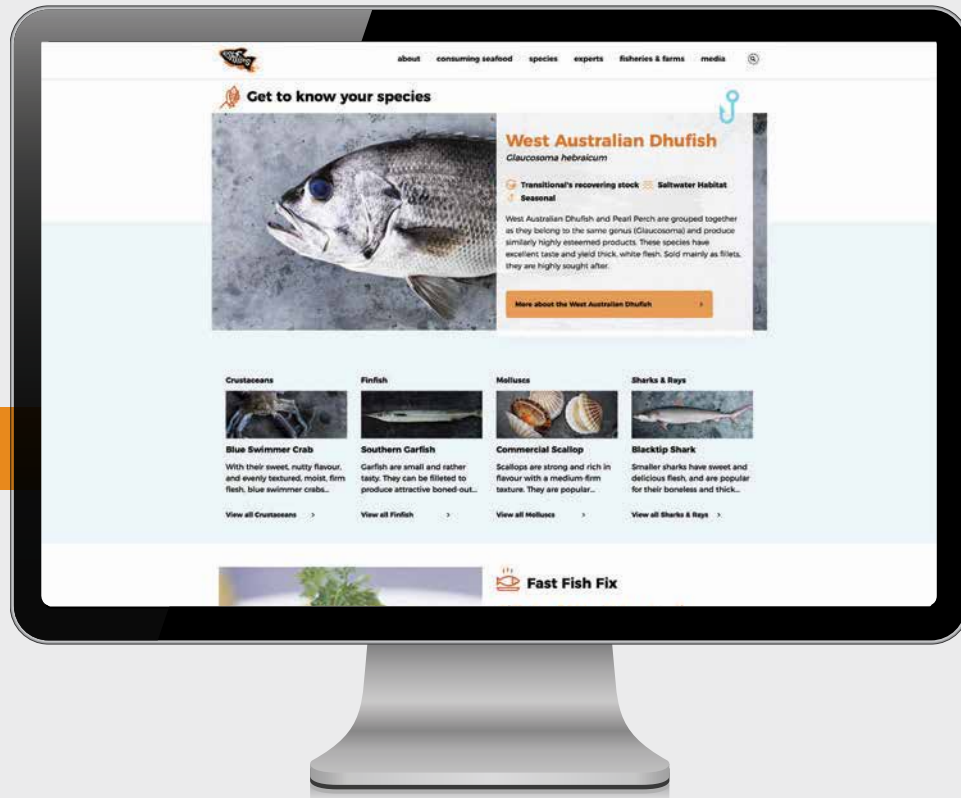
DATA INITIATIVES

THE VALUE OF HABITAT



ALL NEW

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DRAWING CONTENT FROM ACROSS THE FRDC'S DIGITAL PLATFORMS



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

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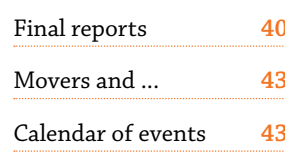
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INDIGENOUS FISHERIES

Story trail shares an evolving history



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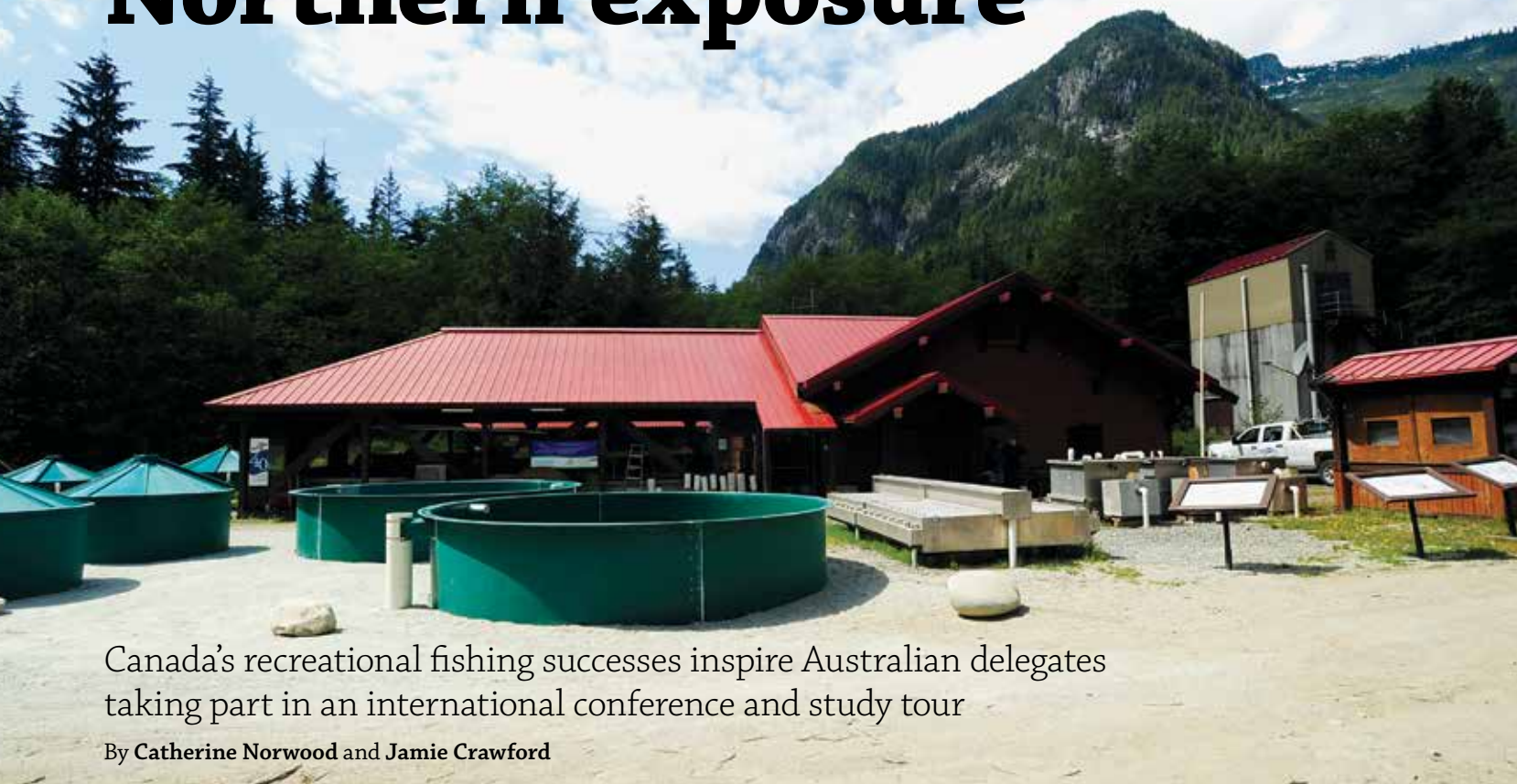
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Northern exposure



Canada's recreational fishing successes inspire Australian delegates taking part in an international conference and study tour

By Catherine Norwood and Jamie Crawford

Crouching in the shallows of Canada's Fraser River, arms full of a two-metre, very much alive, endangered White Sturgeon, was an "unforgettable experience" for Australian recreational fisher Jamie Crawford.

As a recreational fishing journalist based in South Australia, Jamie Crawford says there is nowhere here that might match the sturgeon experience.

Catching a big Murray Cod or perhaps a Barramundi might offer something similar, but there are no freshwater fishing opportunities in Australia where 100-kilogram fish are relatively common.

In British Columbia's White Sturgeon catch-and-release recreational fishery big fish are the norm, and getting in the water is a mandatory part of the handling procedures.

To even go fishing requires a freshwater recreational fishing licence (C\$20 per day, C\$80 per year) with an additional sturgeon conservation stamp (C\$15 per day) as authorisation for a single day of sturgeon fishing. Canada has implemented a user-pay

system, where access is proportional to the cost of service delivery (which is greater in the case of conservation-dependant species such as White Sturgeon).

Every sturgeon of more than 1.5 metres in length must be released while still in the water, and fishers are advised in advance that this will mean getting wet. All fish are also scanned for passive integrated transponder (PIT) tags, which are routinely inserted under the skin as part of long-term research into the species funded through recreational fishing licences.

Jamie Crawford says in his case the tag reader provided by tour company BC Sportfishing Group revealed his sturgeon had already been caught and released three times. All 10 of the Australians who took part in the study tour were able to catch a sturgeon – the tour operators use echo finders and side scanners that image the river adjacent their boats to locate the fish. The largest sturgeon landed during the tour was 265 centimetres and estimated at 150 kilograms. Group members also landed three 'virgin' fish, which they then helped to tag.

Jamie Crawford says the White Sturgeon in the Fraser and Harrison rivers are the last remaining wild populations of the species. In the early 1990s, Canada's White Sturgeon were recognised as endangered after being overfished for their highly prized caviar.

Today, management of the recreational fishery balances the Indigenous interests, represented by the Fraser River Peacemakers, with government, fisher and the broader community interests, who all work together for the preservation of the species.

Through education programs, tagging and monitoring efforts coordinated by the Fraser River Sturgeon Conservation Society, species movements and population densities have been tracked throughout the rivers. Recreational fishing licences have funded research, the creation of a sturgeon hatchery and restocking of some rivers in British Columbia.

Citizen science and stewardship have been pivotal in linking community engagement and participation of recreational fishing, and in fostering "custodianship" of the respective fisheries and surrounding environment.

Below Jamie Crawford with White Sturgeon in Canada's Fraser River.



Below Measuring an adult White Sturgeon caught from the Fraser River. Photos: Jamie Crawford



“Seeing firsthand that we actually lead the world in many areas is invaluable, as is the opportunity to witness new and exceptional projects which we can implement and even improve on our return.”

Frank Prokop

Conference discussion

The sturgeon fishing expedition was part of the study tour that followed the official 8th World Recreational Fishing Conference held in July in Victoria, the capital of British Columbia, attended by 396 delegates representing 21 countries.

The Australian delegation was led by Frank Prokop, a longstanding industry leader and member of the FRDC's Recfishing Research Subprogram steering committee, along with David Ciaravolo, executive officer of Amateur Fishermen's Association of the Northern Territory (AFANT), and FRDC program manager Joshua Fielding.

“Australia's remoteness means that we sometimes feel like we are a management backwater in terms of recreational fishing,” Frank Prokop says. “Seeing firsthand that

we actually lead the world in many areas is invaluable, as is the opportunity to witness new and exceptional projects which we can implement and even improve on our return.”

The conference provided an opportunity to learn about resource allocation and how international fisheries are managed, post-release fish survival and post-release predation in catch-and-release fisheries, along with satellite and telemetry tagging of key recreational species.

Management strategies for declining fish stocks, engaging the community and citizen science, artificial reefs and habitat restoration, fish stocking programs and data and statistic collation were the topics of other presentations.

Joshua Fielding says it is clear that many nations are trying to work out adequate management techniques for recreational fisheries.

“This includes resource allocation between sectors – mainly between recreational and commercial interests – and how to manage recreational fisheries for different motivations.

“Do you manage it for as many fish as possible regardless of size, so that fishers are guaranteed to catch lots of fish? You might expect this type of management close to urban areas where there are many ‘non-expert’ fishers.

“Or do you manage for large fish that might be more rare? This might be expected in remote locations where people are willing to invest time and money in travelling and specialised gear, and where there is a greater chance of not catching a fish.”

Josh Fielding says Canada's licensing for its recreational fisheries has generated good funding for research and management of its fisheries and provides a possible funding model for the sector in Australia.

The FRDC provided travel bursaries for 10 members of the Australian delegation through its Recfishing Research Subprogram in support of emerging leaders in the sector. In addition to Jamie Crawford, other sponsored delegates included: Sam Williams, a marine science PhD candidate at the University of Queensland; Isaac Tancred, a Western Australian tackle manufacturer; and Jackson Davis, a competition angler from NSW.

Recreational peak body representatives sponsored included: Evan Dixon, a competition angler and AFANT committee member; Michael Burgess, executive officer for VRFish, Victoria; James Florisson, research officer at Recfishwest, WA; and Travis Preece, northern Tasmanian regional representative for TARFish, Tasmania.

The FRDC also provided academic travel bursaries to Tasmanian fisheries scientist





Right The bursary group and leaders outside the Kootenay Trout Hatchery.



Sean Tracey and Domenic Holland, who works in the retail fishing tackle industry in WA and is completing a degree in marine science.

Study tour

After the conference, the group began a week-long study tour through southern British Columbia, investigating the challenges faced and the programs and initiatives to support the longevity and sustainability of Canada's recreational fishing sector.

The group had two coordinated hatchery tours. The first was the Seymour Trout Hatchery where Steelhead Trout, Coho Salmon and Chinook Salmon are hatched and reared for restocking nearby lakes and rivers.

The second was Kootenay Trout Hatchery where Rainbow Trout and White Sturgeon are reared. Both hatcheries are funded through recreational licensing for the sole purpose of restocking waterways to enhance fishing opportunities. The hatchery operations and restocking programs are managed by the

Freshwater Fisheries Society of British Columbia.

The group also visited a habitat-restoration project on the lower Seymour River, where a fish fence was used to collect wild river-run Chinook Salmon and Coho Salmon for use in the hatchery. A community-funded task was also underway during the visit, removing a rockslide that had dammed a section of the river and stopped the natural spawning migration of salmon species and Steelhead Trout.

They met with the Fraser River Peacemakers board, which provides a vital link between the local Indigenous community and the recreational sector. The board works to maintain a harmonious relationship between the two sectors in the Fraser River region, which is one of Canada's most culturally and recreationally important fishing regions and home to the White Sturgeon.

In addition to the sturgeon fishing expedition on the Fraser River, the group spent time with professional fishing guides off Vancouver Island to target Chinook Salmon and Cutthroat Trout in the Kootenay system at Cranbrook.

Resource allocation

Jamie Crawford says resource allocation was a topic of particular interest to the group, with direct relevance to the Australian sector.

During the study tour, the group met with Adam Keizer, from Fisheries and Oceans Canada, to discuss resource allocation between the recreational, commercial and First Nations Aboriginal people and to gain an understanding of how the Canadian Government manages the resource of targeted species.

Adam Keizer told the group that Pacific Halibut, together with the five species of Pacific Salmon, were the key social and economic species in British Columbia. Managing a sustainable total allowable catch of these species between each of the stakeholders by reflecting cultural, economic, tourism and social balance is no easy task.

He said that negotiations between each sector based on mutual respect and understanding had resulted in an agreed legislated allocation for each of the sectors. For recreational fishers, the licensing system held a great deal of weight in evaluating participation in their sector and being able to negotiate their allocation.

As fisheries researcher Sean Tracey says, his take-home message was the importance of effective communication between all sectors.

"I was particularly interested to explore the management and grassroots perceptions on resource sharing between multiple sectors in Canadian fisheries.

"They have recognised that there is never a simple answer that will appease all, but this should not be a barrier to progress in ratifying resource-sharing allocations." **F**

A PERSONAL PERSPECTIVE

By Jamie Crawford

For me, being a part of the 8th World Recreational Fishing Conference and study tour was a time of personal growth and development. The opportunity to be surrounded by some of the world's leading researchers and management personnel was humbling. Participating in the bursary program has given me a sense of empowerment and inspiration to believe that we can make a difference to our industry.

For me personally, hailing from South Australia where we don't have recreational licensing, seeing an effective licence system in place, it was obvious that it could make a difference to the recreational

sector and to the broader community.

The benefit of an effective freshwater recreational licensing system and overarching representative body to facilitate projects and expenditure was evident.

Restocking programs, put-and-take fisheries, river access, stock allocation and community education were just some of the initiatives adopted as a direct outcome of recreational licensing in British Columbia.

The tidal (saltwater) licensing system benefited stock allocations and helped to assess the participation and economic value of saltwater fishing. Participation rates are

seen to be on the decline in British Columbia, with funding channelled into re-engaging and connecting with recreational fishers of all ages.

The World Recreational Fishing Conference and study tour bursary project is a long-term investment in our emerging recreational fishing leaders. Some of the bursary participants already hold positions of influence in the recreational industry, and the flow-on benefits of representation and management will be seen in years to come. The varied backgrounds of the participants should see these benefits filter through into a diverse range of fishing industries throughout Australia. **F**

New SAFS species

An additional 37 species to be included in the 2018 *Status of Australian Fish Stocks (SAFS) Reports* have been confirmed by the SAFS advisory group, which guides the development and coordination of the reports. The new species are:

1. Australian Herring (*Arripis georgianus*)
2. Baldchin Groper (*Choerodon rubescens*)
3. Bastard Trumpeter (*Latridopsis forsteri*)
4. Bight Redfish (*Centroberyx gerrardi*)
5. Black Bream (*Acanthopagrus butcheri*)
6. Blue Threadfin (*Eleutheronema tetradactylum*)
7. Blue Warehou (*Seriolella brama*)
8. Bluespotted Emperor (*Lethrinus sp.*)
9. Bluespotted Flathead (*Platycephalus caeruleopunctatus*)
10. Bluethroat Wrasse (*Notolabrus tetricus*)
11. Brownlip Abalone (*Haliotis rubra conicopora*)
12. Eastern Sea Garfish (*Hyporhamphus australis*)
13. Elephantfish (*Callorhinchus milii*)
14. Estuary Cobbler (*Cnidogobius macrocephalus*)
15. Grey Morwong (*Nemadactylus douglasii*)
16. Hapuku (*Polyprion oxygeneios*)
17. Jackass Morwong (*Nemadactylus macropterus*)
18. John Dory (*Zeus faber*)
19. Mahi Mahi (*Coryphaena spp.*)
20. Mangrove Jack (*Lutjanus argentimaculatus*)
21. Mirror Dory (*Zenopsis nebulosus*)
22. Ocean Jacket (*Nelusetta ayraudi*)
23. Ocean Perch (Bigeye Ocean Perch *Helicolenus barathri* and Reef Ocean Perch *Helicolenus percoides*)
24. Pearl Perch (*Glaucosoma scapulare*)
25. Periwinkle (*Lunella undulata*)
26. Rankin Cod (*Epinephelus multinotatus*)
27. Redfish (*Centroberyx affinis*)
28. Ribaldo (*Mora moro*)
29. Roe's Abalone (*Haliotis roei*)
30. Royal Red Prawn (*Haliporoides sibogae*)
31. Sawshark (*Pristiophorus spp.*)
32. School Mackerel (*Scomberomorus queenslandicus*)
33. Silver Warehou (*Seriolella punctata*)
34. Spangled Emperor (*Lethrinus nebulosus*)
35. White Teatfish (Sea Cucumber) (*Holothuria fuscogilva*)
36. Yellowfin Whiting (*Sillago schomburgkii*)
37. Yellowtail Scad (*Trachurus novaezelandiae*)

More information fish.gov.au

DATA FOCUS FOR NUFFIELD SCHOLARSHIP

Tom Robinson (pictured right) from Port Elliot in South Australia has been awarded the 2018 FRDC-sponsored Nuffield Scholarship to investigate how wild catch fishers could use mobile devices such as tablets to collate catch data and prove the sustainability of fishing practices. He believes that access to better and more reliable data will enable fishers to benchmark themselves against industry averages and, in turn, boost their productivity. His research builds on his own initiative in creating the program Deckhand (<http://deckhandapp.com>), which allows fishers to collect their own data electronically. It is already being used in several Australian fisheries. He will travel to North America, Europe and parts of Asia as part of his Nuffield Scholarship to review their collation of fishing data and study how they might use a program such as Deckhand. Tom Robinson previously worked in advertising before making a literal sea change



to Port Elliot, South Australia, to become a commercial fisher in the Lakes and Coorong Pipi Fishery. "I believe it's critical that fishers start influencing their destiny by collecting their own data. Until now it has been impractical for fishers to collect fine-sale data using paper. We believe Deckhand can turn every fisher into a scientist or data collector," he says.

More information <http://nuffield.com.au>



SUSTAINABILITY WIN FOR AUSTRAL

Western Australian-based Austral Fisheries has won the Small to Medium Business Sustainability Leadership Awards at the national Banksia Sustainability Awards, which "recognise and celebrate individual and organisation contributions across Australia". The company was recognised at the awards presentations in November for its efforts in making the business carbon neutral. It is the first fisheries business in the world to do so. CEO David Carter (pictured left) says the award provides recognition for the business beyond the fisheries sector. He says it also helps to put climate and sustainability messages in front of customers and consumers, and to inspire others to follow suit. He says becoming carbon neutral is good for the planet, good for people and good for the bottom line.

More information <https://www.australfisheries.com.au/sustainability-2/carbon-neutral>

FISHERS WANTED FOR SAFETY STUDY

New research aims to identify both the barriers and the motivating factors when it comes to adopting safe work practices in Australia's commercial fishing sector, which has some of the highest rates of work-related injury and illness in the country. The FRDC-funded project (2017-046) is led by researcher Kate Brooks in collaboration with the Australian Maritime Safety Authority (AMSA), the Professional Fishermen's Association of NSW, the Western Australian Fishing Industry Council and OceanWatch Australia.

Kate Brooks is seeking fishers to share their stories or to take part in a survey as part of the research (confidentiality is guaranteed). To take part or to receive updates on the project progress, email her at kate@kalanalysis.com.au

The project will work over 18 months with fisheries and fishers in NSW and Western Australia that have identified workplace health and safety as a high research priority and is expected to provide insights that will raise safety standards in the sector. **F**

BIOLOGY



Japanese
Octopus balls

OCTOPUS LIFE CYCLE LOOP CLOSED

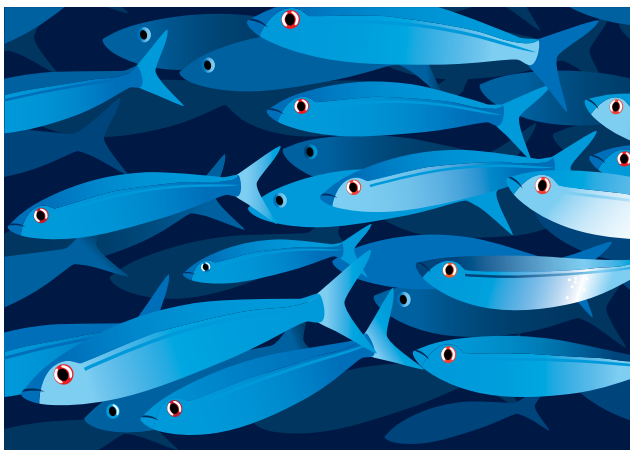
Fully farmed octopus are likely to be available in Japanese restaurants in the near future with Japanese company Nippon Suisan Kaisha (Nissui) announcing a key innovation to ensure survival rates of artificially incubated octopus.

Until now, octopus incubated in this way has been plagued by low survival rates in the first 30 days after hatching. But the company says the identification of an aquatic organism that nourishes the growing octopuses makes the successful hatching of 140,000 eggs by artificial incubation significant. The octopuses were hatched earlier this year in the Oita Marine Biological Technology Center in Saeki in western Japan.

The company hopes to be able to ship fully farmed octopuses to Japanese restaurants and retailers by 2020. Full-cycle aquaculture stipulates that eggs used in the incubation process be derived from animals that were themselves conceived by artificial incubation, the *Nikkei Asian Review* reported.

Photo: 123rf

WORD WISE



TARGETS VS LIMITS

'Targets' and 'limits' are the names for reference points used to guide fisheries management in maintaining the health of fish populations. They are signposts that let fisheries managers know whether a fish population is okay or if they need to take action.

A 'target' is the desirable level at which to maintain a fish population while it is being fished – fish numbers remain self-sustaining, or healthy.

On the other hand, a 'limit' indicates the point at which a fish population is no longer self-sustaining, given the level of fishing activity. When population limits are reached action is needed to lift the population above the limit and back towards the target.

Fisheries managers have different strategies they can use to ensure fish populations remain at healthy levels, including reducing the number of fish caught or closing an area to fishing until a population recovers.

Fish populations may fall towards their limit as a result of many factors, including overfishing, recruitment failure, loss of habitat or environmental factors such as water quality and temperature.

MEDIA

DOCUMENTARY
SETS SIGHTS ON
CLEARER WATERS

Work has begun on *Clearer Waters*, a documentary web series focusing on the key questions that underpin the National Carp Control Plan (NCCP) and the researchers working to find answers.

The series will showcase the huge amount of work going into the NCCP and the key questions the research program is aiming to address.

These include estimating the number of carp in Australia's river systems and addressing the challenges of potentially using a biocontrol.

Clearer Waters will be produced by NCCP Digital Media, published on Vimeo and embedded on the NCCP website (carp.gov.au).

TECHNOLOGY

New ocean forecasts

Fisheries, aquaculture operators and other marine users can take advantage of a system to avoid danger and make their operations more efficient using a new online forecasting tool. The eSA-Marine system forecasts sea surface temperature,

salinity, ocean currents, wind direction and speed for the Spencer and St Vincent gulfs and the southern coast of South Australia.

The system's maps can help fishers save vessel fuel by indicating the most efficient routes or providing the variables that indicate fish habitats. Similarly, for aquaculture operators, the

forecasting system can show optimal routes for towing aquaculture pontoons.

The eSA-Marine system is also invaluable as a search-and-rescue device for its ability to predict storm surges and flooding. The website uses real-time satellite data to capture ocean forecasts ranging from Portland, Victoria,

to Thevenard in South Australia's west, and includes gulfs, shelves and deep waters of the continental slope. This is the first phase of the eSA-Marine 'now-cast' and forecast modelling.

The technology has been developed in South Australia by researchers from the South Australian Research

and Development Institute and the Department of Primary Industries and Regions South Australia in partnership with the Bureau of Meteorology and the University of Adelaide.

Maps can be accessed from any computer or mobile device at:
http://pir.sa.gov.au/research/esa_marine



Search for the fisheries x-factor

The combination of fisheries and start-up science is set to accelerate innovation and the commercialisation of new ideas in the sector.

By Catherine Norwood

THE FISH-X PROGRAM

RECRUIT

Recruit diverse people via pitching problems to solve.

ASSESS

Pivot, persevere or kill. We decide what teams need to get to the next stage of our venture model.

LINK

We concierge linkages to national, regional and global value chains, with some teams going on a linkages tour.

TRAIN

X-Lab runs 2-day microhack(s) and the best teams are picked for acceleration.

ACCELERATE

Over six months we provide coaching in entrepreneurship for different team types.

INVEST

We concierge linkages to funding and investment sources.

OPPORTUNITY EVALUATION

NEW VENTURE CREATION

Source: www.fish-x.com.au

Fostering innovation to solve challenges in the fisheries and aquaculture sector is the aim of the new business-acceleration program Fish-X, officially launched at the Seafood Directions 2017 conference in Sydney in September.

Workshops prior to the launch have already identified seven projects that will receive development support through Fish-X. Further projects are expected to emerge out of workshops held in November 2017 and February 2018.

Fish-X is a joint initiative of the FRDC and business start-up science collaborator X-Lab to help small businesses bring their ideas to life, with a particular emphasis on lean start-ups in rural contexts. Proposals supported so far range from new export products to be made from the invasive freshwater pest species carp, to energy-free technology to oxygenate aquaculture tanks.

Microhacks

The Fish-X process begins with a two-day workshop or 'microhack', which brings together diverse participants who have ideas for a new product or service. The aim is to spark creative opportunities by encouraging synergies between people with different backgrounds. These might include scientists, primary producers or innovators.

Participants put forward their 'idea' and learn new skills by working on their own proposals as well as those put forward by others. They develop the value proposition for their ideas,

pitching for investors and conduct real-market testing during the course of the workshop.

Ideas that add value, are scalable and that support sustainable fisheries or aquaculture are most likely to be advanced for FRDC sponsorship and ongoing assistance from X-Lab to bring them to market.

X-Lab CEO Tim Parsons says the workshops generated a new sense of excitement and possibility among participants. As well as identifying promising teams, it was exciting to see two industry-based accelerators (Fish-X and SparkLabs Cultiv8) established to help build a growing 'cohort' of innovators.

Development initiatives

Food production, digital platforms and technology are the focus of a growing number of development initiatives, including:

Fish-X, www.fish-x.com.au

Food Agility Cooperative Research Centre, www.foodagility.com

Fish 2.0, www.fish20.org

AgriFutures Australia, www.agrifutures.com.au (formerly the Rural Industries Research and Development Corporation)

SparkLabs Cultiv8, www.sparklabscultiv8.com
Food and agricultural technology accelerator established by NSW Department of Primary Industries and international SparkLabs Group

Digital advantage

Tim Parsons says the science of start-ups – the methodologies and tools – has been refined over many years to create a 'lean', experimental approach that can help participants to pursue big opportunities with less capital risk.

Digital 'ecosystems', in particular, are gathering momentum in farming and fisheries, making it easier for small players to implement many new ideas and reach broader audiences.

"We are looking for those in the fishing and aquaculture world with big ideas – individuals, pairs or small groups of fishers, farmers, researchers, consultants, inventors – to apply to participate in this first step to create change," he says.

Applicants can either have new proposals or may already have a fledgling business that could benefit from further support. The next workshop is scheduled for February 2018. Application details can be found at the Fish-X website (fish-x.com.au).

FRDC executive director Patrick Hone says Fish-X provides a systematic approach that considers the commercial opportunities of R&D from the outset, rather than just 'hoping' something might eventuate.

"Coming up with ideas and problems is easy," he says. "Finding answers and bringing them to life is harder. Fish-X aims to help take the next step and bring ideas to reality."

The FRDC initiative has emerged from a series of workshops co-sponsored by the FRDC, the Cotton Research and Development Corporation and the NSW Department of Primary Industries. **F**



Below Eddie Willoughby-Smith
 Frying Nemo, Northern Territory
 Portrait photo: Michael Costa

Out of the ocean, into the fryer

Up for a challenge, the team assessing the national judged Fish and Chips Award traversed the country in search of Australia's best

Story and photos by **John Dory**

(the identity of the judges has been kept anonymous)

It starts with anticipation, as all good meals should. You've agonised over what fish you want. Whether to have it crumbed, battered or grilled. Do you want chicken salt on the chips? If you're in Australia – it was invented Down Under, don't you know? – chances are the answer is "yes". Then it's a simple matter of whether to tartare, or not to tartare (hot tip: only if it's house-made).

You take your little number and stand to the side as the wafts of fishy things frying fill your nostrils with expectation. And, just as impatience starts to set in, a 'BINGO' moment arrives and you've got the warm paper parcel you've been yearning for.

Inside, a veritable treasure trove of salty, battered seafood and potato goodness, and now it's up to you to leg it to the most convenient devouring destination – hopefully dipping your toes in the deep blue, too.

Fish 'n' chips is a meal to share with family, friends and the odd seagull, but the very act itself is quite a focused solitary affair.

A squeeze of lemon before you put your fingertips on the line to tear open batter fresh out of the fryer. Steam billows and reveals the pearlescent fish flesh inside (Yep, batter acts as a protective barrier from the direct heat of the oil. The batter fries, the fish steams).

And after a few optimistic blows of air on the fish, into the gob it goes.

The first few chews are always administered with an open mouth and half huffs of air as you realise it's too hot to eat, but you've gotta wolf it down before the batter goes soggy. Time is

of the essence. Fish 'n' chips might be a simple culinary experience, but there is something special about the entire ritual. It is also one of the hardest dishes to get right – especially if you're dishing up a few hundred serves a day.

I mean it's not like flipping burgers. Most of us don't walk into a burger joint and demand to know where the cow came from, nor do we expect it to be spanking fresh off the land that morning either.

Seafood ambassadors

Fish? Well we want local, we want variety, we want to know where it was caught, when it was caught and why the hell we should be eating it today.

Yep, fish 'n' chippers have it tough – even the supply of fish is at the whim of Mother Nature. Not even those rockin' the boat in gumboots while holding longlines during the wee hours can predict what they'll be reeling in each morning.

As such, our fish 'n' chippers aren't just cooks, they're seafood consultants, educators and ambassadors of the bounty that lands on the dock each day.

Forget celebrity chefs. We need famous fish 'n' chippers!

Finding the best among a list of stellar national finalists from seven states and territories in the Australian Fish and Chips Awards is like publicly declaring which of your children is your favourite. Although each finalist offered differing propositions, the commitment of each was without question.

Stepping inside the unassuming shipping container plonked in the backstreets of



Battered Atlantic Cod,
Great British Fryer,
Queensland

nowhere at Tasmanian Gourmet Seafoods is a juxtaposition of large proportions. As tumbleweed rolls across the paddock outside, inside the large seafood offering defies belief.

On the NSW south coast the crew at Pelican Rocks Cafe work with local fishers who dock and offload their catch just a skimming stone's throw from their front door and even provide table service, too.

On Queensland's Gold Coast expat Brits at Great British Fryer might be importing the fish, batter and cooking oil, but they're showing us Aussies a thing or two about frying fish. The batter and fries were exceptional.

Meanwhile, in Victoria, Trident Fish Bar reminds us why old-school 'wrap it in paper' fish 'n' chippers are not just something from the nostalgic past, they're important institutions.



Crumbed Nannygai
Ocean & Paddock,
Western Australia



Battered flathead
Trident Fish Bar,
Victoria



Grilled Sea Bream
Pelican Rocks Cafe,
New South Wales



(From left) Grilled Jewfish,
Crumbed Threadfin and
Battered Barramundi,
Frying Nemo,
Northern Territory

Frying Nemo is the epitome of celebrating fresh, wild-caught local seafood and cooking with care ...

Over in Albany, Western Australia, the young couple at Ocean and Paddock is part of a new wave of fish 'n' chippers whose milk-bar-style eatery is championing local produce – even the spuds for the chips. They were unlucky to be pipped at the post.

So too The Stunned Mullet, just a hop, skip and jump from Henley Beach, South Australia. The dedication to every detail is simply inspiring and left us feeling like stunned, erm, mullets.

And then there is the eventual winner, Frying Nemo, in Darwin, Northern Territory, which we'll get to shortly.

Our criteria

Firstly, what makes good fish 'n' chips? We considered taste, service, choice, information and labelling.

How well did the batter, crumb or indeed time on the grill manifest in the mouth? Was the fish overcooked? Was everything well seasoned? Was it the right fish for that application? And how long did the various culinary applications last and maintain their integrity throughout the entire eating process? How well did the staff know their fish, and what lengths did they go to in order to share it?

We also considered value. Food is always about perception of value. Whether you're spending \$10 for a sandwich or \$200 for a special night out, the perception of value is how we all evaluate an experience.

Forget what the critics say about a place. Two simple questions will reveal whether a place delivered on its promise. Was it worth the money? Would you recommend

it to a friend? If the answer is "yes" to both, chances are you've had a great meal.

There are fish 'n' chippers out there who are far better than we imagined. Celebrating seasonality, provenance, wild-caught seafood, cooking techniques, sharing of knowledge – all for an average spend per head of \$20 across the board.

The best fish 'n' chippers were innately interested and connected to fishers and where and how the fish were caught.

The handling, storage, display and information were exceptional and it's hardly surprising that they also cared about the batter, the crumb, the grilling, gluten-free options, the oil they use, making the tartare in-house – and the final product on the plate too – even the plate/packaging. →



They knew the best cooking application for a given species and why you should eat a specific species that particular day.

World-class winner

So why did Frying Nemo win? It was the absolute complete package. It altered our perceptions of what it means to eat fish 'n' chips Down Under: destination dining that should not only be celebrated, but championed.

It has a stellar location on Tipperary Waters Marina with al fresco dining (read: wooden tables and benches) for 100-plus people, a children's play area and a buzzer system to let you know when it's time to collect your catch of the day.

Its menu champions the local wild-caught fish – Barramundi, King Threadfin, Jewfish (mullet), Spanish Mackerel, Blacktip Shark – and a few Australian heroes – King George Whiting, Garfish, Flathead, Atlantic Salmon – as well as a bevy of other seafoods – oysters, prawns, calamari, mussels, octopus and sardines too.

It offers four types of chips – shoestring, straight cut, rustic and sweet potato. It even makes its own tartare. But this isn't a restaurant. It's a canteen-style fish 'n' chipper that simply goes the extra mile at every step of the way with staff who know all the details of each fish and how to best cook them.

At Frying Nemo each fish is offered in five different cooking applications, although there are recommendations as to which best suits each fish. From beer-battered (thin, delicate and crisp to the final bite – with a touch of turmeric too), panko-crumbed (giving a light, textured crumb that lets the fish shine) to grilled (without any batter or protective coating and cooked so the centre was still just a touch opaque), tempura (light, crisp and aerated) and a gluten-free, vegetable-based batter as well.

Frying Nemo is the epitome of celebrating fresh, wild-caught local seafood and cooking with care without charging a fortune for the pleasure.

Perhaps through a program like this consumers and fish 'n' chippers will help elevate perceptions, expectations and also the delivery of the product nationwide.

I mean, wouldn't it be grand for a country girt by sea to have a swell of world-class fish 'n' chippers dotted all the way along our vast shorelines? And you'd be hard-pressed to find a fish 'n' chipper on the planet that does a better job than Frying Nemo. **F**

Voting jump-starts seafood conversations

The FRDC's first People's Choice Fish and Chips Awards provide lessons for next year while raising the profile of seafood in Australia

By Peter Horvat



The sheer scale of the response and the enthusiasm with which Australians have embraced the fish and chips awards has amazed us all at the FRDC.

We created new awards this year – both a people's choice category and a judged category selected from the people's choice finalists – to engage the Australian public in a conversation about seafood, integrating these with an existing industry-judged award.

There is no doubt that the conversation has been well and truly started.

Procurement of local catch, fish species, labelling requirements, customers' batter preferences and even the perfect cut of chips have all been hot topics of debate.

Media interest helped raise the awards' profile, along with a healthy dash of parochial competition, typified by the enthusiasm of Senator Anne Ruston, the Assistant Minister for Agriculture and Water Resources. She wholeheartedly threw her weight behind the awards, particularly in support of her home state, South Australia.

Over the seven months of the state and territory, and then national awards, judges travelled more than 22,000 kilometres to sample fish and chips across the entire country.

We received more than 95,000 consumer votes for almost 1000 stores. The awards generated more than 200 media stories, 800,000 social media impressions and led to free publicity for many fish and chips stores in their local media.

As the piece penned by our judge under the pseudonym John Dory demonstrates, the

national judges were astounded by the quality of much of what they sampled. Australian fish and chips have a lot to offer and celebrate.

There were some unexpected outcomes and definite lessons from our first foray into the food awards territory.

Combining the people's choice awards with a judged category created some confusion about judging and voting deadlines that will need to be resolved.

The competition was also far more intense in some quarters than we anticipated. Questions arose about whether customer giveaways should have been allowed and whether this constitutes buying votes. The buying of votes was definitely not encouraged; votes identified as invalid were removed from the tally.

Records were kept of every vote to ensure sound record-keeping and vote-checking. The way voting is conducted will be reviewed.

The goal was to raise the profile of seafood in general and showcase why Australian seafood and potatoes are among the best in the world.

Realistically, more than 70 per cent of seafood consumed in Australia is imported. Not every fish and chips shop is in a position to sell only fresh, local product. For the awards, the issue is about identifying where seafood comes from and allowing customers to choose for themselves.

We are seeking feedback from participating fish and chips shops about the awards – whether they have contributed to an increase in business and what can be improved.

Despite the challenges, we believe the awards have positively raised the profile of seafood in Australia and we look forward to an even greater level of participation when the awards next run. The FRDC will announce details of the next awards in early 2018. **F**



Risk reviews beyond fish stocks

A new business-to-business system of fisheries risk ratings provides easy-to-use information that helps seafood buyers source products with more confidence

By Catherine Norwood

While the sustainability of fish populations underpins the future of seafood supplies, buyers across the supply chain are increasingly calling for additional performance measures when sourcing their fish.

These include the impact of fishing on the broader environment and the kind of management plans in place in a fishery. In future, further performance measures could include labour and animal welfare practices.

While the *Status of Australian Fish Stocks Reports* provides status information for particular target species, the FRDC has launched the Which Fish database, which uses a risk assessment approach to provide additional information on the environmental impact and fisheries management for Australia's leading commercial species.

Sevaly Sen is coordinating the Which Fish project under the FRDC's national research priority one. She has been working on business-to-business tools for assessing the environmental risks of seafood for more than three years.

Business decisions

"Our aim is to help seafood buyers understand the environmental risks of the seafood they buy and use this to inform their own sourcing policies and manage their reputational risks," Sevaly Sen says.

"Which Fish doesn't decide for a seafood business whether a fish is 'good' or 'sustainable' or not," she says. "It provides low, medium

www.whichfish.com.au



Species assessed

Australian species at www.whichfish.com.au are:

Australian Sardine, Balmain Bug, Banana Prawn, Black Jewfish, Blacktip Shark, Blue Endeavour Prawn, Red Endeavour Prawn, Blue Grenadier, Blue-eye Trevalla, Brown Tiger Prawn, Coral Trout, Deepwater Flathead, Eastern King Prawn, Eastern School Whiting, Gemfish, Gould's Squid, Grey Mackerel, Grooved Tiger Prawn, Moreton Bay Bug, Ocean Jacket, Orange Roughy, Pink Ling, Redthroat Emperor, Saddletail Snapper and Sea Mullet.

New Zealand species at www.openseas.org.nz are:

Albacore Tuna, Arrow Squid, Barracouta, Blue Cod, Bluenose, Flatfish, Hake, Hoki, Jack Mackerel, Ling, New Zealand Rocklobster, Orange Roughy, Oreo, Red Gurnard, Silver Warehou, Snapper, Southern Blue Whiting, Southern Bluefin Tuna, Tarakihi, Trevally

and high-risk ratings across three areas: target species; environmental impact of fishing; and management. Only publicly available information is used to inform the assessment.

"This allows buyers to determine for themselves how much risk they are prepared to take when selecting seafood."

It also provides an outlook section, so that buyers can see the likelihood of risks reducing, staying the same, or worsening during the next three years, based on research and management measures in the fishery from which it is sourced.

Collaboration

Sevaly Sen says Which Fish is a "rapid scanning tool", based on the similar business-to-business risk tool (www.seafish.org/rass) developed by the UK industry body Seafish. It has been developed

www.openseas.org.nz



for Australia and in collaboration with Seafood New Zealand. The New Zealand 'OpenSeas' tool is also available online (www.openseas.org.nz).

At its launch in October, Which Fish included 25 Australian species and 20 New Zealand species. The Australian species account for 36 per cent of national wild harvest fisheries production.

Which Fish also separately identifies fisheries that have been certified under a third-party scheme recognised by the Global Sustainable Seafood Initiative, such as Marine Stewardship Council certification.

Sevaly Sen says it does not provide risk ratings for certified fisheries because these already have internationally recognised sustainability determinations. "But not every fishery can afford certification and businesses are asking for information from other fisheries too."

In developing Which Fish, Sevaly Sen met all major retailers and wholesalers, which are estimated to collectively account for more than 70 per cent of domestic sales of Australian seafood. She says "robust", "trustworthy", "transparent" and "easy to use" were the qualities businesses named as priorities in discussions to develop the program.

To ensure the integrity of Which Fish, the risk assessments and rankings have been completed by an independent third party – in this case, MRAG Asia Pacific – and then independently peer-reviewed.

Which Fish is for use available online or as a downloadable Excel spreadsheet that businesses can incorporate into their own systems. **F**



Shared directions on seafood future

Access to new information, inspiration, networking and reporting on the industry's progress to stakeholders are all part of the seafood sector's biennial national gathering.

By Catherine Norwood

Confidence in the future of the Australian seafood sector was high at the national Seafood Directions 2017 conference in Sydney in September, although the event also exposed the "dark side" of the industry, documenting ongoing health and safety issues.

More than 350 delegates, representing all parts of the seafood supply chain, attended the biennial conference, which had the theme 'Sea the Future'.

Assistant Minister for Agriculture and Water Resources Senator Anne Ruston officially opened the event, also launching the Commonwealth Fisheries Policy Statement and the National Aquaculture Strategy. These set out the Australian Government's support and aspirations for the industry.

"Our fisheries are an important resource that must be carefully and sustainably managed for future generations," Senator Ruston said. "Our fisheries are owned by all Australians and shared between numerous stakeholders ... We must explore all opportunities to sustainably grow the economic return from our fisheries."

The National Aquaculture Strategy includes provision for ocean aquaculture in Commonwealth waters, with the government projecting a doubling in the value of aquaculture production to \$2 billion by 2027.

Industry advocates

Also outlining the sector's future direction was Veronica Papacosta, chair of the new peak body Seafood Industry Australia (SIA).

She said SIA and its members would demand good policy from government based on sound scientific and sustainable principles. "We're not going to tolerate other industries or other associations who would use us for their political agenda," she said.



Above Veronica Papacosta, chair of the peak body Seafood Industry Australia (SIA).

"Through collaboration ... we want to amplify the right messages, we want to tackle issues of national importance and provide a single point of consultation for government, NGOs and stakeholders." She said SIA would also 'hunt down' misinformation and sensationalism in the media using science-based information, but also recognising that science and fact would not always be enough.

"We need to rebuild the trust we have with the community. It's not just about fishing, it's not just about people – it's about families and the healthy meal on the family table."

She said SIA would focus on five priorities identified by the industry: improvement of social licence and community respect; country of origin labelling in the food service sector; biosecurity; resource allocation and access (including seismic testing); and continued access to the diesel fuel rebate.

The collaboration she spoke of was reflected in the conference agenda, which included for the first time a session on aquaculture. Indigenous fisheries were also well represented.

Technology was a feature of many



Above Martin Exel from Austral Fisheries, talking of a carbon neutral future.

Right The environment panel session: from left, Lowri Pryce, Simon Rowe, Jonathon Arul, Dennis Holder, Martin Excel and Stewart Frusher.



presentations, looking into how digital innovations and automation could revolutionise the efficiency of the fishing sector, provide more information and new business opportunities throughout the value chain.

Future technologies

Keynote speaker and business futurist Craig Rispin said there were many science fiction-like technologies that were already realities, with the potential to transform the food processing and seafood sectors. These included a testbed ocean aquaculture facility being trialled in Norway that was capable of producing 1.5 million fish a year with a staff of seven. Or the world's first robotic kitchen for Moley Robotics, which can reproduce meals created by leading chefs in your own home.

He said eight "exponential technologies"



Left Opening the conference Assistant Minister for Agriculture and Water Resources Senator Anne Ruston
Below FRDC's executive director Patrick Hone sets targets for 2019. Photos: Chelli Edri



more than half in the next 15 years, he said. Pre-prepared meal services such as Hello Fresh and virtual marketing through software such as GForce were already disrupting traditional sales systems.

Other technological presentations included the SmartCatch system developed in the US to improve catch targeting, and the use of environmental sensors in estuaries developed by The Yield, which has allowed oyster growers to take advantage of more harvesting opportunities (see story page 26).

South Australian fisher Dennis Holder discussed his pursuit of electric over diesel power for his fishing vessel. The aspiration of National Seafood Industry Leadership Program members for Australia's commercial fishing fleet to become carbon neutral by 2030 was also highlighted, following the example of Austral Fisheries, which became the world's first carbon-neutral fishing business in 2016.

Health and safety

Several presentations focused on factors contributing to workplace health and safety issues and the difficulties in addressing these.

The manager of vessel operations at the Australian Maritime Safety Authority (AMSA), Michelle Grech, told the conference there was no accurate information about safety in the fishing industry. Information on injuries and accidents was limited and disjointed, and it was likely that relevant incidents were under-reported. Even so, available figures suggest that compared with shore-based workers, seafarers are up to 27 times more likely to die from work-related injuries.

She reported on an exploratory study in south-eastern Queensland research that sought to understand the maturity of safety culture on fishing vessels and identify benchmarks. Kate Brooks presented on a new research project that has been driven by NSW and Western Australia in the wake of persisting rates of injury and death.

The FRDC-funded project is being conducted in conjunction with AMSA and will begin in 2018 (see page 7 for details on how to participate).

Tanya King, from Deakin University, also presented the preliminary findings of her research into the health of fishers, with almost 1000 registered commercial fishers responding to a survey earlier in the year as part of an FRDC-funded project. She said the study was providing evidence that supported anecdotal information about the impact of uncertainty, including regulatory uncertainty, that affected the mental health of fishers and their families.

2019 challenge

Representing Indigenous Australians and young people, respectively, Stan Lui and Daniela Schwartz both talked about their hopes for the future of the sector in Australia, before FRDC executive director Patrick Hone summed up the conference. He identified a series of achievements he believed the seafood sector should aim to report positively on at the next Seafood Directions conference, in 2019.

- Telling the seafood story – a single story – with funding to support it.
- A clearly defined commitment to the Australian community, made by the seafood sector, which underpins that single story being told.
- Improving transparency across the sector and commitment to resolve differences.
- Establishing a culture of innovation in the Australian seafood sector – creating our own 'disrupters' to transform conventional practices.
- Establishing ongoing funding for Seafood Industry Australia so that it can continue to advocate for the future of the sector.
- Recognising that Indigenous culture is our shared culture, where fishing has been a way of life for thousands of years.
- Improving the safety of workplaces and the physical and mental health of fishers and their families.
- Securing continued funding for OceanWatch Australia as the only government-recognised national resource management organisation for the marine sector.
- Increasing the diversity of people providing leadership for the industry.
- Improving the participation of young people and Indigenous people in the commercial fishing sector.

The 2019 Seafood Directions conference will be held in Melbourne and coordinated by Seafood Industry Victoria. **F**



had been identified that were transforming the world: infinite computing; sensors and networks; robotics; 3D printing; synthetic biology; digital medicine; nanomaterials; and artificial intelligence.

Robotics is expected to have the greatest impact on the seafood sector, particularly in aquaculture production systems and food processing.

Craig Rispin said the seafood sector should also consider the potential impact of all these technologies, as well as on broader food production, retail and service trends. He said information from Food Industry Foresight (fiforesight.com) indicated that the food service sector was more 'growable' than retail in the next five to 10 years.

Spending by Australians on takeaway food and restaurant meals is projected to increase by



Celebration of excellence

The seafood industry's "night of nights" celebrates outstanding performers showing the way for future success

Leaders in the seafood industry gathered in Sydney in September to recognise excellence across a diverse range of categories at the biennial National Seafood Industry Awards. Assistant Minister for Agriculture and Water Resources Senator Anne Ruston helped present the awards during a gala dinner at the Sydney International Convention Centre, attended by almost 400 guests.

The event was held in conjunction with the national Seafood Directions 2017 conference to celebrate outstanding achievements in categories that ranged from business innovation, promotion and safety to environmental sustainability and long-term service.

The most prestigious award of the evening, that of **Industry Ambassador**, was presented to Tasmanian fishers and aquaculture producers Peter and Una Rockliff, who founded Petuna. It recognises more than 60 years of involvement in the industry and their significant contribution to sustainability, innovation and best practice. This includes the pioneering of Atlantic Salmon and Ocean Trout aquaculture in Tasmania. Annie Jarrett and Chris Calogeras were the other finalists.

Winners for the national award categories were as follows:

The Young Achiever Award went to Western Australia's Asher Flynn, who is operations manager of Fremantle Octopus. Asher started his career at 14 and has proved himself a game changer in the industry. He has executed a successful product development launch for international markets and also volunteers his time to visit schools educating children about the seafood industry. Other finalists were: James Polanowski (Tasmania), Karthiga Kumanan (Queensland), and Michael Violante (South Australia).

The Best Large Business Award went to the Northern Territory aquaculture company Humpty Doo Barramundi, a family owned business that started farming Barramundi in 1993 and has become one of Australia's largest producers. Other



Above NSW seafood featured on the awards dinner menu. Photos: Camera Creations

finalists were Debbie's Seafood (Queensland) and Coastal Fisheries (Western Australia).

Victorian wild harvest fishers Bass Strait Direct won the **Best Small Business Award**. It sells directly to the public at Phillip Island, as well as to Melbourne markets. Other finalists were: Monsoon Aquatics (Northern Territory) and Tobin Fish Tales (Queensland).

Western Australia's Ocean Grown Abalone won the **Best Primary Producer Award**. The company is the world's first commercial abalone ranch and has been researching and developing its ranching technology for almost 20 years. Its first commercial harvest last year delivered 18 tonnes of Greenlip Abalone and is expected to rise to 40 tonnes this year. Other finalists were: Australian Bay Seafoods (Northern Territory) and Seafarms Group (Queensland).

Tasmanian mussel producer Spring Bay Seafoods won the **Research, Development and Extension Award** for its work to help develop a range of rapid test kits for paralytic shellfish toxins to reduce the commercial and health risks to producers and consumers, respectively. Other finalists included the research team from



Above Ken Vowles, Northern Territory Minister for Primary Industries and Resources, left, with Bawinanga fisher Don Wilton.

Primary Industries and Regions South Australia, the South Australian Research and Development Institute and the NZRLFA (South Australia), and Future Green Solutions (Western Australia).

The award for **Excellence in Environmental Practice** has become increasingly important for businesses as seafood lovers are more interested than ever before in sustainable seafood practices and scrutinise the origin of the fish and seafood they buy. This year, Austral Fisheries won the title for being the first carbon-neutral seafood business in the world.

Austral operates vessels in Australia's sub-Antarctic fisheries catching Patagonian Toothfish and prawn. All of Austral's wild-caught seafood is certified sustainable and well managed by the Marine Stewardship Council. Other finalists were the Jack and Albert Rivers' Restoration Committee (Victoria) and the Northern Prawn Fishery (Queensland).

The **People Development Award** was won by the Commercial Fishing Operations Skills for the Northern Territory Indigenous Communities program. The enthusiasm and commitment of the indigenous participants from Maningrida have



Left Members of the Bass Strait Direct award-winning team. **Far left** The team from Austral Fisheries (left to right): David Carter, Dylan Skinns, Camay Young, Sam Greaves, Jodie Blacker, Shin Tanabe, Clayton Nelson, Lily Zhang, Markus Gerlich, Sam Colvin, Martin Exel and Jay Shoesmith, celebrate their win of the Environment Award at the National Seafood Industry Awards in September. **Bottom** Guests applaud winners at the National Seafood Awards ceremony at the International Convention Centre in Sydney.



NATIONAL SEAFOOD HALL OF FAME

The National Seafood Industry Awards dinner also provided an opportunity to recognise new members of the National Seafood Industry Hall of Fame. These included the 2017 industry ambassadors Peter and Una Rockliff, as well as the following inductees:

Annie Jarrett began her career working as a deckhand in the Northern Prawn Fishery, Queensland, and Torres Strait prawn fisheries in the 1980s, and has progressed to represent the industry at the state, national and international levels.

Grahame Turk has been a leading figure in the Australian seafood industry for more than two decades, with roles that include leading the privatisation of the Sydney Fish Market and chairing the National Seafood Industry Council.

Bill Passey has provided vision and commitment to help develop the Northern Territory's offshore fisheries. This has included the development of a high lift net and bycatch reduction techniques that have won national environmental awards.

Barry Evans (deceased) was involved in the prawn industry for 50 years, leading collaborative efforts of industry, fishery managers and scientists – particularly in the Spencer Gulf – an approach that has become the hallmark of modern co-management of fisheries.

Arriving in Australia in 1958, **Sime (Sam) Sarin** has helped to shift the tuna industry from low-value canning and poling to high-value tuna ranching, building his company, the Sarin Group, into the world's largest producer and marketer of premium tuna.

Leonie Noble has been a long-standing advocate for the industry, and women in fisheries, promoting fisheries as environmentally responsible, economically important, legitimate users of the marine resource and serving on numerous industry and government advisory boards.

Initially a lobster fisher in Western Australia, **Michael Kailis** (deceased) expanded into lobster processing, then tuna farming, pearling, shipbuilding and exports. His business, MG Kailis Group remains one of Australia's leading marine corporations.

Jayne Gallagher began working in the Australian seafood sector in 1995 undertaking roles across government, research and industry and has established a strong reputation as a strategic thinker, creating wealth-producing visions for the industry. **F**



been the key factor in the success of the program, which incorporates indigenous learning styles and has resulted in a flourishing commercial fishing business within the local Maningrida community.

Other finalists were Sam Evenhuis (Tasmania) and the Seafarms Group (Queensland).

Winner of the **Best Promotion Award** was the Mandurah Licensed Fishermen's Association, in Western Australia, which represents commercial fishers. Its efforts range from marketing to the local community to a major role in the Mandurah Crab Fest, which attracts thousands of people to the region and celebrates the industry.

Other finalists were Adelaide's Finest Supermarkets (South Australia) and Clive Perryman (Tasmania).

Sydney Fish Market, in New South Wales,

received the **Safety Award** for its commitment to ensuring the safety of its customers and workers, having maintained third-party safety certification for 14 consecutive years. Other finalists were the Clean Green Program (South Australia) and Mareterram Fisheries (Western Australia).

Freycinet Marine Farm, which combines an oyster and mussel farm with a restaurant on the Freycinet Peninsula on Tasmania's east coast, won the **Best Restaurant Award**. Other finalists were Manly Fish Café (New South Wales) and Saffron (Northern Territory).

The hotly contested **Best Fish and Chips – People's Choice Award** went to Tasmanian Gourmet Seafoods, and the Northern Territory's Frying Nemo won the Best Fish and Chips – Judged Award category (see story page 10). **F**



AUSTRALIAN FISH STOCKS ADDED TO INTERNATIONAL RESEARCH EFFORTS

By Catherine Norwood

International researchers are using global fish stock assessment datasets to produce new, high-profile research on the status of the world's commercial fisheries.

But Australian fisheries are largely missing from the datasets these researchers use, despite the country's reputation for world-class fisheries management. A new research project led by Richard Little at CSIRO is working to address this issue and provide more up-to-date Australian data to the international information pool.

In this case, it is the RAM Legacy Stock Assessment Database, publicly accessible at www.ramlegacy.org, which forms the basis of fish stock analysis by researchers involved in the Science for Nature and People Partnership (SNAPP) fisheries measures program.

Ray Hilborn, a professor at the University of Washington in the US, leads the SNAPP fisheries measures research team. His international team has had articles published in high-profile journals including *Science* and *Nature* and is working on questions such as whether contemporary science-based fisheries management is effective in reducing overfishing.

Currently only a small portion of Australia's Commonwealth fish stocks are included in the RAM database. Of those that are, much of the information is out of date. The issue, Richard Little says, is not that the information does not exist, but that it has been stored in such a way – particularly the raw datasets – that it is not easily accessible to others.

"So when international teams like Ray Hilborn's publish their research on commercial fish stocks, information about Australian stocks is either missing or it doesn't reflect the current stock status and management," he says.

He is working to change this by developing standard processes and a "pipeline" that will allow national stock assessment datasets to be supplied to the RAM database. This includes securing permission from the owners of the data – in the case of Commonwealth fisheries, the Australian Fisheries Management Authority.

The first dataset he has "harmonised" for the RAM database is the Southern and Eastern Scalegfish and Shark Fishery, specifically data on Redfish, School Whiting and Orange Roughy. Future updates will include the Patagonian Toothfish and Southern Bluefin Tuna.

He says the aim is to ensure the ways in which data are collected and handled align with other processes, such as the provision of data for the *Status of Australian Fish Stocks Reports* published by the FRDC. **F**

Navigating an ocean of data and opportunity

From fisheries resources to seafood consumption, conversations are underway to maximise investment and outcomes in the evolving data landscape

By Peter Horvat

New technologies, underpinned by data, will create efficiencies and uncover opportunities – from untapped markets to smarter fishing to better use of feed in aquaculture systems.

As a broker of fisheries information and data and a stakeholder in the sector, the FRDC is keen to maximise the returns that emerging opportunities afford. This is why it is facilitating a conversation involving industry and government to determine how to best take advantage of these new data-related opportunities.

To ensure a strategic approach that makes the best use of resources and addresses priorities, the FRDC will work with its stakeholders to develop a strategy to help guide investment and activities in this area.

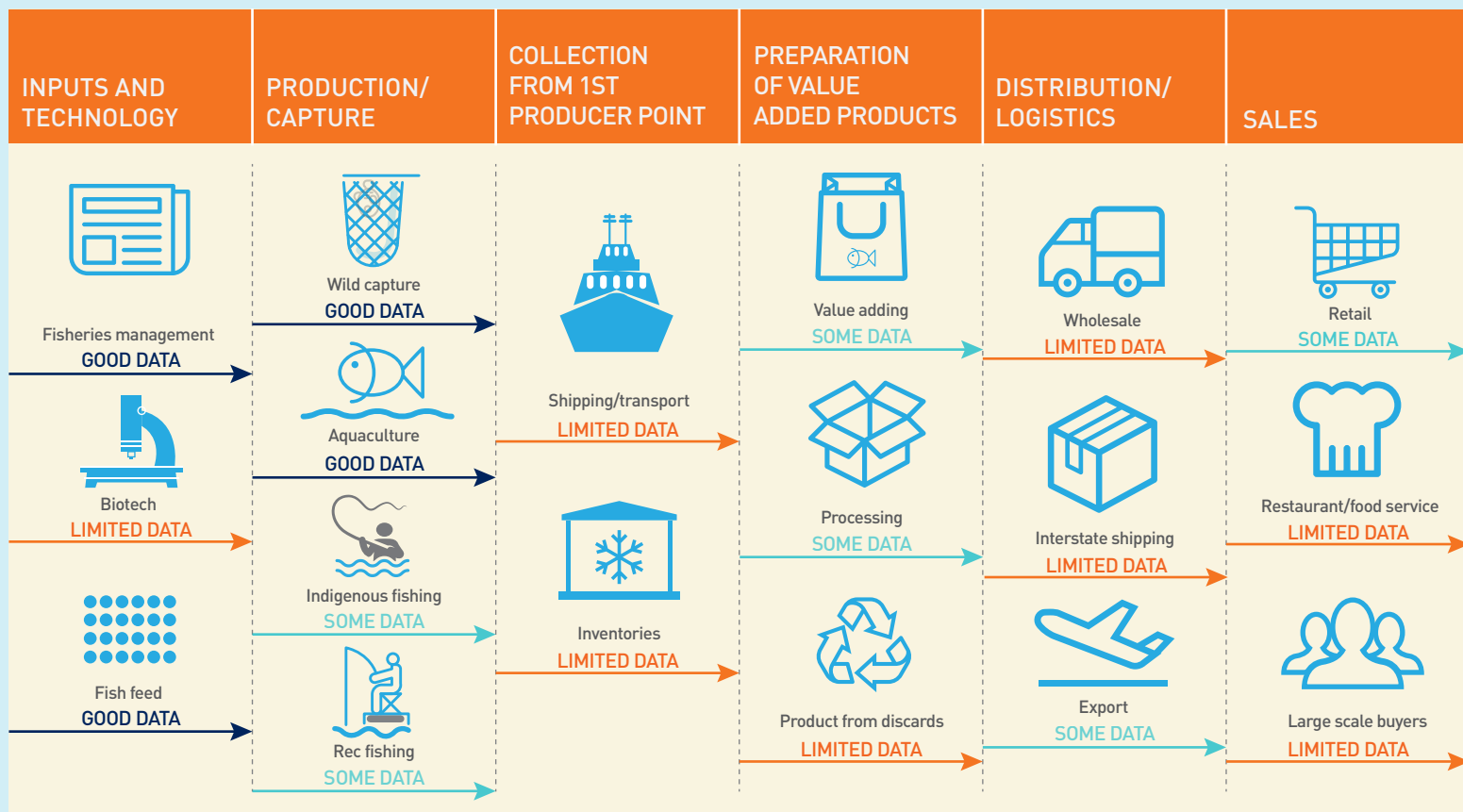
Industry and government stakeholders have identified data as a priority. In the Australian Government's *State of the*

Environment Report 2011, one of the leading issues raised is the lack of an integrated national system for assessment and reporting of marine conditions. Despite the existence of fisheries assessment data, it was not coordinated or easily accessible.

In 2013, the FRDC began to coordinate the *Status of the Australian Fish Stock (SAFS) Reports* in response to that shortfall identified in that report. The success of the reports shows that high-level coordination between jurisdictions is achievable. However, the process brought to light many of the key questions that need to be asked when we are approaching the issue of data.

Some of these are being scoped by the Fisheries Statistics Working Group – a committee of the Australian Fisheries Management Forum. This includes setting out standard approaches to data and developing common terminology and common metadata standards.

Other issues, such as confidentiality, data ownership and the costs involved in

**Figure 1 Fisheries supply chain and existing Australian data availability**

Adapted from Manta Consulting Inc and FISH2.0

harmonisation and collection still need to be looked at. Establishing the right governance and accountability is also key, as is shown by the way New Zealand manages its fisheries data (see page 21).

More recently, there have been significant efforts to broaden the scope of data that the FRDC collects. For example, in 2015 the seafood trade dashboard was revitalised and made available on the FRDC's website (www.frdc.com.au/services/trade-data). This now gives access to trade data in a way that can be interrogated and is easily understandable so that businesses can use this information in their business and strategic decision-making.

One longer-term dataset – the Australian fisheries and aquaculture statistics – has been produced annually for more than a decade and is a valuable source of information. However, changing business requirements, combined with new technologies, have highlighted that even this publication will need to evolve to

deliver more timely data for stakeholders.

The first phase of the FRDC's data strategy will be to map out the priority areas based on stakeholders' needs or potential returns and then put in place mechanisms to address them. This process is already underway. As a basis for future decisions the FRDC is identifying:

- where good data exists and is readily available;
- where some data exists but requires work to be useable or useful if, for example, it is fragmented in multiple systems or must be purchased; and
- where limited or no current data exists.

The supply chain diagram (Figure 1) highlights several gaps in the data landscape. While this diagram gives a good basic overview of the key areas of data, it does not cover all potential data sources.

The FRDC has always been in the business of information – funding research to learn more about biology, ecology, environmental systems and population dynamics, and more.

Many decisions across all of the fishing and aquaculture sector rely on this data.

However, technological changes and the digitisation of most forms of data mean the scope for investment is changing. In parallel with conversations about data in the world at large, the fisheries sector is discussing where it should place its resources and how to be ready for the new opportunities.

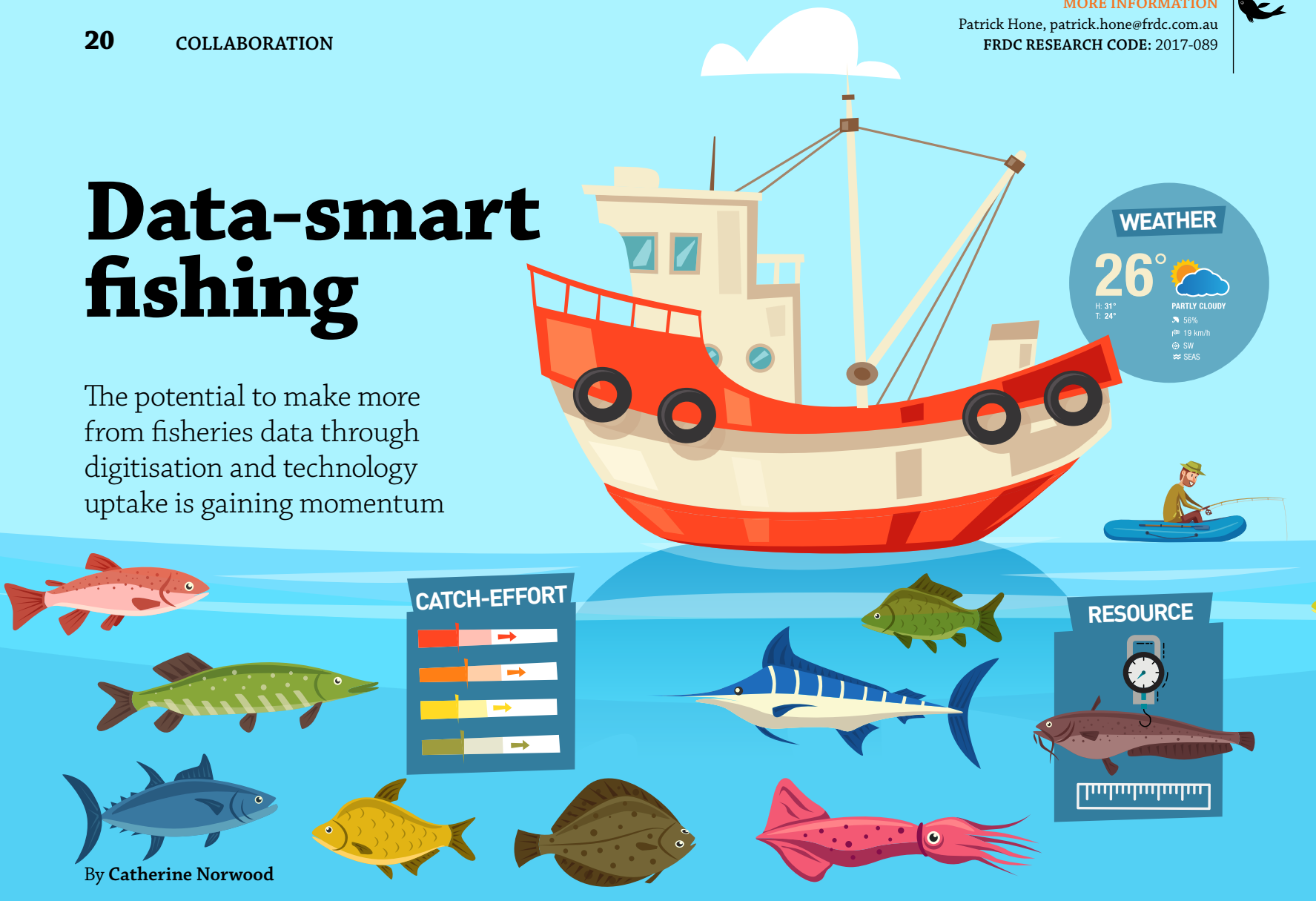
Given the complexity of collecting and looking after data in each of the areas identified in Figure 1, it is likely planning will be needed for each category of data. The stories in this issue on the Which Fish database (page 13) and 'Data-smart fishing' (page 20) show conversations are already underway.

It is important that the FRDC and stakeholders clearly articulate what is needed before we start collecting data – in other words, it will actually be used; and second, that the data that is collected is managed and made available in a way that can be accessed by end users. **F**



Data-smart fishing

The potential to make more from fisheries data through digitisation and technology uptake is gaining momentum



By Catherine Norwood

Advances in technologies such as cloud systems, smartphones and digital data hold incredible potential to create opportunities and improve efficiencies.

For fisheries, digital reporting offers far more opportunities than simply turning paper-based logbooks into electronic ones. With the right integration, fishers' data can be combined with other information in a host of ways to reduce the cost of data collection and fisheries stock assessments, connect fishers with chefs and provide a safer marine workplace.

Earlier this year, the FRDC coordinated a workshop in Melbourne to help industry and government begin the development of a national data vision. The aim, FRDC executive director Patrick Hone says, is to give the industry a lead role in developing the future of Australian fisheries' "digital data landscape".

"The future digital data, internet and cloud systems are going to be the largest

transformation for fisheries in decades. Ensuring that this development is led by industry and government working together on a shared vision and strategy is critical to make the most of this opportunity," he says.

"Digitisation of data over the past decade has enhanced the possibilities of what data can achieve. The next frontier will be understanding how to use this digitised data, to collect it once and use it in many ways to drive efficiencies all the way along the fisheries supply chain."

The workshop attendees agreed that ensuring that ownership, privacy and governance processes are addressed to facilitate access and sharing of data would be critical to this development.

Developments already in the pipeline include the use of continuous digital data streams from satellite, ground radar and ocean current sensors to tell Western Rocklobster fishers where best to set their pots while avoiding losses from strong currents.

Similarly, the Spencer Gulf Prawn Fishery

is proposing to develop a new digital decision tool using ocean, weather and catch data to inform a real-time gross profit margin assessment to maximise the fishery's profit – matching catch with market demand.

Patrick Hone says innovators will not wait for a national strategy in order to develop their software and hardware solutions. However, providing a framework and shared vision can enhance data collection and management across jurisdictions and help innovation to spread more rapidly.

It could also provide direction for those making major investments in related systems along the supply chain – everything from new equipment on vessels to upgrading the government communication systems that collate, process and store fisheries management data. Governments and fishers can take advantage of new technologies and work collaboratively to identify the point where the most-effective data can be collected for the least cost.



The workshop identified key challenges, including the interoperability of data – ensuring it is highly adaptable and easily transferable across different digital operating systems and software programs.

The Australian Fisheries Management Forum (AFMF), a network of fisheries directors from around the country, is already committed to improving cross-jurisdictional harmonisation of data. This includes harmonising the kind of data that is collected – which can vary considerably from one jurisdiction to the next, even for the same species.

Following the workshop, AFMF's Fisheries Statistics Working Group will meet to discuss how they can harmonise their efforts to include interoperability and protocols to standardise the way data is collected and handled.

Further consultation with commercial, recreational and Indigenous fishers is proposed with this in mind and to ensure a national data framework is designed to meet the needs of end users. **F**

Outsourced data delivery a win for NZ

By Catherine Norwood

More than 15 years ago, the New Zealand Government outsourced a range of services from its Ministry of Fisheries to a newly created, industry-owned business, FishServe (<http://www.fishserve.co.nz>). The move came out of a desire within industry to have a greater role in the services they pay for (NZ Fisheries are cost-recovered).

FishServe is a subsidiary of the industry body Seafood New Zealand. It processes licence applications, trading of catch entitlements and quota shares, catch data and provides support to industry – helping fishers understand reporting, licensing and other legal requirements. Increasingly, the services have moved from being paper-based to electronic.

After assessing the risks and benefits, government and industry were able to agree on a model to devolve services to industry, through FishServe, which came into effect in 2001.

Since then, FishServe has been able to reduce its operating costs from NZ\$8 million a year to about NZ\$4 million. Using the internet for business transactions and increasing the number of services delivered online has helped to cut internal operating costs.

Mark Jones is general manager of FINNZ, a subsidiary of FishServe that provides software and data-related services to support fisheries management organisations. He outlined the services that FishServe provided and gave an overview of how data was handled “New Zealand-style” at a recent workshop on data harmonisation held by the FRDC and at the national Seafood Directions 2017 conference in September.

“One of the things we got right when the services were separated from government was our desire to treat our fishers as ‘customers’ of the business,” he said. “When FishServe started, staff put in a lot of effort to work directly with fishers to identify what they needed and to help sort out any issues.

“If someone had a problem we would go and see them, and show them how the forms worked, and how to do things online.”

These early efforts and a customer service focus have improved the quality of data and efficiency of service delivery, and established FishServe as a trusted provider to government and industry.

“It is an interesting position to be in, as an industry-owned organisation, providing industry information required for regulatory compliance to government,” Mark Jones said. “To get the benefits of this type of devolved arrangement, it’s critical to set the service delivery organisation up in the right way and define how it will operate on a day-to-day basis, to eliminate any potential conflict of interest.

“One of the things we got right when the services were separated from government was our desire to treat our fishers as ‘customers’ of the business.”

Mark Jones

“We operate within a service and data governance framework that clearly articulates our roles and responsibilities. We don’t own the data; it is owned by individual fishers and government. Simply, our role is to deliver a number of services to industry and government and it’s very clear what we do with data and what we can’t,” he said.

Staff and organisational accountability are critical to the fundamental controls the organisation needs, along with comprehensive performance standards detailing how data is handled. That is essential to ensure the credibility of the organisation.

There is some data that FishServe does not manage, such as data recorded by fisheries observers. However, it is responsible for the operation of five public registries: quota shares; catch entitlement; fishing permits; vessel licences; and high-sea vessel licences. Under New Zealand fisheries law, these provide ‘one source of truth’ as to the licence details, level of catch entitlement and quota share holdings of individual fishers. **F**

Shy shellfish under scrutiny

By Bianca Nogrady

The first biological evaluation of Brownlip Abalone reveals it is Australia's fastest-growing abalone species

Close-up of a Brownlip Abalone hanging in situ with the tag visible where it is glued to the left side of the shell.

If the coastal marine environment was a cocktail party, Brownlip Abalone would be the guest dressed in a nondescript outfit trying desperately to blend in with the curtains.

They are the archetypal shy, retiring creature, and there has been little research on the species since the 1980s. But a new report commissioned by the FRDC is shining more light its way, both on the wild and as a cultured species.

Brownlip Abalone – *Haliotis rubra conicopora* – is found along the south-western coastline of Western Australia, extending as far around as South Australia.

In an industry dominated by the more eye-catching and lucrative Greenlip Abalone, Brownlip Abalone has long been viewed as bycatch. Its lower commercial value has contributed to the lack of interest in it as a species and as a distinct fishery. There is even debate about whether it is a distinct

species, with suggestions it may be a sub-species of the Blacklip Abalone (*Haliotis rubra rubra*) common to eastern Australian coastlines.

The abalone industry in WA began in 1970, with sales to both domestic and international markets. However, records of Brownlip Abalone catches have only been kept since 1984. The first total allowable commercial catch limit for the species was not set until 1999.

However, interest in the species has been rising in recent years, according to the lead author of the new report, Lachlan Strain, a research scientist from the WA Department of Primary Industries and Regional Development.

Brownlip Abalone catches steadily increased to a peak of just less than 40 tonnes a year between 2008 and 2010, averaging about 35 tonnes more recently. This compares to an annual harvest in WA of about 180 tonnes of Greenlip Abalone.

"Brownlip has become a more important component of the fishery, but until now we

didn't even have basic biological information like growth and mortality rates," Lachlan Strain says.

This information is essential to any fishery, as it enables an evidence-based approach to setting sustainable catch and size limits.

Biological data

With this in mind, Lachlan Strain and colleagues undertook a four-year assessment, including a tag-recapture study of 1171 wild Brownlip Abalone across 19 sites. It also included the spawning and rearing of Brownlip Abalone juveniles in commercial aquaculture systems, modelling their growth and spawning biomass, and developing a 'per recruit' model and a preliminary integrated length-based model for a Brownlip Abalone fishery.

"The big question was really just understanding the basic biology of the animal," Lachlan Strain says. But this proved more difficult than expected.

Unlike Greenlip Abalone, which prefers to



graze in the open across granite or limestone surfaces, Brownlip inhabits cracks, crevices and caves, which makes it much harder to catch.

“Where they’re found in caves, it was much too difficult to access with divers, to the point where you’re pinned up in little caves underwater trying to get these animals out and it just becomes too physically dangerous,” Lachlan Strain says.

This was particularly challenging when it came to finding juveniles; the research team struggled to collect any animals under 50 millimetres in shell length in the wild. Instead, the researchers had to rely on juveniles from commercial aquaculture to develop a growth profile for the animal.

This revealed that the Brownlip Abalone is the largest and possibly fastest-growing abalone species in Australia. They grow larger than Greenlip Abalone earlier in their lifespan – before two years of age – and achieve maturity at about four to five years of age and at 120mm in size.

The chair of the Abalone Industry Association of Western Australia, Peter Rickerby, points out that size and spawning maturity are not always the same thing.

“Once they reach around 120mm, which is below the actual legal size limit, they do enter maturity but their spawning potential is not as good at that age,” he says. “When they get fully mature, then their spawning potential is much greater.”

This has implications for setting harvest sizes to ensure maximum spawning capability is maintained. More than three-quarters of the Brownlip Abalone caught in the tag-recapture study were over the legal minimum length of 140mm, and more than half were between 150mm and 170mm.

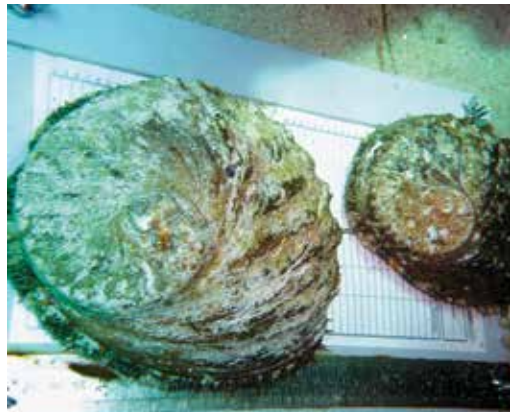
The researchers concluded that the current industry approach of only harvesting relatively large Brownlip Abalone – much larger than the legal minimum size of 140mm – meant the fishery was relatively resilient to pressure from fishing.

The study also noted that the average size of Brownlip being caught commercially has decreased by about 10mm in recent years. Lachlan Strain says one possible cause could be increased diver efficiency, using two divers at a time instead of one, collecting more abalone from each area visited.

Another explanation is environmental.

“In 2010-11, we had a marine heatwave in Western Australia, and we’ve had higher-than-

Below left Divers recorded data related to size and age of Brownlip Abalone before attaching tags to the animals’ shells. **Below right** Small Brownlip Abalone (less than 100mm) captured in the wild for in-water tagging. Photos: Mollusc Section, Western Australia Department of Primary Industries and Regional Development



“This report will also be used with the MSC harvest strategies and help us set the total allowable commercial catch and size limits to the right level to ensure we are sustainable.”

Lachlan Strain

average water temperature for several years after that, which is generally linked to issues with abalone growth and reproduction,” he says.

But overall, the researchers’ modelling of Brownlip Abalone fisheries suggests it is on the right track for long-term sustainability. Industry has welcomed the findings, and Peter Rickerby says the report will be valuable in helping industry and fisheries managers continue working together to shape the future of the Brownlip Abalone fishery.

“It’s going to give us more accurate information in making the best management decisions for the fishery, in terms of setting total allowable catch limits,” he says.

With WA’s abalone fishery awarded Marine Stewardship Council (MSC) certification in October this year, the research report has come at an ideal time, Peter Rickerby says.

“This report will also be used with the MSC harvest strategies and help us set the total allowable commercial catch and size limits to the right level to ensure we are sustainable,” he says.

Lachlan Strain says the findings are a big step forward for the WA abalone industry. “It’s quite a significant stepping stone for us in terms of managing both the Greenlip and Brownlip abalone fishery in WA.

“Not only does it give us a good handle on Brownlip but we’re also transferring the models developed in this project across to Greenlip and other species, thereby improving the stock assessments for all abalone species in WA.”

Brownlip aquaculture

The research has also uncovered crucial information to inform the development of Brownlip Abalone aquaculture, which for the moment is relatively small in WA compared with Greenlip Abalone. The study identified a crucial difference between the two species: Greenlip Abalone likes the light, whereas Brownlip Abalone likes the shadows.

“We looked at Brownlip through what would be considered traditional Greenlip aquaculture systems and techniques. We found that in the juvenile stage, when they’re in the nursery, you wouldn’t need to adjust systems – you could still produce them the same way Greenlip is produced,” Lachlan Strain says.

The problem came when they moved to the grow-out system, where Greenlip Abalone are generally housed in concrete slab tanks; Brownlip Abalone were too exposed for their liking and would crawl out of the tank seeking shelter. The animals also huddled together for protection, which reduced their growth rates, he said.

He suggested grow-out tanks for Brownlip Abalone might benefit from being deeper, and with artificial habitats that allow the abalone to lurk out of sight. Their research suggested that even these simple measures could reduce mortality and lead to better growth rates.

“It starts to indicate that regardless of whether they’re in the wild or aquaculture, that behaviour is still there and that you really need to match the animal’s behaviour to your aquaculture systems to get the best out of it,” he says. **F**



Emerging leaders target collaboration

New perspectives and broader communication were themes at this year's seafood leadership program

By Catherine Norwood



2017 NSILP graduates celebrate a great six months. **Standing (from left):** Tiger Davey, program facilitator Chris Calogeras, Michael Tropiano, Meredith Epp, Justin Holgate, Emily Grilly, Daniela Schwarz, John Ford, James Newman, Lief Hendrikz, Michelle Hansen, Flora Warrior, program facilitator Josiah Pit, program facilitator and manager Jill Briggs; **front row (from left):** Charles David, Kelly Morgan, Mel Carrington, Mike Terry, Brett Colley.

Emerging leaders of the seafood community presented their vision of a united seafood community during their final round of meetings and graduation dinner in Canberra in September.

The members of the 2017 National Seafood Industry Leadership Program (NSILP) met industry leaders and decision-makers to present the strategies they developed during the seven months of the program. They believe the strategies will play a key part in the industry's future.

This year's cohort included a diverse range of participants from the Australian and New Zealand seafood industries, including from retail, aquaculture, marine science, wild harvest, recreational fishing and indigenous fishing.

The vision the group established was: 'A unified and empowered seafood community'.

Their mission: 'To promote sustainable growth of the seafood industry'. This includes the group's aspiration for Australia's commercial fishing fleet to become carbon neutral by 2030.

Strategy planning

During the program, participants formed three teams to develop projects supporting the sector's future.

The 'Seafood Stories' project established a Facebook page and Instagram account as places where seafood industry workers can tell their stories, and help build community awareness and enhance social licence (Facebook: www.facebook.com/AusSeafoodStories; Instagram:

"Breaking down barriers is vital for us to ensure a sustainable industry for future generations"

Meredith Epp, Marine Stewardship Council

@AusSeafoodStories, #ausseafoodstories).

The second project, 'Blue Unity', focused on strategies to unify the seafood community through collaborative marine-habitat restoration and enhancement projects that would lead to an increase in marine resources.

Key to this was identifying and increasing awareness of the barriers that prevent restoration works and promoting potential solutions such as the Blue Carbon Initiative, a global program working to mitigate climate change through the restoration and sustainable use of coastal and marine ecosystems.

SeaTube was the third project, which proposed a marine version of YouTube. It would provide an extensive library of educational videos covering all aspects of the seafood industry. The overall aim was to address lack of community awareness and understanding of the industry.

Diverse viewpoints

Michael Tropiano from Recfishwest says the course helped open his eyes to the bigger picture. "Living over on the west coast can sometimes insulate you from bigger national and whole-industry issues and opportunities, so to end up at the business end of town in Canberra is pretty exciting," he says.

Meredith Epp, from the Marine Stewardship Council, says the program is helping to break down barriers between different sectors of the seafood industry.

"Breaking down barriers is vital for us to ensure a sustainable industry for future generations. NSILP brings people with different backgrounds together to embrace the multidisciplinary nature of the seafood industry and to enable participants to become leaders in their professional and individual lives."

Program facilitator and manager Jill Briggs says industry speakers and mentors this year have put in a lot of work to support the program, and have been "hugely valuable".

"Those taking part have indicated that the diversity of perspectives involved has really stretched their thinking. The program may just seem like nine days of 'get-togethers,' but participants say putting together strategies is complex and hard work. And we don't shy away from that, because that's what leadership needs," she says.

NSILP has been running for 17 years, with funding from the FRDC and sponsorship from Sydney Fish Market.

2018 program

Expressions of interest in the 2018 programs are open, and more information is available at the Rural Training Initiatives website (www.ruraltraininginitiatives.com.au/home/programs/seafood). Applications can be made online and will close on 15 January 2018. **F**

Citizen science captures recreational data

More information on the recreational take is emerging from the development of the Track My Fish app, which in turn is leading to better recreational fishing

By Andrew Cooke

Right
The Track My Fish app provides real-time data for recreational fishers.

Efforts to quantify national recreational fishing activity have been notoriously difficult and expensive in the past, but a new approach developed in Queensland may offer a more targeted and reliable source of fishing activity data.

Led by founder Bill Sawynok and his son Stefan Sawynok, Infofish Australia has been collecting data on recreational fishing for more than two decades.

The accurate forecast of catch rates and fish sizes in some areas is becoming possible as a result of gathering information from the top 20 per cent of most active fishers who, Bill Sawynok says, are responsible for 80 per cent of the recreational catch.

"We are focusing on those 20 per cent – we call them the 'T20 fishers'. They are the ones who respond to changes in fisheries much more readily than the overall population, because they are out on the water more often and their catch rates are much more linked to changes in fish stocks," Bill Sawynok says.

Infofish Australia uses a range of digital technologies to gather and process real-time information. With more than 1.3 million fish records and 850,000 tagged fish in its database, it is Australia's largest non-government fisheries database.

This data feeds into its smartphone app 'Track My Fish', which collects information and provides services for recreational fishers.

Recreational fishers who contribute to the

Infofish Australia datasets are part of a huge volunteer citizen-science effort. "At the moment we have about 300 to 400 registered volunteers, but we also have about 200 more who are providing us with data over and above that," Bill Sawynok says.

Fishers can also choose who they share their data with or not at all. Track My Fish collects data on everything, from tagging and catching efforts through to fishing competitions and fish health issues.

Infofish Australia has set itself a three-year timeframe to develop Track My Fish to the point where it provides real-time data to a broad range of clients nationally. From 2017 to 2020, Bill Sawynok expects the amount of information gathered and processed to increase five to tenfold.

Data provided by fishers is collated and made available on the app the following day. The data is presented on 'dashboards' and shows information such as catch-rate trends, fish sizes, and heat maps that show where the fishing effort is.

Track My Fish already has about 100 different dashboards and more than 1000 maps, charts and tables that are updated daily. As the database expands, more species and locations are expected to be included, and a move to real-time processing would allow fishers to use the app to make decisions "on the water", Bill Sawynok says.

Among these are Crystal-Bowl dashboards, which provide live monitoring of fishing activity, stock assessments and stock forecasts for popular Queensland species and locations.

As well as its Track My Fish website,



smartphone app and online dashboards, Infofish Australia is investigating:

- computerised 'machine learning' to identify fish and fish health issues;
- neural networks to analyse data patterns and improve forecasting; and
- the introduction of real-time stock-assessment technology from the US.

Automation of data analysis will be crucial to future applications. "Using photos and computers, for example, we can process a huge number of samples to identify fish health issues improving data that can be provided to pathologists," Bill Sawynok says.

Infofish Australia data collection in Queensland has already been aligned to match that of the state fisheries authorities and dovetails with the *Queensland Sustainable Fisheries Strategy 2017-2027* to better integrate data and provide information from a broader range of sources. **F**



The internet of oysters

Machine intelligence underlies a new, more efficient and profitable way to manage oyster harvests

By Gio Braidotti

There is a computing term rapidly growing in importance to food producers – the ‘Internet of Things’ (IoT). It is being hailed as the future for managing on-farm, weather-based risks, and Australian oyster growers are at the vanguard of its adoption.

Central to an IoT network, where food production is concerned, are sensors embedded into physical environments that sense the world in the same digital language as computers.

Wireless connectivity allows the sensors to feed huge streams of data to cloud-based computing platforms where data analytics and machine learning process it into useable information. This can then be fed to humans via smartphone apps or used directly to control machines.

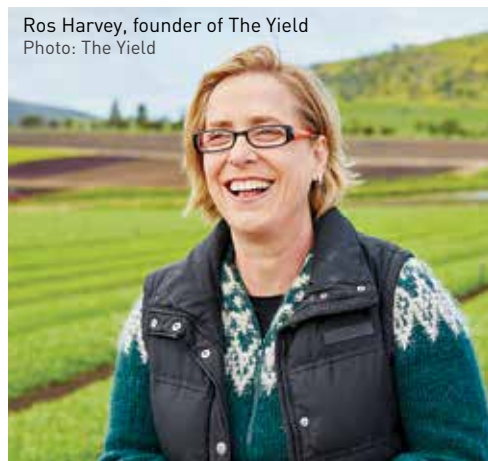
It is the IoT that can make machines seem intelligent and, conversely, allow computers to sense – and ‘learn’ about – some aspect of the world. The breadth of applications – in monitoring, decision-making and automation – is potentially staggering.

The McKinsey Global Institute, one of the world’s leading think tanks, forecasts that the IoT could deliver US\$11 trillion to the global economy by 2025, including up to US\$120 billion annually to the Australian economy.

For award-winning IoT entrepreneur Ros Harvey, applications in food production led her to establish agricultural technology solutions company The Yield.

She says The Yield’s aim is to take the guesswork out of growing. “Australia is a really challenging place to grow things. This also makes it a terrific place to develop IoT-based technology that helps growers

Ros Harvey, founder of The Yield
Photo: The Yield



make important decisions,” she says. Among the earliest applications is an “internet of oysters” called Sensing+ for Aquaculture.

As filter feeders, oysters are affected by changes in water quality, primarily due to rainfall washing land-based contaminants into estuaries that then transiently accumulate in oysters, making them temporarily unsafe to eat.

Monitoring water quality

The Yield’s internet of oysters has proven it can safeguard food safety while reducing unnecessary harvest closures by an estimated 30 per cent. This corresponds to four extra weeks a year of harvest time. This could translate into a \$5.3 million annual saving to the \$24 million Tasmanian oyster industry.

State regulators have traditionally relied on rain gauges from public weather stations to guide when to shut harvesting down. But if the gauges are located hundreds of kilometres away from the oysters, the data they provide may not be easily applicable.



Ros Harvey and her team at The Yield used Microsoft’s Azure IoT Suite to host the data generated by electronic sensors that sit embedded in oyster leases.

“If you are going to do IoT, you need sensors that are robust and reliable,” Ros Harvey says. “One of the things we are really proud of is the real-time electronic sensing technology we have working reliably in salt water, in the gale-force conditions, in open bays.”

Estuary-localised data is combined with wide-area weather data and analysed using data-processing systems developed and patented by The Yield.

She says the system uses machine learning technology and neural networks to not only analyse what is happening with the oyster farms, but also to predict salinity, with 90 per cent accuracy, three days in advance. “These predictions are shared with growers and regulators in real-time via two separate apps that display temperature, salinity and water depth graphs against values that precipitate a closure.”



Oyster growers in NSW and Tasmania will benefit from The Yield's environmental sensors, which state governments are using to assess water quality.
Photo: Melissa Marino



“Australia is a really challenging place to grow things. This also makes it a terrific place to develop IoT-based technology that helps growers make important decisions.”

Ros Harvey, The Yield

Scheduling harvest

In addition, the technology is proving a useful tool for growers when it comes to labour scheduling and harvesting. With advance warning over a possible closure, growers now have time to schedule crews to get product out of the water and to market.

There are already more than 300 growers using sensors to measure a range of variables that affect oyster quality, health and that underpin food safety – water temperature, salinity and depth. Tasmanian growers were the first to come on board, later expanding into NSW.

Only a year after its launch, the expanding network of growers has allowed Tasmanian and

NSW government food authorities to rely on The Yield's IoT technology to manage closures, with 50 per cent of growers using the IoT tool every day.

The system is also built with the flexibility to enable future innovation. Agreements with growers allow data to be made available to researchers to help with the development of new models of animal husbandry and disease risk management. In fact, The Yield is an industry partner to the FRDC-supported Future Oysters Cooperative Research Centre Project (CRC-P) and the Food Agility CRC, providing data to support researchers and a pathway to commercialisation for more rapid impact of research outcomes. **F**

Below (left to right) Oyster grower Justin Goc with Donna Forlin and Ros Harvey from The Yield at Barilla Bay Oysters, Tasmania. Photo: The Yield



INNOVATION AT BARILLA BAY

One of Australia's most fertile aquaculture regions lies along the southern coast of Tasmania – the Coal River Estuary, where Justin Goc works as general manager of Barilla Bay Oysters.

Established in 1980, the company quickly built a strong reputation for innovation. Concerns over irregular quality led it to become a major shareholder in Tasmania's largest oyster hatchery, helping to pioneer the production of 'single-seeded oyster' techniques that ensure bigger, healthier and more accessible oysters.

More recently, environmental challenges – especially the devastating impact of Pacific Oyster Mortality Syndrome (POMS) – inspired the company to once again innovate.

In 2016, Justin Goc turned to The Yield and its Sensing+ For Aquaculture 'Internet of Things' technology, installing sensors inside his harvest area to measure important climatic conditions, including salinity, water temperature and depth, barometric pressure and sea tide height.

The system analyses the data and produces three-day predictions that help Barilla Bay Oysters to plan grading and harvesting activities, especially around rainfall-induced harvest closures. Justin Goc says closures can result in financial losses of between \$20,000 and \$100,000 a day, depending on the season.

“What we need is information that helps us make decisions, and that's where The Yield fits in. This gives us a road map of what is going on in the water, which has always been difficult to quantify.

“Twice already this year we were faced with lots of rain and changes in our environment. With The Yield's technology we were able to prove that the impact from water run-off was not significant enough to make us close.”

Based on available data, it is estimated that Sensing+ For Aquaculture can also provide a greater understanding of the conditions most likely to spawn POMS. Increases in water temperature during the past three years coincided with an outbreak of POMS in Tasmania.



Sound responses

'Hearing' damage in Southern Rock Lobsters and a flinch response in Scallops are two effects identified in world-leading research into the long-term impact of seismic surveys on marine animals

By Bianca Nogrady

The efficacy of seismic surveying as an undersea geological exploration tool has been well established since it was first introduced in the 1920s. Less clear cut is the impact it has on those creatures that live on and just above the sea floor.

Research into the effects of seismic noise on marine mammals such as whales and dolphins has led to practices designed to minimise negative impact on the ocean's larger inhabitants. But relatively little is known about the effects on smaller creatures, particularly fish, shellfish and crustaceans.

Seismic surveying has been a significant concern for fishers and the communities that depend on fisheries for their livelihoods. To date, much of the discussion has been based on anecdotal and circumstantial evidence.

However, two FRDC-funded studies are providing more scientific evidence. Both experiments have examined the effects on two important fisheries species: the Southern Rock Lobster and the Commercial Scallop.

Blasts of air

Seismic surveying uses rebounding sound to build up a picture of the sea floor and the geological structures up to 10 kilometres beneath it. The most common method used is an air gun towed behind a ship, which fires a pulse of sound towards the sea floor every eight to 15 seconds. The reflected soundwaves are recorded by rows of hydrophones also pulled on cables behind the ship.

The first of the two FRDC-supported studies is a collaboration between the University of Tasmania's Institute for Marine and Antarctic Studies and Curtin University's Centre for Marine Science and Technology.

Researchers Jayson Semmens, Ryan Day,

Robert McCauley, Quinn Fitzgibbon and Klaas Hartmann selected two study sites – a 10 to 12-metre-deep sandy site for Scallops and a 10 to 12-metre-deep limestone rock platform for lobsters. They then acquired 380 Southern Rock Lobsters and 560 Scallops from sources including nearby sites and commercial fisheries and stored them briefly before relocating them to lobster pots and enclosures at the sites.

The two species were exposed to differing numbers of passes by the air gun at distances designed to mimic the exposures they would experience in the wild. The experiments were conducted in summer and winter and with different pressures of the air gun. There was also a control group for each species that was not exposed to the air gun at all.

Jayson Semmens and his team saw no evidence of the mass fatalities some fishers had feared. However, their findings suggested the air-gun exposure was far from benign and caused a range of what researchers call "sub-lethal" effects.

Rock Lobster reflexes

First, in the summer experiment, they found lobsters exposed to the air gun had an immediate decrease in the simple tail extension reflex, which in some cases lasted for up to two weeks after exposure.

"The effects of stress in lobsters are known to be exacerbated in warm summer conditions, which explains why this response was only observed in the experiment conducted in the summer," the researchers wrote. "However, the duration of the response indicates that its cause cannot be explained simply by fatigue."

Second, the lobsters exposed to the noise also took longer to right themselves after being placed on their back, which is a more complex reflex. When the researchers investigated further by examining one of the organs that plays a key role in this reflex – the statocyst, which functions in a similar way to the human inner ear – they found significant damage that was linked directly to slower righting times.

One of the winter trials recorded no difference in righting time between the exposed and control lobsters. Researchers examined the statocyst in both groups and found animals in both had significant damage to the organ.

As the lobsters in this trial were originally collected from sites with higher levels of human-induced noise, the researchers have suggested this damage may have occurred prior to the trial. However, the results of this trial also indicate that lobsters might be able to adapt to statocyst damage because they did not display impaired righting reflexes.

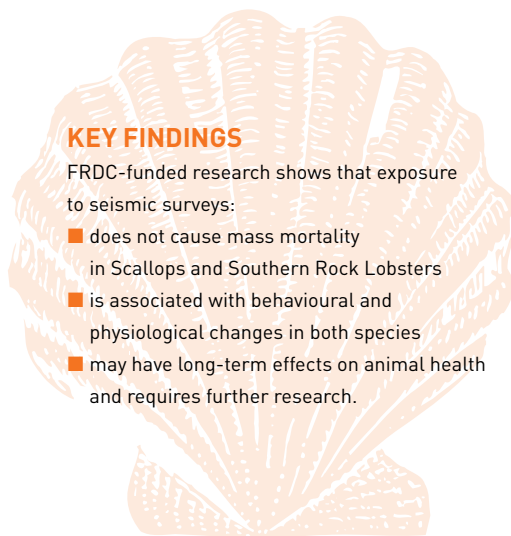
Researchers also looked at the biochemistry of the lobsters' haemolymph – their equivalent of blood – and found a significant decrease in the number of immune cells that serve as an indicator of general health in exposed lobsters.

"These results raise some concern that

KEY FINDINGS

FRDC-funded research shows that exposure to seismic surveys:

- does not cause mass mortality in Scallops and Southern Rock Lobsters
- is associated with behavioural and physiological changes in both species
- may have long-term effects on animal health and requires further research.





Seismic testing in warmer months may exacerbate stress on Southern Rock Lobster.

While the studies may go some way towards reassuring fishers and fishery managers that mass die-offs are not the result of seismic surveying, there is still clear evidence that the surveys are having an effect – possibly long term – on these valuable fishery species.

exposure may affect the immune system of lobsters over a chronic (months post-exposure) time period, leaving them vulnerable to pathogens,” researchers wrote.

The researchers did not see any negative effects of the air gun exposure on lobster embryos.

Scallop exposure

In the case of Scallops, there was no evidence of mass mortality, but researchers did see increasing mortality with an increased level of exposure to the air gun.

Unexposed control Scallops had a mortality rate of less than five per cent 120 days after the experiment began. Scallops exposed to one pass from the air gun had a nine to 11 per

cent mortality. Those exposed to two passes had mortality rates of 10 to 16 per cent and those exposed to four passes had a mortality rate ranging from 13 to 20 per cent.

The Scallops behaved slightly differently after the air gun had passed, showing less of their usual positioning and swimming behaviour. They also demonstrated a new flinching behaviour that was only seen when the air gun was going off.

As with the lobsters, the exposed Scallops showed lower immune cell counts. The team of scientists also saw “extreme” changes in the biochemistry of the Scallops’ haemolymph, which persisted over the course of the 120-day experiment. “The ecological implications of these extreme physiological changes also warrant further

study, as they may have substantial impacts on the ability for Scallops to cope with further stressors (for example, dredging, temperature changes, etc) in the wild following exposure to seismic signals,” the researchers wrote.

This study represents one of the most detailed and controlled experiments worldwide on the impact of air guns on these populations in a natural environment.

Geoscience study

In another study – an FRDC joint venture with Geoscience Australia, CSIRO and the University of Tasmania’s Australian Maritime College – Rachel Przeslawski, Lynton Hurt, Alex Forrest and Andrew Carroll set out to explore the effects of a real seismic survey on ‘wild’ populations of Scallops in the Gippsland Basin off the coast of Victoria. In this case, the team used an autonomous underwater vehicle to take snapshots of Scallop beds before and after the seismic surveys, and also dredged some areas to look for evidence of Scallop die-offs.

The researchers saw little impact from the seismic surveys on Scallops in the region, even though sound monitoring at the sites confirmed that the Scallops were exposed to a significant amount of noise.

Rachel Przeslawski and her colleagues said their study was the third of its kind to find no evidence of mass die-offs in Scallops immediately after exposure to seismic surveying. However, they pointed out that there might be other negative and sub-lethal effects they were not able to detect.

“The main recommendation of the current study is to focus efforts on the long-term or physiological effects of seismic surveys on Scallops and other invertebrates, rather than short-term gross effects such as mortality, as well as other factors that may cause mass mortalities (for example, disease and marine heatwaves),” they wrote.

As is often the case, the two studies deliver some answers but raise many more questions in the process. While the studies may go some way towards reassuring fishers and fishery managers that immediate mass die-offs are not the result of seismic surveying, there is still clear evidence that the surveys are having an effect – possibly long-term – on these valuable fishery species. **F**



Habitats of a lifetime

Queensland research is challenging traditional understanding of fisheries habitats, with new decision-making matrices to map species' needs

By Jo Fulwood

Research carried out in north-east Queensland delves into the detail of habitats that tropical fish species depend upon at different stages of their development.

To do this, the researchers developed life cycle-habitat matrices to help better identify and protect areas that are crucial.

While significant research has previously been undertaken on the habitats of adult fish – the age at which they are most targeted by fishers – little has been known about other habitats tropical fish might need to progress through their life cycles.

Researchers at James Cook University have used advanced underwater video sampling over three years in the Hinchinbrook region of north-east Queensland to uncover the specific characteristics and features important to different species of fish at different points in their life cycles. Using this information, they have developed summary diagrams (or matrices) that highlight the value of critical ecological areas to the survival of particular tropical fish species of north-east Queensland.

Project co-author Marcus Sheaves says the FRDC-funded research is the starting point to understanding the many and varied habitats required by tropical fish throughout their life cycles, and the importance of maintaining the integrity of these habitats to ensure each species survives in the future.

For instance, little had been known about the use of deep-water estuary habitats by fish.

“We now know that particular deep-water habitats harbour large numbers of juveniles of

“A habitat, such as a mangrove habitat or an estuary, is a general term, and we need to drill down and understand which specific parts of these larger areas are important for these tropical fish species at certain stages of their life.”

Marcus Sheaves

important food fish, such as Golden Snapper (*Lutjanus johnii*).” Although this had been observed by anglers, it had not been scientifically verified.

“This research now gives us a way to record this critical information and make planning and research decisions about the numerous habitats this fish occupies throughout its lifetime,” Marcus Sheaves says.

Decision tools

The matrices, used to summarise the use and requirements of different habitats by specific species, will allow both experienced and non-experienced decision-makers to identify the most vital habitats to conserve, replace or remediate. Marcus Sheaves says managers can use the framework to make decisions about coastal and estuarine regions based on data, not guesswork or public perception.

“A manager can use our matrices to help differentiate between different scale habitats rather than just considering the area as a whole.

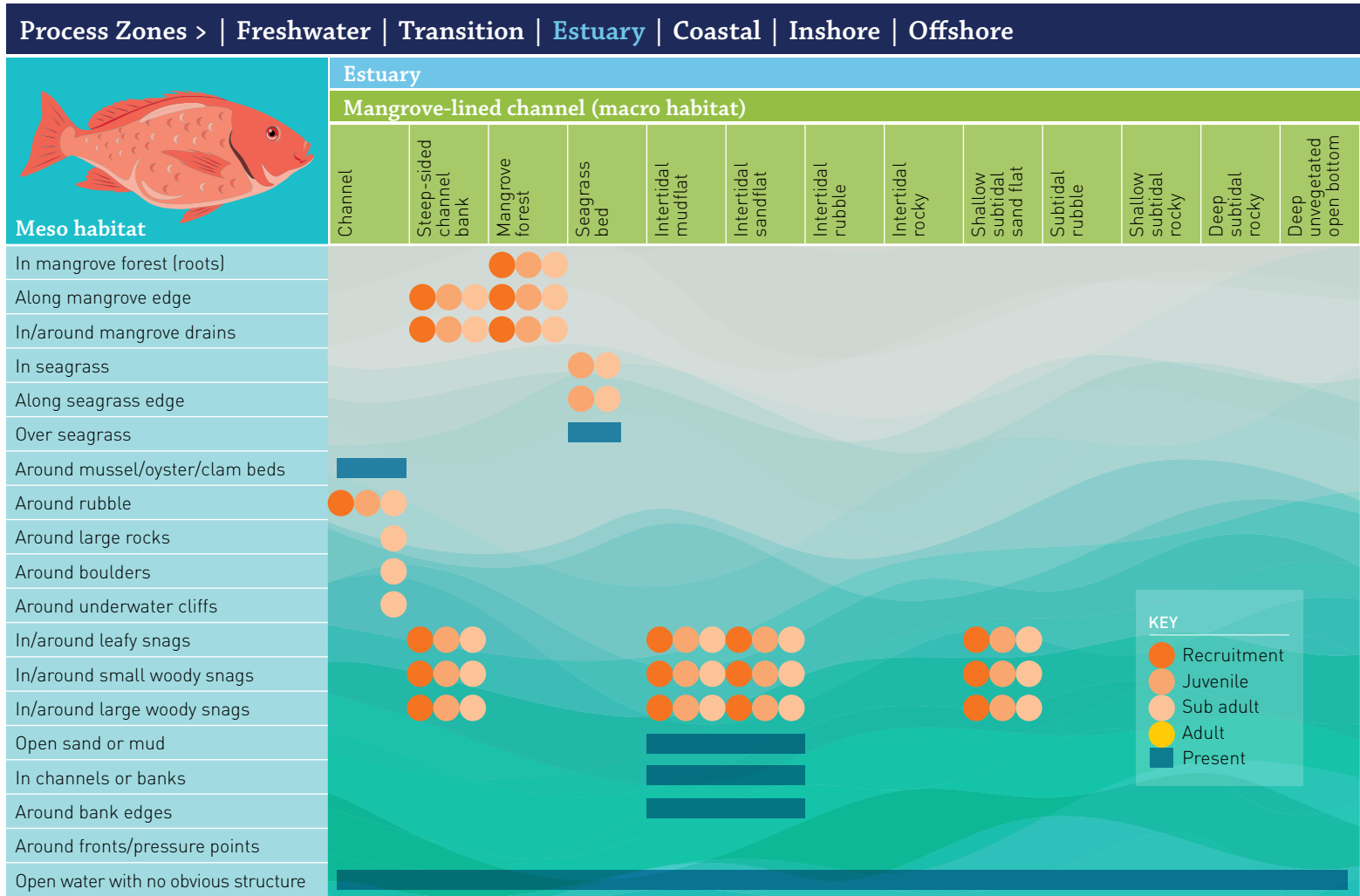
“If we don’t have the full story, almost invariably we make the wrong decisions and this lack of knowledge has seen the collapse of commercial fisheries in many areas around the world where there hasn’t been that understanding of the entire life cycle and the interconnecting habitats required to protect every stage of the fish life cycle.”

“While there are still significant gaps in our research, we have now identified a way, or a framework, that can allow anyone in a decision-making capacity to ascertain which habitats, large or small, are important for certain tropical fish species to thrive,” he says.

Significantly, the research could provide information necessary to protect key fisheries habitats without the need to lock away productive fishing areas by unnecessary zoning. It could allow managers to make decisions more rapidly and with more certainty, and help developers allocate money more accurately and effectively.

While the practical application of the framework is still some time away, Marcus Sheaves says ultimately the tool will ensure research dollars and repair funding are appropriately targeted.

“This work also provides the information needed to populate coastal habitat maps and classification schemes, which, in turn, will be key contributors to improved management outcomes,” he says. The research is also expected to help provide more accurate estimates of the extent and nature of habitat loss in the northern Queensland region.



Process zone × meso-habitat matrix for the Mangrove Jack (*Lutjanus argentimaculatus*). Source: Marcus Sheaves

Complex developmental stages

The research highlights that not all inshore tropical fish species use the same nursery areas, emphasising the danger of conducting large-scale works – such as dredging in coastal areas – without a complete understanding of the life-history values of these areas.

The research has underscored the importance of the nursery mosaic, meaning each species requires numerous different habitats at each different stage throughout its life, most of which are not interchangeable.

“Estuarine and coastal areas act as components of an interrelated nursery mosaic for many species, with different nursery values often contributed by many different macro-habitat components, such as rocks or woody debris,” Marcus Sheaves says.

“This underlines the importance of the whole interacting mosaic and the connections among its components.” He says the study also uncovered a clear distinction between early-juvenile and late-juvenile habitat-use patterns.

“In general, early juveniles often appeared

to be concentrated in a single, specific habitat type, while late juveniles were more evenly spread between three or four habitats,” he says.

“A habitat, such as a mangrove habitat or an estuary, is a general term, and we need to drill down and understand which specific parts of these larger areas are important for these tropical fish species at certain stages of their life.”

Habitat redefined

The research challenges the broad use of the term ‘habitat’, basing its summary diagrams or matrices on four different zones.

Process zones refer to the gradient of overlapping environments from freshwater to offshore that have particular sets of physical conditions and resources.

Macro-habitats are large, homogenous units within the seascape, such as mangrove forests, seabeds and sub-tidal channels, that are considered at a scale of tens to hundreds of metres.

Meso-habitats are the functional components of a macro-habitat. For example, a mangrove

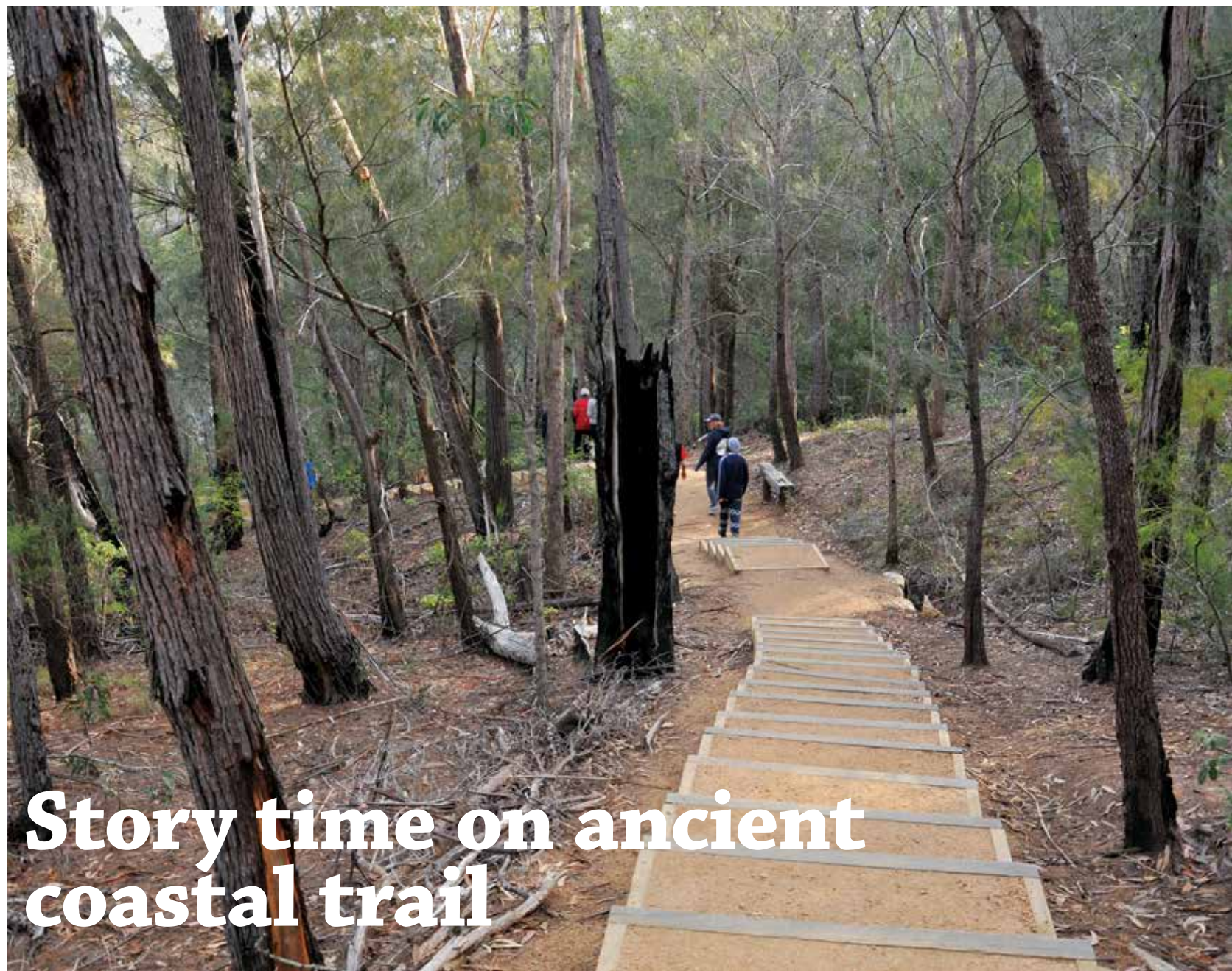
forest could be divided into subdivisions based on horizontal spatial arrangements or even into vertical categories such as substrate, roots, trunks and leaves.

Finally, **micro-habitats** are classified as subdivisions of meso-habitats, providing a more detailed understanding of the requirements of each species of fish within each zone.

Marcus Sheaves says under-protecting these habitats can have catastrophic effects on fish populations, but the reverse is also true when a blanket approach to ecological protection takes place, having a significant impact on many user groups.

In southern Australia, loss of connection to key habitats has contributed to reductions in catches in the Coorong fishery at the mouth of the Murray River to well below 50 per cent of historic levels.

In some Queensland catchments, construction of barriers has seen marine fish excluded from as much as 80 per cent of coastal wetlands. The development of this framework will allow greater ability to direct resources to the most critical habitats, Marcus Sheaves says. **F**



Story time on ancient coastal trail

The restoration of an Aboriginal trail on the NSW south coast provides the opportunity to celebrate and re-engage the community with ancient sea country connections

Story and photos by **Melissa Marino**

There is a story that Yuin man Les Kosez likes to tell about Jandas (Orcas) and how, in the past, they worked with local Aboriginal people “like cattle dogs” to herd Baleen whales into the deep and protected Twofold Bay on the NSW south coast, until they beached themselves, becoming easy pickings for fishers.

Traditional culture says the Jandas were warriors reincarnated, which is why they were

clever and brave enough to help the fishers. Oral stories passed from generation to generation tell that the Jandas were so smart they would even approach the shoreline and slap the water, alerting fishers when Baleen whales were in the area.

This was not a one-sided arrangement – there was something in it for the Jandas, too. “Out of respect they were allowed first pickings and they would go for the tongue and the lips and then the people would utilise the rest of

the carcass,” says Les Kosez, who is acting CEO of the Eden Local Aboriginal Land Council.

This is just one of the insights he shares on the guided tours he leads along the Bundian Way Story Trail, a recently rehabilitated traditional Aboriginal walking track on the NSW south coast. The 1.6-kilometre track, of “moderate” difficulty, hugs the coast from Eden’s Cocora Beach to Quarantine Bay and represents just a small fraction of the original Bundian Way.

Left The Bundian Way Story Trail – an ancient pathway along the NSW south coast rehabilitated by young people working with the Eden Local Aboriginal Land Council. It features lookouts, bridges and steps made from local materials.

Right The Bundian Way Story Trail hugs the coast from Eden's Cocora Beach to Quarantine Bay.

Below and below right Les Kosez from the Eden Local Aboriginal Land Council tells stories of the area's history and future on the tours he leads.



The Yuin people's connection with fishing and the sea is evident through their relationship with the Jandas and the area's natural and sustaining wealth of aquatic life.

Les Kosez, Yuin man

Eventually, the entire 350 kilometres of the Bundian Way, which extends to the highlands of Targangal (Mount Kosciuszko), will be restored and open to bushwalkers. The coastal area was the first focus because of the clear economic and social benefits it could bring from tourism and use of local labour and materials.

The project has employed local people, with several young Yuin men, who had been struggling to find a job, working on the trail's restoration. This has given the young work crew an income and skills as well as knowledge about their culture and a sense of pride in it, Les Kosez says.

As they worked on the trail they discovered the stories of their people, which has empowered them, he says, and will allow them to pass on knowledge themselves as their culture evolves.

The Yuin people's connection with fishing and the sea, he says, is evident through their relationship with the Jandas and the area's natural and sustaining wealth of aquatic life, including a variety of fish, abalone, mussels, pipis, periwinkles and oysters. There is also evidence

of seafood cultivation by indigenous people.

"You've heard of fish traps – well there is some consideration to the possibility that estuaries have been modified for the purpose of cultivation and different aquacultural practices," he says. "You'd be surprised at the level of manipulation that Aboriginal people engaged in with aquaculture, agriculture and even animal husbandry."

The Eden Local Aboriginal Land Council is also working with other local organisations and oyster farmers to lend its expertise to biosecurity and environmental programs.

This includes helping the oyster industry to prevent Pacific Oyster Mortality Syndrome (POMS) in the area by helping destroy outbreaks of pest Pacific Oysters that could host infection. Les Kosez says they take the lead from oyster farmers who know the estuary best, and help them to destroy infected oysters.

They also work with oyster farmers and South East Local Land Services to stabilise eroding estuary banks, using coir logs made from coconut fibre and mesh filled with old oyster



shells. This transforms the shells, often viewed as waste, into an environmental benefit.

This work further builds the connection and understanding crew members have of their traditional country and ensures they have a continuing, active role in the community – a community shared between Aboriginal and non-Aboriginal Australians, Les Kosez says.

"One of the big things we like to talk about with the Bundian Way is that it's a way to describe the shared history," he says. "If you consider yourself Australian in contemporary Australia then Aboriginal culture and the European culture and the entire history of the nation should be just as important to you whether you are black, white or brindle." **F**



Oyster apps advancing productivity

The latest developments in research, science, technology and marketing presented at the 2017 NSW Oyster Conference show how growers in the state are taking greater control of their fate

Story and photos by **Melissa Marino**

As part of the 2017 NSW oyster growers' conference held in Merimbula recently, an innovation workshop highlighted how smart technologies are crunching data and transforming business management for oyster growers.

Two initiatives, SmartOysters and Oyster Cloud – smartphone apps and online software developed by growers for growers – were featured at the workshop.

Both integrate crucial business information from multiple sources to make it accessible on smartphones, transforming day-to-day management and productivity.

This includes tracking stock at various stages of growth while also crunching data to aid long-term planning.

Batemans Bay, NSW, oyster grower Ewan McAsh teamed up with information and communication technology specialist Philip Browning to create the SmartOysters app.

Proving that necessity is the mother of invention, Ewan McAsh said the app was inspired by the “overwhelming” amount of paperwork he faces managing his farm, along with the need to find more time to spend with his baby daughter.

“Six months ago I had 10 hectares of heartache,”

he said. But with the app up and running, he has been able to cut back his work hours, spend more time with his daughter, “and still manage the farm better than it's ever been managed,” he said.

The SmartOysters app guides stock management and scheduling with colour-coded maps of oyster leases marked with pins that describe the status of different batches and actions required. It also provides data analytics, reporting and forecasting functions to help long-term planning and business strategy.

All SmartOysters users own their own data, but the software also allows for collaborations; growers can either share specified data on a one-to-one basis, or in larger groups.

Software developer Philip Browning said once digitised, the value of the data owned by farmers became clearer.

“A key part of farmers taking their destiny into their own hands is in capturing that data through apps like SmartOysters and using it to their advantage,” he said.

Oyster Cloud is a similar program developed by Matt Toan for the Port Stephens-based XL Oysters because the manager's head was “running out of RAM”.

Matt Toan said Oyster Cloud uses colour-coded displays to represent where oysters of

varying age, stage and size were on the leases. The configurations change weekly as oysters are continually brought to shore, assessed, worked on, returned to the lease or sold. It also calculates mortality rates of particular batches in different areas, displaying results as easy-to-read graphs to quickly pinpoint problems as well as comparing data on wild-caught spat or seed brought in from different hatcheries.

“It basically gives you a digital whiteboard – recording and reporting everything that happens,” Matt Toan said. While oyster farms could be very complex businesses with thousands of trays at varying stages of development at any given time, apps customised for individual farms could help to manage them, he said.

The new management apps are a marker of how far the industry has come since the first programs to breed faster-growing, more-resilient oysters began in the 1990s.

Other advances – in breeding, sourcing and handling spat, grow-out systems and stock grading – were also discussed at the conference. These included breeding advances supported by research initiatives including the three-year, \$5 million national ‘Future Oysters Cooperative Research Centre Project’ (CRC-P).

The coordinator of the three-day conference,

Top Matt Toan developed the productivity app Oyster Cloud. **Below** Smart Oysters has freed Ewan McAsh for more family time.



Andy Myers, of OceanWatch Australia, said the event provided important communication opportunities for the 200 delegates who attended.

“Collectively, the industry has the answers, but there needs to be more opportunities for producers to connect, share and learn from one another,” he said.

The conference is one of a suite of communication initiatives he coordinates for the NSW oyster industry. Andy Myers’s OceanWatch role is funded through the NSW Government’s Local Landcare Coordinators Initiative and supported through the partnership of Local Land Services and Landcare NSW. **F**

Market opportunities

NSW oyster growers are joining forces to promote Sydney Rock Oysters as an alternative to the more widely available Pacific Oyster, which has suffered reduced supplies in the wake of recent Pacific Oyster Mortality Syndrome (POMS) outbreaks.

Sydney Rock Oysters represent more than 90 per cent of oyster production in NSW. A new promotion is expected to feed into the NSW Oyster Industry Strategy, which aims to increase the sector’s value.

The strategy has been partly funded through the FRDC (2014-243) and focuses on issues identified by oyster farmers as the most significant in supporting their businesses: production systems; environment and disease; structure and governance; policy; and markets.

At the 2017 NSW Oyster Conference, a marketing and promotion workshop discussed strategies for developing and growing markets, including building strong industry-led campaigns based on the Sydney Rock Oyster’s quality and unique features such as flavour and texture.

Such a promotion, says Wonboyn Oysters farmer and strategy committee member Caroline Henry, would draw on lessons from the wine industry by bringing growers together under the broad Sydney Rock Oyster umbrella while highlighting features of particular areas.

As with the concept of wine terroir, oysters from different estuaries have specific qualities, she says. “Every area has its own special flavour. The oysters take on the characteristics of the water they are in.”

The importance of provenance in marketing was highlighted by NSW Farmers CEO Matt Brand, who urged conference



Signature Oysters delivered in boxes on demand.
Photo: Ewan McAsh

delegates to trade on the industry’s inherent strengths for market advantage.

“You have a raw product that is highly nutritious, with a great story to tell, which are key trends driving consumer choice,” he said. “And you’ve got provenance.”

“There are plenty of companies who would love your imagery but they just don’t have it. A potato being pulled out of the ground isn’t that sexy, whereas an oyster being shucked on the banks of a river – consumers are loving that sort of thing.”

Celebrating provenance is a concept not lost on Claire McAsh, whose marketing company Signature Oysters supplies oysters from a range of farms, including her family’s own at Batemans Bay, to some 50 restaurants.

Delivered in boxes, on demand, with a postcard about the grower and the farm from which they come, the oysters are also supplied with tasting notes highlighting their specific characteristics, which helps wait staff to promote the oysters and increase sales. **F**

LIMITED EDITION EMERALD OYSTERS

It was an odd-coloured oyster that revealed the power of social media, product differentiation and a good back story to oyster marketer Claire McAsh.

Preparing her weekly restaurant oyster delivery, the Signature Oysters manager spoke to a regular supplier who had some “amazing” tasting oysters, but they “looked a bit green”.

Some quick research revealed the effect

was the result of particular algae that turns oyster gills green – conditions that can also be found in France. “And apparently there was a French king at some point who loved this green oyster,” she told delegates at the recent 2017 NSW Oyster Conference.

So Claire McAsh got a photo and launched the green oysters on social media, as the ‘Merimbula Emerald’, a rare type of oyster not unlike those favoured by

French royalty and available for a limited time. [Once the algae disappears from the water, so too does the green hue.]

It worked; the green oysters suddenly became hot property. “I had chefs I had never heard of who had picked it up from Instagram contacting me saying ‘I want 20 dozen and I want them tomorrow’,” she said. “It went kind of crazy.”

Claire McAsh, info@mcashoysters.com



Photo: Josh Niland, Saint Peter



Access all areas

The FRDC's revamped websites will provide unprecedented access to fisheries information for diverse audiences, from consumers and fishers to researchers, traders, managers and the media

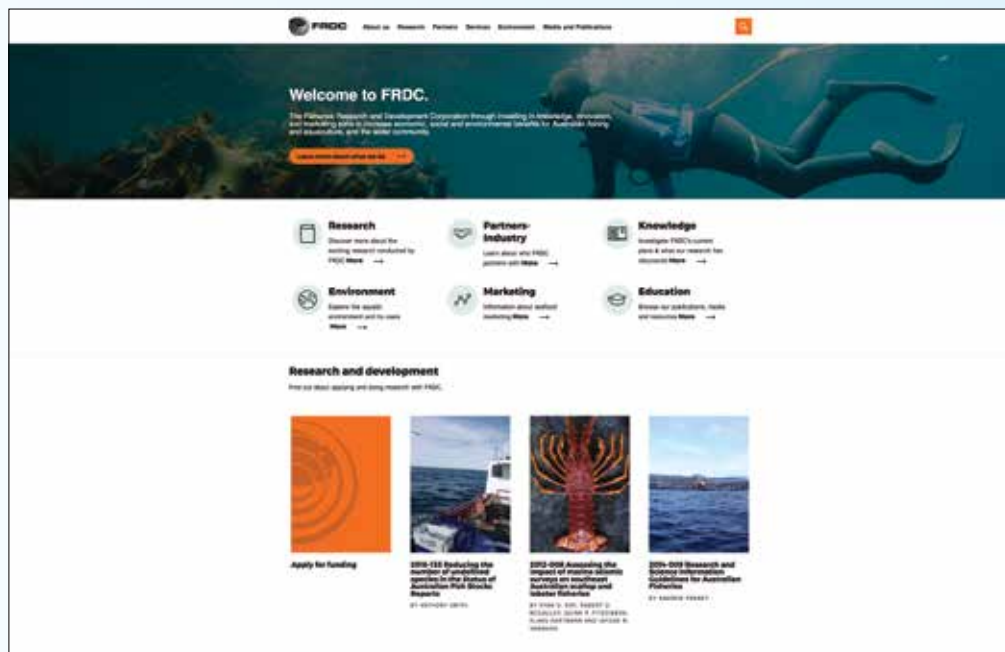
By Annabel Boyer

Centralising its information and data and connecting what were previously standalone websites into a suite of integrated sites is allowing the FRDC to make greater use of its resources and improve user experiences.

The shared information means that users can move easily between different content types. For example, the Fishfiles site is geared to consumers, but can take advantage of information on sustainability and catch data from the *Status of Australian Fish Stocks (SAFS) Reports*, which is the focus of the fish.gov.au. Consumers can also be pointed to relevant FRDC research projects, which were previously housed on the FRDC's corporate site but were unconnected.

With the imminent upgrade to Fishfiles and the FRDC's corporate site, frdc.com.au, all six of the FRDC's web portals will be connected around a central pool of information. The revamped websites offer a slick new interface, which is consistent across the FRDC's digital platforms; drawing on common sources of data ensures consistency and accuracy across all websites.

Other websites include fish.gov.au, which hosts the *SAFS Reports*, and fishnames.com.au – the go-to point for names officially registered under the Australian Fish Names Standard. There is also safefish.com.au, which focuses on the technical details of import and export food requirements, and carp.gov.au, the key portal for the National Carp Control Program.



“The biggest advantage of the new system,” says the FRDC’s ICT manager Kyaw Kyaw Soe Hlaing, “is the integration of disparate sources of data and content into a publicly available platform that can be targeted towards particular purposes or user groups.”

Another advantage of the new system is that information is collected once, but used multiple times. This helps to maximise efficiency for the FRDC’s small team, reduce errors and deliver targeted, relevant content across the different platforms.

Kyaw Kyaw Soe Hlaing says the new websites have been designed from the ground up with mobile devices in mind, for ease of use. All FRDC websites will be linked via the website logos on the footer of each website. Contact and subscription links are also standard across all sites.

The goal of bringing the sites together has been a clear focus for the past five years, says FRDC communications, trade and marketing manager Peter Horvat. “Linking our systems means users will be able to access all our information more easily. It is about making best use of FRDC resources,” he says.

“However, the journey for building knowledge and providing information does not stop with a new website. The FRDC is continuing to address data gaps and add key pieces of information against the species covered in the websites.”

Your guide to the FRDC's digital platforms

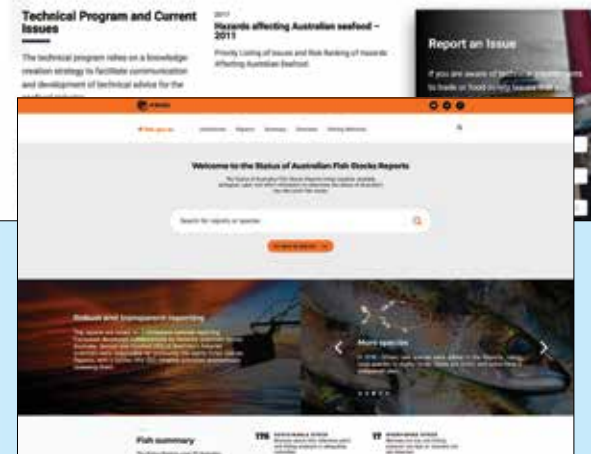
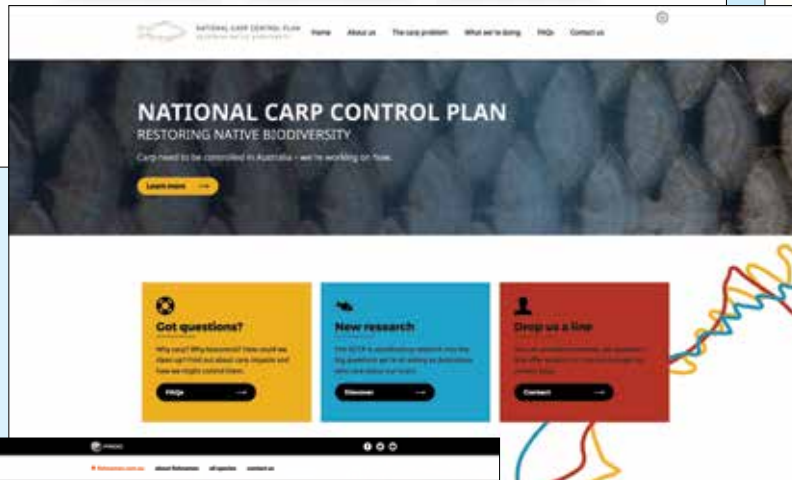
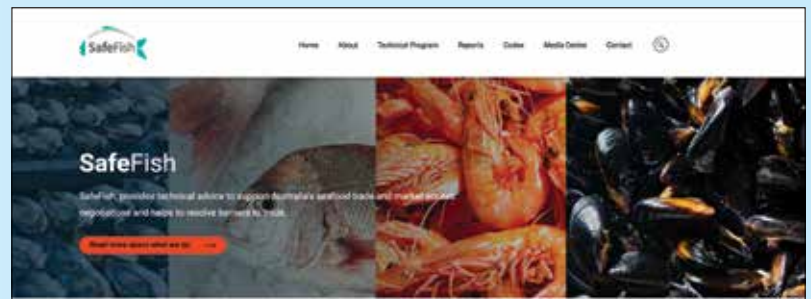
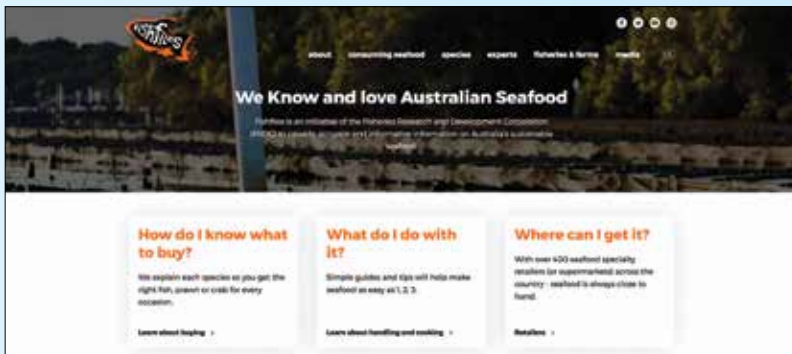
frdc.com.au

The FRDC’s corporate website includes all organisational content including information about how the FRDC funds and prioritises the research it supports. It is also a portal to apply for FRDC research grants.

It has reference material about the different fishing sectors (commercial, indigenous, recreational, aquaculture and post-harvest), the environment, biosecurity, animal welfare and climate change.

All projects funded by the FRDC are now featured on frdc.com.au from the time they are funded. Once research reports are completed, these and any other associated publications or content and information on project funding are included with each project.

The FRDC is dedicated to making sure the best information is used to underpin Australia’s fisheries and aquaculture management and for the sector to have the best information upon which to base management and business decisions. In line with this, the services section has several accessible databases, including trade data, fisheries statistics and market data.



fishfiles.com.au (new version to be launched January 2018)

The Fishfiles website is the FRDC's one-stop shop to educate seafood consumers about the nutritional and culinary qualities of Australian seafood. In short, anything you need to know if you want to buy and cook seafood in Australia.

Sharing content with fish.gov.au and frdc.com.au will mean that information about things such as sustainability and relevant research are further integrated into this otherwise consumer-focused platform.

The FRDC is continuing to add new species to the website; at the launch there were more than 150. Along the way, the FRDC is ensuring that the content attributed to each species is consistent and more comprehensive across the range of seafood available to Australian consumers. For example, the Queensland Department of Agriculture and Fisheries is undertaking nutritional analysis of species where no data is available. Likewise, the FRDC is partnering with several chefs to get better information on lesser-known species.

fish.gov.au

In December 2016, the FRDC launched the third *SAFS Reports*. The fish.gov.au website now shows the status of the stocks for 83 species.

The data in the reports is the foundation of fish.gov.au, allowing for increased user interactivity. Users can dig into the details to learn more about the stocks and assessed species. This valuable source of information includes sustainability status and gear and catch data and is now integrated with the FRDC's other platforms.

fishnames.com.au

The Australian Fish Names Standard acts as a dictionary, providing the agreed language – in this case, names for seafood species – and acting as the foundation for all species references across all of the FRDC's resources. Agreed names are crucial to prevent confusion about species that may be known by many different names depending on where you are in Australia.

The standard includes more than 4000 Australian and imported species. The fish names website is a searchable database that allows users to search for the correct Australian standard fish name. Each entry also includes the scientific name and an identification photo, and the Codes for Australian Aquatic Biota scientific reference.

The fish names list continues to be developed and monitored. The FRDC funds the Australian Fish Names Committee, which manages the Fish Names Standard.

safefish.com.au

An FRDC-funded initiative, SafeFish provides technical advice to support the resolution of issues and challenges relating to the export, import and domestic trade of Australian seafood products.

The SafeFish website provides resources for industry around issues such as hygiene and safety of seafood, as well as other technical barriers to trade. It includes news, updates and reports produced by SafeFish and provides a way for industry to report issues, raise concerns or ask questions. The SafeFish website also contains relevant FRDC information such as research projects and relevant *FISH* magazine articles.

carp.gov.au

In 2016, the Federal Government handed the FRDC the responsibility to run a research program to investigate the feasibility of the release of a virus to reduce and remove carp that infest many of Australia's inland waterways.

Carp.gov.au details information about the scope of the National Carp Control Plan, the background to the project, and provides research and activity updates. It also provides a contact point for those wishing to find out more about the project. **F**



Cultural change at sea

A proactive approach to building relationships and collaborative research are part of Kyri Toumazos's style in improving respect for the commercial seafood sector and enhancing its prospects

Fishing is a longstanding tradition in the Mediterranean nation of Cyprus, from which Kyri Toumazos and his family hail. And although they were not fishers before emigrating in the mid-1980s, the seafood culture from which they came, combined with Australia's seemingly endless waters offered them new opportunities.

However, Kyri Toumazos initially chose a different career, studying pharmacy after finishing school. But just three years into his new profession the lure of the seafood sector – and his family – led him to join his uncle's seafood processing and distribution business, The Fish Factory, in Adelaide.

In doing so, he quickly realised he was jumping ship from a highly regulated industry to an even more regulated one.

That was in 2000. For the next 13 years he worked as general manager at The Fish Factory, all the while thinking about ways to create a less rule-reliant future. "I wanted to explore options in which industry and government could move together, to improve their relationship and co-manage fisheries," he says.

In 2014, feeling "at a crossroads" in his career, he started a new fishing business, Southern Sea Eagles, with his brothers Terry and Philios. He also took up a new role as executive officer of the South Australian Northern Zone Rock Lobster Fishermen's Association (NZRLFA).

It was a job that allowed him to remain in the industry and close to the family business, but at the same time offered a new challenge. He says the Northern Zone Rock Lobster Fishery was also looking to try something new at that time.

"We had a traditional fishing season – we went fishing and delivered product – and we accepted whatever price the market could pay us then. But I feel that we actually need to change and move with the times. We need to deliver

product to the market when the market wants it, not when it suits the fishing season," he says.

At the NZRLFA, Kyri Toumazos initiated a proposal to research the feasibility of extending the fishing season, which might allow the fishery to adopt a more market-based approach.

Historically, South Australia's Northern Zone Rock Lobster Fishery had been closed from June to October. This was part of a fishing ban put in place in 1966 designed to restrict fishing activity and protect spawning in the fishery, which stretches along the state's coastline from the mouth of the Murray River to the Western Australian border.

The research was jointly undertaken by the NZRLFA, the South Australian Research and Development Institute (SARDI) and the Department of Primary Industries and Regions South Australia (PIRSA), with funding from the FRDC. NZRLFA members used their vessels to provide important data on the Southern Rock Lobster catch and bycatch for two consecutive winters, in 2014 and 2015.

Profits and protection

The research indicated that lobster egg production and population numbers would not be affected by winter fishing because most lobsters caught during this period were male. Winter fishing could also provide some biological benefits for the fishery, such as reducing predation of lobsters in pots and reducing undersized catch.

The findings prompted PIRSA to lift the seasonal ban and introduce a 12-month fishing season from May 2016.

While there has been considerable research into resource sustainability, Kyri Toumazos says, the project looking at extending the fishing season, married research with the economics.

When Southern Rock Lobsters are traditionally in short supply – in winter –

South Australian fishers have been able to access price premiums in lucrative Asian export markets, particularly in China.

"In March 2017, the average beach price of lobster caught in the outer region of the fishery was approximately \$48 per kilogram," he says. "Lobster caught in July, August and September of the same year achieved prices greater than \$85 per kilogram."

Working collaboratively with government, fishers have also introduced strategies in combination with year-round harvesting to protect the fishery resource. These include an emphasis on protecting spawning lobster, which are concentrated in the shallow inner region of the fishery.


He says fishers are spreading the footprint of their catch over a larger, deeper area within the fishery's existing boundaries. They have overlaid the quota management system introduced in 2003 with new spatial management quotas that delineate the fishery's outer zone and its biologically sensitive inner zone.

The total allowable catch of Southern Rock Lobster for the fishery is 300 tonnes a year, with current catch quotas for the inner and outer zones 250 and 50 tonnes respectively. These new spatial catch limits are based on annual lobster biomass estimates generated by the fisheries modelling group at SARDI.

"Traditionally, we caught less than five per cent of our catch in the outer region of the fishery, but since introducing new quotas in 2016, we have increased our fishing effort in those deeper areas," Kyri Toumazos says.

"The inner zone of the fishery is our bread basket and we believe that protecting its spawning biomass will deliver better catch rates in the long term."

Kyri Toumazos says transparency in the



“We need to find ways of educating the community that we are professional, responsible operators and encourage understanding that we are custodians of the marine environment and the public’s fishing resource.”

Kyri Toumazos
Photo: Jacqui Way

fishery’s practices is key to industry-driven changes in management, and has helped strengthen fishers’ much-needed social licence to operate in the North Zone Rock Lobster Fishery.

The successful research collaboration was named the 2017 South Australian seafood industry award winner for best research, development and extension, and was a finalist in this year’s national industry awards.

He says research is crucial in providing the tools that will allow the industry to progress. He is also involved with a new FRDC-funded research project (2014-702), testing five alternative lobster pot designs to improve the retention of full-sized lobsters. The aim is to develop a prototype for industry adoption.

One of those five designs has come from observations from the Toumazos’ fishing

operations. “It features a narrower entry point, which is positioned further inside the pot so it is more complex for lobsters to exit,” he says.

In the shark fishery, the Toumazos brothers are also planning to switch from demersal set gillnets to demersal longline fishing, a move Kyri Toumazos says he expects will improve the fishery’s sustainability and profitability.

Longlines prevent bycatch issues associated with gillnets and allow fishers access to more fishing grounds. FRDC-funded research (2011-068) also found that Gummy Shark caught on longlines achieved a 15 per cent premium at markets in Melbourne during the past two years, supporting the business case for the change.

“There is an obligation out there by industry and government and all other stakeholders for a sustainable, yet economically viable, fishery.

I think research – the right research – ensures sustainability and maximises profitability. We focused on sustainability for a very long time, but a lot of the projects happening now are trying to look at how you marry the two together, rather than looking at them in isolation,” he says.

But education is also an important part of the picture, he says, and is needed to support the social licence and continued community and government support for the sector. As such he spends part of his time talking with student groups at Adelaide-based universities, TAFE institutes, and primary and secondary schools.

“We need to find ways of educating the community that we are professional, responsible operators and encourage understanding that we are custodians of the marine environment and the public’s fishing resource.” **F**

Final reports

Inshore commercial fisheries 2013-301

This report examines the potential economic benefits to regional communities from Queensland inshore fisheries (pot, net and line fisheries). In doing so, the project has developed a series of questionnaires and analysis tools that could potentially be applied in other regions with fairly minimal modification. The report outlines the theory underpinning these methods, as well as their application. The results of the analysis indicate that the inshore fisheries produce substantial local benefits well in excess of their own gross value.

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Society for Fish Biology conference 2013-404

The Australian Society for Fish Biology (ASFB) was founded in 1971 to promote research, education and management of fish and fisheries and to provide a forum for the exchange of information. The primary outcomes of this project have been knowledge transfer, building research partnerships and recognition and promotion of research achievements, particularly among early career researchers, arising from very successful ASFB annual science conferences held in 2013, 2014 and 2015. Every year during this three-year period saw the ASFB partner with at least one other science-based society or interest group for the annual conference.

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Understanding Giant Cuttlefish 2013-010

The Giant Australian Cuttlefish, *Sepia apama*, is the largest cuttlefish species in the world and forms an extraordinary breeding aggregation on a small stretch of rock reef in the Upper Spencer Gulf (USG), South Australia. This research was undertaken to address key knowledge gaps relating to movement and population structure, as well as factors contributing to population viability. The research commenced following dramatic declines in abundance of Giant Cuttlefish at the breeding aggregation location.

Results confirmed that within Spencer Gulf there are two distinct population groups of Giant Cuttlefish. The data suggest that these two clusters can be considered as two separate species. A spatial age-

structured population model was used to test scenarios of different potential threats to the USG cuttlefish population. This model indicated that bycatch due to prawn trawling and cuttlefish harvesting away from the breeding aggregations pose negligible risks to the population. However, the population's viability could be compromised due to increased mortality of embryos prior to hatching and increased adult mortality if there is an increase in harvesting at the breeding grounds. Consequently, the continued closure of the aggregation site to cuttlefish harvesting is expected to improve the viability of the northern Spencer Gulf population and the population has recovered.

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Scientific information guidelines 2014-009

Government ministers and decision-makers, stakeholders and the public need to have confidence and trust in research and scientific information used to inform fisheries management. To help achieve this, key principles for ensuring quality of science need to be adhered to, and effective science quality assurance processes need to be put in place. These guidelines provide guidance for high-quality and reliable scientific information to inform fishery management decisions, regardless of the source of that information. The guidelines set out principles for research and scientific information quality. This includes identifying responsibilities and describing requirements for getting third-party peer reviews, evaluation of scientific information quality, storage and management of data and documentation and communication of results.

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Tropical fish life histories 2013-046

Many tropical fishery species rely on a range of systems (estuaries, tidal wetlands, shallow coastal waters) to complete their life cycle. This project aimed to develop a detailed understanding of the sequence of habitats required by inshore tropical north-east Queensland fisheries species at different stages of their growth and development.

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marcus.sheaves@jcu.edu.au

Improving live mud crab grading 2014-218

The first Australian Industry Live Mud Crab Grading Scheme (AILMCGS) was rolled out across the entire mud crab industry in November 2012. The scheme was an industry-owned and driven initiative to resolve the ambiguity of having various schemes operating around the country. An initial survey on the status of the industry's grading issues identified areas of the scheme that would improve its acceptance and use to both sellers and buyers. From the outset of the project the industry worked in consultation with the research team to modify attributes of the scheme, resulting in a better predictive test for crab quality and meat fullness.

More information: John Mayze,
john.mayze@daf.qld.gov.au

Migratory patterns of shark species 2010-003

This project took advantage of an unprecedented deployment of acoustic receiver infrastructure around the Western Australian coast to monitor a large number of sharks implanted with acoustic tags. The research was undertaken to better understand the migratory and dispersal patterns of a number of commercially important sharks off the coast of Western Australia – Gummy, Dusky, Whiskery and Sandbar sharks. This has enabled a re-evaluation of the risks of catch and bycatch to Dusky and Sandbar shark stocks and the development of population simulation models with which to test the implications of different spatially based fishery management regimes. Another application is the future spatial management arrangements for Whiskery and Gummy shark stocks.

More information: Rory McAuley,
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Southern Rocklobster research program 2010-402

Seventeen major projects were commissioned, approved, monitored and evaluated during the course of the project, with a total expenditure of \$4.7 million. The projects undertaken covered the agreed-upon priorities of the SRL RD&E Strategic Plan 2011-2016. These include market research and trade access, harvest strategies and fisheries management, stock population dynamics and sustainability, extension and communications and people development. Work done on both free trade agreements and harvest strategies will provide greater certainty for the sector and the potential for increased profits into the future.

The project fully met its objectives with the mix of R&D projects benefiting all sectors and stakeholders associated with the SRL supply chain, improving profitability of the industry within the limits of resource sustainability.

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Significance of deep reefs as habitat 2014-012

This study surveyed fish communities associated with two large patches of coastal reef that had been mapped previously using high-resolution multi-beam acoustics. The reefs, located on the eastern and southern coasts of Tasmania, are the focus of important commercial and recreational fisheries. The surveys utilised underwater video methods, including baited remote underwater video and remotely operated vehicles, as well as gillnets. Overall, this study has expanded our knowledge of the reef fish communities associated with Tasmania's coastal deep reefs, including the associations between habitat characteristics and individual species distribution and abundance.

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jeremy.lyle@utas.edu.au

Fisheries risk-cost-frontier 2012-202

Given that some fisheries are often low in value and management can be high cost, there is a real need to understand the trade-off between ecological and economic risks associated with harvesting, the benefits of harvesting, and the costs associated with management. This relationship is known as the risk-

cost-frontier and has been adopted conceptually by the Australian Fisheries Management Authority.

Harvest strategies implemented for Australian Commonwealth fisheries were placed in eight tiers, ranging from data-rich to data-limited, and their performance evaluated using a full end-to-end ecosystem model. Generally, the risk to the resource increased as less data was available due to biases in the assessments and slow response times to unexpected declines in resource status. On average, more data leads to improved management results in terms of risk.

More information: Cathy Dichmont,
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Improved aquaculture management tools 2012-024

The project developed a suite of frameworks, models and decision-support tools with potential to support major improvement in the efficiency and effectiveness of coastal and marine management in southern Tasmania, along with salmon aquaculture expansion.

A new approach to identifying community, government and industry values (Your Marine Values – YMV) was developed to facilitate more informed engagement processes and greater trust between participants. A new biogeochemical model was also developed for the waters of the Derwent Estuary, Huon River and D'Entrecasteaux Channel. This model has been validated in detail and is now being used by stakeholders to test scenarios for planning and water quality impact assessment.

The online risk-based decision support tools CONNIE and MAREE built on the other study components to provide stakeholders with direct access to information and scenario testing capabilities. This will lead not only to improved environmental management of aquaculture and other coastal activities, but also support development of shared skills and understanding among stakeholders, thereby reducing the potential for conflict.

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Gulf St Vincent trophic model 2013-031

Modelling results indicated that the marked increase in Snapper biomass in the late 2000s in Gulf St Vincent (GSV) was unlikely to have contributed significantly to the observed biomass reductions in Blue Swimmer Crab and Western King Prawn. Scenarios comparing the ecosystem response to greater gear selectivity in the GSV prawn fishery supported the expectation that the introduction of bycatch reduction devices/T90 cod-end mesh has resulted in positive ecological benefits (an increase in the biomass of demersal sharks and rays), and no negative impacts on other commercially targeted species were identified.

An important outcome of the study was an ecosystem-based assessment of the performance of the key GSV fisheries over a 20-year period. Results suggest that the declining performance of many of the key fisheries in GSV in recent decades could be due in part to a decline and/or loss of production in the ecosystem over time. The important implications of this finding are the additional questions it raises about the source(s) and cause(s) for declining productivity, and further model developments could explicitly examine these questions. The GSV ecosystem model provides a basis for an ecosystem-based management decision-support tool for fisheries and other key activities in GSV.

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Environmental data evaluation 2014-031

Storm Bay, at the mouth of the Derwent River, Tasmania, was sampled monthly from 2009 to 2015 for water quality – physical characteristics, nutrients, phytoplankton and zooplankton. This report is an evaluation of one of the largest longer-term datasets of water quality collected in a major waterway in Australia in recent years.

The project was conducted primarily for the Tasmanian Atlantic Salmon aquaculture industry and is the first major baseline assessment of water quality before Atlantic Salmon farming commences in a new region. The report is also of importance to other users of coastal waters in south-eastern Tasmania, including commercial and recreational fishers, because it describes the major oceanic currents and

weather patterns that influence water quality and productivity in the region. It also examines changes that have occurred over the previous three decades.

The results form a comprehensive baseline for the potential expansion of Atlantic Salmon aquaculture into Storm Bay. They are critical to future assessments of impacts on water quality and to effective management of Atlantic Salmon farming operations. The data has already been utilised by the three Atlantic Salmon farming companies operating in Tasmania to develop environmental impact assessments for their proposed developments. The Tasmanian Government is also applying this data to the development of a monitoring program and setting threshold levels for water quality in relation to Atlantic Salmon farming in Storm Bay.

More information: Christine Crawford, christine.crawford@utas.edu.au



Mapping Queensland's fishing areas 2014-208

CSIRO Oceans and Atmosphere created a web portal that electronically maps the major components of Queensland's coastal fishing resources: commercial and recreational fish catch and effort; spatial restrictions on extractive fishing; and some significant coastal infrastructure that supports the fishing endeavour. The portal is available to the general public online (research.csiro.au/mqcftr). A year of negotiation with data custodians enabled the acquisition of spatial data to assemble and display the data via the portal. Though previously much of the data was publicly available, it was available as raw data files or as static print form in publications that were limited in distribution. The MQCFR portal provides a single-source, multi-layered electronic display that allows visualisation of several data themes simultaneously to better understand and plan current and optimal fishery management.

More information: Rob Kenyon, rob.kenyon@csiro.au

Yellowtail Kingfish pilot project 2014-706

The overall Yellowtail Kingfish (YTK) pilot project has determined that YTK is a suitable species for sustainable production in the midwest region of WA. The trial demonstrated higher-than-anticipated growth rates and controllable survival. To support the YTK pilot project, the industry partner aligned with the research capacity available in WA. This identified and prioritised the research required to meet industry's applied needs. The project developed insight and baseline information on the key performance indicators of potential growth and health of YTK in WA and managed the 'just in time' research resulting from the changing requirements of a real-time sea cage pilot trial.

The coordination project allowed for ongoing communications between the multiple agencies and industry to ensure the most valuable data and knowledge was collected and collated in a manner that would assist industry participants moving forward with larger-scale production. This project also developed knowledge and skills of key personnel throughout the trial, including on-farm staff and researchers and rural personnel indirectly involved in the trial, such as local veterinarians.

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Mapping data for SAFS 2014-030.20

Production of the *Status of Australian Fish Stocks (SAFS) Reports* is an enormous task, requiring cross-jurisdictional cooperation in determining assessments. This process highlighted differences in data collected between agencies in terms of quality, quantity and format, which greatly increased the effort required to prepare the collaborative reports. This study was commissioned to identify the different datasets used in the reports and to describe the differences in data reported. The gap analysis revealed that, for the most part, information is readily available to address the most common indicators used by sustainability assessment programs.

More information: Matt Koopman, koops@netspace.net.au

Focus on small pelagics 2013-064

The aim of the small pelagic coordination program was to build confidence in the science underpinning the sustainability of small pelagic fisheries in Australia. This was achieved through a series of high-profile workshops that included broad stakeholder engagement across industry, community, government and research, media reports and articles, and the completion of several major research projects.

Research contributed significantly to the understanding of the stock status of target species in the small pelagic fishery, while an international expert forum suggested that the assessment and management frameworks for Australia's fisheries for small pelagic species, especially the South Australian Sardine fishery, were consistent with world's best practice.

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Testing Moulting Bay oysters 2015-042

In January 2016 there was an outbreak of gastrointestinal illness that was confirmed through a health trace-back investigation to be associated with the marine bacterial pathogen *Vibrio parahaemolyticus* consumed via oysters harvested from the Moulting Bay region (St Helens) in Tasmania. A total of seven confirmed illnesses and a further three suspected cases were reported.

Oysters were sampled from five sites in the Moulting Bay harvest region fortnightly from February to May 2016. Oysters were analysed for *V. parahaemolyticus* and *V. vulnificus* using a combination of traditional microbiological culture and DNA-based detection methods.

All samples collected in mid-February were considered unsatisfactory from a public health perspective and three of five samples collected from 7 to 9 March were considered potentially hazardous. It was concluded that there may be a regulatory impact associated with these illnesses as Australia can no longer claim an absence of risk due to a lack of epidemiology.

More information: Tom Madigan, 0428 491 491





Movers and ...



Jacque Wilson has taken over from **Tim Mee** as executive officer of the Abalone Association of Australasia Inc.

Jane Lovell has been appointed the inaugural chief executive officer of representative organisation Seafood Industry Australia.

Sue Grau has taken over as executive officer of Oysters Tasmania after

Neil Stump resigned from the position. There have been some changes at the New Zealand Rock Lobster Industry Council, with former deputy CEO

Mark Edwards moving into the position of CEO and long-term CEO **Daryl Sykes** taking over the role of COO.

Andrew Campbell is now CEO at the Australian Centre for International Agricultural Research (ACIAR).

Ann Fleming has taken over from **Chris Barlow** as research program manager, fisheries, at ACIAR.

Marilyn Shea is now coordinator for the FRDC's seismic research program.

Allison Webb, director of fisheries management and science at the Victorian Fisheries Authority, has returned to her home country, Canada.

Kirsten Abernethy has left her role at Seafood Industry Victoria to work as an independent consultant.

Linda Sams, head of sustainability at Tassal, is leaving her position to go home to Canada.

Lowri Pryce has taken over as Executive Officer of OceanWatch.

After a career of more than 38 years, **John Mayze** is retiring as principal seafood technician from the Queensland Department of Agriculture and Fisheries.

Program leader of aquatic habitat rehabilitation with the NSW Department of Primary Industries, **Craig Copeland** is moving to the not-for-profit sector as the CEO of OzFish Unlimited.

Obituaries

The FRDC was saddened to learn of the passing of **George Raptis**; he was a much-loved and pioneering figure in Australia's seafood sector.



FEEDBACK

FRDC WELCOMES YOUR COMMENTS

frdc@frdc.com.au

MOVERS WE'VE MISSED?

INFO PLEASE TO

Annabel Boyer, 02 6285 0415,
annabel.boyer@frdc.com.au

Calendar of events

DATE	EVENT	MORE INFORMATION
2018		
15 February	FRDC closing date for first-call research applications	www.frdc.com.au/Research/Call-for-applications
19 to 21 February	19th International Conference on Shellfish Restoration & Shellfish Reef Restoration Network Meeting, Adelaide	www.shellfishrestoration.org.au/news-events/19th-international-conference-on-shellfish-restoration-shellfish-reef-restoration-network-meeting
19 to 22 February	Aquaculture America 2018, Las Vegas, US	www.was.org/meetings/pdf/AA2018RegBro.pdf
27 to 28 February	FRDC Board Meeting, Melbourne	02 6285 0400
6 to 7 March	ABARES Outlook 2018, Canberra	www.agriculture.gov.au/abares/conferences-events
15 to 20 April	6th International Otolith Symposium, Taiwan	www.facebook.com/ios2018tw
19 to 20 April	FRDC Board Meeting, Adelaide	02 6285 0400
24 to 26 April	2018 Seafood Expo Global, Brussels, Belgium	www.seafoodexpo.com/global
1 to 5 July	Canyons to Coast: Australian Marine Science Association Conference, Adelaide	www.amsa.asn.au/amsa-annual-conferences

Having people who understand international markets is good for everyone in the Australian seafood industry.



LOOKING TO EXPORT TO NEW MARKETS? LOOKING TO EXPAND YOUR HORIZONS?

DO YOU WORK IN AUSTRALIA'S FISHING AND AQUACULTURE SECTOR?

ARE YOU A PASSIONATE ADVOCATE FOR AUSTRALIAN SEAFOOD?

The **FRDC** is **inviting applications** for travel bursaries in 2018. Each awardee will have the opportunity to visit one of the world's great seafood events (Seafood Expo Global in Brussels or Seafood Expo North America are some possible destinations), as part of study tour which will help participants to gain insight into the global seafood marketplace. Participants will also have the opportunity to visit seafood markets, and meet significant regional seafood players.



FRDC



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