FISH

FISHERIES RESEARCH & DEVELOPMENT CORPORATION **NEWS**

VOLUME 24
NUMBER 3

SEPTEMBER 2016

Australian seafood abroad

NEW BEGINNINGS FOR SHELLFISH

WASTE TRANSFORMATIONS

THE STRONGER THE VOICE

THE BIGGER THE CATCH

Now is the time to come together to promote, protect and develop our industry.
Let's unite and create one strong voice for seafood industry in Australia.

For all the details on the Peak Body Proposal and to download your letter of intent, go to unitedseafoodindustries.com.au or email us on info@unitedseafoodindustries.com.au

Get on board and give your support by 16 December 2016.

United Seafood Industries
Developing a National Peak Body

FRDC

FISH is published by the
FISHERIES RESEARCH AND DEVELOPMENT CORPORATION (FRDC)

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.

FRDC
Fisheries Research House,
25 Geils Court, Deakin, ACT 2600;
Locked Bag 222, Deakin West ACT 2600
T 02 6285 0400 **E** frdc@frdc.com.au
W www.frdc.com.au
To contact the FRDC or individual staff members see the FRDC website (www.frdc.com.au)

SUBSCRIPTION
FISH is available free. To subscribe, contact the **FRDC**
T 02 6285 0400 **E** frdc@frdc.com.au
FISH is online at www.frdc.com.au

FISH is written and produced by the FRDC and **Coretext Pty Ltd**.

FRDC executive editor: Peter Horvat
Deputy editor: Annabel Boyer
Coretext editor: Catherine Norwood
Creative director: Tim Claeys
Coretext, PO Box 12542, Melbourne Vic 8006
T 03 9670 1168 **F** 03 9670 1127
E enquiries@coretext.com.au **W** www.coretext.com.au
ISSN: 1833-4784 (Print) **ISSN:** 2202-7122 (Digital)

FRDC HOME **www.frdc.com.au**
UPCOMING EVENTS **www.frdc.com.au/pages/calendar.aspx**
RESEARCH **www.frdc.com.au/research**
KNOWLEDGE **www.frdc.com.au/knowledge**
ENVIRONMENT **www.frdc.com.au/environment**
SEAFOOD CONSUMERS **www.fishfiles.com.au**
STOCK STATUS REPORTS **www.fish.gov.au**
VIDEOS
FRDC FISHERIESRESEARCHAU
www.youtube.com/user/fisheriesresearchAU/videos
FISHFILES **www.youtube.com/user/FRDCFishfiles**

FISH

WWW.FRDC.COM.AU
SEPTEMBER 2016

CONTENTS

Retreat reveals Indigenous cultural links

Potential benefits of shellfish reef restoration

Fresh fish experience for young chefs

Features

Regular

FEEDBACK
FRDC welcomes your comments
frdc@frdc.com.au

GET IT ON Google play
AVAILABLE ON THE App Store

FISH magazine is available as an app.
Please follow these steps:
- Open Google Play or the App Store on your device
- In the search function type: FRDC FISH magazine
- Tap to download the app
- Once downloaded, open the app and enjoy reading

COVER
Illustration: Sonia Kretschmar

MORE INFORMATION
Adrianne Laird, adrianne@npfindustry.com.au
www.npfindustry.com.au

Eyes on the prize

An initiative to 'crowd-source' ideas from industry could see prawn bycatch in the north reduced by more than 30 per cent

By **Bianca Nogrady**

The iconic 'prawn on the barbie' is as much a feature of the Australian summer as thongs, cricket and sunscreen. But in recent years, prawn fisheries – like many other marine-based industries – have become much more conscious of the environmental impact of their trade, and one of the biggest issues they are grappling with is bycatch.

To find a solution, the industry collective NPF Industry Pty Ltd (NPFI) has taken the unusual approach of going straight to the men and women on board the Northern Prawn Fishery (NPF) fleet to ask for ideas.

With a target of a 30 per cent reduction in bycatch, the NPFI has offered $20,000 in prize money to whoever can come up with the most successful methods of reducing bycatch.

"We wanted to engage the people on the water – the skippers and fleet managers and crew – to get their ideas, because they do come up with great ideas," says Adrianne Laird, project officer with the NPFI. One promising design has come forward already, with early trials showing a reduction in bycatch of between 30 and 85 per cent. Kon Triantopoulos, a retired skipper and now a net-maker for A Raptis & Sons, has developed 'Kon's Covered Fisheyes', a modification of an existing bycatch-reduction device.

Adrianne Laird says most of the bycatch is small fish, crabs and syngnathids – creatures that are a similar size to prawns but poor swimmers, making it difficult for them to escape the prawn nets. They are trapped in the net with the prawns, and have to be brought aboard the ship, sorted and discarded.

The amount of bycatch varies enormously across the prawning sector, largely because of the different types of prawns and catching methods used. Banana prawns tend to swim up into the water column, which makes them easier to catch.

> The skipper who trialled this device was keen to start using it immediately, before it had even been formally approved, because he could see the benefits from it.
>
> Michael O'Brien, manager of the Tropic Ocean Prawns fleet

Tiger prawns lurk on the seabed, so the nets must skim along the bottom to stir them up. These characteristics are reflected in the amount of bycatch. In banana prawn fishing, it can range from just five per cent of the overall catch, while in tiger prawn fishing it can be as much as 80 per cent.

Despite this, there is little evidence that fishing is having a negative impact on the populations of bycatch species in the NPF. The few species that might be vulnerable to impacts on bycatch are closely monitored through the NPF scientific and crew member observer programs.

The NPF prides itself on having achieved certification by the Marine Stewardship Council in 2012 – testament to its high level of sustainability – and reduction in bycatch is an issue it wants to address. Public demand for sustainable product also makes fishers keenly aware of public attitudes towards issues such as bycatch.

"Fishers have addressed the problem of the big creatures like turtles and sharks and rays through the turtle excluders," Adrianne Laird says. "But the little stuff gets through those bars and the battle now is to try and stop that or provide an easy way for them to escape."

The other challenge with bycatch reduction devices is that they must let only the bycatch out, not the prawns. At most, the industry will tolerate a 2.5 per cent loss of prawns. Any more than that and the device becomes a hindrance.

Test guidelines

In the quest for user-generated solutions, the first step was to identify suitable 'tests' for any new ideas. The NPFI wanted to make sure this was done properly from the start. Working with CSIRO, NPFI developed a trial guide that gives skippers a method to follow to test the new devices and record the results in a standardised fashion.

"We needed to be able to show that there was some influence and that it would be worth putting under a scientific trial," Adrianne Laird says, pointing out that a proper scientific trial is rigorous, thorough and not cheap.

Any device or strategy has to be tested over a period of time, in different conditions and different locations, as well as rotated around the four nets of a typical prawn trawler, to ensure that any variations in bycatch are not the result of other factors.

Fisheye revisited

Already, this approach has delivered a potential winner. Kon's Covered Fisheyes include a cone-shaped insert that fits inside the fish-eye. This creates an area of low water flow, which makes it easier for the bycatch to swim into it and escape, says Michael O'Brien, manager of the Tropic Ocean Prawns fleet. The device is a modification of a bycatch reduction device already approved by the Australian Fisheries Management Authority (AFMA), called a 'fish-eye'.

"When you see the ones that we use now and then you see what Kon's designed, you see how simple it is," Michael O'Brien says. "The other thing that Kon did was to put two in a net. Instead of just putting one in, he put one in further down

Above Kon Triantopoulos.

Below Kon's Covered Fisheyes.

Left In trials, the green net fitted with Kon's Covered Fisheyes resulted in significantly less bycatch, compared to the black net fitted with a standard bycatch reduction device.
Photos: Australian Fisheries Management Authority, Phil Robson

the net end, and another further up the codend, and again, it's making what we had better."

The device has just completed formal testing in the tiger prawn fishery in the Gulf of Carpentaria, and everyone is excited about the results.

"The skipper who trialled this device was keen to start using it immediately, before it had even been formally approved, because he could see the benefits from it," Michael O'Brien says. "It's really exciting because it looks like we might have found a winner and will come home strongly with it."

The trial of Kon's Covered Fisheyes was supervised by AFMA observers in June 2016. Analysis of the catch shows the device is achieving an average 40 per cent reduction in small bycatch, with a less than two per cent loss of prawns.

For Adrianne Laird, hearing the trial results was a moment of truth. "The first night, Mike rang me and he said the worst result was 30 per cent bycatch reduction, the best was 85 per cent and they caught just under 400 kilograms of tiger prawns and only lost six kilograms of prawns all up. I was so excited and these great results continued night after night," she says.

The other advantage of the device is that it is lightweight and small. Bulky or heavy devices could create a problem for crew, particularly in rough weather conditions.

"That's key as well – to have something that's simple, easy to use, and not just reduces bycatch, it's also safe for the crew to use," Adrianne Laird says.

Tailored to conditions

While this device looks promising in the Northern Prawn Fishery context, that doesn't necessarily mean it will work for all prawn fisheries around Australia or internationally. Michael O'Brien says industry has tested some devices used in prawn fisheries overseas, but they didn't work as well in Australian conditions.

"A lot of bycatch reduction devices are built and suitable for particular fisheries, with particular environments and particular types of fish being caught," he says. "Ours being a tropical hot water fishery, it will probably react differently in South Australia."

The approach of crowd-sourcing ideas from those working on the boats has proven so successful that it is likely to be taken up elsewhere. Michael O'Brien says the level of engagement across the NPF was incredibly high, with everyone involved going above and beyond the call of duty to resolve the issue of bycatch. F

MORE INFORMATION
Stewart Fallon, 02 6125 4261, stewart.fallon@anu.edu.au;
John Kalish, john.kalish@dfat.gov.au **FRDC RESEARCH CODE 1993-109**

Scales provide age data for 'living fossil'

The radioactive signature from nuclear testing in Australia is providing crucial information about vulnerable lungfish populations

Above Lungfish scale showing a section through the scale. **Left** Tom Espinoza holding a giant lungfish. Photos: Stewart Fallon, Andrew McDougall

By **Natasha Prokop**

With air-breathing lungs and fleshy, paddle-like fins that contain limb-like bones, the Australian Lungfish (*Neoceratodus forsteri*) looks like something from prehistoric times. That's because its morphology has remained largely unchanged for the past 100 million years.

But this living fossil is under threat. The Australian Lungfish is listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*. It is found only in several rivers, dams and lakes in south-eastern Queensland, and there is concern that many of these populations are experiencing poor recruitment.

Researchers have been struggling to understand exactly what is happening to the lungfish population, in part because they have not had a reliable method for ageing them. Accurate information on the age structure of a species reveals the growth, longevity and mortality characteristics of a population. Without it, researchers can't be sure which years are associated with poor recruitment, let alone investigate its causes.

Other bony fish have solid calcified ear bones called otoliths that lay down annual growth rings, but lungfish otoliths are gelatinous, making them unsuitable for ageing in this way. Attempts to age lungfish using growth increments on their scales had also proven unreliable, until researchers turned to a radiocarbon-dating technique for fish developed as part of FRDC-funded research more than 20 years ago.

"We had several lungfish whose birth dates occurred pre-bomb, or pre-1954."

Bomb test signature

"Extensive testing of nuclear weapons in the 1950s and '60s caused a dramatic increase in the levels of carbon-14 in the atmosphere and oceans," says Stewart Fallon, head of the Radiocarbon Dating Laboratory at the Australian National University (ANU). "This was incorporated into the cells of living things and has left a unique carbon-14 signature in organisms born during this period.

"We had several lungfish whose birth dates occurred pre-bomb, or pre-1954," he says. "By taking measurements from the scales of those fish, we were able to see both the sharp increase and decrease in carbon-14 associated with the nuclear testing, to give a sort of 'lungfish reference curve' from which we could age the other fish."

Bomb radiocarbon-dating techniques for fish were developed by former ANU researcher John Kalish, who was the principal investigator on a 1993 FRDC-funded project that was among the first to investigate the feasibility of this method.

"When I first did this work in the early 1990s, the person who ran the equipment I used said, 'There's no way you'll see anything. It won't work,' " John Kalish says.

Yet his results showed an almost perfect relationship between the amount of carbon-14 in corals, which was the focus of previous research, and that in the otoliths of long-lived Snapper (*Chrysophrys auratus*). With the FRDC funding he investigated the broader applications for age validation with an additional 28 commercially important species and found the method was reliable in almost every case.

John Kalish says the bomb radiocarbon-dating technique has now become a routine and cost-effective method for verifying the ages of a wide range of fish species including, it seems, those lacking solid otoliths, such as lungfish. The technique is applied to the fish scales, which also has the advantage of being a non-lethal approach to age testing.

Stewart Fallon's work on the Australian Lungfish has found that fish from the Mary, Burnett and Brisbane Rivers can live for more than 70 years, but he is interested in the overall population structure.

"If we know which age groups had poor or no recruitment, then we can start to look at environmental factors in those years, like flooding or drought, and see if they correlate," Stewart Fallon says.

The ageing work is part of a larger Australian Research Council Linkage Grant project looking at the age structure, population size and genetic diversity of the Australian Lungfish. F

Oyster opener a game-changer

A new oyster-processing system devised by South Australia's Bob Simmonds has the potential to revolutionise oyster markets, making live oysters more widely available and easier to open by oyster expert and novice alike. It could be to oysters what screw-top bottles have been to wine, improving consumer access, ease of handling and product quality.

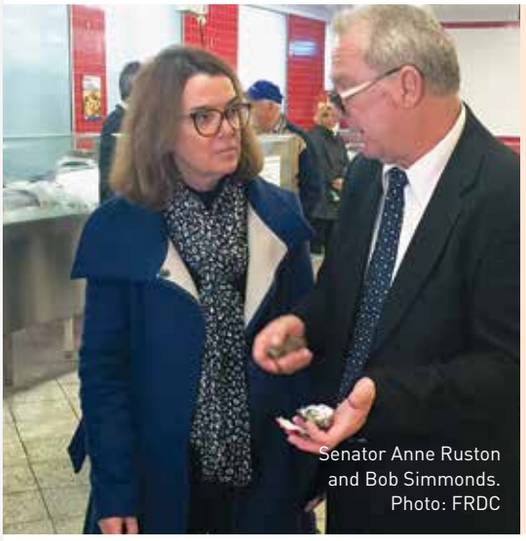
It is a simple approach – shaving the shell at the lip of the oyster creates a small opening into which a knife can be inserted to open the oyster. The opening is immediately sealed with wax, keeping the oyster alive and in pristine condition, complete with the oyster liquor, which is usually lost in the traditional processing of oysters.

Bob Simmonds, who operates the Oyster Bob distribution and marketing company, developed the initial prototype with support from the Australian Seafood Cooperative Research Centre.

"It will meet demand for fresh, unopened product, particularly in Asia, and allow us to brand it clearly as a product of Australia," he says.

The FRDC secured further funding to automate and commercialise the system through the Rural Research and Development for Profit programme with a grant of $427,000. This was done collaboratively with Oyster Bob, Angelakis Bros and Tassal Operations Pty Ltd.

Worldwide patents for the process are owned by the FRDC.



Senator Anne Ruston and Bob Simmonds. Photo: FRDC

Senator Ruston remains in fisheries role

Following the federal election in July, South Australia's Anne Ruston has retained her position as a state representative in the Australian Senate. Barnaby Joyce was also re-elected, and continues as Deputy Prime Minister and Minister for Agriculture and Water Resources. Senator Ruston will remain in her supporting role for Minister Joyce, with the title of Assistant Minister for Agriculture and Water Resources. She continues to oversee the fisheries and aquaculture aspects of the national agriculture portfolio.

New FRDC Chairman announced

The FRDC is pleased to announce the appointment of a new chairman to its Board – former Queensland National Party Senator Ron Boswell. Ron Boswell is set to take over from current FRDC Chairman Harry Woods on 1 September 2016 for a three-year term.

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

Of particular note for his new role with the FRDC is the prominent role he took in the political debate on fishing rights in relation to marine parks – namely the Great Barrier Reef Marine Park reforms. This ensured an outcome that benefited all stakeholders, while affording the reef the recognition and protection it needed. During that time Ron Boswell worked closely with both commercial and recreational fishing groups.

The FRDC is sad to farewell outgoing Chairman Harry Woods. He will be remembered by FRDC staff with affection. He is well liked for his considerate approach and effort to get to know staff members. The FRDC thanks him for his six years as Chairman. Harry Woods has steered the FRDC through a period of great transition, overseeing the launch of its new RD&E plan in 2015 as well as a period of corporate revitalisation, which culminated in the opening of the new Adelaide office earlier this year.

Burnaia helicochorda, named in honour of Robert Burn. Photo: Leon Altoff

Queen's honour recognises marine contributions

In the Queen's Birthday 2016 Honours list, Victorian Robert Burn received a Medal of the Order of Australia (OAM) in the General Division for services to marine science, and in particular to the study of the nudibranchs members of the mollusc family, commonly known as sea slugs. A builder by trade, Robert Burn is recognised as an international expert in the creatures, identifying almost 100 of the hundreds of species in Australian waters over more than 50 years. "They're the most gorgeous little animals," he says. Much of his knowledge is compiled in *Nudibranchs and related molluscs*, published by Museum Victoria last year.

MORE INFORMATION
www.cleanseas.com.au;
www.fishfiles.com.au

Right
Lemon-cured Kingfish with carrot, daikon and nuoc cham sauce at the Qantas Lounge.

Far right
Hiramasa Kingfish destined for market.

Quality a global passport

By **Peter Horvat**

As FRDC's manager of marketing, trade and communications, Peter Horvat travelled to Belgium for the Global Seafood Expo this year. On the way, he found himself tracing the steps of Australia's Yellowtail Kingfish on a similar route to international destinations. It was a chance to discover first-hand how and why this fish is winning the hearts of the world's leading chefs and seafood suppliers.

Grown in the clear blue waters of Arno Bay in South Australia, near Port Lincoln, Cleanseas Tuna's Yellowtail Kingfish (*Seriola lalandi*), marketed as Hiramasa Kingfish globally, spends two years growing from a fingerling to a healthy four to five kilograms before it is harvested. From there, this South Australian ventures out into the world to find its markets, travelling far and wide to grace some of the world's finest tables.

Fresh from harvest, the fish go directly for processing at Port Lincoln. There they are carefully packed into foam cartons to keep them in pristine condition for transport around the country.

Some of those destined for more distant markets are processed – cleaned, gutted, filleted and sealed in packaging – before being snap frozen down to minus 60°C, keeping the fish at its highest (sashimi grade) quality. These are then packed into shipping containers for transport around the globe. Others are packed fresh and sent by air.

All aboard

My first encounter with kingfish on this journey is at Sydney airport, where it is on the menu in the Qantas International Lounge. Renowned chef Neil Perry is an adviser to Qantas. He also features kingfish in a number of his restaurants. He has been using the fish for many years, its versatility and culinary attributes keeping him a fan.

In the Qantas International Lounge it is served lemon-cured with carrot, daikon and the classic Vietnamese nuoc cham sauce. The balance of salty, chilli and sweetness perfectly complements and accentuates the soft, rich texture of the kingfish.

Next stop, the fish and I go international – to London. On my way to the Global Seafood Expo in Brussels I stop off there to meet with Wine Australia and also drop in to Southern Aqua, a European specialist sales and marketing agency. Southern Aqua's Jamie Angus explains that the fish arrive either by air or sea, depending on how they have been processed and which market they are destined for. "Obviously air allows us to get the fish from Australia to Europe very quickly, ensuring freshness. In some cases the fish can be in Europe within a day of being harvested," he says.

"From there we break down the shipment, working with local distributors and suppliers to fill orders from restaurants and customers around the United Kingdom."

For a company like Southern Aqua, the aim is to combine great customer service, contemporary marketing tools and innovative

Above
Chef Gohei Kishi holds up an Australian Yellowtail Kingfish.

Above and middle
Examples of Kingfish Maki with Yuzu.

All photos: Peter Horvat

logistics models to provide a complete solution for clients, such as Cleanseas Tuna, that are looking to establish business across Europe. Southern Aqua supplies to chefs, retailers and distributors in every corner of Europe.

A global product

One of Southern Aqua's customers with a true appreciation of the Yellowtail Kingfish is chef Gohei Kishi, head of Asian concepts across the Gordon Ramsay Group, and sushi head chef at the restaurant Maze, in central London.

"The secret to preparing great seafood," says Gohei Kishi, "is to know the product so well, you can extract the optimal flavour out of it. A great chef understands this and knows what to do and when."

Gohei Kishi's approach to cooking reflects his heritage. Born in France to Japanese parents, this merging of two cultures flows into his work at Maze. (His twin brother, who works for the Gordon Ramsay Group in the United States, has followed a different path, focusing on French cuisine.)

It is clear Gohei Kishi has some strong foundations to his approach to food – quality, consistency, flavour, and a thirst for learning more. These translate into the produce he sources from around the world, including Australian Yellowtail Kingfish. It is a philosophy that also aligns with his Gordon Ramsay Group role of ensuring consistency and quality.

"The story behind the fish also interests me," he says. "I know the fish comes from Australia and it is used in many great restaurants around the world – it is a global product. For me, it is good to see how others are using the product. It also provides a great deal of confidence in the quality.

"I like that the fish comes in whole. It allows us to see its quality. We can see this also when we cut the fish. I think it gives our chefs an appreciation for the product and helps them learn how to cut and break down the fish.

"We prepare a range of seafood including hamachi, salmon and tuna, and the texture and flavour of the Yellowtail Kingfish is different. It has less fat but more structure than the hamachi."

These traits make Yellowtail Kingfish ideal for nigiri, maki, carpaccio and tartare. While these are cold dishes, Gohei Kishi says he would like to take the fish further in the future by applying some classic French techniques to cooking it.

Customer insight

Serendipity has put David Head, the new CEO of Cleanseas Tuna, in London at

CleanSeas Hiramasa (Yellowtail) Kingfish

Region of origin A natural inhabitant of the waters of Southern Australia, Hiramasa Kingfish are farmed by Cleanseas Tuna in the Spencer Gulf's Boston, Arno and Fitzgerald Bays.

Growing conditions Produced from wild brood stock, hatchery-raised fingerlings are grown in an open-water culture environment.

Sustainability Grown in compliance with the requirements of ISO 14001 and ISO 9001 quality standards.

Harvesting method Ike-Jime, humane method, pneumatically stunned.

Availability Year round.

Sizes (whole) Winter – premium 4.5 to 5.5 kilograms; summer – premium 3.5 to 4.5 kilograms.

Flesh colour White to pale pink.

Bone structure Minimal.

Flesh fat content Winter – premium 16 to 19 per cent; summer – premium 14 to 17 per cent.

Flavour Sweet, rich and clean.

Texture Firm, broad flaked flesh.

Chef Gohei Kishi with Cleanseas Tuna CEO David Head.

Cleanseas CEO David Head at Selfridges.

Yellowtail kingfish graces the seafood counter at London's Selfridges store.

the same time. He is also on his way to the Global Seafood Exposition, and making the most of the chance to gain some first-hand insight into what his international customers think of Cleanseas Tuna's new product.

David Head has more than 25 years' experience as a chief executive in Australia, New Zealand, Asia and Europe, working with multinational corporations including PepsiCo and Lion Nathan. He has accepted the challenge to expand the market for Cleanseas Tuna's Yellowtail Kingfish.

Gohei Kishi tells him that customers clearly like and appreciate the product, both from a taste perspective and the story that accompanies it.

Selfridges

Our next stop is the iconic Selfridges retail outlet. We meet Matthew Couchman, who is responsible for supplying sustainable seafood to the store. This ranges from a myriad of locally caught fish and crustaceans to the bright-blue New Zealand Paua (abalone), MSC-certified Australian Spencer Gulf Western King Prawns and Cleanseas Tuna's Yellowtail Kingfish. Matt Couchman has a lifetime of experience with seafood, including some time in Australia. He knows his fish and sees the value in having Australian product in his star-studded line-up. "I know the story of the fish, I know where it comes from and the ethos behind it."

> "The story behind the fish also interests me. I know the fish comes from Australia and it is used in many great restaurants around the world – it is a global product. For me, it is good to see how others are using the product. It also provides a great deal of confidence in the quality."
>
> Chef Gohei Kishi, head of Asian concepts across the Gordon Ramsay Group

He says this is as important as knowing its culinary characteristics. The Yellowtail Kingfish is well known for its raw characteristics, but people are now seeing its versatility for a range of cooked dishes as well.

Next up, it's back to the restaurant environment, where two cultures collide in a culinary crescendo.

SushiSamba

Looking out over central London through the floor-to-ceiling windows of SushiSamba on the 38th floor of the Heron Tower, it is hard to envisage how a fish from Port Lincoln ends up here in this hip fusion restaurant half a world away.

SushiSamba showcases the blending of Japanese, Brazilian and Peruvian cuisine. It is a mix that resulted from the emigration of Japanese in the early 20th century to South American cities like Lima in Peru, and Sao Paulo in Brazil, where the integration of cultures flourished.

Head chef Tai Po Wong, a 16-year veteran of Japanese cuisine, is another keen user of Australian Yellowtail Kingfish. The restaurant serves the fish in a variety of ways ranging from classic Japanese to South American and a fusion that brings the two together, using techniques such as sushi rolls that incorporate Brazilian flavours.

Tai Po Wong uses the soft, creamy texture of

Kingfish ceviche at SushiSamba.

Kingfish at SushiSamba with a mole-style sauce.

Wing of kingfish chargrilled on the SushiSamba churrasco.

the raw kingfish to its full potential, matching it with markers of colour, taste and texture that take diners on a journey through the two regions. Several dishes are clearly inspired by South America – crispy empanada shells, reminiscent of small tacos, hold the delicately diced fish, which is dressed with a spicy chilli sauce and lime-driven ceviche kingfish. Other dishes, such as slices of sashimi served with a mole-style sauce, traverse the boundary between the two.

In addition to being served raw at SushiSamba, the Yellowtail Kingfish is also char-grilled over the coals on the churrasco. Tai Po Wong highlights how popular the wings from the kingfish are. "The flesh around the wings contains a number of different textures. The grill provides additional layers of flavour – smokiness and caramelisation on top of the creamy white flesh beautifully showcases the fish."

It is clear from speaking with Tai Po Wong that understanding the products he buys is very important. This knowledge contributes to an understanding of how best to prepare the product and is the foundation of what he does. The dishes should reflect the produce, culture and skill of the chef, he says. And from what I've seen, they do.

Export and growth

Following Cleanseas Tuna's Yellowtail Kingfish, it is clear that the company's export rationale involves a number of considerations. Market size and financial drivers are important. Europe provides a sizeable market with customers willing to pay the price for the quality product they receive.

> "(Exports) obviously provide value to the company selling the fish. But further . . . exports add value to what we do here in Australia."
>
> Peter Horvat

However, this is not the only factor. Good supply-chain partners and customers with a place in the market, such as Selfridges, support the decision. Throw in key users such as celebrity chefs Gohei Kishi and Tai Po Wong who value the product because it meets their high expectations and specifications, and the rationale to export strengthens.

For Cleanseas Tuna, sales growth has continued in the Australian and European markets, and the company is developing new fresh and frozen products targeted at food service and retail markets. In addition, it is looking to re-enter the US and Asian markets with a prime-grade sashimi product.

David Head says he has joined at a good time. "Over the past four years Craig Foster (who retired in late 2015) and the management team have made great progress restructuring the business and in particular the company's aquaculture operations. I am looking forward to leading the company through its next phase of growth and development."

Value to Australia

Looking at the journey of kingfish, or any other fish, it's clear there are several reasons why exports are important. They obviously provide value to the company selling the fish.

But further – and this is certainly the case for Cleanseas Tuna's Yellowtail Kingfish – exports add value to what we do here in Australia. The reputation of where the fish is grown, how it is handled and how it tastes all tell a compelling story that chefs and consumers around the world are willing to pay for.

Home in Australia, that story still has resonance. You don't need to visit London to try some of the best fish on the planet; it is right here on our doorstep. A visit to most fish shops will land you the same fish the world's top chefs are using. And for me, being able to serve great fish to friends is a pretty good position to be in. F

MORE INFORMATION
AMSA Connect 02 6279 5000,
amsa.gov.au, engagement@amsa.gov.au

Comment wanted on national levy for maritime safety services

Fishing boats in harbour, Fremantle. Photo: 123rf

The Australian Maritime Safety Authority (AMSA) has launched a two-month consultation process to discuss the structure of a new single national levy to fund the National System for Domestic Commercial Vessel Safety. The consultation will also address new national fees for services. The levy and charges are expected to be introduced on 1 July 2017, when AMSA becomes responsible for the delivery of all services under the national system.

There are 27,000 vessels and 66,000 seafarers involved in domestic commercial vessel operations in Australia. The levy will apply to most domestic commercial vessels, including those used in fishing and aquaculture operations, for tourism, fishing and diving charters, or offered for hire. It will not apply to private recreational fishing boats.

Two models have been proposed for the levy and AMSA is seeking comment from stakeholders on these models, as well as the suggested fees for services. Consultation began in August and officially ends on October 10 2016. Feedback from stakeholders will help determine which levy model is used.

A series of information sessions is being held around Australia. You can register your interest in attending on the AMSA website at www.amsa.gov.au. Registration is required and will determine which sessions go ahead.

Details of the proposed levy models and fees are also available from the AMSA website, and comment can be made online via the website.

AMSA estimates it will cost $23 million to deliver services directly. The current combined cost of delivery of the safety system through state and territory agencies is $40 million. Fees vary, as some governments subsidise the cost of providing these services by up to 85 per cent. Standardised national fees will be set on a cost-recovery basis.

For more information on the consultation or to submit your feedback, you can also visit apps.amsa.gov.au/moreview. F

FRDC farewells seafood sector pioneer

FRDC staff are saddened by the passing of Noel Gallagher on 25 July, and take this opportunity to honour his contribution to the seafood industry. Noel Gallagher has had a tremendous impact, with many in the industry citing him as a major influence, mentor and 'the father of the seafood marketers'. Over his lifetime he built up a wealth of experience in management, and the processing and marketing of seafood, both in Australia and overseas.

Noel Gallagher was an adviser to the FRDC and a cornerstone of its Fish Names Committee (FNC) in its formative years, championing consumer rights in relation to the accurate naming of fish for sale. He was also a life member of the Australian Seafood Importers Association. Alan Snow, project manager for the FNC, says: "Noel provided a lot of valuable information and insights into the imported seafood industry. He would argue the case for appropriate names for imported seafood products with a very calm demeanour. He always arrived with charts, books and posters to justify his position on a name. He was articulate but also a thorough gentleman of the old school. One of his many achievements was the introduction of the name Basa in Australia."

Noel Gallagher grew up on the lower Clarence River at a time when the area supplied about one-sixth of the fish consumed in New South Wales. It was here that he became fascinated with the industry. He later became the general manager of the Clarence River Fishermen's Co-operative, and director of the Queensland Fish Board.

He then spent 10 years as a consultant to overseas companies and governments in Asia and the Indian Ocean basin, paving the way for new trade partnerships. He was also involved in consultation on joint ventures with the former Soviet Union and in New Zealand. He finished his career with his own successful business in seafood merchandising, N A Gallagher and Sons, trading as Seafood Traders of Australasia, in Brisbane.

FRDC executive director Patrick Hone with seafood marketing pioneer Noel Gallagher. Photo: FRDC

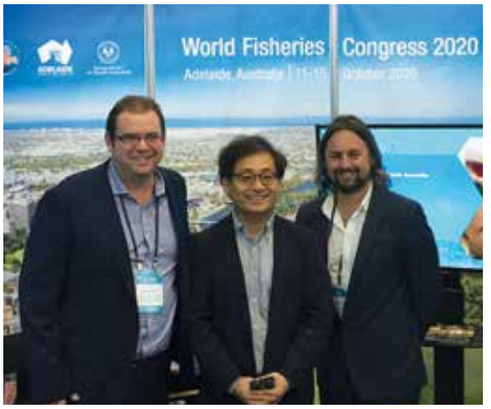
Noel Gallagher will be fondly remembered by many. He is survived by his wife Margaret, four sons, 19 grandchildren and eight great-grandchildren. F

Fisheries congress set to bring the world to Adelaide

The 2016 World Fisheries Congress in Busan gave Australian delegates a head start on making the next event, in Adelaide, a success

By **Peter Horvat**

SARDI's Keith Rowling and Mike Steer with a happy customer at the Australian booth at the 2016 World Fisheries Congress in Busan, South Korea.
Photo: Peter Horvat



Australia has won the right to host the World Fisheries Congress (WFC) in Adelaide in 2020, with the event expected to bring more than 2000 delegates to the city. It reinforces the proactive approach Australia has taken to develop its reputation internationally. Australia last hosted the WFC in Brisbane in 1996.

The theme of the 2020 Congress will be 'Sharing our oceans and rivers: a 2020 vision for the world's fisheries'.

The announcement of Australia's successful bid, just prior to the 2016 World Fisheries Congress, allowed time to put together a small delegation to promote the Adelaide 2020 Congress and to gain first-hand experience of the task that lies ahead.

2016 World Fisheries Congress

The 2016 congress was held in Busan, South Korea. This bustling seaport boasts a city skyline that resembles a scene from a science-fiction novel, and belies the city's 1000-year history. Soaring modern skyscrapers stretch along the coastline, containing the modern infrastructure, technology and business enterprises of a thriving metropolitan centre. Only pockets of the old remain, such as the small dock where elderly women sit and process the day's catch.

Busan's affinity with the ocean made it a fitting host for the 2000 delegates, from 66 countries, who attended the WFC.

Make no mistake, the WFC is a major international event that requires planning and global coordination.

In Busan this year there were about 500 presentations from more than 400 speakers, who addressed 48 fisheries-related themes. An additional 260 posters were displayed, and events ran in conjunction with the congress, including a meeting of host organisation, the World Council of Fisheries Societies, of which Australia is a member.

The World Council's main aim is to promote international cooperation in fisheries science, conservation and management, making the World Fisheries Congress a key event.

At this year's meeting of the council, South Australian researcher Bronwyn Gillanders was elected president for the next four years.

Promoting Australia

A key task for the Australian delegation attending the congress in Busan was promoting the 2020 Adelaide congress.

Australia hosted an exhibition booth and made the most of opportunities to meet and speak with both conference organisers and delegates.

Nearly all of the congress delegates experienced some of South Australia's iconic tourist attractions, including Port Lincoln, the Barossa Valley and Kangaroo Island, albeit through a pair of 360° virtual-reality goggles.

The goggles were a huge drawcard and ice-breaker that attracted students, esteemed fisheries scientists and other exhibitors. The South Korean Minister for Oceans and Fisheries, Young-Suk Kim, and his delegation, which included Korean media, took a 'virtual' tour of South Australia, demonstrating the value and effectiveness of our engagement strategy, attracting shy colleagues and overcoming language barriers. It also fostered considerable networking, with the Australian booth at times resembling a corner table at a relaxed cafe.

Each visitor was given promotional literature (provided by the South Australian Tourism Commission and FRDC) and a WFC 2020 flyer, and was encouraged to register their interest online. All those who provided business cards while visiting the booth, or during congress networking, have been registered to receive further information. During the congress the WFC 2020 website registered approximately 600 visitors and a multitude of interest. The booth at this year's WFC clearly indicated to the world that Australia is focused on delivering the best event possible.

It also highlighted areas we need to keep our eyes on in preparation for 2020. These include attracting a broader range of delegates, such as fisheries managers, industry companies, processors, supply chains and the fishers themselves, not to mention building a much larger trade show, and working with external agencies to bring delegates from the region to Adelaide, particularly from developing nations. A key reason for Australia to host the Congress in 2020 is to communicate the sustainability and scientific rigour with which our fisheries are run.

Australia has started the discussion. Now we must continue to speak with a global audience, and over the next three years visit and participate in World Council of Fisheries Societies meetings. This will allow us to promote the conference and source the best speakers from the international fisheries fraternity. F

The World Fisheries Congress 2020 will be held in Adelaide from 11 to 15 October 2020. To register visit www.wfc2020.com.au

MORE INFORMATION
Janet Howieson, 08 9266 2034, J.Howieson@curtin.edu.au
Charles Franchina, 08 9335 1812, charles@fishtrade.com.au, www.sampi.com.au
FRDC RESEARCH CODES: 2013-711.40, 2014-704, 2016-223, 2016-224

New value from seafood

Innovation in processing and product development is identifying new opportunities to increase the value of waste in the seafood sector

By **Catherine Norwood**

Doing more with the seafood we already harvest is the aim of an FRDC-funded project focusing on new opportunities for seafood processing.

Curtin University researcher Janet Howieson is leading the research, which has two main themes. One is to maximise the economic returns from the existing catch with products for human consumption. This includes using trimmings and other fish 'waste' to make new edible products.

The other is to reduce the cost of disposal where food products are not an option, through either conversion to a saleable product, such as fertiliser, or into a form with a reduced environmental impact and lower disposal costs. Any reduction in costs is a step towards improved profitability for individual operators, and for the industry as a whole.

Taking stock

An audit of what waste is produced, and from where, was the first step in the 'New opportunities for processing waste' project, says Janet Howieson, who is based at Curtin University's Centre for Excellence in Science, Seafood and Health (CESSH).

"In Australia we have a diverse range of fish and seafood caught and processed right around the coast. This makes it difficult to

Below Southern Bluefish Tuna offal is transformed into liquid fertiliser and other products. Photo: Janet Howieson

Below right Seafood 'trimmings' incorporated into a biscuit snack. Photo: Duc Minh Nguyen

get detailed information," she says. "From a processing perspective, it also makes it difficult to get the quantity of scale needed to make investment in new processes or equipment, or make new products worthwhile."

The audit identified more than 55,000 tonnes of waste generated during processing. Although Janet Howieson says there are still gaps in this data, white fish were found to be the most significant source of waste, adding up to an estimated 35,000 tonnes.

The project is also working with individual businesses, developing case studies to come up with new ways to use or add value to fisheries waste.

Total utilisation

These case studies build on work CESSH is undertaking with Western Australian fisher and processor Peter Jecks of Abacus Fisheries, through the FRDC-funded project 'Waste transformation methods for value-added products for the catering market'.

Peter Jecks believes better use of the fish and seafood already harvested could net an additional $1 billion for the Australian seafood industry. "That's big money without catching a single fish more," he says.

He has made "total utilisation" the mantra for his Carnarvon-based family business, Abacus Fisheries, where he now produces 1.2 kilograms of Blue Swimmer Crab product for each kilogram of crab harvested. This includes using the water in which the crabs are cooked for stock, which is then incorporated into a range of products such as crab cakes. He also sells the shell for further processing, to extract chitin – a long-chain polymer that has a range of uses, from fertiliser to a finish on surgical thread that adds flexibility and strength.

Peter Jecks' latest waste transformation project is focused on reclaiming as much protein as possible from fish and processed fish frames for use in a reconstituted product.

"I was given 100 kilograms of Atlantic Salmon frames to process, and I extracted 30 kilograms of meat from the frames," he says. "When you consider some processors are dealing with 30 tonnes of fish a week, there's a lot of seafood protein that can be reclaimed," he says.

"Other species may not produce good fillets, but the flesh could be removed, minced and reconstituted into meat portions for catering," he says.

Work with CESSH and the CSIRO has developed a cold-set binding process, testing a range of setting agents, including alginate – a setting agent derived from algae – that has allowed him to create fish portions from the reconstituted meat with an acceptable taste and texture. This work has been undertaken with the needs of the aged-care sector in mind.

Based on the results so far, Peter Jecks has already invested in four processing machines, each of which strips as much flesh as possible from fish frames, but with variations in the processing settings, to cater for different final products.

Further work at the CSIRO facility in Werribee, Victoria, later this year will test an extrusion process for the development of other fish products.

New products

Using a similar approach to that taken by Peter Jecks, the FRDC's 'New opportunities for processing waste' project is also investigating a seafood snack. Food science research student Duc Minh Nguyen has developed a seafood biscuit containing five per cent dried minced snapper frames.

Sensory trials to evaluate consumer acceptance of the snack, including taste, texture and odour, will be conducted later this year. The target end product is a long-life, high-protein snack for Asian markets.

Other human food products being assessed include new products from existing resources, such as fish minces, soups, stock, sauces, snacks and caviar. Extracting high-value, functional

National survey

Food research scientist Stephen Pahl at the South Australian Research and Development Institute (SARDI) is coordinating a national survey to develop a more detailed picture of waste in Australia's seafood sector. The survey, conducted online at www.surveymonkey.com/r/DQ5SR98 will seek information about the different types of waste, quantities, location and current methods of management or disposal.

Stephen Pahl says the survey will also provide an opportunity for the sector to help identify and prioritise future research and product-development opportunities. "Reducing waste can reduce our environmental footprint, while also improving the profitability of the industry."

More information: Stephen Pahl, 08 8303 9333, Stephen.Pahl@sa.gov.au

chemicals such as omega 3 oils and potentially collagen and gelatin, is another avenue of inquiry.

Pearl meat and swim bladders

Janet Howieson says for products targeting human consumption there are additional hurdles, including the need to ensure the 'trimmings' are treated as a food product with appropriate handling from point of harvest and through processing.

The process is easier in vertically integrated companies that deal with their product from harvest to market. In fragmented supply chains, once 'waste' moves beyond the first point of processing, it becomes more difficult to ensure the appropriate handling, food safety and cold-chain management have been applied.

She says the development of a premium pearl oyster meat product for the domestic and export food service industry is an example where entire supply chain focus is needed.

Pearl oyster meat is a recognised food product in many Asian countries. An earlier project funded through the Australian Seafood Cooperative Research Centre identified changes required in the shucking, cooling, packaging and freezing of the meat on board harvesting vessels to enhance quality. Kerri Choo, from CESSH, has been working with Paspaley Pearls to develop this product, undertaking shelf-life and quality studies on fresh and frozen products to support plans to target premium markets.

Janet Howieson is also developing drying techniques for Barramundi air bladders, which are normally removed and may be discarded when fish are gutted. However, there is a growing Asian demand for swim bladders for use as 'food therapy', and a similar product is already being supplied from Iceland.

Above Research is investigating new ways to use seafood trimmings for other products, through mincing, drying, conversion to powder and incorporation into new products. Photo: Duc Minh Nguyen

Machine-dried Australian Barramundi air bladders are being tested against traditional Asian sun-dried products. Sanitisers and enzymes are being trialled to 'clean up' the bladders before drying, rather than requiring fishers to remove the blood and membrane as the fish are harvested and processed.

Several other projects underway are investigating the potential for fish roe products, and abalone viscera, and possible uses for fresh, but damaged shellfish.

Janet Howieson says overall, it's clear that processors are interested in value-adding to their businesses and to the industry as a whole.

Chefs' challenge

It is not just producers and processors who are keen to maximise the use and returns from seafood while minimising waste. In the hospitality trade, some restaurants use pre-processed fillets to minimise waste, while others trim their own seafood, usually dealing with waste through normal food waste disposal.

However, there is a growing trend among savvy chefs for a similar total utilisation of the whole animal, extracting every gram of value out of their purchase. The proportion of fish recovered varies from species to species, but for larger fish fillets, the cheeks, liver, roe and wings are all usable. Further options include scraping the bones to get a fine mince, using skins for a 'crunch' element, and making fish stock from the frames.

But at some point there will be parts that cannot be used for food, and the quantities of this waste are generally larger and more costly to deal with for fishmongers and processors than they are for restaurants.

Small-scale retail

Fish and seafood waste can be disposed of as landfill, usually at a cost to the processor. Some companies sell or donate waste for use in plant fertilisers, pet food, fish feed or even roadfill. The FRDC project is working to develop simple and easily adopted value-adding options for both large and smaller operators, including seafood retailers.

The initial waste audit found that generally only 50 to 65 per cent of a white fish is recovered for sale during processing, leaving 35 to 50 per cent of the fish as 'waste', depending on the species and processing technique.

Industry advice has also indicated that of all white fish harvested, about half was processed at major facilities, and half was sold as whole fish and processed at food service, retail outlets, or by the consumer.

"Many smaller businesses have to store their waste in fridges or freezers because it's

Above Patagonian Toothfish being processed at sea, where offal must be disposed of in an environmentally appropriate way.
Photo: Rhys Arrangio

only collected for disposal once a week. These smaller operations require a different strategy, because they don't have the volumes that would make investment in a more complex product worthwhile," Janet Howieson says.

"So we are designing a small, standalone processing unit that fish trimmings can be added to each day. A commercial enzyme is used to break down the proteins and liquify it, so that it could be used as a fertiliser, or some other product, rather than going to landfill. "That leaves the bones, and we're looking at ways to liquify those as well, as well as for other uses of the liquid."

Processing units with two to four-litre capacity have worked well in benchtop trials, she says. A larger, 50-litre prototype unit will be built and trialled with a business whose waste largely consists of snapper and salmon trimmings.

SBT Kingfish conversion

This proposed system is essentially a simpler version of that used by Port Lincoln fish waste processor SAMPI to transform about 2000 tonnes of Southern Bluefin Tuna and Yellowtail Kingfish waste and offal into hydrolysate each year.

SAMPI's managing director Charles Franchina says that for his company this waste is "a high-value raw material with lots of nutrient value".

The fish hydrolysate that SAMPI produces is organically certified and is sold as a biological soil conditioner and aquafeed ingredient, with growing demand in both markets. It currently supplies aquafeed markets in Indonesia, Malaysia, South Korea and the Philippines, and trials of the higher-quality hydrolysate now being produced are underway with an Australian aquafeed manufacturer.

The company previously used an acid, but has switched to an enzyme process, which it has been refining in conjunction with the FRDC project. The result is faster hydrolysis and a higher-quality, homogenised liquid product, with higher protein levels and about 10 per cent oil. The new hydrolysis process results in a 100 per cent conversion of all material into a saleable product.

Bone matter separated out is used to make recreational fishing berley, and there is further research into higher-value uses for calcium extracted from the process, which could even potentially be used for human consumption.

Charles Franchina says while SAMPI currently handles material only from Port Lincoln, the plant has the capacity to process waste from other regions.

The 'New opportunities for processing waste' is part of the FRDC's National R&D Priority 2: "By 2020 deliver RD&E for fishing and aquaculture to increase productivity and profitability consistent with economic, social and environmental sustainability." F

Low-impact ocean disposal

Austral Fisheries has been involved in a case study trying to streamline operational efficiencies by 'transforming' Patagonian Toothfish waste into a product that could be more easily disposed of at sea, or, alternatively, reclaiming the oil components for use or sale. On board, the toothfish are headed and gutted but the offal can't be disposed of on the fishing grounds because of the potential to attract seabirds and whales.

Austral Fisheries CEO David Carter says seabird mortality has reached near-zero levels in toothfish fisheries in recent years, thanks to a suite of mandatory mitigation methods, including offal retention. "The offal is stored on board for as long as possible, and we try to make only one or two runs per trip to the edge of the fishing zone," he says. For Austral, this offal is expected to total 500 to 600 tonnes in 2016.

In the Heard Island and McDonald Islands Patagonian Toothfish Fishery, vessels are required to travel outside the 200-nautical-mile fishing zone to dispose of their waste, which is expensive in terms of both operating costs and lost fishing time.

"We've been looking at some kind of waste-digesting approach that will break down the offal into components that would make it unattractive to whales and seabirds if it was disposed overboard. If there were additional uses, such as reclaiming oil to use in the engine, that would be a bonus," David Carter says.

Initial trials investigated both an acid and an enzyme-based approach to break down the offal in a process known as hydrolysis. However, acid was deemed a potential environmental hazard.

The commercial enzyme tested was effective in breaking down the proteins, but required temperatures of 40 to 50ºC to work – conditions that are too difficult to maintain on a vessel where the temperature averages 2ºC. Patagonian Toothfish waste is also being examined for potential functional food ingredients that could be extracted. Researcher Ranil Coorey and post-graduate student Ahmad Jauhari are testing extracts from hydrolysed toothfish for food properties such as foaming, gelling and water holding.

More information: Austral Fisheries, 08 9217 0100 austral@australfisheries.com.au, www.australfisheries.com.au

MORE INFORMATION
Michael Gilby, michael.gilby@ecodev.vic.au
FRDC RESEARCH CODE: 2014-226

Fishing for culture

A weekend retreat launches new connections for Victoria's Taungurung people and traditional fishing practices

By **Annabel Boyer**

If you look at the sandstone walls that make up old parts of Sydney you can see the remains of ancient middens stuck between the blocks – evidence of ancient fishing practices and thousands of years of feasting on shellfish by Indigenous people. Michael Gilby, Aboriginal Project Officer with Fisheries Victoria, himself a Barkindji man from Mildura, uses this as an analogy for how traditional practices are often hard to discern even though they are embedded in the world around us.

Far from Sydney, near Eildon in Victoria, the Taungurung Clans Aboriginal Corporation has met with staff from Fisheries Victoria, the Monash University Gukwonderuk Indigenous Engagement Unit, Monash Country Lines Archive and the FRDC as part of the Taungurung Cultural Fishing Retreat. The weekend event was part of an FRDC-funded project with Fisheries Victoria that aims to document cultural fishing practices in Victoria.

"Maybe our mob didn't use fishing rods, but this," Michael Gilby says, holding out a fishing rod, "is a tool to talk about traditional techniques, to access past customs, whether that was spears or using traditional fishing gear, nets, eel traps or anything else."

Shared experience

The retreat was designed to begin a process of connecting to culture and country by fishing together, meeting fisheries managers and simply being together to talk about fishing. It aimed to document information, including the medicinal value of aquatic plant life, how local people kept pools fresh in times of drought and how important fishing was for subsistence. The event was held near Eildon at facilities of the Holmesglen Institute of TAFE, which is part of Taungurung Country. The Taungurung people are at an exciting point in their history, having begun negotiations in May last year to recognise their rights over land in parts of central Victoria. The Taungurung Clan is the first traditional owner group to negotiate a settlement directly with the Victorian Government under the *Traditional Owner Settlement Act 2010*, which allows traditional groups to agree to out-of-court native title settlements.

Taungurung country stretches from Kilmore in the west of Victoria through to Wangaratta in the north, eastwards to Mount Beauty and south to the top of the Great Dividing Range. The Taungurung Clan call themselves the first people of the rivers and the mountains.

The Taungurung Cultural Fishing Retreat is part of a wider clan process of reconnecting and rediscovering culture, some of which involves fishing. For the FRDC-funded project led by Michael Gilby, it is a way of jump-starting the process of gathering and documenting traditional practices so that Indigenous culture around fishing can be taken into account in fisheries management practices.

Living history

Lawrence Moser is CEO of the Taungurung Clans Aboriginal Corporation. "Fishing is just one avenue that Taungurung might be able to use to re-engage with culture and connection to country," he says.

He grew up outside Taungurung country and only later discovered his roots. But he says he always had a connection to fishing through his grandmother, who would catch cod to sell using handlines. "I'm quite adamant that fishing for our mob was part of our cultural practices and I take that for granted, it's innate," he says.

His grandmother taught him that if you take the air sac out of a Murray Cod without breaking it, and press it between two sheets of paper, as you would a flower, you are left with an imprint that is the shape of the tree that the cod was born beneath.

Little clues embedded in stories like this, in family histories and memories, can be the seeds from which cultural practices are rediscovered. This in turn can lead to greater understanding of how waterways like those around Eildon functioned before colonisation, and this has implications for how fisheries can best be managed.

For example, while the current wisdom is that Taungurung country is devoid of eels and that the people here did not fish them, as a knowledge holder of her people's traditions, Lee Healy tells a different story. Lee Healy has been weaving for 30 years. She knows which plant fibres to collect and at what time of year to collect them. She weaves traditional baskets that women would have used, and she also weaves eel traps.

"We know that eel fishing took place on Taungurung country, but we have to go back to diaries and talk to Taungurung people," Lawrence Moser says. In this way the project aims to follow the leads that arose during the retreat to discover greater understanding.

Insights into how waterways used to operate are among the reasons that Fisheries Victoria is keen to engage with traditional owners. Activities on the first day of the retreat included fishing in Lake Eildon and a tour of the Snobs Creek Hatchery, with a presentation by senior manager of Fisheries Victoria's freshwater fisheries, Anthony Forster.

Below Elijah Cruse fishing at Snobs Creek Hatchery.

Right Michael Gilby, Karen Adams and John Douglas. Photos: Annabel Boyer

"One of the things we really want to know is just what things were like before the period of colonisation." Anthony Forster, Fisheries Victoria

Habitat changes

"One of the things we really want to know," says Anthony Forster, "is just what things were like before the period of colonisation. We are dealing with highly modified waterways, where 70 per cent of water is used for irrigation and most native fish are threatened. We want to work out how to restore habitat. We are keen to work with Indigenous people and I see lots of ways we can engage. Indigenous communities are a missing link in improving and celebrating our fisheries."

Fisheries Victoria is keen to identify ways in which Indigenous Victorians and fisheries resource managers can benefit from working together. This is as much about finding new ways to engage with country as it is about looking to the past to discover how Indigenous ancestors did things.

Discussions at the hatchery made it clear that a new era of engagement was on the table – moving forward with a conversation rather than a directive. It was agreed that the Taungurung would be involved in the Eildon Fishing Festival, performing a welcome to country and taking part in Fisheries Victoria reference groups.

Opportunities around the restoration of riparian habitat is a promising area for engagement that was frequently discussed during the weekend. Riparian habitat consists of the area from the water's edge to about 30 metres up the embankment, and it has often been destroyed. Ecologically it is important as habitat for animals both in the water and on the shoreline, and plants that shade waters affect what can live there. Rich in diversity and activity, the restoration of these habitats is a key area where Taungurung cultural knowledge has much to offer.

Cultural maps

Inter-generational transfer of knowledge is a key motive for both the Taungurung Clans and the FRDC project, which will develop maps overlaid with history, stories and cultural practices.

Shannon Faulkhead, from the Monash Indigenous Centre at Monash University, has worked with a number of Indigenous groups around the country to animate stories of creation on their country. Resources such as videos and animations provide both educational tools to maintain knowledge, and act as a catalyst for remembering and gathering more information.

"We are remembering things we didn't even know we knew," Shannon Faulkhead says. "What we find is that someone might have told us a story, and we'll remember other things from watching an animated version or from the kids asking questions about it."

There is consensus from the group that work should be done to create content around the seasonal calendar, bark canoes, Spiny Freshwater Crayfish, and native fish and eels. These will become an educational resource for Taungurung people and the wider community, including children, and the resources will be updated as new information is recorded. Michael Gilby will continue the work begun during the retreat by following up leads and continuing to cultivate relationships.

A second event of this kind will be held on the same weekend as the Eildon Fishing Festival, on October 15 and 16. F

Flexible investment approach

The FRDC is adopting a more flexible approach to the application, submission and assessment of research funding proposals.

By **Peter Horvat**

The FRDC has developed a more flexible approach to how it funds projects to align with the FRDC Research Development and Extension (RD&E) Plan principles of 'Lead, Collaborate and Partner'. Nationally, the FRDC will LEAD and target investment towards three national research priorities:

- ensuring that Australian fishing and aquaculture products are sustainable and acknowledged to be so;
- improving productivity and profitability of fishing and aquaculture; and
- developing new and emerging aquaculture growth opportunities.

PARTNERING involves devolving some authority to jurisdictions through research advisory committees (RACS) and industry sectors through Industry Partnership Agreements (IPAs) – to allow them greater ownership of how and where to invest.

The FRDC has an RAC for each fishery jurisdiction: Commonwealth, all states and the Northern Territory. Each RAC consists of a chair and members who provide expertise in the areas of fishing, aquaculture, management (fisheries), research, environment, post-harvest and other community interests, and is managed by an FRDC project manager (see contacts, right).

IPAs are in place with 11 different industry sectors, and allow industry groups to identify and prioritise issues that relate to their sector and ensure RD&E investment against those priorities. Each IPA is managed by an FRDC project manager (see contacts, right) and an industry executive officer who reports to their governance committee.

Stakeholder priority setting

In September and October the RACs and IPAs will meet to discuss and set priorities for the coming year. Following these meetings the FRDC will convene a workshop of advisory groups around October each year to discuss the developed priorities, align them and identify areas for potential collaboration.

RACs and IPAs will also be able to further develop their priorities when they meet in March, July and October each year, or should a major issue arise, they will be able to progress research to deal with that issue.

Application process

The FRDC will evaluate applications based on two levels of assessment:

- Greater than $175,000 (incl GST) assessed by the FRDC Board. This will occur at the April, August and November board meetings.
- Less than $175,000 (incl GST) and considered low risk, assessed by the FRDC. An application can be submitted at any time where an RAC, subprogram or IPA has available funds, and wishes to address an issue. These projects must have a budget of less than $175,000 and be considered a low risk by the FRDC.

A summary of the process is as follows:

The FIRST CALL for applications will be posted in November.

- Closing date for applications is 15 February.
- Applications will be assessed by the RACs, subprograms and IPAs in March.
- The FRDC will assess these applications in April and notify applicants in April–May.

The SECOND CALL for applications will be developed in April, as required, following the RAC, subprogram and IPA meetings.

- Closing date for applications is 15 June.
- Applications will be assessed by the RACs, subprograms and IPAs in July.
- The FRDC will assess these applications in August and notify applicants in August–September.

The THIRD CALL for applications will be developed in August, as required, following the RAC, subprogram and IPA meetings.

- Closing date for applications is 15 September.
- Applications will be assessed by the RACs, subprograms and IPAs in October.
- The FRDC will assess these applications in November and notify applicants in November–December.

If in doubt, check with the FRDC's project managers. F

FRDC contacts

The FRDC has also restructured the way it manages research, development and extension (RD&E) internally. FRDC managers now have portfolios made up of RACs, subprograms and IPAs. When an applicant responds to a priority they will need to consult with the relevant FRDC managers.

Christopher Izzo
christopher.izzo@frdc.com.au
Tasmanian RAC
Victorian RAC
South Australian RAC
Commonwealth RAC

Skye Barrett
skye.barrett@frdc.com.au
Western Australian RAC
Northern Territory RAC
Queensland RAC
New South Wales RAC

Wayne Hutchinson
wayne.hutchinson@frdc.com.au
Australian Barramundi Farmers Association IPA
Australian Southern Bluefin Tuna Industry Association IPA
Australian Prawn Farmers Association IPA
Australian Abalone Growers Association IPA
SafeFish
Yellowtail Kingfish RD&E through the Rural Research and Development for Profit programme

Jo-Anne Ruscoe
jo-anne.ruscoe@frdc.com.au
Oysters Australia IPA
Pearling IPA
Social Sciences and Economics Research Coordination Program
Indigenous Fishing Subprogram
Aquatic Animal Health and Biosecurity Subprogram
People Development (national)

Joshua Fielding
joshua.fielding@frdc.com.au
Tasmanian Salmonid Growers Association IPA
Southern Rocklobster IPA
Abalone Council Australia IPA
Recfishing Research Subprogram
New and Emerging Aquaculture Subprogram

Crispian Ashby
crispian.ashby@frdc.com.au
Western Rocklobster IPA
Australian Council of Prawn Fisheries IPA

Australian Rural Leadership Program participants visiting Indonesia, including Lowri Pryce (right). Photo: Lowri Pryce

Leadership skills to connect shared aspirations

Negotiating the diverse interests of fisheries stakeholders requires strong leadership and vision

By **Catherine Norwood**

It's not often a leader can take time out from trying to get things done to reflect on and develop their own leadership skills. But doing so can make their leadership efforts much more effective.

That's the philosophy underpinning the highly regarded Australian Rural Leadership Program (ARLP), and an important consideration for the FRDC in sponsoring program participants.

Leaders working in the fisheries and research arenas are negotiating the complex management of publicly owned and shared resources. They are also supporting rural and regional communities, where leadership skills can be less prevalent, but are critical to the long-term sustainability of these communities.

"It is the shared resource that unites us," says Jo-Anne Ruscoe, who oversees the FRDC's national people development initiatives. "And it takes good leadership and communication skills to connect the research and extension with policy and community expectations."

The current ARLP group – cohort 22 – includes two FRDC-sponsored participants: Tim Lester, executive officer of the Council of Rural Research and Development Corporations, and Lowri Pryce, executive officer of OceanWatch Australia.

Tim Lester's role puts him in a unique position, working across Australia's 15 Rural Research and Development Corporations as they drive the innovation to improve our primary industries.

OceanWatch has also been highly successful in connecting research, commercial fishers and the general community to improve environmental outcomes and industry practices, and Lowri Pryce has been an integral part of this success.

Tim Lester and Lowri Pryce began their 15-month program in May 2015 with two weeks in the Kimberley, and it officially concludes in September 2016 in Perth.

Tim Lester says it has been personally challenging, while creating space to think about and test different aspects of leadership. "It's not often that you have the opportunity to take such a large chunk of time to reflect on how you can do things better."

While the program addresses skills leaders need, such as negotiation, problem solving, presentation and media engagement, he says it also offers insight into the importance of recognising different personal and cultural perspectives.

For him, this has included a much greater awareness of Australia's traditional owners and their ancient and modern history, as well as current interactions. A session in Indonesia also highlighted sensitivities that need to be addressed for effective international engagement and exchange.

Lowri Pryce says she has found the ARLP to be an amazing and intensive learning experience. "For me the highlight has been the very inspiring group of people doing the program with me.

"Leadership issues are so broad they cross all sectors, but it always comes back to the people and how we work with others."

Lowri Pryce says it has also given her a new appreciation for the role of women in leadership and gender dynamics in leadership.

"I think I've benefited from the program already, but the intent is to give you lifelong skills that will help you to continue to grow. There's not a fixed outcome at the end of the course."

The FRDC has sponsored another two participants in the ARLP's 23rd cohort: Alex Ogg, operations manager at the Western Australian Fishing Industry Council (WAFIC), and Helen Jenkins, executive officer of the Australian Prawn Farmers' Association.

Alex Ogg says he hopes the program will help him to become more effective in his specific role at WAFIC, and more broadly across the fisheries sector.

"There are decisions being made at state, national and international levels that will affect the ability of fishers to continue accessing the resource. It has become a highly competitive resource-sharing environment. I want to be able to connect the dots across different aspects of our sector, and with our many stakeholders."

Helen Jenkins says she hopes the course will help to expand her thinking and views. "I want to be equipped with skills to navigate a journey of growth for Australia's prawn farm industry and to be more effective at influencing key decision makers to allow this to happen," she says.

Applications are already open for the 24th ARLP course, which will run from August 2017 to October 2018. The program is for established leaders and involves six sessions – one online and five residential sessions totalling 54 days, over 15 months. A competitive application process applies and scholarships of $55,000 are provided, with participants contributing $5500 to the cost.

The Australian Rural Leadership Foundation runs several other programs for emerging leaders, including the Australian Agribusiness Leadership Program, TRAIL for emerging leaders, and client-specific programs. F

Evolution of quality and collaboration

Executive director Patrick Hone reflects on his time with the FRDC and charts some of its major changes as it celebrates 25 years

By **Patrick Hone**

The FRDC is one of Australia's 15 Research and Development Corporations (RDCs), a partnership between fisheries and aquaculture sectors and government that reached its 25-year milestone this year.

From its inception on 2 July 1991, the inaugural executive director, Peter Dundas-Smith, and chair, Bill Widerberg, implemented a quality management approach to all aspects of the FRDC's business practices. This saw the FRDC become the first Research and Development Corporation to achieve third-party certification as a quality organisation.

The quality-management system is at the heart of everything the FRDC does to this day. The key was to be 'efficient and effective', thus keeping our overheads down to maximise the investment in RD&E. As a consequence of the quality-management approach, the FRDC was an early adopter of information technology to deliver financial and research management systems.

We were the first RDC with real-time integrated accounting and project management systems. We were one of the first organisations to have an electronic application system, although we have moved from five-inch floppy disks to live access via the internet. This allowed the FRDC to ensure information entered on a project application never had to be re-entered, and that the financial management system was always able to provide detailed reports on the FRDC's financial commitment and expenditure for stakeholder reporting.

When I first started at the FRDC we were still a relatively naive organisation in terms of our planning and income and how we did our work. We had moved from thinking of research and development as a grant to thinking of it as an investment, but we hadn't actually worked out how you did that.

The first big change was sitting down with industry and developing a better planning horizon. What that did was to drive a more commercial focus to our research, so that people could clearly see outcomes.

There was a lot to develop around planning, prioritisation and building the FRDC business model. That was a big change that took place from around 1997 to about 2007.

Then, at some point we got too plan rich. So the next improvement was building plans across whole sectors or around thematic concepts. We looked at national issues, and drew them together across multiple sectors.

Ecological sustainable development is an example of where we pulled together a subprogram that covered all sectors, including wild-catch and aquaculture. That started to mean we were focused at a much more national level. We went from being jurisdictionally focused, to jurisdiction plus sector, and then to jurisdiction, sector and national.

Collaboration

The other big change that has happened since the 1990s is that initially we had a big push on what we called collaboration. But early on, the only group we pushed to collaborate was researchers. From the mid-2000s we started to push for collaboration within the industry. For example, could you make a case for abalone and rock lobster sectors to collaborate on a project in China where they are in the same market? Sure enough, we've been able to do this.

We have continued that collaboration trend. Getting fisheries managers to collaborate has resulted in the development of various guidelines. The Status of Australian Fish Stocks (SAFS) Report is an example of starting to get collaboration between management agencies to produce a single collaborative report.

Diversified income

The next change for the FRDC was diversification of income sources. When we started, we had a pretty

"It is rare that a single project delivers the outcome you are looking for; often it takes multiple projects to deliver a planned outcome. So those complex problems require complex investment platforms..."

Patrick Hone, FRDC executive director

Below Team FRDC circa 2000 with executive director Peter Dundas-Smith.

Right Gary Zippel and Annette Lyons. Photos: FRDC

limited funding source. It was Commonwealth government dollars and industry dollars and that was about it. Now some of our projects might have two, three or four income streams.

Back in the 1990s, it was rare to see income in a project. Now it is rare that there is not someone else investing in it. And that is quite a change in attitude. If you look back to the '90s, it is probably fair to say that most people saw research as a cost activity. Now most people can see the investment benefit.

The next big change was operational. When we first started we had a very simple planning cycle – once a year we would fund a national call through what was called the Fisheries Research Advisory Bodies, and that was it. If you look at our investment process now, we've got everything from competitive research ideas right through to commissioning of research. We've got a much broader suite of investment mechanisms, and they all vary depending on the type of research, development and extension activities.

More complex research

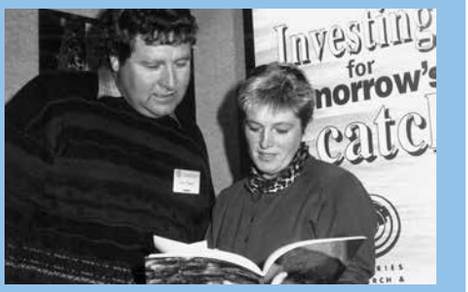
In the '90s, we tended to work on pretty simple science problems. How old was the fish? How many eggs did the fish produce? Relatively simple biological-type problems. Now research has become much more complex. It is rare that a single project delivers the outcome you are looking for; often it takes multiple projects to deliver a planned outcome. So those complex problems require complex investment platforms, and they also need people to stay in the planning environment for longer than three years.

Culturally, the FRDC is going to have to change from being an investor in research to more of a service body. So in our new Research, Development and Extension Plan we talk about key infrastructure services the FRDC is going to deliver, such as Fish Names, SafeFish and the SAFS infrastructure. We are going from being a facilitator to an actual doer.

Successes

One of the big wins for the FRDC has been in building capability. There isn't an executive officer on any of the industry councils who hasn't done one of our leadership or capacity-development programs. That brings cultural change, and those sectors that have invested the most in people development are usually the best-performing sectors. A lot of people didn't think that people development would produce these sorts of results, and now we are in a situation where people are demanding more of it, which is great.

You get a lot of satisfaction when something actually delivers a commercial outcome, and we have had a lot of successes. When abalone farming went over 1000 tonnes, that was great, and when the prawn farmers started to yield above 15 tonnes per hectare, some of them up to 19 to 20 tonnes, that was an enormous change. That has been fantastic, and being part of the rise of the salmon-farming industry, and the professionalisation of that sector, has been incredibly exciting. F



Changing times

By Annette Lyons
(FRDC's longest-serving employee)

I started at the FRDC in 1992 when there were only five employees – the executive director, the business manager, office and quality manager, program manager and one project manager. I started as an office assistant. They sat me down in front of a computer, I asked what it was and was told that was how I had to work. I had never worked on a computer. At that stage, we had inherited 51 projects from the Fishing Industry Research and Development Corporation, and then invested in an additional 42 projects, bringing it to a total portfolio of 93. We now have in excess of 400 projects.

With a small staff there were always things to do and everyone did everything, even the executive director. You always felt valued, you actually felt like everything made a difference and you gained a lot of knowledge. All final reports were stored in a cupboard with a maroon ribbon around them. At one point we even charged for the final reports based on weight. Now we don't receive hard copies and we have been evolving to a paperless office – almost. Some sayings come to mind, such as "join the dots", "the big end of town", "hit the ground running", "peaks and troughs", "think quality", "don't do things twice, avoid rework" – these seem to define the FRDC.

I have seen many changes over the years: three iterations of our project management systems, from keying in applications to an online system; the expansion of the FRDC (now with an Adelaide office); a small newsletter that has grown into a national magazine; two office locations; and various chairs, boards, Fisheries Research Advisory Bodies and Research Advisory Committees (so much paperwork). My reason for sticking it out for so long is loyalty, and an ever-changing environment. I have really appreciated that the FRDC has always been very supportive of family, allowing me to attend school activities or be home with sick children. I hold close to my heart all the relationships and friendships I have made with many stakeholders throughout my time at the FRDC and many ex-staff and board members.

Congratulations FRDC on 25 years.

It is an honour to serve.

MORE INFORMATION
Australian shellfish restoration network, www.shellfishrestoration.com.au; The Nature Conservancy Australia, www.natureaustralia.org.au; Simon Rowe, OceanWatch, livingshorelines@oceanwatch.org.au; restorepumicestonepassage.org. **FRDC RESEARCH CODE** 2012-036

Reef revival

A diverse range of stakeholders keen to improve marine productivity are coming together to investigate the potential benefits of shellfish reef restoration

By **Catherine Norwood**

The re-establishment of shellfish reefs around the country is the focus of a growing number of habitat restoration research projects, which aim to improve biodiversity, water quality and the productivity of estuarine fisheries.

Projects are already underway in most Australian states, and the Australian Shellfish Reef Restoration Network was formed last year to help researchers and other stakeholders share information and inspiration.

The 2014 FRDC-funded report *Revitalising Australia's Estuaries* identified shellfish reefs as a priority for habitat restoration. The report's principal investigator, Colin Creighton, says shellfish reefs are a comparatively easy and logical place to start to improve the health of estuaries and nearshore fisheries.

"Shellfish reefs have an important role in providing habitat, maintaining water quality and protecting the shoreline from wind and wave erosion," he says.

Reefs are formed by high densities of oysters or mussels that build up over time, and can grow to several metres high, stretching along kilometres of coastline.

In Australia these reefs were once common in subtidal or intertidal areas, some based on a single species, and others a combination of different oysters and mussels.

New shellfish attach themselves to the layers of dead shell material below, which allows the reef to grow in size and mass, creating a complex, three-dimensional structure that offers food and shelter to other marine life.

Work in Chesapeake Bay, in the US, has demonstrated massive increases in fish and crustaceans with the re-establishment of shellfish reefs. An early trial at Pumicestone Passage in south-east Queensland has also found that reefs provide habitat for fish spawning.

Shellfish are filter feeders and strip nutrients out of the water column, which helps to improve water quality for other marine life. They also re-process fine clay in sediment into larger, heavier aggregations, which are less likely to be re-suspended through wind-wave action. Following the FRDC report, Creighton and a team of researchers led by Ian McLeod from James Cook University and Chris Gillies from The Nature Conservancy have been working with the National Environmental Science Program (NESP) Marine Biodiversity Hub to identify the total value of shellfish reefs to the marine food chain.

Their first report, *Shellfish reef habitats: a synopsis to underpin the repair and conservation of Australia's environmentally, socially and economically important bays and estuaries*, was released last year through James Cook University.

As an international environmental agency, The Nature Conservancy has been driving several restoration initiatives already underway in Australia, building on its experiences with shellfish projects in the US.

Chris Gillies, The Nature Conservancy Australia's marine manager, says that globally, 85 per cent of shellfish reefs have been destroyed, making them the most threatened marine ecosystem in the world. According to the NESP report, Australia has lost 99 per cent of native shellfish reefs, and they are "functionally extinct" ecosystems in this country.

Experimental mussel bed, Point Wilson, Port Phillip Bay.
Photo: Ben Cleveland

Above Project leaders for the OceanWatch initiative Sydney's Living Shorelines, Andy Myers and Simon Rowe, trial different bagging techniques for oyster shells, to create a foundation on which new reefs can form.
Photo: OceanWatch Australia

Left Leaf Oyster reef in northern Queensland, with Hinchinbrook Island in the background.
Photo: Ian McLeod

Surviving reefs have been found in Hinchinbrook Channel (Queensland), Sandon River (NSW) and Georges Bay (Tasmania). Only the Tasmanian reef remains actively commercially productive, with two licences for the harvest of wild Native Oysters (*Ostrea angasi*). (Most Native Oysters commercially available are the product of aquaculture).

Fading memory

At Primary Industries and Regions South Australia, and through research at the University of Adelaide, manager Heidi Alleway has been trying to understand the extent of lost habitat. A search through the SA archives has found fisheries records dating back to the early 1800s that reveal Native Oysters provided the state's first significant commercial fishery.

"The records indicate that commercial harvesting from natural oyster reefs occurred along 1500 kilometres of the South Australian coastline," she says. But by 1910 the reefs had been overexploited, and suffered such a significant decline, as a result of harvesting and poor water quality, that they have never recovered.

There is mounting evidence that similar highly productive shellfish reefs also existed along other parts of the Australian coastline. Collectively, the fact that the reefs and related commercial fisheries ever existed has been largely forgotten.It is the recreational fishing community that is emerging as the champion for reef restoration projects, with Victoria and Queensland leading the way.

STATE BY STATE

Victoria

In Victoria, Albert Park Yachting and Angling Club member Bob Pearce has fished in Port Phillip Bay for close to half a century. He says while club members have been concerned about declining catches of their favourite recreational species, such as snapper, they also wanted to do something about the major decline in the health of shellfish reefs in the area as a basis for rebuilding biodiversity and fish stocks.

Bob Pearce says the reefs used to be "lush", with large numbers of shellfish often washing up on beaches after storms. But in the early 1980s they suffered a major decline, attributed to the impact of dredging and water quality in the bay. Pollution and disease are other likely contributing factors.

"Local knowledge tells us what used to be there, and what could be there again," he says. The three-year Victorian trial has received $300,000. The angling club has contributed $50,000, with the bulk of funding from Fisheries Victoria and The Nature Conservancy. University of Melbourne researchers are also providing assistance with the trial design and monitoring.

The Victorian project is the first in The Nature Conservancy's Great Southern Seascapes initiative, which has expanded to include shellfish reef projects in South Australia, Western Australia and Queensland.

The Nature Conservancy's Victorian project manager Simon Branigan says there is natural recruitment of both Native Oysters and Blue Mussels (*Mytilus edulis*) in Victorian waters. However, they are "substrate limited" – there are few hard surfaces shellfish can attach themselves to as foundations for new reefs.

There are two trial sites, one at Hobsons Bay, off the Melbourne suburb of St Kilda, and another in Corio Bay, south of Geelong. Trials began in 2014, with limestone rubble used to create a foundation to lift shellfish off the bottom, and prevent them being smothered by mud and sedimentation. Future trials will incorporate recycled shells collected from restaurants and seafood wholesalers in Geelong.

The limestone substrate was seeded with Native Oysters, produced at the Victorian Shellfish Hatchery, and Blue Mussels, from Advance Mussel Supply, with some natural spat settlement.

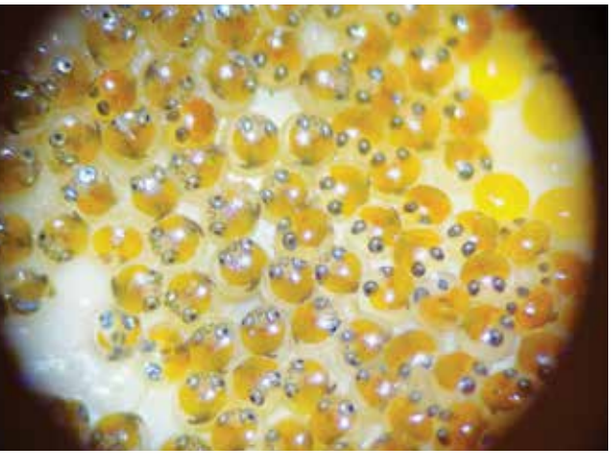
Simon Branigan says phase one results surpassed expectations, with more than half of shellfish seeded onto the substrates surviving six months after deployment. Elevation proved critical to survival and it appeared that the larger the oysters when seeded, the more likely they were to survive. "We're getting closer to proof of concept," he says.

Planning for phase two of the trial is underway, and will involve expanding the foundations from several independent one-metre-square blocks to four 20-metre-square plots at each trial site.

Queensland

In Queensland, local community groups including recreational fishing clubs, oyster

Below Fish eggs deposited on a trial reef site at Pumicestone Passage, Queensland.
Photo: Ben Diggles



Right Extensive intertidal oyster reefs existed along many parts of the NSW coastline, including the Hunter River region where shell materials in Aboriginal middens date back more than 6000 years.

farmers, traditional owners and community conservation groups have all shown strong interest in shellfish reef restoration in Pumicestone Passage, between Bribie Island and the mainland. Together they have established the organisation 'restorepumicestonepassage.org' to support related initiatives.

Marine biologist Ben Diggles, from fish health consultancy DigsFish Services, says subtidal Sydney Rock Oyster (*Saccostrea glomerata*) reefs occurred naturally throughout Pumicestone Passage prior to European settlement in 1824. By the 1860s, oyster harvesting was one of Queensland's largest industries.

The industry peaked in the early 1890s but declined as south-east Queensland became more intensively developed. Today the region's subtidal shellfish reefs are functionally extinct in the area and a continuing decline in water quality has become a major community concern.

Ben Diggles had been working with local oyster farmers and recreational fishing clubs on a range of issues and recognised that both groups shared common concerns about the health of local fisheries and the estuary. He says the potential of shellfish reef restoration to address these issues has brought these groups together. One of the fishing clubs, the Pumicestone Passage Restocking Fish Association, has already re-allocated $50,000 originally raised for restocking finfish into the estuary to shellfish restoration instead. Its members now consider that shellfish restoration will provide much better "bang for their buck".

Ben Diggles' preliminary research suggests that restoring reefs is likely to pay off in terms of marine biodiversity.

Small-scale trials have measured substantial increases in recruitment of oysters, fish and invertebrates at the trial sites. The preliminary data suggest improvements in fish and invertebrate biomass of up to 1000 per cent if subtidal shellfish reefs were restored in Pumicestone Passage on a large scale.

The potential of shellfish to improve water quality has also attracted the interest of local councils, and water and catchment management authorities who have contributed funding to research. In the US, a single Eastern Oyster (*Crassotrea virginica*) has the capacity to 'filter' 200 litres of water a day, although it is not yet known whether Australian species match this capacity.

Ben Diggles says the ultimate aim of the restorepumicestonepassage.org group is to scientifically quantify the ecological benefits of shellfish reefs.

This will underpin the business case for investment in environmental offsets, which will help fund larger-scale projects to re-establish self-sustaining shellfish in Pumicestone Passage and throughout south-east Queensland.

> "As we get a greater understanding of the habitat we have lost ... it does paint a picture of the potential greater productivity of our fisheries."
>
> David Ciaravolo, RecFish SA executive director

South Australia

In South Australia, RecFish SA has been lobbying to increase recreational fishing opportunities, and has supported the use of South Australian government funding for a new artificial reef project to incorporate the re-establishment of a Native Oyster reef. The $600,000 project, which is in its design phase, will create a new recreational fishing hotspot across a four-hectare site near Ardrossan, in the Gulf St Vincent.

RecFish SA executive director David Ciaravolo says he hopes the oyster reef element of the project proves successful and can kickstart the self-sustaining formation of what once existed naturally.

"As we get a greater understanding of the habitat we have lost, through Heidi Alleway's work for instance, it does paint a picture of the potential greater productivity of our fisheries, if they had the right habitat," he says. "We have the opportunity to make an enormous long-term improvement to recreational fishing and potentially commercial fishing."

Other project partners include The Nature Conservancy, South Australian Research and Development Institute, South Australian Tourism Commission, Department of Environment, Water and Natural Resources and the University of Adelaide.

Left Close-up of Native Oysters, South Australia.
Photo: Heidi Alleway

Above Native Oyster bed, Tasmania.
Photo: Chris Gillies

New South Wales

A project in Sydney Harbour is an initiative of OceanWatch Australia in partnership with a wide range of organisations, from local councils, oyster farmers and seafood processors to universities. The project focuses on Sydney Rock Oysters and has two overarching objectives: shoreline protection and oyster reef restoration.

Program managers Simon Rowe and Andy Myers are leading the OceanWatch project, called Sydney's Living Shorelines. The first pilot in Sydney Harbour has five sites marked in inter-tidal areas, with trials to begin this year.

Nine tonnes of waste oyster shells are being collected from commercial oyster farms in NSW and from Sydney restaurants including the Star Casino. These shells are then packed in biodegradable, custom-designed coir (coconut fibre) mesh sacks to form pillows to provide the foundation for new reefs.

Over time oyster spat in the water column will settle on the old shells and as they grow this will bind the structure together.

The University of NSW's Water Research Laboratory has provided engineering support to optimise the design of the mesh sacks to disperse wave energy, which contributes to erosion.

Local volunteers, including schools and landcare groups, are helping with the project, packing the shell sacks and helping to install them at the trial sites.

Simon Rowe says the project can help inform the community about the value of shellfish reefs and other marine habitats and provides the opportunity to get involved in their rehabilitation.

"The project is attracting a lot of attention from councils as the technique provides a natural, low-cost alternative to erosion control in some situations. It also diverts shells from landfill into natural resource management projects that can deliver long-term ecosystem benefits," he says.

The project is supported by the Coastal Councils Group, the Greater Sydney Local Land Services and the Australian government, with the University of Sydney and Macquarie University also undertaking related research projects.

Western Australia

On the other side of the continent, The Nature Conservancy is leading a Western Australian feasibility trial to re-establish Native Oyster reefs at Oyster Harbour, Albany. The WA Recreational Fishing Initiatives Fund is contributing funds, with support from Recfishwest, the WA Department of Fisheries, Western Australian Museum, University of Western Australia and South Coast Natural Resource Management Authority.

Laterite, a type of rock found naturally in Oyster Harbour, has been used to create a substrate for oysters, which have been reared at the Frenchman's Bay hatchery at Albany and were seeded onto the prepared substrate earlier this year.

Recfishwest's CEO Andrew Rowland says there has been strong recreational fishing support for the project. "Recreational fishers understand that healthy waterways underpin healthy fish stocks, and we strongly support protecting and restoring fish habitat which will then ensure enjoyable experiences for an estimated one-third of the population who like to wet a line."

Working with the community, the project will develop a baseline understanding of historical and current oyster populations in order to guide future restoration efforts. If this year's trial is successful, the aim is to begin large-scale restoration activities from 2017.

Tasmania

Based at the Institute for Marine and Antarctic Studies, marine biologist Christine Crawford says interest in shellfish reef restoration has been gaining momentum in Tasmania, although no specific projects are underway.

The Nature Conservancy held a workshop in Hobart earlier this year involving salmonid and mussel producers, recreational fishers, indigenous and tourism representatives and other research and environmental stakeholders. While potential projects are still being developed, initial sites proposed included Triabunna, the Derwent River and D'Entrecasteaux Channel.

"Members of the Tasmanian Aboriginal community have shown interest in restoring the cultural heritage of the reefs," she says.

Colin Creighton notes that Aboriginal middens dot the Australian coast, including Tasmania, many with enough shells in them that early colonists mined them for lime.

"Part of our vision in re-creating shellfish reefs is to reconnect various coastal Aboriginal groups with their traditional food resources," he says. "The task of re-establishing reefs will hopefully provide work, and from this indigenous base reconnect the entire Australian community with the bounty of our coastal resources." F

MORE INFORMATION
www.appetiteforexcellence.com
FRDC RESEARCH CODES 2013-024, 2013-024.01

Culinary young guns tour NSW regions

Educating the food sector about the sustainability of Australia's fisheries remains an important focus for the FRDC

By **Peter Horvat**

Food-service industry professionals occupy a unique place as both significant buyers of seafood and as opinion leaders. What better way to get the message across about the sustainability of our fisheries than through direct, first-hand experience – as they say, seeing is believing.

One pathway the FRDC has used to connect with the food-service sector is its long-term partnership with the Electrolux Appetite for Excellence program. The FRDC, along with other Rural Research and Development Corporations, sponsors a regional tour that takes the competition's national finalists to visit producers.

Having an FRDC representative on hand also gives voice to the science that underpins the fishing practices the group is exposed to.

On the road

All 2016 national finalists participated in the week-long tour, beginning on Sunday 3 July, which visited a range of producers in central New South Wales, including Wallis Lake fishers and oyster producers.

The first port of call for the 15 finalists was Wallis Lake Fishermen's Co-operative in Tuncurry, NSW. The Wallis Lake region is home to a range of fishers, including three trawling boats (fish/prawns), seven lobster fishers, 10 boats in the Ocean Trap and Line Fishery, and 35 lake fishers (crabs, fish and prawns).

Monday morning saw the crew head out on to the lake to watch Wallis Lake Co-op chair and OceanWatch Master Fisherman Greg Golby mesh for mullet and Luderick.

He demonstrated how the net was set from his boat, creating a ring before it was hauled in by hand. The finalists all noted how passive the process was, and how labour intensive. They saw how the fisher could control the quality of fish harvested, and how quickly the fish were placed on ice. This, combined with the fact that the fish was back in the co-op within a matter of hours, guaranteed a very fresh product.

The next stop on the lake brought the group up alongside another OceanWatch Master Fisherman – Danny Elliot. He demonstrated the process to set and pull crab pots, measuring the catch to ensure it met standards for size and quality. The finalists asked many questions about the size, grading, and differences between the sex of the crabs.

To the table

As part of the tour and sponsorship, the FRDC organised an informal dinner with the seafood industry, where the finalists got to show off their skills preparing the local product.

Just like the locals, the finalists got their pick of the daily catch. In addition to the mullet, Luderick and Blue Swimmer Crabs they saw being caught earlier in the day, the chefs picked up some local bonito and flathead.

It took them only a few hours to bring

"The tour group taking the catch from the day and turning it into an amazing seafood buffet was the highlight."

Wallis Lake Fishermen's Co-operative operations manager Suzie McEnallay

Clockwise from above Tour participants used the catch of the day to prepare a feast for 60 people; Danny Elliot demonstrates mud crab fishing techniques; freshly caught bonito, selected for the evening meal; Graham Barclay, third from left, discusses oyster growing with the visitors.

Left Appetite for Excellence finalists on Wallis Lake. Photos: DEC Creatives

2016 Appetite for Excellence host producers

Distillery Botanica, Erina
Wallis Lake Fishermen's Co-operative
Graham Barclay Oysters, Forster
Little Hill Farm, Mount Vincent
Pokolbin Purple Farm, Pokolbin
Binnorie Dairy, Pokolbin
Keith Tulloch Wine, Pokolbin
Melanda Park Free Range Pork, Denman
Oakvale Wines, Pokolbin
Swallow Rock Organics, Ebenezer
Piercefield Pastures, Muswellbrook

together a seafood feast to feed around 60 people. They prepared dishes including oysters with nam jim sauce, bonito in a warm pickle of tarragon and garlic, whole baked Luderick, chilli Blue Swimmer Crab, and spiced barbecue flathead and Luderick fillets. They also managed to produce three desserts – the star being fire-roasted bananas with chocolate and caramelised orange sauce.

Operations manager for the Wallis Lake Fishermen's Co-op, Suzie McEnallay, said the dinner was a great opportunity to showcase the local seafood industry to the young chefs, restaurateurs and waiters. "The tour group taking the catch from the day and turning it into an amazing seafood buffet was the highlight. The fishers, tour group and local business people also developed some interesting conversations over dinner," she said.

"It was hard to pick the best dish of the evening – between bonito ceviche, chilli Blue Swimmer Crab, flathead and the Luderick dishes, my favourite may just be the bonito ceviche."

The next morning, a bleak and overcast Tuesday, the group headed out to meet Richard Ellery at Graham Barclay Oysters. Barclay Oysters is a third-generation business that produces quality oysters and supplies statewide. Richard Ellery explained the process of growing an oyster from spat right through to harvest and then on to the plate.

A key part of the discussion revolved around when their oysters came into prime condition for sale. Richard Ellery highlighted that Wallis Lake oysters hit prime condition later in the year, around Christmas time and during summer. Others further south reach prime condition during winter, before spawning.

Having spent the previous day on the water, the finalists also appreciated the pristine conditions in which the lake oysters were grown. F

Electrolux Australian Young Chef National Finalists

Aaron Ward*	Sixpenny	NSW
Jordan Monkhouse	Aria Brisbane	QLD
Mal Meiers	Fatto Bar & Cantina	VIC
Nick Gannaway	The Bridge Room	NSW
Thiago Miranda	Church St Enoteca	VIC
Troy Crisante	Bennelong	NSW
Zackary Furst	IDES	VIC

Electrolux Australian Young Restaurateur National Finalists

Cameron Cansdell*	Bombini	NSW
David Parker	San Telmo and Pastuso	VIC
David Ralph	Kim Restaurant	NSW
Kelvin Shaw	Altair Restaurant	VIC

Electrolux Australian Young Waiter National Finalists

Andrew Day*	Akiba	ACT
Dylan Labuschagne	Stillwater Restaurant	TAS
George Papaioannou	Luxemburg	VIC
Morgan Golledge	Blackbird Bar & Grill	QLD
Natasha Janetzki	Blackbird Bar & Grill	QLD
Rory McCallum	Supernormal	VIC

* Divisional winner

MORE INFORMATION
www.oecd.org/fisheries-innovation

Innovation focus to drive fisheries productivity

Innovation is critical to the future of sustainable fisheries and aquaculture production. So how does Australia's performance stack up?

By **Catherine Norwood**

Above A screen shot of the new OECD web portal comparing fisheries innovation by country, based on the number of patents lodged.

Australia's innovation in fishery and aquaculture industries can now be more readily compared with other countries as a result of a new web-based initiative from the Organisation for Economic Co-operation and Development (OECD).

The Fisheries and Aquaculture Innovation Platform uses several criteria to measure innovation. These include patents lodged for new technologies, national spending on research and development, and an assessment of government policies, organisations and research networks, to support innovation that highlights the role of the FRDC.

Innovation can be difficult to quantify. The FRDC sees the OECD platform as an excellent first step, although it does not perfectly measure the achievements of a country like Australia, whose success in knowledge creation is often not reflected in patents or other commercial opportunities. Comparing innovation across different countries is an imperfect exercise, faced as it is with the challenge of reconciling different systems and cultures.

Based on the number of patents lodged, Australia ranks ninth for innovation in harvesting and fishing technologies, with more than 50 patents between 2008 and 2012. The US leads this field, with 1309 patents during the same period, followed by South Korea with 957 and Japan with 300.

The aquaculture innovation rankings for 2008–2012 were led by South Korea (439), the US (369) and Germany (118). Australia ranked 19th with 14 patents for related technologies. The web-based platform also provides searchable international databases of 372 research organisations, 36 research networks and more than 300 projects. The information has been collated from publicly available data, although further contributions to the databases are being encouraged to make them more comprehensive, and to help identify research gaps and expand the potential to find new research partners.

The OECD launched its Fisheries and Aquaculture Innovation Platform last year as an addition to its already extensive international data-gathering efforts, which cover a broad range of social and economic activities, including education, employment, trade, science and social welfare.

While innovation is not an end in itself, the OECD identifies it as crucial to sustained growth and the creation of economic opportunities, providing the foundation for new businesses, new jobs, and resilient and adaptable economies.

It says that over the next few decades, population and income growth, together with urbanisation and dietary diversification, are expected to create additional and greener demand for fish products.

"To meet these needs, fish production has to be efficient without harming the environment or using natural resources irresponsibly. It is essential to establish new patterns of production and consumption in order to help decouple growth from natural capital.

"Governments play a key role in fostering a sound environment for innovation, by developing policy frameworks that enhance policy coherence, investing in innovation, empowering people to innovate, helping firms overcome barriers to innovation, facilitating the role of knowledge diffusion and ensuring that innovation contributes to key goals of public policy."

The Australian government has pledged to encourage innovation. One avenue for this is supporting research in collaboration with industry groups. The FRDC is already a leader in collaborative research in the fisheries sector. For the FRDC, its engagement with stakeholders to identify ways to advance innovation – through its 'lead, collaborate, partner' strategy – is innovative in its own right. F

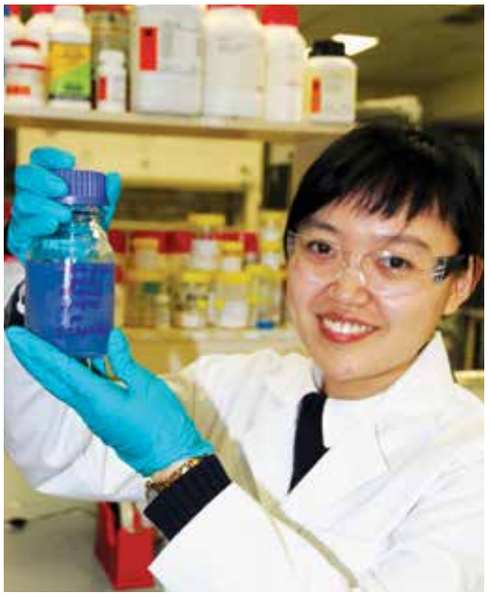
What is the OECD?

The Organisation for Economic Co-operation and Development was formed in 1961, by 20 member countries, to stimulate markets and trade. Through shared information and analysis, it aims to help governments assess opportunities and develop policies to support economic growth and prosperity. The OECD has expanded to include 34 countries. Australia joined in 1971.

Students win for presentations on aquaculture research

Atlantic Salmon and abalone are the focus of FRDC award-winning PhD presentations

By **Melissa Marino**



Left Jiadai Wu is researching the antiviral properties of abalone.
Photo: University of Sydney

Below Tina Oldham's research has focused on oxygen levels in Atlantic Salmon pens.

Photo: University of Tasmania

Two outstanding presentations based on the work of PhD students Tina Oldham and Jiadai Wu that could benefit aquaculture industries have won FRDC-sponsored awards at the Australian Marine Science Association (AMSA) annual conference.

Focus on oxygen

The University of Tasmania's Tina Oldham has addressed a key environmental challenge facing the Tasmanian Atlantic Salmon (*Salmo salar*) industry – hypoxia related to low levels of dissolved oxygen. In research assisted by Huon Aquaculture, she monitored levels of dissolved oxygen at five water depths in five commercial salmon cages throughout a summer season.

Her winning presentation, 'Occurrence of hypoxia in Tasmanian Atlantic Salmon production cages – biological and environmental influences', included findings that dissolved-oxygen saturation varies as much as 73 per cent from the surface to the bottom of a cage. She also found dissolved-oxygen levels are highly variable and can change dramatically within minutes.

Oxygen solubility reduces as water temperatures rise, and as Tasmania increasingly experiences warmer-than-average summer waters, salmon farmers are reporting more frequent problems with low dissolved-oxygen events. Impacts can range from decreased growth, reduced appetite and immune function to, in extreme cases, death.

Overall, Tina Oldham found dissolved-oxygen concentrations, which fluctuate naturally, were reduced in cages compared to reference sites. Optimal dissolved-oxygen concentrations were generally present only in the cage's upper half.

She will examine more closely the reasons for reduced dissolved-oxygen levels in cages and the implications for fish health and mortality through the remainder of her PhD, co-supervised at the University of Melbourne.

Her findings will help the salmon industry plan future management and mitigation strategies to maximise fish welfare and production performance. These could include supplying additional oxygen or aeration, reducing stocking densities and farming at sites with greater water flow.

Herpes modelling

University of Sydney PhD student Jiadai Wu won the FRDC student poster award, which outlined her work sequencing a gene that helps Blacklip Abalone (*Haliotis rubra*) produce an antiviral protein.

This respiration protein – hemocyanin (HrH) – possesses antiviral activity against one of the most common human pathogens, herpes simplex virus type 1 (HSV-1), which is responsible for cold sores.

To investigate its potential as a novel antiviral drug, Jiadai Wu has cloned the entire gene that encodes for the HrH protein molecule, which is composed of nearly 7000 amino acids, and is detailed in her poster 'The sequences of Blacklip Abalone hemocyanin'.

This data enabled her to predict the theoretical three-dimensional structure of HrH. She says this is a stepping stone to understanding how the antiviral mechanism works against HSV-1.

It opens the way for the development of therapeutic applications, such as a drug to treat HSV-1, which is the second-most-prevalent human virus in the world, after the common cold. HSV-1 infects 3.7 billion people globally, including 70 per cent of the Australian population.

Her findings could also benefit the abalone industry in Australia, which recently suffered an outbreak of an abalone herpes virus that killed 95 per cent of infected molluscs in 14 days.

Experimental models based on the HrH protein could provide new information and potential treatments for other herpes viruses.

The 2016 AMSA conference was held jointly with the New Zealand Marine Sciences Society in Wellington in July. Outstanding student presentations and posters are recognised each year with prizes, including the FRDC awards for research in the areas of environment and industry development.

The FRDC's research projects manager Carolyn Stewardson, who chaired a conference session, says the FRDC is delighted to support students undertaking such high-calibre work. "These are students working hard and at the cutting edge of scientific research, and it's great they have been recognised through these awards," she says. F

MORE INFORMATION
Mike Gerner, 02 6225 5379, mike.gerner@afma.gov.au;
SuccorfishM2M www.succorfish.com
FRDC RESEARCH CODE 2009-076

Fisheries go on the record

New technology and more sophisticated data systems are helping fishers and managers offer greater assurance on sustainable fishing practices

By **Tom Bicknell**

The increased complexity of fisheries management and greater scrutiny of the industry overall is leading to an increase in the monitoring of fishers in Australia and internationally. The technologies that provide monitoring capacities are also becoming cheaper and easier to use. The increase in monitoring comes with mixed blessings, but the end result is greater accountability within the fisheries sector.

On-board observers

In July 2015 the Australian Fisheries Management Authority (AFMA) formally launched a mandatory electronic monitoring (e-monitoring) system in several Commonwealth fisheries as a reliable and more cost-effective way to verify fishers' logbook data. Traditionally, on-board human observers have been used to verify approximately 10 per cent of catches.

E-monitoring involves a set of cameras and sensors installed on vessels to monitor and record fishing activities. Three or more high-definition cameras cover all activity areas on fishing vessels. There is also a hydraulic gear sensor, a drum sensor, a GPS receiver, satellite communications and a control centre. The sensors trigger the video recording, which is stored in a hard drive in the control centre, and transmits live data on location to AFMA for real-time monitoring.

The new AFMA program is the result of five years of development, in conjunction with the commercial fishing sector. This has included extensive trials to determine whether the technology could be used to verify information fishers provided in their logbooks.

Based on the trial results, and in consultation with commercial fishers, in July 2015 AFMA made e-monitoring a mandatory part of its compliance program for the 75 vessels fishing in the Commonwealth's Eastern Tuna and Billfish Fishery, the Western Tuna and Billfish Fishery and the Gillnet, Hook and Trap Fishery.

In other Commonwealth fisheries, human observers continue to provide the basis for logbook validation.

AFMA CEO James Findlay says e-monitoring has been a game changer for cost-effective fisheries management and industry assurance. "The more exposure we and industry have to this technology, the more we have come to realise just how powerful a tool it can be."

He says the benefits of e-monitoring include increasing the accuracy of catch reporting and verifying interactions with threatened species – and ensuring that fishers are doing the right thing during these interactions.

The value of that capacity was demonstrated in February 2016, when a vessel unintentionally landed a whale shark in the Small Pelagic Fishery. The vessel's e-monitoring system was quickly able to provide footage to confirm details such as the time the shark spent out of the water and the procedures the crew used in handling the animal.

Responsive monitoring

One of the major advantages of e-monitoring compared to human observers is the level of coverage it can provide in 'sensitive' fishing zones. While 10 per cent of video footage is reviewed as the base level of monitoring – the same as was previously provided by human observers – AFMA reviews 100 per cent of footage for fishing trips in the Australian sea lion and dolphin zones.

AFMA's electronic manager, Mike Gerner, says this aspect of e-monitoring is a positive one for the commercial fishing sector, allowing fishing to be undertaken in these sensitive zones. "It can support fishing activity that would not have been financially viable using a human observer."

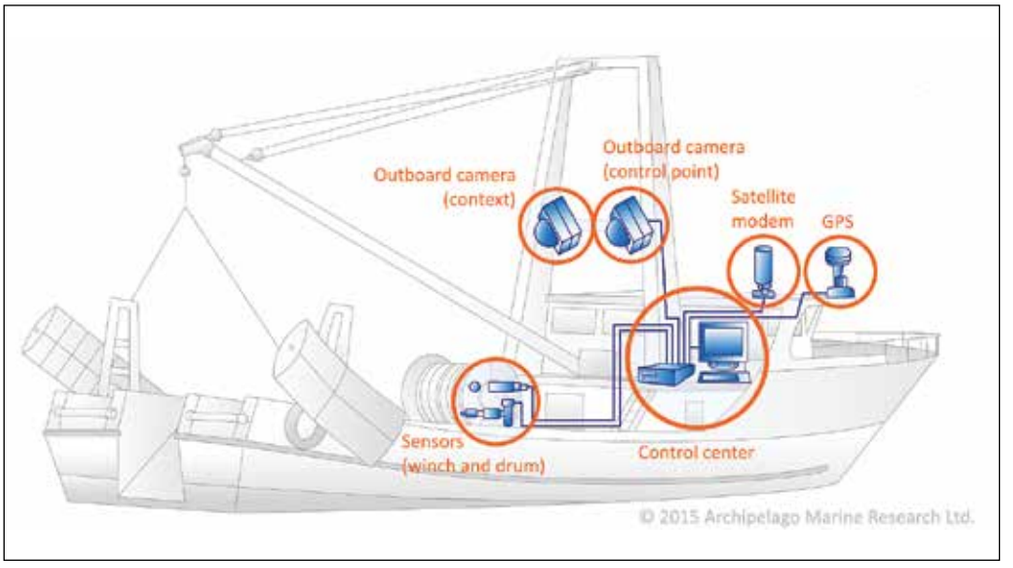
It also has the potential to provide fishing operators with more flexibility, given that each individual vessel can be monitored and there is more individual accountability.

For the commercial fishers who fund the operational costs of the monitoring, the financial benefits have gone some way to assuage their concerns about the increased level of scrutiny.

Renee Vajtauer, executive officer of the fishing industry's Commonwealth Fisheries Association (CFA), says industry recognises the lower cost of e-monitoring compared with human observers. "E-monitoring provides a great validation tool for industry members to confirm that logbooks are being filled in correctly and publicly available fisheries information is accurate."

However, she says there are lingering concerns about the potential for

Below and left
E-monitoring systems as shown in the photo and diagram consist of multiple cameras that capture all activity areas on board. Photo: AFMA



"E-monitoring provides a great validation tool for industry members to confirm that logbooks are being filled in correctly and publicly available fisheries information is accurate."

Renee Vajtauer, executive officer of the CFA

footage to be used "outside of fisheries management", possibly with the specific aim of undermining fishing operations.

Location, location, location

Catch monitoring by either electronic or human observers is in addition to the mandatory use of vessel monitoring systems (VMS) in Australia's Commonwealth fisheries.

VMS that transmit location data have provided a base level of vessel monitoring for decades, helping to identify authorised vessels from those fishing illegally in Australian waters.

The VMS used in Commonwealth fisheries monitor a vessel's position, course and speed using AFMA-approved equipment installed on each vessel. These transmit encrypted location data via satellite to an AFMA receiver.

The introduction of new fishing zones and marine parks has seen a growing interest in expanding VMS in a number of state fisheries, and within areas such as the Great Barrier Reef Marine Park.

This is in part driven by the growing community emphasis on sustainability and providing higher levels of fisher and management accountability.

The UK-based firm SuccorfishM2M is a global leader in VMS technology in a wide range of industries. Company spokesman Tom Rossiter says the technology has a valuable role to play in sustainable fisheries management in Australia and around the world.

"Today more than ever the fishing industry must evidence its activity or face being overlooked by the marine planning process. Spatial information is also critical to biological fisheries management, and increasingly it's becoming a requirement for market access," he says.

In addition to vessel location data, Tom Rossiter says VMS can also provide additional information such as catch, fishing effort and environmental monitoring. The data is transmitted over secure, encrypted systems.

New technology is making these systems less expensive, and more attractive for use in fisheries management.

"Traditionally VMS has only been used on larger vessels, and this was driven by relative risk, the size of the technology and cost," says Tom Rossiter. "Today, there is wider acceptance that fisheries management would benefit from having all fishing vessels monitored," he says.

The new generation of technology offers VMS devices that are about the same size as a compact digital camera. Some can link to mobile phone networks for transmissions, rather than satellites, which reduces operating costs. In Australia these are generally effective up to 32 kilometres offshore. These systems also cost hundreds of dollars, instead of thousands of dollars.

This is allowing more fisheries to explore the potential of VMS as a management tool. In the Northern Territory, Succorfish M2M is working with the Department of Primary Industry and Fisheries on a monitoring system for the Mud Crab fishery.

"As well as monitoring the location of the vessel, we also want to know with certainty where the pots are located and how regularly they are worked," Tom Rossiter says. This would provide valuable information for fisheries managers about fishing intensity, yield and catch per unit effort.

"Ultimately as a manager you would like a fully documented fishery, and our technology is moving us closer to this goal all the time," Tom Rossiter says.

AIS alternative

An even simpler and cheaper vessel-tracking option is the use of automatic identification systems (AIS). An AIS transmits a unique vessel identification, position, course, and speed over a VHF radio signal, which can be picked up by

MORE INFORMATION
Erica Starling, erica@wn.com.au; Department of Fisheries Western Australia, www.fish.wa.gov.au/Fishing-and-Aquaculture/Aquaculture/

Below E-monitoring cameras. Photo: AFMA

nearby ships, AIS base stations, and an increasing number of specially equipped satellites. These are an essential safety system required by the International Maritime Organisation for:

- vessels of 300 gross tonnage and upwards engaged on international voyages;
- cargo ships of 500 gross tonnage and upwards not engaged on international voyages; and
- passenger ships, irrespective of size, which carry more than 12 passengers.

In Australia, AISs are regulated by the Australian Marine Safety Authority (AMSA). AISs are not compulsory for many fishing vessels and skippers can turn off systems if they feel their operation is jeopardising the safety of their vessel or crew.

Because the AIS broadcasts are transmitted by VHF radio they can be monitored by anyone with VHF radio access. It's a very public system, designed to improve safety at sea by preventing collisions and helping to track vessels in an emergency.

Because AISs are easily installed with cheap off-the-shelf hardware they have been adapted for use in some international fisheries to monitor vessels. However its primary purpose is as a maritime safety tool, and it has limitations in terms of fisheries management.

There has also been limited support in the Australian fisheries sector for the use of AIS because of the public nature of the location transmissions. Fishers, traditionally protective of their fishing locations, are also wary of being targeted by anti-fishing lobby groups. F

Western Australia looks to aquaculture for growth

A coordinated, inter-agency approach is being formulated to support the development of aquaculture in the west

By **Catherine Norwood**

The need for sustained and patient capital, and an alignment of government and industry effort, were two of the key messages to emerge at a forum discussing the future of aquaculture in Western Australia earlier this year.

The 2016 Aquaculture Western Australia State Forum was the first of its kind for the state – an opportunity for industry, policy makers, regulators and funders to share information to better understand risks and barriers to aquaculture success. Participants also discussed collaborative action needed to support the sector's development.

Attendees heard from existing aquaculture operators, including Western Australia's Shane McLinden from Southseas Abalone, who operates abalone farms in Tasmania, South Australia and Victoria, and David Whyte from the Tasmanian Atlantic Salmon farming company Huon Aquaculture.

Erica Starling spoke about her family business, Indian Ocean Fresh Australia, based at Geraldton, which has evolved from plans to farm tuna, and then Mulloway, to its current focus on Yellowtail Kingfish.

Craig Kestel, from the land-based farm and hatchery 888 Abalone, outlined the history of the business and its partnership with the abalone-ranching operation Ocean Grown Abalone, which is set to produce its first commercial harvest of Greenlip Abalone from Flinders Bay, WA, this year, after 20 years of research into ranching techniques. Glen Dibben of Blue Lagoon Mussels also discussed the challenges of mussel farming in WA's Cockburn Sound over more than a decade, including recent environmental changes.

Economist Dan Fels provided an overview of Operation Sea Dragon, a major initiative of the Seafarms Group that aims to establish extensive land-based prawn production, with several proposed sites in WA and the Northern Territory.

Although not involved in aquaculture, David Carter, CEO of Austral Fisheries, spoke about the challenges of maintaining a social

Left A new aquaculture zone is being developed in the Abrolhos Islands, Western Australia.

Below Yellowtail Kingfish, raised in ocean pens, are the focus of aquaculture development in WA.

Photos: Erica Starling

licence to operate. Staying ahead of potential issues through engagement and good leadership would help the industry win community and consumer support from the beginning, he said. Transparency was crucial, he said.

The FRDC's executive director, Patrick Hone, also outlined the national research, development and extension priorities, and the FRDC's New and Emerging Aquaculture Opportunities sub-program. He said it was important to focus on in-depth research about a few selected, 'most-likely' species, to get the best value for money, and seek out national and internatioanl expertise.

Next-generation opportunities

Following the forum, Erica Starling said she believed the event marked a "generational opportunity" for the state, after years of limited development that have seen Tasmania, NSW and South Australia leap ahead.

"I think hearing from existing operators has opened people's eyes to just how long we have actually been at this, and the journey – the challenges and setbacks," she said. "Aquaculture is a risky business and there have been a lot of failures. It takes time to get it right and it must be in 'continual improvement' mode, which is where quality research counts. Sustained and patient capital is necessary to develop it.

"There are already some opportunities we could focus on; with a few tweaks we could be away. It's about creating the right environment to bring in the sophisticated and educated aquaculture investors to see the opportunities here and to help grow the industry." She pointed to Barramundi, Yellowtail Kingfish and abalone as three species already showing potential in WA, and suited to different areas of the state.

The forum was coordinated by WA's Regional Development Commissions and followed a major statement of commitment to aquaculture issued last year by WA Premier Colin Barnett. This included support for "investment-ready" aquaculture zones, the first of which has been established at Cone Bay, with another underway for the Abrolhos Islands off Geraldton.

Regional investment

Eight of WA's nine Regional Development Commissions identified aquaculture as a major growth opportunity in their 10-year development "blueprints". These blueprints were finalised in 2015 and are backed by a $642 million investment through WA's Royalties for Regions program, part of which will be earmarked for aquaculture.

Minister for Regional Development Terry Redman, who opened the forum, said afterwards that a 10-year plan would be developed to help WA capitalise on the potential of aquaculture to build a new industry and generate economic growth for the state. A multi-agency approach would be needed to coordinate fishing, investment, planning and training expertise.

At the forum, the aquaculture industry called for a high-level advisory group of relevant government agencies and industry members to lead the sector's expansion and growth over the next 10 years. The FRDC will be part of these ongoing discussions. F

MORE INFORMATION
Jeremy Lyle, 03 6226 8255, jeremy.lyle@utas.edu.au
FRDC RESEARCH CODES 2010-016, 2013-008

Community stake in skate survival

New information about the Maugean Skate's life and habits has prompted changes to the management of Macquarie Harbour to protect this endangered species

By **Annabel Boyer**

Australia, and specifically Tasmania, is home to what is possibly the rarest skate species in the world. Officially identified in 1988, the Maugean Skate (*Zearaja maugeana*) has only ever been found in two locations: Bathurst Harbour and Macquarie Harbour – both on the west coast of Tasmania.

The Maugean Skate was listed on the endangered species list in 2004, under the *Environmental Protection and Biodiversity Conservation Act 1999*. With no reports of the species in Bathurst Harbour for several decades, it seems likely that Macquarie Harbour has become the last remaining habitat of the species.

Shared concerns about the future of the species have brought together scientists, recreational fishers, the aquaculture sector and other business and community interests in the Macquarie Harbour region to learn about the skate and help its conservation.

With such a limited distribution, little has been known about the skate until now. Jeremy Lyle, from the Institute of Marine and Antarctic Studies (IMAS), has led an FRDC-funded project to conduct the first major study into the ecology and biology of the Maugean Skate. He says it occupies a very unusual ecological niche. "It lives in brackish waters, rich in tannins where there is very little else. It is basically a deep-water species living in shallow waters." Of the 400 skate species identified worldwide, the Maugean Skate is the only one known to inhabit brackish water.

Competing uses

Despite Macquarie Harbour's remote location, the skate is competing with a growing range of human activities, including expanding aquaculture operations, tourism, and recreational fishing.

The aquaculture sector has been integral to the research project. Adam Main, of the Tasmanian Salmonid Growers Association (TSGA), says it was a priority for the industry to understand more about the Maugean Skate as Atlantic Salmon and Ocean Trout aquaculture began to expand.

"For us, this project has been a fundamental part of our members' commitment to the community as they have expanded into Macquarie Harbour. We have been gratified to be part of a project that has expanded the knowledge about an endangered species, about which so little was known."

For Brian Gardiner, president of the West Coast Recreation Association, looking after the skate is an important aspect of what he sees as his own and his members' stewardship responsibilities, and is crucial to continued recreational fishing in the harbour.

The project has identified the distribution, habitat, reproductive dynamics, feeding habits and population of the Maugean Skate in Macquarie Harbour. It has also assessed the impacts of current and proposed marine farming operations on the population, including the impact of salmonid escapees, and evaluated strategies to reduce risks of bycatch and incidental mortality of the Maugean Skate due to gillnetting.

Maugean Skate facts

Estimated population 3200
Habitat range Macquarie Harbour, Bathurst Harbour, Tasmania
Preferred water depth six to 12 metres
Feeding pattern predominantly nocturnal foraging on crabs and shrimp
Size at maturity females 632mm, males 632mm
Reproduction seasonality year round
Lifespan 11 to 15 years

Tasmania is the only state that allows recreational gillnetting, so recreational fishers in the area are keen to be seen as responsible fishers. Brian Gardiner says gillnetting is one of the few options that allow recreational fishers to catch edible fish in this area – generally flounder. "If we don't gillnet flounder, we don't fish, so we want to look after the area to maintain our rights," he says.

A previous FRDC-funded IMAS project, completed in 2014 and also headed by Jeremy Lyle, looked at the effect of gillnetting on different species. At that time, the Maugean Skate was found to be caught regularly in gillnets set at depths of between five and 15 metres. Although most Maugean Skate captured were in excellent condition and lively when released, a small proportion of those captured in overnight deployments were in poor condition or had died.

Far left Researcher Justin Bell examines a female Maugean Skate by using a portable ultrasound to assess the size of the eggs and whether it is reproductively active.

Left A researcher holds a large female skate.

Photos: University of Tasmania

Sound observation

In the more recent project, researchers spent 12 months monitoring the population of Maugean Skate using an extensive array of acoustic receivers positioned throughout Macquarie Harbour. Local aquaculture companies Tassal, Huon and Petuna supported the project with boats and staff to help researchers set the large number of receivers involved.

Almost 60 Maugean Skate were acoustically tagged at multiple locations. The tags emit a unique signal that is detected when the tagged skate move to within about 400 metres of an acoustic receiver. Using this technology, the behaviour of individual Maugean Skate was monitored over 12 months.

Research fishing was also conducted over 15 months to assess reproductive status and diet before releasing skate back into the water. Blood hormone levels and ultrasound examinations were used to determine reproductive condition, while stomach pumping was used to investigate diet. All skate were microchipped before being released. Population sizes were estimated using tag recapture rates.

During the monitoring, the tagged skate were detected at depths of six to 12 metres, 85 per cent of the time, and occasionally at depths greater than 55 metres.

The project concluded that Maugean Skate prefer depths with less variable salinity, temperature and oxygen content. This knowledge has been a key driver for changes to reduce the capture of skate in gillnets.

Fishers direct change

Jeremy Lyle says it was the Macquarie Harbour locals – particularly the Western Coast Recreation Association – who came up with a workable solution that was implemented over other proposals. These changes include the closure to gillnetting of most waters in the harbour deeper than five metres, and the closure of the Table Head/Liberty Point region.

He says the Table Head/Liberty Point closure is particularly significant as this area contains the highest abundance of Maugean Skate and has traditionally been a popular area for recreational gillnetters.

Brian Gardiner says this solution came out of a desire to protect the skate, in conjunction with maintaining what he sees as the valuable cultural tradition in the area.

"You can look from one point to another across the harbour to see the demarcations of where you can and can't fish. So this is good for the fishers and the police, it leaves no guesswork to where you can and can't net," he says.

The project also found that direct interactions between Maugean Skate and aquaculture operations was limited, as most aquaculture leases were located in deep waters outside of the preferred depth range for the species. It was also unlikely that escapees from aquaculture operations would affect the skate, as more than half of escapees die within two months of escaping their pens, 25 per cent are captured in recreational gillnets, and 20 per cent leave the harbour. F

Macquarie Harbour's Maugean Skate

By **Jeremy Lyle**

The project estimated the population of the Maugean Skate to be around 3200 individuals, although this may be an underestimate. Within their preferred habitat (predominantly five to 15 metres) they probably also have one of the smallest distributions of any elasmobranch (shark, skate or ray).

Overall, Maugean Skate spent 85 per cent of their time at depths of six to 12 metres, although they were occasionally detected from 0.6 metres to more than 55 metres. This indicates that they are not restricted to their preferred depth range.

Depth utilisation appears influenced by water chemistry. Shallow waters have low salinity and high temperature variability. Deeper waters are stable in temperature and salinity but have low concentrations of dissolved oxygen. The intermediate depths that skate prefer are relatively stable in salinity, temperature and dissolved oxygen.

Maugean Skate were found widely distributed throughout Macquarie Harbour and displayed a high degree of site fidelity, with home ranges generally less than 10 kilometres square. Many skate showed an affinity for the Liberty Point/Table Head region, in the central, south-western side of the harbour.

While some skate left their core range for brief periods (days to weeks), almost all returned. There was no evidence to suggest long-term movement of skate out of the estuary. This means that Macquarie Harbour's Maugean Skate are likely to be a distinct population.

Maugean Skate were more active at night and moved into shallower water, which probably represents nocturnal foraging. Their diet was dominated by crabs and shrimp. While there was no evidence of feeding on aquaculture pellets, this cannot be ruled out due to their small home ranges and the fact that sampling was conducted some distance away from the farm lease sites.

Preliminary estimates of age suggest the species is relatively short-lived. The maximum age observed was 11 years, but they may live to about 15 years. Maximum age (and size) is a useful proxy for productivity and suggests that Maugean Skate are probably relatively productive.

MORE INFORMATION
FRDC RESEARCH CODE: 1998-204

Above
Fritz Drenkhahn in Eden.
Photo: Annabel Boyer

A voice for fishers

Chance transformed Fritz Drenkhahn from electrician to commercial fisher, while love of the job ignited a desire to help secure a long-term future for the fisheries sector

By **Annabel Boyer**

The house where Fritz Drenkhahn lives with his wife, Jen, sits on a slope that overlooks Snug Cove at Eden, on the NSW south coast. As we sit and chat over a cup of tea, the seas where he has spent most of his life reflect the grey of the sky, and the smell of the salt and the sound of the surf rise up from the twin bays below.

It also becomes clear that the twin themes of fishing and community have been an integral part of Fritz Drenkhahn's life.

He credits his time as fisher and as a skipper with giving him the tenacity to pursue the community interests he holds dear, including those of the fishing industry.

"It's the challenge of the elements," he says. "If you give in, and walk away, you'd never make a skipper, because you can't give in, you can't walk away, a challenge is a challenge."

That tenacity also proved crucial when it came to negotiating with government over the future of fishers and fishing, as president of the South East Trawl Fishing Industry Association (SETFIA), during a turbulent period of restructuring.

Sea change

German-born, Australian-grown, Fritz Drenkhahn worked as a fisher for more than 30 years, mostly in the South East Trawl Fishery. Although he likes to say that he started fishing when he was just five years old, he became a fisher by chance, when on leave from his first career as an electrician working in steelworks and mines.

"In about 1978 or '79, one of my friends had a boat in the Wollongong Harbour and I was on annual leave from Paraburdoo. He was going fishing regularly and I was joining him.

"One of the fishermen there – Neil Kelly who owned the *Belbara* at the time and was a pioneer in the Royal Red Prawn fishery – his crew didn't roll up. He asked if we could give him a hand."

Fritz Drenkhahn admits he was hooked from that point on. Within six months he was fishing for gemfish in Eden. He became part-owner of the *Imlay* and has skippered four other vessels at various times, fishing for all of the 30 species in the South East Trawl Fishery in waters from Sydney to Hobart. "It can be very stressful; a skipper is only as good as his last catch. But I love fishing and I love catching fish," he says.

In the 1990s Fritz Drenkhahn worked collaboratively with researchers, allowing observers on his boats. This work resulted in more reliable stock assessments and a better understanding of the catch rates for target and bycatch species in the South East Trawl Fishery.

Changes in technology such as GPS chart plotters have made fishing easier, but also brought new challenges, he says. Easier because you know where you can and cannot go, more challenging because having more information means there are more options to fish further afield, and you take them.

New types of net material and codend designs developed through FRDC-funded research projects have also made fishing more efficient. "If you increase the mesh sizes, the selectivity of what you retain is so much better," he says.

After 20 years on the water as a full-time fisher, Fritz Drenkhahn began to wind down his commitments and became involved with SETFIA.

Time to talk

"Because I have a passion for the industry and am dedicated to the trawl fishery I went with Lochie Marshall, who was another fisherman, to a SETFIA meeting, some time in 2000, and I kept going ever since."

One of the real challenges for fishers becoming involved in industry organisations is simply having the time to be involved, he says. He continued to fish while president of SETFIA by organising a job-sharing arrangement where he would skipper his boat one week out of four.

He says fishers are on the water every day, but very often their needs, views and experience are overlooked. For this reason it's vital that they continue to participate in industry organisations.

He was president of SETFIA for seven years, at a dramatic time in fisheries history. The Commonwealth and Victorian governments had designated marine parks and were looking at restricting fishing quotas. Fishing grounds had also been overfished, and making a living was becoming an increasingly difficult proposition.

Something needed to change. The question was how this transition would affect the fishers. For more than a year Fritz Drenkhahn and Gail Richey (then executive officer of SETFIA) travelled extensively, representing SETFIA. He says they were regularly visitors to Parliament House in Canberra, putting proposals to ministers, sitting down to work out arrangements. Eventually this persistence and hard work paid off, with the Commonwealth government offering a generous buyout scheme in 2006 that covered four fisheries. The buyout resulted in the removal of half the licences from the South East Trawl Fishery.

"We had to get rid of a few cowboys," Fritz Drenkhahn says. "Also, we had a lot of ageing skippers, who had ageing boats, and the buyout was their super. It let them leave the fishery with a bit of dignity and enough to retire, or help retire.

"SETFIA drove it and to be part of that, in my life, was a brilliant achievement."

After the fishery restructuring Fritz Drenkhahn says he was very optimistic about the future of the fishing industry around Eden. The number of vessels taken off the water meant those who remained could expect to make a decent living.

But he has been surprised that quotas haven't changed to reflect that. Looking back, if he could change one thing, he says it would be to push for greater equality in different jurisdictions and fisheries, so that fishers fishing in the same waters have the same rights and responsibilities.

> "If you sit at the table with your enemies or your friends it doesn't matter, but you have to have a say. If you don't sit at the table you just have to wear what's thrown at you."
>
> Fritz Drenkhahn

Working together

If fishers want to be heard they have to be involved, Fritz Drenkhahn says.

"If you sit at the table with your enemies or your friends it doesn't matter, but you have to have a say. If you don't sit at the table you don't have a say and you just have to wear what's thrown at you.

"I'm not the sort of person that stood for that. I like to have my say. You get to control your own destiny and the destiny or future of your industry."

Over the years there have been many industry changes driven by regulation. Fritz Drenkhahn can see two sides to this coin. On one hand he believes that regulation for crew safety is important and skippers need to take that responsibility seriously.

"Being a skipper you've got two things to do, you go to sea and you've got to come back with your crew alive and catch fish and that's the two main things and what happens in between can be adventurous, dangerous, all extremes."

On the other hand, many of the regulations have unforeseen consequences, he says. The resourcefulness required to make a living out on the water can be stifled by the inflexibility of regulations. He talks about the old days when the trawl fishers used to work with the cray fishers to supply bait while fishing in Tasmanian waters, particularly around Flinders Island, and everyone benefited.

"You would get up at six in the morning and there'd be four boats alongside you and all the crew from the cray boats'd come and give you a hand while you are cleaning grenadier for market. They were boxing up the heads and taking the heads for cray bait. And now that's frowned upon by government departments."

Now retired from commercial fishing, Fritz Drenkhahn still likes to fish three times a week, mainly for ling, snapper and trevalla. However, his commitments to the Eden and fishing communities continue to eat into his recreational fishing time.

He is in the thick of local debate about the development of a new wharf on Twofold Bay that would allow cruise ships to visit. He brings out aerial photos of the wharf, competing plans for the development, letters and other documents, which suggest an alternative proposal he feels would be more efficient, with fewer environmental impacts.

"You can sit on your bum and do nothing and just go fish and ignore everything. But then when you see what happens around you, you say, well no you can't have that happen, there are better avenues and better ways to do things," he says. F

Optimising harvest potential 2010-200

This project investigated the harvest potential of the Western Australian Developmental Octopus Fishery (DOF) for *Octopus tetricus*. Since 2001 the fishery has been using lightweight shelter pots in shallow waters between Kalbarri in the state's north and Busselton in the south. That was until 2010, when the introduction of heavier, larger trigger traps enabled the expansion of the fishery to 50-metre depths and a wider range of habitats. This, combined with the greater efficiency of the traps, saw a 260 per cent increase in annual harvest from 2009 to 2010. This change in fishery dynamic prompted a re-examination of sustainable harvest rates for the fishery. Between 2010 and 2014 the Department of Fisheries, Western Australia, undertook a series of investigations into the harvest potential of the fishery. The study found octopuses caught in the fishery had a maximum age of approximately 1.5 years and that the life profile of octopuses caught in shelter pots differed from those of the trigger traps. The efficiency of the trigger traps was also found to be approximately 15 times greater than that of the shelter pots. Using commercial catch and effort data, the total harvestable biomass of the DOF was modelled under different risk scenarios. The report recommended the 2014 harvest of around 200 tonnes be increased to 1000 tonnes. However, due to the octopus' life history characteristics and the consequent fluctuations in biomass from year to year, it was recommended that this expansion of the fishery be made incrementally and based on total catch limits for each of the four fishing zones.

More information: Anthony Hart, Department of Fisheries, Western Australia, Anthony.Hart@fish.wa.gov.au

Aquatic animal health training 2013-414

This project conducted a review of aquaculture vocational training in relation to aquatic animal health (AAH). The vocational training and education sector has an existing curriculum known as the Seafood Industry Training Package (SFITP), which incorporates aquatic animal health. Twelve registered training institutions (including TAFEs and private training institutions) from all the states and territories (excluding the ACT) offer accredited aquaculture training from the SFITP. The review found that practical application of AAH theory is a vital part of the course structure. Almost all vocational training institutes have aquaculture facilities that are used for practical skills experience. Most areas of aquatic animal health are well serviced by the current curriculum, however, training in biosecurity and welfare need to be enhanced within the SFITP.

More information: Mark Oliver, Australian Aquaculture Support Services, admin@lmctraining.com

Best practice for small pelagics 2013-063

This report outlines the outcomes of a technical workshop and stakeholder forum on fisheries for small pelagic species, held at the South Australian Research and Development Institute (SARDI) in July 2014. This project was motivated by the debate in 2012 surrounding the introduction of a large freezer-trawler into the Commonwealth Small Pelagic Fishery (SPF). The Australian community clearly articulated its expectation that the research and management systems for Australia's fisheries for small pelagic species should match, or exceed, world's best practice. The objective of this project was to compare the Commonwealth SPF, and the South Australian Sardine Fishery (SASF), to best practices worldwide and to identify opportunities for improvement.

Discussions at the technical workshop suggested that Australia's fisheries for small pelagic species, especially the SASF, are consistent with world's best practice with respect to: the use of fishery-independent stock assessment techniques such as the daily egg production method (DEPM), use of formal harvest control rules and operational management procedures, assessment of the ecosystem effects of the fishery, and mitigation of operational interactions with wildlife. The workshop also identified areas of research that should be undertaken to improve the assessment and management frameworks of Australia's small pelagic fisheries, including: i) comparing estimates of adult parameters obtained using gillnets, purse-seine nets and trawl nets; ii) reviewing approaches for estimating spawning fraction; and iii) examining benefits and limitations of using a population model and/or DEPM estimate of spawning biomass to set total allowable catches.

More information: Tim Ward, SARDI, 08 8207 5433, tim.ward@sa.gov.au

First-ever Jungle Perch production 2012-213

This project has demonstrated, for the first time, the feasibility of hatchery production of Jungle Perch *(Kuhlia rupestris)* fingerlings. This project was motivated by concerns from recreational fishers about the decline in Jungle Perch stocks in south-east Queensland and the Mackay-Whitsunday region, and whether restocking could occur. Following successful breeding and rearing of Jungle Perch in captivity, the researchers were able to make the first-ever releases of hatchery-reared Jungle Perch fingerlings back into rivers and streams within their historical range. More than 3300 tagged fingerlings were released into Currumbin Creek, the Mooloolah River and St Helens Creek in Queensland.

The research conducted at the Bribie Island Research Centre on Jungle Perch production has enabled a hatchery production manual and accompanying instructional videos to be produced. This has given private commercial hatcheries the information needed to produce Jungle Perch fingerlings. Currently Jungle Perch are not a permitted stocking species, however, hatcheries will be able to sell fingerlings to the aquarium trade or supply aquaculture facilities that could produce Jungle Perch for human consumption. Should Jungle Perch become a permitted species for stocking, this would provide hatcheries with a new product to sell to fish-stocking groups. It would also benefit anglers by providing another iconic Australian species for impoundment stocking programs. This could have flow-on benefits to regional economies through angler tourism.

More information: Michael Hutchison, Department of Agriculture and Fisheries, Queensland, 07 3400 2037, Michael.Hutchison@daf.qld.gov.au

Fishing and aquaculture outlook 2015-503.20

This report presents a strategic review and analysis of the business environment for the fishing and aquaculture industry in Australia. It was undertaken to provide baseline data and analysis to support FRDC and industry planning activities. In particular, the findings supported the development of the National Fishing and Aquaculture Research Development and Extension Strategy for the period 2015–2020. The review considered the four main fishing and aquaculture sectors across all jurisdictions – commercial wild catch fishing, aquaculture, recreational fishing, and Indigenous customary fishing, in terms of resource context, fishery access and management, and creating products and services for markets.

More information: Ewan Colquhoun, Ridge Partners, admin@ridgepartners.com.au

Spawning biomass estimates 2014-033

In this study, a daily egg production method (DEPM) was applied to two small pelagic species – Blue Mackerel (*Scomber australasicus*) and Australian Sardine (*Sardinops sagax*) – off the east coast of Australia, in order to estimate spawning biomass. The DEPM is a fishery-independent survey method, which relies on the premise that spawning biomass can be estimated if total daily egg production and mean daily fecundity (number of eggs produced) of the species is known. It is widely used in stock assessments of small pelagic species, which often produce multiple batches of pelagic eggs over an extended spawning season. From samples of adults and eggs collected between August

and September 2014, the spawning biomass for Blue Mackerel on the east coast of Australia was estimated to be approximately 83,300 tonnes. The spawning biomass for Australian Sardine was estimated to be approximately 49,600 tonnes.

This was also the first study to estimate adult reproductive parameters of the iconic recreational species Tailor (*Pomatomus saltatrix*), and the first to evaluate the feasibility of the application of a DEPM to estimate adult spawning biomass. However, egg production, spawning area and spawning biomass could not be estimated due to the lack of eggs collected. This study made some crucial technical developments such as establishing a robust method for ageing fish eggs from field surveys, and filled several gaps in knowledge on the adult reproductive parameters for Australian Sardine and Tailor.

More information: Tim Ward, SARDI, 08 8207 5433, tim.ward@sa.gov.au

Cultural fisheries management 2012-216

This report details the results of a survey of Aboriginal cultural fishing practices in the Tweed region of far-northern New South Wales. It also outlines the community and industry consultation process used to develop the Tweed Aboriginal Cultural Fisheries Management Plan. The information gathered about the size and nature of the Aboriginal cultural catch in northern NSW will provide a better understanding of the cultural fishery in the region. This information will be used to ensure policy is more attuned to the needs of Aboriginal communities dependent on fisheries resources, and will also assist Aboriginal communities from the region in arguing for a fairer share of fisheries resources and more culturally appropriate management. The development of the draft Tweed Aboriginal Cultural Fisheries Management Plan is the first of its kind in NSW. It was developed over two years in close consultation with local and regional Aboriginal organisations and relevant state-wide bodies.

More information: Stephan Schnierer, Southern Cross University, 02 6620 3650, stephan.schnierer@scu.edu.au

Mitigating whale interactions 2013-037

Following a significant increase in reports of whale entanglements in commercial fishing gear in WA, this project sought to investigate factors influencing whale interactions with commercial gear and to evaluate the effectiveness of potential mitigation measures. Two databases managed by the WA Department of Parks and Wildlife were analysed to determine the spatial and temporal extent of migrating whales and how this overlaps with commercial fishing gear. The results of this study suggest entanglement reports from the central coast and around Fremantle might reflect the southern and easterly movements of whales during the population's northward migration, rather than an area of increased incidence of entanglement. The data also revealed inter-annual variation in the migration of humpback whales. Such variation may provide an adaptive means by which the fisheries' mitigation measures may be introduced, dependent on the migration timing of that year. This would enable targeted implementation of modifications, thereby reducing the impost on fishers to use gear modifications when whales are unlikely to be present. The project also included a cost-practicality assessment of whale-mitigation gear modifications. An industry-run workshop identified a series of potential whale entanglement mitigation measures. This informed an industry-wide trial of gear modifications during the 2014 whale migration season.

More information: Jason How, Department of Fisheries, Western Australia, 08 9203 0111, jason.how@fish.wa.gov.au

Profitability and participation 2014-240

This report details the development of a Finfish Action Plan (FAP) aimed at supporting profitable and sustainable Torres Strait Islander-owned businesses in the Torres Strait Finfish Fishery (TSFF). The TSFF is a line fishery taking predominantly Coral Trout and Spanish Mackerel and focused on the north-eastern part of Torres Strait. Commercial fishers include a traditional inhabitant boat sector and a non-traditional inhabitant sector. In 2008, the Australian government funded a buyback of all TVH fishing licences and the fishery is now 100 per cent owned by Torres Strait traditional inhabitants. Immediately prior to the buyback of commercial licences, the value of finfish catches taken by commercial fishers in the TSFF averaged around $3.37 million annually. It has since declined to around $1.1 million annually. The FAP aims to guide future investment, in order to increase the value of the fishery under 100 per cent traditional ownership and increase traditional inhabitant participation, while also safeguarding the sustainability of the fishery. Extensive community consultation was undertaken in 2015, in combination with business modelling, in order to develop a Finfish Action Plan Program Logic for achieving these goals.

More information: Andy Bodsworth, Cobalt Marine Resource Management, andybods@cobaltmrm.com.au

Estimating recreational catch of SBT 2012-022.20

This report details the development of cost-effective methods for estimating the national recreational catch of Southern Bluefin Tuna (*Thunnus maccoyii*). Southern Bluefin Tuna (SBT) is a high-value commercial species, whose popularity with recreational anglers has increased over the past decade. The most recent assessment of the stock status of SBT suggested that the species remains in an overfished state. Reliable estimates of SBT catch across all sectors is required for international reporting and stock assessments. However, the dispersed and episodic nature of the recreational fishery for SBT has confounded attempts to accurately estimate the national catch from this sector. This project developed survey methods, in consultation with industry and experts, to estimate the recreational catch of SBT. These methods were trialled in 2014. The study found that the most cost-effective and robust method for estimating the national catch of SBT is to conduct separate surveys in each state jurisdiction. Off-site surveys are the most cost-effective approach for Western Australia, Tasmania and New South Wales, whereas on-site surveys are the best approach for South Australia and Victoria. Catch estimates derived from such surveys can then be combined with charter-boat logbook and game-fishing tournament data to provide a total estimate of catch in each state.

More information: Andy Moore, ABARES, 02 6272 3090, Anthony.moore@agriculture.gov.au

Monitoring NSW Pipis 2012-018

This project evaluated the feasibility and cost-effectiveness of fishery-independent and dependent methods for monitoring Beach Clam (*Donax deltoids*), known as Pipi, populations in NSW. The sustainability of the fishery is currently monitored via fishery-dependent methods. However, because of the aggregated nature of the distribution and harvesting of Pipis, this method may be biased and not indicative of Pipi populations across all beaches in NSW.

The study found that assessments of the Pipi resource and commercial fishery in NSW would best include a combination of fishery-dependent and independent data sources. The study identified that logbooks and port monitoring (i.e. fishery-dependent data sources) would be the most cost-effective means to monitor commercial harvests of Pipis. However, a standardised fishery-independent sampling strategy will provide the only consistent framework to deliver robust and reliable data essential for assessing and managing the Pipi resource across the breadth of NSW. Fishery-independent sampling needs to be

appropriately stratified and replicated in space and time to account for small-scale spatial and temporal variability, as well as the variability across-beach distributions of Pipis. This information will be valuable to management and stakeholder groups in designing an appropriate long-term monitoring and assessment program for the commercial Pipi fishery in NSW.
More information: Charles Gray, WildFish Research, 02 9435 4600, charles.gray@wildfishresearch.com.au

Finding common ground 2012-500.20

This report details the progress of the Common Language Group (CLG) towards a common understanding of the issues associated with the use of Australian aquatic ecosystems and resources. The confusion that exists among a range of stakeholder groups along the seafood industry supply chain, including the general public, around issues of sustainability, responsible fishing, marine protected areas, fishing methods and indigenous cultural fishing contributes to the negative perception of the Australian seafood industry.

The fisheries CLG was established in 2013 to bring disparate stakeholders with competing objectives together to develop agreed language and position on key issues affecting the seafood supply chain. The key outcomes of this project were the establishment of a Custodian Group for the CLG, whose goal was to identify issues facing recreational, aquaculture, research, retail, post-harvest, fisheries managers and extension and consumer groups. The Custodian Group was successful in reaching consensus across these stakeholder groups on key elements of sustainable wild catch. Two issues papers were developed around this topic and an open forum was held to discuss, and seek feedback on, the final paper: *Common Language for Sustainable Wild Caught Seafood*.
More information: Michelle Christoe, Food Focus Australia, michellec@foodfocus.com.au

Recreational fishing: benefits and priorities 2012-303

A 2014 survey of recreational fishers in South Australia sought to identify priority areas for the future development of recreational fishing in SA and the circumstances under which SA fishers might find the introduction of a recreational fishing licence acceptable. Forty per cent of fishers felt they would reduce or stop fishing in SA if a $30 annual licence was introduced, while 59% would fish the same amount or more often. The study recommended that investments focus on enabling fishers to achieve the full benefits they desire from fishing, specifically the ability to relax, spend time with family and friends, and enjoy being outdoors, as well as to catch fish. The results also suggest priorities for investment in recreational fishing in SA, including infrastructure such as cleaning benches, and also state-wide habitat improvement and improved fisheries sustainability. Low levels of engagement with recreational fishing organisations was identified as an issue, suggesting the need for more dialogue with all fishers to better identify objectives for future investment.
More information: Jacki Schirmer, University of Canberra, 02 6201 2785, jacki.schirmer@canberra.edu.au

Managing makos 2011-077

This study used a multi-disciplinary approach to investigate the patterns of population structure, spatial connectivity, and contemporary effective population size of the Shortfin Mako (*Isurus oxyrinchus*). It represents the first comprehensive study of the connectivity of this highly migratory species in the Southern Hemisphere. The Shortfin Mako is listed as a migratory species under the *Environmental Protection and Biodiversity Conservation Act 1999*, and is targeted by recreational and game fishers under an exemption. Despite its continued harvest, there remains limited information on the population structure and spatial connectivity of Shortfin Mako populations in Australia and neighbouring regions. The 2012 Australasian Mako Shark Workshop identified this as a key research gap requiring attention. This study used satellite tracking and conventional tagging techniques in combination with genetic data from mitochondrial and nuclear genomes.
More information: Paul Rogers, SARDI, 08 8207 5487, paul.rogers@sa.gov.au

Assessing data-poor species 2013-202

The Southern and Eastern Scalefish and Shark Fishery (SESSF) has had a four-tiered system of harvest strategies in place since 2007. A Tier 1 strategy applies to species and/or stocks where a robust quantitative assessment that provides an estimate of current biomass is available. As tiers move from 1 to 4, increasingly less robust data such as catch curves, or trends in catch rates, are used to estimate fishing mortality and allocate harvest strategies. This study used management strategy evaluation methods to: i) establish guidelines for when the harvest strategy identified for a given stock becomes inappropriate and; ii) to determine how to assess particularly data-poor species when none of the present tiers is appropriate (i.e. potential Tier 5 approaches).

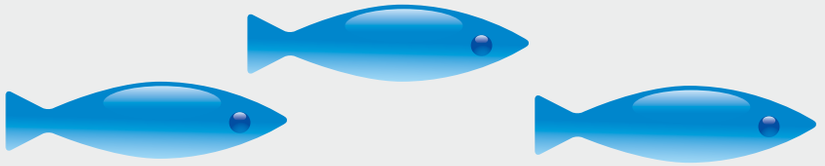
The report recommended that the appropriateness of each assessment method for a particular stock be based on meeting the assumptions behind each assessment method. It was also noted that there are no standard methods or formal criteria independent of the assessment and management process that can be applied to determine whether a fisheries stock assessment is appropriate or not. The report recommended that more formal criteria be recognised and made part of the Resource Assessment Group's decision to accept or reject a stock assessment. The report also identified possible methods for estimating sustainable catch for use in Tier 5 (data-poor) assessments. Assessment methods could include measures of the central tendency of catches, such as the average or median catch, as a means of estimating the sustainable harvest. The report also recommended options for model-supported catch-based methods, including the Depletion-Corrected Average Catch, the Depletion Adjusted Catch Scalar, and the Depletion-Based Stock Reduction Analysis.
More information: Malcolm Haddon, CSIRO, 03 6232 5097, Malcolm.Haddon@csiro.au

Review of recreational fishing education 2011-527

This project, funded under the Recreational Fishing Industry Development Strategy, undertook the first national strategic review of recreational fishing education (RFE) in Australia. This included a review of current and past RFE programs, a review of RFE in the school sector, and the first analysis of the use of social media by recreational fishers in Australia. The project developed several new RFE tools aimed at improving the delivery of key RFE messages to industry and the public. The report recommended greater promotion of key messages regarding the environment and fish welfare.

The review also revealed the need to innovate in both the promotion of recreational fishing and RFE. A national strategy for RFE was developed in response to this need. It identified key priorities, including promoting participation, developing partnerships, developing people, sourcing funding, and developing consistent standards and key messages. A national 'RecfishEd' internet forum was created to gather feedback on the draft national RFE strategy. The schools review identified the need for improved teacher access to existing syllabus-compliant RFE materials. A national RFE school teachers' portal was developed to enable ease of access to these materials. The social media analysis showed recreational fishers (especially young fishers) use social media extensively and positively. The effectiveness of social media campaigns in targeting angler behaviour was tested with a 'Think before release' campaign in the Northern Territory.
More information: Alistair McIlgorm, University of Wollongong, 02 4221 8117, amcilgor@uow.edu.au

Movers and ...



David Williamson has taken on the position of new deputy secretary of the federal Department of Agriculture and Water Resources (DAWR). Director **Nora Galway** has left the department to take up a placement in India. Currently **Shayne Daniels** is acting in this position.

Natalie Dowsett, executive officer at the South Australian Research and Development Institute for SafeFish, is on maternity leave. Her position is being filled by **Navreet Malhi**.

John Harvey has left the Grains Research and Development Corporation to take on the role of managing director at the Rural Industries Research and Development Corporation (GRDC). **Steve Jefferies** is the new managing director at GRDC.

Managing director of the Australian Egg Corporation, **James Kellaway**, has retired.

Alison McMorrow will stand in as director of the Australian Government's Rural Research & Development for Profit Program while **Alison Curran** is on maternity leave.

Helen Strickland has been appointed as the new independent chair of the South Eastern Professional Fishermen's Association Inc.

Shane Griffiths has left CSIRO's Marine and Atmospheric Research Division for a position at the Inter-American Tropical Tuna Commission. **Cathy Dichmont** has left her position at the CSIRO to conduct stock assessment training in Papua New Guinea. CSIRO chief scientist **Tony Smith** has retired.

After a 40-year career in the aquaculture industry, **Pheroze Jungalwalla** has retired as chair of the National Aquaculture Council. **Adam Main** and **Aaron Irving** replace him as co-chairs of the NAC.

Claire Webber has joined the Aquatics Working Group of the Australian Animal Welfare Strategy (AqAAWS).

Danait Ghebrezgabhier has been appointed liaison officer at the Australian Fisheries Management Authority – South East Trawl Fishing Industry Association. Her arrival follows **Andrew Trappett's** departure after a successful 15-month tenure.

Scott Haywood has taken over from **Marty Phillips** as president of the Australian Barramundi Farmers Association.

Geoff Blackburn has been appointed chair of OceanWatch, replacing **Brad Warren**, who remains in the position of executive director.

Donald Keith has transferred from head of Woolworths seafood purchasing to head of Woolworths deli.

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

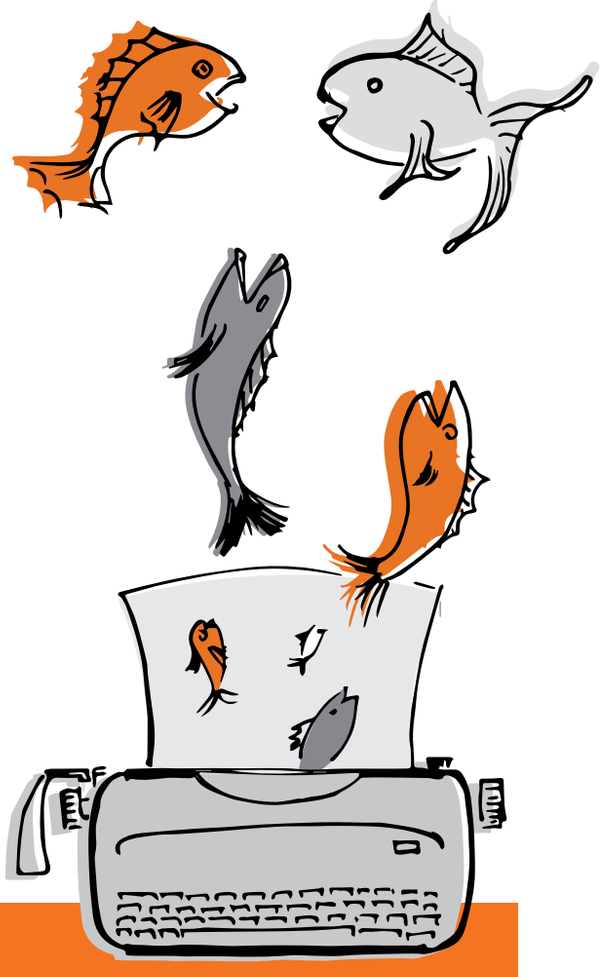
DATE	EVENT	MORE INFORMATION
2016		
5 to 8 September	**Australian Society for Fish Biology Conference, Hobart**	www.asfb.org.au
6 to 8 September	**2016 Seafood Expo Asia, Hong Kong Convention & Exhibition Centre, Wan Chai, Hong Kong**	www.seafoodexpo.com/asia
19 to 22 September	**GOAL 2016 Conference, Guangzhou, China**	www.gaalliance.org
20 to 23 September	**Aquaculture Europe 2016, Edinburgh, Scotland**	www.easonline.org
29 September to 2 October	**Ceduna Oysterfest, Ceduna, South Australia**	www.ceduna.sa.gov.au/oysterfest
1 to 2 October	**Narooma Oyster Festival, Narooma, New South Wales**	www.naroomaoysterfestival.com
6 to 9 October	**Palm Cove Reef Feast, Palm Cove, Queensland**	www.reeffeast.com.au
15 to 16 October	**Eildon Fishing Festival, Eildon, Victoria**	www.eildonbigfishchallenge.com.au
22 to 23 November	**FRDC Board meeting, Canberra**	02 6285 0400
28 November to 1 December	**Latin American and Caribbean Aquaculture 2016, Lima, Peru**	mario@marevent.com
2017		
21 to 22 February	**FRDC Board meeting, Geraldton**	02 6285 0400

FRDC

FRDC Fishfiles
E-newsletter

Your fortnightly haul of all things seafood.

* **Catch of the Day**:
  A wrap up of what's washed ashore from Fishhead himself John Susman.
* **Critical Mass**:
  What seafood restaurant critics are eating.
* **Inshore Offerings**:
  Domestic Seafood news.
* **Deep Sea Swell**:
  International news, trends and views.
* **Stock assessment**:
  What's happening in science and sustainability.
* **Off the hook**:
  A quirky round-up of what's being talked about in the fisheries world.



fishfiles

To subscribe visit
www.fishfiles.com.au