

FISHERIES RESEARCH & DEVELOPMENT CORPORATION NEWS

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VOLUME 24 NUMBER 1
MARCH 2016

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7

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Contents

3

F I S H

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FEATURES

- 4 Carbon credentials
- 8 FRDC takes on a new design
- 10 Let's keep an eye on the reef, BRUV
- 12 Port Lincoln rides the tuna tide
- 16 Options to go
- 18 Inshore challenges
- 20 New ocean 'property' to increase production
- 22 Growth opportunity
- 26 Value-adding to research perspectives
- 28 Success tied to cultural priorities
- 30 Southern Bluefin Tuna by the numbers
- 31 Chinese get a taste for Australian seafood adventure
- 32 Positive outlook
- 34 Supply chains combine to test certification schemes
- 35 Purpose-built centre for large salmon research
- 36 How to build Australia's recreational fishing picture
- 38 Keeper of the faith

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12

Port Lincoln rides the tuna tide



31

Chinese get a taste for Australian seafood

COVER
A diver checks for rock lobsters that have been resettled onto an artificial reef in the River Derwent, Tasmania. See page 20.

PHOTO: SIMON TALBOT, IMAS/UTAS

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REGULAR

- 7 In brief
- 40 Final reports
- 43 Movers and ...
- 43 Calendar of events

FRDC HOME www.frdc.com.au
UPCOMING EVENTS www.frdc.com.au/Pages/Calendar.aspx
RESEARCH www.frdc.com.au/research
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38

Keeper of the faith

David Carter with MSC-certified Glacier 51 Toothfish, which is in the process of being certified as carbon neutral.

CARBON CREDENTIALS

SUSTAINABILITY

Austral Fisheries takes sustainability to the next level, investing in tree planting to offset the impact of carbon emissions from fishing

By Catherine Norwood

In a move that puts Australia at the forefront of global best practice, Western Australia's Austral Fisheries has become the world's first seafood sector company to "go carbon neutral". The initiative will officially be launched in Perth in March by the Australian Minister for Foreign Affairs, the Hon. Julie Bishop. Austral's chief executive officer David Carter says the initiative recognises both risks and opportunities for the company and its fisheries.

The Australian Government and environmental groups have welcomed Austral's initiative as an example of industry leadership

and commitment to managing fishery challenges.

David Carter says fishers have been among the first to see tangible impacts on their operations from climate change. While scientists investigate the details, fishers around the world are experiencing real disruptions as fish move away from traditional fishing grounds, and from one country's boundaries to another. Internationally, long-term changes have the potential to significantly affect the sharing of resources between nations, or at a national level between states, with further implications for the location of fisheries processing infrastructure.

In Australia, warm-water species on the east coast are travelling further and further south of the 'normal' range. In WA, marine heatwaves have knocked out scallop fisheries. David Carter says a trip to Antarctica last year as part of an entrepreneurial think tank experience revealed a changing landscape where penguins are travelling further south to find shelter and glaciers are shearing at an accelerating rate.

He says while there are yet to be recognisable effects of climate change on the species that Austral fishes for – notably Patagonian Toothfish and prawns – that time could soon come. "I think that, as an energy-intensive business, it would be churlish of us to benefit from good harvests and not to step up and take what action we can. And I believe the greatest impacts in addressing these issues will come from people and progressive businesses collaborating in the market place to make things happen."

From a business perspective, the carbon neutral initiative will allow Austral to add to its already impressive list of sustainability and social responsibility credentials that represent both good business practice and marketing opportunities. The company has been a long-time supporter of the Marine Stewardship Council (MSC), and all of its catch of Patagonian Toothfish and prawns comes from MSC-certified fisheries. It has also been a leading player in the development of Australia's



PHOTO: DAVID CARTER

The Yarra Yarra Biodiversity Corridor includes plantings of up to 40 native tree and shrub species indigenous to the region. Seeds and seedlings are planted alongside fragmented remnant vegetation and nature reserves, with the aim of restoring the project landscape to its natural condition.

The project has been established on degraded, semi-arid agricultural land that no longer supports viable farming. More than 90 per cent of the original woodlands in this region have been cleared for agriculture. A baseline survey of biodiversity in the project area identified more than 450 species of plants and animals that will benefit from the revegetation project.

Patagonian Toothfish fishery, playing an active role in international efforts to eradicate illegal operators who were overfishing the resource.

For Austral, working proactively in partnership with NGOs to acknowledge and address difficult issues has been a standard approach. These partnerships include those with Sea Shepherd on illegal Patagonian Toothfish fishing, WWF on sustainable fisheries, and the Antarctic and Southern Ocean Coalition on eliminating seabird bycatch in the Antarctic.

David Carter says sustainability – once considered ‘green racketeering’ in some quarters – has become like food safety: “It is fundamental, a given – without it you don’t deserve to be in business,” he says. “Our commitment to sustainable seafood has been an important part of our business development and philosophy. In that space the rest of the world has caught up.”

He says progressive businesses must always look at what is next. “What are the issues that

could flare into ‘social outrage’ or conversely can be used to drive support?” He says live cattle exports, the *FV Margiris* super trawler and live bait in the greyhound industry sparked social outrage that brought related operations to a halt.

Greenhouse gas emissions are the next challenge that Austral has chosen to address, and David Carter describes the solution at this point as being “as simple and as elegant as planting trees”.

Austral operates three vessels in the Southern Ocean and southern Indian Ocean, and 10 refrigerated prawn trawlers in the Northern Prawn Fishery, harvesting about 2400 tonnes of Patagonian Toothfish and 1800 tonnes of prawns a year. It also produces 27,400 tonnes of greenhouse gas emissions, or carbon dioxide equivalents (CO₂e), a year. The bulk of this – about 22,000 tonnes – is from the seven to eight million litres of diesel the vessels use to go fishing in remote regions. Austral conducted a baseline audit of its carbon emissions in 2014, with an independent audit of its numbers by Ernst & Young to add credibility and transparency to the process.

After establishing the benchmark, the Austral team then spent much of the following year searching for potential offsets. Its main conditions were that the offsets were recognised internationally as Gold Standard and were in Australia. “Wherever we can we have looked for best practice,” David Carter says.

The outcome is a long-term arrangement with Carbon Neutral Pty Ltd, a business that invests

Refitted in Norway, the *Atlas Cove* is one of Austral Fisheries’ toothfishing vessels that travels long distances through the Southern Ocean for its catch.



PHOTO: JOHN KRAKENES

INITIATIVE WELCOMED

WWF Australia's conservation director Gilly Llewellyn says Austral Fisheries has already displayed leadership in its commitment to sustainability, having achieved Marine Stewardship Council (MSC) certification for its icesh, Patagonian Toothfish and northern prawn fisheries.

"Austral is leading the way as a Southern Ocean fishing operation committed to going carbon neutral. We look forward to seeing this becoming standard practice for vessels in that part of the world, whether for fishing, tourism or Antarctic base resupply," she says

Australia's Assistant Minister for Agriculture Senator Anne Ruston, who is responsible for fisheries, has also welcomed Austral's carbon offset commitment.

"I certainly congratulate David Carter and his team at Austral Fisheries – now becoming the first fisher in Australia to use the National Carbon Offset Standard for measurement and audit.

"The Coalition Government has an ongoing commitment to working with business to reduce greenhouse gas emissions, and it's pleasing to see a company such as Austral taking action in this space," she says.

"This is just another example highlighting the fact that Australian fisheries are world leaders when it comes to managing environmental challenges."

The FRDC's manager of communications, trade and marketing, Peter Horvat, says Austral's initiative is another example of why Australian fishing and aquaculture is so good.

"For many who work in the seafood sector being good at what you do means catching fish and bringing them to market in good condition and making enough money to pay staff and the bills. And there is nothing wrong with this approach to business. Some businesses are able to extend this beyond the day-to-day catch and markets to include the broader environment in which they operate. This includes ensuring the resources on which they rely are in good shape, and looked after. I believe most of the Australian industry operates at this level," he says. "The rise of best-practice programs such as Southern Rock Lobster's Clean and Green program and the increasing number of third-party-accredited fisheries and companies lays testament to this view.

"Then there is a very small group of leaders who see the global environment in which they operate, and who view their role as international custodians of our resources. The announcement by David Carter at Austral that the company will become the first Australian fishing company to be carbon neutral clearly shows the world we have businesses and people committed to the highest level of industry guardianship."

in tree planting to rehabilitate degraded and non-productive farmland on the eastern fringes of WA's grainbelt. It will involve planting 180,000 trees (or 140 hectares) a year. The project is part of a 13,135-hectare Yarra Yarra Biodiversity Corridor and native reforestation initiative developed in conjunction with local stakeholders that will sequester 1.257 million tonnes of carbon.

"We would have preferred 'blue carbon' offsets

(to benefit coastal or estuarine systems) but at this stage the methodology for measuring carbon in those systems is not adequately developed. Those offsets aren't available yet, but we will certainly be paying attention, and if we can find credible blue carbon offsets, we'll be there," he says.

Austral's carbon neutral accounting started on 1 January 2016 and it hopes to be the first fisheries business to be certified for organisation and products under Australia's National Carbon Offset Standard (NCOS).

Emissions are calculated in three categories.

Scope 1: Direct greenhouse gas emissions as a result of the company's operations.

Scope 2: Indirect emissions from electricity purchases.

Scope 3: Other indirect emissions in the supply chain that the company has no control over.

While the emissions related to diesel use were expected, David Carter says he was surprised by the Scope 3 emissions. "Scope 3, for example, includes fuel used to catch the squid that's used for bait to catch the

Patagonian Toothfish, or the carbon involved in bringing the food together to feed the crews.

"One of the challenges is defining the boundaries of the operations, which comes down to judgement and opinion. If all of our suppliers were carbon neutral, then we would have no Scope 3 emissions to worry about. But this is really the beginning of the carbon neutral journey for all of us, so in our accounting of our inputs, we have assumed that nobody else is doing this."

He says the carbon neutral process "screams" for an MSC style of treatment to make it easier for businesses to adopt, and to provide international credibility. In terms of fisheries sustainability, MSC has already determined and gained international agreement from stakeholders, industry and conservationists on the principles and criteria for sustainability and the evidence needed to support the claim. "For carbon, we've had to figure out a lot of it for ourselves: What exactly does carbon neutral mean, and at what level (Scope 1, 2 or 3)? In the end, we've just opted for best practice and covered all levels of assessment."

As well as carbon neutral certification for the business as a whole, Austral is also in the process of carbon neutral product certification for its branded Glacier 51 Toothfish and Skull Island Tiger Prawns, which require a life cycle assessment of the products.

"This will allow us to have another certification on our label and, if we're successful, we would be one of the first businesses in Australia and globally to have both organisation and product certification under NCOS. That's a pretty big deal for us.

"We have been blessed to have seafoods developing as premium luxury brands. We have a solid provenance and commercial sustainability story, and it's such an easy add-on to say to customers: 'to enhance your guilt-free experience, this is also carbon neutral,'" he says.

While investing in carbon offsets, Austral will also focus on reducing its carbon footprint, investigating more accurate targeting of fish, along with innovative approaches to fishing operations and more efficient fishing gear. It will also continue its efforts to support sustainable fisheries management, as healthy fish stocks mean fishers do not need to travel as far, or burn as much fuel, to harvest their share of the catch.

David Carter says while there are sound business decisions behind Austral's carbon neutral move, he also hopes it will prompt more discussion within the Australian community generally and seafood sector specifically about the impact of climate change and what can be done. **F**



Austral's prawn fleet at Townsville, Queensland.

PHOTO: DAVID CARTER

Seafood sector honours

Several well-known members of Australia's seafood sector have been recognised in the 2016 Australia Day Honours List for their contributions in a range of fields. These include Peter Dundas-Smith, Grahame Turk, Michael Gardner, Norman Moore and Bruce Standen, who are each named as a Member in the General Division of the Order of Australia (AM).

Brian Easton was named as an Officer in the General Division of the Order of Australia (AO) and Steven Moon received the Medal of the Order of Australia in the General Division (OAM).

Peter Dundas-Smith, AM, was recognised for his significant service to the fishing, aquaculture and seafood industries through innovation, research and development. This included his past roles as executive director of the FRDC and chair of the Australian Seafood Cooperative Research Centre.

Michael Gardner, AM, best known to fishers for his role on the Queensland Seafood Industry Association and the Queensland Fisheries Advisory Committee, was recognised for his service to cardiothoracic medicine as a surgeon and teacher.

Norman Moore, AM, is a former Minister for Fisheries in Western Australia, and was recognised for his service to the WA Parliament, to education and to the community. He is

chair of the Australian Fisheries Management Authority.

The deputy chair of OceanWatch Australia and an independent director on the Sydney Fish Market Board, Bruce Standen, AM, was recognised for significant service to primary industry, particularly to agricultural economics, sustainability and research.

Grahame Turk, AM, was recognised for significant service to the seafood and fisheries industry through leadership roles, and to the development and sustainability of the sector. He is chair of Sydney Fish Market and was previously its managing director. He is also a director (and former chair) of the National Seafood Industry Alliance.

Steven Moon, OAM, was recognised for service to marine environment preservation. He was project manager for the Australian Government's Crown-of-thorns Starfish control program and is president of Dive Queensland.

Brian Easton, AO, was recognised for distinguished service to conservation and the environment through leadership roles with a range of organisations, to public administration in Western Australia and to aged care. He was a member of the Aquatic Advisory Committee for the Department of Fisheries.

DEBUNKING MEDIA MYTHS

International fisheries experts have joined forces to establish CFOOD (www.cfoodu.org), which will provide rapid, scientifically based responses to inaccurate reporting on seafood-related matters in the media. Australia's representative on the CFOOD forum is CSIRO fisheries scientist Tony Smith. Other countries represented include Argentina, Germany, Japan, Malaysia, South Africa, the UK and the USA.

International study

Applications from the commercial fishing and aquaculture sectors are encouraged for the 2017 Nuffield Australia Scholarships. Applications open in April 2016 for the scholarships, which provide a \$30,000 bursary for up to 12 weeks of international travel, allowing primary producers to investigate a topic of their choice to assist their business and the development of their sector in Australia. The FRDC is a regular sponsor of the annual scholarships.

More information: Nuffield Australia, www.nuffield.com.au

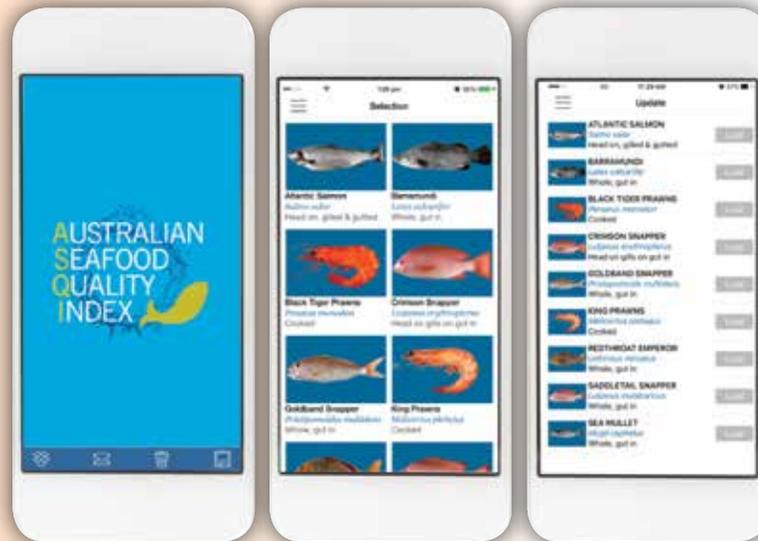
National export award

Austral Fisheries overcame stiff competition to win the national agribusiness prize in the 2015 Australian Export Awards. Austral Fisheries trades a range of premium products internationally including Glacier 51 Patagonian Toothfish sold to high-end restaurants around the world. The Australian Export Awards is a national program that recognises the achievements of Australian companies engaged in international business.

FRESH FISH TEST APP

Sydney Fish Market (SFM) has launched a new smartphone app to help seafood buyers and restaurants assess the freshness and shelf life of their seafood.

The app is based on the Australian Seafood Quality Index and has been developed by SFM, the University of Queensland and the Queensland Department of Agriculture and Fisheries, with funding from the FRDC and the Australian Cooperative Research Centre.



**HAVE
YOUR SAY
ON FISH
MAGAZINE**

The FRDC is interested in your (the readers') views on *FISH*. In each issue the FRDC aims to put forward research updates and key issues facing industry. We aim for a mix of stories that covers all aspects of fishing and aquaculture. As a reader, what do you think about the current mix of stories, and what suggestions do you have for changes or additions that would make the magazine more valuable to you? Have your say by filling in the survey at: <http://intuitivesolutions.com.au/fishsurvey.html>

As a thank you for your participation, all surveys completed by 15 April will go into the draw to win one \$100 gift card.



FRDC takes on a new design

CORPORATE STRUCTURE

A new office and new industry services are part of the FRDC's changes designed to deliver on national priorities for the seafood sector

By Ilaria Catizone

Twenty-five years after it began, 2016 brings a substantial change and evolution in the way the FRDC operates. The changes to the FRDC have been occurring for many years, initiated with the development of the National Fisheries and Aquaculture Strategy and the Productivity Commission report into the Rural Research and Development Corporations (RDCs).

This led to profound changes in the activities the FRDC could undertake – allowing the FRDC to work directly on research and extension projects as well as undertaking marketing activities. Planning the implementation of the changes has been ongoing over the past two years and takes into account two internal reviews of the organisation's structure, a ministerial request to relocate and consultation with stakeholders about what activities and services the FRDC will undertake.

The FRDC Research, Development and Extension (RD&E) Plan 2015–20 launched in September 2015 (see *FISH* issue December 2015, page 14) articulates and reinforces the direction in which the FRDC is heading and outlines clear delivery targets against three strategic priorities.

Adelaide office

To ensure the FRDC delivers on these priorities, changes are being made to the structure and staffing of the organisation. At its November 2015 meeting, the FRDC Board agreed to establish a regional office in Adelaide, co-locating with Wine Australia and the Grains Research and Development Corporation.

The office will house four to six staff who will focus on the planning and extension of RD&E with end users via the regional Research

Advisory Committees (RACs) – formerly Fisheries Research Advisory Bodies (FRABs).

The FRDC chair, the Hon. Harry Woods, outlined the decision: “As a small agency that is co-funded by both the government and fishing and aquaculture, it is important we remain as connected as possible, and establishing an office closer to our stakeholders is the first step. The long-term strategic vision for the FRDC is to deliver against national issues while still ensuring that regional priorities are identified and addressed.”

In the long term, the FRDC may consider setting up offices in other locations in addition to working with similar primary industry organisations, such as other RDCs, the Regional Australia Institute or the National Farmers' Federation, to develop and co-locate in a “rural hub” in Canberra. This would allow for the sharing of services and accommodation and reduce overall costs.

Assistant Minister for Agriculture and Water Resources Senator Anne Ruston has welcomed the FRDC's decision to open a regional office in Adelaide. She says this is a positive move, relocating agencies with a strong rural focus closer to the industries that they serve.

“Setting up a regional office in Adelaide will allow the FRDC closer and better access to the geographical spread of its industry stakeholders and improve engagement,” Senator Anne Ruston says.

The move also sends a clear message that the FRDC will work closely with fishing and aquaculture regions across Australia.

Working with Wine Australia offers a range of collaborative opportunities, especially in export markets. Seafood and wine work well together and linking them to showcase Australia's premium seafood and wine status benefits everyone.

Research Advisory Committees

In October 2014 the FRDC commissioned a review of the FRABs to identify better practice and better outcomes from stakeholder consultation, and to identify how to improve the efficiency and effectiveness of the FRAB network.

Based on this review and consultations with stakeholders, the FRDC Board decided that the FRDC would take over the management and running of the FRABs – now RACs – to achieve more direct regional engagement and visibility.

The new arrangements are intended to give the RACs greater autonomy and flexibility as well as addressing accountability gaps. Three new staff members will be employed and will oversee the eight RACs. The objective is to deliver improved regional engagement and delivery of services including extension and commercialisation of R&D across the country.

Services

The FRDC has always taken a pragmatic approach to the delivery of services and with the changes to the *Primary Industries Research and Development Act 1989*, some key activities are now being considered for direct delivery from inside the organisation. The overall objective remains to improve the service for stakeholders and ensure the FRDC achieve its outcomes.

Marketing is a good example. In looking to develop marketing capacity, the FRDC took a very long-term view, and has made it a priority to listen to what industry wants from the FRDC before jumping in. A year of consultation and discussions has led to the development of a national framework for seafood marketing (see *FISH* issue December 2015, page 12). Over the coming 12 months, the FRDC will start to deliver marketing services for those industry sectors that ask.

Status of Australian Fish Stocks

Another service to be undertaken internally will be the management and development of the *Status of Australian Fish Stocks* reports (SAFS). The reports bring together available biological, catch and effort information to determine the status of Australia's wild-catch fish stocks against a nationally agreed reporting framework, and provide a resource to inform the general public, policymakers and industry on the sustainability of stocks.

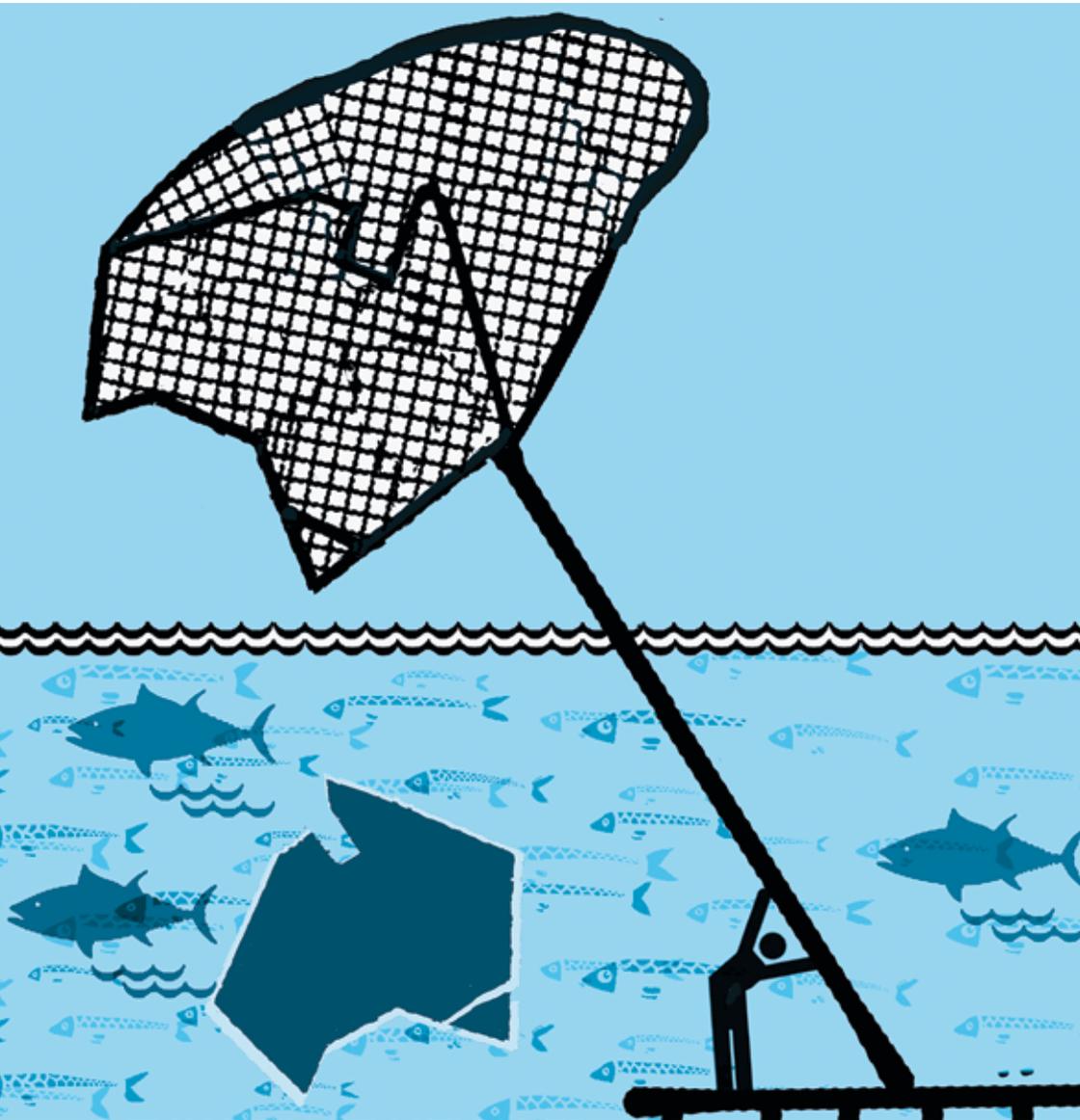


ILLUSTRATION: JUSTIN GARNSWORTHY

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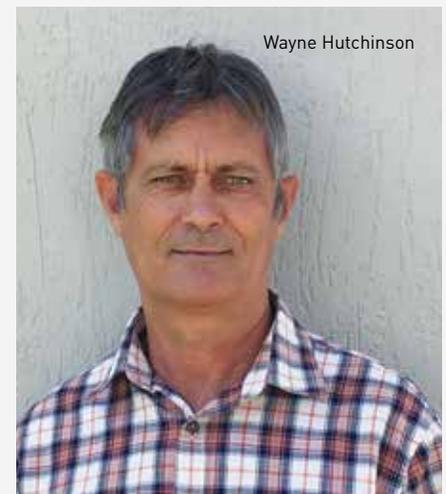
Wayne Hutchinson is the first staff member to join the FRDC's Adelaide office, where he will work as project manager – research. He will also take on the role of research, development and extension manager for Oysters Australia, taking over from Rachel King. He started on 1 February 2016 and brings an extensive background in aquaculture to the team. He holds a Master of Applied Science in Aquaculture (Research) from the University of Tasmania.

Since 1994 he has been expanding research and technical skills relevant to the development of new species for marine finfish aquaculture. R&D projects he has managed have been instrumental in the establishment of the growing marine finfish aquaculture sector in South Australia.

His research has primarily addressed hatchery-related issues ranging from egg supply through to fingerling production of a range of local marine finfish species including snapper, King George Whiting, Yellowtail Kingfish, Mulloway and Southern Bluefin Tuna.

In his most recent role at the South Australian Research and Development Institute's Aquatic Science division, Wayne Hutchinson was subprogram leader, propagation and systems, for the aquaculture program. He also conducted and managed the Australian Seafood Cooperative Research Centre R&D projects on Yellowtail Kingfish and Southern Bluefin Tuna in collaboration with industry.

As part of this role, he provided technical advice to industry on issues relating to captive spawning of Southern Bluefin Tuna.



Wayne Hutchinson

In 2015 the FRDC changed how SAFS would be managed into the future, internalising this function within the corporation. The FRDC's Carolyn Stewardson has taken on the role of managing the day-to-day operations and is now the first point of contact for SAFS at the FRDC. She will work with agencies from across Australia to increase the coverage of the 2016 report to include almost 80 species, a major improvement from the 68 in the 2014 reports. This will see the coverage of the reports increase to more than 90 per cent of the annual catch and value of Australian wild-capture fisheries.

Governance of SAFS is overseen by a SAFS Advisory Group comprising members from each jurisdiction, and is supported by the Australian Fisheries Management Forum.

Under the new management structure, the advisory group held its first meeting to progress 2016 reports by teleconference in December 2015. The FRDC held face-to-face visits with individual jurisdictions throughout February 2016 to discuss the reporting process, timelines for reporting requirements, roles and responsibilities of authors and technical queries.

The FRDC is continuing to extend information on SAFS to the general public through its social media platforms (FRDC and Fishfiles Facebook and Twitter accounts) and a partnership with Andrew Ettingshausen, which will showcase a short segment on a species in each episode of his Channel 10 TV show *Escape with ET* (<http://tenplay.com.au/channel-ten/escape-with-et>). **F**



The artificial reefs have attracted 50 finfish species, both large and small, such as the pictured Longsnout Boarfish.

LET'S KEEP AN EYE ON THE REEF, BRUV

PHOTO: LISA WEST, DEPARTMENT OF FISHERIES, WA

RECREATIONAL FISHING

Recreational fishers, motivated by community stewardship, are helping to develop cost-effective monitoring options for a Western Australian artificial reef trial

By Natasha Prokop

Baited remote underwater videos (BRUVs) have largely been the domain of scientists. However, the recreational fishing community in Western Australia is harnessing this technology for a unique citizen science program.

Reef Vision is part of an FRDC-funded research project investigating whether highly engaged recreational fishers can provide a cost-effective means of monitoring artificial reefs.

In south-west WA a network of 32 dedicated recreational anglers and supporting scientists is helping to monitor the social, biological and structural impacts of artificial reefs.

A key component of this program is an Australian first: the use of BRUVs by the general public as part of a coordinated monitoring program.

This program is based around the first-ever purpose-built artificial reefs in WA. Recfishwest

chief executive officer Andrew Rowland is the principal investigator for the monitoring program, and says deployment of the new reefs was largely driven by WA's 740,000 recreational fishers. "These days fishers really understand that we take, take, take and that maybe it's time to put something back, in the form of either habitat enhancement or artificial reefs," he says.

In early 2013 the WA Department of Fisheries deployed the purpose-built reefs off the coast of two popular south-west towns: Bunbury (150 kilometres south of Perth) and Dunsborough (200 kilometres south of Perth).

The reefs consist of six clusters of five cube-shaped cement modules, each weighing 10 tonnes, spread across four hectares of seafloor. The custom design includes propeller-shaped cross braces to create upwellings that serve as the base for food webs, attracting higher-order fish.

Recreational fishing licence money provided 20 per cent of the \$2.38 million price tag, with 80 per cent funded from the WA Government's Royalties for Regions program.

The purpose: to provide a public amenity aimed at improving recreational fishing opportunities in the south-west of WA. The artificial reefs provide a safe fishing destination close to shore. This allows fishers with small boats to target species otherwise out of their reach.

New inhabitants

The reefs have quickly been colonised by a diverse range of species. The initial 12 species of fish observed pre-deployment, on a bare sand bottom, have been joined by more than 38 other species in the three years since deployment.

These include recreationally targeted species, which the reefs were designed to attract, such as Samsonfish (*Seriola hippos*), snapper (*Pagrus auratus*) and Silver Trevally (*Pseudocaranx dentex*). The reefs have also attracted smaller, non-target species in abundance, such as Rough Bullseye (*Pempheris klunzingeri*) and Western King Wrasse (*Coris auricularis*).

These diversity metrics are important. State legislation requires evidence that the objectives of the artificial reefs have been met and also that the reefs remain in position and are structurally sound.

Monitoring success

The ability to monitor these trial reefs is essential to help the making of additional artificial reefs in WA. The five-year program for the existing reefs included pre-deployment surveys and four years of monitoring by the Department of Fisheries, WA, at a cost of \$575,000, funded by the WA Government.

Paul Lewis, a research scientist with the Department of Fisheries, WA, says future reef projects will not require the same high

level of monitoring. “However, because this is the first-ever trial of a purpose-built reef in WA, the scientific reference group overseeing the project wanted to get the most out of the monitoring, to best assess the reef and any impacts on the local environment,” he says.

This has included not only the trial reefs but also comprehensive surveys of local natural reefs, and other nearby artificial reefs, such as the HMAS *Swan* wreck and the Busselton Jetty.

Stereo BRUV technology is being combined with underwater stereo-video methods and side-scan sonar to best capture the size, biomass and diversity of fish present, and to assess the structural integrity and positioning of the reefs.

Andrew Rowland says the monitoring has offered a unique opportunity to run a citizen science program concurrently with an extensive and scientifically rigorous program. Reef Vision was born out of this opportunity.

Running the scientific and citizen programs concurrently will help determine whether the citizen-based program has the rigour and credibility needed to meet legislated monitoring requirements. If so, this could also help reduce the cost of future monitoring programs.

Reef Vision is being led by Recfishwest, which represents WA’s recreational anglers, with scientific oversight provided by Murdoch University and the Department of Fisheries, WA.

Fishers engaged

Andrew Rowland says this citizen science program differs from other community-based fisheries science projects, such as sending skeletons or reporting the presence of species, in terms of the level of commitment and engagement required.

“These artificial reef projects are what the community wants delivered on the back of its licence money,” he says. “So I think the sense of stewardship, and therefore the sense of wanting to contribute, is a lot higher than it would be perhaps for more generic fisheries-related science.”

Every two weeks, for more than seven months, local fishers have been dropping custom-built weighted skids with a GoPro® camera and bait basket attached (the BRUV) onto the artificial reefs. They have been collecting biological data on the species inhabiting the reefs and their abundances. The year-round monitoring will also allow for the assessment of seasonal shifts in the fish communities that use the reefs.

This task requires not only the hour on the water waiting to retrieve the BRUV,



Garry Dyer deploying his BRUV on the Dunsborough artificial reef.

but also time spent on preparation and travel to the boat ramp and reef.

Garry Dyer has been volunteering with the Reef Vision program for four months with the help of his father and young son. He says his passion for fishing and desire to give back to the community motivates him to keep going out each fortnight to deploy his BRUV.

“This was something that I could do to put back into the community,” he says. “The more the community can do to help out, the better it is for us as fishers and for the future of our fisheries.”

He says the community response to the reefs themselves and Reef Vision program has been strongly positive.

“When I’m at the boat ramp, people will see the BRUV in the boat and ask what it is. They’re really interested and supportive of it.”

Garry Dyer says one of his favourite elements of the program is sharing the experience with his family, friends and the rest of the fishing community.

“I make clips of the BRUV footage that I put on YouTube and send out to local tackle shops, to try and get the word out about what’s going on at the reefs and to help get the community behind it.”

The response from the community has extended to include local fishing businesses. Whitey’s Tackle in Australind and Dunsborough Outdoor Sportz have donated hundreds of dollars’



Garry Dyer’s helpers, son Cooper and father John, on the way out to the Dunsborough artificial reef to drop their BRUV.



Recfishwest provides the Reef Vision volunteers with an instruction kit, including their BRUV.

worth of merchandise as incentives for volunteers.

Andrew Rowland says the project is also investigating the capacity for other innovative technologies to be used as citizen science tools. One such tool is high-end fish-finding sonar, the structure scanning functions of which are capable of building 3D images of the underwater landscape.

“The community’s appetite to assist is definitely there,” Andrew Rowland says. “As these technologies continue to get more affordable and accessible, there’s no reason there can’t be some kind of transition more towards using these community-based methods.”

However, he says this project is not about replacing traditional, highly scientifically robust methods. Instead, the goal is to develop complementary methods that are cost-effective and which have the resolution to meet legislative requirements.

“It’s about partnerships,” Andrew Rowland says. “There’s the opportunity to do almost anything more cost-effectively with partnerships between scientific institutions and the community.”

Through such partnerships, and by harnessing the enthusiasm of recreational fishers such as Garry Dyer, these methods have the capacity to build community stewardship and provide cost-effective monitoring options, with potentially wide-ranging applications. **F**

Port Lincoln rides the tuna tide

HISTORY

From boom to bust and back again, South Australia's Southern Bluefin Tuna industry celebrates its diamond jubilee this year

By Catherine Norwood

Port Lincoln, South Australia, bills itself as the seafood capital of Australia, and while this reputation is based on a wide range of wild and cultured species, Southern Bluefin Tuna (SBT) (*Thunnus maccoyii*) is undoubtedly the fish that has put this small rural community on the map. From booming catches to falling fish stocks and innovations in aquaculture that have revived the industry, SBT continues to mark the tide of Port Lincoln's fortunes.

This year, Australia's SBT industry, centred in SA, marks its 60th anniversary. While the fishery's first steps are recorded more than a decade earlier, 1956 is the year that US fishing experts Chris and Sverre Jangaard made a successful expedition to

Australia to share their fishing techniques and provide their assessment of the fishery's potential.

Port Lincoln historian Ross Haldane is well positioned to tell the story of the SBT industry as he is the son of Bill Haldane, one of the three brothers who pioneered tuna fishing in Australia. A former prawn fisher, Ross Haldane still owns a prawn boat and also holds some SBT quota. He was involved in fisheries management in SA for many years.

He says the potential of the SBT fishery was first recognised by CSIRO fisheries researcher Stanley Fowler in 1944 when he "hitched a ride" with a Royal Australian Air Force reconnaissance flight over the Great Australian Bight towards the end of World War II. This was when Stanley Fowler first identified abundant schools of migrating tuna off the coast of SA. However, it was not until 12 years later that tuna fishing really kicked off on the Eyre Peninsula.

The development of the fishery from this point on, until the modern tuna ranching era, was shaped by a multitude of international influences, Ross Haldane says. It began with the perseverance and ambition of the Haldanes, a Scottish boat-building and fishing family based

in Victoria and later SA (see page 15). Their vessel was modelled on the US tuna seiners and it was the expertise of the US-based Jangaard brothers, who were immigrants to the US from Norway, that finally kicked off the fishery in earnest. In the 1950s and 1960s an influx of European immigrants, particularly from Croatia, led the expansion of the fishing effort in Port Lincoln, using the line and pole method the Jangaards had demonstrated during their visit in 1956.

Stepping back to view the international picture, Ross Haldane says that at the same time Australian efforts were beginning, the Japanese were also aggressively expanding their own fishing fleet, which had been restricted until 1952 by the US following World War II.

By the early 1960s Australia was catching 8000 tonnes of SBT. The Japanese catch peaked in 1962 at 82,000 tonnes. There were three SBT fisheries operating in Australia at the time: Esperance, Western Australia; Port Lincoln; and off the coast of New South Wales. The Australian catch was canned for domestic consumption, while the Japanese sold most of their catch in Japan.

ILLUSTRATION: SONIA KRETSCHMAR



New technology

In the late 1970s the Australian fleet began to change from poling tuna to purse seine fishing. This technology was combined with Norwegian boat design, which proved better suited to the rougher waters in the Great Australian Bight than US boats, which generally fish in calm tropical waters.

New technology, already widely adopted by the US tuna fleet, included overhead power blocks to lift heavy catches and nylon nets that proved far more resistant to breaks and tears.

A combination of chumming boats and purse seine net boats allowed the fleet to improve its catch efficiency. By scattering handfuls of locally caught bait fish, chum boats would draw the fish to the surface while the net boats would encircle the school and unload them to larger chumming boats before casting their nets again.

However, by the mid 1980s the overall global SBT catch was beginning to decline. The Australia catch peaked at 21,000 tonnes in 1982, but the Japanese harvest of 40,000 tonnes was less than half its peak.

The Japanese introduced a ban on fishing in the spawning grounds, which lie in the Indian Ocean south of Indonesia, and moved their own fishing efforts further south into the Indian Ocean, the Southern Ocean and off the South African coast.

In 1983 an Australian Government inquiry found that the SBT fishery was biologically over-exploited and heavily over-capitalised.

Individual transferable quotas were introduced to the previously unregulated fishery.

Internationally, the Japanese and New Zealand governments also agreed to limit catches. Quotas were introduced, and then reduced, but between 1984 and 1988 fishers were unable to catch even the lower quotas. All three countries agreed to further reduce catch limits with annual reviews.

In 1989 a trilateral conference was held between Japan, Australia and New Zealand where it was agreed that the total combined yearly quota for all three countries would be limited to 11,750 tonnes. This informal management of the SBT fishery between the three countries was formalised in 1994 when the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) was established.

Today the extended commission has seven members: Australia, Japan, New Zealand, South Korea, Indonesia, Taiwan and the European Union. The Philippines and South Africa are cooperating non-members. The total allocation proposed for 2016-17 for these nine entities combined is 14,627 tonnes.

In 2011 the CCSBT adopted a harvest control rule called a management procedure (MP). The MP sets the quota based on the key data trends. Since it was adopted, the CCSBT quota has increased by 55 per cent and the Australian quota by 41 per cent based on the improvements in stock numbers.

The Australian domestic SBT fishery is managed by the Australian Fisheries Management Authority,

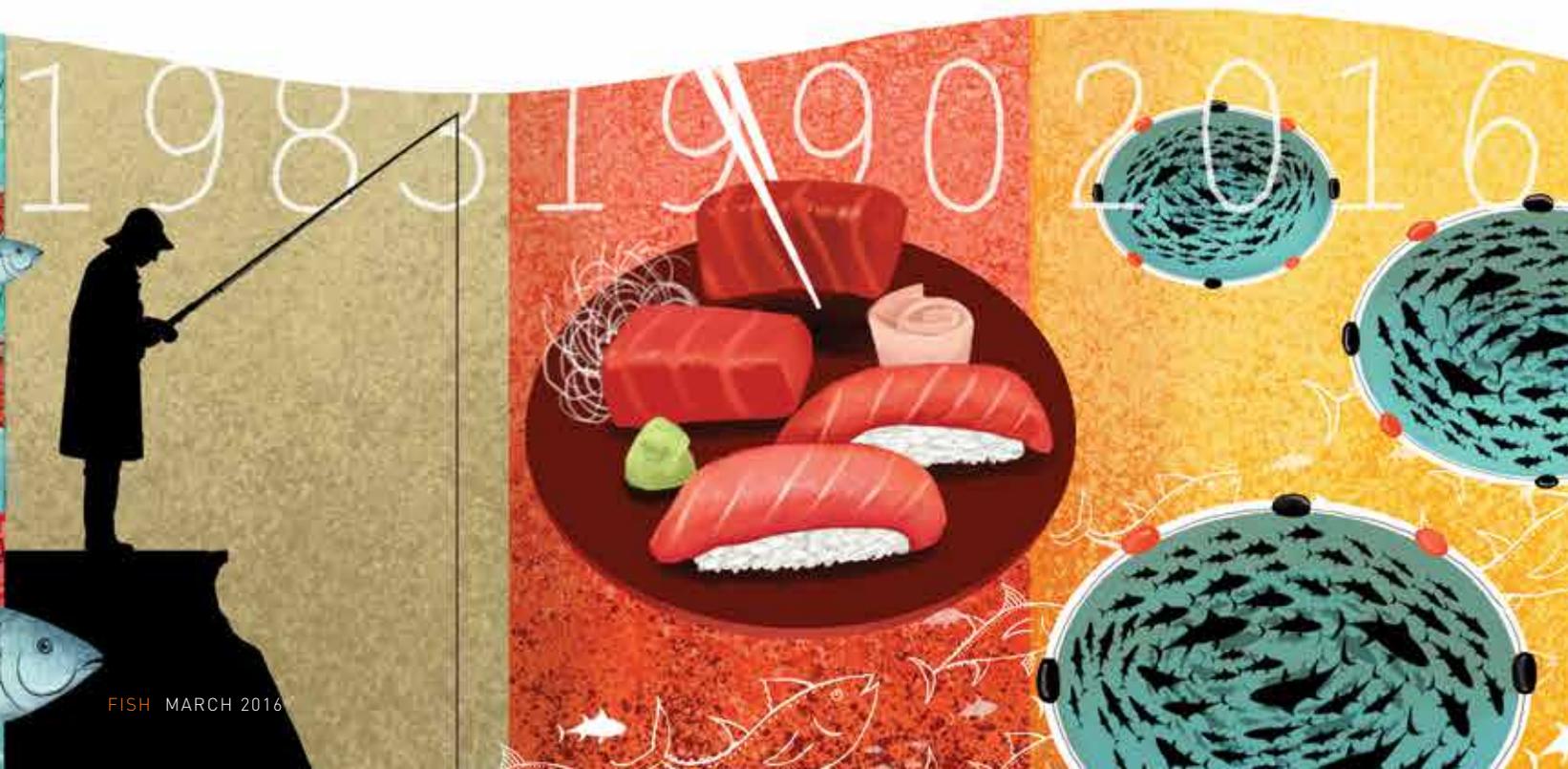
which contributes data towards stock assessments conducted by the CCSBT scientific committee.

The 2014 SBT stock assessment suggested the spawning biomass was at nine per cent of its original biomass, and below the interim target of 20 per cent of original biomass target for a sustainable yield. However, there was improvement from the 2011 stock assessment, and the current catch quotas provide a 70 per cent probability of rebuilding to the 20 per cent target by 2035.

The FRDC has funded research to develop new and more accurate ways to assess SBT stocks, to more accurately monitor the rebuilding of the biomass. This includes a new genetics-based method of measuring the spawning stock, called the "close-kin" method, which has been used to analyse the 2006-10 SBT stock data. It indicates the actual spawning stock is up to three times the level indicated by the conventional stock assessment methods. This new approach is being extended to analyse data from more recent years, and the full period will be considered for use in the stock assessment and in a revised management plan.

New markets

Japan's expansion as far south as South Africa was aided by new technology, the development of freezing fish to minus 60°C, which effectively revolutionised the market for SBT. It allowed SBT, a highly fatty fish, to be frozen in prime condition. Super-cooled freezing stabilises fats in the flesh, which prevents degradation. And



thus the SBT sashimi market was born, and what was once worth \$2 per kilogram in cans became worth \$45 per kilogram or more, as a premium culinary product. Ross Haldane says it was the Japanese interests that initially proposed ranching SBT, to grow out the smaller-sized fish migrating past Port Lincoln to a marketable size.

Towards the end of the 1980s the high-value sashimi market offered a glimmer of light for an industry that had struggled through the challenges of declining fish stocks, a 67 per cent quota cut, overcapitalisation, growing debts and a global recession.

Although Australia was not able to effectively tap into this market until the 1990s, the Japanese sashimi market is now the destination for 95 per cent of Australia's SBT. Ranching has revived the SBT industry in Port Lincoln and latest estimates put the value of the SBT industry at \$122 million in 2013-14.

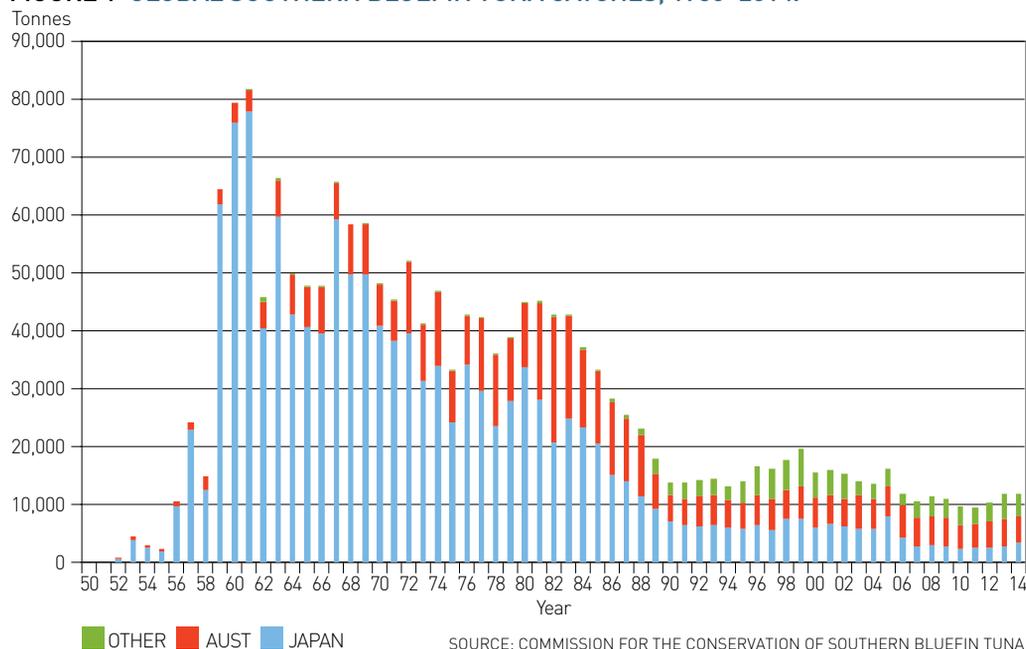
Ranching

In 1991 the Tuna Boat Owners Association of Australia – now known as the Australian Southern Bluefin Tuna Industry Association (ASBTIA) – and the Federation of Japan Tuna Fisheries Co-operative Associations initiated a study to investigate the potential of growing out SBT captured at 15 to 20 kilograms. Northern Bluefin Tuna (*Thunnus orientalis*) were being ranched on a small scale in Japan, but from 400 grams, with more than 90 per cent mortalities. Other countries had also tried ranching other tuna species, but the fish were known to be easily spooked in closed environments, damaging themselves and the pontoons. SBT can swim at up to 70 kilometres an hour and grow to 200 kilograms.

The SBT study in Australia was conducted in conjunction with the Overseas Fishery Cooperation Foundation and with the support of the SA Government and the Australian Government. It was undertaken by the Australian SBT industry in partnership with the FRDC, and was one of the first projects funded by the FRDC after its formation in 1991. Brian Jeffriess, now the chief executive of the ASBTIA, was the lead investigator, and it was also one of the first projects for Patrick Hone, now executive director of the FRDC, as he was beginning his research career.

Patrick Hone says it was clear within two years that ranching SBT would be viable. The SBT proved more amenable to being ranched than some other species, and the young fish, generally

FIGURE 1 GLOBAL SOUTHERN BLUEFIN TUNA CATCHES, 1950–2014.



two to four years old, could be quickly fattened to a size suited to the Japanese sashimi markets.

On the basis of this study, the industry began to capture SBT by poling individual fish into the wells of their vessels, and transporting them to pontoons in Boston Bay, SA. It was local fisher Dinko Lukin who introduced tow pontoons, which allowed the SBT to be purse seined in larger numbers. The innovation of towing pontoons greatly reduced fish mortality compared with previous capture and transfer methods.

The fish are towed from the point of capture, at speeds of about one knot, into the ranching pens, which can take two weeks. The pens were originally located in Boston Bay. However, a major storm in the Port Lincoln area in 1996 wiped out all the SBT stocks being ranched in the bay, and led the industry to relocate to much deeper water in the lower part of the Spencer Gulf.

Patrick Hone says since the initial project that established the potential for ranching, the FRDC has been partner in the development of the industry. As a co-funder of the Aquaculture Cooperative Research Centre (CRC), the Aquafin CRC and the Australian Seafood CRC, it has invested with industry in research involving fish health, nutrition, physiology and metabolism, product quality and the environment. Without the support from industry leaders such as Joe Puglisi, Sam Sarin, Tony Santic and Hagen Stehr, among others,

to take this research and drive development, the industry would not be as it is today.

The collaboration of the FRDC and the CRCs with the SBT industry and major Australian research institutions has greatly enhanced and improved husbandry and production methods, and improved understanding of the international SBT fishery resource as a whole. For example, the FRDC funded a project that identified liver flukes as the cause of fish mortalities and development of treatment strategies.

Despite all that has been learnt, ASBTIA recognises there is still a long way to go to fully optimise ranching operations.

Since ranching began, the industry has steadily expanded to produce up to 9000 tonnes of gilled and gutted SBT annually with an estimated annual ex-farm value of about \$200 million. Direct and indirect employment in Port Lincoln is estimated at the equivalent of more than 1000 full-time jobs. In 2016 there are eight companies ranching SBT with about 100 pontoons in specified aquaculture zones.

Sardine fishery

SBT ranching also resulted in the development of Australia's largest volume fishery, the Australian Sardine fishery in SA. This allowed the SBT industry to use locally caught feed for its operations, rather than importing feed from international fisheries – a practice that

PHOTOS: TACOMA PRESERVATION SOCIETY



TACOMA PIONEERS SBT FISHERY

The *Tacoma* is the boat that launched Australia's Southern Bluefin Tuna (SBT) industry, which marks its 60th anniversary this year. It was built by brothers Bill, Hughie and Alan Haldane at Port Fairy, Victoria, and made of Bluegums they selected themselves from the Otway Ranges in south-east Victoria.

Ross Haldane, Bill Haldane's son, describes the 150-tonne *Tacoma* as the "supertrawler" of its time. It was modelled on the lines of American purse seine tuna clippers and its 200-tonne haul capacity far outstripped anything else then fishing in Australian waters.

The Haldanes expected the vessel would take four years to complete. In the end it took seven-and-a-half years, and a loan from the South Australian Government, which committed them to fishing from Port Lincoln on SA's Eyre Peninsula.

Post World War II, governments around Australia were trying to encourage economic development and fisheries was one of the sectors targeted.

Their early purse seining efforts were unsuccessful and plagued by net problems and the inability of the local cannery to process catches of any significant size. The Haldanes switched to bamboo poling, a technique that was proving highly effective in the US tuna fishery.

In 1956 the SA Government sponsored US fishing experts Chris and Sverre Jangaard to visit Port Lincoln to demonstrate tuna poling. It was their visit that proved the potential of the *Tacoma*, and of the fishery resources, effectively launching a new industry for Port Lincoln.

Poling proved successful for many years, and eventually changes in net and lifting technologies allowed the *Tacoma* (and other vessels) to successfully begin purse seining – although it was almost 20 years after the Haldanes' original efforts.

The vessel fished tuna, Australian Salmon and prawns (among other species) in state and Commonwealth waters for 52 years before being retired in 2003. It is still based in Port Lincoln under the care of the *Tacoma* Preservation Society, which holds two tuna poling re-enactment trips each year.

The society's volunteers keep the vessel in working order and the re-enactments are the society's main form of fundraising. This year's trips have been organised in conjunction with events to mark the 60th anniversary of the SBT industry.

The Tacoma Preservation Society has developed an exhibition titled *Two men and their boats*, which opened at the Nautilus Art Centre in February 2016. The exhibition details the contribution of the Jangaard brothers to fishing internationally, including their influence in Port Lincoln. As Norwegian immigrants to the US, the Jangaards followed the fortunes of various fisheries from halibut and herring, to sardine, sharks and tuna, having a lasting influence on international boat design and fishing methods.

More information: Tacoma Preservation Society, www.tacoma.org.au

Poling proved successful for many years, and eventually changes in net and lifting technologies allowed the *Tacoma* (and other vessels) to successfully begin purse seining – although it was almost 20 years after the Haldanes' original efforts.

also presented a biosecurity risk. More than 90 per cent of the annual harvest from the SA sardine fishery is used to provide feed for SBT. The FRDC has also been involved in research to ensure the sardine fishery remains sustainable, including refining methods for estimating the biomass of this and other small pelagic species.

Certification

In December 2015 ASBTIA chief executive officer Brian Jeffriess announced that the Australian SBT fishery and farms had been awarded international sustainability certification by Friend of the Sea, a non-profit NGO that is the world's largest certifier

of seafood. The Friend of the Sea sustainability award covers both the catching of Australian SBT from the wild and the value-added ranching of the catch. It includes the sustainability of the fishery, of the ecosystem (including any bycatch), of staff safety and labour conditions, the carbon footprint of organisations, product testing and traceability, animal husbandry and welfare, vessel monitoring and waste management.

The SA Government's support for the industry has helped to achieve the landmark certification. Continuous audits of industry operations and audit reports were important in the independent certification process.

SBT breeding

Meanwhile, there is intense international competition to close the life cycle for SBT. This development requires a high cost of production, but would allow for complete control of SBT farming and remove pressure on wild resources that may be not sustainably managed.

In Australia, Hagen Stehr at Cleanseas had been driving research in this area, with research facilities at Arno Bay, near Port Lincoln, with assistance from the South Australian Research and Development Institute, the University of Tasmania and Japan's Kinki University. The Cleanseas research into breeding SBT is currently suspended. **F**

Options to go

SUPPLY CHAIN

From boxes of bulk seafood, new packaging technologies are supporting portion-sized serves and direct marketing to consumers



Dimitri Hari, Pymont Seafood,
at Sydney Fish Markets.

PHOTO: JAMES HORAN

By Ilaria Catizone

Operations manager of Pymont Seafood Dimitri Hari says: “Nothing beats polystyrene boxes for their thermal capacity.” Sydney-based Pymont Seafood is one of the leading seafood wholesalers in New South Wales. Despite a poor environmental performance, polystyrene remains the most cost-effective packaging for the distribution of seafood.

Dimitri Hari says the company has found that for interstate shippings, the polystyrene boxes delivered seafood in the best condition, as the product was kept cooler for longer. However, the boxes are bulky, polystyrene does not break down in landfill and opportunities for recycling are limited.

Pymont Seafood is based at Sydney Fish Market (SFM), where the company can dispose of its boxes in SFM’s specialist polystyrene recycling machine. However, customers receiving deliveries may not have access to a similar recycling option.

The company is one of many investigating alternatives, particularly for transport over shorter distances where long-term temperature control is not necessary. Dimitri Hari has found that waxed cardboard boxes are well-suited for distributing oysters from his base at SFM to the Sydney metropolitan area.

“Using more environmentally sound packaging than poly boxes is more expensive, but it can also be used as a selling point to consumers who are becoming increasingly more environmentally aware,” he says.

Modified atmosphere

As well as cardboard boxes, Pymont Seafood has been using sophisticated modified atmosphere packaging (MAP), which removes the air from the plastic packaging and replaces it with a special blend of gases. Without oxygen, bacterial growth is inhibited and this extends the product’s shelf life to almost three times that of unpacked seafood. “We find the shelf life of MAP-wrapped products can be up to 12 days, compared with loose seafood, which will only last three to four days,” Dimitri Hari says.

MAP is not for everyone, given the substantial investment required for the equipment, which is usually \$100,000 or more.

The equipment requires its own operating space and more time is needed to train staff. There may also be some experimentation needed to find the best combination of gases, usually a mix of nitrogen and carbon dioxide, to maintain the product in prime condition.

Correct handling of the product is crucial. The MAP packaging can be punctured and the product still needs to be kept at the correct temperature throughout the supply chain to prevent spoilage.

However, the investment of time, space and money in a MAP system has the potential to improve marketability and traceability of seafood products as the packaging provides space for improved labelling.

There is little or no need for chemical preservatives and it can further extend shelf life, thanks to the carbon dioxide from the package dissolving into the fish flesh, which helps to prevent bacterial growth. The risk of contamination through the supply chain is also much lower in packaged products.

Vacuum option

A less-expensive, more widely used alternative is vacuum or skin-packed products. These deliver many of the advantages of MAP, but the equipment can be purchased for less than \$20,000. This method removes the air from the packaging, although it does not replace it with anything. Shelf life is extended to about double that of loose seafood and there is also less risk of puncturing the pack during handling, compared with MAP.

Removing the air from the packaging prevents oxidation of the meat and this is particularly important when dealing with high-end products such as Southern Bluefin Tuna (SBT), says South Australia's Steve Moriarty. He founded Mori Seafood, which specialises in supplying sashimi-grade SBT fillets to international markets.

He has recently sold this business and established Mori Consulting. While at Mori Seafood he oversaw large volumes of seafood exported from SA to China.

"We mostly used vacuum packaging for restaurants, only adding our brand name and handling information on the pack," he says. "This type of packaging prevents the fish from

PHOTO: JAMES HORAN



"Using more environmentally sound packaging than poly boxes is more expensive, but it can also be used as a selling point to consumers who are becoming increasingly more environmentally aware."

– DIMITRI HARI

browning due to contact with oxygen and lends itself to larger portions, suitable for chefs.

"For supermarket shelves, skin packaging is more popular. The fish is placed on a tray then vacuum packed." He says this makes it look neater and provides enough space to supply the consumer with cooking suggestions and other information about the product such as its provenance and how the fish was caught, and takes on an educational role for the public.

Label information

Steve Moriarty says consumers increasingly want this kind of information. "We thought a traditionally Chinese red and gold package would sell best in China, but now we have realised they actually prefer a more unique look that brands the product as Australian," he says. "Chinese consumers increasingly value sustainable seafood from pollution-free environments, so packaging that can be recycled and that tells them the product's story is most successful."

Tania Schwede from Oceanic Agencies says her clients have also found that Australian consumers are attracted to a product that has a good story behind it. Oceanic Agencies is a small Queensland-

based enterprise providing design and packaging services to larger producers and fishers who want to directly market their own products.

Like Dimitri Hari, Tania Schwede has found that polystyrene boxes still hold an important place in the packaging of seafood, but she has noticed a trend towards supplying consumers with smaller portions, often in appealing, flexible, stand-up pouches.

This type of wrapping provides a large amount of space for marketing and it is also attractive to producers of niche products as it is a cost-effective option for smaller batches as well as large. "Smaller size packages are more popular as it goes directly from producer to consumer," Tania Schwede says.

The shift from trade packaging to consumer packaging has been a definite trend in recent years. The new packaging options provide better quality control and improved food safety.

MAP and vacuum packaging technologies have been around for more than 15 years but adoption has accelerated in the past few years. Pre-packed seafood is one of the fastest growing protein sources, as it is easier to handle for retailers and consumers alike, while providing the option of a fresh or frozen product. **F**

Inshore fisheries such as those at Myall Lakes and Port Stephens, NSW, are competing with urban, environmental and recreational interests for a share of marine resources.

INSHORE CHALLENGES

PHOTO: 123RF.COM

RESOURCE ACCESS

Working with other sectors to prevent loss of access to fisheries resources is a top priority for Australia's inshore commercial fisheries

By Peter Horvat

Some of Australia's most sustainable fisheries, from both an economic and social perspective, are not hundreds of miles off the coast; they are adjacent our major cities. Proximity to urban centres provides ready access to markets, but has also become a significant challenge in the competition for resources.

Inshore commercial fishers from across Australia came together at a recent national workshop to talk about the key issues they face, their successes, and opportunities for industry leadership and engagement.

Challenges for small-scale inshore fisheries across Australia were first raised at a national level eight years ago when industry

representatives attended a workshop in March 2008. This workshop led to the creation of *A Strategic Plan for Australia's inshore fisheries*.

The plan provided a guide to help relevant industry bodies focus their actions to improve the industry's leadership and capacity and strengthen the future security for Australia's inshore commercial fishers. However, few of the findings of the plan were ever fully realised. In some fisheries, problems identified in 2008 have continued to escalate.

Small-scale inshore fishers in Australia and overseas are subject to high levels of social, political and management intervention. The reasons may have nothing to do with the sustainability of the fishery. As business operators, fishers also face a range of pressures including succession planning, training and financial, such as increased production costs and a competitive market place for their catch.

During the FRDC's engagement with stakeholders during the past year, fishers around the country highlighted a need to revisit the issues facing inshore fisheries and

update a plan of action. In October 2015, following the Seafood Directions conference, the FRDC hosted a National Inshore Fisheries Workshop at Sydney Fish Market (SFM), with 26 fishers and industry representatives from 20 inshore fisheries attending. Fishers came from as far away as Karumba, Queensland, in the north; Albany, Western Australia, in the west; Sandford, Tasmania, in the south; and Myall Lake, New South Wales, in the east.

The focus for the two-day workshop was listening to fishers and understanding what they saw as the key issues, successes and opportunities. However, to set some context and provide a wider range of views, it included presentations from six guest speakers who provided insight into their successful experiences involving small-scale fisheries.

International speakers discussed how their organisations had sought to change the sociopolitical landscape for small-scale fisheries in the UK and the US.

Guest speakers were Tom Pickerell (Seafish, UK), Sevaly Sen (SFM Research Centre), Joshua Stoll (Walking Fish, US), John Susman

(seafood marketer, Fishtales), Brad Warren (OceanWatch Australia) and Herman Wisse (Global Sustainable Seafood Initiative).

Presentations focused on engaging with communities to help them understand and support local commercial fisheries and the role of fisheries in the community. It was shown that this process, done well, helps to secure industry interests and access to fish stocks when there is competition with other interests such as recreational fishing, coastal development and conservation expectations.

The range of concepts presented included:

- providing alternative sources of information that links producers and their products to consumers;
- profiling fisheries and offering information to help consumers make choices about the products they may buy and consume with confidence based on the fishery's ecological footprint and resource sustainability;
- identifying and developing management tools to improve the management outcomes of fisheries and engage fishers in benchmarking of those processes for inshore fisheries with limited resources and, at times, limited data;
- developing an in-depth understanding of the opportunities that exist to profile species and apply branding strategies to increase the market penetration and consumer acceptance of seafood;
- creating alternative mechanisms for directly linking fishers with consumers to increase the industry's profile and social licence within their communities; and
- understanding processes associated with third-party certification of fisheries and what it can mean for consumer confidence and fishery security.

Path forward

The workshop also provided an opportunity for participants to share their experiences with fishers from other inshore fisheries, and to share initiatives that other regions may be able to benefit from. It was clear from discussions that there were many common or related issues across fisheries and jurisdictions.

The workshop reviewed the list of issues and opportunities to identify a small number they believed could be effectively acted upon during the next three to five years.

Findings from the workshop will require industry leadership to engage fishers, managers and government to work on the key issues at

local, regional, state and national levels.

The highest-priority initiatives identified were those that could develop the fisheries and improve access such as the reopening of some closed areas. Increasing profitability, particularly through marketing and the development of new products, was also identified as a priority, as was the need to improve social and economic factors. This included better ways to value inshore fisheries and to recognise their contribution to the regional communities they are a part of.

The industry will work with fisheries managers to improve management models suited to small-scale, multi-species fisheries based upon best practice in co-management and harvest strategy development to improve access security. Workshop participants also agreed to revise the 2008 strategic plan and develop a more coordinated industry approach across different inshore fisheries.

They identified that putting the plan into action would require an ability to work with a wide range of interests, such as fisheries managers, seafood consumers, other extractive and non-extractive stakeholders, research providers and governments across a diverse range of jurisdictions.

The industry will need a strong and committed program for ongoing engagement with the community, and activities to enhance fisheries management outcomes will be part of this. Strategic projects will be needed to enhance the capacity of fishers and their representative organisations to improve governance and communication.

The fisheries considered in urgent need of support are those facing or most susceptible to reduced access. Causes of this were identified as a current trend by governments to redistribute fishery resources away from food production for consumers to non-commercial users, and changing access arrangements to deal with conflicts (real or perceived) with the urbanisation of coastal zones. This has promoted the concept that inshore fisheries are incompatible with the "sea change" movement, increasing demands for conservation and the needs of "modern" communities.

The Australian Fisheries Management Forum, which involves the heads of Commonwealth and state/territory fishery management agencies, has also indicated it is keen to better manage and engage inshore fisheries. Strengthening the relationships and building more effective partnerships between managers and industry will be important in supporting changes into the future. **F**

CHALLENGES AND OPPORTUNITIES PARTICIPANTS USED TO IDENTIFY PRIORITIES

Key challenges

- Reduced access – need to maintain viability/certainty/investment
- Poor public perception – need to raise profiles/political capital/relevance to the community
- Clearer seafood labelling for all products – need to increase confidence in purchases
- Lack of social acceptance – problems/access security/educate recreational and community
- Uncertain future – need to build job security
- Increased government regulations – need to review and remove
- No next generation – families/ease of entry for new entrants
- Too much latent effort – hard to manage and is a risk to fishers

Key opportunities

- Industry works together – greater strength/coordination of efforts is more efficient and impactful
- Increase industry profile – will help improve social acceptability
- Maintain sustainability – fundamental/future
- Develop and use codes of practice – consistent story
- Demonstrate social responsibility – profile/certainty/trust
- Promotion – product differentiation/tell story
- Optimise industry branding – product diversity/selling your story
- More flexible management – improve diversity/survival
- Safe seafood – consumer trust/community perception

INSHORE COMMERCIAL FISHING

Fisheries along the seashore – carried out by small, open boats and other craft usually within territorial waters. They include lobster, crab and prawn fisheries; the breeding and fattening of oysters; and the gathering of cockles and mussels.

INSHORE WATERS Waters of the shallower part of the continental shelf. Similar to nearshore waters.

New ocean 'property' to increase production

OFF-SHORE AQUACULTURE

Proof-of-concept research in Tasmania is investigating the possibility of artificial reefs to increase high-value seafood production

By Catherine Norwood

Artificial reefs for recreational fishing have been making a splash around Australia for many years, but new research is investigating the potential for man-made offshore reefs to increase the commercial productivity of Tasmania's fisheries. The prime candidates for this new real estate are high-value fisheries species such as rock lobsters and abalone.

Leading the research for the Institute for Marine and Antarctic Studies (IMAS) at the University of Tasmania is Stewart Frusher, who says that, globally, offshore aquaculture is still in its infancy.

While Europe and northern America focus on fish species such as salmon and seabass, he believes Australia has an opportunity to become a frontrunner in innovative offshore

marine production systems focused on high-value and sustainable reef species.

"Tasmania already has a considerable 'first-mover' advantage," he says. "The University of Tasmania is the only institution globally that can reliably culture juvenile lobsters to pilot-scale numbers. And Australia already has an international reputation for high-quality export seafood, especially in rock lobster and abalone. This is an opportunity to build on that reputation."

Demographic projections indicate the world's population will increase to nine billion by 2050. While this will require a 30 per cent increase in food production overall, key seafood markets for Australia are expected to be found among the increasing number of wealthy consumers in South-East Asia who will be better able to afford higher-quality food.

However, environmental impacts on the natural production systems for Southern Rock Lobster and abalone have resulted in declines in catches in recent years, Stewart Frusher says. Artificial reefs, stocked by cultured animals, offer an alternative system that is less affected by environmental impacts and can increase Australia's export supply of these valuable species.

Trial underway

In February 2015 two artificial reefs were deployed in Tasmania's River Derwent as a first-stage proof-of-concept. After 10 months of 'conditioning' allowing algae and other marine organisms to accumulate on the reefs, a pilot project to seed the reef with juvenile Southern Rock Lobsters was undertaken in December 2015.

The rock lobsters were aged between 12 and 24 months and had been tagged. They were collected as part of a previous project investigating the triggers for puerulus (late-larval stage) settlement, and then raised at IMAS pending their return to the water as part of the reef trial.

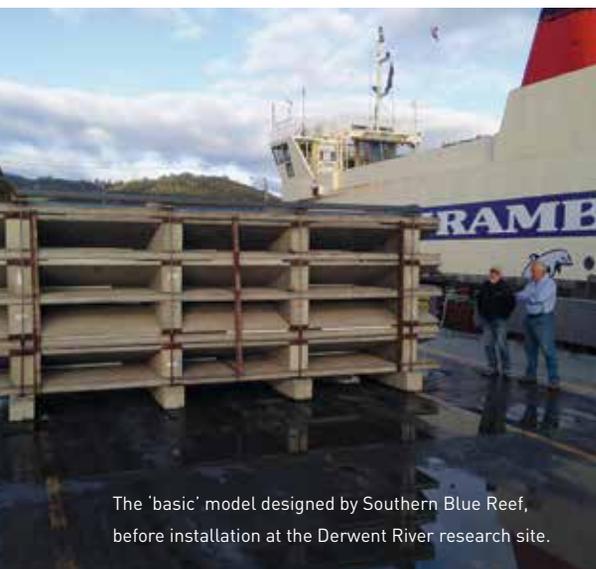
The artificial reefs were designed and built by Southern Blue Reef, based in Victoria, which is also funding the trial. Almost three years in the making, the concrete construction has a footprint of seven square metres on the ocean floor, a total surface area of 110 square metres and weighs 17 tonnes.

There are two designs. One is four storeys high with a basic cantilever design and is the cheapest possible construction option. The second reef, also with four storeys, incorporates a series of different-sized chambers and entrances.

"This first project will look at whether the rock lobsters will stay on the artificial reefs, and secondly whether there is a preference for either reef, or any particular part of the reefs. For instance, the reefs are about 2.3 metres high, and it could be that the rock lobsters prefer the lower levels."

The rock lobster population on the artificial reefs will be assessed in May 2016. "We'll decide then whether to remove the rock lobsters or continue monitoring," Stewart Frusher says.

Executive director of Southern Blue Reef Greg Page says the project is a labour of love for him, underpinned by his belief that engineering can help oceans to provide more food. "Reefs are the most productive part of the ocean and our aim is to help the oceans become more productive by creating additional reef habitat," he says. "Ideally, production from the reefs would help to pay for their construction."



The 'basic' model designed by Southern Blue Reef, before installation at the Derwent River research site.



A researcher tags a Southern Rock Lobster prior to release onto the new artificial reefs being trialled in Tasmania.

IMAGE: DELTASYNC/SEASTEADING

An artist's impression of what a seasteading community might look like, part of a vision to make greater use of the world's marine resources.



Australia's marine domain covers more territory than its terrestrial domain, and is the third-largest exclusive economic zone (EEZ) in the world. However, fisheries production in Australia is relatively low, at less than three kilograms per kilometre of coastline, or just over 0.07 kilograms per square kilometre of continental shelf. This compares to between 30 and 45 kilograms per kilometre of coast and between 0.8 and six kilograms per square kilometre of continental shelf for several countries in Europe and the US, and up to 550 kilograms per kilometre and more than five kilograms per square kilometre of continental shelf for several countries in Asia.

"Given the size of the Australian EEZ, if only a minor part of it could be realised for seafood production, Australia could shift from a minor to major seafood-producing country with the largest market on our doorstep," Stewart Frusher says.

The right location

For Stewart Frusher, the long-term vision involves offshore "floating-reefs" for marine production, in conjunction with renewable energy systems that also use the offshore environment.

Several countries in Asia (Japan, South Korea and China) have established commercial production from artificial reefs in inshore coastal regions. However, coastal regions in Australia are already subject to competition for a diverse range of uses and suffer from

the effects of human interactions, including urban development and pollution.

Stewart Frusher says offshore marine production locations offer access to high-quality and less-polluted waters, where large-scale sites could be stocked at low densities benefiting growth while minimising the opportunity for disease.

"Tasmania is located away from extreme events, such as cyclones and hurricanes, and the Tasman Sea, between Australian and New Zealand, is relatively protected," he says. "It is also at the confluence of warm nutrient-poor waters from the East Australian Current and the cool nutrient-rich waters of the Southern Ocean."

A floating reef system in this convergence zone would not have to fight against constant unidirectional currents to maintain its position, so minimal power would be required, he says. "These confluence zones are also zones of natural higher productivity, which would be used to enhance productivity naturally in a floating reef system."

Lower trophic-level species, such as rock lobster and abalone, would also be less reliant than other species on supplementary feeds, such as fishmeal, and could be integrated as part of a multi-trophic system that includes mussels and seaweeds.

Future vision

Productive offshore reefs would require a permanent human presence to maintain facilities, provide appropriate animal husbandry and to

continue R&D. This links to ideas being mooted internationally including "seasteading" (www.seasteading.org) and rigs to reef proposals (www.rigtoreef.com). Seasteading is an international movement that involves the creation of floating cities, while the rigs-to-reef concept has been developed by researchers at the University of Technology Sydney to redevelop decommissioned oil rigs as new benthic habitat.

Integrating with these concepts, Stewart Frusher says, through innovative and creative design, floating reef-based systems could also provide unique marine tourism accommodation including options for divers, recreational fishers and seafood lovers.

"The multisector approach, including marine production, biodiversity conservation, marine tourism and renewable energy, provides a more holistic approach that could transform the way we use our marine domain into the future."

He admits it may all seem a bit futuristic, but discussions are already underway with a group of researchers at the Australian Maritime College who are investigating wave and swell energy.

"The college also works with the providers of offshore platforms for the oil and gas industry, and we hope to bring those people together.

"We see this as a series of proof-of-concept projects that will lead to the development of off-shore reefs, and we've already taken the first steps." **F**

Growth opportunity

WILD HARVEST

Innovation has been crucial in developing a viable fishery and market for Australian octopus

By Rose Yeoman

Fifteen years ago, when brothers Craig and Ross Cammilleri were working in the West Coast Rock Lobster industry, they saw high numbers of Gloomy Octopus (*Octopus tetricus*) captured as bycatch – usually destined to become bait. They wondered if the octopus could, with the right development and marketing, become a profitable product.

The Cammilleris have come a long way since 2001 when they decided to act on their idea, working with the Department of Fisheries, Western Australia, to officially initiate “developing a new fishery” for octopus. After 15 years of work the fishery is nearing final, formal recognition as a “managed fishery”, and has Marine Stewardship Council (MSC) pre-accreditation. The Cammilleris

have also taken a step beyond domestic demand, breaking into US markets with their branded Fremantle Octopus range of delicacies.

When they formed Fremantle Octopus they initially bought live octopus from other fishers with the intention of growing them out in an aquaculture setting or by ranching them. However, the supply and size were too variable and this approach proved unviable.

The general manager at Fremantle Octopus, Arno Verboon, says octopus fishing at the time was “a cottage industry”. Octopus were harvested from shelter pots, which were essentially pipes with an open end. Yields were relatively low and harvesting was cumbersome and labour-intensive.

Trap innovation

These issues led Craig Cammilleri to consider how to build a better trap. In 2006, making use of his knowledge of octopus behaviour, he began developing a new design that would capture octopus without causing any damage to the animal.

Octopus typically respond to encounters with crabs by winding their tentacles around the crab

to crush the claws and prevent themselves being nipped. With this in mind, Craig Cammilleri created an artificial lure in the form of a plastic orange crab as the bait for his new trap.

Rather than a traditional pot or pipe, the new trap is a rectangular plastic box. The crab is fitted with a light-emitting diode that flashes every six seconds to attract the octopus. In order to crush the crab, the octopus must climb into the box and this triggers the closing mechanism on the trap.

The so-called ‘trigger trap’ has been through several design stages and has impressive environmental credentials. It can only catch one octopus, and only an octopus strong enough to trigger the trap, which also protects it from predation until it is harvested. And if a trap is lost at sea only one octopus is lost: the traps do not contribute to ghost fishing.

At the Department of Fisheries, WA, manager for the northern bioregions Shane O’Donoghue says Craig Cammilleri’s trap has revolutionised the industry and it has been crucial to the development of the fishery.

PHOTOS: CATHERINE NORWOOD





Seven-step process

1 Freshly harvested octopus is steamed. **2** Trays are unloaded from the steamer. **3** Quality is evaluated after cooking. **4** Immersion in an ice bath completely stops the cooking process. **5** The octopus is cut into smaller pieces and seasoned. **6** Seasoned octopus is packed into jars and marinated in oil. **7** Final quality check before packing and distribution.



The traps are produced by a separate Cammilleri company, Octopus Technologies Pty Ltd, and were approved for use in 2006. The most common configuration is a cradle of three traps together, which has proven up to 15 times more efficient than shelter pots.

By 2012, 95 per cent of all octopus fishing effort on the west coast was using trigger traps. Now about 20,000 trigger trap cradles are arrayed around the WA coastline and Ross Cammilleri predicts the harvest in the expanding fishery will be 180 tonnes in 2015-16.

At present trigger traps are unique to the WA Octopus Fishery. Tasmania, the only other Australian state with an octopus fishery, uses shelter pots.

Fishery status

When the Cammilleris began working with WA Fisheries to develop what they saw as “an underutilised resource” the first step was to initiate the Developing New Fisheries process (outlined in Fisheries Management Paper No. 130). This recognises a fishery that has unexploited potential. The second stage was to obtain a declaration for an Interim Managed Fishery.

The Developing Octopus Fishery was set up in 2001 and in 2015 was reclassified as ‘interim managed’ under the Octopus Fishery Interim Management Plan (Figure 1), which limits type and amount of gear used by commercial operators.

At present the WA’s octopus fishery occupies three zones and two bioregions. The Department of Fisheries, WA, sets maximum trap numbers for each zone and individual fishers have been allocated a set number of units within the management plan, which corresponds with the number of traps they are permitted to use in each zone. The units are fully transferable and may be sold, purchased or leased.

The fishery has passed pre-assessment by the MSC and licensees are in discussion with the Department of Fisheries, WA regarding moving to full MSC assessment.

The final stage for the fishery, if certain criteria are met, will be the declaration of managed fishery, where long-term access is granted to fishers through legislation or by a management plan.

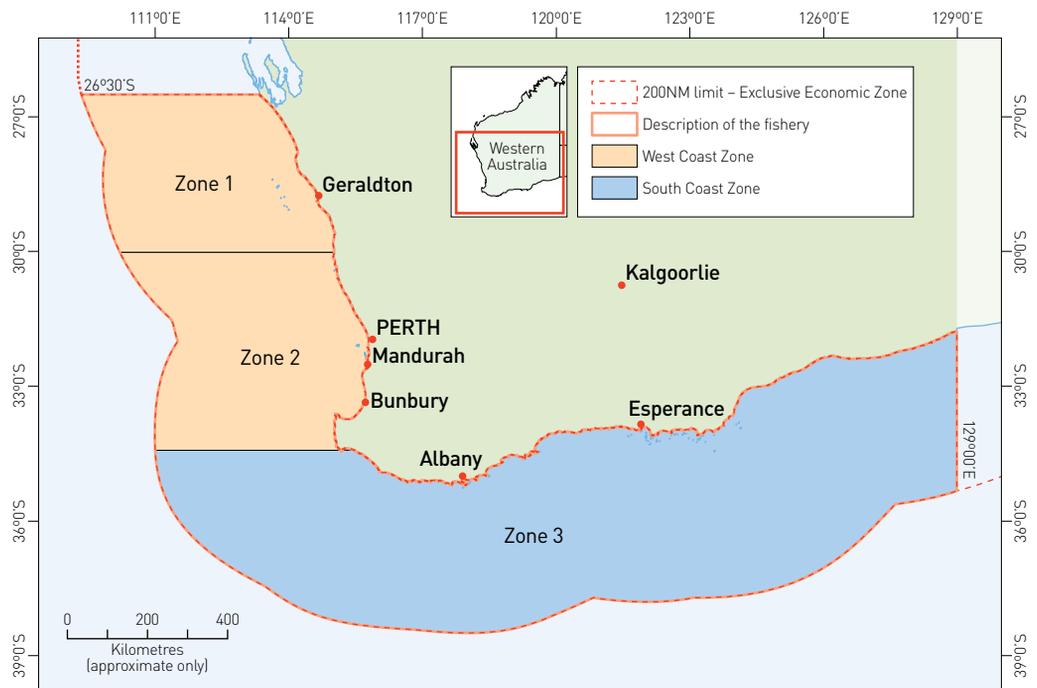
The FRDC has supported research for the development and management during the past few years to evaluate the potential capacity of the new fishery. Shane O’Donoghue says that although less than 200 tonnes of Gloomy Octopus are landed each year, a



PHOTOS: CATHERINE NORWOOD



FIGURE 1 DEVELOPING OCTOPUS FISHERY INTERIM MANAGEMENT PLAN.



SOURCE: GOVERNMENT OF WESTERN AUSTRALIA, DEPARTMENT OF FISHERIES

new report to be released in 2016 describes the potential as 1000 to 2000 tonnes.

“The capacity of the new fishery under the new management plan is based on 630 tonnes for the fishery and there is the capacity for further expansion over time based on continuous positive research results,” he explains.

When Fremantle Octopus was first established, the Cammilleri recognised that they could not develop the fishery by themselves.

“So we invited our fishers to participate in ownership. If they stayed with us for five years, they would be invited to participate in ownership of the octopus fishery licence when the fishery became managed. And we’re doing that right now,” he says.

The Cammilleri no longer engage in fishing themselves and purchase octopus from 10 fishers who work the licence allocation off the WA coast between Leeman and Cape Leeuwin. They supply exclusively to Fremantle Octopus.

Apart from Fremantle Octopus and Octopus Technologies, there is a third business: Occoculture, which is exploring the potential to farm the species. With the aid of scientist Sagiv Kolkovski from the Department of Fisheries, WA, a model octopus farm was established in an attempt to close the life cycle gap and grow all octopus life cycle stages in an aquaculture setting. Although this has not yet been achieved, a great deal has been learnt about octopus diet and aquaculture techniques applied to the Gloomy Octopus.

Products and markets

Fremantle Octopus has its head office and factory facility near Fremantle, WA. Octopus are processed on site within 24 hours of being caught and packaged either flat (as “hands”), where body and tentacles are placed into a flat, flexible plastic package, or they are steamed, cut into pieces, marinated in herb-flavoured oil and packaged into jars.

About 80 per cent of products are sold in Australia and 20 per cent are exported to Singapore, Hong Kong, Dubai and cities in the US.

During a recent visit to the US, Arno Verboon attended the Food and Wine Festival in Atlanta. He says many chefs commented that the flavour and texture of their product was superior to the locally available Spanish octopus. At the recent Gourmet Escape food and wine festival in Margaret River, WA, English celebrity chef and restaurateur Rick Stein also described Fremantle Octopus product as the “best in the world”. **F**

INTERNATIONAL OCTOPUS AID

It is not just Australian octopus fishing that will benefit from trigger trap technology. For several years, Ross Cammilleri has pursued the idea that the trigger trap could be used to enhance the economy, diet and food security in developing countries.

And now, with the aid of a \$57,000 grant from the Australian and Mauritian governments, Octopus Technologies will develop a pilot project for establishing a sustainable octopus fishery on Rodrigues, Mauritius, and exporting product to the European Union.

“The traditional fishing method involves spearing the octopus with a long metal pole, but the technique is damaging to coral and the ecology of the reef,” Ross Cammilleri says. “Replacing the metal poles with trigger pots and training locals in the harvest, grow out and processing of their octopus species – *Octopus cyanea* – will enhance sustainability.”

He explains that in Rodrigues, fisheries were historically characterised by an ‘open-access’ approach due to lack of employment opportunities in other sectors. In 2011 a study supported by the Indian Ocean Commission predicted that the local *O. cyanea* stock would be depleted by 2015 if nothing was done to reverse the trend of overfishing. The problem was compounded by a steady rise in the number of fishers and the low genetic diversity of Rodrigues’s octopus stock. In the event of fisheries collapse, it would be difficult for the octopus to recover.

To address these concerns, the SmartFish food security program of the Food and Agriculture Organization of the United Nations prepared for the first ‘Octopus Closed Season’ in 2012. Rodrigues has an “allowances” system where registered fishers are compensated for days that they are unable to fish due to poor weather or if a fishery is temporarily closed.

However, during the two-month Octopus Closed Season of 2012 the Rodrigues authorities opted for an environmental services policy rather than a compensation policy as paying fishers a daily allowance would have heavily affected the regional budget as well as creating dependency. Fishers were employed on the island in diverse jobs including revegetation projects, maintenance of riverbeds and reservoirs, invasive plant species control, beach clean-ups or surveillance of fish stock. The closure in 2012 and subsequent years has successfully rejuvenated the fishery, which is now ready for a boost from trigger trap technology.

CHOOSE YOUR DISH

Octopus have a mild flavour and dense texture, making them ideal for marinating, blanching and charring.

They are best cooked quickly over high heat or simmered slowly for 15 to 20 minutes in a flavoured broth.

Marinating helps to tenderise the flesh and strengthen flavour for enhanced results when fast cooking such as in a stir-fry or on a barbecue. Mediterranean and Asian flavours work well with octopus, including fresh basil, mint, coriander, chilli, lemon rind, Spanish onion and capsicum with grilled or barbecued octopus, served with a balsamic or rice vinegar dressing. Marinated, blanched or chargrilled octopus is a tasty addition to warm salads or antipasto platters. About 90 per cent of an octopus is edible. With whole octopus, the guts, hard beak and ink sac are removed and although the head is edible, it can be tough and chewy.

BLISSFUL BITES FREMANTLE OCTOPUS SKEWERS IN PIZZA OVEN

- 50 grams steamed octopus per skewer

Prep and cook

- Cut up steamed hands, skewer and marinate. Cook in pizza oven for five minutes or until brown.

Blissful bites – Fremantle octopus skewers in pizza oven.



PHOTO: FREMANTLE OCTOPUS

VALUE-ADDING to research perspectives

FRDC-supported projects have helped researchers develop new skills to incorporate economic and social perspectives into fisheries-based research.

RESEARCH CAPACITY

Economic skills continue to bring new insight to the seafood sector's research and management

By Catherine Norwood

Economic awareness and capability in Australia's seafood sector is steadily increasing with the completion of more than a dozen PhD research projects and a new, ongoing advisory process for FRDC-funded research.

More than five years ago the FRDC initiated the Building Economic Capability project under the leadership of Sarah Jennings at the University of Tasmania (UTAS) to address an identified skills gap in fisheries research and management.

Sarah Jennings, an adjunct researcher at UTAS, says the project has successfully raised the profile of fisheries economics in Australia, while providing valuable research to improve resource management.

"It has also raised the profile of Australian fisheries economists internationally, with more than 20 papers from our student researchers published in international peer-reviewed journals, and more to come," she says.

The project initially helped fund 14 higher research degrees at UTAS, the Queensland University of Technology (QUT) and the University of Adelaide, which included both theoretical and applied economic research. Funding was later extended to support a further three PhD research projects that are now underway.

International comparison

In one of the initial PhD projects French researcher Sophie Gourguet undertook a comparison of the Bay of Biscay demersal mixed fishery and the Australian Northern Prawn Fishery. Her thesis looked at the trade-offs associated with balancing ecological, economic and social objectives to sustainably manage these fisheries.

Both fisheries have direct and indirect effects on a range of marine species. Multiple fleets



PHOTO: BRAD COLLIS

operate in the Bay of Biscay and catch a range of fish species. A single fleet operates in the Northern Prawn Fishery, using several different fishing techniques to catch several prawn species.

Sophie Gourguet says her modelling found that, based on the target species, both fisheries were well managed for biological sustainability. However, the ongoing socioeconomic viability of the French fishery was at risk unless vessel numbers declined. For the Northern Prawn Fishery, current management was found to result in a high probability of both ongoing biological and economic viability.

"Despite very different management contexts and objectives, reducing the number of vessels in both cases would increase the viability of the fisheries under current management strategies," she says.

In the Northern Prawn Fishery modelling different scenarios also suggested that flexibility in the species harvested (as under current management) would help to manage economic risks, compared with specialised harvesting.

Sophie Gourguet's research was conducted jointly with UTAS and the Université de Bretagne Occidentale (France). In 2015 she received the PhD award of the Monaco Oceanographic Museum, given to a young researcher for PhD research in marine science and related publications. She has now joined the French national research agency, the Centre National de la Recherche Scientifique, as a bioeconomic modeller.

Other fisheries to feature among the completed PhD theses include Sydney Rock Oyster, Southern Rock Lobster, Queensland East Coast Trawl Fishery, Pacific Island tuna fisheries and aquaculture in Sri Lanka. Topics include individual transferable quotas, effective use of fishing capital, recreational fishing, marine protected areas, life cycle assessment of fisheries, and new systems of fisheries modelling.

Value for coastal communities

At QUT, Samantha Paredes investigated environmental offsets for marine and coastal developments for a Master of Business (Research) (Economics), supported by the Building Economic



“My early reading suggests that for tourists, eating local seafood helps provide a sense of place, and is part of the cultural experience of travel.” – SAMANTHA PAREDES

Capability project. She says offsets usually involve “like-for-like” compensation. After avoiding and minimising potential impacts on coastal wildlife, developers are required to offset their impact by establishing a similar environment to the one the development will affect at a nearby location.

However, her research found that community members were willing to accept alternative offsets, provided the conservation value of the alternative was greater than the standard offset required. This research was part of the National Environmental Research Program’s Marine Biodiversity Hub.

After completing this work in 2015, Samantha Paredes has begun a PhD, also supported by the Building Economic Capability project, which has taken her in a new direction: commercial fishing. Her aim is to examine the value of local fisheries in their local communities as an industry and as a source of fresh seafood. She will also investigate the value of local seafood for tourism.

She says the project has been inspired in part by her own love of seafood and by her interest in the growing farmers’ market trend. She will look at

consumer preferences in coastal communities for local seafood as well as the preferences of tourists.

“My early reading suggests that for tourists, eating local seafood helps provide a sense of place, and is part of the cultural experience of travel,” she says. Her research will help put a value on that experience for the local community.

Samantha Paredes says she also plans to investigate different supply models, based on the findings about preferences for local seafood. This might help fishers to connect more effectively with markets in their local communities.

Continued focus

The legacy of the Building Economic Capability project includes the skills the participating researchers have developed, and ongoing efforts to incorporate resource economics into the management of the Australian seafood sector.

Sarah Jennings says there is now a strong network of practising fisheries and marine economists within Australia with a regular newsletter and social media presence. The Australian

Fisheries Economics Network has a LinkedIn group to facilitate discussion and there is a recognised annual forum for face-to-face interactions.

The FRDC has also established a Social Sciences and Economics Research Coordination (SSERC) program to better integrate economics and the social sciences with the biological and physical sciences in the research it funds.

The SSERC program leader is Emily Ogier, from UTAS, who works with a steering committee of six experts to review research proposals and identify opportunities to better address social and economic dimensions of the Australian seafood industry. The SSERC committee members are Sarah Jennings, Nicki Mazur (ENVision Environmental Consulting), Sean Pascoe (CSIRO, QUT), Nyree Stenekes and Robert Kancans (Australian Bureau of Agricultural and Resource Economics and Sciences), Ian Curnow (Department of Primary Industry and Fisheries, Northern Territory) and Jo-Anne Ruscoe (FRDC).

The committee also reviews research proposals to assess whether the suggested methods are likely to provide the best outcomes for the research, or whether there are better alternatives. Emily Ogier says sometimes it is difficult to identify what kind of social or economic information needs to be collected, what can realistically be collected or measured, and what information will be useful.

She says it is also becoming increasingly important to ensure research addresses the societal and ethical components of fishery practices, which reflect changing community attitudes about what is acceptable and most valued. This includes consideration of the well-being of the people behind Australia’s productive fisheries and aquaculture and their capacity to be future innovators.

“Managing fisheries is actually about managing the people, so it’s important that we integrate the social and economic aspects into research,” Emily Ogier says.

Masterclass

As part of the Building Economic Capability project, a Future Harvest Masterclass in Fisheries Economics was also developed. The masterclass is designed for managers, researchers and fishers and begins with the core principles of economic thinking, building up to fisheries management, modelling and optimising harvest returns.

First launched in 2010, the one-day masterclass has now been revised and will be offered again this year. It has also been developed as a self-paced online program, which will be available via the FRDC website. **F**

Success tied to cultural priorities

INDIGENOUS FISHERIES

History, culture and country come together in the Yagbani Aboriginal Corporation's Aquaculture Knowledge Partnership Project

By Rose Yeoman

Aquaculture has long been seen as having potential for significant economic and employment opportunities for Indigenous people living in coastal northern Australia. Low-technology artisan fishing techniques and sea-based opportunities are well matched with Indigenous cultural practices and lifestyles.

However, many business ventures have failed because they did not adequately engage with the local communities, they were not supported with appropriate regulatory frameworks, and the locations chosen were not ideal for transport logistics and were therefore inadequate for long-term operations.

With this in mind, Warruwi, a small, mostly Indigenous community of 400 people located on Mardbalk Island (South Goulburn Island) in West Arnhem Land, Northern Territory, was chosen as the place to conduct a pilot study on development of an aquaculture-based fishing enterprise. Warruwi lies between the coastal communities of Minjilang (on Croker Island) and Maningrida, about 280 kilometres north-east of Darwin.

An early FRDC-funded research project 'Identifying the key social and economic factors for successful engagement in aquaculture ventures by Indigenous communities' identified three key factors that should be considered:

- provision of R&D to improve entrepreneurial opportunity and economic viability and certainty;
- capacity building both of individuals employed by the enterprise and of community organisations responsible for community governance, and business planning and management; and
- ensuring access to physical infrastructure and land tenure, and availability of adequate financial resources over realistic time frames.

In 2011 the Darwin Aquaculture Centre, part of the NT Government's Fisheries Division, held a workshop for practitioners engaged in Indigenous development programs to discuss key success factors for viable community-based enterprise development and Indigenous engagement. Participants identified three determinants for successful engagement:

- effective cross-cultural communication;
- clarifying community aspirations and goals; and
- valuing both traditional and Western knowledge in enterprise development.

In late 2011 Goulburn Islands elders Bunug Galaminda and Jenny Inmulugulu as well as Wayne Tupper, who at that time worked for the West Arnhem Shire Council, proposed that the community form a not-for-profit governance organisation. And so the Yagbani Aboriginal Corporation (YAC) was formed with committee representation from each of the five main clan groups on the island.

Economic goals

One of YAC's main goals is to promote economic independence in the Goulburn Islands, and consultation with the community identified a desire to pursue enterprises based on fisheries and aquaculture. The community agreed that this approach showed respect for history, culture and country.

To support the development of Indigenous fisheries in the region, the FRDC funded the Aquaculture Knowledge Partnership Project in 2012, with Ann Fleming at the Darwin Aquaculture Centre as the lead investigator. Stakeholders included YAC researchers from the Northern Institute at Charles Darwin University (CDU) and Tasmanian Seafoods, which holds all six licences for the harvesting of sea cucumber from NT waters and has worked with Indigenous communities in the harvesting and processing of the catch.

The CDU researchers worked with the Warruwi community to document traditional ecological knowledge about target aquaculture species – specifically sea cucumbers, oysters and giant clams. This research, together with associated projects funded by the Australian

Centre for International Agricultural Research, the NT Government and Territory Natural Resource Management, collected scientific data such as how fast each species grows and how to commercially produce each species in the context of Warruwi's natural environment. Tasmanian Seafoods was an important contributor to the research and data collected in relation to sea cucumbers.

The project also identified community aspirations with respect to aquaculture projects. Many people in the Warruwi community had no prior exposure to business development principles or management. In 2013 Linda Ford, from the Northern Institute at CDU, ran a series of workshops on how to start a business and how to apply for grants. She also organised visits to other Indigenous organisations that were running businesses.

Linda Ford's background is Rak Mak Mak Marranunggu, from Kurrindju, NT, and her involvement assisted cross-cultural understanding and acceptance of the researchers within the Warruwi community. When she was invited to join the project, she first sought approval from the Traditional Owners of the land before accepting.

"If you're a scientist working in an Indigenous community, it helps to know simple social protocols," she says. Being Indigenous, being local and being related to people in the local community also allowed her to be accepted, she says.

Key materials generated collaboratively by YAC and CDU researchers through the Aquaculture Knowledge Partnership Project include a sea farming seasonal calendar, maps, good eating cues and identification of the life cycles of sea-farmed animals.

School involvement

As part of the project the local school principal also agreed to include aquaculture in the school program. Senior students worked with aquaculture research staff who explained aquaculture activities on the island and outlined future employment opportunities. The teacher also incorporated the sea cucumber trials and the history of sea cucumber trading into the class curriculum. A classroom-based aquarium was set

up to provide students with hands-on experience in caring for marine animals. Field trips to the research site also allowed students to learn firsthand about sea-farming methods and gave them the opportunity to interact with aquaculture staff.

The executive officer for the FRDC's Indigenous Reference Group, Chris Calogeras, says it is important to get the basics right and to work with communities to identify culturally appropriate Indigenous business opportunities, and also what the impediments to these opportunities are. Sometimes a good opportunity that is culturally appropriate will not work if there is no infrastructure.

Chris Calogeras also notes identifying business development opportunities was recognised as a priority for funding through the current FRDC's Indigenous Subprogram funding round. **F**

The CDU researchers worked with the Warruwi community to document traditional ecological knowledge about target aquaculture species – specifically sea cucumbers, oysters and Giant Clams. It also identified community aspirations with respect to aquaculture projects.

Sea Shells from Goulburn Islands

IYAYIK

This poster gives the Mawng names for some common types of shellfish found at Goulburn Island in Northwestern Arnhem Land, Northern Territory, Australia. Mawng is an Australian Aboriginal language spoken by around 300 people. It is an endangered language but is still being learnt by children. This poster aims to help Mawng children learn more about shellfish and also help people who don't speak Mawng to learn more about the Mawng language.



Arawirrawirr
Worm Snail
Serpulorbis sp. - Vermetidae



Nganypan
Swollen Venus Clam
Gafrarium tumidum - Veneridae



Yarrkaj
Lesser Longbum
Terebralia semistriata - Potamididae



Kalannyun
Window Pane Oyster
Placuna placenta - Placunidae



Pulyuyu
Ear-shaped Horse Mussel
Modiolus auriculatus - Mytilidae



Ngarnji
Hiant Venus Clam
Marcia hiantina - Veneridae



Yupirrk
Staghorn Murex
Chicoreus cornucervi - Murecidae



Wiyirr
Barnacle
Megabalanus sp. - Balanidae



Takutaku
Pyramid Top Snail
Tectus pyramis - Trochidae



Kunkarrk or Wulyuyu
Chinese Fingernail Clam
Solen sp. - Solenidae



Wurlngun
Greyish Turban Snail
Turbo cinereus - Turbinidae



Wumunpanji
Longbum
Telescopium telescopium - Potamididae



Ngarlawi
Baler Shell
Melo amphora - Volutidae



Wirlamurrk
Pearly (or Chambered) Nautilus
Nautilus pompilius - Nautilidae



Murriny
Bastard Pearl Oyster
Pinctada radiata - Pteridae



Ngartjerr
Mangrove Nerite
Nerita balteata - Neritidae



Arrayi
Black-lip Oyster
Saccostrea mytiloides - Ostreidae



Wirtuwirtu
Bicolor Razor Shell
Pinna bicolor - Pinnidae



Maminga
Scaly Giant Clam
Tridacna squamosa - Tridacnidae



Arlajirr
Reddish Ark Clam
Anadara rufescens - Arcidae



Karrarnarn
Black-lip Oyster
Saccostrea cucullata - Ostreidae



Malawurkpinyananut
Screw Shell
Turritella terebra - Turritellidae



Martpoj
Round-ribbed Ark Clam
Anadara rotundicostata - Arcidae



Warrgili
Spike Chiton
Acanthopleura spinosa - Chitonidae



Yurtujurtu
Arabian Cowry
Cypraea arabica - Cypraeidae



Ngarlawk
Mud Mussel
Polymesoda erosa - Corbiculidae

Kurungpawurrn pata Iwumirrawung
Puka pata amarkpi pata
Iwurnangajukung ngarru inguraj
kariuri: Ralph Gumardul,
Nita Gardjalalug, Nancy Ngalmindjalmag,
Ijilil Lamilami, Richard Willan awunung
ja Balanda inguraj.

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SBT by the numbers

RECREATIONAL FISHING

A new report advises how Australia can best meet its international commitment to report its Southern Bluefin Tuna (SBT) recreational catch

By Melissa Marino

As part of efforts to monitor and rebuild international stocks of Southern Bluefin Tuna (SBT) (*Thunnus maccoyii*), Australia has agreed to account for its recreational catch of the species. A new report from the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) outlines how this might be done.

SBT is prized by commercial and recreational fishers alike. Strong international and domestic demand for the species over many years has put the stock under stress.

With current spawning stock biomass estimated to be as low as nine per cent of unfished levels, the migratory species is subject to an international rebuilding plan. This is led by the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). Australia is a member of the CCSBT, which sets the international quotas for SBT.

In Australia, the Australian Fisheries Management Authority oversees domestic commercial fishing of SBT in line with the quota allocation from the CCSBT. In 2014 the CCSBT agreed to a common definition of “attributable catch”, under which members are expected to have a process to account for all sources of mortality, including commercial, discards and recreational catch within their allocation by 2018.

ABARES researchers led by Andy Moore collaborated with Fisheries Victoria and the Institute for Marine and Antarctic Studies to develop and test methods for collecting this data. They reviewed recreational fishing survey practices and also modelled different fishing scenarios to estimate how many days of on-site surveys would be needed to build an accurate picture of the data.

The simulation modelling has helped to identify the most cost-effective way to obtain a robust estimate of the national SBT recreational fishing catch. In some states this was through

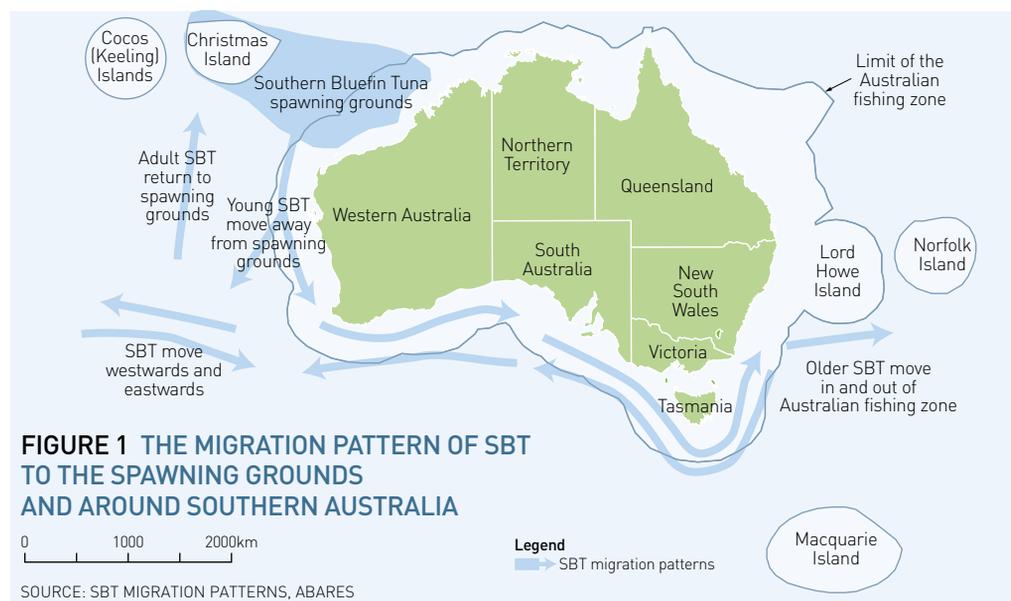


FIGURE 1 THE MIGRATION PATTERN OF SBT TO THE SPAWNING GROUNDS AND AROUND SOUTHERN AUSTRALIA

SOURCE: SBT MIGRATION PATTERNS, ABARES

on-site surveys. In others, where a targeted “sampling frame” of fishers identified through fishing or boat licence databases was available, off-site phone surveys were preferred.

Andy Moore explains that determining recreational catch rates of SBT has particular challenges. One is the transient nature of the species, which travels through different jurisdictions covering 6500 kilometres of Australia’s southern coastline from Western Australia to New South Wales. This makes standard survey techniques difficult to implement cost-effectively.

Phone or ramp surveys

In Victoria and Tasmania catch data are relatively easy to gather because SBT tend to congregate in a few places and on-site surveys at popular boat ramps near these congregation points can quickly and effectively gather the required data.

However, in others, such as South Australia and NSW, where SBT move quickly along the coast, fishing tends to be more episodic and diffuse, making sampling difficult and costly. Staff doing surveys at key boat ramps could entirely miss the fish, Andy Moore says.

Off-site phone surveys offer a solution to this, but are not currently available in all jurisdictions.

In WA and NSW off-site surveys were found to be the most cost-effective techniques, as they are in Tasmania where they are already in use. On-site surveys were preferred in Victoria and are the only current option in SA, where there is no available fisher-related databases that could be used. The modelling indicated that in SA over

a fishing season of eight months, a minimum of 500 survey days would be required. In NSW, 330 survey days over a two-month season would be required if phone surveys were not an option.

In all states the survey information could be combined with data from charter boats and game fishing competitions to develop a national estimate.

The project has estimated that in the short term the total cost of a national SBT recreational fishing survey would be \$2.3 million, in addition to resources already allocated such as WA’s biennial recreational fishing survey. These costs could be reduced in the future if an off-site sampling frame for SA could be developed, Andy Moore says. Over the longer term, a national “sampling frame” could reduce annual costs to \$0.4 million.

“This whole project is about how to obtain an accurate catch figure in the most cost-effective way,” Andy Moore says. “The simulation and scenario testing allowed us to hone it right down to a realistic sample size.”

The project had an advisory committee comprising representatives from the game fishing community, charter boat sector and state fisheries organisations. This was funded by the FRDC, the Australian Department of Agriculture and Water Resources, the NSW Saltwater Recreational Fishing Trust and the research collaborators.

Andy Moore says if, in the long term, there was a way to identify people who planned to target SBT, perhaps through a specific SBT harvest tagging or permit system, it would increase the accuracy and precision of surveys while reducing costs. **F**

Chinese get a taste for Australian seafood adventure

INTERNATIONAL MARKETS

The chance to see where Australian wild abalone comes from is drawing the next generation of Chinese chefs to our shores

By Catherine Norwood

Twenty-five of China's best young seafood chefs will visit Australia's leading abalone and seafood-producing regions in March to experience firsthand where the products come from and how they are harvested, processed and packed.

The chefs were all finalists in the inaugural Australian Wild Abalone® Innovative Cuisine Design Competition, which was held in Beijing in November 2015. The competition, on 10 November, coincided with the passing of legislation in Australia (on 9 November) to enact the China–Australia Free Trade Agreement. This removes tariffs on a variety of Australian seafood imports into China, including abalone.

For Australian seafood producers, the agreement provides the prospect of increasing returns from the export market, which for abalone and rock lobster alone is worth \$760 million a year. These industries contribute \$1.3 billion to Australia's export earnings. Additionally, these sectors support Australian fishing, which provides more than

8500 jobs in rural and regional Australia.

Australia produces about half of the global wild harvest of abalone, with almost 4000 tonnes harvested in 2013-14 worth \$138 million, according to the latest national fishing statistics.

The Australian Wild Abalone® culinary competition has been developed in partnership with the China Cuisine Association to showcase the combination of premium Australian produce and Chinese culinary skills. It follows six years of research into the Chinese market with the assistance of the Australian Seafood Cooperative Research Centre and the FRDC.

The aim of the competition is to inspire Chinese cuisine and catering industries to use Australian Wild Abalone® in unique and innovative ways. It is also an opportunity to improve the abalone product knowledge of young Chinese chefs.

To enter the competition chefs were required to submit photos and descriptions of their dishes online. There were 115 entries received from 81 chefs throughout China during September and October.

These entries were put through a rigorous judging process by a distinguished panel of culinary judges. Ten finalists were selected and they competed with each other in a cook-off at the Jinsong Vocational School in Beijing. The finalists produced their best Australian Wild Abalone® dish in an exciting live competition showdown.

The winning chef, Zhu Jie, created

Australian Wild Abalone® in plum juice and black rice. He has been named as Australian Wild Abalone®'s official Chinese chef ambassador.

The Australian Gourmet Adventure will take place in March and it is part of the competition prize for Zhu Jie, nine other finalists and a group of 15 interested chefs. As well as visiting abalone production areas, they will meet with Australian chefs and visit several Australian tourist attractions. This prize has been supported by the Tasmanian Department of State Growth and the Australian Hotels Association.

Dean Lisson, chief executive of the Tasmanian Abalone Council and executive chair of the Abalone Council Australia, says the competition has also sparked a request from Chinese restaurateurs to visit Australia as part of a formal delegation with the China Cuisine Association.

"This is great news for the Australian wild abalone sector but also for other Australian primary producers," Dean Lisson says. "China has a long history and tradition in the culinary arts. Australia has a similar history and tradition in producing fine-quality, safe, sustainable, nutritious and, even more important, tasty wild-caught abalone.

"The competition allowed both countries to showcase their skills and knowledge and to start forming a strong partnership that will provide a fantastic platform to further promote the special features of Australian Wild Abalone® and our relationship with China."

Dean Lisson says the finalisation of the China–Australian Free Trade Agreement will help maintain this momentum and secure the future of Australian fishing as exporters of premium seafood.

"Right now we are feeling really positive about the future." **F**



Bronze Award winning chef Li Hao preparing his dish during the Australian Wild Abalone® Innovative Cuisine Design Competition.



Outstanding Gold Award winning dish – Yuexiang Fragrance Abalone by chef Zhu Jie from Taizhou City.



Positive outlook

COMMUNICATIONS

With five years of funding secured and expanded capabilities, the FRDC's 2014–15 Annual Report points to changes ahead

The FRDC's 2014-15 Annual Report highlights a challenging and productive year for the organisation, including extensive stakeholder consultation across Australia to help develop a range of strategic plans and possible marketing options.

The outlook for export markets is optimistic, the report says, with new free-trade agreements with South Korea and China expected to provide long-term benefits, following the four-year reduction of tariffs. The weakening Australian currency and decreasing energy costs during the year have made exports more competitive, improved the financial performance of several fisheries, and made exports more feasible for others, such as oyster exports.

During the year there was ongoing debate about access to marine resources, especially between commercial and recreational fishers. Three states implemented fisheries reviews and reforms that will have a lasting impact on the commercial and recreational fishing industry. Broader community debate about establishing marine parks in state and Commonwealth waters has also seen commercial and recreational fishers combining forces to secure continued access.

The Australian Government progressed its goal of transferring rights in the Torres Strait to the Indigenous community. Elsewhere, governments continued to formalise Indigenous fishing access.

The FRDC says good news continues for the sustainable management of Australian fisheries, with efforts over the past two decades leading to improved stocks for several previously troubled Australian fisheries, and important

marine species – some even approaching the threshold to be taken off environmental watchlists.

However, the report notes that while the improvements in populations of species such as whales, turtles, sharks and seals is pleasing, it also increases opportunities for interactions with humans and fishing and aquaculture. Fisheries managers will be challenged to incorporate new strategies, practices and technologies to enable fishing to coexist with conservation objectives.

The expansion of aquaculture is highlighted, including Atlantic Salmon, oysters, prawns and abalone, but with increased community scrutiny, such as the Senate Inquiry into the finfish aquaculture industry in Tasmania.

During the year, the FRDC contributed to a review of country of origin labelling and a Senate Inquiry into R&D levies in the agricultural sector, as well as participating in at least four parliamentary inquiries covering both Commonwealth and state jurisdictions. However, representation of national peak or representative organisations continues to be an issue, the FRDC says, as these organisations lack the resources to contribute to national policy and other programs designed to address collective risks facing all seafood sectors.

The FRDC contributed to the development of the *National Marine Science Plan*, officially released in August 2015, and participated in the first meeting of Australian and state fisheries ministers held in more than a decade, which was in Melbourne in December 2014.

It also worked with the Australian Seafood Cooperative Research Centre (CRC), which came to an end in June 2015, taking on several incomplete CRC projects to ensure their completion and supporting the

development of the seafood sector in northern Australia. This commitment follows the release of the Australian Government's Developing Northern Australia White Paper in June 2015 and the announcement of the new Developing Northern Australia CRC.

Operational changes

The annual report highlights several major changes that are continuing to shape the way the FRDC operates. The Commonwealth funding agreement for 2015–19 was signed in May 2015, incorporating new requirements to spend funds raised from a particular fishery on projects relevant to that fishery sector or state/territory, and to consult through the relevant industry sectors in that state or territory.

The board began stakeholder consultation and a rigorous due diligence process, investigating possible relocation options, following a request from the Minister for Agriculture and Water Resources, the Hon. Barnaby Joyce, in May 2015 asking the FRDC to consider moving its office to a regional centre (see pages 8 and 9).

The FRDC's *RD&E Plan 2015–20* was finalised after a comprehensive assessment of the operating environment for fishing and aquaculture, consultation, analysis and stakeholder engagement. This process identified three national priorities that will be the focus of the FRDC's investment under the new Plan:

- ensuring that Australian fishing and aquaculture products are sustainable and acknowledged to be so;
- improving the productivity and profitability of fishing and aquaculture; and



ILLUSTRATION: SUNSHINE CONNELLY

- developing new and emerging aquaculture growth opportunities – this means concentrating on outcomes that will have a greater impact on the future of fishing and aquaculture in Australia.

In conjunction with this, the board has reviewed the FRDC's enterprise strategy and organisational design, including its Fisheries Research Advisory Bodies in 2014-15. This has led to some significant changes. Both reviews aimed to improve the efficiency and effectiveness of the delivery of services, and to best structure staff and resource needs.

The FRDC has also been involved in extensive consultation to evaluate what the industry wants in relation to marketing, both at sector and national levels. The stakeholder engagement follows changes to the Rural Research and Development Legislation passed in 2013, which has given the FRDC the ability to undertake marketing activities.

From 1 July 2014, the *Public Governance, Performance and Accountability Act 2013* replaced the *Commonwealth Authorities and Companies Act 1997*, and key changes will involve additional governance and performance reporting for the FRDC.

A pending budget issue for the FRDC is the payment of membership to six regional fisheries organisations, previously paid for by the Australian Government. These

TABLE 1 FRDC INCOME AND EXPENDITURE 2010-11 TO 2014-15.

EXPENDITURE	2010-11 \$ million	2011-12 \$ million	2012-13 \$ million	2013-14 \$ million	2014-15 \$ million
Total expenditure	25.76	29.68	25.69	27.56	28.16
Total of R&D projects	21.56	25.98	22.14	22.87	24.85
R&D Program 1 (Environment)	10.14	11.8	8.25	10.2	10.44
R&D Program 2 (Industry)	8.34	9.47	9.57	8.33	10.09
R&D Program 3 (Communities)	0.16	0.47	0.74	0.75	0.83
R&D Program 4 (People development)	1.9	2.12	1.8	1.94	1.49
R&D Program 5 (Extension and adoption)	1.02	2.12	1.78	1.65	2.00
Management and accountability	4.20	3.70	3.55	4.69	3.31
Total income	26.70	25.42	25.98	26.89	31.75
Industry contributions	8.69	7.70	7.98	8.46	8.57
Government matchable contribution	5.52	5.56	5.83	5.99	6.25
Government 0.5% AGVP	11.03	11.12	11.66	11.97	12.49
Project funds from other parties	0.89	0.46	0.48	0.17	4.27
Other revenue	0.59	0.63	0.29	0.33	0.20

The FRDC had an increase in \$1.2 million write down of assets, which increased the cost of management and accountability in 2013-14.

KEY RESEARCH ACTIVITIES IN 2014-15

- Received \$3 million from the Rural Research and Development for Profit program for a project to further develop Yellowtail Kingfish aquaculture.
- Created an Indigenous Subprogram to be managed by the Indigenous Reference Group to drive the FRDC's investment in this area.
- Developed national guidelines for developing fishery harvest strategies.
- Technically reviewed formal harvest strategies to assist in the revision of the Commonwealth's harvest strategy policy.
- Developed a methodology to measure the economic value of recreational fishing at a national level.
- Developed and tested social objectives for fisheries management.
- Made significant progress in the development of octopus aquaculture.
- Assessed the vulnerability of benthic habitats to impacts by demersal gears in Australia's exclusive economic zone of the Southern Ocean.
- Validated the use of near-infrared spectroscopy to age fish.
- Developed a management framework and harvest strategies for small-scale, multi-species, multi-method community-based fisheries using the South Australian Lakes and Coorong Fishery as a case study.
- Signed five industry partnership agreements with peak industry sectors.
- Identified viable refrigerant alternatives for use in the Northern Prawn Fishery.
- Developed a methodology to forecast the spatial distribution of Southern Bluefin Tuna in the Great Australian Bight fishery.
- Developed a method to add value to seafood processing waste through the recovery of bioactive molecules.
- Worked closely with stakeholders in the small pelagic fishery to fund priority research to improve the knowledge base for key species across Australia.

memberships are estimated at \$1.4 million per year. However, the required legislative changes making the FRDC responsible for these payments have yet to be finalised.

The annual report acknowledges the continued support from the Australian Government and

stakeholders across the commercial, recreational and Indigenous sectors as vital in ensuring high-quality research priorities are identified and turned into outcomes. The complete report is available for download at the FRDC website (www.frdc.com.au) and feedback is welcome. **F**

Supply chains combine to test certification schemes

SUSTAINABLE SEAFOOD

A new benchmarking tool offers the chance to test where certification schemes sit against international standards

The Global Sustainable Seafood Initiative (GSSI) has launched its new Global Benchmark Tool, which has been welcomed as an important advancement for the international seafood trade. The tool aims to build confidence in sustainably certified seafood and help seafood buyers make informed purchasing choices.

The benchmarking tool was officially launched as part of celebrations for the 20th anniversary of the United Nations Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries.

In recent years the number of certification schemes in seafood production has massively increased, posing considerable challenges for all players in the supply chain. GSSI seeks to provide a remedy. Its benchmarking tool is the first collective and non-competitive approach to provide clarity about seafood certification worldwide, and the first assessments are expected to be completed before June 2016.

The initiative was conceived in 2013 when seafood companies, non-government organisations, experts, and governmental and intergovernmental organisations joined forces to build confidence in certified seafood programs across the supply chain.

Thirty-two companies, including the FRDC, are currently backing GSSI as funding partners, together with Deutsche Gesellschaft für Internationale Zusammenarbeit and the Dutch Sustainable Trade Initiative. This includes some of the world's leading seafood wholesalers, processors and retailers, with several of the participating buyers already committing to sourcing seafood that uses certification schemes benchmarked by GSSI.

The GSSI is also supported by five non-profit affiliated partners, including the FAO and the World Wide Fund for Nature.

The benchmark tool was the result of an extensive multi-stakeholder discussion focusing on three reference documents: the Code of Conduct

for Responsible Fisheries, the FAO Guidelines for Ecolabelling of Fish and Fishery Products from Marine/Inland Capture Fisheries and the FAO Technical Guidelines for Aquaculture Certification.

The GSSI Global Benchmark Tool will be used to make information available across the supply chain to drive change and lower costs. Producers will have more options to choose the scheme that is right for them and reduce the need for multiple audits.

Seafood buyers worldwide will then have simpler, more consistent data to guide their purchasing decisions. The tool will also work towards minimising the environmental impact of seafood production to meet a growing demand. Open and checked information helps promote environmental sustainability.

The tool aims to make the certification landscape more straightforward as schemes sign up to be benchmarked and achieve GSSI recognition.

The GSSI Expert Working Groups spent time implementing a pilot test with eight schemes that included worldwide stakeholder feedback and a second round of public consultation.

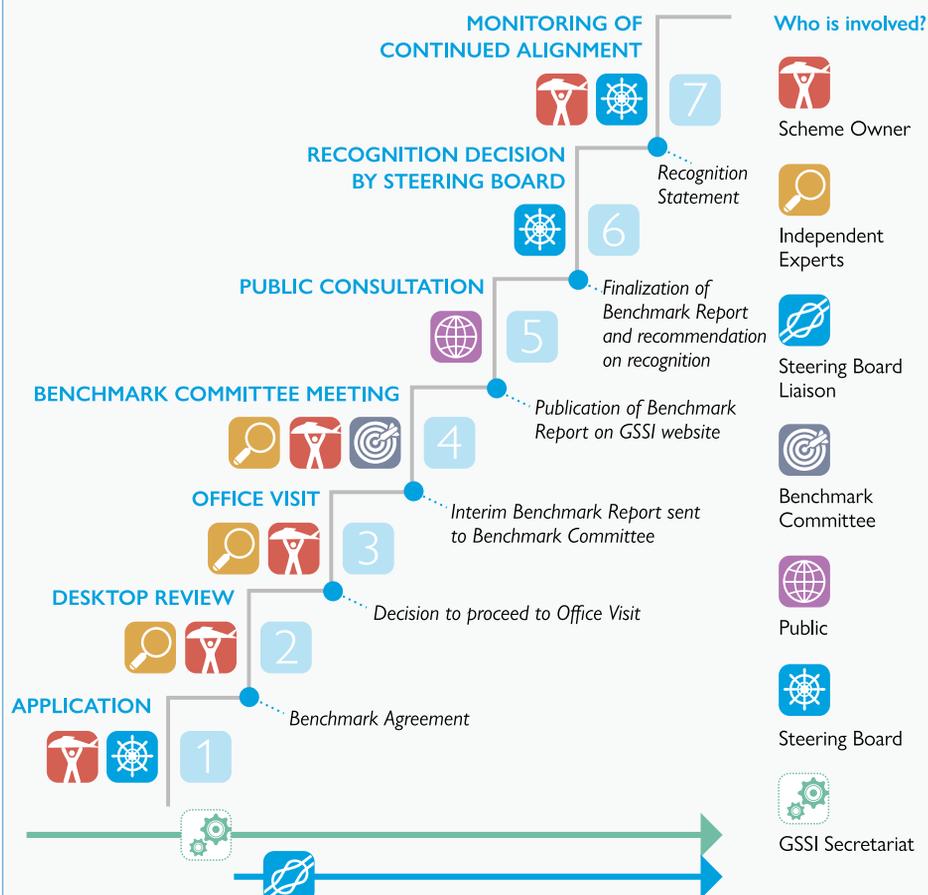
Participate

The GSSI is inviting seafood certification schemes to go through the benchmarking process and become GSSI-recognised. The aim is that by 2020, 30 per cent of seafood production will be certified in accordance with a recognised scheme.

The post-2015 business model and future strategy are being developed. New partners are being invited to join this global public-private partnership, and have the opportunity to work on this leading knowledge-exchange initiative and collaborate on topics shaping the future of the seafood sector. **F**

The GSSI Global Benchmark Tool is available at <http://ourgssi.org>.

From Application to Recognition: Key steps and responsibilities in the GSSI Benchmark Process



Purpose-built centre for large salmon research

RESEARCH CAPACITY

Industry involvement drives ready-to-use research for Atlantic Salmon aquaculture

By Mary Brewer

The preparations are almost over and research is officially about to begin at the new \$6.5 million Experimental Aquaculture Facility (EAF) at Taroona in Tasmania.

Research leaders for the new facility are Chris Carter and Polly Hilder. Chris Carter is head of the Fisheries and Aquaculture Centre at the Institute for Marine and Antarctic Studies, where the EAF is based as part of the University of Tasmania. Polly Hilder is manager at the EAF and together they will oversee the commercially focused research program, which aims to improve the health, nutrition and growth of Atlantic Salmon (*Salmo salar*).

The facility itself was funded by the Australian and Tasmanian governments, the Australian Seafood Cooperative Research Centre, the University of Tasmania and industry partners. Equal industry partners are Atlantic Salmon producer Huon Aquaculture group and Skretting Australia, a division of the international agri-feed producer Skretting.

Chris Carter says the facility has been designed specifically for research on large Atlantic Salmon (more than one kilogram) and is the first of its kind in the Southern Hemisphere: a land-based seawater system using recirculation aquaculture technology.

“There has been a lot of research on much smaller fish and the results have been extrapolated to predict what would happen in large salmon. But many physiological and nutritional processes change as fish get larger, and these changes may be challenging to predict,” he says.

The design of the EAF will help researchers to isolate the effects of environmental factors from normal changes in the fish as it grows. There are 24 fibre-reinforced plastic research tanks, each capable of holding up to 40 fish. Seawater for the facility is pumped from the nearby River Derwent

and undergoes filtration to one micron and ultraviolet filtration before being stored for use.

Environmental conditions including light, water quality and temperature can all be controlled to examine climate change effects relevant to local conditions. An important part of these controls is the new low-pressure oxygenation system customised for the site and supplied by BOC and Linde AG Engineers. The purpose-built system involves a combination SOLVOX OxyStream and SOLVOX A and SOLVOX Stream to cater for diverse experimental requirements.

Twelve indoor tanks will be dedicated to biosecurity research, particularly the control of amoebic gill disease, Tasmania’s most costly finfish disease. Current treatment requires salmon to be bathed in fresh water up to six times.

In the 12 outdoor tanks, the dedicated recirculation system is capable of providing water at two different temperatures. While the ideal temperature for Atlantic Salmon is 15°C, they can tolerate temperatures from 5°C up to 20°C. The experiments aim to see what variables can be altered to allow the fish to grow best when temperature stressors are added.

“In that way we can determine how different factors influence optimal growing conditions and transfer these learnings in a way that is appropriate in a cage environment,” Chris Carter says.

Experiments in the 12 seven-kilolitre, fibre-reinforced plastic research tanks will be conducted on fish that have been held on-site and grown for six months from approximately 100-gram smolt to large fish prior to the experimental period. Experiments conducted in the seven-kilolitre tanks and the inside tanks will have a six-month experimental period.

The tanks have been modelled on those used at Skretting’s research station at Lerang, Norway, which will allow the facilities to be benchmarked against each other.

The managing director of Skretting Australia, James Rose, says the EAF brings new research prospects to Tasmanian aquaculture. “Skretting Australia’s focus will be on the challenges unique to the Tasmanian Atlantic Salmon industry. This includes developing functional feeds to



PHOTO: MARY BREWER

The manager at the new facility, Polly Hilder, feeds Atlantic Salmon in the tanks. An automated surveillance system will trigger an alarm on her phone if anything at the facility needs urgent attention.



PHOTO: UTAS

Taroona, Tasmania

support fish during high-temperature conditions as well as other key research areas,” he says.

Frances Bender, Huon Aquaculture co-founder and executive director, says this extension of aquaculture research in Tasmania will make an invaluable contribution to innovation, growth and sustainability of aquaculture in Tasmania. **F**

How to build Australia's recreational fishing picture

NATIONAL RECREATIONAL FISHING SURVEY OBJECTIVES

- To determine the participation rate in recreational fishing and profile the demographic characteristics of recreational fishers.
- To identify key species and quantify catch and effort of the recreational fishing sector.
- To assess economic activity by the recreational fishing sector.
- To assess the social contribution of recreational fishing and fishers' attitudes to and awareness of issues relevant to fishing.

RECREATIONAL FISHING

A clearer picture of recreational fishing is expected to improve fishing management and the sharing of marine resources

By Melissa Marino

For fisheries researcher Lee Georgeson the value of recreational fishing is personal. He uses the time spent on some 30 fishing trips each year as an opportunity to “get back to basics” and connect with the natural environment.

“When you are moving carefully through an environment, say when fly fishing, you get in the zone and notice things that you wouldn't otherwise,” he says. “It can be a very meditative way to escape and is also a good excuse to hang out with your mates.”

The value for communities visited by people such as Lee Georgeson is also significant – and just one reason to establish some clear national figures around recreational fishing in Australia. This includes the number of people participating,

the economic and social value they contribute, and the types and number of species they are catching.

The need to gather such information has been recognised with a recommendation from the Australian Government's Policy for a More Competitive and Sustainable Fisheries Sector to conduct a national recreational fishing survey every five years.

In response, the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) has assessed how best to conduct regular national surveys to capture this data. The result is the report *A framework for regular national recreational fishing surveys*.

Led by Lee Georgeson, the report recommends the most accurate and efficient way to collect this vital national recreational fishing data is to align the timing of surveys across state and territory jurisdictions, using a telephone survey and diary (phone-diary) approach. Coordinated, credible information will be crucial for future policy and planning.

Survey techniques

The phone-diary method is a proven technique that is used for many state-based surveys and was also used for the National Recreational and Indigenous Fishing Survey 15 years ago.

Using the same technique is expected to build on the work of these previous surveys to assess trends over time, providing consistent data to build a national picture of recreational fishing, Lee Georgeson says.

The method involves using the *White Pages* and recreational fishing licence databases to conduct telephone surveys to get an idea of who is fishing and how often. From these respondents, a subset of fishers is then asked to complete a 12-month diary, providing more detailed information on the species and quantity caught, and money spent on

fishing-related expenses. The surveys may also include questions about people's awareness of and attitudes to issues affecting fisheries.

Fishers would also be surveyed at boat ramps to compare and validate actual catch and effort data with survey responses. For an accurate national picture ABARES estimates 70,000 initial phone interviews and more than 8000 diarists would be required across Australia's states and territories.

“What we are proposing is very comprehensive,” Lee Georgeson says. “All those different components collect information on catch, fishing effort, participation rates, money spent, the benefits of fishing to individuals and communities and attitudes to fisheries issues and management.”

Data for decision makers

As well as considering social and economic aspects of recreational fishing, consistent national data are also essential to sustainably managing fish stocks and fisheries, many of which cross regional and jurisdictional boundaries. This is particularly important as the recreational catch for species exceeds the commercial catch, Lee Georgeson says.

“At cross-jurisdictional and national scales, we often don't have enough information to know how many people are fishing and what they are catching,” he says. “It's really important to have a good understanding of total mortality of a fishing stock and how this is changing over time so that you can manage it sustainably.”

Lee Georgeson says the national survey framework developed aims to satisfy the needs of various stakeholders, from managers and scientists who want catch and effort information to aid fishery assessment and management, to the recreational sector interested in what the industry is worth and what its social contribution is.

“There's the old adage that you can't

PHOTO: GRAHAM FIFIELD



ABARES' Lee Georgeson with a Barramundi caught on the Daly River, Northern Territory. "I go all over the place to fish," he says. "And this is a magic spot."

manage what you can't measure. We have tried to develop a framework that will satisfy everyone's needs," he says.

Matt Barwick, program manager with Recfishing Research, says quantifying the economic value recreational fishing brings to communities is one reason the sector supports an updated national survey. This is because its economic value should be considered by policymakers from all levels of government when decisions are made around tourism, access and other issues affecting fisheries, he says.

As well, he says, consistent, coordinated national data on catch size, quantity and release rates is "absolutely fundamental" in underpinning sound fisheries management, healthy fisheries and continuing access to the resource.

"It helps to maintain social licence when the

non-fishing community understands robust data is being collected and used to inform sustainable management practices," Matt Barwick says.

Lee Georgeson says support from the recreational sector for a national survey and for the ABARES report has been important. "We worked with many collaborators and that was necessary to get agreement on the national survey objectives and the preferred approach."

Funded by the Australian Department of Agriculture and Water Resources, collaborators included the Australian Recreational Fishing Foundation, the FRDC, Recfishing Research, CSIRO, the University of Tasmania's Institute for Marine and Antarctic Studies, all states and the Northern Territory and various Australian and New Zealand experts in recreational fishing survey design and implementation.

Lee Georgeson says the enduring legacy of that first national survey, which is still used as the baseline for recreational fishing data in Australia, is evidence a similar approach would be effective today. It will also provide practical benefits, allowing comparisons with the original results to reveal changes over time.

Securing funding and support to implement the ABARES report's recommendations are the next steps, Lee Georgeson says. This will start with the report being presented to state fisheries management at the Australian Fisheries Management Forum later this year.

"We have a fantastic opportunity to get another national picture of recreational fishing and to establish a long-term time series of data," he says. "And this report provides the recipe for how the information will be collected." **F**

Keeper of the faith

PROFILE

Suzie McEnallay shows there is still plenty of heart in the Wallis Lake fishing community on the NSW north coast

By Catherine Norwood

It was a proud moment when the Wallis Lake Fishermen's Co-operative received not one but two state awards at the Sydney Fish Market (SFM) Seafood Excellence Awards last year.

For the co-op's operations manager Suzie McEnallay the "highly commended" in the Best Supplier and Best Business categories was an important recognition for her "family" of fishers at the co-op. It was also a clear sign of how far they have come since 2008, when the co-op was on the verge of folding.

Officially, Suzie McEnallay did not join the co-op until a year or so after the "crisis", but in truth it was more of a homecoming than a new workplace for her.

Hailing from a fourth-generation fishing family at Tuncurry, New South Wales, where the co-op is based, her family has been involved in the co-op for most of its 70-year history. As a child she was a regular visitor to the wharf and the co-op's shed perched on the bank of Wallis Lake where the Great Lakes meet the ocean.

Suzie McEnallay says her father, Noel Gogerly, never allowed his children to work at the co-op while they were younger, when he was chair of the co-op. After school she left Tuncurry for Newcastle, NSW, and studied business before becoming the manager of a pizza store. Then, with husband Troy McEnallay, she bought into a store franchise.

But with two young children, they moved back to Tuncurry in 2006. A few years later one of the co-op directors approached her about bringing her business and food service skills to the co-op's retail outlet. She progressed from retail assistant in 2009 to retail/wholesale manager, and in 2012 took on the operations management position.

"When I joined the co-op it was just getting back on its feet; the previous 18 months had been pretty touch and go," she says. "They were about to lose their co-op and all the facilities they rely on to go fishing and sell their catch. The board of directors really took back control of operations and there were a lot of changes and solid commitment from the fishers themselves to get the co-op back on its feet."

Reward for quality

The Wallis Lake Fishermen's Co-operative is one of the few that operates with a weekly pool price for its fishers, a system that has remained relatively unchanged for many years. The pool system provides a collective reward for quality, rather than an individual reward, and encourages all members of the pool to work with that in mind.

The success of that joint approach has been reflected in last year's recognition from SFM of the co-op as a supplier of excellence. "It's been a pretty big improvement for us, to get to that level of recognition, that our product is one of the best," Suzie McEnallay says.

"I think, like a family, we've worked together to survive the difficulties and it has made us stronger. There's a good vibe now, and the fishers know the co-op is really theirs, and it is there for them."

From barely surviving to thriving, the co-op has turned over more than \$7 million per year for the past couple of years. It is about to undertake a major refurbishment of its slipway and has made a big investment in a new ice plant for members. Further expansion of the facility is also on the agenda.

Suzie McEnallay says rebuilding the co-op has included addressing the "loss of faith" the co-op suffered between the fishers and the co-op's management, between the co-op members themselves and between the co-op and the local community.

Under previous management differential pricing deals had contributed to some distrust between members and undermined operations,

she says. A real turning point in rebuilding of co-op and re-establishment of trust was the introduction of regular social barbecues five years ago. "It gave members a chance to meet and just talk about things, unrelated to fishing, which really improved relationships."

Fishing is one of the town's founding industries (Tuncurry is an Indigenous word meaning "plenty of fish"). However, when the retail shop was suffering its greatest losses, locally caught fresh seafood was generally bypassing the shop. Local customers lost faith in co-op's store as a source of good-quality, local fish and they stopped coming.

"Now we make sure that the retail shop gets the first pick of the day's catch," she says. It has become a point of pride that the best local fish caught daily are sold daily. The support of the local community was rebuilt when the local catch returned to the counter, and consumer confidence in the product on offer has seen the retail business continue to grow. It now turns over \$1 million per year: not bad for a town of 20,000 people, she says.

Fishing family

Given her family background, Suzie McEnallay has an intimate understanding of the difficulties that fishers face, the dangers of the work and the uncertainty the industry confronts in the midst of government reforms. She knows how important it is that things run smoothly, and she works with fishers to sort out smaller problems before they escalate.

Outside of office hours there are often phone calls from fishers with a simple issue such as an unset alarm, or something more important such as an ice machine breakdown. Or it could be a fisher needing some bait on a Sunday afternoon – a small matter, she says, but the difference between being able to go to work or not.

"There are boundaries, but the fishers know if they need something, or want to talk, then I'm there to help."

In 2015 Suzie McEnallay took part in the National Seafood Industry Leadership Program (NSILP), sponsored by SFM and the FRDC.

PHOTO: SHANE CHALKER



As operations manager at the Wallis Lake Fishermen's Co-operative, Suzie McEnallay ensures that fishers, and the community, can rely on the co-op to provide the best, freshest fish for their customers.

Without really knowing what to expect, she says it expanded her view of how much more there was to the sector than the commercial fishing industry.

As part of the NSILP she worked on a group education project, which developed a fisheries collect-a-card concept that was presented to Woolworths Supermarkets.

"I just know we have to focus on education. This is a generation of children that doesn't understand that the fishing industry has been around for a long time, and that there is so much protection in place to make sure we can keep fishing," she says.

That lack of understanding is something she experienced firsthand a few years ago when one of her daughters, then aged seven, made a visit to the co-op. "She saw my dad (her pop) unloading fish from the boat, and

she was nearly crying. She thought he had caught all of the fish in the sea, that there were no fish left. Of all the children, I thought my daughter would have understood more."

Expanding horizons

The importance of education is one of the reasons the co-op provides school tours and spends time teaching students about the life cycle of local marine species. "It's really important because they go home and talk to their parents and friends – they remember."

Following her involvement in the NSILP, Suzie McEnallay was chosen to take part in an eight-day study trip to the US in February 2016, to attend a local seafood summit in Norfolk. The focus of the tour was to identify business models

of similar small commercial fisheries in the US, and to learn about tapping into new markets.

The Wallis Lake Fishermen's Co-operative is already adept at tapping into tourist demand in NSW's Great Lakes region. "Tuncurry is a holiday destination and a lot of visitors say the co-op is their first stop," Suzie McEnallay says. "Mullet, flathead and Luderick fillets are our best sellers at the store but they're often unfamiliar to people visiting from the city who are used to 'restaurant' species such as Atlantic Salmon or Barramundi.

"We're often able to introduce people to something new. It's great when you can get them to try something else; I love being part of that," she says. "And I love the fact that we have a seafood industry that's still thriving and that we're seen as a positive part of our community." **F**

RD&E FOR THE RECREATIONAL SECTOR**2013/401**

This project has facilitated the prioritisation of research needs for the recreational fishing sector nationally, and the funding, management and extension of projects addressing these priorities.

Recfishing Research is a subprogram of the FRDC, established in 2005 to help increase return on investment delivered from research, development and extension (RD&E) activities that benefit the recreational fishing community at a national or multi-jurisdictional scale. Participants at a national workshop in March 2013, and in 2014, reviewed the functions that Recfishing Research delivers to ensure these remained relevant and were delivered effectively.

Recreational fishers have benefited from the program through the delivery of R&D that addresses their needs, and improved access to information on relevant topics. Fisheries managers have benefited from the provision of information to assist them in meeting management objectives, and building the knowledge base of the fishing community on issues including best fishing practices. The research community has also benefited through the communication of targeted priorities to assist in the formulation of proposals, and provision of advice to help maximise the likelihood of success in gaining investment through the FRDC's annual open round and Tactical Research Fund.

MORE INFORMATION: Matt Barwick, GreenFish Consulting, 0422 752 789

INTERNATIONAL ECONOMICS IN BRISBANE**2013/412**

The 17th Biennial Conference of the International Institute of Fisheries Economics and Trade (IIFET) was held in Brisbane in July 2014. IIFET is the principal international association for fisheries economics, and the biennial conference is an opportunity for the best fisheries economists in the world to meet and share their ideas.

During the three-and-a-half-day event, 270 participants from 39 countries benefited from 243 oral and 27 poster presentations, five plenary addresses and a variety of discussion panels, in 53 regular (submitted abstract) sessions, eight special pre-organised sessions and four plenary sessions.

A total of 63 Australians participated in the conference, representing all states and territories. Two-thirds of these were from research institutions, while the remainder were from industry and management authorities. Most of the PhD students supported through the FRDC capacity building project (FRDC 2008/306) also participated and presented the results of their research.

There was a wide range of papers presented, from theoretical and highly quantitative modelling studies through to qualitative case studies of fisheries management. The two keynote speakers provided talks related to the conference theme (ecosystem-based fisheries management and the role of economics). The special sessions ranged from marketing issues and certification, through to the greater integration of social sciences in fisheries management.

MORE INFORMATION: Sean Pascoe, CSIRO Oceans and Atmosphere Flagship, 07 3833 5966

INDIGENOUS SCHOLARSHIP**2008/326.38**

Angela Jeffery received a FRDC Indigenous Development Scholarship in 2013. She used her scholarship to develop a better understanding (within self and the broad community) of Aboriginal fishing practices – past and present – through development of educational materials.

This was undertaken as on-the-job training while working at Fisheries Victoria's Marine and Freshwater Discovery Centre and, as a result of this scholarship, by researching Indigenous fishing methods at the National Museum of Australia, Canberra.

MORE INFORMATION: Angela Jeffery, 0429 176 640

PIPI PACKAGING NEEDS**2013/237**

This project aimed to identify the trade preferences for packaged Pipi products, particularly chilled Modified Atmosphere Packs (MAP), trade and regulatory requirements, prospective demand and indicative prices to underpin the development of a market entry strategy for the selected products in domestic and overseas markets.

Field studies and desk research identified a widespread lack of understanding of Pipsis as a seafood category particularly as to how they should be stored and handled at home or in retail or food service businesses to maximise shelf life. Confusion and uncertainty about the various names on Pipsis and other bivalve molluscs referred to as Vongole, Cockles or clams were other market impediments that would need to be overcome with tailored messages on packaging and on promotion collaterals such as point-of-sale leaflets and websites.

After evaluation of all information from trade studies and desk research, the prospective demand for chilled MAP Pipsis within Australia was estimated at 30 to 40 tonnes in year one at an indicative price of \$12.50 to \$13 per kilogram in-store for Sydney wholesalers. These outcomes are likely with traditional selling practices and minimal investment in promotion, but likely sales would be about 50 to 60 tonnes or more with modest investment in market promotion.

A market entry strategy has been developed to build new marketing channels to reach new consumers, particularly specialist fine-food stores, lapsed Pipi users and people using chilled New Zealand clams. This strategy does not rely on sales through existing market channels to current retail, restaurant and home users of loose Pipsis.

Limited fieldwork and face-to-face discussions with prospective Pipi importers and trade users in Hong Kong and Singapore indicated little interest in MAP Pipsis given Australian costs and the prevailing strong value of the Australian dollar, but there is some encouraging interest in a bulk pack of frozen Pipsis, subject to meeting customer specifications and pricing requirements.

The market-entry strategy proposed for prospective overseas markets follows the same themes and marketing principles outlined for domestic markets: quality-assured products tailored to the needs of the particular customer's specifications for product quality and packing, at mutually agreeable prices and a promotional program for product launches and ongoing trade support.

MORE INFORMATION: Tom Robinson, Coorong Cockles, 08 8554 3706

2014 TRAVEL AWARD ADDS LAB SKILLS**2009/315.32**

Marianne Douglas from the Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE) received a 2014 Australian Animal Health Training Scheme award to travel to Hokkaido University, Hakodate, Japan, to obtain training in advanced molecular biology techniques.

Marianne Douglas used her knowledge to help identify a species of *Nocardia*, a bacterium associated with chronic infections, which causes outbreaks in Atlantic Salmon hatcheries in Tasmania. The evidence she gathered suggests that the Tasmanian isolates may represent a new species of *Nocardia*.

The knowledge gained during the study period in Japan was brought to immediate use at the Australian Animal Health Laboratory where Marianne Douglas helped identify another bacterium species that affects abalone, *Vibrio lentus*. Information about this analysis technique is now being written so that the procedure can be used at the Australian Animal Health Laboratories for future diagnostic cases.

MORE INFORMATION: Marianne Douglas, Tasmanian DPIPWE, 03 6777 2137

STUDY OF GIANT CUTTLEFISH SPAWNING**2013/032**

The Australian Giant Cuttlefish spawning population increased its biomass by 589 per cent in 2014 compared with the 2013 estimates. This increase occurred after a steady

For a copy of an FRDC project final report go to www.frdc.com.au or contact the FRDC on 02 6285 0400, email frdc@frdc.com.au

period of decline and coupled with the return of larger animals. It indicated that 2013-14 was a relatively favourable year for Australian Giant Cuttlefish reproduction, growth and survival, yet management is remaining cautiously optimistic, as the reason for this increase is unknown.

This project was coordinated by the South Australian Research and Development Institute (SARDI) (Aquatic Sciences) and also addressed other key knowledge gaps identified by the Giant Cuttlefish working group.

It is part of a larger collaborative research initiative undertaken by Primary Industries and Regions South Australia, SARDI (Aquatic Sciences), the University of Adelaide, the South Australian Museum and the Environmental Protection Authority through combined state and federal funding. There is a commitment by all levels of government to understand more about the biology and ecology of this species to assist in determining the future management actions required to ensure its sustainability.

MORE INFORMATION: Michael A. Steer, SARDI, 08 8207 5435

RED-LEGGED PRAWN ASSESSMENT

2013/047

To evaluate the ecological sustainability of the at-risk species, habitats and ecosystems affected by the Joseph Bonaparte Gulf (JBG) sub-fishery, existing data and assessments were synthesised to detail the changes that have occurred in the fishery in relation to temporal and spatial trends in effort, implementation of bycatch-reduction devices and the scale of monitoring of the fishery bycatch by scientists and industry.

The key outcome of this project was the collation of information to inform an external review of the JBG sub-fishery's ecological footprint and the research required to address the key information gaps. Fishery effort data was sourced from Northern Prawn Fishery (NPF) logbooks and the vessel monitoring system program, and bycatch data was sourced from NPF logbooks, the Australian Fisheries Management Authority scientific observer program and the NPF crew-member observer program.

MORE INFORMATION: Annie Jarrett, Northern Prawn Fishery Industry, 0411 426 469

NSW FRAMEWORK FOR CO-MANAGEMENT

2013/226

The Professional Fishermen's Association (PFA) was born out of concern about the future of the commercial fishing industry in New South Wales. Concern was primarily about the decline in their long-term rights to harvest seafood on behalf of the community.

While the PFA has grown and delivered an effective service to its members, there continues to be a range of issues that constrain its ability to represent the industry at large as well as being formally recognised as the voice of the industry.

This project aims to build upon previous studies assessing the issues needed to support a peak industry body in NSW. It seeks to identify the issues that will enable the PFA, or a similar body, to be recognised as the representative organisation for the industry in NSW. Further, it provides advice on options for development of co-management frameworks to enhance industry participation in the consultative processes established by government.

The project included a review of previous advice to government and the industry on options for the structure of a peak industry body. A review of the co-management processes, roles and funding of the peak industry bodies in Australian jurisdictions was also undertaken. Additionally, it engaged industry members in meetings to identify their thoughts and consideration of options for approaches by the industry and enhanced engagement with government.

MORE INFORMATION: Neil MacDonald, NMAC (SA), 0409 559 995

GILLNET IMPACTS IN TASMANIA

2010/016

In Tasmania, both recreational and commercial gillnetting is permitted. This study, conducted by the Institute for Marine and Antarctic Studies between 2010 and 2013, represents the most comprehensive investigation into the Tasmanian gillnet fishery and its implications for bycatch and biodiversity.

The research identified several species at high risk, each specific to a sub-fishery and a result that reflects differences in mesh selectivity as well as differences in the spatial coverage of the fisheries. Bastard Trumpeter was the only species ranked as high risk in the graball (reef) sub-fishery, largely because inshore reefs represent the core habitat for juveniles and sub-adults and the species is particularly susceptible to gillnet capture.

None of the species that interacted with the graball sub-fishery were ranked as high risk, predominantly due to the high level of selectivity achieved for the target species by the large mesh size. Atlantic Salmon and Rainbow Trout were ranked as having high vulnerability in the non-reef sub-fishery but, being introduced exotics, this represents a positive ranking, with fishing pressure contributing to their removal from the environment.

Maugean Skate and Whitespotted Dogfish were also identified as high vulnerability species; the former has a highly restricted distributional range, presumed low population size and key biological attributes are unknown, and the latter is among the least productive known Chondrichthyan species (cartilaginous fish).

Within the small mesh fishery, the Great Cormorant, Rock Flathead and Snook were ranked as having high vulnerability, although low catches and wide distribution outside of Tasmanian waters suggest the actual vulnerabilities, for the fish at least, may not be as high as implied by this analysis. Of the marine mammals, other seabirds and other Chondrichthyans were ranked as medium vulnerability, mainly due to low productivity levels.

MORE INFORMATION: Jeremy Lyle, University of Tasmania, 03 6227 7255

AGEING FISH WITH LIGHT

2012/011

Results from the current proof-of-concept study indicate that near infrared spectra (NIRS) collected from fish otoliths have potential to estimate the age of Barramundi (*Lates calcarifer*) and Snapper (*Pagrus auratus*), with performance varying between species and locality of capture. A case study of hypothetical running costs suggest significant cost savings could be achieved if NIRS is used to supplement standard fish-ageing methods. However, there is considerable time (at least three years) and start-up costs to develop and validate NIRS calibration models for fish age to a point where only maintenance is required.

Results also indicate that NIRS may be particularly useful for spatial stock discrimination. The potential applicability of NIRS was recognised by end user stakeholders in Queensland and the Northern Territory, who are proposing further research work. Understanding what NIRS measures in fish otoliths and how this is correlated with age (or geographic location) was a common desire of fisheries end users in all jurisdictions, because this knowledge could reduce error and would significantly enhance the applicability of NIRS technology in fisheries science.

MORE INFORMATION: Julie Robins, Queensland Department of Agriculture and Fisheries, 0488 093 648

DECKHAND APP PASSES TEST

2011/250

From January to March 2012 the South Eastern Professional Fishermen's Association trialled a version of the iPad and iPhone application Deckhand, developed by Real Time Data, onboard 22 vessels in the South Australian Southern Zone Rock Lobster Fishery (SZRLF). The SZRLF was the first fishery in Australia to begin commercial trials of this nature with this application. The project aimed to deliver a functional,

onboard, electronic data capture system that addressed requirements of regulators, research agencies and industry, and to do so in a cost-effective manner.

Ultimately, the project has resulted in a functional and robust onboard electronic reporting mechanism for fishers that will be adopted on a fishery-wide basis in the SZRLF for the 2015-16 season, as well as being trialled in several other "like" fisheries including the SA Northern Zone Rock Lobster Fishery.

MORE INFORMATION: Justin Phillips, Justin Phillips Consulting, 08 8132 0257

SOCIAL SCIENCES SUMMARY

2012/300

The FRDC Social Sciences Research Coordination Program I & II arose from the recognised need for the social sciences aspects of industry to be taken into consideration subsequent to the largely economic drive of the 1990s. This report summarises the key activities of the Social Sciences and Research Coordination Program II (SSRCP II), which was implemented in 2012 and concluded in 2015. It focuses on the key objectives of the program, achievements and recommendations for future iterations of this type of program, and areas where the FRDC may want to focus efforts to encompass the social sciences dimension of fisheries research.

MORE INFORMATION: Kate Brooks, KAL Analysis Pty Ltd, 03 9917 2665

2014 VISITING EXPERT DAN GWINN

2008/328.22

The aim of this project was to enable Dan Gwinn to meet with Australian leaders in fisheries research and management as part of a coordinated program of meetings, workshops and presentations, to optimise outcomes delivered for high-profile/high-value species and fisheries in eastern Australia. Visits, meetings and workshops conducted during the visit by Dan Gwinn resulted in outputs and outcomes across several species and fisheries of commercial and recreational value. The visit by Dan Gwinn has been invaluable to Australian fisheries researchers and managers, in terms of design and evaluation of fish monitoring and assessment methods.

MORE INFORMATION: Dan Gwinn, University of Florida, dgwinn@ufl.edu

ECONOMIC REFERENCE POINTS

2011/200

Improving the economic performance of Australian fisheries requires identifying appropriate target reference points, which are often measured in terms of the biomass level for each species. Within multispecies fisheries, identifying the level of biomass that is associated with maximum economic yield requires detailed bioeconomic models of the fisheries. For many fisheries, such models are unavailable, so some form of cost-effective proxy measure is required to estimate approximate target reference points based on, in some cases, limited information.

In this study, a framework was developed for estimating appropriate economic target reference points for species within mixed fisheries. The framework was tested against a case study fishery, and it was found that the framework, while not perfect, was able to perform better than current default assumptions about the target reference points.

MORE INFORMATION: Sean Pascoe, CSIRO Oceans and Atmosphere Flagship, 07 3833 5966

MAKO, PORBEAGLE SHARKS: WHAT DO WE KNOW? 2011/045

The Porbeagle (*Lamna nasus*), Shortfin Mako (*Isurus oxyrinchus*) and Longfin Mako (*Isurus paucus*) are lamnid sharks with widespread distributions across the world's oceans. Makos are generally bycatch and byproduct species of pelagic longline and gillnet fisheries (both pelagic and demersal) where they are kept for their meat and high-value fins. They are also a highly prized recreational species in many regions. Porbeagle Sharks are taken as bycatch primarily in pelagic longline fisheries, although small target fisheries exist in the north Atlantic Ocean.

Lamnid sharks have low productivity because they do not mature until reaching a large size, producing few young and are unlikely to reproduce annually. Risk assessments in Australia, the Indian Ocean and in the Atlantic Ocean have concluded that Mako and Porbeagle Sharks fall within the medium to highest risk of all pelagic sharks to the impacts of fishing.

This project summarises the available information on the population biology of the Shortfin Mako, Longfin Mako and Porbeagle Sharks in Australasian waters and other parts of the world based on a workshop held at CSIRO Marine Laboratories, Hobart, and via reviews of published literature.

The report evaluates the available catch and effort data from the Australian fishery that takes the majority of mako sharks in Australian waters (the Eastern Tuna and Billfish Fishery) and provides data summaries of catches from other fisheries in Australia and New Zealand.

It also provides a series of progress reports on current research in the Australia-New Zealand region and the Pacific Ocean. Although available data does not indicate any evidence for significant declines in Mako Shark abundance, it is not possible to quantitatively assess their current status in Australasian waters. Mako and Porbeagle Sharks have a demonstrated vulnerability to the impacts of fishing in other regions, and experiences in both the Mediterranean Sea and Atlantic Ocean support that careful attention towards monitoring their populations elsewhere is required, including in Australasian waters.

The workshop provided a highly successful construct to discuss datasets and research as well as facilitating collaborative partnerships between researchers, management agencies and stakeholders. The comprehensive information collated will support management and inform policy decisions into the future. These elements combined to form a useful framework from which not only to guide nationally coordinated initiatives for Mako and Porbeagle Shark research, but also offer a model for addressing similar issues for other species with international cross-jurisdictional links that require a nationally coordinated approach to research and management.

MORE INFORMATION: Barry Bruce, CSIRO Marine and Atmospheric Research, 03 6232 5413

ECOSYSTEM MODELS FOR THE SEAFOOD SECTOR 2011/205

This project was undertaken to provide a Spencer Gulf ecosystem model capable of addressing "what if" scenarios for the fisheries and aquaculture sectors. The Spencer Gulf ecosystem model is needed to provide fisheries and aquaculture managers with evidenced-based information on the effects of current and future developments in the Spencer Gulf.

Once further refined, the Spencer Gulf ecosystem model will provide industry and managers with a tool to investigate drivers of change in ecosystem indicators, as well as changes in catch of key fisheries (for example, sardines and Western King Prawns) and levels of aquaculture production. How changing effort in the Spencer Gulf Prawn Trawl Fishery affects important bycatch species can also be investigated in more detail including in relation to bycatch reduction devices.

The project provides proof-of-concept for the coupling of several different models to assess how fishing and aquaculture can interact with each other and affect ecosystem structure and function. This project is an important first step towards the establishment of scientific tools that can be used to determine the individual and cumulative impacts of all industries that operate in and around the Spencer Gulf. Such tools are needed to ensure that both the health of these ecosystems is maintained and the socioeconomic benefits of these industries to the community are maximised.

MORE INFORMATION: Bronwyn Gillanders, University of Adelaide, 08 8313 6235



Movers and ...



WAYNE HUTCHINSON joined the FRDC on 1 February 2016 as project manager – research. He was previously subprogram leader, propagation and systems, for the Aquaculture Program of the South Australian Research and Development Institute, Aquatic Sciences. Wayne Hutchinson is the first staff member to be located at the FRDC’s Adelaide office.

The National Seafood Industry Alliance has new office bearers. **KATHERINE WINCHESTER** replaced **GRAHAME TURK** as chair; **FRANCA ROMEO** took over from **NEIL STUMP** as secretary; and **ALEX OGG** is the new treasurer, following **JOHN HARRISON**. **RHONDA FARLOW** remains the support officer.

KIM CHANCE (former Western Australia Minister of Agriculture) was recently elected as chair of the WA Fishing Industry Council (WAFIC) replacing **ARNO VERBOON**. **NATHAN ADAMS**, a National Seafood Industry Leadership Program graduate, was elected to replace **KERRY ROWE** on the WAFIC board.

ROBERT LOAT has been appointed as the new chair of VRFish, the Victorian recreational fishing sector’s peak body.



FELICITY HORN has replaced Phil Bruce as executive officer for Shark Bay Prawn Trawler Operators.

RHYS HAULER has taken on the role of commercial manager at the aquafeeds manufacturing company Skretting Australia.

Clean Seas has announced the appointment of **DAVID HEAD** as its new managing director and chief executive officer. He replaces **CRAIG FOSTER**.

HARRY PETROPOULOS has replaced **JONAS WOOLFORD** as independent chair of Wildcatch Fisheries SA.



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INFO PLEASE TO

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Calendar of events

DATE	EVENT	MORE INFORMATION
2016		
6 to 8 March	Seafood Expo North America/Seafood Processing North America, Boston, US	www.seafoodexpo.com/north-america
26 to 28 April	Seafood Expo Global/Seafood Processing Global, Brussels, Belgium	www.seafoodexpo.com/global
10 to 11 May	FRDC Board Meeting, Sydney, New South Wales	02 6285 0400
23 to 27 May	7th World Fisheries Congress, Busan, South Korea	www.wfc2016.or.kr/english/main/index_en.asp
4 to 7 July	New Zealand Marine Sciences Society and Australian Marine Sciences Association Sharing Ocean Resources Joint Conference, Victoria University of Wellington, Wellington, New Zealand	www.amsa.asn.au
11 to 13 July	2nd Global Summit on Aquaculture & Fisheries, Kuala Lumpur, Malaysia	http://aquaculture.global-summit.com
11 to 15 July	International Institute of Fisheries Economics and Trade Conference, Aberdeen, Scotland	www.iifet-2016.org
4 to 6 August	ASEAN Fisheries and Aquaculture Conference and Exposition 2016, Bangkok International Trade & Exhibition Centre, Bangkok, Thailand	www.aseanfishexpo2016.com
24 to 25 August	FRDC Board meeting, Canberra	02 6285 0400
5 to 8 September	Australian Society of Fish Biology Conference, Hobart	http://asfbconf.asnevents.com.au
6 to 8 September	2016 Seafood Expo Asia, Hong Kong Convention & Exhibition Centre, Wanchai, Hong Kong	www.seafoodexpo.com/asia
22 to 23 November	FRDC Board meeting, Canberra	02 6285 0400



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FISHERIES RESEARCH & DEVELOPMENT CORPORATION



Discover
the latest information
on fish species



Catch of the day

King Prawns

King Prawns are the most popular species of prawn in Australia, due no doubt to their rich flavour and moist flesh. They are extremely versatile and excellent for display purposes. Suggested coatings include batters (regular or tempura) with a touch of saffron.



Recipe of the day

Lime and Lemongrass BBQ Skewered Prawns

The combined flavours of lemongrass, chillies, ginger, sugar and fish sauce will certainly entice you and your guests to more than one of these skewers at your next lunch or dinner event.



Knowing

Trouble deciding on which fish? Look here for some help



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What you need to know about handling and storing seafood



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