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# Market makeover for Australian Salmon

MARKETS Atlantic Salmon may soon have a challenger in the form of a native namesake that is the focus of new initiatives from harvesting to product development

#### By Rose Yeoman

We eak demand and low prices, rather than reduced fish numbers, have been responsible for the decline in commercial catches of Australian Salmon since the mid-1990s. However, this could be about to change thanks to a new Australian Seafood Cooperative Research Centre (Seafood CRC) project that is using an existing technology to improve fish quality. The project is also fostering collaboration between researchers and industry, and contributing to some clever new seafood product development.

Western Australian Salmon (*Arripis truttaceus*) is a sea perch from the family Arripidae. It is closely related to its eastern counterpart *Arripis trutta* (Eastern Australian Salmon), but despite the name, neither are related to the true Salmon – including Atlantic Salmon (*Salmo salar*) – of the family Salmonidae. Australian Salmon is only one of many underutilised finfish species that will be included in the database developed as part of this Seafood CRC project.

The database will include challenges specific to each of the underutilised species that make it difficult to bring a reliable quantity of quality product to the marketplace.

Janet Howieson, from the Centre of Excellence for Science, Seafood and Health (CESSH) at WA's Curtin University, is coinvestigator on the project and says Australian Salmon is the first species to be studied in depth.

As manager of the post-harvest supplychain improvement program at CESSH, Janet Howieson's focus is to improve the performance of seafood supply chains through science and innovation. This includes the development of new seafood products, which she says need to be driven by end users.

Each year in Australia, about 25,000 tonnes of finfish that could be sustainably harvested are overlooked. Janet Howieson says the reasons for this are diverse. For example, sardines and Australian Salmon both have a comparatively short shelf life. They require an exacting supply chain to reach the market in good condition. "This means they must be caught and processed quickly so they reach the market in the shortest possible time to maintain their quality," she says.

Other species might only be found in remote locations where there is a lack of infrastructure, such as chilled or frozen storage space, to harvest and process them, and bring them to markets in good time and in good condition. And if market demand for a specific species is relatively weak, when additional tonnages are harvested the fish are destined for lower-value product such as bait and aquaculture feed.

Consumer perceptions can also be a challenge. Australian Salmon has been perceived as an "average" eating fish. However, when processed quickly and served in the right way, consumers have rated it close to Barramundi (*Lates calcarifer*) in desirability.

#### Harvesting challenge

Early in the analysis of Australian Salmon, an industry development group was formed and fishers, processors and marketers held a workshop to identify the best practice processes that would bring fish to market in the best possible condition. This included the need to process fish as quickly as possible to maintain flesh quality.

Studies show that when a fish dies slowly, it runs out of oxygen, which leads to a build-up of

Fishing for Australian Salmon: commercial beach haul netting at Cheynes Beach, 60 kilometres east of Albany, on the south coast of Western Australia.



lactic acid in the tissues. This produces opaque flesh and lowers pH, causing sour-tasting fish. It also makes the flesh soft, which means a shorter shelf life. Avoiding such pitfalls and harvesting to promote quality is a fundamental step in the chain of events leading to quality marketable Australian Salmon products.

The Australian Salmon industry group looked at what other sectors of the seafood industry were doing to maintain quality, including processes to kill fish quickly and without causing them stress. A portable 'stunning machine', the size of a large office desk, emerged as the possible key to revolutionising the Australian Salmon industry in WA.

Originally developed by Queensland company Seafood Innovations for the Atlantic Salmon industry in Tasmania, it uses compressed air to stun fish. Fisheries scientist and Seafood Innovations founder Bruce Goodrick explains that in order to preserve good eating quality, a fish's environment should be as natural as possible until the second it dies.

With this in mind, his company, now owned by Baader and known as Baader Seafood Innovations, developed a series of stunning machines that simulate an environment where fish are enticed to swim into the stunning machines. The machine then delivers a high-speed blow to the skull.

Considered to be one of the most humane and efficient ways of killing fish, the technique is known as 'percussive stunning'. If fish entering the machine are all the same species, the same level of stunning may be used for fish ranging from one to 15 kilograms.

A trial with Australian Salmon was held at Bettys Beach on WA's south coast, where fish were harvested with beach haul nets. Fish were taken from the nets on the beach, stunned, hand bled and placed in ice slurry for transport to a processing plant in Albany. A total of 1.4 tonnes of frozen fish was produced for market trials and new product development.

#### Salmon products

Value-added products produced from the 'quality' fish samples included eight flavours of canned smoked Australian Salmon, an Australian Salmon fish burger and Thai fish cakes with 100 per cent Australian fish. A dog-food range of dried slices and cuts and seafood jerky have been suggested but not yet developed.

Janet Howieson reports that chef Dale Sniffen experimented with hot-smoked Australian Salmon

and took samples to his fly fishing club. "The response was overwhelmingly positive," she says. "The samplers were intrigued by the excellent flavour – they could not tell whether it was cobbler, flathead, queen snapper or some other fish."

Dale Sniffen also developed 'Australian Fish Cakes' and 'Australian Thai Fish Cakes' from frozen vacuum-packed loins. These are a cost-effective use of product and have been well received by consumers.

In a consumer taste trial at Curtin University, microwaved frozen fillets of Australian Salmon were presented alongside similar products of Spanish Mackerel (*Scomberomorus commerson*), Barramundi, mullet, snapper and whiting. Overall, the salmon was fourth in preference, but close to Barramundi.

In another survey, also at the university, 83 per cent of respondents said they would be more likely to choose products from a wellmanaged fishery and 66 per cent said they would pay a premium price for them.

#### **Project partners**

Janet Howieson says the support of industry partners for her work has been crucial. One partner is Garry Bevan, of Bevans (WA) Pty Ltd, the only export-registered fish-processing plant in Albany. Bevans exports to South-East Asia.

"There's a shortage of protein in the world and Australian Salmon comes from the pristine waters of the Southern Ocean. If handled and processed correctly, it will be desirable."– Garry Bevan





Bevans has sent the 'quality' market samples of frozen whole fish, headed and gutted fish, fillets and loins to South Korea, Thailand, China and Hong Kong and while there are no confirmed orders as yet, a second and larger quantity of samples has been sent for further assessment.

Garry Bevan is optimistic: "There's a shortage of protein in the world and Australian Salmon comes from the pristine waters of the Southern Ocean. If handled and processed correctly, it will be desirable," he says. "Setting up the supply chain correctly and providing a consistent supply would be crucial."

Catalano's Seafood is a WA fish processor, wholesaler, retailer and exporter. The business has developed a jarrah-smoked Australian Salmon, which should reach the market within a year. Managing director Nick Catalano says: "Without Janet's help we would not have gone down this path. We want to offer the fishery an alternative market and we're satisfied with the first stage of R&D and that we have a product for human consumption. The texture stands up well to smoking."

Nick Catalano is clear about the value of promoting sustainably fished products. "Our objective is to process Australian, especially Western Australian, product and we see the Australian Salmon fishery as sustainable. There's no point putting energy into a non-sustainable fish."

Fisher and processor Tony Westerberg has created tinned value-added products as his contribution to the project. Taste tests have identified two flavours – Penang curry and matsaman – as being most desirable and he hopes to launch the product within the next six months.

#### The future

Les Pinninger is a long-time professional fisher on WA's south coast who counts Australian Salmon as part of his catch. He says fishers are very interested in developing a range of new markets. "They're willing to adjust their methods of handling and potential volume of catch to meet market expectations, particularly to achieve improved quality," he says.

John Harrison, CEO of the Western Australian Fishing Industry Council, also sees a lot of potential for the WA Salmon fishery. "I am a firm believer that we've got an opportunity to provide real value-adding to a product historically regarded as somewhat low in value," he says. "We've got an opportunity to fit into a marketplace where it is becoming increasingly difficult to purchase wild-harvest fish.

"A high-quality fish at lower cost will fit well into the shopping cart of those who cannot afford



(From left) Cost-effective 100 per cent Australian Fish Cakes and 100 per cent Australian Thai Fish Cakes made from Australian Salmon loins, and hot-smoked Australian Salmon pieces, all created by chef Dale Sniffen.

premium-priced product. It's Australian, attractive in taste and likely to be competitively priced. And there's the potential to stimulate the economy, as this fishing industry will be economically viable."

Janet Howieson says an increased and more valuable market share will be possible as fishers optimise their harvesting techniques, quality management and supply volumes.

"There will also need to be an increased infrastructure capacity in Albany to manage increased harvest volume," she says. "Work is continuing with the industry development group on these issues, as well as the value-added product development and on exploring new markets."

The underutilised finfish species database is expected to be complete by mid-2015, although new species may be added as market conditions change. Two or three other underutilised species from the database will be chosen for further work. Stakeholder consultation has so far provided positive responses with producers in Esperance, the Pilbara trawl and the Great Australian Bight requesting project development for other finfish species.

However, case-study species selection will also be dependent on whole-of-chain commitment from producers, processors and retailers or other end users. Janet Howieson says this aspect is essential for the successful launch of new seafood products. In brief



#### Award for recovered waste

Janet Howieson, from Curtin University, has won the Health Sciences Prize in the Curtin Commercial Innovation Awards 2014 for her work to minimise waste in the seafood industry. Her research has included work with Peter Jecks from Abacus Fisheries to find sustainable ways of designing and manufacturing products from the waste created from processing Blue Swimmer Crabs (*Portunus armatus*).

"Instead of going to landfill or being made into low-cost products such as fertiliser and pet food, we've discovered ways to meet the needs of niche consumer markets, in a cost-efficient way, at industrial scale. We've created gourmet fishcakes from Blue Swimmer Crabs, which are being sold to high-end restaurants," Janet Howieson says.

The FRDC and the Australian Seafood Cooperative Research Centre helped to fund the research.

More information: search 'Curtin finds new value in seafood waste' on YouTube

#### Fisheries a global priority

Australia was among 11 member countries of the International Coalition of Fishing Associations (ICFA) represented at a meeting of the organisation held at the offices of the Food and Agricultural Organization (FAO) in Rome in September.

The FAO's director of fisheries and aquaculture policy, Lahsen Ababouch, opened the first day, recognising the importance of meetings between ICFA and FAO. The FAO's Fisheries and Aquaculture Department provided presentations on illegal, unreported and unregulated (IUU) fishing, food security, climate change, traceability and statistics.

Presentations on the Blue Growth Initiative and the role of seafood in global food security clearly identified fisheries and seafood as a priority for the FAO; the key focus now is getting the balance right. The FAO says it is important to ensure productivity (food production) is the primary driver, while still delivering a high level of environmental and social sustainability. The second day of the meeting discussed key policy issues facing the seafood industry around the globe. These included: International Marine Organization vessel numbering and other anti-IUU measures; the Global Seafood Sustainability Initiative; the role of fisheries in global nutrition; traceability; and working conditions and ethics in the seafood industry (human rights).

Australia tabled the issue of seismic surveying, noting it was becoming a

significant issue and that several research projects were already underway.

#### ICFA

The International Coalition of Fisheries Associations (ICFA) is a coalition of the national fish and seafood industry trade associations from the world's major fishing nations. ICFA provides input into global policies for the long-term sustainable use of living marine resources.

#### DRAFT GLOBAL SEAFOOD BENCHMARKS REVISED

A second round of public consultation will be held on the development of a global benchmarking tool to improve the comparability of different fishery sustainability systems around the world. The tool has been developed as part of the Global Sustainable Seafood Initiative (GSSI), whose partner organisations represent all sectors of the fishery and seafood supply chains and stakeholder communities including retailers, seafood processors, food services and NGOs.

Australian stakeholders who commented on the initial draft of the tool during the first round of public consultation included Sydney Fish Market, with support from the FRDC, and the Western Australian Department of Fisheries. All submissions can be viewed at the GSSI website (www.ourgssi.org).

GSSI Executive Committee chair Bill DiMento thanked all those who submitted comments or participated in public consultation webinars and workshops. "This initial working draft was created by a diverse range of stakeholders who were still working to find common ground on some issues."

The GSSI's three expert working groups (aquaculture, fisheries and procedural) will use the comments received during the first public consultation to revise the tool. It will then be tested and released for a second public consultation period early in 2015. The revised draft will include a report that details how comments received during the first public consultation phase were addressed on an issue-by-issue basis.

#### Oyster studies for Nuffield Scholar

Stacey Loftus, from Wonboyn Lake in New South Wales, has been awarded a 2015 Nuffield Scholarship, supported by the FRDC, to study marketing and branding in oyster production.

She is the business manager of the family oyster farm, working with her husband Andrew and parents-in-law Ross and Anne Loftus. The farm is one of the largest oyster producers in Wonboyn, farming nine leases over 13 hectares and producing close to 360,000 oysters for the domestic market, mostly wholesale into Brisbane and Sydney.

Stacey Loftus says historically the Sydney Rock Oyster (*Saccostrea glomerata*) industry has not branded or

marketed itself well, a situation she wants to improve. She plans to investigate how oyster farmers all over the world have successfully used branding.

"I am particularly interested in how longstanding industries in Europe and the revitalised American sector approach marketing. I can also draw experience from other industries," she says. Stacey Loftus will travel to the US, France, Ireland, Japan and Singapore to complete her Nuffield Scholarship research.



## The pointy end of strategy planning

POLICY AND PLANNING The next iterations of the National Fishing and Aquaculture RD&E Strategy and the FRDC's RD&E Plan are progressing

V aluable input has been received from stakeholders for the next iteration of the National Fishing and Aquaculture Research, Development and Extension (RD&E) Strategy, being coordinated by the FRDC, and also the FRDC's RD&E Plan.

Input has come from a range of forums including an end-user workshop held in Adelaide in July, meetings with the FRDC's representative organisations and a national workshop with the Fisheries Research Advisory Bodies (FRABs) in April.

Input for both documents will also be bolstered with input from several studies that have been completed or are in the process of being completed. These are a capability audit of research capacity in Australia and an overview of all sectors of fishing and aquaculture in Australia that includes some of the external/international drivers.

The capability audit, conducted by RDS Partners, is now completed. It shows that over recent years, especially the five years since the last audit in 2008, investment levels for fishing and aquaculture research have been at a standstill. If considered in real terms it would represent a decrease.

The Strategy Governance Committee, which oversees the development and implementation of the National Fishing and Aquaculture RD&E Strategy, notes that this data confirms that we are being asked to do more research with fewer resources.

Other outcomes of the capability audit show that there has been a trend of capability moving from state government research agencies to universities, particularly in the eastern states. The Strategy Governance Committee believes the outcomes of this study show that this shift is not creating any gap in research capability.

"The 2013 capability audit shows that themes of the 2010–15 strategy helped to deal with gaps that existed in capability at that time, especially in the area of aquatic animal health," says Patrick Hone, chair of the Governance Committee.

Another key study forming both the FRDC RD&E Plan and the National Fishing and Aquaculture RD&E Strategy is an environmental scan of fishing and aquaculture in Australia. This study is yet to be completed but there are some interesting trends, especially internationally. "The World Bank predicts that not only is global population going to rise to nearly nine billion by 2050, but seafood per capita consumption is expected to rise from about 17.5 kilograms per year to 18.2 kilograms per year by 2030. Thus, there are two factors at play here resulting in increased demand for seafood," says Ewan Colquhoun of Ridge Partners, who is conducting the study.

In October the Strategy Governance Committee met in Melbourne to discuss and refine the outcomes from the end-user workshop held in July. The Governance Committee confirmed the key issues that the strategy will attempt to address, including:
how Australia's fisheries and aquaculture are managed, and acknowledged, to be ecologically sustainable;

- security of resource access and allocation;
- maximising benefits and value from fisheries and aquaculture resources;
- streamlining governance and regulatory systems;
- maintaining the health of habitats and environments upon which fisheries and aquaculture rely;
- people development and capacity building; and
- aquatic animal health and biosecurity (inclusive of pests).

The FRDC is considering changing the structure through which it prioritises research to a multi-pronged approach that funds national, regional-based and sector-level priorities.

Crispian Ashby, programs manager at the FRDC, says: "While we are aiming to be more targeted in our investment in some key national priorities, we have a range of mechanisms, such as FRABs, subprograms and industry partnership agreements, that ensure that we are funding priorities from the grassroots of fishing and aquaculture.

"We will continue to utilise these avenues both to ensure we are meeting the grassroot needs and that all sectors are getting the RD&E they require." **F** 

"The 2013 capability audit shows that themes of the 2010–15 strategy helped to deal with gaps that existed in capability at that time, especially in the area of aquatic animal health."

– Patrick Hone

## Listening: an essential first step

MARKETING Talking to industry members about what they want from a seafood marketing program is a vital part of ensuring it delivers

#### By Peter Horvat

The FRDC is bringing together the expertise of some senior and respected seafood industry members in a Marketing Function Advisory Committee and engaging communications specialists to develop a marketing program for the seafood industry to consider.

The first meeting of the FRDC's Marketing Function Advisory Committee was held in Sydney on 17 September 2014. Committee chair Brett McCallum opened the day noting that the aim of the meeting was to allow the FRDC to hear views and obtain feedback from committee members on its proposed marketing engagement. This would help the FRDC to confirm whether it was heading in the right direction and to make changes to its approach if needed, before asking the wider industry for feedback.

"Industry asked government for the FRDC to include marketing activities," says Brett McCallum. This resulted in the FRDC's exploration of marketing.

The FRDC communications, trade and marketing manager, Peter Horvat, provided context for the discussion, touching on some of the most significant seafood marketing events of the past 20 years.

The background to collective approaches to seafood marketing in Australia has not always been a smooth path and the committee noted the seafood industry has a long memory.

The basic approach the FRDC is taking is to listen to industry and to find out what industry wants to achieve at both an individual business level and for the seafood industry as a whole.

The committee looked at what industry does in marketing now and what activities need to be undertaken in the future to achieve results across a arrange of "key marketing themes" – seafood trade, education, seafood markets, promotion, quality and seafood safety. The goal was to find out if these categories were easily understood, if they accurately represented what industry was doing, whether other key areas were missing, and if these would be priorities for the future.

The results indicated the initial approach needed some refinement as some themes meant different things to different people. As a result the themes were refined as follows.

#### Market and consumer research

... is about having the knowledge and understanding of what your customers like or do not like. It is about knowing how they want your product to be available. This category should be one of the most important of all marketing areas because it will mean you can better target what you do and ensure you get the result you are after.

#### Image of seafood industry (not product)

... is about you the fisher, you the industry and not what you sell. It is about how the community sees your activities and values you as a fisher or fish farmer.

#### International trade

... is about undertaking activities in overseas markets – China and Japan for example. Note this area will not be a category for all industry sectors.

#### Retail (point of sale)

... is about how your brand or product is seen at the point of sale. This includes information supplied to the retailer, in-store packaging and demonstrations, window dressings and in-store promotional activities. This category should apply to anyone who has seafood that ends up in a retail shop.

#### Advertising

... is about the sales pitch. It is how you communicate with the consumer. It includes television, radio and print advertising,

Next steps: feedback

The FRDC wants to know what is good

and what is bad. We want to hear your

thoughts. Email, phone or visit the new

FRDC marketing function website.

www.seafoodmarketing.frdc.com.au

It is a place where everyone can come

together to share ideas and thoughts.

magazine articles about your product or company, public relations activities, celebrity endorsements, product and company placement on menus. This category is broad and will apply to most companies selling seafood.

#### Education (learning about seafood)

... is about helping customers and chefs understand your product: what it is, where it comes from, and how to prepare and cook it.

#### Quality standards

... is about ensuring your product or brand has a baseline that every customer knows they will receive each and every time they purchase it. It is a combination of research (getting the quality), guidelines and marketing, which informs customers what they should expect every time.

#### Seafood safety

... is like quality: it underpins both your product and brand. It is something that every customer expects and demands that you are able to show. It is a combination of research (ensuring good monitoring, processes and practices) and marketing telling customers what to expect as well as when and why a product is not available.

Key take-home messages from the first meeting of the committee included the following.

- Language simple language was very important. Poorly chosen words could bring the process undone. For example, the committee understood what the term 'engagement' means, but were not sure it would be clear to everyone. They suggested using simpler terms like 'listening'.
- A lot of fishers across the country are doing it tough.
- There is a need for a clear definition so everyone is clear about what a marketing activity is and what it is not.
- There is a lot of entrenched industry scepticism. The FRDC needs to allow time to work through the issues with industry.
- Target audience recent research by the FRDC indicates there are nationally about 14,000 to 15,000 commercial fishing licences, which are owned by about 6500 entities (people and companies). The FRDC needs to prioritise who it speaks with, but also allow everyone the opportunity to have a say.

#### At the first meeting of the committee members

were keen to assist the FRDC initiate the listening process with industry about a marketing function and hopefully see a program that brings industry together. However, they also made it clear that the FRDC process needed to be well considered and transparent. **F** 



#### MARKETING Prestige, premium prices and even state bragging rights are some of the benefits that come with gold medal status for aquaculture producers taking part in the Sydney Royal Fine Food Show

#### By Catherine Norwood and Ian Lyall

n February 2015 some of Australia's best farmed seafoods will line up before the judges in the increasingly high-quality and hard-fought contest for champion status in the Sydney Royal Fine Food Show's Aquaculture Competition.

New South Wales-based Tathra Oysters, for instance, will be seeking to defend its championship status, after winning the Champion Sydney Rock Oyster title in both 2013 and 2014. The business has competed continuously at the Sydney Royal Fine Food Show since the aquaculture competition was launched in 2001. The many gold and championship medals Tathra Oysters has accumulated over the years have helped the company achieve a premium price for its product, according to owner Gary Rodely.

"Our philosophy at Tathra Oysters has always been to try to grow the best possible oysters. When we have choices of quantity or quality in our farming process we always try to steer towards the quality option. But this best-quality approach only works in a business model if the end product attracts a premium price that more than offsets the extra expenses incurred.

"We are now lucky enough to attract that premium price. It has been our successes at the show that have given our product the credibility in the marketplace we needed. When you have a Sydney Royal medal behind you it commands great respect in the food industry," Gary Rodely says.

Tathra Oysters also claimed the inaugural President's Medal and \$10,000 prize in 2006. The medal – the pinnacle of the Sydney Royal Awards – is awarded from a field of six finalists who are top producers that have been named as champions in their class from the combined Sydney Royal Wine, Dairy and Fine Food Shows. The President's Medal evaluates triple-bottom-line performance: profitability, community engagement and sustainability.

Other aquaculture businesses to make the finals for the President's Medal include Huon Aquaculture in 2010, with Atlantic Salmon, and Gold Coast Marine Aquaculture in 2009 and 2013, with Gold Coast Tiger Prawns. Gold Coast Marine Aquaculture has won 20 gold medals, the Champion Prawn exhibit a record six times, an Award of Excellence and a Heroes Award, as well as two President's Medal nominations.

Owner Noel Herbst says the success of Gold Coast Tiger Prawns is the result of the efforts and commitment to quality of staff at the hatchery, farm and processing facilities.

"The prestige of winning gold medals at the Sydney Royal Fine Foods Show gives us a great advantage as a marketing tool. When you have a high-quality product and the awards to prove it there is immediate acceptance in our displays and advertising.

"The Sydney Royal Aquaculture Show is the most important peer-judged competition in our industry and the feedback we get is vital to keeping us from 'dropping the ball' in the future," he says.

Speaking about the benefits of being involved, the co-founder and director of Huon Aquaculture, Frances Bender, says it helps the company tell its story about quality and to maintain a good market presence.

"We have had a wonderful success rate and are extremely proud of the fact our locally produced products are considered of such high grade by so many local and national judges. We were thrilled to be recognised as one of six finalists, from a field of 5000, for the President's Medal in 2010 and we continue to point to it as evidence of our product being of the highest grade." She says the awards are also an opportunity to benchmark the company's products against the best in Australia.

Other participants also point to feedback from the judges as one of the most valuable parts of being involved.

"Exhibitor feedback sheets are sent out after the competition showing you how your oysters were rated in 10 categories such as richness, presence and texture," says South Australian Pacific Oyster producer Brendan Guidera, of Pristine Oysters, who achieved gold medal and champion status in 2013.

"This information has been very useful in helping me understand what the most desirable characteristics of our oysters are perceived to be as determined by people deemed to be the most qualified to judge."

When Daintree Saltwater Barramundi first entered the Sydney Royal competition in 2006 it had no way to benchmark the quality of its product, so the judges' feedback was invaluable, manager Mark Hober says. His product achieved a bronze medal status in that first year. "Since then we have worked hard to improve quality and gone on to receive gold and champion of class awards," he says. "Attending the awards presentation ceremony along with all the other winners across the different classes was also a great learning experience and networking event, especially with the Sydney connections."

Mark Hober says the competition has given the business greater recognition and confidence in its product. "I encourage other producers to be part of it, as it is a stringent test and will help you better understand your product. We enjoy entering and we hope that by doing so we set the bar higher for other Barramundi farmers."

#### Changes for 2015

The Sydney Royal Fine Food Show has evolved to reflect changing trends in the Australian food industry and in consumer tastes. These trends include a greater acceptance of a more diverse range of quality aquaculture products from around Australia. From just two categories, for Sydney Rock Oysters and prawns, in 2001, the aquaculture competition in 2015 will also include Pacific and Native Oysters, Barramundi, fresh and smoked Atlantic Salmon, Ocean and Rainbow Trout, other fish species and value-added products such as paté, terrine and gravlax.

There have also been some changes to the timing of judging. Previously there was both a spring and summer judging but these will be combined into a single event on 18 February 2015, prior to the Sydney Royal Easter Show. Entries close on 7 January 2015, with an entry fee of \$120. **F** 



Sydney Rock Oysters.

#### **HOW DOES JUDGING WORK?**

A points-based judging system is used for the Sydney Royal Fine Food Show Aquaculture competition.

- Gold Awards achieve a score of 91/100.
- Silver Awards achieve a score of 83–90/100.
- Bronze Awards achieve a score of 74–82/100 The judging criteria include three key areas depending on species.
- Visual presentation appearance, condition, conformation, preparation.
- Taste flavour, strength/intensity sweetness, aftertaste.
- Condition texture and mouthfeel.

In the early years of the competition, there were sometimes no medals or only bronze medals awarded. But 14 years on, the products submitted are routinely outstanding and some of the best seafood anywhere in the world.

Judging panels comprise three to five people associated with the Australian seafood industry: chefs, food media, retailers, industry experts and other specialists.

All judging is undertaken 'blind'; entries are presented without packaging and only identified by class code and the number of the entry.



# DIVER DATA DRIVES IMPROVED ABALONE MANAGEMENT

#### **ABALONE CONVENTION** Australia

and New Zealand's abalone industries have distinct cultural and operational differences, but a shared need for better information is bringing closer collaboration

#### By Catherine Norwood

D ivers, data loggers and the divergent approaches to data management were among leading topics of conversation at the first joint Australian–New Zealand abalone industry convention this year.

The convention was held in Queenstown, New Zealand, and attracted more than 150 participants – researchers, managers and fishers – to hear the latest research and marketing developments for the industry. It was a joint initiative of the Australian Abalone Council and the New Zealand Paua Industry Council and sponsored by the FRDC.

One of the major benefits to come from the event was the recognition of the shared needs of the industries in both countries, says Australian researcher Craig Mundy, who has been collaborating with New Zealand for almost a decade. The two countries have already worked together on several projects, but Australia's FRDC and the New Zealand Ministry for Primary Industries indicated at the convention that they would move to formalise shared research priorities. Chief among these is the need for better information in assessing the state of the abalone resource (or paua, as it is known in New Zealand). Populations can be highly variable in productivity, even within a space of a few hundred metres, depending on exposure to different water and weather conditions.

Based at the Institute for Marine and Antarctic Studies (IMAS) in Tasmania, Craig Mundy has been working in this field for more than 10 years, developing new data-logging systems to improve information gathering and subsequent decision-making. This has involved creating or adapting everything from the equipment to the programming and data analysis to suit the needs of the abalone fishery.

For most of these 10 years he has also worked closely with the New Zealand industry, which was quick to see the potential of the data-logging approach and has adapted the Australian work to fit its own particular industry operations.

#### **Proof of concept**

Craig Mundy's first major abalone data project, funded by the FRDC, involved abalone industry groups in Tasmania, Victoria, New South Wales, South Australia and Western Australia. It successfully provided a 'proof of concept' for the data-logging equipment and analytical methods to utilise the spatial data.

The equipment consists of a boat-based data logger and depth logger for each diver. The boat units use the same GPS technology as mobile phones, combined with a mini computer. They record time, date and location. As the divers are connected to the boats by a surface supply hooker line (they are never more than 30 metres from the boat), diver units only track depth and water temperature. This information is transferred to the boat units when divers surface.

"In the first project we focused on how to manage the data; in Tasmania alone we generate about eight million records a year from 24,000 dives," Craig Mundy says. "We also needed to work out how to turn that information into performance measures for the fishery, so that we weren't just making maps of where people were diving."

One of the indicators to emerge from the amalgamated data was the frequency of short dives (10 to 15 minutes). He says 15 minutes is generally the point at which a diver decides whether to leave a site, or whether there appears to be enough abalone to make it worth staying. "If the proportion of 15-minute dives is increasing in a particular area, it indicates the resource is in decline in that area. If the number of short dives is steady, or decreasing, it suggests the resource is stable or improving," he says.

#### **Performance measures**

Craig Mundy's follow-up four-year project, also funded through the FRDC, involves Tasmania, western Victoria and NSW. The project is formally incorporating data logging into abalone fisheries management, and Tasmania is leading the way. This project began in 2012 when Tasmania introduced mandatory data logging for all of its 121 licensed abalone divers. Craig Mundy says government and industry agreed that the information collected was valuable, but to make it worthwhile everyone had to be involved. A similar philosophy underpins the strong Victorian and NSW industry engagement with this new approach.

The project has funded the staff and operational costs of data logging and analysis, with each state providing the data-logging equipment for its operators. Every three months, the memory cards in the boat units are exchanged for new ones and the collected data is sent to Craig Mundy. While the individual information remains confidential, the amalgamated information is used to identify trends and develop performance indicators.

The data loggers do not collect information on catch. This is still submitted separately by fishers as a total for the day, along with time spent diving. These catch-and-effort records can later be cross-referenced with information from the data loggers. The statutory catch forms only record information per catch 'block', which might be a 40-kilometre or more stretch of coast. The data loggers operate on a scale of 20 to 30 metres.

"At the moment, only two pieces of evidence are used in the abalone resource assessment: catch and catch per unit of effort (CPUE). There are a lot of variables that can affect how long it takes a diver to get their catch other than abundance, which in turn affects the CPUE.

"If I can expand that to five or six pieces of information, then it gives us more certainty that the fishery is heading in a particular direction and we can more closely validate what divers are experiencing."

#### Short dive pattern

Craig Mundy says on the east coast of Tasmania the catch rates have been falling in recent years and there has been some concern about the state of the fishery, but it now seems to be turning around. The proportion of 15-minute dives can be used as an indicator of the abalone being in decline and there were fewer 15-minute dives recorded in 2012 and 2013. "That's what we would expect with a fishery in recovery," he says. "On the west coast, where catch rates have been falling for several years and we have started to take some reductions in the total allowable commercial catch, the number of 15-minute dives is increasing."

However, divers have also indicated that catch rates were not reflecting the decline they were seeing in the resource. "They might get in the water and catch 100 kilograms in an hour, but the following year they might need to travel twice as far during the dive to do that."

He is working to analyse the distance divers travel from the data, but is also working on loggers to record the rate of catch, without asking the boat operators to stop and record weights for each bag harvested.

"In the past we have put a depth logger on the weighted line that is used to drop new bags to divers and is exchanged for the full bag of abalone. From this we know the precise location of the diver, because we know where the bag goes into the water. And the faster the bags are exchanged, the higher the level of catch in that area."

However, the technical challenge has been to develop a logger that can withstand the impact of hitting rock each time the bag is dropped. While divers liked the catch information the process provided, hardware failure was a constant issue.

#### New Zealand initiative

Craig Mundy's research also sparked the interest of the New Zealand industry, led by the executive officer of the Paua Industry Council of New Zealand, Jeremy Cooper. The two worked closely together although the distinct operational differences in New Zealand have resulted in a different approach to data logging.

While Australia's fishery is based on one or two divers operating from a boat-based hooker supply line, New Zealand paua is a breath-held fishery and divers are often some distance from their boat.

"You could have four divers operating from one boat," Jeremy Cooper says. "They're dropped along the coast, and the boat waits up the end, and everyone sort of leapfrogs each other up towards the boat.

"We needed different information and a different system to the Australian one,



and we wanted something that was fully automated and as real-time as possible."

Their boat unit is similar to the Australian one, but can record data for up to four divers. It connects with the turtle units that the divers wear on their backs. These record depth and duration of dive as well as recording GPS coordinates each time a diver comes to the surface. When divers return to the boat, the boat operator pushes a button on the boat unit to record the catch for each diver and the location of the catch. One unit effectively captures catch, the other captures effort. At the end of each day, the information is uploaded to a cloud-based database.

Working in conjunction with the New Zealand crayfish industry, the paua industry has also developed a satellite modem with the aim of uploading the day's information, either via satellite or mobile phone technology, directly from the boats. Jeremy Cooper says this system should be operational next year.

Use of the data loggers in New Zealand began five years ago on a voluntary basis and all data is owned by the industry, which also buys the equipment itself. The boat units cost about NZ\$1400 (A\$1245) and diver units are NZ\$700 to NZ\$800 (A\$620 to A\$710). The satellite modem is expected to add NZ\$750 (A\$665) to the cost of the boat unit.

Information is stored on a cloud-based web server accessed by password. Individual operators can review their catch and dives from their data each day. (Craig Mundy hopes a similar system will be available in Australia within the next two years.) The New Zealand system also allows divers to share their information, to improve fishing efficiency.

#### **Business case**

About 80 per cent of New Zealand divers are already using the data loggers and in the 2014-15 season some larger quota holders are making it compulsory for all of their divers to use data loggers. It is about business efficiency: it simply does not make sense to have divers visit an area that has recently been harvested, or which is known to be in decline.



New Zealand operates a breath-held fishery, with divers using only snorkels and lung capacity to hunt for their catch.

Jeremy Cooper says one of the major benefits for the industry will be reducing the need for full-blown stock assessments, which cost up to \$300,000. "Eventually, we can see our data will be used in the stock assessment process, which we hope will reduce the cost of assessments to a third of what it used to be."

The information from an individual dive is aggregated to per hectare level, then to a reef, then to the larger statistical areas and up to quota management areas.

Divers still complete statutory forms for catch and effort at the end of each day, which can take up to three months to be processed. They are then made publicly available at the amalgamated statistical level.

"Once we get the complete system up and running, that level of reporting would be available next day. It would indicate where the best catches are coming from and help fishers to identify where to go tomorrow; it's a harvesting tool," Jeremy Cooper says.

"Because we own the data, we have our own internal reporting and we can already start comparing the productivity of individual reefs this year with last year. We hope to be able to set key performance criteria and put in place harvest limits on certain reefs, and when that limit is reached a 'bell' will ring."

He says the industry is working closely with the New Zealand Ministry for Primary Industries to allow for the fully digital transfer of catch-andeffort data for statutory reporting, catch sampling data and stock assessments. With the satellite modems, the data loggers could also provide a vessel monitory system capacity, showing where every vessel is and how much each has caught up to that point.

#### Abundance in Fighting Bay

For Jeremy Cooper, the ultimate outcome of data loggers is to automatically generate an index of abundance to support the sustainable management of the industry. Being able to zero in on a specific reef and review the index of abundance for that area could better guide fishing effort. "If the index is going up in a certain location, it suggests there are more paua there; if it's going down, it suggests there are fewer to harvest," he says.

However, generating a "robust" index of abundance for the paua is not a simple issue. "It's easy in the crayfish industry, because all the lobster pots are the same size and are deployed in the same way. In the paua industry, you can't just use kilograms per diver per hour because it's not robust enough. There are too many variables that can mask the real abundance – dive depth, visibility, wave conditions, even how fit the diver is."

However, a small-scale stock assessment at Fighting Bay, on the north-eastern tip of New Zealand's South Island, has provided an important first step in setting a baseline for an index of abundance. The bay has been closed to harvesting for 16 years, so the project has provided an indication of the 'unfished' state of the Marlborough region abalone reefs.

From an 18-kilometre stretch of coastline, an area 400 metres long by 10 metres deep and 10 metres wide was fished. Over the course of five days, four divers harvested 8.5 tonnes of abalone. The longer they fished, the fewer abalone they harvested, until every abalone of legal size had been collected.

"It is all mapped with the data loggers," Jeremy Cooper says. "Every dive made, every catch landed, every time divers crossed the reef." The results have revealed a direct relationship between the rate of depletion and abundance, a finding that has excited CSIRO senior scientist Malcolm Haddon, who specialises in resource assessment and fisheries modelling.

Malcolm Haddon was also involved in the early development of the spatial data logging approach in Tasmania. He says it is important to have a clear understanding of the assumptions used in resource assessment, and often "an allowance" is made for variables, so that the catch rate is not a direct reflection of abundance. "What Fighting Bay shows is that maybe we should not make that kind of adjustment," he says.

Jeremy Cooper says New Zealand wants to further test this assumption, which could allow information from the diver data loggers to be used entirely as the basis for stock assessments. "We want to be able to generate a number that indicates whether our fishery is looking better or worse on this side of the reef, or that side of the reef, compared with the same time last year."

## **Grassroot actions earn OceanWatch stewardship role**

SUSTAINABILITY A favourite organisation with fishers has been asked to serve as the marine environment **Natural Resource Management agency** 

#### By Gio Braidotti

or 25 years, OceanWatch has helped seafood producers nationally reap productivity benefits through projects as diverse as developing best harvest practices at a grassroot level through to restoring important coastal habitats and improving water quality in waterways.

Its role underlying the industry's sustainability-linked profitability was recently recognised by the Australian Government, which nominated OceanWatch to serve as the Natural Resource Management (NRM) organisation responsible for Australia's marine environment.

The not-for-profit group was also awarded \$440,000 to help it transition to the new role. The grant adds to recurring funding from three sources: a voluntary contribution from the seafood industry; federal and state government grants; and fundraising activities and donors.

"The NRM recognition will improve OceanWatch's ability to work strategically, instead of being solely reliant on short-term project funding," executive chair Brad Warren says.

"More importantly for the seafood community, OceanWatch's recognition as the marine NRM organisation for Australia will lead to an improved profile for seafood community priorities within Australian Government NRM investment streams, such as the National Landcare Programme."

The new status allows OceanWatch to expand its environment and marine programs even as it maintains its trademark approach, building partnerships with communities and businesses that aid the adoption of world-best industry practices.

"OceanWatch has always worked with grassroots seafood producers to improve their environmental performance, as well as championed the value of healthy, productive marine ecosystems," Brad Warren says.

"We will be continuing with that work while we also engage widely with industry and communities in the development of Australia's first national marine NRM plan."

OceanWatch was established in 1989, in response to reports of poor water quality and high levels of contamination in fish due to Sydney's inshore ocean outfalls. Today it has a national focus, working with fishers to find practical solutions to environmental problems that affect coastal environments and estuaries.

"The Professionalising Industry project, currently funded through a partnership between the FRDC and OceanWatch, is a good example of NRM in action," Brad Warren says.

"Through the project, OceanWatch is training, assessing and accrediting commercial fishers in environmental best practice and social responsibility."

Web-based information on sustainability and management, as well as profile videos of the fishers and their fishing methods, is to be made available to consumers through quick response (QR) codes attached to the fishers' products.

"The goal is to build provenance, improve transparency of industry practices and create a point of difference between local and imported products," Brad Warren says. For fishers, services such as these, which provide practical assistance to adopt new technologies and improve practices, are especially valuable.

A typical example of OceanWatch activity is the SeaNet program, a national environmental extension program that operated from 1999 to 2013. SeaNet helped fishers to develop, trial and adopt innovative technologies and practices that improved environmental performance, such as bycatch reduction devices. SeaNet also supported linkages between seafood producers, regulatory bodies, researchers and local communities, including the provision of education to communities about sustainability measures being adopted by the seafood industry.

While profiling the value of productive waterways through the Tide to Table program, partnerships were also formed with land and marine primary producers, landholders, regional NRM bodies, and government and community-based Landcare and Bushcare groups. This resulted in projects to improve water quality and aquatic habitats.



OceanWatch chair Brad Warren launching the Maybell Environmental Management System at Sydney Fish Market.



Commercial fishers at Southwest Rocks at a Master Fisher training session.



OceanWatch's Tide to Table project works to improve water quality and fish habitat, to protect the quality of the seafood we eat

The partnership strategy has proven a successful one. OceanWatch has received numerous awards including an Award for Excellence from the United Nations Association of Australia, World Environment Day 2005 and an Honourable Mention in the WWF International Smart Gear Competition for the Popeye Fish Excluder developed for use in the Northern Prawn Fishery.

The NRM announcement was made by the Minister for Agriculture, the Hon. Barnaby Joyce, who says the move delivers on a 2013 election promise of further developing Australia's sustainable fishing sector. The chair of the National Seafood Industry Alliance, Grahame Turk, congratulated the minister on the selection of OceanWatch and has welcomed the evolution of OceanWatch's status.

"Sustainable seafood is not just about the management of our fisheries and aquaculture production but also must take into account factors impacting the productivity of our natural environment," Grahame Turk said. F

# Innovative thinking to keep birds at bay

BIODIVERSITY Whether they use colour, water, movement or noise, fishers are working to develop new options to keep seabirds at a safe distance from their vessels



PHOTOS: CATHERINE NORWOOD

A gentle shower keeps birds away from the trawl net warp wires.

#### By Catherine Norwood

There's a gentle shower falling on the water astern the Lakes Entrance-based trawler *Lady Miriam*, but it is not falling from the skies; it is being generated by the trawler's own rain-maker as part of an industry-initiated research trial.

To the vessel's Victorian owner Tony Guarnaccia, the device is a bird sprayer, rather than a rain-maker. Its purpose is to prevent seabirds from becoming entangled in the wires that attach the trawl gear to the back of the boat.

The invention is one of two designed by fishers that are being trialled as alternatives to 'pinkies' – the large, round, bright-pink buoys. Pinkies are, so far, the only authorised bird-deterrent device for vessels in the southern Commonwealth trawl fisheries. All trawlers in these fisheries are required to use pinkies to reduce bird entanglements as part of their licence conditions. Fishers at Eden, NSW, have developed the 'baffler' with rubber strips overhanging the warp wires to deter seabirds.

#### Safety focus

Although the pinkies have been successful in keeping birds away, local fishers have been working on alternatives because, depending on the configuration of the trawler, pinkies can pose some operational hazards for the crew.

The buoys hang off the trawl gear warp wires, but sometimes need to be untangled or adjusted during fishing operations. For Tony Guarnaccia, this is a real problem. "In winds of 40 knots, seven-metre seas and at night it is so dangerous for the crew. The last thing I want is to lose a crew member," he says.

So he and fellow trawler owner Sot Sotirakis have come up with the 'bird sprayer'. It looks something like an old-fashioned television aerial hanging off the back of the trawler. Stored vertically when not in use, it is lowered into place once fishing begins. When the sprayer is turned on, water is pumped through hoses into the spray arms to create a relatively gentle shower over the 'danger zone' – the warp wires behind the boat. Whether it is the sound or the sensation of the 'rain' the birds do not like, it is enough to keep them away, Tony Guarnaccia says.

The sprayer is an advance on their first idea – using a deck hose directed at the warp wires to deter the birds. "But that wasn't really a safe idea for the crew," Tony Guarnaccia says. Now they a have a boom they can "set and forget", keeping the crew drier and free to continue with fishing operations.

Developing the bird-sprayer design is part of the South East Trawl Fishing Industry Association (SETFIA) project 'Mitigation of seabird interactions in the trawl sectors of the Southern and Eastern Scalefish and Shark Fishery (SESSF)', funded through a National Landcare Programme Innovation Grant.

#### **Revised design**

Recent revisions to the design include increasing the spray coverage across the warp wires from 1.5 metres up to four metres. The two spray arms are offset to increase coverage, and also swivel 180 degrees, to ensure the spray will cover the wires when wind and currents result in the nets drawing in at an angle to the stern. So far only one sprayer has been manufactured. It is fixed to the starboard side of *Lady Miriam* for preliminary trials. The intention is to fit sprayers to both sides of the vessel.

The trawler generally fishes off the Victorian and Tasmanian coasts, targeting flathead in

shallower water, and Pink Ling (*Genypterus blacodes*) and Blue Grenadier (*Macruronus novaezelandiae*) in deeper water. Tony Guarnaccia has been fishing in the South East Trawl Fishery for more than 45 years – 30 of those aboard his own vessel. For the past 15 years, he has left the fishing to his crew, but is still closely involved in overseeing operations.

"I'm always happy to jump into projects that are going to improve what we're doing," he says. "So far we've directly invested about \$7000 in the project, along with local engineering company J&S Engineering, plus our time and that of our vessel.

"We're here for the long haul, and we have to protect our industry by making sure we're doing the right thing," he says. "We want a sustainable future as fishers. I don't begrudge the birds a feed, but we don't want them getting caught on our lines either."

To gain approval from the Australian Fisheries Management Authority (AFMA) as an authorised bird deterrent, new devices must be as effective or more effective than pinkies. AFMA's recently released evaluation of pinkies found that these have reduced seabird interactions by 75 per cent since they were introduced.

SETFIA executive officer Simon Boag says SETFIA will use the same methodology as AFMA's pinkie evaluation to test the effectiveness of the bird sprayer. "I'm confident we can actually reduce bird interactions by more than 90 per cent," he says.

A second design being developed by fishers based at Eden, New South Wales, is known as a 'baffler'. A boom fixed out over the back of a trawler is fitted with heavy, relatively rigid rubber strips that slap against the surface of the water as the vessel moves.

Simon Boag says the most commonly encountered seabird in the South Eastern Trawl Fishery is the Shy Albatross, which is often anything but shy.

#### New Zealand tour

"We are fortunate we don't interact with as many different bird species as the New Zealand trawlers do. They have a much larger commercial fleet than we do, and they also have much larger bird populations in the areas where they are fishing."

Simon Boag was among a small Australian contingent to tour New Zealand earlier this year as part of research into potential seabird mitigation options, funded by the Australian Government. The contingent also included fishers,



PHOTO: SETFIA

a marine scientist and representatives from AFMA and the Great Australian Bight Fishing Industry Association.

The group attended the New Zealand Federation of Commercial Fishermen's Conference in Invercargill and met with representatives from the Deepwater Group – the industry association for New Zealand's deep-water fisheries – travelling from port to port meeting with fishers and New Zealand Ministry for Primary Industries staff. They also visited fishing vessels, seafood processors, net makers and mitigation device distributors.

Simon Boag says exposure to such diverse operations enabled the tour group to put management of seabird interactions in their own fisheries into perspective. During a final debriefing session, the group put forward mitigation devices they thought might work in the southern Commonwealth fisheries, including their own ideas. The bird sprayer and the baffler were the designs chosen for further trials.

"If we can give fishers a range of options to choose from, it will improve safety and compliance, and will ultimately reduce seabird interactions even more," Simon Boag says. **F** 

#### SEABIRD MANAGEMENT PLANS

All Commonwealth trawl vessels in south-east Australia and the Great Australian Bight operate with regulated seabird management plans to minimise interactions with seabirds. Compliance with these plans is a condition of fishing licences.

Under the seabird plans, all vessels must manage their offal by batching or retaining it (to avoid attracting the seabirds) and use a mitigation device that protects seabirds from bumping into trawl cables.

Currently, the only mitigation device available to all 61 trawl vessels in the fishery is the 'pinkie', a buoy that is towed in the danger zone, just in front of where the trawl cables enter the water.

#### Greenlip Abalone are in peak condition in autumn.

# Autumn tops abalone weigh-in

STOCK ENHANCEMENT The desire to target Greenlip Abalone at their peak weight could lead to significant changes in the timing of harvest for the South Australian fishery, benefiting both abalone populations and fishers

#### By Catherine Norwood

**S** outh Australia's wild Greenlip Abalone (*Haliotis laevigata*) reach their peak weight in autumn, specifically April and May. For divers, this means less time and effort to harvest their allocated quota. Harvesting larger Greenlip Abalone also increases the overall value of their harvest, even with a smaller number of abalone in the bag.

This is the finding of research initiated by the SA abalone industry, keen to improve the profitability of the fishery while preserving its sustainability. These are also key goals of Primary Industries and Regions South Australia, the government body responsible for the sustainable management of abalone fisheries in SA.

Marine scientist Ben Stobart from the South Australian Research and Development Institute (SARDI) presented the research findings during the combined Australian and New Zealand abalone industry convention in New Zealand recently. He says local divers were generally aware that Greenlip Abalone weighed more in the cooler months and were keen to quantify what this might mean for the fishery.

January and February have traditionally been the busiest period across the state, in the lead up to Chinese New Year, when abalone is in high demand as a luxury, celebratory item. From the opening of the quota period on 1 January, about half of the year's total catch has previously been harvested by mid February, and 80 per cent by the end of April. However, 95 per cent of SA's Greenlip Abalone is exported frozen, so the timing of harvest makes little difference from a marketing perspective.

Ben Stobart says the research (Table 1) found that a larger autumn harvest, in conjunction with the current weight-based total allowable commercial catch (TACC) of 69 tonnes bled-meat weight, could increase the fishery value by 1.3 per cent or almost \$110,000. This would largely be due to catching more Grade 1 abalone in April and May. It would also leave 13 per cent more Greenlip Abalone in the water – about 36,000 animals.

Autumn harvesting with an increase in the TACC to allow the same number of individual Greenlip Abalone to be harvested could increase the fishery's value by more than 10 per cent, or \$1 million.

The research identified several other potential benefits from later harvesting. These included allowing more Greenlip Abalone to complete their spawning, which extends from October to January. By maintaining the current TACC, an Harvesting more Greenlip Abalone allows fishers to reach their quota weight with a smaller number of higher-grade animals.

additional 36,000 abalone would also be retained to spawn – potentially another 61 billion eggs a year to protect the sustainability of the fishery. The additional Greenlip Abalone in the fishery would have more time to grow larger, increasing the percentage of Grade 1 abalone in future years.

The collective result for the fishery could improve overall profitability, as catch per unit of effort (CPUE) and incomes increased, as a result of harvesting higher-grade abalone.

Vice-president of the SA Abalone Industry Association Bill Ford says changes to the timing of harvest are gradually being introduced in the western zone of the Greenlip Abalone fishery, from Franklin Harbour to the Western Australian border, which was the focus area of



the research. A cap of 15 per cent of quota in January and 15 per cent in February was introduced in 2014.

"This will allow us to leave more abalone in the water," Bill Ford says. "Industry has agreed with the state government on the cap, to make sure everyone is operating on the same basis. At this stage we're implementing the changes a little at a time and we'll see how it goes."

Bill Ford says a similar project is planned for Blacklip Abalone (*Haliotis rubra*) next year. **F** 

#### TABLE 1 MODELLED CHANGES TO INCOME AND ABALONE HARVESTED AS A RESULT OF CHANGES TO HARVEST TIMING IN THE SOUTH AUSTRALIAN GREENLIP ABALONE WESTERN ZONE.

% OF QUOTA HARVESTED BY MONTH										
MONTH	SCENARIO NUMBER									
	1	2	3	4	5	6	7	8	9	10
January	50	39	8.3	33						
February	14	11	8.3							
March	10	6	8.3	7.6	17	14				
April	7	13	8.3	22	21	29	50	10		
May	4	1	8.3	22	21	29	50	20	10	
June	4	6	8.3	7.6	8.2	14		30	20	
July	2	3	8.3	7.6	8.2	14		30	20	
August	3	4	8.3		8.2			10	20	10
September	3	2	8.3		8.2				20	15
October	3	6	8.3		8.2				10	20
November	1		8.3							25
December	1		8.3							30
HARVEST STRATEGY 1: TACC 69 TONNES BLED-MEAT WEIGHT										
Number of abalone harvested to reach TACC	277,481	271,501	276,128	259,833	255,522	244,155	241,308	247,646	265,610	313,080
Revenue	\$8,282,749	\$8,297,583	\$8,272,010	\$8,333,701	\$8,333,176	\$8,373,044	\$8,382,358	\$8,358,657	\$8,295,188	\$8,152,976
Change in revenue compared to Scenario 1		\$14,834	-\$10,739	\$50,952	\$50,427	\$90,296	\$99,609	\$75,908	\$12,440	-\$129,773
HARVEST STRATEGY 2: TACC APPROX. 277,481 ANIMALS										
Revenue	\$8,282,749	\$8,480,331	\$8,312,543	\$8,898,033	\$9,049,308	\$9,515,942	\$9,638,910	\$9,365,642	\$8,665,934	\$7,225,943
Change in revenue compared to Scenario 1		\$197,582	\$29,794	\$615,285	\$766,559	\$1,233,193	\$1,356,161	\$1,082,893	\$383,186	-\$1,056,806

The research analysed 10 different harvest timings under the current total allowable commercial catch (TACC) by weight and with an increased TACC that maintained the current number of abalone harvested. Scenario 1 represented the fishing pattern between 2005 and 2009. Scenario 2 represented the more delayed 2011 harvest pattern. The other eight fictional scenarios provide a range of timings for comparison of abalone yield and financial returns.



## **Industry toolkit** focuses on communicatio

**PEOPLE DEVELOPMENT Storvbooks.** recipes, videos and infographics are all part of the mix industry leaders are using to share the story of fishing and seafood

#### By Julie Haldane

onnecting with younger Australians has been the focus of several initiatives from the FRDC's 2014 National Seafood Industry Leadership Program (NSILP), including children's books and online resources for teachers. The 14 members of the 2014 NSILP program graduated in Canberra in September, where they launched their vision and mission for the future of the fishing industry and outlined the projects they developed during the program. Collectively these projects form a toolkit to help different sectors promote the industry through the effective presentation of information.

#### **Children's books**

NSILP participants identified that there were few books about fishing aimed at children, especially those aged six to eight. To address this gap, the group produced two books: an illustrated storybook Captain of my Fishing Boat and a photographic picture book Coastal Crabber: life *as a professional fisher*. Copies of the storybook are already in use in an ACT school and Penguin Australia is reviewing the book for publication. The photographic picture book has been published as an e-book and can be downloaded free from the Blurb website bookstore (www.blurb.com), and is available for iPad, iPhone and iPod devices. There is also a link to a YouTube video that gives children 'real' visuals of how the industry operates. The project team also developed a photographicpicture-book template so other groups within the seafood community can develop their own.

#### **Resource list**

The resource list Schools of Fish is an effort to create an online collection of seafood industry resources. The list aims to give teachers and curriculum writers access to information about seafood industry sectors so that fisheries can be more easily incorporated into the school

curriculum. The team intends to present the collection to the Primary Industry Education Foundation for further promotion.

#### Cookbook

The cookbook Fisherman and the Chef was devised to showcase Australian seafood and promote seafood producers and recreational fishers, as well as engage well-known chefs. The group gathered profiles, photographs and recipes from fishers and farmers, as well as recipes from chefs, and compiled these into a book, which has been printed. A PDF of the book is also available. Some sectors of the seafood industry have expressed interest in using recipes from Fisherman and the Chef on their websites.

#### Video resources and QR code

A six-and-a-half-minute video, 'The sustainable Mud Crab Story', was produced by the NSILP's video resources and quick response (QR) code group. The video features a day in the life of Mud Crab fisher Troy Billin, with cooking tips from celebrity chef Fast Ed (Edward Halmagyi). Published on YouTube, Facebook and Twitter, the video has been shared by industry including the Commercial Fishermen's Co-op, the Professional Fishermen's Association and Sydney Fish Market. The group also generated a QR code for the video

Illustrated storybook Captain of my Fishing Boat and photographic picture book Coastal Crabber: life as a professional fisher.

for easy access by mobile phone. The team hopes to have the video filmed and edited professionally and to see the QR code on menus, price tags, online and in printed supermarkets catalogues.

FRDC RESEARCH CODE: 2012/401

#### Infographics

Providing simple but potent communication and education tools for industry was the goal of the Seafood Knowledge Condensed: Infographics team. Infographics are a powerful tool for conveying key messages and gaining attention. The group produced sample infographics and a step-by-step guide for industry to develop their own. Infographics are useful as fact sheets for sharing through social media and on industry association websites, print advertising, posters in retail outlets and in the education system.

#### **Role of leadership**

FRDC executive director Patrick Hone says the seafood industry is changing rapidly. "The industry must invest in developing people to initiate and manage this change across the board. There is always a role for leadership, regardless of your position," he says.

Applications for the 2015 NSILP program are now open. The program is delivered over six months through three residential sessions of three days each. The program focuses on developing skills at three levels: personal, business and national industry. It is funded through the FRDC and developed, managed and delivered by Rural Training Initiatives. F



#### 2014 NATIONAL SEAFOOD INDUSTRY LEADERSHIP PROGRAM GRADUATES

(From left) Jacqui Johnson - seafood industry teacher, Trenayr Campus North Coast TAFE, Grafton, NSW; Donna English - promotion and marketing officer, Northern Territory Seafood Council, Fisherman's Wharf, Darwin, NT; Trent O'Brien - sales and refitting, Tropic Ocean Prawns Australia, Redlynch, Queensland; Nathan Adams - abalone fisher and licence holder from Augusta, WA; Stephanie Williams – marketing and public relations executive, Sydney Fish Market, NSW; James Florisson - research officer, Recfishwest, Hillarys, WA; Jane Wilson - salesperson, A Raptis and Son, Colmslie, Queensland; Troy Billin – commercial fisher, Clarence River/northcoast region, NSW; Luyin (Camay) Young - inventory and procurement manager, Austral Fisheries, Pyrmont, NSW; Charlotte Connell communications manager, Marine Stewardship Council, Miranda, NSW; Jamie Sellen - owner and manager, Coffin Bay Oysters, Port Lincoln, SA; Naomi Brydon – assistant director, Fisheries Reform, Queensland Department of Agriculture, Forestry and Fisheries, Cairns; Patrick Sachs - Australian Fisheries Management Authority, liaison officer to the Australian Recreational Fishing Foundation, ACT; and John Maloney – general manager, Pacific Reef Fisheries Australia, Ayr, Queensland.

## Whale watch for rocklobster fishers

**RESEARCH** The rise in whale numbers along Western Australia's coast has prompted new research to reduce the risk of entanglements in fishing gear

#### By Sarah Clarry

he West Coast Rock Lobster Managed Fishery in Western Australia has been a spectacular success story since moving from an input control management system to an output (or quota) control management system in 2010-11.

The quota system with a year-round fishing season has allowed fishers to spread the catch throughout the year. In doing so, higher beach prices have been maintained. Fishers now fish to demand and catch the amount and sizes that will deliver the best profit. It has also contributed to a healthier rocklobster population.

But the year-round fishing has also coincided with an increase in the number of whales getting caught in rocklobster fishing gear.

Since 1990, there have been 130 entanglements recorded in WA; of these, 128 involved commercial fishing gear. Since 2010, there has been a dramatic increase in the number of whale entanglements in commercial gear (with most of them being in rocklobster fishing gear).

In 2013, there were 18 reported entanglements in lobster gear, well above the long-term average of whale entanglements for this fishery, which until then was between zero and four (average 1.72) per year.

Entanglements can lead to injury or death of the animal (although no deaths have been recorded as being caused by rocklobster gear), sometimes many hundreds of kilometres from the initial site of the entanglement. Whales are a protected species under Australian legislation and the West Coast Rock Lobster Managed Fishery is acutely aware of the need to reduce the number of entanglements.

The industry is working collaboratively with researchers, as part of an FRDC-funded project, to trial measures including modifications to fishing gear, technologies such as audio pingers and acoustic or anode remote release systems.

Project leader Jason How explains: "Whales move through our coast from May to November. The old rocklobster season ended in June, by which point there was not a lot of fishing occurring, with low catch rates and poor weather conditions. So the bulk of [whale] migration occurred when no one was out fishing."

However, he says the change to the season length cannot be the only reason for the increase in entanglements.

"We are also seeing more entanglements in the 'old' part of the season, that is, earlier than expected. The season change may have meant subtle changes to fishers' behaviour and we are trying to pinpoint what these are," he says.

"There are also a lot more whales. The Humpback Whale population that uses the WA coast is one of the fastest recovering whale populations in the world." Humpback Whales account for more than 90 per cent of entanglements with rocklobster gear.

Jason How suspects that differences in the timing of entanglements between years may be the result of changes in timing of whale migrations, which have seen whales arriving on the west coast later than in other years, or weather conditions that may exacerbate entanglements. He says the FRDC is funding further research to evaluate the impact of these issues.

"We want to make contact with other scientists undertaking work on the modification of fishing practices to reduce whale entanglements," he says.

"We have been encouraged by the assistance from industry. While it would be good to have more feedback from fishers, several have taken time and considerable effort to test the new gear and undertake a number of surveys. Industry is working strongly with government to find a solution to whale entanglements for the good of both the industry and the whales."

With increased awareness of the issue there has already been a decline in whale entanglements in commercial rocklobster gear this year; seven incidents were recorded between January and October 2014. F



#### FIGURE 1 TYPICAL WESTERN ROCKLOBSTER FISHING SET UF

#### WHALE WATCH RECORDS

To examine the dynamics of Humpback Whale migration along the Western Australian coast, researchers use information from two sources: the cetacean stranding database (which monitors dolphins and porpoises as well as whales), and the commercial whale-watching database. Both are managed by the WA Department of Parks and Wildlife, the state's lead agency for whales.

A new whale-watching app, Whale Sightings WA, is expected to help researchers gather more information, providing a way to tap into the state's extensive network of water users and whale watchers. This includes commercial operators and members of the public, who will be able to report sighting of various whale species via the app.

More accurate, up-to-date information about when and where whales are travelling may allow fishers to choose alternative locations to set their pots.

# **Economics 101** TRANSFORMS PIPI FISHERY

ECONOMICS A simple mathematical tool used in agriculture and manufacturing is improving the way the South Australian Pipi Fishery is managed, and optimising its value

By Lynda Delacey

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F ifteen years ago, pipis (also called clams or cockles) had fallen out of fashion as a food product in Australia and were mostly sold for bait. But when the human consumption market began to expand again, more fishers began to work in the South Australian Pipi Fishery, which is part of the Lakes and Coorong Fishery. This caused major concerns about the stock levels. Strict quotas were introduced to protect and rebuild the resource, but getting all stakeholders to agree on a process to set the total allowable catch (TAC) levels was causing considerable angst within the community.

In 2012, the Australian Fisheries Management Forum (AFMF), a group comprising heads of state and territory government agencies responsible for fisheries, was tasked with developing the National Guidelines to Develop Fishery Harvest Strategies. The aim was to meet a need for a coordinated, nationally consistent approach to creating harvest strategies across all fisheries. The project was led by Sean Sloan, director of fisheries and aquaculture policy from the Department of Primary Industries and Regions, South Australia, and supported by the FRDC.

The pipi fishery served as an early test case for the guidelines. The group sat down with scientists, fishers and government and industry representatives from the fishery to develop an annual harvest strategy that everyone could agree on.

"The pipi fishery posed some interesting challenges as it was a small fishery catering to

Bringing in their catch: Chris Wilton (left) and Brett Goodwin.



Donax deltoides – better know as pipis – harvested fresh 365 days of the year.

both the recreational fishing bait market and the human consumption market," Sean Sloan says. "The science was showing that stocks had improved so the catch could be increased, but fishers predicted that prices would go down if more catch was put onto the market, which meant they'd be working harder for the same money. We needed to develop a decision-making process to set the TAC annually that would take all the heat out of the debate."

This is where Roger Edwards entered the debate. Roger Edwards has been the independent chair of the Goolwa Pipi Harvester's Association since 2008. He originally trained as an agricultural economist, working with the Department of Agriculture before moving into the fishing industry. For 20 years he developed and ran various fishing associations and represented the industry to government.

Roger Edwards says that it was clear the fishers were asking for economic data to be taken into account when setting the annual catch levels. Usually, setting TAC levels is based on biological data. When economics is factored in, it often takes complicated and very costly modelling to produce a maximum economic yield (MEY) estimate. The pipi fishery needed a process that was much less expensive, that would take less than 12 months to turn around and that all the fishers could understand.

"I think I just brought a fresh set of eyes to the table," Roger Edwards says. "I remember looking at the graph of the pipi catch for the past 12 years and realising it was just a classic supply-anddemand graph – straight out of Economics 101. The higher the catch went, the lower the price. And the lower the catch, the higher the price went. It showed that the pipi market in Australia was responsive to supply."

Having worked in the Department of Agriculture many years before, Roger Edwards knew that a tool called the gross margin calculator is widely used to set supply levels. "I couldn't see why it wouldn't work in the pipi situation," he says.

Roger Edwards developed a simple preliminary fishery gross margin model, which he then presented to the harvest strategy group. The group approached one of Australia's top fisheries economists, Julian Morison from EconSearch, and asked him to critique the model.

"Julian reported back that it did work in our situation but there are some considerations to keep in mind – such as the fact that you can't predict price. He was then commissioned to take the model and make it very robust from an economic point of view," Roger Edwards says.

From there, the pipi fishery could develop an annual harvest strategy that takes into account both stock levels and market drivers. Thus far the strategy has proven to be highly accurate and has resulted in more conservative annual catch levels than might otherwise have been applied.

"I think there are two key elements to the strategy that are fundamental," Sean Sloan says. "The first is that the fishers participate in the independent surveys that are conducted on the beach three times a year by our scientists to estimate the relative biomass activities on the beach – the size and numbers of pipis. This then provides a reference point for the scientists to propose catch levels for the year.

"The second element is that we can look at what the economic outcome for the fishers would be if we changed the TAC for the year. If the science shows that the catch could be increased, but the economics show that the fishers would make less money, everyone can agree not to increase the catch that year."

Roger Edwards believes part of the success of the survey is that fishers take such an active role in the decision-making process and can see the logic in the outcome.

He says the success of the model hinges on the fact that the pipi market in Australia is almost entirely a domestic market. "It wouldn't work for an international market such as rocklobsters because there are too many factors that you just can't measure and predict."

It also works because the fishery could draw on good economic data that was already available through EconSearch. "If we didn't have good data already available, it wouldn't have worked," Roger Edwards says.

For Sean Sloan, it has been a positive test case for the national harvest guidelines. "The next step is to develop more case studies to test the practical application of the guidelines," he says.

#### **FISHERS TO FOOD MARKETERS**

On 30 September 2014, fishers and business people from the Lakes and Coorong Fishery came together to launch a new national company, the Goolwa PipiCo and processing plant at Port Elliot. The new state-of-the-art processing facility was established in part with the help of South Australian Government and FRDC funding.



Roger Edwards

The independent chair of the company, Roger Edwards, says the business sprang from the recognition that pipi populations had recovered and extra tonnage was available, but there was a need to find ways to increase demand in the market.

Although pipis are considered a seafood delicacy overseas, SA pipis could not develop the human food market in Australia until a convenient product was made available to restaurants and wholesalers.

"We did a lot of market research on product form and consumer preferences and found there was definitely latent demand out there, but the product needed to be more convenient and shelf life was an issue," Roger Edwards says. "Then we found that modified atmosphere packaging (MAP) could extend the shelf life up to 10 days.

"We also found through our market research that consumers would accept a frozen MAP product, which meant we could provide a year-round supply."

MAP keeps the catch vacuum-sealed in water. Based on learnings from the mussel industry, the group believes the MAP product will soon account for large volumes of the catch.

The Goolwa Pipi Harvesters Association, whose members hold 56 per cent of the pipi quota in SA, decided to set up a company to buy a factory and process their harvest. The facility is capable of processing up to three tonnes of catch per day. The pipis go into tanks to be de-sanded, sorted, blanched, packaged and distributed nationally and internationally.

"The Goolwa PipiCo is one of the first in Australia to put pipis into a package for consumers," Roger Edwards says. "It's a really unique example of fishers working to shift from independent hunter/gatherers to food marketers."

In the 1990s, Goolwa's Pipi Fishery was worth about \$750,000 a year. In 2012-13, it generated \$3.2 million gross value of production for the local economy. Roger Edwards says if they can build the demand and price, the fishery could support an increase of up to 50 per cent in harvesting. This would increase the value of the fishery 50 to 100 per cent.



# OYSTER FARMERS TAP AMERICAN KNOW-HOW

#### AQUACULTURE Technology that

accelerates the growth of juvenile shellfish proved a popular workshop subject when US expert Dale Leavitt met with Australian oyster growers

#### By Gio Braidotti

n a whirlwind two-week tour of Australia's oyster-growing estuaries, American researcher Dale Leavitt met with more than 200 growers in New South Wales, Tasmania and South Australia. In the process, he provided workshops on a shellfish farming technology popular in the US but yet to be widely adopted by Australian producers – the floating upweller system, or FLUPSY.

Having grown up a fisher and wild shellfish harvester in Maine, Dale Leavitt said during his visit that he felt a deep camaraderie with the Australian farmers he met, and he also fell in love with the wildness of Australia's coastlines and countryside.

Based at the Roger Williams University in Bristol, Rhode Island, and having been a farmer himself, Dale Leavitt works closely with shellfish growers and provides extension services to the industry.

Director of the NSW-based Select Oyster Company Ana Rubio helped to coordinate Dale Leavitt's visit, which was sponsored through an FRDC travel fellowship. Because of his (Top right) a solar-powered FLUPSY required for remote cultivation sites. (Bottom right) inside a FLUPSY set-up. Three components are used: a floating raft; silos that hold the oyster seed with mesh on the bottom allowing bottom-up water flow; and outlet pipes that insert into a central trough to direct discharge out of the system.

#### NSW GROWERS CONSIDER JOINT VENTURE

The idea of building a shared floating upweller system (FLUPSY) to improve the production of Sydney Rock Oyster (*Saccostrea glomerata*) spat is being considered by some New South Wales oyster growers.

Ana Rubio is a director of the NSW-based Select Oyster Company (SOCo), which was established by the NSW oyster industry in 2004 to commercialise new lines of Sydney Rock Oysters, particularly those with improved disease resistance. However, she says production of spat by the hatcheries involved in SOCo has struggled to keep up the supply.

A single FLUPSY system would have capacity to grow out more spat than any single oyster producer is currently able to secure.

Following the visit by Dale Leavitt and workshops detailing the FLUPSY technology, she says growers in several regions have discussed with her the possibility of a jointly operated system in their estuaries.

"If hatchery production increases and becomes as consistent as the supply of Pacific Oyster (*Crassostrea gigas*) spat is in Tasmania and South Australia, it might be more economically viable for individual businesses to have their own nursery systems," she says. "But there is simply not enough hatchery-reared Sydney Rock Oyster spat for that at the moment.

"Working together, growers farming in the same estuary would be able to share the costs, and the capacity of a FLUPSY." She says some nursery operators in NSW are also interested in the technology to replace or to add to the landbased upwellers they use.

- CATHERINE NORWOOD

experience, he was able to talk about a range of issues of interest to growers including the use of oysters to remediate polluted waterways, cultivation of alternative shellfish species and industry extension programs.

#### Accelerated growth

But it was the topic of his July and August workshops – the FLUPSY – that generated the most interest among growers. Dale Leavitt explains that upweller systems are located in oyster-growing waterways and use water flow to nurture and accelerate the rearing of healthy juvenile oysters to a size big enough to farm. As such, they can provide a handy transition from the hatchery stage, where spat are produced, and the grow-out stage, when the oysters are farmed.

"The feature that interests farmers is that it promotes a quick growth stage because of the way the water flows through the shellfish and replenishes the oysters' food supply," Dale Leavitt said.

In the US, a 25-millimetre oyster can be reared to grow-out size in a FLUPSY in about six weeks. "That's because upwellers are a pump system that deliver a lot more food to the animals than if they were placed in baskets or trays," Dale Leavitt said.

The extra nursery stage also allows for better adaptation to the wild environment of the farm, so that the oysters are healthier and can better withstand conditions in the estuary, including diseases.

While the original concept was developed in the UK, FLUPSYs have been extensively adapted and adopted in the US. They are now used by 95 per cent of oyster farmers on the north-east coast. They are also used to cultivate other shellfish, such as clams and scallops.

"It is widely recognised as being an effective and popular technology for nursery culturing of oysters in the US," Dale Leavitt said.

He described the technology as simple and affordable. It is the kind of device that canny farmers can easily construct themselves. The tricky issues relate to water flow rates and seeding densities – issues that Dale Leavitt has researched extensively.

"If farmers were to build a regular electric powered upweller from scratch, it is going to cost about US\$3000 [A\$3385] – more if they want the solar option," he said. "That's a perfectly reasonable cost."

#### **Three components**

There are three basic features to a US\$3000 FLUPSY. First, there is a floating raft. Embedded within the raft – hanging down into the water column – are a series of small containers, called silos, that have solid sides and a mesh on the bottom small enough to hold oyster seed. Each silo then has an outlet pipe that inserts into a trough located in the middle of the float where a pump continually pumps water back out of the trough.

The pump creates a water level differential between the inside of the trough and outside in the silos where the shellfish are held. That pressure difference induces a flow of water up through the



bed of shellfish and then out the discharge pipe into the centre trough where the water is then pumped back out.

"They are called 'upwellers' because the net water flow goes from the base up to the top of the column of shellfish seed," Dale Leavitt said. "You have to custom-make the silos and centre trough but everything else you can buy off the shelf, including the pump."

All the information Dale Leavitt made available at the Australian workshops has been converted into PDF files that can be viewed at the Select Oyster Company website (www. selectoysterco.com.au), Ana Rubio says.

A 'how-to' kit that describes how to build a FLUPSY especially suited to Australian shellfish producers is also being prepared for the FRDC. "There is a huge amount of interest in the technology," Dale Leavitt said. "Everywhere I went people asked for specific information because their intention is to build one and test it out sometime in the next year. What attracts them is the same thing that attracted me to do this research – the potential for commercial efficiencies. It leads to better outcomes for their business."

He said he found the contrast between operations in the US and Australia interesting. "From a technological standpoint, the US maybe has a little better grasp on hatchery development and nursery operations. But the Australians definitely have the leg-up in terms of grow-out technology."

He cites the example of Australian growers' use of the basket culture system for growing oysters in suspended culture. "That is something I don't think many of our US growers had thought about as they mostly grow oysters in racks on the bottom," he said. **F** 

# Indigenous rangers boost regional research capability

INDIGENOUS FISHERIES By drawing on a unique blend of theoretical, practical and local knowledge, an Indigenous marine ranger training program is boosting research capability in northern Australia

#### By Rose Yeoman

dentifying two key fisheries research needs in northern Australia was the impetus for an Indigenous ranger training program that will boost regional research capability.

Thor Saunders, principal scientist at the Northern Territory Department of Primary Industry and Fisheries (DPIF), explains the first need was to address knowledge gaps in the biology of key coastal reef fish species.

"Stock assessments in NT have identified current harvest levels of Golden Snapper (*Lutjanus johnii*) and Black Jewfish (*Protonibea diacanthus*) are unsustainable in the Darwin region and fisheries managers require information on stock structure of these species to effectively respond to the situation.

"The second need was the aspiration of Indigenous communities, which wished to develop their own scientific research capability and be involved in sustainably co-managing their sea country fisheries resources," he says.

Indigenous community members, keen to be involved in monitoring and managing aquatic resources, were offered places in the newly developed Certificate II Vocational Education and Training (VET) course in Measuring and Analysis. Students were nominated for the course by community ranger coordinators based on their interest in resource management.

The course incorporated literacy and numeracy learning pathways with mentor support to expand the program to a wider range of participants.

Course participants were taught how to follow set procedures to collect samples, accurately

record data in the field and use equipment such as scales, calipers and microscopes to conduct basic laboratory analysis and accurately record – by hand – observations and measurements, then enter this data into software.

The laboratory component of the course involved dissecting whole fish collected from other projects, as well as fish from the students' sea country. This allowed them to learn how to take and record important measurements and extract samples for analysis.

The course was conducted in Darwin in June 2014 with 17 students from six Indigenous communities. They all passed with flying colours, Thor Saunders says.

The program will boost the regional research capability of the FRDC and government agencies across northern Australia between the Kimberley region of Western Australia and across NT to Cape York in Queensland.

"We're concerned about the sustainability of important reef fish species but it's not economically feasible for government agencies to sample from such a wide area, and often in remote regions," Thor Saunders says.

"The obvious solution was to engage with Indigenous communities that lived in these regions to find the best way of conducting the work that offered maximum benefit to both parties."

Initial discussions indicated Indigenous communities wanted to be more active in managing their aquatic resources and, at the same time, provide development opportunities for community members.

#### **Indigenous marine rangers**

The new marine ranger program is designed to deliver a blend of theoretical and practical knowledge to participants who already have local knowledge.

Simon Xuereb, marine ranger coordinator at NT DPIF, says the initial Indigenous marine

rangers used their local knowledge of species' locations to provide samples for fisheries researchers in the field.

However, they were not trained in the specific technical skills needed to collect fish samples and data with a minimum of supervision.

"The development of a vocational course with the outcome of technically trained rangers has meant more significant industry engagement and smarter business for the department. It also increases community awareness of susceptible species and the rangers have scientific backing to manage species more sustainably.

"We particularly want rangers to understand the link between data gathered in the field and what happens in the lab, and why the information is critical to fisheries management," Simon Xuereb says.

#### Post-certification sampling

A total of six ranger groups from across northern Australia were represented at the course. These were: Larrakia rangers from Darwin, Djelk rangers from Maningrida, Dhimurru rangers from Nhulunbuy (Gove), Lianthawirryarra rangers from Borroloola, Gumurr Marthakal rangers from Elcho Island and Anindilyakwa rangers from Groote Evlandt.

Now that 17 participants have passed the course, the aim is to continue collecting the remaining samples for the stock structure component. Two days have been allocated for sampling at sites near each ranger's community, which will be an important "performance indicator" for the results of the course.

In the past three years, NT DPIF has also supported the development of Indigenous fishing businesses, including small-scale businesses that catch and sell small quantities of fish to their local communities. A percentage of each catch is put aside for analysis. "This way we can monitor trends and downturns in catch rates as well as the maturity of fish and population dynamics," Simon Xuereb says. "We want to know whether there is potential for further development of small-scale, inshore fisheries."

Fish are captured either by line or net fishing. Datasheets are completed to record location and species and the fish are then separately bagged and stored on ice to preserve sample integrity. Length, sex, size at maturity and reproductive parameters are recorded for each species. Back in the laboratory, otoliths (ear-bones), DNA and parasite samples are collected.



All about fish: students (from left) Zelanda Watson (Djelk rangers), Maxine Wilson (Djelk rangers), Grace Wunungmurra (Dhimurru rangers) and Patricia Gibson (Djelk rangers) collect fish DNA and parasitic and biological data.

#### **Ranger groups**

Jade Murphy, a graduate of the Certificate II course, is a Larrakia ranger who describes the course as an "awesome" experience – especially meeting other Indigenous rangers from across NT and the opportunity to understand their different perspectives and how they work on their own country. Part of her work has involved monitoring reef fish for NT DPIF, which she says has given her more opportunities to work with other government departments.

Carl Joswig, the ranger facilitator at Larrakia, says there are concerns that some of the coastal reef fish populations around major population centres may be under pressure from overfishing, particularly due to the dramatic increase in popularity of charter fishing.

"This is an issue in tropical Australia. It will become more important with increased mining and gas development projects, which will increase access opportunities, which will put pressure on Indigenous sea country stocks.

"The present study on three important reef species will be used as a case study to determine the information that needs to be collected in future studies so we can make informed management decisions, ensuring reef fish are sustainably fished around current harvest areas, as well as in developing fisheries in Indigenous sea country," he says.

#### **Going forward**

Thor Saunders believes the Certificate II VET course has had immediate benefits and subsequent visits to communities with newly trained graduates have found that the graduates have become more active in collecting data for resource management.

He says this has included samples for the population-structure project, as well as collecting biological data from fish caught in emerging Indigenous fisheries and providing fish samples for heavy-metal analysis.

The excellent quality of the data collected by the trainees means that they can now conduct this work on a 'fee for service' basis, he says, which provides the benefits of employment opportunities for new ranger positions from the money generated.

"The qualification each of the trainees received also supplies the additional benefit of them being more competitive if they decide to apply for jobs outside of their community in the area of resource management. To train Indigenous rangers to collect samples is good but we want to achieve more," Thor Saunders says.

"The qualification is a pathway to employment, and an increased role in the management of aquatic resources and it looks like happening within the span of the project, which finishes in 2016."

It is envisaged that future courses will involve students outside ranger groups and in other communities outside NT. **F** 



Class of 2014: instructors and students from the first Indigenous Marine Ranger Certificate II VET course in measuring and analysis held in Darwin.



PHOTO: PAUL WATSON

# **SMALL SIZE, BIG ROLE**

#### WILD-CAPTURE FISHERIES

Understanding the place of small pelagic fish within the larger food chain is a crucial part of managing these highly variable fish stocks

#### By Karin Derkley

we research being undertaken along the east coast of Australia is helping to assess the adult biomass of commercially and recreationally targeted pelagic fish species to better estimate future sustainable harvest levels.

Small pelagics, also known as forage fish, are the species on which other, larger pelagic fish such as tuna and barracuda like to dine. Small pelagic species are also a major part of the diets of many other predators, including sea birds, sharks, seals and dolphins. Given their role in the food chain, supporting a host of higher-order predators and as part of developing commercial fishery, accurate assessments of fish stocks are crucial. The FRDC is supporting a suite of projects to develop and refine assessment techniques.

This work is being led by Tim Ward, who is the research leader for finfish at the South Australian Research and Development Institute (SARDI). He says that many small pelagic species share Australian waters, but only a few are fished commercially. Most of Australia's fisheries targeting these species are relatively new or have been fished inconsistently.

#### **Small pelagics**

Many small pelagic fish move in huge schools, which make them easy picking for predators, be they fish, bird or beast. But there is evidence that some species are also subject to significant natural population fluctuations, as the fledgling South Australian sardine fishery discovered in 1995 when large numbers of sardines were found dead off the coast of southern Australia.

A similar event occurred in 1998. As much as 70 per cent of SA's sardine stock was estimated to have died in each event, although the populations have since recovered off south-eastern Australia. Commercially, Australian Sardines are highly sought-after to feed the burgeoning tuna ranching industry, and markets for human consumption have been developing since 1994 at least. In SA, the sardine fishery was established in 1991 and has since grown to replace most baitfish imports used to feed farmed tuna in the Spencer Gulf. From the first annual catch of just 10 tonnes, the harvest in SA has grown to about 34,000 tonnes a year, worth about \$22 million.

Tim Ward says there has been significant work undertaken in SA to develop stock assessment techniques. These techniques are now being expanded to the east coast of Australia, and to other species, as part of a range of FRDC-funded projects. This includes benchmarking current practices to ensure Australian approaches reflect international best practice.

#### Assessment measures

Many Australian fisheries use the catch per unit effort (CPUE) method, where a measure of the effort needed to catch a certain amount of fish is



PHOTO: SARDI

#### **SMALL PELAGIC SPECIES**

Species being assessed as part of the FRDC-funded research include Australian Sardines, Jack Mackerel, Blue Mackerel (Scomber australasicus), Redbait (Emmelichthys nitidus) and Tailor (Pomatomus saltatrix). Some, such as Jack Mackerel, are not so small, growing to more than 60 centimetres. Other well-known non-target species include Australian Herring (Arripis georgianus) and Yellowtail Scad (Trachurus novaezelandiae). In the Northern Territory development licences have recently been issued to assess the commercial potential of several species, including Smallspotted Herring (Herklotsichthys lippa), Goldstripe Sardinella (Sardinella gibbosa) and Indian Anchovy (Stolephorus indicus).

used to monitor the abundance of the stock in a particular area.

However, Tim Ward says that the CPUE method is misleading for schooling fish such as sardines and mackerel. One shot or haul could catch hundreds, if not thousands, of fish – whereas others might deliver none. Catch rates can stay high even if overall abundance is low, because modern equipment is very effective in finding schools.

In Australia and internationally, the daily egg production method (DEPM) is widely accepted as the most effective way to assess stocks of schooling pelagic fish. When the average number of eggs produced by a female adult is known, the number of eggs found in a sample area can be used to determine the breeding biomass of adults. The age and size frequency curve for the population can then be used to calculate an estimate for the target stock biomass.

"We've done a lot of work with sardines in SA, but we're not sure yet if the sardine stocks along the east coast have the same reproductive parameters," Tim Ward says. He expects this

information will emerge from surveys undertaken in January and September 2014.

The summer survey of the New South Wales, Victorian and Tasmanian coast was the first dedicated DEPM survey of Jack Mackerel conducted in Australia and involved concurrent sampling of eggs and adults. "We sampled the key spawning sites during the peak spawning season and collected 2700 adults during the survey, so we are expecting to generate robust estimates of adult biomass."

The DEPM surveys completed in September 2014 targeted eggs and adults of Blue Mackerel (Scomber australasicus), Australian Sardine and Tailor (Pomatomus saltatrix) along the NSW and Queensland coast. The University of Tasmania, the NSW Department of Primary Industries and the Queensland Department of Agriculture, Fisheries and Forestry participated in the project. While state and commonwealth fisheries are often managed independently, the multi-jurisdictional approach in this research recognises that fish populations move between management zones.

Tim Ward says an analysis of the survey data is still being completed and will be discussed at a meeting of small pelagic fishery researchers and stakeholders scheduled for March 2015. Information from a review of the Commonwealth small pelagic fishery harvest strategy being undertaken by Tony Smith, who leads CSIRO's fisheries ecosystem-based management research and assessment group, will also be taken into account.

#### International workshop

As part of the work to benchmark Australian practices against international best practice a Small Pelagic Fisheries Workshop and Forum was held in Adelaide in August. Among those attending was Paul Watson, executive officer of the South Australian Sardine Industry Association. He says as Australia's small pelagic fisheries, such as the sardines, are relatively new, they have been able to avoid mistakes that led to overfishing of these species in other parts of the world. "We've had the luxury of coming into it with the benefit of seeing what had been done elsewhere."

He says it was reassuring from an industry perspective to find that the DEPM is used worldwide as a stock-assessment tool. "It is clearly the global standard," he says.

The conference heard from a range of speakers who gave a global perspective on the status of their respective fisheries – size, value, funding models, management systems – and provided an overview of the developments in the research being undertaken.

Speakers included leading US pelagic scientist Nancy Lo, who has more than 40 years' experience working as a biometrician in marine fishery science and who has helped to develop and validate many of the most-used fishery statistical models. Together with her colleague Kevin Hill, she provided an overview of the latest work in the US and for the North American Sardine in particular.

Cindy van Damme provided an overview of Atlantic Horse Mackerel. She has spent the past decade working on small pelagic fisheries in the northern hemisphere (North Sea). She is widely recognised as a leading researcher in small pelagic fisheries, in particular for egg, larvae and fish surveys.

Leire Ibaibarriaga, a senior researcher in the Pelagic Fish and Fisheries area in the Marine Research Division of Spain's AZTI Tecnalia, provided an overview of work related to the Spanish Anchovy and also of the International Council for the Exploration of the Sea Working Groups.

#### Australian research

At the forum, Australian scientists discussed the different statistical methodologies employed to analyse data collected for application of the DEPM with international researchers. At present, fisheries around the world use a variety of statistical methods to estimate egg production. During the workshop, SARDI's Jonathan Carroll demonstrated that no one technique suits all situations. As part of the research for the FRDC he is developing guidelines on what procedures should be used in different circumstances, depending on the species, location and time.

Addressing another part of the DEPM project, SARDI oceanographer John Middleton discussed the simulation model being developed that will help the factors that affect the capacity to estimate egg production to be understood with accuracy and precision.

"At the moment, there is significant uncertainty around estimates of egg production," Tim Ward says. "This project will help us provide more precise estimates of fish abundance, which will enable managers to set total allowable catches with even greater confidence." This is important, he says, because fisheries managers are starting to use the DEPM to assess the abundance of a range of new species, including snapper and Tailor.

Forum participants were impressed by Australia's management approach, particularly a study of SA's sardine fishery that showed that the precautionary approach to management is achieving its goal of ensuring ecological sustainability. This long-term study was conducted by Simon Goldsworthy's team at SARDI in conjunction with the pelagic fish team and a large group of students. It found that, even while the number of sardines harvested in the state had increased, there was no detectable negative impact on birds and animals that forage on the sardines.

Chair of the Small Pelagics Forum Colin Buxton, from the Institute for Marine and Antarctic Studies, says the ecosystem study was described as one of the best global examples of studies of the roles of fisheries species in the ecosystem.

#### **Recreational perspectives**

There is also support for robust science-based stock-assessment methods for small pelagic species from Australia's recreational fishers who target larger species.

"Small pelagics are an important resource in terms of their ecological role within the environment," says Andrew Rowland, chief executive officer of Recfishwest. "It is very important we have a clear understanding of this role as well as their biomass and stock structure. It is critical that we invest in research to attain the level of knowledge we require to effectively manage this fishery."

Brett Cleary, president of the Game Fishing Association of Australia, also supports the research into stock structure and biomass. However, he believes more work still needs to be done on understanding stock movements and the impact of localised depletion.

"We need a better understanding on how long it takes for fish stocks to be replaced in a particular area. Because even while the percentage of fish taken by commercial fishers may be small overall, the impact of taking them from a particular area may be significant for those such as recreational fishers and the communities that depend on them economically, and also ecologically for the birds and seals that feed on them."

#### **NEW MARKET OPPORTUNITIES**

Most small pelagic fish harvested in Australia are used as baitfish for the tuna ranching industries. A small amount is used in petfood, and less than two per cent are for human consumption. This is because small pelagics are oily fish that require immediate processing to avoid spoilage. Onvessel processing and freezing is expensive and requires large-scale operations.

One company that has managed to overcome these obstacles is Western Australia's Cape Le Grande. In conjunction with Curtin University's Centre for Excellence for Seafood, Science and Health, Cape Le Grande, under managing director Tim Rowe, has developed a strict supply-chain

protocol to harvest Australian Sardines for human consumption. The fish are stored in ice slurries immediately after being caught off the Western Australian coast and filleted as soon as they are landed.

The company has had positive responses from chefs who have tried their product, and is hoping that more Australian chefs and consumers will

follow the lead of countries such as Spain, Italy and Greece, where sardines are a staple on restaurant menus.

The South Australian Sardine fishery is also expanding into higher-value, human consumption markets.

The raw Australian Sardine fillets appeal to creative chefs in high-end restaurants.



Tim Rowe

# A common approach defines sustainable fishing

LANGUAGE A year of listening, debating and discussing has paved the way to a new definition of sustainability for Australia's wild-catch seafood

#### By Josh Fielding

**E** arly in 2014, an issues paper, *Defining Sustainable Australian Seafood "Wild-Capture Fisheries"*, was circulated widely among stakeholders of the Australian seafood industry, as part of efforts to reach a consensus on what 'sustainability' meant in this context.

The paper was developed by the Common Language Group (CLG), an initiative of the FRDC established in 2012 in response to the confusion that exists among a range of stakeholder groups about the language the seafood industry supply chain uses (producers, wholesalers, retailers).

Completed surveys responding to the issues paper were received from groups, businesses and individuals across the wild-catch fishing sector seafood supply chain. Respondents included environmental NGOs, key retailers such as Coles, the FRDC's Indigenous Reference Group and the Australian Fisheries Management Forum.

After reviewing these responses, the CLG has now completed a definitions paper titled *Common Language for Sustainable Wild Caught Seafood*. This paper, while technical in nature, begins to form the basis of common language around the term 'sustainability' for wild-caught seafood.

Survey respondents to the issues paper agreed on the following definition.

Sustainable seafood is that for which the status of stocks of retained target and other fish is sustainable and, in addition, in harvesting the seafood, the fishery's impacts on bycatch species, protected species, marine habitats and marine ecosystems are such that their existence and functioning also is maintained in a healthy state.

The paper defines five elements that contribute to sustainability and provides both a common language definition and a technical



#### FIGURE 1 THE FIVE ECOLOGICAL COMPONENTS USED TO DETERMINE ECOLOGICALLY SUSTAINABLE FISHERIES

definition. It then identifies several components that make up each of the five elements and defines each of these in the same way – with a common language and technical definition.

The issues paper and the new definitions paper were both prepared by the CLG's custodian group, which is keen to get feedback on the new definitions.

The CLG custodian group is made up of researchers, management representatives from commercial, recreational and Indigenous sectors, post-harvest processors, importers, environmental NGOs and extension agencies. Chair of the CLG's custodian group Meryl Williams is also vice-chair of the scientific committee of the International Seafood Sustainability Foundation.

The purpose of the Common Language Group initiative is to develop a consensus on terminology for a range of important issues affecting the Australian fishing and aquaculture sectors in order to gain greater clarity and transparency for the industry. The CLG will develop agreed positions using a consensus approach involving key stakeholders through both representation on the CLG and wider public consultation.

The CLG members agreed to start the process by trying to define the sustainability of commercial Australian wild-caught seafood.

In doing so, the CLG has set aside social and economic aspects of sustainability to initially focus on the ecological aspects of fisheries sustainability.

Definitions of sustainability range from narrow and precise interpretations to broader, less-specific definitions. Government definitions of the terms 'sustainable development', 'sustainable fishing' and 'sustainable use' are helpful when considering the meaning of 'sustainable seafood'.

Other institutions and organisations may not require formal definitions, and can be flexible in how they interpret 'sustainability' in light of their members' interests and corporate mission statements. They can then use these different definitions of seafood sustainability and management, according to their own missions, priorities and campaigns or promotions.

The aim of the CLG is to bring government and other stakeholders groups to agreement on the meaning and use of these terms. **F** 

Common Language for Sustainable Wild Caught Seafood is available for comment via the FRDC website (www.frdc.com.au/knowledge/common\_language) until 15 December 2014. Comments can be submitted by email to CLG@frdc.com.au. Spawning *Dicathais orbita* sea snails deposit dozens of egg capsules containing thousands of eggs.

# A NEW CANDIDATE FOR AQUACULTURE

PHOTO: WARWICK NOBLE

AQUACULTURE A tasty local sea snail that can be milked for anti-tumour compounds, anaesthetics and other biologically active chemicals is causing excitement among South Australian aquaculture researchers

#### By Gio Braidotti

quaculture in Australia is diversifying. This is a trend the sector wants to encourage through the use of R&D to bring new species, products and markets into play for producers.

Stakeholder consultation undertaken to help develop the FRDC's strategic investment plan for the next five years has highlighted the desire for a broader range of species in production.

To date, about 70 species are grown in commercial aquaculture systems in Australia. The sector earned more than \$1 billion from a total production of 84,605 tonnes in 2011-12. This is an increase of more than 10 per cent from the previous year in both value and amount produced.

According to *Australian Fisheries Statistics*, the top five earners – salmonids, rocklobster, prawns, Southern Bluefin Tuna (*Thunnus maccoyii*) and abalone – are all produced for consumption as seafood. But new avenues of research are investigating a different range of products, with a focus on the production of newly identified biological compounds.

Marine biologist Kirsten Benkendorff, from Southern Cross University (SCU), has been leading efforts to identify additional biological value from marine sources, challenging the food-based aquaculture paradigm. In the process, she is also training a new generation of scientists to work in this promising and highly topical area of research. Among them is Warwick Noble, whose doctoral studies were undertaken with Kirsten Benkendorff at Flinders University in South Australia, before she moved to SCU.

Warwick Noble researched the aquaculture potential of a gastropod (or sea snail) native to Australia and New Zealand called *Dicathais orbita*. Although *D. orbita*'s range is limited to Australian and New Zealand waters, similar gastropods are fished and sold all over the world.

For Warwick Noble the allure of this species is that while the mature whelks have a worldwide seafood market, research in Australia has identified that *D. orbita* produces bioactive compounds with a range of desirable effects. This includes the compound Bromoisatin, which has anti-tumour properties. "The most interesting compounds cannot be chemically synthesised for pharmaceutical development at this time, whereas consuming the whole organism may convey similar benefits to a purified compound ... in the form of a tasty meal," he says.

This discovery of bioactive agents not only lifts *D. orbita* into the more lucrative category of a functional food, but Warwick Noble's research has also established that the compounds can be repeatedly "milked" from the juveniles as they grow into marketable size.

#### Introducing Dicathais orbita

Warwick Noble describes *D. orbita* as belonging to a "cosmopolitan" group of scavenging and predatory gastropod families found in every ocean of the world. Often referred to as whelks, the three most important families for fisheries and aquaculture are the Muricidae, Buccinidae and Melongenidae.

*D. orbita* is a member of the Muricidae family for which there are species that are highly valued in Asia, Central America and South America.

"Whelks are sold at seafood markets around the world and used in a variety of ways ... from raw and pickled to uses in pasta sauces and salads," he says. PHOTOS: WARWICK NOBLE



Broodstock of *Dicathais orbita*, a sea snail native to Australia and New Zealand under study for its potential to be aquacultured using production systems similar to those employed for abalone.

"Like other molluscs, they are very versatile and the foot tastes a lot like abalone. When eaten whole it has a spicy flavour, which is prized in some Asian and Mediterranean cultures."

Growing it in aquaculture involves production systems, costs and logistics not unlike those required by abalone.

Females spawn annually, depositing dozens of egg capsules on hard substrates, each containing thousands of eggs. These develop into larvae and hatch in about a month. The larvae spend a few weeks feeding on phytoplankton before settling and undergoing metamorphosis into juveniles that resemble the adult and feed on carrion or prey on other benthic animals (that live on the ocean floor).

"The juveniles will also consume pellet feed and marketable products could be harvested after 12 to 18 months," Warwick Noble says.

#### Milking a whelk

Kirsten Benkendorff and several of her students have played a pivotal role in characterising the bioactive compounds produced by *D. orbita* as they sought to understand the role of these agents in the life of the organism.

"Some of the bioactive compounds are used by *D. orbita* to anaesthetise their prey and others seem to be produced for their antimicrobial properties," Warwick Noble says. "They were first identified from chemical analysis that revealed similarities to molecular structures in other organisms with known bioactive properties. This triggered the research interest in these compounds."

Obtaining samples of these compounds need not kill the organism; Warwick Noble established a way to repeatedly milk these compounds from *D. orbita.* As to the technique involved, he says it involves getting the gastropods drunk.



Warwick Noble has conducted research on sea snails (or whelks) with an eye to their commercialisation in Australian aquaculture farms specialising in molluscs. Along the way he has acquired a culinary appreciation for whelks, which he cooks for friends as part of "seafood feasts".

"The compounds are produced in what is most likely a stress response to the addition of ethanol to the water the animal is kept in," he says. "The yield is quite low, but the technique is the first to milk more than one snail at a time. It does not seem to harm the animal, so can be repeated more than once."

Market interest exists for these substances in the alternative therapies market and Warwick Noble is keen to see research continue in support of commercialising and marketing *D. orbita*.

"Aquaculture in Australia is rapidly diversifying beyond traditional species and seafood products," he says. "Australian producers are exploring endemic species to satisfy domestic and international markets.

"As for *D. orbita*, it could easily be marketed as a functional food. Since the nutraceutical and functional foods markets are estimated to be worth billions of dollars and expected to increase further in future years, there are strong



indicators that *D. orbita* could enhance Australia's aquaculture profile."

#### Marketing a snail

Opportunities to commercialise *D. orbita* especially excite Warwick Noble given that aquaculture in SA is dominated by relatively few species. He says that within molluscan aquaculture, the focus is on abalone, oysters and mussels.

"Presumably aquaculture in SA has taken this form because the species farmed are relatively high value or techniques were developed for the culture of similar species."

With two large gulfs sheltered from open oceans and a large expanse of open coastline, he believes that SA has tremendous diversity within its marine biota.

"There are many species in SA that have properties that could be explored and exploited for aquaculture," he says. "Current production systems are missing out on value adding or diversifying their production and products. Exploring further opportunities could have environmental benefits, increase employment, spread risks of losses due to pathogens or market fluctuations and increase profit for producers."

He adds that with *D. orbita* he has seen the potential for domestic and international markets grow every year he has worked on this native sea snail. **F** 

# TECHNOLOGY ENHANCES RECREATIONAL ENDEAVOURS

**RECREATIONAL FISHING** Advanced technologies are helping recreational fishers more accurately target their preferred catch, while reducing the environmental effects of their activities

#### By Natasha Prokop

The recreational fishing trade and tackle industry is worth more than a billion dollars a year in Australia. Each year, many new products are put on the market, with innovations increasingly focusing on more environmentally responsible fishing.

Many recreational fishers see themselves as frontline environmentalists, according to the chief executive of the Australian Fishing Trade Association (AFTA), Allan Hansard.

"It's in their interests to look after their fish and the environment," he says. "And that is a trend that is driving the development of new products in a highly competitive and technologically advanced industry."

The publisher of Australia's leading recreational fishing magazine *Fishing World*, Jim Harnwell, has been reviewing products for more than two decades. He says advances in a wide range of commercial technologies are quickly being adopted by the recreational fishing industry. Aerospace-grade carbon fibre for fishing rods and smartphone-style electronics incorporated into fish finders are just two leading technologies found in the latest products.

He says the 20-year-old innovation of braided fishing line fundamentally changed the way people fish and the types of products developed. "You can't underestimate the impact, especially in sport fishing, of being able to use lighter line, lighter gear to catch bigger fish." And as lines have become lighter and stronger, the performance of rods has had to improve to meet the demands for size, sensitivity and strength.

The family-owned Australian tackle manufacturer Wilson Fishing is one company

that has risen to the challenge. It has poured three years of research and development into a new technique for wrapping carbon fibres as part of its high-performance fishing rods. The company has patented its Xantu material, making its highly sensitive Venom X range of rods entirely of carbon fibre without the associated weakness of rods that use nano resins or fibreglass inner layers.

Head rod builder at Wilson Fishing Kord Luckus says the Venom X range has been designed and tested right down to the millimetre to be suited to uniquely Australian conditions and the large fish, such as Giant Trevally (*Caranx ignobilis*), that recreational fishers like to chase. The new Venom X rod was the winner of the 2014 AFTA new product award.

New materials, including new metal alloys, are also making their way into reels and other gear designs, with the Japanese firm Shimano a leader in reel technology. The company's latest release at the recent AFTA trade show is an addition to the long-running Stella series.

#### **Catch and release**

The Stella FI reel uses new materials, micromodule gears adapted from bait-casters and coil wave drag technology to ensure smoother and therefore faster retrieval, which minimises stress on fish destined for release.

This is an important consideration in the tackle industry as several projects, including some funded by the FRDC, show that more anglers are releasing fish more often, including larger fish.

For example, an assessment of Barramundi (*Lates calcarifer*) line-fishing in northern Australia found that 72 per cent of fish caught were released. Recreational fishers had become more aware of the biology and conservation values of the species, which are hermaphroditic. They change to females as they grow to 90 centimetres, and releasing larger fish contributes to conservation efforts.



Total Fishing Australia app menu.

Improving post-release survival with the correct techniques and gear is a critical part of the catch-and-release philosophy. The increased use of circle hooks that avoid deep hooking (a major contributor to post-release mortality) and use of fish-friendly soft mesh landing nets are becoming increasingly popular with recreational anglers.

An international leader in the tackle industry, Shimano has an extensive R&D team, with more than 100 staff working on reels alone, constantly trying to improve past designs. "Shimano won't re-release something that is essentially the same," says Chris Cleaver, manager for the company's rods and reel sales in Australia. "We try to find anything that was possibly a negative with the old [product] and improve it with new materials and designs."

#### **Design detail**

Australian company Halco Tackle has spent hundreds of hours developing a life-like action for its AFTA award-winning C-Gar surface lure. Halco Tackle managing director Ben Patrick says trying to make a "stable, unstable lure" is a hard line to tread and "takes a lot of tweaking." He says the difference between a lure that is stable enough to do what it needs to, yet unstable enough to mimic an erratic swimming motion to attract fish, can be in the order of microns in the design.

R&D in outboard motors is also shifting towards environmentally friendly innovations including better fuel efficiency and lower emissions. Jim Harnwell says there is even discussion about hybrid engines that incorporate electric motors, although in the fishing industry this could still be a decade away from reality.

Improvement in the electronic technologies used in depth sounders and fish finders has paralleled that of mobile phones and they are now capable of a wide range of incredibly advanced processes. Some fish finders can target individual fish of specific species and sizes. This accuracy can assist in avoiding catching and causing unnecessary stress to non-target fish.

#### **Fishing apps**

The recreational fishing industry has been quick to take advantage of social media to share stories of a successful catch. Social media and apps are also proving popular sources of reference information on the go, as well as providing programs to record catch information. One of the latest and most comprehensive fishing apps to be released is Total Fishing Australia (http://totalfishingaustralia. com.au), which took nine months to develop. Its features include guides on species, knot tying, locations, a GPS logger and fishing diary, rules and regulations, and photo competitions.

The benefit of such apps is that they offer on-the-spot access to size and bag limits to assist in sustainable fishing and diaries help get fishers enthused about recording fish that they release. Total Fishing Australia is available from the iTunes App Store. Other fishing apps available include: My Fishing Mate Australia, Fishabout, the Australian Fishing App, Redmap and Ikijime Apps.

As fishers continue to insist on products that allow them to fish responsibly and technologies continue to improve, product developers will keep pushing the envelope of innovation to remain competitive. Allan Hansard says, in line with this, the AFTA is planning to introduce an innovation category as part of its industry awards, presented at its annual trade show. The award will recognise the contribution that innovations make to driving change in the industry. The 2015 AFTA trade show will be held from 26 to 28 July on the Gold Coast. **F** 

#### **SPOTLIGHT ON INNOVATION**

The Australian Fishing Trade Association uses its annual trade show to highlight some of the best and most innovative new products on the market. Winners from the 2014 awards announced at this year's trade show included the following.

#### AFTA 2014 BEST NEW ROD

#### Wilson Fishing Venom X 10-20lb Spin Rod

Wilson Fishing's patented carbon-fibre Xantu material uses a new technique for wrapping carbon that combines strength with lightweight sensitivity. The Venom X rods adapt the technology in Wilson Fishing's larger Venom rods for medium to light gear. The Venom X range comes in a variety of sizes to suit the range of Australian conditions.



Wilson Fishing's Venom X rod.

#### **AFTA 2014 BEST NEW REEL**

#### Shimano Stella 2500 FI reel

Micromodule Gear Technology is a new feature of the FI Stella adapted from baitcasting reels. The material is stronger and the gear mesh finer to give better gear alignment for smoother casting and reduced noise when retrieving. But the most environmentally conscious feature is the coil wave drag – a spring drag system that creates consistent pressure on the drag washers, meaning a smoother and faster retrieval and reduced stress on the fish. The Stella FI comes in four size models.

#### AFTA 2014 BEST NEW HARD BODIED LURE

#### Halco C-Gar Slow Sinking Stick Bait

Halco's C-Gar lure is weighted for easy casting into a strong breeze but also just enough for a slow sinking rate that will not splash on the surface like a popper. The C-Gar strikes the balance between stability and instability to create a lifelike swimming action to attract large surface species such as Queenfish, Trevally, Mackerel and Tailor. Combined with the popular, heavy duty 1/10 Mustad treble hooks and Halco's strong fish rings, these will not break off, allowing for better catch and release, or catch-and-keep fishing. The C-Gar is 120 millimetres long.

#### AFTA 2014 BEST NEW LINE

#### Samaki Xtreme PE braided line

Australian company Samaki has brought the latest Japanese-manufactured Dyneema braid to Australia with its Xtreme polyethylene line. This line has eight times the standard polyethylene abrasion resistance, a feature achieved through the specific manufacturing process and coating used. An ultraviolet stabilised coating prevents breakdown of the line, without affecting sensitivity. These features ensure this line will not break under the pressure of a big catch, or leave line dangling from the one that got away.

Shimano's Stella 2500 Fl reel.

PHOTO: HALCO TACKLE

Halco's C-Gar surface lure, pictured in Smelt.



PHOTO: ROBBIE KILPATRICK, AAD

A deepsea camera system designed to attach to trawl gear.

PHOTO: AAD



The deepsea camera system, designed to attach to longline gear, being tested on the Australian Antarctic ship *Aurora Australis*.

PHOTO: JASON HAMILL, AFMA, AAD



Robbie Kilpatrick, one of the scientists behind the development of the deepsea camera system, attaches the trawl camera to fishing gear during a trial near Heard Island.

# Seeing is believing

TECHNOLOGY New deepwater camera technology has huge potential to help fishers and fisheries managers by revealing the effectiveness of fishing gear and its effects on the seafloor, allowing for changes to improve performance

#### By Ilaria Catizone

asy to use, reliable, capable of operating in water depths of 2400 metres and temperatures near 0°C, and able to withstand the rigours of commercial fishing – these were just a few of the essential performance criteria for a new deepwater camera system developed by the Australian Antarctic Division (AAD).

The cameras were created as part of an eight-year project to assess whether commercial fishing was damaging the ocean floor around Heard Island and the McDonald Islands (HIMI), a relatively fragile part of Australia's fishing grounds. However, the cameras have also helped fishers assess the effectiveness of their gear and revise operations to both increase catches and reduce environmental effects.

The ability to monitor both fishing impact and gear modifications gives the Australian technology,

developed with FRDC funding, practical applications that could improve fisheries worldwide.

#### Low-impact fishing

The video footage and photographs of fishing and of the HIMI seafloor environment have shown that fishing for Patagonian Toothfish (*Dissostichus eleginoides*) in the region has had little impact on the sea floor.

The AAD research team, led by Dirk Welsford, estimated that only 0.7 per cent of the sea floor within the HIMI fishing zone has had some interaction with fishing gear since the Patagonian Toothfish Fishery was established in the region in 1997.

About 1.5 per cent of biomass has been affected by commercial fishing in the region; the remaining 98.5 per cent of sensitive seafloor biodiversity in the area is still undisturbed by fishing. There have been various degrees of damage in that area, depending on the vulnerability of each species affected.

Most vulnerable organisms were found to live on the sea floor at depths less than 1200 metres. This habitat overlaps with trawl fishing to depths of 1000 metres and, to a lesser extent, longline fishing, which can fish deeper than 1000 metres.

It was estimated that the HIMI Marine Reserve, where fishing is not permitted, contains more than 40 per cent of the seafloor organisms considered vulnerable to demersal fishing.

Researchers found only a low risk that fishing would cause significant effects to seafloor biodiversity in the HIMI region in the medium term and identified strategies to minimise fishing impact, such as gear modification and the avoidance of sensitive areas. They recommended that risk assessments for the fishery be updated regularly, to evaluate the likely performance of the current management approach in the long term.

#### From idea to reality

Andrew Constable, leader of the Southern Ocean ecosystem change program at the AAD, was the principal investigator of the team that developed the cameras. He says designing the cameras to withstand the rigours of commercial fishing without affecting the performance of the fishing gear was a significant challenge.

"They also needed to be extremely easy to use so that anyone could benefit from the data collected. Marine technician Robbie Kilpatrick was instrumental in producing cameras that were strong enough to go on trawling gear and that could be attached to different areas of the nets."

General manager of Austral Fisheries Martin Exel is enthusiastic about the camera system, which has been monitoring the company's PHOTO: AAD



Diverse seafloor habitat captured by the trawl-mounted camera during testing in the Southern Ocean.

# 07/21/07 16:31:27:1

A video frame from the trawl camera as a Patagonian Toothfish is captured in the net.

PHOTO: WENDY PYPER, AAD



Scientists catalogue seafloor species collected during deepsea camera trials.

#### THE SECRET LOVE-LIFE OF KRILL

Temporarily stuck in ice during an Antarctic voyage in 2010, a team of Australian scientists decided they might as well put their deepwater camera gear to good use and check out what was happening beneath the ship.

Australian Antarctic Division (AAD) researcher Andrew Constable says they were confident their gear could handle the depths and the temperatures beneath the ice in the waters around the Antarctic ice. But they did not think much more about the footage of krill they captured until some time later, back in the Hobart laboratory.

When they showed the footage to AAD krill biologist So Kawaguchi, he was astounded to realise that the footage contained the first ever images of the mating behaviour of Antarctic krill in the wild. "These are groundbreaking observations," So Kawaguchi says. "This behaviour was filmed on the sea floor when, traditionally, Antarctic krill were thought to mate and lay eggs in the surface layer [0 to 200 metres]."

The finding has been published in a scientific journal and highlights the importance of the ocean bottom as a habitat for krill. The excitement of this discovery was further publicised through successful outreach by Lisa Roberts, an artist specialising in science communication, who produced an animation 'Do krill have sex?' (www.livingdata.net.au/content/visualisations/ animations/Animations-KrillSex.php), which portrayed the entire sequence of krill mating. Patagonian Toothfishing operations. "Not only could we assess the impact of our nets on the seabed and work to minimise it, but we were also able to make changes to the gear to increase our catch rates by about 10 per cent," he says.

The cameras were deployed on trawl nets from about 400 to 1000 metres depth. "As soon as the cameras came up the crew were really interested in downloading the footage and seeing what had happened down there," Martin Exel says.

The cameras can be programmed to automatically turn on and off to film the most important phases of fishing operations, such as deployment and retrieval of nets. Once the gear is back on board, the data can be easily downloaded for immediate review, or analysed in more detail at the AAD's Hobart laboratory.

"For the first time we were able to see the reaction of the fish to our gear and make improvements. We tweaked the foot rope to avoid having fish escape in the gap between that and the seabed, then we deployed the nets again with the cameras attached to see if our changes were effective."

The crew also changed how the bobbins worked to allow the nets to ride over boulders rather than getting stuck.

"We are keen to keep using the cameras and we are talking to AAD to obtain some more," Martin Excel says.

The project has developed a world-first technique to attach cameras to long lines that are deployed through a chute in the stern of the vessel on autolines. The company Australian Longline also fishes for Patagonian Toothfish in the HIMI, and managing director Les Scott says he was thrilled to have been involved in the research.

"We had cameras going to depths of between 800 and 2400 metres, and that gave us a real insight about the behaviour of our gear," he says. "We were particularly interested in seeing the effects of the sweep of the lines across the sea floor, and we were pleased to find that after they were deployed the lines had minimal movement."

#### Wider use

The cameras have been designed to be versatile. They can be attached to nets, lines and other fishing gear, such as demersal pots, and could easily be used in other Australian fisheries and overseas. They can also be used as drop cameras to record the habitat in new areas before any fishing occurs.

Andrew Constable says the falling cost of technology will make the camera units more affordable to build than the original unit, made in 2006, which cost \$15,000. Researchers are making the camera specifications freely available to anyone who would like to build their own unit.

The Commission for the Conservation of Antarctic Marine Living Resources, which manages fishing activities in the Southern Ocean, is considering whether the system could be used to manage the effects of demersal fishing in its region. The commission's scientific committee identifies areas that may be particularly sensitive to bottom fishing, known as vulnerable marine ecosystems, and suggests measures to protect those areas. Using the cameras to observe gear interactions with the sea floor and to map high-risk areas could help with this. **F** 

MORE INFORMATION: Marty Deveney, 08 8207 5434, marty.deveney@sa.gov.au FRDC RESEARCH CODE: 2011/255

# UNDERWATER CONTAGION CONTROL

**PROFILE** A fascination with the forces that allow pests and pathogens to flourish, threatening our aquatic industries, drives Marty Deveney's research into better biosecurity measures

#### By Catherine Norwood

The blood, sweat and tears we spill, along with various other bodily fluids, are among the major sources of disease transfer between humans. And the closer you pack people together, the faster and more frequently this fluid-based transfer occurs. Think influenza, the common cold and, most recently, Ebola.

"Air is actually a relatively poor transmitter of pathogens," says South Australian marine scientist Marty Deveney. "Liquids are much more effective." But what happens when your whole environment is liquid? How much faster does disease progress then and how do you stop it?

While human biomedicine may have been the first point of serious study for Marty Deveney, it is the vast extent of the "unknowns" in aquatic environments that has held his attention for the past 15 years. "You have to manage diseases in animals that live in these environments in a substantially different way," he says.

Working as an aquatic biosecurity specialist at Marine Innovation South Australia (MISA), Marty Deveney says disease management is clearly crucial to the success of aquaculture – the "new frontier" of farming around the world. While land-based farming systems have been established for thousands of years, many aquatic systems are still in their initial phases of development. Aquatic animal health knowledge is decades behind terrestrial agriculture in many ways.

"It's an exciting field of research – there are a lot of things still to find out in terms of knowledge

and science. For the same reason it can also be difficult, because the knowledge base can be quite slim."

He says abalone is a case in point when it comes to unknowns. This large, univalve gastropod has an ancient lineage, but information about how the species' immune system works is limited, particularly compared with mammalian immunology. "We are aware it has an immune system, but in terms of the practicalities of how it works we are still almost entirely ignorant. When abalone farming first started in Australia we had virtually no idea about what diseases could affect it."

There are about 70 fish and seafood species farmed in Australia. Most are

native species, but all come with their own entourage of parasites and pathogens. The challenge for aquaculture is to expand production while also putting in place systems to protect the industry from disease outbreaks.

#### Learning and growing

Marty Deveney says he first became interested in the links between aquatic systems and food production while still at secondary school, after undertaking work experience with the Department of Zoology at the University of Queensland. He began his studies at the same university with a focus on human biomedicine, but soon changed to marine biology and parasitology. This was followed by a PhD, spent largely on Heron Island in the Great Barrier Reef, investigating the biology of parasites that commonly affect reef fish such as Coral Trout, Queensland Groper (*Epinephelus lanceolatus*) and Flowery Rockcod (*Epinephelus fuscoguttatus*) – all candidates for aquaculture.

After graduating and completing a short stint with the University of Queensland, he moved into

a marine regulatory and policy position with the Department of Primary Industries and Regions South Australia (PIRSA) in 2001.

"One of the fundamental differences between terrestrial animal husbandry and aquaculture in Australia is that farms are generally freehold land owned by farmers, but aquatic farms operate on a lease of a publicly owned resource. There is greater and more immediate connectivity with the broader environment than on land," he says. "There is a strong desire and a responsibility to maximise returns – not just for profit, but to make best use of a common resource. Setting the framework for this is crucial," he says.

"One of the fundamental differences between terrestrial animal husbandry and aquaculture in Australia is that farms are generally freehold land owned by farmers, but aquatic farms operate on a lease of a publicly owned resource. There is greater and more immediate connectivity with the broader environment than on land."

#### – Marty Deveney

Profile

While at PIRSA he helped to develop an integrated aquatic biosecurity system for SA. This recognises that the risks from fisheries, aquaculture and the overall marine environment are interconnected and need to be considered as a whole, rather than as affecting separate industries or sectors. Risks across all aquatic sectors were prioritised and resources were allocated to the issues requiring the greatest mitigation.

In 2007, he returned to research, working for the South Australian Research and Development Institute (SARDI). His biosecurity role with SARDI is to lead the MISA Marine Biosecurity Node, where he can continue to investigate the "intimate and fascinating relationships between hosts and disease agents".

Take the minute *Zeuxapta seriolae* for instance, a gill fluke that can, in sufficient numbers, overcome the comparatively giant



Yellowtail Kingfish (*Seriola lalandi*). The fluke is only 200 microns (0.2 millimetres) long when it hatches from eggs laid into the water column, while Yellowtail Kingfish grow to 2.5 metres.

Z. seriolae larvae can swim only a few millimetres a second and survive only a day without a host. Tiny, slow and short-lived – finding a host in the open waters of Australia's oceans is a herculean challenge.

But the sea cages of a kingfish aquaculture operation provide abundant candidates within easy reach. Parasite numbers can build quickly, affecting the health and growth of the fish. The gill flukes feed on blood and over time cause anaemia, which can eventually kill the fish.

Similarly, *Benedenia seriolae* feeds on the skin of the fish. Nibbling away at the epithelial tissue in large numbers, they break down the barrier between the internal environment of the fish and the sea. This also affects growth and, if not managed, will eventually kill the fish.

Marty Deveney's research to better understand the host–parasite relationship has identified ways to protect Yellowtail Kingfish from fluke infections and optimised treatments to control fluke.

The work has been undertaken in conjunction with CleanSeas Australia, with funding from the Australian Seafood Cooperative Research Centre. "If you can improve parasite management, you can reduce the cost of production, increase efficiency and productivity, and improve the welfare of the animals, which are all important," he says.

He expects the role of aquatic disease management and biosecurity will continue to increase as an inevitable outcome of the burgeoning demand for seafood. With oceans at capacity in terms of wild production, expanding fish farming is the alternative.

#### **New winners**

Most aquaculture production in Australia comes from just a few species, and while these might be the "winners" for now, Marty Deveney says this may not necessarily be the case in the future.

Many aquaculture industries in Australia had limited markets when they were first established. Industries have created their own markets: now there is broad acceptance and aquaculture products are on menus everywhere. "New farmed species will provide potential for new winners," he says.

Among species showing aquaculture growth potential are freshwater finfish such as Rainbow Trout (*Oncorhynchus mykiss*), Silver Perch (*Bidyanus bidyanus*) and Murray Cod (*Maccullochella peelii*). But parasites have been an increasing problem for these species in Victoria. Through an FRDCfunded project, Marty Deveney has been working with the Victorian Trout Association to identify treatments for one of these organisms, a ciliate Marine biosecurity specialist Marty Deveney.

parasite, which has become increasingly problematic for trout farmers.

In Victoria, summer temperatures have been rising and rainfall has declined, taking water temperatures to the upper tolerance range for the fish (about 17°C) more often. Higher temperatures provide good growing conditions for the parasite. "We found that the biology of the ciliate in Victoria was sufficiently different from those in North America and Europe that we needed to develop a different treatment approach. While the findings applied to Rainbow Trout, they are also relevant to other freshwater finfish that are aquaculture targets." Marty Deveney says.

He says, overall, he would like to see aquatic animal health more strongly embedded within the aquaculture industry, as opposed to practitioners "off to the side doing research". This is already beginning to happen with veterinary courses at the University of Adelaide and elsewhere including a stronger focus on aquatic animal health. "I think this will become more prominent as time goes by."

From the microscopic world of pathogens, Marty Deveney is also involved in the big-picture issue of national marine pest biosecurity as part of his role at MISA. This includes the development of new detection and surveillance systems for Australia.

He leads a team working on molecular tools to detect high-priority marine pests and to streamline the national monitoring system that surveys 18 sites every two years. Logistics and cost have been a problem in the past. Molecular testing can provide a more rapid and cost-effective process to boost surveillance and improve the speed of response.

"For aquatic systems in general and aquaculture in particular, we need to enhance our basic biosecurity systems," he says. "We need to be able to manage emerging pathogens and pests, even in an environment where we know relatively little about them, before they spread." **F** 

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## Movers and ...

STUART SMITH is finishing up as director-general of the Department of Fisheries, Western Australia.

The FRDC welcomes new staff member KALYA CHO who joined the FRDC in October 2014 as office administrator. Kalya graduated from the Australian National University in 2013 with a Bachelor of Science in Biology and Chemistry. She will complete a Postgraduate Diploma in Forensic Science from the University of Canberra at the end of 2014. Her main interest is in biosecurity issues. Outside of work and study Kalya enjoys travelling, music festivals and cats.

# **Calendar of events**

**EVENT** 

NATHAN ADAMS is the Abalone Industry Association's new executive officer.

The appointment of LARRY MARSHALL as the new chief executive of CSIRO was announced by the chair of the CSIRO board, SIMON McKEON.

The new executive officer of the Pearl Producers Association is AARON IRVING.

FEEDBACK FRDC WELCOMES YOUR COMMENTS frdc@frdc.com.au

> MOVERS WE'VE MISSED? INFO PLEASE TO Julie Haldane, 02 6285 0415, julie.haldane@frdc.com.au

#### **MORE INFORMATION**

2015		
9 to 11 February	SeaWeb Seafood Summit, New Orleans, USA	www.seafoodsummit.org
10 to 11 February	FRDC Board Meeting, Perth	02 6285 0400
10 to 13 February	59th Annual Australian Agricultural and Resource Economics Society Conference, Rotorua, New Zealand	www.aares.org.au
18 February	Sydney Royal Fine Food Show, Aquaculture Competition, Sydney (entries close 7 January)	www.sydneyroyal.com.au/finefood
19 to 25 February	Aquaculture America 2015	worldaquadaol.com
15 to 17 March	Seafood Expo North America and Seafood Processing North America, Boston, USA	www.seafoodexpo.com/north-america
14 to 15 April	FRDC Board Meeting, Hobart	02 6285 0400
28 to 30 April	2015 Trans-Tasman Rock Lobster Industry Conference and 9th Rock Lobster Congress, Fremantle, Western Australia	www.wrlc.com.au
20 to 22 May	NAAFE Forum 2015: Economic Sustainability, Fishing Communities and Working Waterfronts, Ketchikan, USA	www.oregonstate.edu/dept/IIFET/NAAFE/Home.html
26 to 30 May	World Aquaculture 2015, Jeju, Korea	www.was.org/meetings/default.aspx?code=WA2015
10 to 11 June	FRDC Board Meeting, Darwin	02 6285 0400
6 to 11 July	Third Australasian Scientific Conference on Aquatic Animal Health, Cairns, Queensland	joanne.slater@csiro.au
26 to 28 July	Australian Fishing Trade Association Trade Show, Gold Coast, Queensland	www.afta.net.au
25 to 26 August	FRDC Board Meeting, Canberra	02 6285 0400
21 to 23 October	6th International Oyster Symposium, Cape Cod, USA	www.oystersymposium.org
25 to 27 October	Seafood Directions, Crown Casino, Perth	www.seafooddirections.net.au
17 to 18 November	FRDC Board Meeting, Canberra	02 6285 0400

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DATE

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#### **SEAFOOD DIRECTIONS 2013**

2012/505

Seafood Directions 2013 took place from 27 to 30 October 2013 at Port Lincoln, South Australia. There were 244 conference registrations, including 13 complimentary registrations for sponsors; this was more than expected, and also included 59 commercial fishers. The increased interest from commercial fishers could be attributed to the conference being held in a major fishing port. The higher than expected registrations and sound management resulted in the conference making a profit.

Plenary sessions were led by national and international speakers. Sam Guthrie from International Trade Communications spoke on 'Business development trends in the Chinese domestic market'; Glen Hurry from the Western Pacific Tuna Commission spoke on the state of world tuna stocks; and Colin Buxton from the University of Tasmania spoke on the science of the super trawler. There were 42 presentations in all.

The program for Seafood Directions 2013 was specifically designed to encourage delegate participation, discussion and debate, and each presentation was followed by a question-and-answer session. Media activities included the Family and Fishers Day, the National Seafood Awards, launch of the Seafood Hall of Fame and ABC 'Country Hour' interviews with speakers broadcast from the conference. Feedback from delegates personally and via Facebook and emails indicated a high degree of satisfaction and a lack of negative comment.

MORE INFORMATION: James Fogarty, Shearwater Consulting, 07 4031 2345

#### SEA CUCUMBER HARVEST STRATEGIES

2012/200

A management strategy evaluation (MSE) approach was used to evaluate the benefits of a rotational harvest strategy in the Queensland East Coast Sea Cucumber (Bêchede-mer) Fishery (ECBDMF). In general, the current management arrangements result in a low risk to most fishery species and reduce the risk of localised depletion. Harvest strategies limit and spread effort, including the rotational zone strategy, which allocates a limited number of fishing days (15) to each of 154 zones once every three years on a rotational basis. It is a common-sense approach, developed by industry and embraced by management. However, there are still risks to some highly targeted species, and filling important information gaps would reduce uncertainty.

This ECBDMF has a small number of participants and modest annual catch (387 tonnes in 2010-11), with a current GVP of approximately \$5 million a year. This project has shown there is the potential for expansion in terms of both volume and value of fishery products by spreading the fishery effort widely. This research has demonstrated a benefit of rotational harvest zones for a sea cucumber fishery and most likely has application to other sea cucumber fisheries in the Northern Territory and Western Australia and in regional fisheries in the South Pacific and South-East Asia.

MORE INFORMATION: Timothy Skewes, 07 3833 5963, tim.skewes@csiro.au

#### **TORRES STRAIT AQUACULTURE**

2008/326.34

Aquaculture opportunities are limited in the Torres Strait region due to a lack of knowledge and experience. This project was undertaken to gain knowledge, understand aquaculture methodologies and explore potential opportunities throughout the region. This was achieved by visiting several aquaculture sites and speaking to experts in the field.

This included a visit to the clam aquaculture farm in Pohnpei, Micronesia, which has a community-based set-up and partnership with the local indigenous population. The Darwin Aquaculture Centre was visited to better understand the challenges of undertaking aquaculture within Australia. Aquarium Industries in Melbourne was also visited to better understand the potential markets for farmed marine products, including for the aquarium trade, and to better understand the process of product handling, storage and preparation for these markets.

The knowledge and experience gained from this project was significant and will be used to develop the most appropriate aquaculture venture suitable for the Torres Strait region.

MORE INFORMATION: Frank Loban, 07 4069 0700, frank.loban@tsra.gov.au

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#### MARINE CAREERS PROMOTION

An evaluation of the Tasmanian 'Working on the Water: from Aquaculture to Zoology' Careers Promotion Program demonstrated the benefits of the program to the local seafood industry and identified strategies to increase its sustainability.

The pilot program ran in 2007 and 2008, targeting Year 9 and 10 students, and has created strong partnerships and networks between the local seafood industry, schools, training and careers promotion sectors. It has increased engagement and commitment to careers promotion by the local seafood industry by giving it ownership over the messages communicated to students.

It has raised the profile of the local seafood industry among secondary school students and highlighted potential career opportunities, demonstrating the transferability of many relevant skills. It has also raised awareness among teachers and careers advisers of the diversity of jobs and training opportunities available within the local seafood industry.

MORE INFORMATION: Sam Ibbott, 0400 697 175

#### AUSTRALIAN SALMON POPULATION AND CATCH 2006/018, 2008/056

New information from this collaborative project involving researchers and managers from Tasmania, Victoria and New South Wales has identified that the Eastern Australian Salmon in these three states – and also in Queensland – are part of a single population unit.

The updated information on the biology, life history, stock structure and fisheries for Eastern Australian Salmon will be used to improve management of the species and to develop future collaborative monitoring and assessments. Evidence of spawning was recorded as far north as Coffs Harbour in NSW, about 740 kilometres further north than the previous northernmost observed spawning location in Bermagui.

New information on the diet and consumption rates of this species has addressed the concerns of various stakeholders (commercial fishers, recreational fishers, NSW fisheries managers) that schools of salmon were having large negative effects on the juveniles of their target species. Juvenile Eastern Australian Salmon eat mainly small crustaceans and become more reliant on fish prey as they grow; adults eat a wide variety of prey but mainly (~93 per cent) small baitfish such as Australian sardines, anchovies, scads and Blue Mackerel.

A cultural study undertaken within Indigenous communities on the south coast of NSW found that Australian salmon have a long history of customary importance, primarily as a staple food. An improved understanding of the Indigenous values and cultural uses of Australian salmon should result in better consultation and incorporation of Indigenous needs and interests in the management of this species. MORE INFORMATION: John Stewart, 02 9527 8411

#### SPANISH MACKEREL DECLINE

#### 2010/007

2009/327

In response to increasing concerns from long-term fishers, fisheries and environmental managers about the Queensland East Coast Spanish Mackerel Fishery (ECSMF), this project explored and defined historic patterns of exploitation, contemporary patterns of vulnerability and methods for mitigating risk. Project staff from the Centre for Sustainable Tropical Fisheries and Aquaculture and the University of Queensland reconstructed a 63-year timeline (1949 to 2012) of trends in the fishery. This clearly identified that the ECSMF has declined over time and indicated that the overall size and reproductive potential of the east coast stock has been significantly reduced.

During 2010 and 2011 innovative acoustic monitoring identified the remarkable aggregating behaviour of Spanish Mackerel during their annual spawning season.

Monitoring of a discrete group of well-known spawning reefs off the Townsville coast revealed strong reef and aggregation fidelity for a period of a single lunar month, after which mackerel appeared to disperse. This suggests spatial closures could provide some protection for Spanish Mackerel during spawning, although the project did not identify which reefs supported the largest and strongest spawning aggregations.

The implications for the commercial fishing industry are significant. The key findings highlight the contraction of a fishery resource that has historically supported a considerable commercial harvest at a time when recreational fishing effort is increasing and recreational catch could soon overtake the commercial catch. MORE INFORMATION: Andrew Tobin, 07 4781 5113, andrew.tobin@jcu.edu.au

#### **PACIFIC SWORDFISH NETWORKS**

2007/036

2011/239

Acoustic tracking has been used to gather information about the connectivity of south-western Pacific Swordfish stocks in the Tasman and Coral seas fished by the Australian Pelagic Longline Fishery to improve stock assessments and develop effective management strategies for the species. The project was able to use new towed electronic tags developed by CSIRO incorporating a GPS sensor, which significantly improved the quality of the data available. The 14 Swordfish tagged and tracked ranged widely through the Coral and Tasman seas, travelling up to 1268 kilometres during the 68 days between tagging and recovery.

This investigation revealed that Swordfish have site fidelity, at a spatial scale of a few hundred kilometres. There was also evidence that they migrate to some extent, at least regionally in the Coral and Tasman seas.

The ultimate outcome of the analysis is that the fish would likely move outside any modest spatial management zone, although mixing at a larger scale is likely limited by site fidelity of individual fish. However, reducing fishing pressure in locations preferred by Swordfish would be expected to reduce fishing mortality to some extent. The movement estimates from the analysis are in a form that could be readily incorporated into other analyses, including spatially structured stock analysis models.

MORE INFORMATION: Chris Wilcox, CSIRO, 03 6232 5306

#### **BANANA PRAWN CATCH PREDICTIONS**

This project was built upon some earlier work that developed a partially linear model relating the annual total catches of White Banana Prawns (*Penaeus merguiensis*) to rainfall indices for each of nine separate common banana prawn stock regions within the Northern Prawn Fishery (NPF).

The White Banana Prawn is a short-lived, fecund, tropical species whose annual catches have varied markedly – about eight-fold – over the history of the fishery. Although fishers and others associated with prawn fisheries have long known that there is a strong relationship between banana prawn catches and rainfall, description of statistical relationships that are adequate for predictions of catch at the large spatial scale of the NPF has been elusive.

In the early model, the predicted potential catch for the fishery was simply the sum across predictions for nine individual stock regions. Although successful, the model was unstable and difficult to fit in some regions. This project built upon that earlier work, particularly to make the model more stable and to investigate the uncertainties in the model and its predictions. We developed economic tools necessary to address maximum economic yield (MEY) goals. These tools enable the prediction of the response of prawn price to landings of Banana Prawn, and the calculation of catch and effort combinations that represent MEY. **MORE INFORMATION: Rik Buckworth, CSIRO, 07 3833 5902, rik.buckworth@csiro.au** 

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#### ENHANCED CONSULTATION AND COLLABORATION WITH INDIGENOUS COMMUNITIES 2010/320

This project facilitated enhanced communication between the Northern Prawn Fishery Industry Pty Ltd and the Lardil, Yangkaal, Kaiadilt and Gangaliddaa people of Mornington Island, Queensland. Through this project, NPF Industry members were also provided with a better understanding of issues and areas of cultural significance to the Wellesley Island Indigenous communities. Representatives of each of the four language groups within the Wellesley Island region have been able to develop a more detailed and accurate understanding of how the Northern Prawn Fishery operates and the standard to which its sustainability is managed. A process has been developed to enable ongoing sharing of information between these parties, and many of the lessons learned will be useful to similar engagement opportunities elsewhere. MORE INFORMATION: Annie Jarrett, 0411 426 469

#### **TROUT PARASITES UNDER CONTROL**

#### 2011/255

Changes to the timing and dosages of treatments to control the ciliate parasite *lchthyophthirius multifiliis* have been developed to better reflect Australian conditions and to provide more effective treatment of the parasite in Australian finfish aquaculture operations.

A meeting of the Victorian Trout Growers Association (VGTA) identified *I. multifiliis* as a limiting factor for the growth and sustainability of the Rainbow Trout aquaculture industry. This study focused on developing effective treatment systems and is an extension of a previous Victorian DPI (now the Department of Environment and Primary Industries) project 'Improving the resilience of aquaculture sectors to climate variability – better practice fish health management for salmonid farmers'.

The principal objective of this study was to refine treatment methods, improving their efficacy to better manage the infection. This was achieved by investigating the minimum effective dose for treatments against the susceptible stages of *I. multifiliis* in Rainbow Trout.

We also evaluated the differences between applied and effective doses of treatments throughout raceways, and characterised the life cycle of *I. multifiliis* to time treatments to interrupt the parasite's life cycle. We developed management strategies that can be applied by growers to better manage Australian *I. multifiliis* infections: static bath treatments of sodium percarbonate or formalin administered at the minimum effective dose repeated at the appropriate time in the ciliate's life cycle have improved efficacy and fish welfare and reduced stock loss.

MORE INFORMATION: Marty Deveney, South Australian Resarch and Development Institute, 08 8207 5400

#### **CUTTING DOWN ON BYCATCH**

#### 2013/052

Spencer Gulf Prawn Fishery, South Australian, is investigating the potential of alternative bycatch-reduction devices, with the aim of reducing the catch of two species in particular: Giant Cuttlefish (*Sepia apama*) and Blue Swimmer Crab (*Portunus armatus*). Most other bycatch species have already been eliminated from the fishery's operations, which target western king prawns (*Penaeus* (*Melicertus*) latisulcatus).

While there has been no correlation between prawn trawling and the recent decline of Giant Cuttlefish populations, the species is susceptible to trawls during its annual spawning migration through the Spencer Gulf, and it is a conservation priority to reduce this interaction as much as possible. From an operational perspective, the bycatch of Blue Swimmer Crabs requires additional handling – they are separated inside the trawl codend using a large-meshed liner. The hard exoskeletons of the crabs also damages the relatively soft-bodied prawns and cuttlefish in the nets, and would ideally be excluded during towing. This study identified that Nordmøre-grids in trawl nets, as an alternative to conventional codends, have the potential to substantially reduce bycatch of both species in this fishery, with minimal commercial impacts on the targeted prawns. A conventional codend was compared to the smallest and largest practical sizes of Nordmøre-grids (the latter to maximise sorting area), with correspondingly large and low grid angles. Both grid arrangements reduced the total bycatch, with specific reductions in both cuttlefish and crabs. However, the smaller grid size also reduced the prawn catch. Additional work is required, particularly in regard to the guiding panel, grid bar spacings and escape mortality of the cuttlefish.

MORE INFORMATION: Steve Kennelly, 0418 290 960, steve.kennelly@icic.net.au

## FISH HEALTH MANAGEMENT FOR INLAND AQUACULTURE 2010/036

Murray Cod integrated aquaculture is a sustainable and developing industry in inland Australia that uses dams within horticulture and grazing enterprises to rear the fish. In the first study of its kind in the Murray Cod (*Maccullochella peelii*) industry, the Victorian Department of Environment and Primary Industries and the University of Melbourne collaborated to examine the major causes of death and disease on integrated inland farms. The initial impetus for this project was anecdotal reports from farmers that they were losing up to 60 per cent of stock within the first two weeks of transferring it to the farm. Because these farmers are remote from veterinary services and laboratories they are not generally equipped with the usual supports and tools that other aquaculture enterprises may enjoy. This problem is compounded by the fact that Murray Cod aquaculture is usually a secondary enterprise for the farmers and most do not have skills or knowledge in the area.

Over a period spanning more than two years, Murray Cod integrated aquaculture farms were visited and samples of fish and farm data were collected. A census of farms providing detailed information about each individual enterprise was undertaken at the commencement of the project and baseline farmer knowledge was assessed using a simple quiz. The project was conducted across Victoria, New South Wales and Queensland and was finalised in September 2013.

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#### CATCH SAMPLING FOR WA'S CRYSTAL CRAB FISHERY 2011/254

This project aimed to develop a cost-effective and efficient means for West Coast Deep Sea Crustacean Managed Fishery fishers to sample their Crystal Crab *(Chaceon bicolor)* catch and record the data. Length frequency monitoring data for Crystal Crab is currently collected by staff of the Department of Fisheries, Western Australia.

The data collection method is expensive because the fishery extends from Cape Leeuwin in the south of the state, to North West Cape in the north and the small number of boats operating in the fishery tend to work in different areas.

Crystal Crabs tend to vary in size along different parts of the coast and at different fishing depths. Good-quality length frequency data is dependent on good coverage of depths and coastline. The project will provide training for those fishers who are sampling the catch and recording the data.

Over the course of a year it would be feasible to build up a reliable dataset of catch measurements using electronic vernier calipers fitted by Scielex Pty Ltd with a Bluetooth feature. This design also makes it possible to measure crabs in the catch using a different button for each sex and to transmit the data electronically to a receiving device, in this case an iPhone. A smartphone app was designed to capture the data transmitted from the vernier calipers and to automatically add the date and latitude and longitude of where the crab was measured.

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