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COVER
The final block of the *RV Investigator* was lifted into place in January 2013.
Photo: CSIRO

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Periwinkles are found on exposed reef and boulder habitat in shallow temperate waters from NSW to Tasmania and southern WA.

PHOTO: JOHN KEANE

PERIWINKLE POTENTIAL

WILD CATCH Research into the life cycle of Tasmania's periwinkles shines a light on the untapped potential of this niche seafood product

By Sarah Clarry

The Tasmanian periwinkle fishery is at a crossroads. Management changes since 2010 have allowed the industry to expand harvesting efforts. But to realise the economic potential of the fishery, divers need to develop a supplier-driven, integrated marketing campaign for periwinkles in order to increase awareness and promote the species as a high-quality, niche seafood product.

Edible periwinkles (*Lunella undulata*) have been harvested commercially in Tasmania and several other Australian states since the 1980s, but little is known about the species' biology and population structure.

The 2005 management plan for the Tasmanian Commercial Dive Fishery provided a total allowable catch (TAC) of 35.2 tonnes for periwinkles, with a minimum size of 30 millimetres. In 2011, concerned that stocks were recovering slowly, fishers voluntarily agreed to raise the minimum size to 40 millimetres.

However, the precaution was applied with little scientific evidence to support it. This led to an FRDC-funded study to assess the periwinkle resource in Tasmania, evaluate market potential and suggest strategies for the sustainable development and management of the fishery.

A crucial part of this was identifying the size of periwinkles at sexual maturity in order to set size limits on harvesting that will allow populations to maintain their numbers.

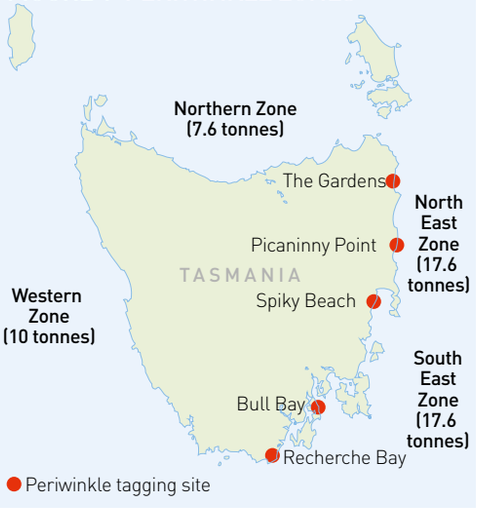
Growth study

Most of Tasmania's periwinkle harvest comes from the south-east and north-east coasts, with catch rates higher in the south-east. The growth study sampled five locations in the main fishing regions on the east coast (Figure 1), capturing, tagging and releasing 3000 animals.

John Keane from the Institute for Marine and Antarctic Studies (IMAS) was a member of the research team and says the growth study shows periwinkles grow rapidly early in their life cycle.

Within the first three years, animals reach 35.8 to 46.2 millimetres – 80 per cent or more of their final size. They can live for up to 10 years, given favourable environmental conditions. The study shows there is significant variability

FIGURE 1 PERIWINKLE ZONES



in growth depending on location. The average maximum length differed by as much as 32 per cent, ranging from 47 millimetres at Spiky Beach (central east coast) to 62 millimetres at Picaninny Point (north-east coast) and Recherche Bay (southernmost site).

Growth was also considerably slower at Spiky Beach, where it took more than six years for periwinkles to reach the legal minimum size. At other sites, periwinkles reached legal size in 2.8 to 3.7 years. Growth rates and maximum sizes were negatively related to water temperature, indicating that productivity may be influenced by climate variability.

Sex and maturity status of periwinkles is determined using examination of gonad development. Mature males have a creamy-white gonad, while mature females have a green gonad of variable shades.

Age and size at sexual maturity for both sexes varies according to the location; sexual maturity begins at 23 millimetres and 100 per cent have reached sexual maturity when they are 33 millimetres.

"The increase from the previous minimum size limit of 40 millimetres set in 2011 to the current size limit of 45 millimetres means the vast majority of animals have the opportunity to complete at least one spawning, and for most two, before recruiting to the fishery," John Keane says.

Periwinkle fishers were consulted when the minimum size limit was revised again and anticipated it would have negligible impact on their operations.

Harvesting of periwinkles has generally fluctuated greatly from season to season, and from month to month, a factor the study identified as limiting market potential.

Market potential

Since 2006 commercial harvests have ranged from 13 to 35 tonnes a year, with an average of 22 tonnes a year. Some of the variation has been attributed to individual divers entering or leaving the industry, or simply switching to other species, such as abalone or urchins.

However, regional catch rates – kilograms per hour – have remained relatively stable since effort data was first recorded in 2007, which suggests current catch levels in the main fishing areas are sustainable.

The study also identified large sections of coastline where little or no catch is harvested, and the fishery has since been re-zoned to encourage harvesting in these areas. The statewide TAC has also been lifted, from 35.2 to 52.8 tonnes (Figure 1).

In 2013-14, the Tasmanian periwinkle fishery was valued at approximately $120,000, well below its potential value of $340,000 should the TAC be fully harvested.

The supply of product to market is, at best, 'irregular', ranging from zero to 6.6 tonnes a month.

John Keane says feedback from markets indicates that inconsistent supply has made it difficult for some mainland retailers and restaurateurs to source periwinkles. This has subsequently led to a decline in consumer demand. In addition, occasional fishers will, from time to time, dump large catches on the market, resulting in a substantial price discount.

"Reliability of catch is critical," he says. "Incidences of oversupply and undersupply damage the relationships that the regular periwinkle fishers are seeking to build with the markets. Markets are increasingly realising this and seeking to build a sustainable and reliable supply with a core group of periwinkle fishers.

"Consistency in supply will be one of the key aspects of developing the periwinkle fishery."

At the demand end, the market for periwinkles appears to have considerable potential for expansion, especially through the restaurant and retail sectors in Sydney and Melbourne. Vietnamese communities prize periwinkles in their cooking and restaurateurs who have used periwinkles find them to be a versatile product, adding an element of the unusual as well as flair to menus.

However, a lack of product knowledge in the broader marketplace and the inconsistency of supply are hindering market growth. Those in the industry believe that a supply-driven, integrated marketing campaign is essential to increase product image and knowledge.

The way forward

Periwinkle fisher Bryan Denny says that any expansion of the fishery will need to be market-driven.

"We have good relationships with many of the buyers and the key to that is supplying them consistently," he says. "As things stand, if a new entrant to the industry wanted to target periwinkles, they would probably find it difficult as there needs to be this good relationship built up between fishers and buyers, and this relies mainly on consistency and quality.

"The peri fishers, including myself, have exhausted a lot of avenues, sending off samples and sometimes not getting a reply. But if the market starts requiring a lot of stock, there will be the potential for more fishers to get in," Bryan Denny says. F

A growth study at five locations spanning the main fishing regions along the east coast of Tasmania involved capturing, tagging and releasing 3000 individual periwinkles.

PHOTO: JOHN KEANE

SNAPSHOT: PERIWINKLES

- Moderately sized marine gastropod growing to approximately 65 millimetres.
- Found on exposed reef and boulder habitat in shallow temperate waters (up to 20 metres) from New South Wales to southern Western Australia, and Tasmania.
- Harvested commercially by hand.
- Tasmanian TAC 2013-14 fishing season: 52.8 tonnes.
- Tasmanian minimum size limit: 45 millimetres.
- Licence holders: 55.
- Annual value of Tasmanian fishery: $120,000.
- Potential value of Tasmanian fishery: $340,000.
- Markets: solely domestic, predominantly the Vietnamese community and some high-end restaurants.
- Quality: periwinkles are 'purged' before being sent alive to market. This involves placing them in clean seawater for several days to get rid of any sand and debris in the shells.

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FRDC RESEARCH CODES: 2013/412

EXPANDING YIELD PERSPECTIVES

ECONOMICS Economic modelling is helping managers and fishers deal with uncertainty while assessing the trade-offs required to balance the environmental and financial sustainability of the industry

By Jane O'Brien

Australia is a world leader in using fisheries economics to improve the long-term profitability and viability of the industry. This was recently recognised when Brisbane hosted the 17th Biennial International Institute of Fisheries Economics and Trade conference.

According to CSIRO marine resource economist and event organiser Sean Pascoe, Australia was a coveted location for the event, based on advances made to push maximum economic yield (MEY) to the forefront of fisheries management across the country.

"We are undoubtedly the frontrunners," Sean Pascoe says.

"Everybody else is talking about it but we're the only group actually doing it. We've got a lot of international scientists who have come here to see what we do."

Almost 300 delegates, representing more than 40 fish-producing nations, attended the FRDC-sponsored conference at Queensland University of Technology in July. They spent four days sharing ideas and methods for maximising the contribution of economics to best-practice, ecosystem-based management of fisheries.

"While the key focus of the conference was on economics, we also focused on including social considerations as part of the overall management system," Sean Pascoe says. This has been achieved by expanding the definition of the ecosystem to include local communities affected by fishing and aquaculture policies.

Sean Pascoe sees the development of this social dimension as a next step for Australia, as the industry continues to reinvent its management systems through evaluation and modelling. He says the Australian fishing industry has come a long way since the 2007 policy shift to focus on MEY rather than total yield as a key performance indicator.

ILLUSTRATION: PAUL DICKENSON

Changing indicators

"Initially, managers and industry weren't convinced that our models would work, and a lot of earlier bioeconomic modelling work was scorned," Sean Pascoe says. "It takes a long time to transition science, but some Australian fisheries have recognised how these models can help them achieve their economic, environmental and social goals."

Looking at the fisheries he has worked with in recent years, such as the Northern Prawn Fishery, Sean Pascoe says industry members have become champions of the cause, involved now in collecting the data for the economic models and validating the main assumptions.

"It's totally changed the focus of the industry. By and large, the industry is much healthier than it has been historically, and also healthier than where it might have been if not for the modelling work."

Sean Pascoe is now examining the economic, environmental and social objectives used in modelling to clarify what they are and how they should be prioritised.

"Some of the objectives are difficult to quantify. It's hard to pin down what they are and what they mean to different people," he says.

There is a difference of opinion, for example, around what should be included in MEY, and whether it should take into account flow-on effects up and down the supply chain such as processor rents and supply-related costs. Social objectives, traditionally viewed as issues such as employment, equitable access to resources and enhanced community resilience, are even more difficult to quantify.

Sean Pascoe believes clarity is important to avoid inconsistency around decision-making. He says economists have a role in working with the industry to define key objectives to achieve effective ecosystem-based fisheries management.

With FRDC funding he has been involved in several projects to closely examine and quantify objectives in collaboration with industry. This information will be used to evaluate management strategies and modelling in the future. F

INTERNATIONAL AWARD FOR AUSTRALIAN ECONOMIST

An Australian marine economist has joined the ranks of the world's best economic scientists, winning International Institute of Fisheries Economics and Trade's (IIFET) 2014 Distinguished Service Award. CSIRO's Sean Pascoe is the first Australian to win the prize, which is awarded each year for the outstanding application of economic science to international fish industries and assisting in the vital exchange of information between academic, trade and government participants.

Previous winners include renowned economist Lee Anderson from the US and Ola Flaaten from Norway.

Presenting the award at the international conference, IIFET executive director Ann Shriver said the organisation's executive committee had selected Sean Pascoe in recognition of his long-term service record.

"Throughout his career, Sean has acted as a bridge between the sometimes very isolated worlds of academia and government," she said. "Sean has had significant policy impact through his work at CSIRO and with Australian government agencies. He led research on the potential benefits and costs of removing statutory fishing rights, which led to a decision to retain those instruments."

Ann Shriver also highlighted Sean Pascoe's research on fisher targeting behaviour in the Northern Prawn Fishery, which led to policy and management changes to improve the viability and sustainability of that fishery. His ongoing work to assess maximum economic yield in fisheries, and to develop tools such as spatial management and multi-criteria decision analysis, continues to support the sustainable use of fisheries resources in Australia, she said.

Earlier in his career Sean Pascoe spent 12 years in the UK in several key advisory, committee and research positions focusing on the development of fisheries in the English Channel. He is the author of nearly 100 academic articles and continues to serve as a mentor to graduate students, who will contribute to future fishing industry advancements.

Response-ability revolutionises fisheries

ECONOMICS Technology, institutional changes and aquaculture have positioned fisheries to deal with the challenges of the future

By Jane O'Brien

While some scientists around the world continue to talk about an international fisheries crisis, renowned Norwegian fisheries economist Rognvaldur Hannesson's focus is on industry's unprecedented ability to prevent it.

He believes that the two revolutionary cycles in fisheries since the 1950s – technological advances followed by institutional changes – have put industry in the driver's seat to avoid the stock depletion disasters of the past and, hopefully, to meet the challenges of the future.

Rognvaldur Hannesson shared his optimism for managing wild stock issues while delivering a keynote address at the International Institute of Fisheries Economics and Trade conference held in Brisbane in July.

But it is not wild catches that he sees meeting the increasing global demand for food. He believes aquaculture is the third revolution, with industry scientists working hard to overcome the particular challenges associated with farming fish.

Rognvaldur Hannesson said it was largely technology that got people talking about a crisis in fish stocks but, in turn, it has helped deliver the solutions. "The technological revolution meant bigger and more powerful boats and fish-finding and navigation tools," he said. "But the open access regime, where this technological revolution initially played out, was not appropriate. It could have ended in tears, in decimation of fish stocks and declining fish captures."

However, he said the technological revolution led to an institutional one, particularly the introduction of the 200-mile exclusion zone.

"This new arrangement has provided the necessary incentive to control fish stocks and to maximise the economic benefits from their use. We now have a situation where technology means that we are much better equipped to predict what's coming, whether it's environmental or human factors threatening stock rates. We also have control measures in place to enable the timely intervention that was lacking in the past."

Looking at some of the biggest disasters of the past few decades, Rognvaldur Hannesson is confident that some, if not all, of them could be prevented today. From the Californian sardine collapse in the 1950s, the disasters in the Peruvian anchovy fishery (1960s), the Atlanto-Scandian herring (1970s) and the Northern cod of Newfoundland (1990s), all collapsed as a result of either over-exploitation, environmental factors or a combination of both.

But environmental issues, such as the El Niño effect, are predicted and quantified with much greater certainty today, and the institutional frameworks are largely in place to reach quick agreements on reducing quotas or introducing other control measures before it is too late, he said.

The ability of the Peruvian anchovy industry to bounce back in little more than a year after a strong El Niño weather sequence affected the fishery in the 1990s suggests that Peruvian authorities were better equipped in 1998 than they were in 1973, Rognvaldur Hannesson said.

However, he warned that these measures for avoiding crisis will work only when they are used to their best capacity. "Even where nations have virtual control within their borders, the management may fail for reasons of insufficient understanding and political expediency, as it did for the Northern cod of Newfoundland," he said.

"Unfortunately there is still a lot of ocean left where no state has jurisdiction except over its own boats. This is also where we have the greatest problems in controlling fisheries. Changes in migration and geographical distribution of fish stocks have sometimes thwarted established agreements on shared fish stocks.

"If there is a crisis in world fisheries, it is a crisis of waste. It consists of using many more boats and fishers than needed to capture the fish that we take."

Rognvaldur Hannesson said that despite the disasters of the past, the world's production of fish has increased almost tenfold from 20 to 180 million tonnes since the 1950s, with aquaculture playing a key role in more recent increases.

There has been a technology revolution in aquaculture as well. To some extent, he said, that revolution is still ongoing, as scientists overcome the barriers to further advancements.

This increase in aquaculture production has occurred despite the fact that production of fish meal has stagnated. Most of the expansion of the aquaculture industry has involved omnivorous or filter-feeding fish, which require little or no fish-meal-based food, he said.

However, feed producers have found ways of substituting plant-based feed for fish meal in feed blends and there is a possible development in using algae as a fish feed.

"If that would be possible then I would forecast a huge increase in aquaculture development," Rognvaldur Hannesson said. F



End users evaluate national strategy needs

POLICY AND PLANNING Consultation is providing valuable insight into the benefits of and potential improvements to our national fishing and aquaculture strategy

By Josh Fielding

The FRDC is coordinating the development of the National Fishing and Aquaculture RD&E Strategy on behalf of stakeholders – government, industry and researchers – with the aim of guiding the investment of RD&E funds across Australia. A key component in forming the strategy is consultation with the end users of RD&E.

In July, the FRDC facilitated an end-user workshop in Adelaide to discuss the current National Fishing and Aquaculture RD&E Strategy and identify possible changes for the next one. There were 58 people at the workshop representing most end-user sectors including wild-catch fisheries, aquaculture, indigenous fishing, recreational fisheries, research providers (including universities), workforce development, and post-harvest and fisheries managers from both state and federal government.

Positive outcomes from the first National Fishing and Aquaculture RD&E Strategy included improved collaboration in RD&E and greater communication between research providers, largely due to the success of the National Research Providers Network in the fisheries sector.

Also beneficial was the improved communication from the national strategy's governance committee, which is made up of representatives of the commercial, indigenous and recreational fishing sectors, fishery managers and research agencies. The governance committee provides an important link between the strategy, the National Research Provider Network and fishery managers, industry bodies, indigenous representatives and research funders.

Among the presentations were reports on two projects commissioned by the FRDC to help set the context for the new strategy and provide a springboard for identifying some new opportunities.

Ewan Colquhoun, director of Ridge Partners, is conducting one of the projects providing data to underpin the strategy. Ridge Partners is producing a sector overview of the industry across its four sectors – commercial capture, recreational, customary and aquaculture fisheries. This follows a similar study in 2009 and will enable an understanding of what the industry and fisheries look like today, who is involved, how much they are catching or producing, how the product is used, the main international risks and trends, and their future aspirations.

"There are some mega trends occurring on the international scale and we should be positioning ourselves to capitalise on them," Ewan Colquhoun says.

"With the increasing world population, in the coming years, aquaculture production for human consumption will overtake production from wild-capture fisheries for human consumption. To maintain its competitiveness the wild-catch sector must investigate novel methods to increase yield, such as reducing waste."

The other project report presented was the National Seafood Industry Leadership Program (NSILP), part of the FRDC's people development program. The group of leaders who participated in 2013 secured funding from the FRDC to undertake a workshop, which they titled the 'NSILP-13 Seafood Community Think Tank'.

Tony Charles, a NSILP graduate from Australian Prawn Farms, helped to organise the think tank. "It was a great opportunity to get together with a range of people, a 'new' batch of leaders for the fishing and aquaculture industries who would not normally come together to think about the opportunities in a different, innovative way," he said. The think tank was held at the Sydney Institute of Marine Science.

The workshop identified some common themes at the national level centred on the public perception of fishing and fish farming, streamlining governance and regulatory systems, growth and potential markets for seafood, resource access and allocation, workforce development, and the effects of non-fishing practices on fishing and fish farming.

The other main topic of discussion at the workshop was the governance of the strategy and how to link investment to priorities. Workshop participants felt there were improvements to be made in the timing of funding processes, and that maintaining just a few national priorities is important to obtain sufficient resources to achieve something "deeper not wider". They felt this should be clearly articulated in the overall philosophy of the strategy.

Workshop participants said that integrating the governance of the strategy with the governance of other funding processes resulted in a complex structure, which was not well understood by end users. The current structure of the Fisheries Research Advisory Bodies and the research hub linkages needed to be better integrated with good communication to allow for greater collaboration in the setting of priorities and assessment of research proposals.

There are still several steps in the process of developing the final RD&E Strategy, which will include consulting on a draft document and a workshop with the Strategy Governance Committee. The strategy will be finalised and implemented by 1 July 2015. It must be approved by all government ministers for agriculture and the Agriculture Senior Official Committee, which comprises the heads of state and federal agriculture departments. F

FRDC RESEARCH CODE: 2009/303

TRUST AND INTEGRITY:
The secret ingredients of successful fish farming

AQUACULTURE Highly scrutinised and highly responsive to industry criticism, aquaculture has the opportunity to set the benchmark in sustainable food production

By Catherine Norwood

In terms of global food production, aquaculture has come late to a table that is dominated by land-based competitors. But by establishing its sustainability credentials, José Villalón believes farmed fish can leapfrog the performance of other primary production sectors.

As director of corporate sustainability for the global fish and stock feed company Nutreco, José Villalón was the opening plenary speaker at the World Aquaculture Conference in June. The five-day event was held at the Adelaide Convention Centre and drew more than 2000 delegates from around the world for technical workshops, research presentations and networking opportunities.

José Villalón said that with a projected global population of 9.3 billion by 2050, food production would need to double. The challenge is to do this while managing the environmental footprint of food production.

Fresh water is already a critically constrained resource worldwide and 70 per cent of all fresh water is used for agriculture, he said. Opportunities to expand land-based agriculture were also limited because of competition from other uses, including urbanisation. However, there are vast amounts of open ocean waters that aquaculture could use to overcome critical land and water shortages to increase food production – if done responsibly.

In terms of production efficiencies, aquaculture is a natural leader, he said. "Fish convert a greater proportion of the food they eat into body mass than livestock. Therefore the

PHOTO: FRDC

Seafood starred at the President's Reception of the final evening of the World Aquaculture Conference. The reception was held at the Adelaide Oval.

environmental demands, per unit of biomass or protein produced are lower. On average, to produce one kilogram of finfish protein requires seven kilograms of grain compared with beef protein, which requires 61.1 kilograms of grain and 38 kilograms for pork protein."

Scrutiny and certification

In terms of environmental and social impact, the industry has already been subject to intense scrutiny during the past two decades, he said – more than any other land-based food production system. This scrutiny included the eight-year international negotiations of the World Wildlife Fund's Aquaculture Dialogues, which have resulted in the Aquaculture Stewardship Council standards to assess and certify farming practices.

"Aquaculture is the only 'centre-plate' protein-production system with a referenced gold standard for addressing environmental and social impacts," José Villalón said.

But collaborative action, such as the recently established Global Salmon Initiative, was needed to address outstanding environmental and sustainability issues. The CEOs of companies producing 70 per cent of the world's farmed salmon were working together in a pre-competitive agreement to resolve a number of issues for the industry, with the aim of achieving Aquaculture Stewardship Council certification by 2020. It was a model of corporate collaboration – putting sustainability before competition – that other aquaculture sectors are also beginning to consider.

José Villalón said that while the industry still had issues to resolve, it was well placed to leapfrog ahead of other food sectors, and to act as an example to other sectors in responsibly producing food on a finite planet. But engagement, open collaboration and communication would all be crucial to maintaining the industry's social licence to operate.

Social scrutiny

This point was echoed and expanded on by Charlie Arnot, CEO of the Centre for Food Integrity. "The potential and the need for productive aquaculture, on a global scale, is so great that we dare not risk allowing it to fail because we didn't engage in the right way," he said.

Over the past three decades, capture-fishing production increased from 63 to 93 tonnes. During that same period there was a phenomenal growth in aquaculture from five million tonnes to 63 million tonnes. "In 15 years aquaculture is expected to surpass total production from wild-capture fisheries – if you can build and maintain your social licence," he said

"That is going to be the critical limiting factor. It is not likely to be science or technology or economics."

The Center for Food Integrity defines social licence as the privilege of operating with minimal formalised restrictions based on maintaining public trust.

"If the public trusts you to do what's right, they don't feel the need to impose more formal restrictions – legislation and regulations," Charlie Arnot said. Those formal restrictions were coming not only from governments, but also increasingly from global food companies under increasing pressure to demonstrate their responsible sourcing practices.

Three key issues he identified as threats to the credibility of the aquaculture industry included the views of people who simply did not like fish farming and who felt there was something unnatural about aquaculture.

There are also concerns about the application of technology, such as genetically modified salmon, antibiotics or other animal health products, which could quickly lead to calls for greater controls over the industry.

Fraud was also identified as a pressing and immediate threat to the industry: "If the level of fraud within the seafood industry became more widely known publicly I think the global outcry for social control would be overwhelming," he said. "It is an unacceptable risk." The global aquaculture community needed to demonstrate better systems of source verification and management, to reduce fraud and ensure food safety, and maintain its social licence, he said.

Operating with public trust – with a social licence – would allow businesses to maintain flexibility and respond quickly to market signals and new opportunities.

Operating without public trust – under a system of enforced social controls – would inevitably be bureaucratic and more expensive. There would be a focus on regulation, legislation, litigation and compliance – elements that would add cost and make it more difficult to capitalise on new opportunities.

"And once you tip over into a social control system, you never go back," Charlie Arnot said.

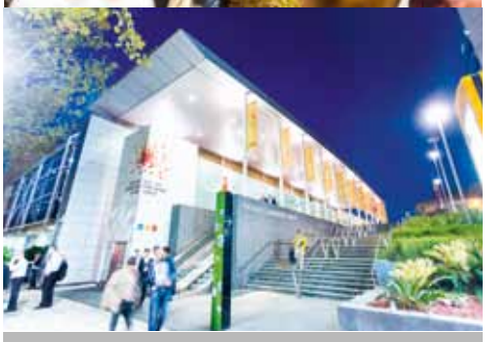
"There is a fairly compelling economic case for maintaining social licence, because at the end of the day, as a business, it is very difficult to justify additional investment if there is not some return. This is not altruism; it is enlightened self-interest."

He said that, historically, agricultural industries have operated under the assumption that with the right facts, the right data and with science on their side, they will ultimately prevail. But in today's increasingly complex environment, this was no longer sufficient.

Charlie Arnot said that new research from the Centre for Food Integrity had identified that while the influence of others – family, friends and trusted experts – remained important in decision-making, confidence in shared values was 3.5 times more important

PHOTOS: FRDC

The recently redeveloped Adelaide Oval provided an atmospheric venue for the conference's formal function.



PHOTOS: FRDC

Running over five days, the international event was held at the Adelaide Convention Centre.

to consumers than ethical and operational competence, which includes supportive science.

"So engage early, often and consistently, and make sure you use value-based communication," he advised delegates.

Science scrutiny

It was advice that struck a chord with a case on the Tasmanian Atlantic Salmon (*Salmo salar*) industry presented during the session dedicated to social licence later in the conference.

Social scientist Emily Ogier, from the Institute for Marine and Antarctic Science, said a collaborative research project with CSIRO funded by the FRDC began by examining the science related to Tasmania's coastal management. However, it was soon expanded to incorporate a study of the role of science in the Atlantic Salmon industry's social licence to operate.

The Atlantic Salmon industry is based adjacent to large urban centres in south-east Tasmania, and has grown rapidly since its beginnings in the 1980s – not without a suite of hotly contested environmental sustainability issues.

Emily Ogier said that while participants in negotiations assumed that science could be brought in to resolve various issues, the reality was far more complex.

She said that in the case of the Tasmanian industry, when there was conflict over whether an aquaculture operation was sustainable or not, the debate was characterised by divergent and contested interpretations of scientific data, so much so, that the credibility or the social licence of the science itself was called into question.

There emerged what she called 'vicious cycles' of adversarial conflict, particularly related to the release of commercially sensitive data, which resulted in accusations of industry secrecy, further entrenching reluctance from aquaculture operators to release information.

There have also emerged 'virtuous cycles' where there has been dialogue among stakeholders, resulting in the co-production of knowledge and a focus on the nuances of the biological data being produced, rather than on the secrecy.

Emily Ogier says the co-production of knowledge resulting from engagement between scientists and communities of interest proved essential in developing trust and overcoming an environment of conflict.

She said the case study highlights the need for social licence not just for business, but also for science itself. It is important that production of science takes into account the values of stakeholders and the questions and information they think are important.

Production efficiency

While José Villalón looked to the oceans to expand aquaculture in his opening presentation, other sessions focused on land-based systems including integrated multi-trophic aquaculture, pond culture, aquaponics and recirculating aquaculture systems.

Thomas Losordo, a principal scientist at the global fluid dynamics company Pentair and an emeritus professor at North Carolina State University, held a series of workshops on recirculating systems, which are being adopted more widely for highly intensive fish farming. He said the technology was not yet a 'game changer' for the sector, but it was starting to change the way aquaculture was being practised around the world.

"I believe that to meet this surging food demand, aquaculture will increasingly become more land-based than it is now and recirculation technology enables this to happen," he said.

By treating waste within the system and re-using as much water as possible, recirculating systems can reduce the need for water inputs. This significantly reduces water discharges when compared with ponds and flow-through systems. Recirculating water also reduces the energy needed to heat or cool the water, and allows fish to be grown outside their normal geographic range.

Thomas Losordo said the technology could assist ocean-based aquaculture enabling fingerlings to grow and develop in a safe environment for longer. "The longer fingerlings are kept in a controlled environment the better, which means the technology enables them to reach ocean cages larger and stronger, ultimately producing a higher-quality seafood product," he said.

Rodney Missen from the Australian-based consultancy RADAQUA said recirculating systems were used extensively in hatcheries and research institutions in Australia. Growing fish to market size was generally limited to Murray Cod (*Maccullochella peelii*) and Barramundi (*Lates calcarifer*).

The size of Australian commercial operations is small, compared with overseas – 200 to 250 tonnes a year, compared with 1000 tonnes, and up to 10,000 tonnes in Europe and China, where they grow species such as Atlantic Salmon and groper.

He said recirculation systems allow more production with a smaller environmental footprint; recent reports indicated an annual production of 1000 tonnes of fish could be produced from 0.6 hectares. Pond-based systems would need 100 to 200 hectares to produce 1000 tonnes a year, depending on the species.

While the Australian industry was clearly dwarfed by what was happening overseas, Rodney Missen said local producers are still achieving the highest levels of efficiency internationally, in terms of production per unit of water or area of land, and there is clearly the potential to increase local production. F

Andrew Puglisi, managing director of Kinkawooka Shellfish.

2015 WAS CONFERENCE

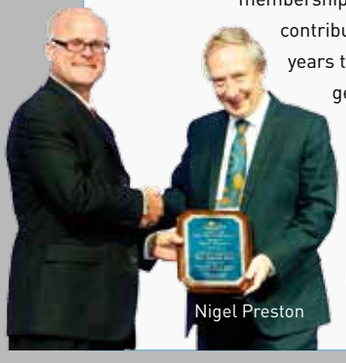
The next World Aquaculture Society Conference will be held at Jeju Island, South Korea, from 26 to 30 May 2015. South Korean organisers expect more than 3000 delegates to attend the event, which is in a central location for areas of greatest industry expansion in Asia. South Korea has an extensive seafood culture with an average seafood consumption of 58 kilograms per person compared with 25.5 kilograms per person in Australia (Food and Agriculture Organization, 2011). While annual Australian aquaculture production totals around 80,000 tonnes a year (FAO, 2012), South Korea produces 1.5 million tonnes, much of which is seaweed-based aquaculture (FAO, 2012).

INTERNATIONAL AWARDS

Australian scientist Nigel Preston, from CSIRO, was named as a Fellow of the World Aquaculture Society (WAS) at the annual conference, held in Adelaide in June. Nigel Preston is director of CSIRO's Food Futures Flagship, which has a focus on breed engineering. His wide-ranging research includes the development of improved aquaculture feeds and improved species genetics, specifically the Black Tiger Prawn (*Penaeus monodon*).

New WAS Fellows named at the conference were Wagner Valenti, from the University of São Paulo (Brazil), who pioneered the culture of freshwater prawns (or shrimp), and Tom Losordo, a world-leading aquaculture engineer and principal scientist with the global engineering firm Pentair, and an emeritus professor at North Carolina State University in the US.

Norwegian aquaculture specialist Trygve Gjedrem, was also awarded an honorary life membership for his contribution over almost 50 years to aquaculture genetics research, including genetic improvements to fish and shellfish, notably Tilapia, Atlantic Salmon (*Salmo salar*) and Rohu Carp.



Nigel Preston

NATIONAL AQUACULTURE STATEMENT

PHOTOS: FRDC

Senator Richard Colebeck launched the Australian Government's new *National Aquaculture Statement* at the World Aquaculture Conference, as a precursor to the development of a national aquaculture strategy. He says the statement is a clear commitment from federal, state and territory governments to help the industry expand.

It recognises that there are several issues that need coordinating or streamlining at a national level to help the industry to progress. These include biosecurity, veterinary medicines, environmental approvals and market access.

Extensive stakeholder consultation will be undertaken in developing a national aquaculture strategy, with the industry committed to best practice in environmental and animal management.

Richard Colebeck said innovation is an important part of the aquaculture sector in Australia and the focus on quality and research and development is driving growth in the industry. More than 40 species of fish and seafood are cultivated in Australia: the most prominent are Atlantic Salmon (*Salmo salar*), Southern Bluefin Tuna (*Thunnus maccoyii*), oysters, mussels and pearls. He said the aquaculture sector as a whole is predicted to overtake the wild-capture sector this year, in terms of value to the Australian economy.

The Tasmanian Atlantic Salmon industry was leading the way, with a value of more than $500,000, and a target of $1 billion by 2020. However, Richard Colebeck said other species offered the potential for similarly ambitious growth as Atlantic Salmon, particularly the emerging Yellowtail Kingfish (*Seriola lalandi*) sector.

The *National Aquaculture Statement* is available at: www.daff.gov.au/fisheries/aquaculture

BLUE THUMB AWARD WINNERS

The winners of annual Australian Aquaculture Awards, the Blue Thumb Awards, were also announced as part of the WAS conference, with presentations made at the final conference dinner.

Winner of the science and researcher award was the New South Wales Department of Primary Industries Port Stephens Fisheries Institute. The best new product or technical innovation award was presented to BioGill, and the service provider award was won by Sue Carson of Aquasonic, Marine Solutions and Aquanel. The production award went to David Ellis.

A special recognition award was presented to Tim Walker and the producers of *Austasia Aquaculture Magazine*, for services to the industry. The magazine, which had been in circulation for 27 years, ceased publication earlier this year.

'Football colours' was the dress-up theme at the President's Reception where the Australian Aquaculture Blue Thumb award winners were announced.

CULINARY YOUNG GUNS TOUR TASMANIA

MARKETING No exploration of Tasmania's finest food offerings would be complete without seafood

Seafood was the theme of the first day of the week-long culinary expedition around Tasmania held for the national finalists in the Electrolux Appetite for Excellence Young Chef and Young Waiter awards.

During the tour, the young leaders of Australia's hospitality industry had the opportunity to taste and discuss a broad range of food with the primary producers who grow, catch and cultivate it.

The tour is sponsored by the FRDC, Meat and Livestock Australia, Australian Pork Ltd and Dairy Australia, and included producers of oysters, lamb, dairy foods, wine and Atlantic Salmon (*Salmo salar*).

Peter Horvat, communications, trade and marketing manager for the FRDC, says: "We want to show these young professionals where the products come from and show them that Australian farmers are using some of the best research and practices in the world to underpin the effort that goes into their production."

Seafood set the scene on the opening day of the tour, with the morning spent at Huon Aquaculture. An on-water tour was followed by some product tasting and a presentation on all aspects of Atlantic Salmon farming. David Whyte from Huon Aquaculture conducted the tour, which included the opportunity to inspect Huon Aquaculture's new salmon pens, which have been designed to be better for both the people working on them and the fish swimming in them.

"It was an open and honest account of how they go about their business and the issues that they deal with," Peter Horvat says.

The Appetite for Excellence tour used one of Robert Pennicott's wilderness journey boats to get out on the water to see the salmon pens. While this was not a normal trip for the tourism operator's crew, it provided them with an opportunity to extend their knowledge of the aquaculture industry, which they see almost every day.

Oyster life cycle

The tour then headed to visit oyster supplier Cameron of Tasmania at Eaglehawk Neck. Ben and Ellen Cameron hosted the group, explaining all aspects of their business. Ben is undertaking the Australian Rural Leadership Program (see page 31).

The group visited both the land-based operation sites and the lease on the water, gaining an overview of oyster production from grow-out, through to harvesting and processing. To complete the tour of Cameron's fully vertically integrated business, the group called into the Dunalley hatchery (one of the few buildings in this area to survive the 2013 bushfires), for an explanation of the oyster growing process.

Closing out Monday night, the chefs got an opportunity to showcase their culinary skills cooking some top-quality Tasmanian seafood – Huon Atlantic Salmon, Flathead, Gummy Shark, scallops, Spring Bay Blue Mussels and Cameron of Tasmania's Pacific Oysters – for some members of the local seafood industry.

PHOTOS: FRDC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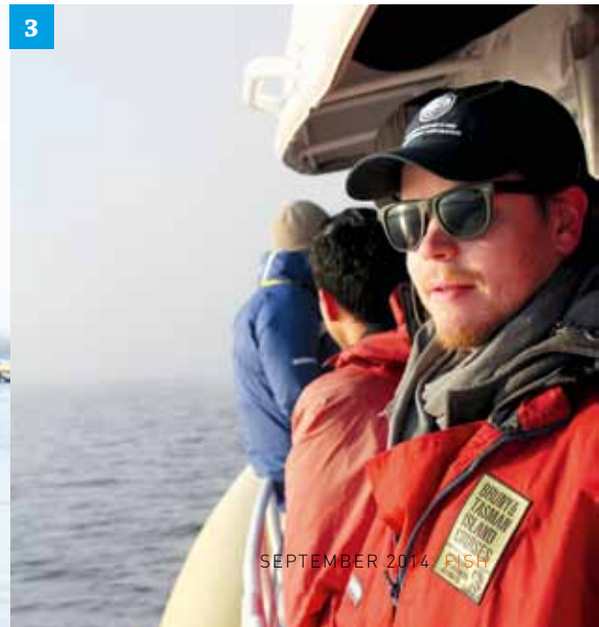
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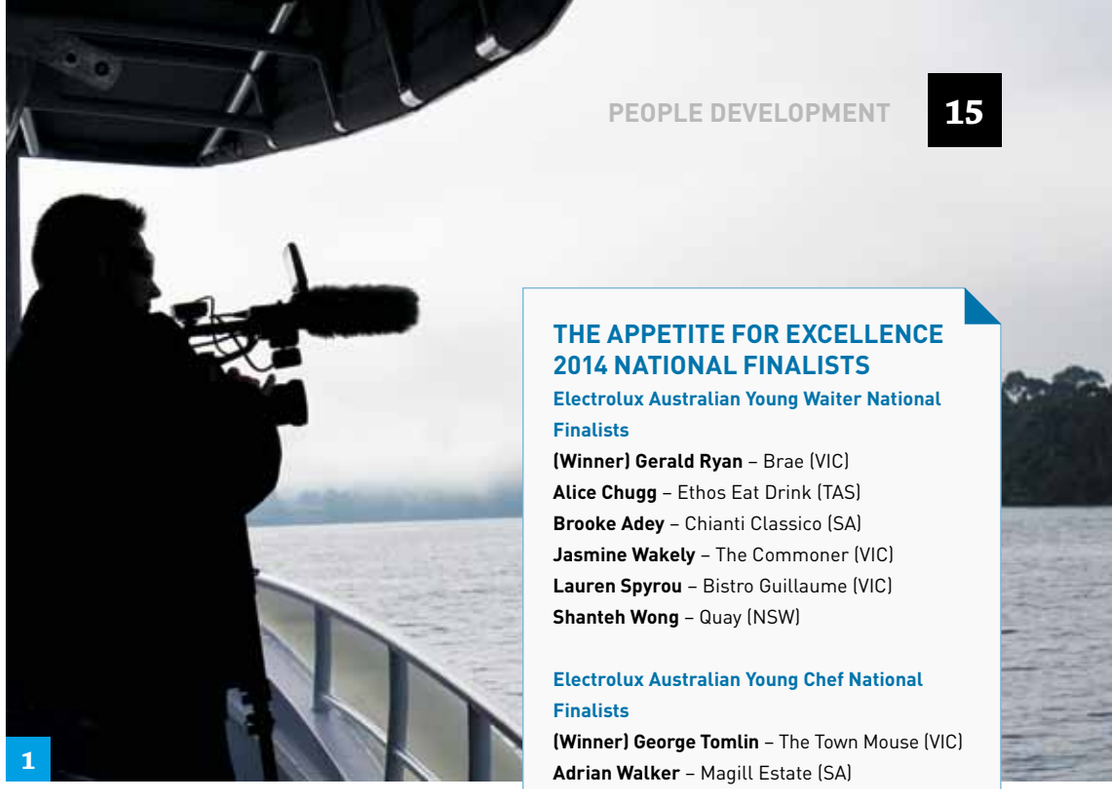

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Long-time supporter of the Appetite for Excellence tour, the Parliamentary Secretary to the Minister for Agriculture and Senator for Tasmania, Richard Colbeck, also attended the dinner.

A participant in the first Appetite for Excellence tour of Tasmania in 2006, Senator Colbeck said it was a great initiative, educating the chefs and the hospitality industry on where produce came from. He said it was important they knew the work and research that went into primary production in Australia.

It was a fantastic evening and thanks must go to the owners of Ethos – Chloe Proud and Ian Todd (both past finalists in the Appetite for Excellence awards) – for allowing the group to take over their restaurant for the night.

Industry participation

Several fishing industry representatives attended the dinner, including Ian Cartwright, Australian Fisheries Management Authority commissioner (and former FRDC director), Martin Excel, general manager of environment and policy with Austral Fisheries, and Pheroze Jungalwalla, chair of the National Aquaculture Council.

Ian Cartwright noted it was "an inspirational event" and a "wonderful showcase for Tasmania and Tasmanian seafood production".

Martin Exel said he felt it was great for the finalists to gain an insight into not only salmon and oyster production but also the complexity of fisheries in general.

Pheroze Jungalwalla took the opportunity to highlight public perception as the single biggest issue facing fishing and aquaculture. He said people in the hospitality industry, such as the finalists, had an important role in delivering good messages about seafood. He commended the FRDC for organising the tour, saying that events such as the Appetite for Excellence tour are great for the education of both sides of the production–consumer fence.

"The finalists are the next generation of opinion leaders in the food sector and we want to help educate them about what producers are now doing," Peter Horvat says.

"Programs like this are not only good for the finalists but also for the primary producers. They get a direct link with people who are cooking with their product, as well as with the front-of-house staff who are engaging with the consumer."

The Electrolux Appetite for Excellence program was established to identify, recognise and nurture the finest emerging young talent within the Australian food industry. F

THE APPETITE FOR EXCELLENCE 2014 NATIONAL FINALISTS

Electrolux Australian Young Waiter National Finalists

(Winner) Gerald Ryan – Brae (VIC)
Alice Chugg – Ethos Eat Drink (TAS)
Brooke Adey – Chianti Classico (SA)
Jasmine Wakely – The Commoner (VIC)
Lauren Spyrou – Bistro Guillaume (VIC)
Shanteh Wong – Quay (NSW)

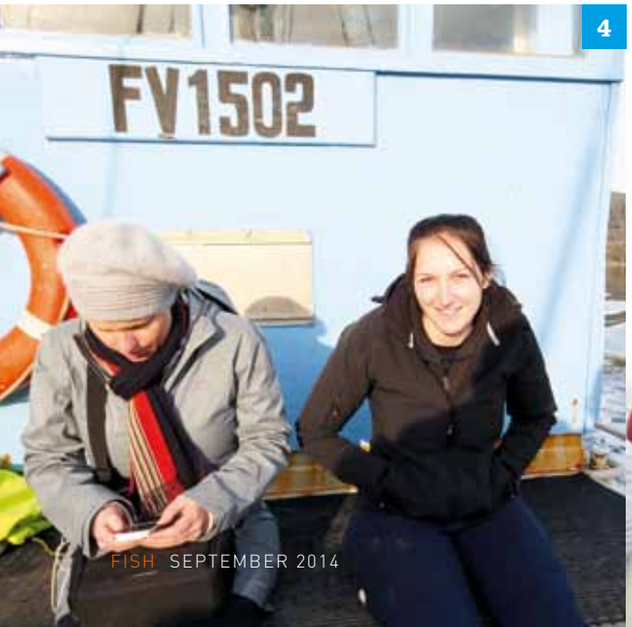
Electrolux Australian Young Chef National Finalists

(Winner) George Tomlin – The Town Mouse (VIC)
Adrian Walker – Magill Estate (SA)
Dale Sutton – momofuku seiobo (NSW)
Emma Barnes – Clarke's of North Beach (WA)
Hanz Gueco – Cafe Paci (NSW)
Jake Kellie – The Commoner (VIC)
Simon Tarlington – Quay (NSW)

Electrolux Australian Young Restaurateur National Finalists

(Winner) Troy Rhoades-Brown – Muse (NSW)
Anna Pavoni – Ormeggio at The Spit (NSW)
Chris Thornton – Restaurant Mason (NSW)
Matthew Dempsey – Gladioli (VIC)

1. Capturing the moment. 2. Finalists with Huon Aquaculture's David Whyte. 3. George Tomlin (The Town Mouse) and winner of Young Chef. 4. Phee Gardner (left) from Appetite for Excellence with Ellen Cameron. 5. David Whyte explaining about the Huon Aquaculture operations. 6. Ben Cameron explains the process of growing oysters.



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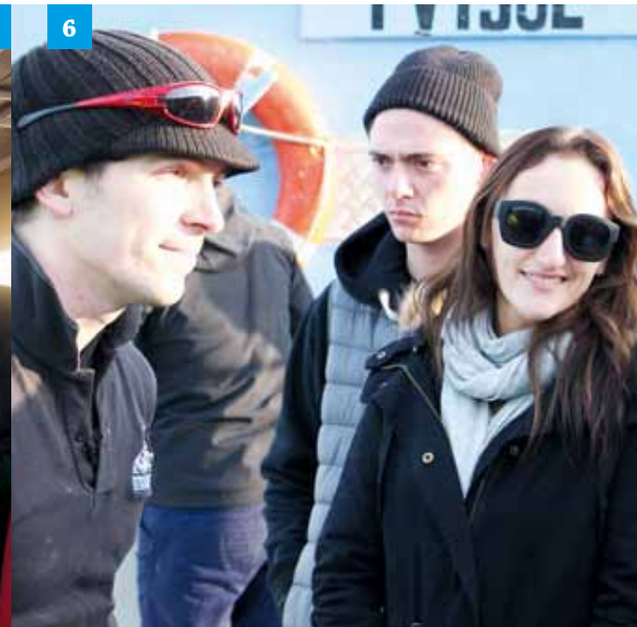

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MORE INFORMATION: Peter Horvat, 02 6285 0400, peter.horvat@frdc.com.au

Building a seafood marketing plan

MARKETING Translating industry's thoughts about marketing into action that will add value to Australia's seafood harvest is one of the next big challenges for the FRDC

The FRDC is embarking on its largest ever industry engagement program to find out what type of market activities the fisheries and seafood industry want.

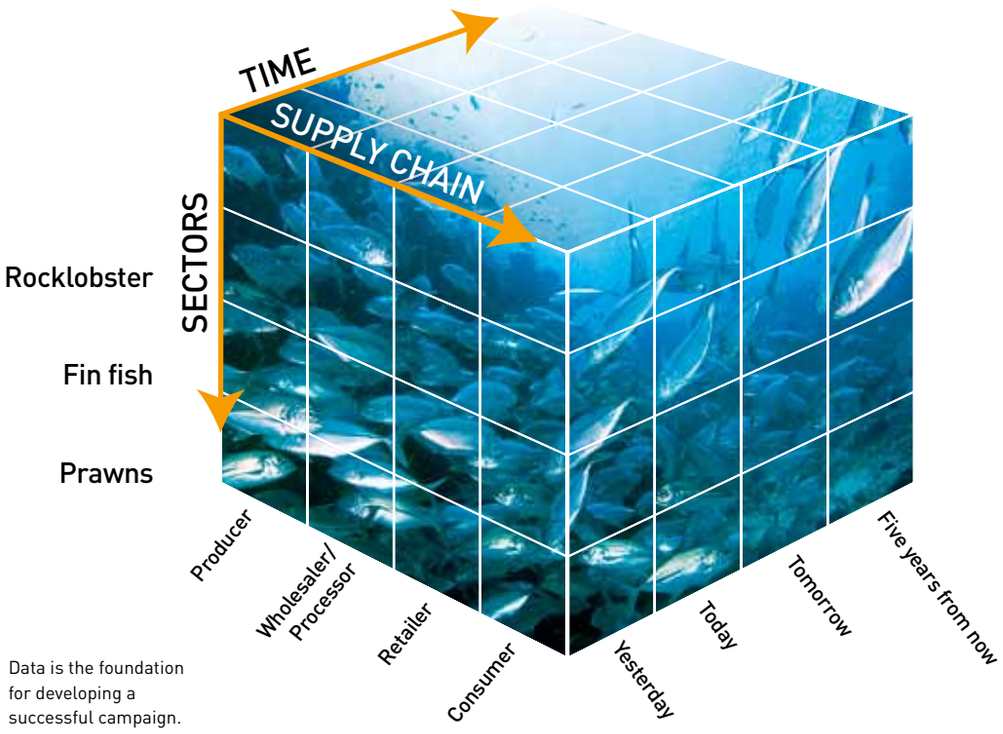
Peter Horvat, manager of communications, trade and marketing for the FRDC says this means understanding the long-term aspirations of businesses and of the industry as a whole as well as identifying priorities. What is the industry ultimately prepared to invest for marketing its seafood and products?

"The FRDC will spend the next six months gathering the industry's views," Peter Horvat says. "We want to hear what fishers and farmers want and we welcome their input in any way they want to provide it, whether it is face to face when we are out visiting, over the phone or sent to us as a hand-written note or email.

"We have also added a new section to the FRDC website built for the marketing engagement process, to allow people to comment online."

The FRDC has established a Marketing Function Advisory Committee and has engaged two external companies, Sefton & Associates and Collabforge, to assist. Both bring a high level of expertise to the project team – Sefton & Associates has extensive experience with the primary-industries sectors and has worked with research development organisations on some of their marketing and levies programs. Collabforge brings a high level of technical expertise in collaboration and communication engagement tools.

The industry views will form the foundations of a marketing business plan that will encompass broader market issues that apply to all sectors, such as supply chains, market data and how to fund market activities. The plan will also encompass specific industry-sector needs such as product awareness. 'Love Australian Prawns' is a successful example of a product awareness campaign.



Data is the foundation for developing a successful campaign.

The FRDC wants to build a long-term platform for industry marketing. The platform should ensure any marketing investment is:

- overseen with strong governance;
- strategically focused;
- disciplined in approach;
- based on solid market information;
- able to quantify its success;
- strongly linked to enterprise level investment; and
- evaluated and monitored regularly and consistently.

Engagement process

The FRDC has a goal of engaging with as many industry sectors as possible to gain their views. To achieve this, a four-stage process will be used.

- The first stage will work with the Marketing Function Advisory Committee to obtain its input on the engagement process and to fine-tune it, to make it as effective as possible.
- Stage two will be to work with several key stakeholder groups who have already begun some marketing initiatives, so that lessons can be learned from their experiences. These groups include the Australian prawn farmers and fishers and Barramundi farmers, abalone industry and rocklobster groups. In addition, the FRDC will identify some cross-sector groups such as the wholesale markets and

cooperatives to gain some broader views.

- During stage three, the FRDC will use market research to gather opinions from about 300 key seafood companies and licence holders.
- Stage four will run in parallel with stage three and will see the FRDC staff talking to industry at all levels, from fishers right through to including industry councils, whenever possible (meetings, phone calls and emails).

"The reality is that any marketing activity the FRDC undertakes will be in response to and driven by industry," Peter Horvat says. "Our job is to ensure that we have in place the systems to make informed decisions about what will work best and then measure the results. Several sectors, prawns, abalone, rocklobster and oysters (see page 39), have undertaken marketing activity so far. They have primarily focused on improving awareness and sales.

"One of the key findings has been that measuring the success of their marketing has been difficult because at present there isn't enough market data. The Australian Seafood Cooperative Research Centre has undertaken specific research for the sectors, which has been vital for the initial work. However, in the long term, industry will need an ongoing good stream of market and consumer research and intelligence to help us make the best decisions possible".

Building the system

A key long-term requirement for any marketing activity is to gain a baseline of consumer and market data and knowledge. This includes production volumes, sale prices along the supply chain, and customer preferences, such as what they want, when they want it, how much they will pay for it and, most importantly, what motivates them to purchase a seafood product.

The infrastructure and marketing system does not need to be complex. At present, the FRDC is working on three areas: market data, evaluation and funding approaches.

The illustration on page 16 provides a simple view of the type of market and consumer data the FRDC aims to map. The FRDC is researching how industry can get accurate real-time sales (market) data. The study is expected to be completed by the end of September and will provide an overview of what is currently available, where there are gaps in the data, as well as suggested approaches for getting any additional data that is required.

Peter Horvat says further down the track, sectors will need to consider adding to this data with some targeted 'consumer insight' research that will help understand the views held for seafood products.

The 'Love Australian Prawns' campaign is a good example of where targeted research and data collection worked well. The research showed that consumers loved Australian prawns and saw them as having a special place on their menu – a treat for special occasions. Preserving that sense of 'something special' was important to consumers.

Brand Council, the agency engaged by the prawn fishers and farmers to create the campaign, used this insight to not only build the campaign but to also design an iconic symbol that was prominently displayed at more than 400 seafood retail stores and many hundreds of Woolworths supermarkets across the country.

As well as understanding consumers' views, it is also important to develop a solid evaluation method for marketing activities. The approach that needs to be used will largely depend on the type of marketing. For example, for a campaign solely focused on increasing sales volume, sales data will provide a good indication of success. However, activities that aim to improve the consumers' perception will be much harder to evaluate. The FRDC is looking to develop a suite of evaluation tools that industry can use for these purposes.

Questions of concern within the industry will be who pays for these marketing activities, and how to collect the funds. Answering these questions will take a considerable amount of thought and the FRDC is keen to hear industry views. F

HAVE YOUR SAY

The FRDC wants to hear from the whole industry on what the key issues are. Over the coming months, the FRDC will be out and about visiting many sectors and individuals. If you are keen to let us know what you think sooner or to get some more information visit the FRDC Marketing site (www.frdc.com.au/marketing).

MARKETING FUNCTION ADVISORY COMMITTEE

Undertaking an extensive engagement program requires not only good planning but also good industry knowledge and support. The FRDC will coordinate a group of industry representatives to assist with this.

The Marketing Function Advisory Committee brings together individuals who represent producers (licence holders and fishers), companies (small to large), sectors and representatives of the supply chain.

The committee will help the FRDC to refine and implement the stakeholder engagement strategy. Members of the committee are:

- Brett McCallum – Pearl Producers Association;
- Tim Hess – Petuna Sealord;
- Arthur Raptis – Arthur Raptis and Sons;
- Peter Fare – Sarin Group;
- Nathan Maxwell-McGinn – Craig Mostyn Group;
- Gus Dannoun – Sydney Fish Market;
- Anthony Ciconte – Commonwealth Fisheries Association;
- Andrew Puglisi – Kinkawooka;
- Jules Crocker – Joto Fresh;
- Shane Geary – Coffs Harbour Fisherman's Co-operative;
- John Susman – Fishtales;
- Sam Gordon – Blue Harvest;
- Jonas Woolford – Wildfish South Australia;
- David Caracciolo – NT Fish;
- Rachel King – Oysters Australia;
- Katherine Winchester – Northern Territory Seafood Industry Council and National Seafood Industry Alliance;
- Dallas D'Silva – VRFish; and
- Anthony Mercer – De Costi Seafoods.

New blends in research mix

RESEARCH CAPACITY More sophisticated approaches to fishing and aquaculture research are combining public and private-sector capabilities, while striving to find the balance between fundamental science and industry-specific needs

By Karin Derkley

In the past five years there have been some significant changes to Australia's fishing and aquaculture research sector. Governments have streamlined their operations, offset by an expansion of capability in universities and private enterprise.

Between 2008 and 2013, national investment in fisheries research was somewhat stagnant (Figure 1) which, if considered in real terms, represents a decrease, confirming that scientists in the fisheries sector are being asked to do more with less.

In 2009, an audit of the wild-capture and aquaculture industries' research capability (both human and built resources) was commissioned and funded by the Strategy Governance Committee that oversees the development of the National Fishing and Aquaculture RD&E Strategy. This study was conducted by RDS Partners and was repeated again in 2013. Most responses were from government agencies, so private-sector capabilities are not well represented.

Comparison between the two studies was only done for those institutions that responded to both surveys, so results must be interpreted with this in mind. Overall, there has been minimal change in capability between the two study periods (approximately a two per cent increase).

However, state research agencies in Queensland, Victoria and South Australia all reported capability reductions of 10 or more positions, with New South Wales reporting a reduction of slightly less than 10 positions.

Director of the private agency IC Independent Consulting, Steve Kennelly, was previously Chief Scientist of the NSW Department of Primary Industries and director of fisheries research. He says that in the past two years there has been a significant movement of government fisheries scientists into the private sector. This includes his own move from government to private consulting in 2013.

"As state departments of primary industries have reduced the numbers of fisheries scientists, many of those scientists have decided (for various reasons) to join the private sector. Mostly this involves the need to earn a living, but also the desire to continue using their substantial expertise and experience in fisheries science and management," he says.

Having made the move into the private sector he says there are benefits, including greater freedom and flexibility in choosing projects, and fewer of the constraints that often affect government scientists. Benefits for clients include lower costs as a result of lower overheads.

Duncan Souter, who helped to establish the Asia–Pacific branch of global marine consulting company MRAG in 2008, says private companies are particularly well placed to deliver services that are not traditional strongholds of the public sector. Before joining MRAG, he spent 16 years with the Queensland Seafood Industry Association, followed by three years as an adviser to the Australian Minister for Fisheries.

As chief executive of MRAG Asia Pacific, Duncan Souter says the business provides a range of services including resource, economic

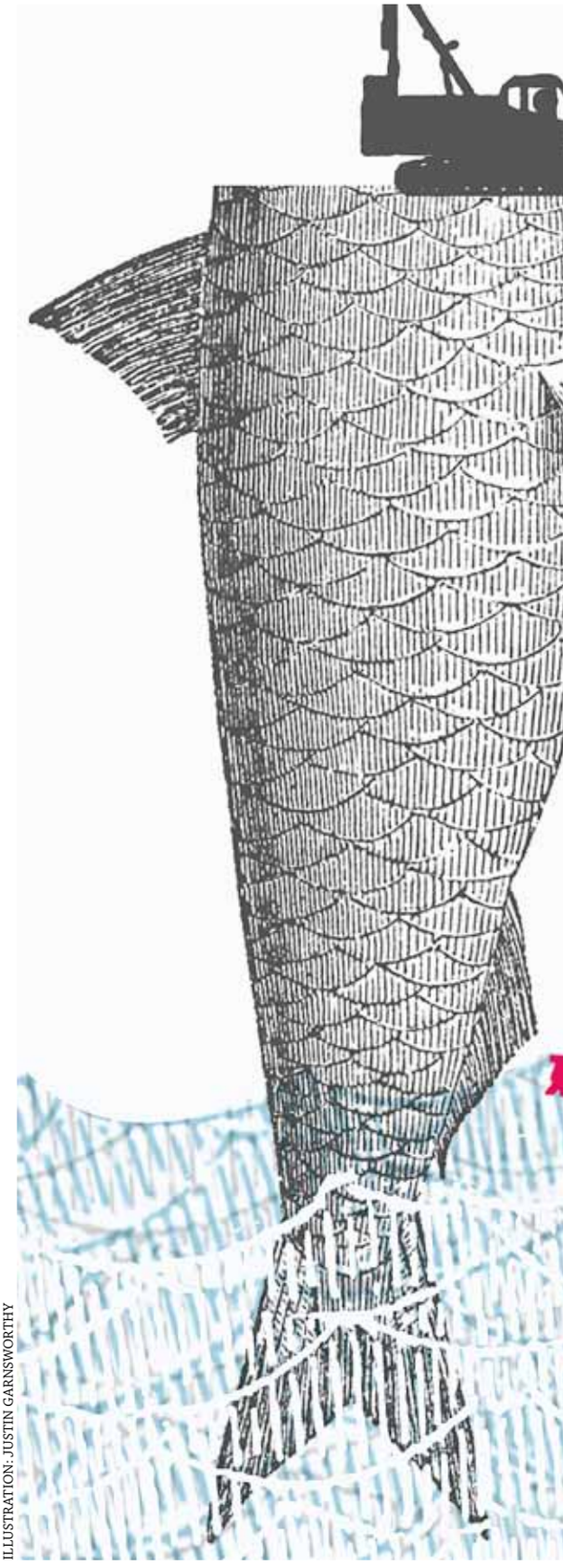


ILLUSTRATION: JUSTIN GARNSWORTHY

and environmental assessments. One advantage of being part of a private agency is building experience and moving across a number of jurisdictions. "One week we'll be working in Western Australia, the next we'll be in Micronesia." He says the knowledge and expertise the firm gains from each project feeds into others.

Responsiveness

A private agency such as MRAG is able to quickly bring together the most appropriate team of people for a particular project or task. "We do a lot of subcontracting and with the networks we have we can always find the best and brightest for the specific needs of each project."

Currently conducting a best practice review of Queensland's fisheries, MRAG has brought into its team a former CEO of the Australian Fisheries Management Authority (AFMA), a finance, economics and seafood-supply-chain expert from New Zealand, and a former chief science adviser to the US National Marine Fisheries Service.

However, he says that while more and more private research companies are emerging to conduct specific research in particular areas, there is still an important place for publicly funded research. "There are world-class capabilities in public agencies and we have some very close interactions with public agency staff."

As a researcher who has also worked on both sides of the public–private fence, Kyne Krusic-Golub says private providers have a very high level of accountability to their clients. He worked with the Victorian Department of Primary Industries' Central Ageing Facility for 14 years before the centre was rationalised in 2008, narrowing its services to only core Victorian fish species.

He and fellow scientist Simon Robertson took the initiative to establish Fish Ageing Services Pty Ltd to fill the gap in services no longer being provided by the department. "We had those skills so we were able to take on [the department's] former clients."

He says that with no department manager or government organisation to pass the buck on to, he has a greater sense of responsibility and accountability to his clients and their needs. "We are wholly responsible for providing that service and we are completely answerable to our clients."

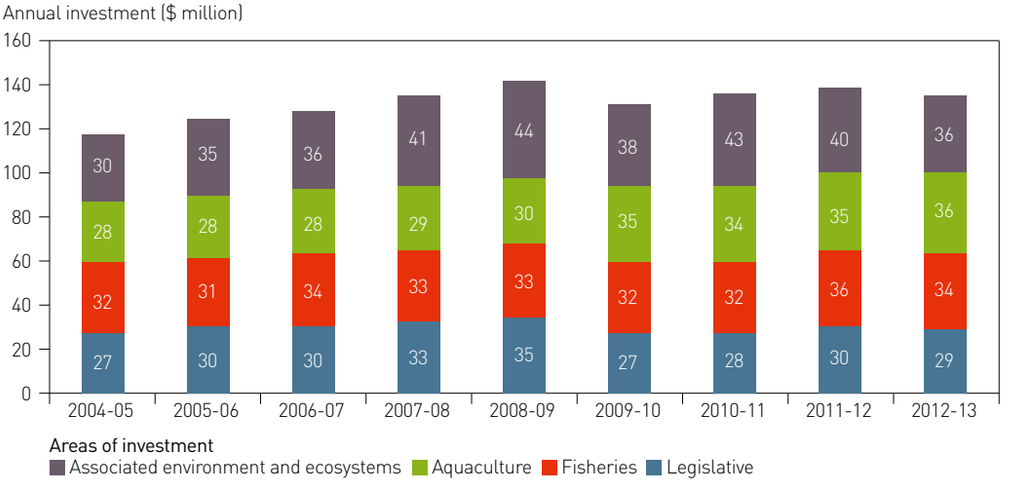
As a private agency, Fish Ageing Services has been able to provide clients with a more cost-effective service, partly because of the lower overheads. "We run a small staff, and our equipment was not too expensive to set up and maintain. So we are able to do the work more cheaply and efficiently and pass on the savings to our clients."

Critical mass and collaborating

Research by public agencies is built on a long history that often goes back decades, providing a rich source of data and expertise as well as linkages across the many areas of knowledge that are relevant to fisheries industries, says Caleb Gardner, an associate professor and program leader for fisheries at the Institute for Marine and Antarctic Studies (IMAS) at the University of Tasmania.

His department is not averse to using private consultants where required. IMAS used economic data sourced from agricultural economic

FIGURE 1 INVESTMENT BY KEY NATIONAL RESEARCH PROVIDERS 2004-05 TO 2012-13



SOURCE:FRDC

research company EconSearch to feed into its long-range economic survey work for the use of fisheries management in Tasmania and SA.

"It was very sophisticated modelling and EconSearch managing director Julian Morrison is very good at discussing economic processes," Caleb Gardener says.

But while private researchers are good at filling in the gaps, Caleb Gardener says that he doubts whether bigger projects could be achieved without the critical mass that can be achieved in the public area. "We are able to collaborate easily across large areas. For instance we work with people in CSIRO and at other universities. We tend to be less interested in where the other researcher is from than whether they have expertise in areas that are relevant to the project."

In SA, the South Australian Research and Development Institute (SARDI) delivers a breadth of expertise that cannot be matched by the private sector, says research chief of SARDI's Aquatic Sciences Gavin Begg. "At the end of the day, most of the private businesses are fairly small and usually built on one key person, whereas we have expert teams in a whole lot of areas. We have a suite of people that we can draw on in terms of their skills and expertise."

Given that fisheries are operating within a public natural resource, having a research agency that can balance the needs of all sectors using that resource is essential, he says. "SARDI acts not just for government but also for the other sectors – commercial, recreational, community and indigenous – whose interests may sometimes conflict. What we provide is a vehicle of independence to deal with all those sectors to ensure their interests are balanced out."

The extent to which state research agencies have outsourced research varies. WA's Department of Fisheries chose to keep all its fisheries research capacity in-house when it conducted a review in 2010 into how fisheries research was best managed in the state.

The decision to do that, rather than splitting it off into a stand-alone agency or outsourcing research to the private sector, was based on the effectiveness of management, says research director Rick Fletcher.

It was decided that keeping the three key components of fisheries management – research, policy and compliance – in-house was essential for efficient and effective management of natural resource systems, he says. "If you take out one of those three legs of the 'management stool', it falls over."

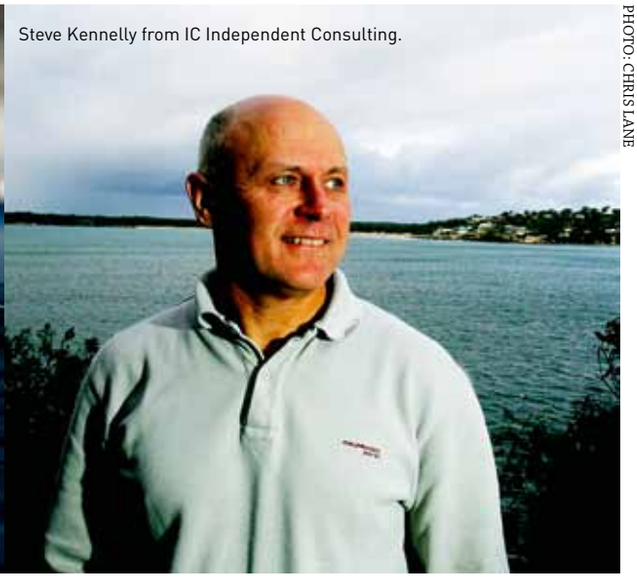
The free flow of information among the various divisions has been beneficial for management outcomes, he says. "If you need to find information from someone else in the department, or you identify an issue of relevance to other groups, there is generally no need for a formal process so this exchange can occur rapidly. This means management actions and shifts in research priorities can be initiated in a very timely manner." This integrated arrangement also means that the department takes long-term responsibility for all past work, irrespective of when it was done.

Kyne Krusic-Golub of Fish Ageing Services.

PHOTO: FISH AGEING SERVICES

Gavin Begg from SARDI.

PHOTO: SARDI



Steve Kennelly from IC Independent Consulting.

PHOTO: CHRIS LANE

The need for balance

From an industry association perspective, Renee Vajtauer, executive officer of the Commonwealth Fisheries Association (CFA), questions how responsive public research agencies are to the needs of industry in their research priorities. Moving to the CFA from her previous role as

Austral Fisheries staff were part of a collaborative research project gathering information about Australia's Patagonian Toothfish Fishery, around Heard, Macquarie and McDonald Islands. Austral conducted extensive annual scientific surveys to closely monitor the toothfish populations and worked with government observers to monitor practices, fish biology and conduct continuous stock assessments.

executive officer of Seafood Industry Victoria, she says research at state level tends to be much more industry-driven. Priorities at the Commonwealth level are more likely to be driven by government processes, such as through Management Advisory Committees (MACs) and Resource Assessment Groups (RAGs).

"There needs to be evidence that the research proposals have engaged industry through adequate consultation, from the expression of interest stage to the final report," she says. "Preferably, I would like to see more research projects owned by industry."

Renee Vajtauer believes that the private sector is as capable of carrying out the research as the government sector. "And if they can do it more cost-efficiently and with the same outcome, I think that works better for the industry."

However, Gavin Begg says that there are concerns regarding the objectivity of private research that is purely industry-driven. "A number of consultants have been seen as industry-available, and some might be seen as less objective than others. Whereas, what you expect from a government organisation is independent and objective science."

This is an issue that also concerns industry representative Martin Exel, who is general manager of environment and policy at Austral Fisheries and who also holds several industry representative positions, including past chair of the CFA. He is concerned about the steady decline in publicly funded research into fisheries, and the assumption that industry will carry the burden of funding private research into their operations.

Collaborative research between industry and private and public research agencies can work well, he emphasises, citing as an example work done over the past couple of years by his own company and Australian Longline Pty Ltd into the status of Patagonian Toothfish (*Dissostichus eleginoides*) stocks. This industry collaboration has helped inform quotas and management strategies and has involved the FRDC, IMAS and AFMA, as well as the World Wildlife Fund and the Australian Antarctic Division of the Department of the Environment.

"That was a truly collaborative outcome. We all paid for it, so we all had a sense of ownership and were able to closely monitor the milestones," Martin Exel says.

However, while the Patagonian Toothfish industry was prepared to provide funding for the laboratory equipment and pay for fish ageing services and fisheries modelling, he is concerned this has triggered an assumption that industry will continue to fund these government research obligations.

"We know there are limitations of how much government can pay, but it is scary when this is turned into a regular thing. There needs to be a base standard of government research into fisheries and the marine environment."

While enjoying his move into the private sector, Steve Kennelly's 25 years of experience with government agencies means he is highly attuned to the responsibilities of managing publicly owned resources such as fisheries.

"Fisheries are managed by government on behalf of the whole community – it is a core function of government to do this. Most of the researchers previously based at Cronulla were working on wild-capture fisheries resource assessment, and their work cannot easily be picked up by the private sector. Private businesses are usually not set up to do long-term stock assessment work in the way that governments are, so it is crucial that governments maintain the capacity to manage these public resources effectively and sustainably."

Steve Kennelly says the emerging mix of public and private research is providing new opportunities and efficiencies for industry, particularly for the aquaculture sector – where projects are much more driven by the needs of private enterprise.

However, for wild fisheries, the public expects governments to maintain sufficient scientific capacity to manage these resources for current and future generations. F

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SHARPER SENSES AID OCEAN INVESTIGATIONS

PHOTOS: CSIRO

RESEARCH CAPACITY The latest addition to Australia's marine research capacity is set to revolutionise ocean research, with open access to far more detailed data than has ever been available before

By Emily Weekes

After more than a decade of debate, design and construction involving many hundreds of people, Australia's first custom-made research vessel, *Investigator*, is undergoing final trials in preparation for its first official voyage in 2015.

Commissioned by CSIRO as part of the Marine National Facility, *Investigator* is set to double Australia's ocean research capacity. And it is a much needed boost, given that Australia has the third largest exclusive economic zone, but only 12 per cent of it has actually been mapped.

Mapping alone is an enormous challenge, with only one vessel in the national research fleet at any one time. But *Investigator* has been designed to do so much more. The 93.9-metre blue-water vessel is equipped with a technical prowess not seen before in Australia, to cater for as many scientific disciplines and fields of research as possible.

Investigator will be able to operate 300 days of the year and has berths for 40 scientists, who can remain at sea for up to 60 days. Its predecessor, the 66-metre *Southern Surveyor*, was a refurbished North Sea trawler, which operated at sea 180 days a year and could accommodate only 14 scientists for up to 28 days at a time.

Quiet passage

For Rudy Kloser, an acoustics research scientist at CSIRO and group leader of the Deep Water Ecosystems Status and Predictions team, one of the greatest achievements in designing and building *Investigator* is its "quiet signature".

"We're going from a rattle box, designed for fish capture, to a vessel that is designed to be very silent," Rudy Kloser says. "This means that we can do a lot more research and get a lot more resolution from our acoustic instruments."

Swath mappers are the instruments set to benefit most from the quieter operations. These acoustic devices installed beneath the ship use soundwaves to profile large areas of the sea floor. *Investigator* has two swath mappers: one for shallow water and one for deep water. As the ship travels, these instruments will capture ocean topography and backscatter information, creating a three-dimensional view of the seafloor to maximum ocean depth, which is about 11,500 metres.

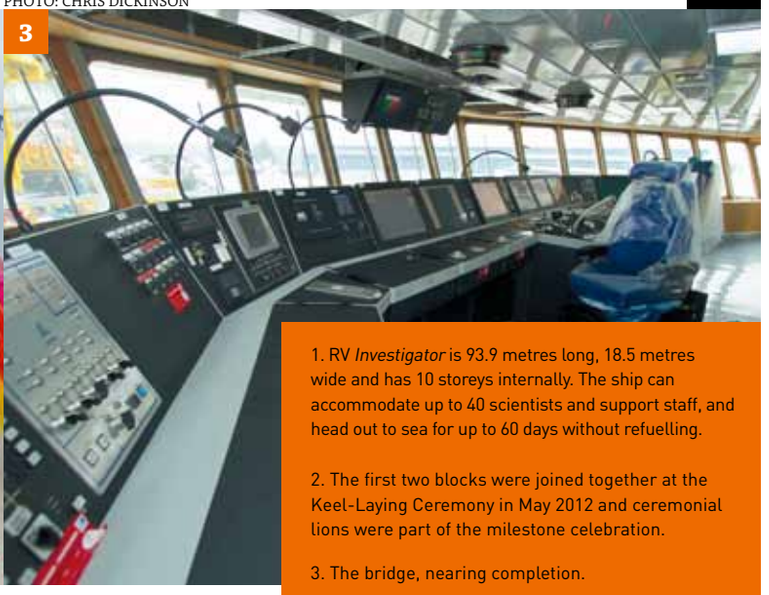
"It's important to consider not only the shape of the sea floor, but its composition, because then we can better map seabed habitat, and understand the associations of fish and fishers to that habitat," Rudy Kloser says.

"*Investigator* also has an EK60 – a five-frequency acoustic system to map pelagic habitats. Together with the vessel's quiet signature, our sonar capability has expanded enormously and allows us to resolve more pelagic and benthic habitats and go much deeper than ever before."

Data from the deep

On board *Southern Surveyor*, researchers could only collect fish biomass data to depths of 1500 metres. On *Investigator*, researchers expect to explore marine life down to at least 3000 metres. With the multi-frequency capability, the equipment will be able to delineate different sorts of species

PHOTO: CHRIS DICKINSON



1. RV *Investigator* is 93.9 metres long, 18.5 metres wide and has 10 storeys internally. The ship can accommodate up to 40 scientists and support staff, and head out to sea for up to 60 days without refuelling.

2. The first two blocks were joined together at the Keel-Laying Ceremony in May 2012 and ceremonial lions were part of the milestone celebration.

3. The bridge, nearing completion.

4. CSIRO established a site team at the Singapore shipyard where *Investigator* was built for the duration of the construction.

5. Questions about weather, climate and atmospheric conditions in remote areas of the world's oceans can now be answered, thanks to the dual-polarisation weather research radar atop *Investigator*.

groups, which will help monitor changes in the ocean environment. Rudy Kloser says they are still testing the full extent of their new capabilities.

Along with the fundamental capability to capture conductivity, temperature and depth data, *Investigator* is equipped with two drop keels, each weighing three tonnes. These can be deployed independently, at depths of four metres below the bottom of the ship. On board each keel is a suite of scientific equipment, including the EK60. In the undisturbed water below the ship, the keels will be the hub of data collection for individual deepwater species in their natural habitat.

Similarly, *Investigator* has been fitted with a TRIAXUS, an electronic two-metre cube, which can be towed up to three kilometres behind the ship, to a depth of 350 metres. As the water rushes through the cube, the TRIAXUS counts the number of plankton, and other marine life, in the water. Oceanographers are particularly keen to see what they can discover about where certain species live and how they behave – in an undisturbed environment.

"We're asking *Investigator* to do a lot of everything," says Don McKenzie, the vessel's operations manager. "We'll be able to get larger groups of scientists looking at more aspects of a problem or question because we're almost tripling the number that can come on board on any one voyage."

Customised quarters

Customisation of the new vessel includes 10 laboratories, eight of which are accessible from the main deck, which allows samples and equipment to flow more easily and safely between stations. In the past, scientists have had to negotiate flights of stairs as they moved between laboratories.

"When you come in off deck and you have great buckets of mud and rock, or fish, or containers of water, you always need space to sub-sample these. The flow of samples needs to go into smaller and cleaner and drier labs," Don McKenzie says.

Even the width of the corridors has been made to suit the research environment, so that scientists can manoeuvre heavy plastic bins without grazing their knuckles.

For Iain Suthers, a professor in the School of Biological, Earth and Environmental Science at the University of New South Wales and a founding member of the Sydney Institute of Marine Science, *Investigator* offers "a completely new set of eyes" on Australia's marine environment.

He was a researcher on Australia's first national research vessel, *Franklin*, during the 1980s, and has been involved with *Southern Surveyor* for more than 12 years as a member of the science advisory panel. Now he is eagerly awaiting the new vessel's first voyage.

"*Investigator* will be able to tell us, with accuracy, what kind of oceanographic conditions we're in," Iain Suthers says. "So we can actually know what the fish are sensing, whether they're spawning and why they're there."

An independent steering committee will oversee operation of *Investigator*, which is managed by CSIRO. Competition for sea time is already intense. Applications are internationally peer-reviewed and independently assessed in terms of the quality of the science and their contribution to the national interest.

All of the data collected on board *Investigator* will be publicly available after each voyage through the Australian Oceanographic Data Network. The process of sharing data has already begun through the Integrated Marine Observing System.

Iain Suthers says access to data brings together scientists who would not normally interact. "I think we need to increase our cooperation and have more of a multidisciplinary approach. Usually when you get multiple users, you get multiple discoveries that you'd otherwise never dreamed about," he says. F

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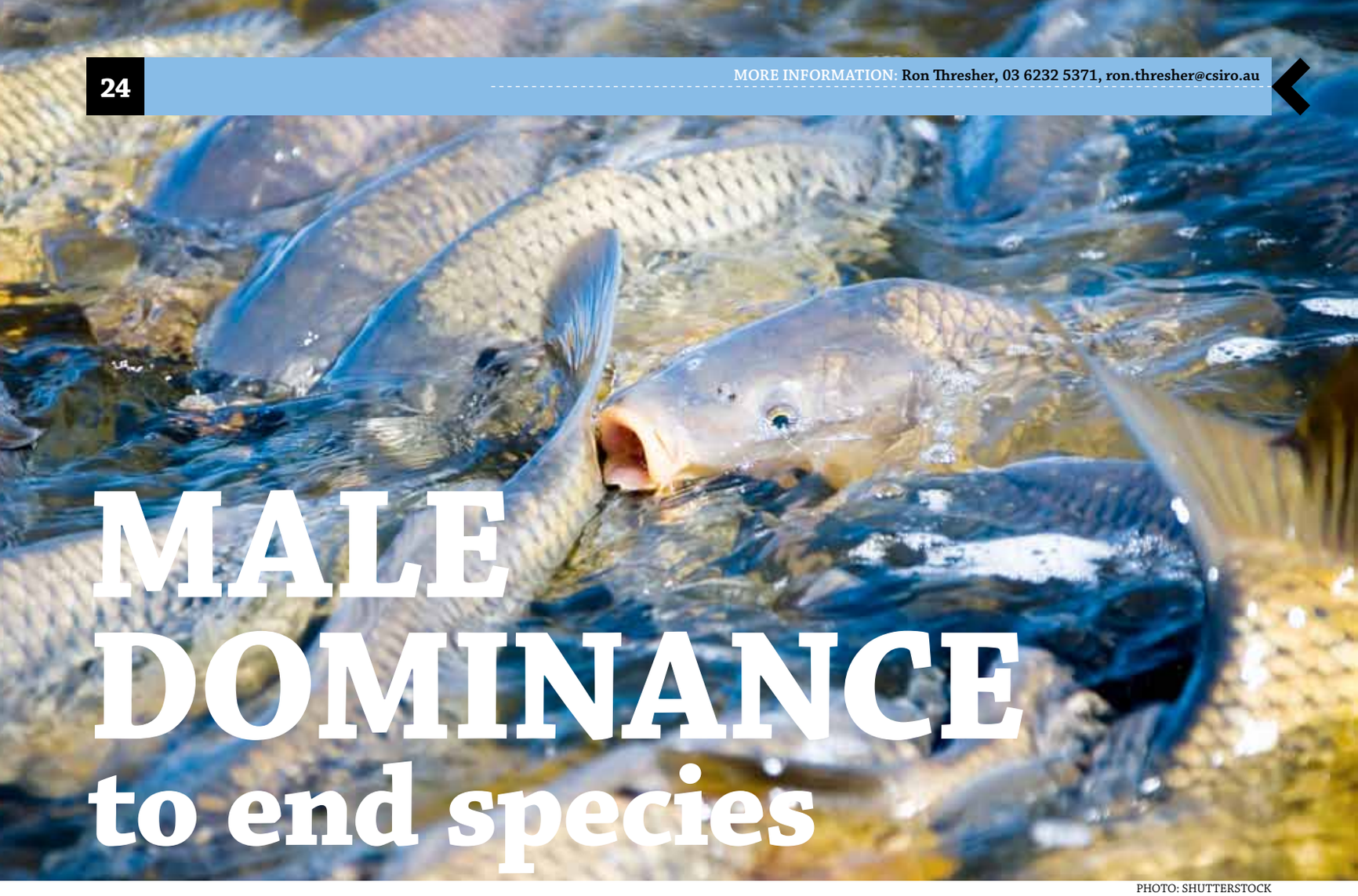

MALE DOMINANCE to end species

PHOTO: SHUTTERSTOCK

BIOSECURITY Gene technology offers new hope for carp-free rivers after many years of trials

For the first time, scientists have successfully trialled a technology that could control and even exterminate invasive fish such as carp.

In a paper published in May 2014 in the journal *Nature Biotechnology*, CSIRO scientists reported the first proof-of-concept that 'daughterless technology' works in vertebrates.

Daughterless technology involves modifying the genes of fish so that when they reproduce, only the male offspring survive or are fertile. This modification is specific to a particular fish species and can be transferred only from parent to offspring, preventing spread to other species.

When the gene modification is inherited by female fish it either reduces female fertility or survival. This reduces the ratio of females to males in the population, eventually driving the pest to extinction as females become increasingly rare in the population.

Rabbits of the river

Invasive European Carp (*Cyprinus carpio*) were first introduced to Australian waterways in 1859. However, it was the escape of a German strain (known as 'Boolarra') from an Australian aquaculture farm in the 1960s that resulted in a massive expansion of carp in Australian waterways. They are now the most abundant large freshwater fish in many parts of Australia, including most of the Murray–Darling Basin. A noxious species, Boolarra carp spreads rapidly and has been associated with significant damage to waterways, much like rabbits and cane toads on land.

Carp can tolerate a wide range of conditions and habitats and multiply very quickly. One female carp can produce more than 1.5 million eggs a year. It is no wonder they are often referred to as Australia's 'river rabbits'.

To date, carp control has mainly consisted of commercial harvesting or poisoning. While these options may reduce carp numbers, and poisoning may occasionally eradicate them from isolated areas, other options are being explored for more widespread control.

In one case of successful eradication of carp from Lake Crescent in Tasmania, a combination of several control methods was used including: barrier mesh and traps to reduce breeding and capture carp; 'judas carp' (which involves implanting a radio transmitter on an individual) to locate carp aggregations; use of a pheromone 'lure' odour to attract and trap mature carp; and some localised application of poisons, lime and rotenone to kill unhatched carp embryos.

New control technology

With funding from the Murray–Darling Basin Authority (MDBA) and the Invasive Animals Cooperative Research Centre, research to trial 'daughterless technology' on fish began in 2000, about the same time entomologists in the UK began similar trials on insects in an attempt to improve the 'sterile insect technology' for pest insect control. The technology clearly works on insects, and field trials involving mosquitoes have now been carried out in several countries.

CSIRO honorary fellow Ron Thresher and his team identified and decoded the gene sequences that produce a sex-change effect

in fish and then began laboratory studies to test if the altered gene assembly would actually produce male-only offspring.

"To establish if daughterless technology works on vertebrates, we undertook studies with Zebrafish (*Girella zebra*). We chose this fish species because it is small, has a short generation time and is closely related to several invasive carp species," Ron Thresher says. "We are also in the process of testing the technology on carp themselves; however, this takes much longer because carp have a much longer generation time."

Trials on carp have been underway since 2009 at specialist facilities at Auburn University in Alabama, US. Several thousand juveniles carrying different versions of daughterless genes are being reared and tested, including versions that are suitable for field trial and release.

"We trialled three approaches using three species-specific gene assemblies: one that is lethal to females, but not males, before they reproduce (female lethal); one that converts female embryos into males (daughterless); and one that causes female but not male sterility (female sterile)."

He says of the three, the female lethal system is the most advanced, with Zebrafish carrying a prototype gene assembly having been bred through four generations. All fourth-generation fish were males. Importantly, because the carriers have to compete with wild-type males for breeding, the CSIRO team was able to show that the male carriers are fully competitive for females and had the same levels of reproductive success as the wild-type males. There are possibilities to enhance the success rates of the male carriers, which would improve the efficiency of a pest-control program.

So far, only one generation of female sterile fish have been bred. The gene assembly reduces female fecundity by approximatey 85 per cent and has had no apparent adverse effect on the fitness of male carriers. "The sex-change gene assembly appears to be working in carp, with a large excess of males in the first generation of fish bred, but we need to wait until more fish are mature before we can be certain it is effective," Ron Thresher says.

The MDBA stopped funding the project in 2012, but the project was taken up by the Lower Murray Darling Catchment Management Authority, which supported the daughterless carp research for a further 12 months. The funding ensured that newly maturing carp were kept alive to breed and the next stage of the research on the second generation of carp could continue.

Zebrafish have been used to test the daughterless technology.

PHOTO: CSIRO

"Once this research with carp is complete our results will be evaluated by government regulatory bodies including the Australian Government Office of the Gene Technology Regulator and, as we have done throughout the course of this research, we will also continue to consult widely with industry and stakeholders," Ron Thresher says.

Soon after the start of the project, community consultation, in the form of feedback from media reports, public presentations, discussions with state and Commonwealth managers and a formal survey, indicated that such a technology, if practical and species-specific, would be publicly acceptable.

"At that time, the public seemed comfortable with this gene technology for controlling carp, but they clearly want to be fully consulted before anyone contemplates releasing genetically modified fish into Australian waterways," Ron Thresher says.

Rivers free from carp?

Daughterless technology alone can lead to pest eradication; however, CSIRO's models indicate this technology is much more effective when combined with complementary control strategies such as use of localised poisoning, disruption of spawning activities or the introduction of a biological control agent, known as biocontrol.

A future where Australia's rivers are free from carp and many of the native fish are potentially returned from the brink of extinction depends on further research, careful and controlled field trials, consultation with the Australian public and consideration by government regulatory bodies, specifically the Office of the Gene Technology Regulator.

Nonetheless, this research is an exciting advance for vertebrate pest management. F

CSIRO acknowledges the funding agencies that have supported this research, which include the Murray–Darling Basin Authority, the Lower Murray Darling Catchment Management Authority, CSIRO, Auburn University and the Invasive Animals Cooperative Research Centre.

PHOTO: RON THRESHER, CSIRO

Fisheries facility at Auburn, Alabama, US, where Rex Dunham is raising carp for the trial.

From research to real world

PHOTO: FRDC

Sean Sloan discussed national guidelines to assist development of consistent harvest strategies, at the Australian Marine Sciences Association conference in July.

CONFERENCE REPORT **Collaborative research and practical benchmarks to assess the success of fisheries management were among key topics for discussion when the nation's marine scientists came together in July**

By Ilaria Catizone

The importance of interdisciplinary interactions was highlighted during the 51st annual Australian Marine Sciences Association (AMSA) conference, held in Canberra in July, with the theme of 'Investigating our Marine Nation'.

The event drew 330 researchers from around the country, representing diverse scientific disciplines. Ngannawal Elder Judy Barlow provided an official welcome and AMSA patron Joe Baker urged participants to "cross boundaries" and network with researchers from other disciplines.

Australia's Chief Scientist Ian Chubb's opening address focused on the importance of nurturing the scientific disciplines underpinning marine science, including mathematics, chemistry, physics and biology.

Over the four days of the conference, more than 260 presenters contributed to the 21 sessions. The plenary speaker was the director of meteorology and CEO of the Bureau of Meteorology (BoM), Rob Vertessey, who outlined the many synergies between meteorologists and marine scientists and described BoM's marine services that could be of use to researchers.

Climate-related themes were also part of the conference's dedicated fisheries session, sponsored by the FRDC.

CONNECTIVITY SCIENCE CLAIMS AMSA AWARD

At the gala dinner on the final day of the Australian Marine Sciences Association conference, the FRDC's executive director Patrick Hone presented the FRDC AMSA 2014 Student Award to John Ford, for his presentation 'Empirical evidence for source-sink dynamics in a marine fish metapopulation'.

The presentation, based on John Ford's PhD research, focused on the connectivity among fish populations.

"When fishing a species with many separate stocks, it's important to understand to what degree those stocks are connected. How are the stocks reliant on one another? Does fishing one stock affect the other? From a fisheries management perspective, it is critical to effectively manage the more productive populations because any decline in these will also affect the less productive populations they are connected to," John Ford explains.

He was able to successfully evaluate the dynamics between more-productive and less-productive fish populations by directly observing them, rather than through computer modelling studies. He conducted counts of the Southern Hulafish (*Trachinops caudimaculatus*), which is an important prey item for snapper and Southern Calamari (*Sepioteuthis australis*) in Port Phillip Bay, Victoria, over five years. By tracking natural chemical markers in fish otoliths (ear bones) he was able to estimate the connectivity among different Southern Hulafish populations in the bay. He was able to identify two important source populations in Port Phillip Bay and provided a strong framework for applying his theory to other more commercially valuable fish species.

After finishing his PhD this year John Ford is now working at the University of Melbourne, leading an FRDC-funded project titled 'Using local knowledge to understand linkages between ecosystem processes, seagrass change and fisheries productivity to improve ecosystem-based management'. The project partners with commercial fishers in Corner Inlet, Victoria, and the West Gippsland Catchment Management Authority to harness the knowledge of fishers for improved catchment management and maintenance of healthy seagrass and sustained fisheries productivity.

He says he would like to continue to engage fishers in management stewardship and conservation through his current project, and to boost fisheries productivity through the restoration and rehabilitation of important habitat such as oyster reefs.

PHOTO: FRDC

FRDC executive director Patrick Hone (left) awards the Australian Marine Sciences Association award for the best student presentation to John Ford.

Claire Spillman from the Centre for Australian Weather and Climate Research spoke about how the latest climate models could assist fishers and aquaculture operators better plan their businesses.

The fisheries session was well attended and featured talks that covered everything from more efficient data analysis methods to evaluating stocks. CSIRO's senior fisheries modeller Malcolm Haddon opened the session with his presentation about the science of invertebrate stock status reporting.

Malcolm Haddon said "sustainable and profitable fisheries" were the conceptual objective of fisheries management. "But to measure management success we need operational objectives that measure the performance of the fishery relative to defined reference points. If data was lacking, proxies may have to be used."

Malcolm Haddon explained that the general approach both here and overseas was to reconcile the available science with necessary management decisions and from there develop a harvest strategy appropriate to the fishery.

Harvest strategies were an effective way to guide the fishing industry and fisheries managers through difficult decisions, Sean Sloane from the Department of Primary Industries and Regions, South Australia, reported.

He has helped to develop national guidelines that Australian fisheries could use to prepare consistent harvest strategies. The national guidelines provide definitions, common language and important contextual information.

Sean Sloane said the common language was important to help stakeholders establish a shared understanding of the purpose and application of a harvest strategy as a management tool.

The right context

Another way for fishers to be actively involved in the management of their fishery was to adopt a co-management model, as discussed by Rob Day, from the University of Melbourne. His presentation emphasised the importance of setting up the right context where industry felt confident in the research approach presented.

But sometimes deciding whether the science at hand was trustworthy could be difficult – an issue outlined by Andrew Penney from the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) in his presentation on science quality-assurance standards.

Andrew Penney said common key principles for scientific quality assurance included accuracy, objectivity, integrity, relevance, reliability, reproducibility and lack of bias.

Peer review was recognised as the primary mechanism for reviewing science against these principles, he said. Openness, transparency and management of conflicts of interest were key elements for increasing trust in scientific information.

"A scientific quality-assurance standard for Australian fisheries science should be based on international experience and be relevant across all science institutions," Andrew Penney said.

Updates and implementation

Matthew Flood, also from ABARES, presented the latest news on the development of the next edition of the *Status of Key Australian Fish Stocks Reports*.

First released in 2012, the next edition, to be released at the end of 2014, will include 18 more species. The second edition will, like the first, provide invaluable information about the status of each species, assessed through a standardised and consistent national fisheries reporting framework.

Rick Fletcher, from the Department of Fisheries, Western Australia, spoke about cost-effective, risk-based ecosystem management for fisheries and aquatic environments.

"If you have 400 species, you can't regulate them all individually," Rick Fletcher said. "Grouping them allows for easier and more efficient regulation of species with similar characteristics. The biggest challenge is therefore getting an appropriate governance framework developed, not how to collect more data.

"Even if you can collect lots of data and complete complex analyses, these will not be useful unless there is a governance framework that is capable of using this information in an effective manner."

The manager of the Gillnet Hook and Trap Fishery for the Australian Fisheries Management Authority, David Power, also talked about novel approaches to management. He said AFMA was using sophisticated cameras installed on vessels to ensure accurate bycatch records were kept and to minimise the impact of fishing activities on marine mammals.

This information meant that it would be possible to undertake individual reviews of fishers who struggled to comply with bycatch regulations, rather than closing the whole fishery, which is happening at the moment. AFMA's new approach was expected to provide greater incentive for fishers to comply with bycatch regulations, he said.

Craig Mundy from the University of Tasmania was also part of the fisheries session, reporting on fleet dynamics and site fidelity in Tasmania's abalone fishing industry. F

Assistance for fisheries exporters

On 13 May 2014, the Australian Government announced a $15 million package assisting small exporters. This package includes:

- a small exporters a rebate in 2014-15;
- a fees and charges review; and
- funding projects to benefit small exporters.

The rebate will be available to eligible small exporters in sectors where there is a specific export registration charge – that is, in the meat, dairy, egg, seafood, horticulture and grain export sectors.

Five specific industry consultative committees will work with the Department of Agriculture to roll out this initiative. This will involve leading the discussions on the fees and charges review, and making recommendations to the Hon. Barnaby Joyce, MP, Minister for Agriculture, by 30 June 2015 about the equity and sustainability of the current fees and charges, including a proposal for a new structure, if appropriate.

The consultative committees will also recommend suitable projects to the Minister by 30 June 2015 to improve market access for small exporters. F

Applications for the rebate and criteria for eligibility are available at: www.daff.gov.au/biosecurity/export/package-assisting-small-exporters

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A WHOLESALE APPROACH

SUSTAINABILITY Sydney's largest top-end seafood supplier has developed a program to help restaurants make sustainable seafood choices

By Melissa Branagh

Poor labelling, along with claims and counter claims about seafood sustainability are creating confusion in the marketplace, according to leading Australian fishmonger Jules Crocker. So much so, that he has taken the step of creating his own independent assessment tool to use when choosing fish. This ensures his pick meets his sustainability criteria. He then sells his sustainable choices under the Cleanfish Australia name.

The assessment tool, based on his own rigorous research and his interpretation of the available sustainability data, gives Jules Crocker confidence in the sustainability of the seafood he offers to clients of his Botany Bay wholesale seafood business, Joto Fresh Fish. "Rather than offering the full plethora of product day in, day out, I am offering what is fresh, in season and sustainable," he says. "I plan to grow the Cleanfish Australia brand that way."

A-list Sydney chefs Matt Moran (Aria), Luke Mangan (Glass Brasserie), Peter Gilmore (Quay) and Neil Perry (Rockpool) are among Jules Crocker's 200 restaurant, wholesale and retail clients who rely on his recommendations and endorsement so that they can make qualified claims about the sustainability of the fish and seafood they offer. Many of these businesses cater for highly discerning customers who are concerned about the impacts of global warming, overfishing and aquaculture practices.

In addition to making sustainable seafood more commonplace, Jules Crocker says there is a public-education element to what he is doing. "It's important to acknowledge fisheries that are doing things the right way by promoting their product."

Growing interest

In recent years, there has been a shift towards more accessible bistro dining, which Jules Crocker says has led chefs to use lesser-known species, such as cuttlefish, squid, mackerel and leatherjacket – species not seen on menus five years ago. This has been driven primarily by affordability. However, a handful of these chefs also have an interest in sourcing 'sustainable seafood' – which they regard as fish or shellfish that reaches the plate with minimal impact on the marine environment.

"There is also a small, but growing, level of public interest in sustainable seafood. However, with no forum for information delivery and with only limited certification programs available, there is an information and supply gap that reflects poorly on our industry," he says.

Into the gap

This information gap, and his commitment to offering superior-quality, affordable and predominantly local seafood in season, is what motivated Jules Crocker to develop the Cleanfish Australia tool. "There is a crossover between all of those credentials and sustainability," he says.

He has invested a significant amount of time, energy and money researching individual fisheries and species to develop the Cleanfish Australia tool. "I started to develop Cleanfish Australia five years ago when there was no certification available for aquaculture," he says.

The Cleanfish Australia assessment produces a basic sustainability profile for individual species using minimum criteria for animal health and welfare, food safety, environmental integrity and socioeconomic factors.

In conjunction with his own research, he recognises and incorporates several existing standards for both marine capture and aquaculture fisheries.

He says species that have met these standards are easy to pick, the work has already been done; he just brings them all together under the Cleanfish Australia brand.

For marine-capture fisheries he uses Marine Stewardship Council and Friends of the Sea certification for fisheries, and draws on information provided by the FRDC through the *Status of Key Australian Fish Stocks Reports* to determine whether Australian fisheries that do not have third-party certification should be endorsed.

Until relatively recently there were fewer aquaculture standards; however, this has changed and now he includes the Aquaculture Stewardship Council standard and Best Aquaculture Practices standards, which were developed under the Global Aquaculture Alliance, and the Food and Agriculture Organization of the United Nations guidelines for sustainable aquaculture.

Fish are dry-filetted, which helps retain their flavour, and vacuum-packed.

PHOTOS: MICHELE MOSSOP

Jules Crocker says in the coming year he wants to extend the framework to include 'excellence' for aquaculture assessment. This will consider a fishery's sustainable practice based on its contribution to the environment, recycling and packaging, energy, education and the community.

Chef Tom Kime, from Fish & Co, was instrumental in developing the excellence category and has been appointed Cleanfish Australia Chef Ambassador of Excellence to encourage businesses to improve their approach to sustainability.

Chain of custody

When talking about the credentials of a fish, chain of custody is very important, Jules Crocker says; you need to be sure that the fish you buy actually came from where it was supposed to. The Cleanfish Australia assessment features a robust internal chain-of-custody component to ensure all products can be traced back to the source. "We uphold best industry practice in this area but it can be challenging," Jules Crocker says.

Industry adoption

Jules Crocker plans to consult with other industry members to drive adoption of the Cleanfish Australia model at a broader level. "Our investment has given us a thorough understanding of seafood sustainability in Australia from a number of perspectives throughout the supply chain, which puts us in a position to help other industry players who want to get into this space," he says.

Since opening his Botany Bay factory doors to the public on Saturday mornings in October 2013, Jules Crocker has observed the majority of customers are not consciously buying based on sustainability. "They see it as an added bonus," he says. "But I believe the Cleanfish Australia program ticks all the boxes and I can see its value in the long term." F

MORE VARIETY

The Cleanfish Australia approach aligns well with recommendations to consumers to eat locally caught, lesser-known species.

The *Status of Key Australian Fish Stocks Reports*, commissioned by the FRDC and prepared by more than 100 scientists from across Australia, provide a baseline snapshot of fish stocks by region. The reports cover more than 70 per cent of the volume of fish caught in Australia and encourage consumers to look beyond popular species such as snapper and flathead and try something new.

The second edition of the *Status of Key Australian Fish Stocks Reports* will be released in December and will provide information on an additional 18 new species.

Cleanfish Australia holds a 'market day' on Saturday mornings in Sydney.

Fishmonger Jules Crocker has created his own seafood sustainability assessment tool.

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FRDC RESEARCH CODE: 2012/746

Initiative to set global certification standard

SUSTAINABILITY Seafood is an international commodity and a new benchmarking initiative for certification programs aims to help buyers compare the product credentials no matter where they came from and who certified them

By Catherine Norwood

Around the world there is a multitude of seafood-related certification systems in operation – more so for wild-capture fisheries than for aquaculture. Certification systems cover a range of areas from environmental sustainability and management of fisheries, through to chain of custody and traceability, which can make it very difficult to assess the value of one program against another.

Ironically, what was intended to provide certainty for consumers has created confusion along the entire supply chain. The Global Sustainable Seafood Initiative (GSSI) is looking to clear some of the confusion.

The GSSI was formed in February 2013 to develop a consistent global benchmarking tool that will provide transparency between labelling and seafood certification programs.

The GSSI benchmarking framework consists of different criteria and indicators based on the Food and Agriculture Organization of the United Nations (FAO) guidelines *Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries* and *Technical Guidelines on Aquaculture Certification*.

The initiative has three expert working groups – one for aquaculture, one for fisheries, and one for the procedural, institutional and evaluation processes of seafood certification. Together they are developing the global benchmarking tools to assess and identify the differences in certification programs.

Program partners come from all sectors of the fisheries and seafood supply chain and stakeholder communities, including retailers, seafood processors, food services and NGOs.

GSSI program manager Herman Wisse was recently in Australia to present a workshop on the draft Benchmark Framework for Aquaculture Standards at the World Aquaculture Society Conference in Adelaide. This marked the beginning of public consultation on both the aquaculture and marine-capture fisheries draft standards.

Herman Wisse
PHOTO: FRDC

During his visit to the conference, Herman Wisse also participated in the FRDC's first webinar to explain the aims of the program and the consultation process. The FRDC is among the many organisations to make a submission to the consultation process. In the past year, the GSSI has worked intensively with stakeholders in the global seafood supply chain, including industry, public institutions, NGOs and academia, to develop the first draft of its benchmarking tool and get feedback from as many stakeholders as possible.

As a 'work in progress' there are still areas where perspectives differ and stakeholders continue to work towards consensus. The consultation process and pilot testing is expected to help resolve some of these issues.

The consultation process closed in August and included structured stakeholder consultation, as well as an open call for public comment to solicit comprehensive feedback.

By reducing confusion and providing transparency, the GSSI aims to facilitate more efficient decision-making and application of seafood certification programs worldwide. The ultimate goal is to ensure consumers retain confidence in the supply and promotion of sustainable seafood, and to promote improvements in the certification and labelling programs.

A revised version of the benchmarking tool is expected to be finalised by the end of the year. F

Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries: www.fao.org/docrep/013/i1948e/i1948e08.pdf

Technical Guidelines on Aquaculture Certification: www.fao.org/docrep/meeting/028/ar133e.pdf

ABOUT THE GSSI BENCHMARKING TOOL

The recent draft of the Global Sustainable Seafood Initiative (GSSI) Benchmarking Tool for seafood certification schemes has three main components.

- Benchmark framework: this component outlines the requirements for responsible seafood certification schemes.
- Benchmark process: this component outlines the process by which seafood certification schemes will be objectively assessed against the requirements of the GSSI Benchmark Framework.
- Public recognition: this component outlines GSSI's process for communicating benchmarking results of seafood certification schemes that have successfully undergone the benchmarking process.

Rural leaders harvest new skills

PEOPLE DEVELOPMENT **Two of Australia's leading young oyster farmers report on their experiences as part of the Australian Rural Leadership Program**

By Rose Yeoman

Oyster farmers Ben Cameron and Jedd Routledge have more than one thing in common. They are managers of family-owned businesses with considerable history in the industry and both are participants in the 20th intake of the Australian Rural Leadership Program (ARLP).

The FRDC provided two $50,000 scholarships for the 59-day program to allow both to take part in the ARLP, which is held over 17 months and includes residential sessions in Australia and one component in India.

The aim of the ARLP is to foster personal growth and assist participants to develop the knowledge, skills and networks to be effective leaders in their communities and industries. It also aims to develop 'contextual intelligence' so leaders can understand the drivers that shape rural Australia and its primary industries.

"The whole course is a journey involving personal and group growth and it challenges your pre-existing ideas," says Jedd Routledge, managing partner at Natural Oysters, based in Coffin Bay, South Australia.

"One of the great aspects was sharing other people's journeys and hearing about different industries. I applied because a previous participant in the course recommended it to me and I'm already using what I have learnt. I try to be proactive both inside and outside business.

"For example, I've been involved in setting up a work inspirations program to attract and retain talented people, including youth. On the Seafood Jobs website (www.seafoodjobs.com.au) we describe a variety of jobs, which we hope will inspire people to apply for aquaculture jobs."

Ben Cameron is general manager at Cameron of Tasmania, and came into the family business after completing a Bachelor of Economics and a Bachelor of Arts in Public Policy and Political Science.

Positive impact

In 2013, Ben Cameron was the recipient of the Tasmanian and the Australian Young Achiever of the Year industry award. He says he was motivated to apply for the ARLP because his father had been accepted for the third course, which had a major positive impact on his father's business and industry life.

Both Ben Cameron and Jedd Routledge have busy professional lives. Ben Cameron contributes to the management of several aquaculture industry bodies and for the past three years has been a director of the Tasmanian Oyster Research Council. He is also a member of the industry working group on Pacific Oyster Mortality Syndrome (POMS), where the goal is to support research into oyster viruses and biosecurity issues.

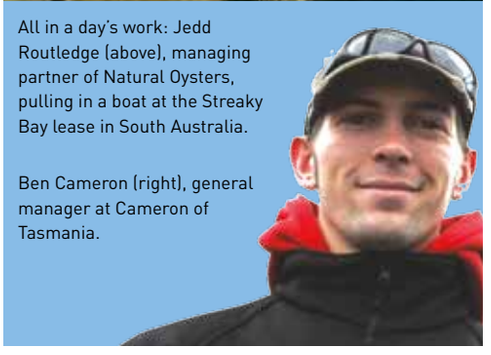
Jedd Routledge began his academic studies with a law degree and although he has never practiced law, says it has been useful for understanding the legal framework of business. More recently, he has completed a professional management program and is currently studying for a Masters in Business Administration. He is vice-president of the South Australian Oyster Growers Association and is the SA research and development representative for Oysters Australia. He is also director of a new company named Natural Angasi, which is in the research and development phase and focused on Native Oysters (*Ostrea angasi*).

Ben Cameron and Jedd Routledge both say that through the course they have learned to better understand different personality types, which has made it easier to understand different points of view and individual 'filters' people might be applying, to improve team operations.

Skills and experience

Ben Cameron cites media training at the ABC as a particularly useful part of the course. "I was in the media a lot after the Dunalley bushfires in January last year and the training that we did would have made a huge difference if I had done it beforehand – I will be able to present a much more professional face for the fishing industry in the future."

The intensive negotiation training was another highlight, he says. "It was about how to concentrate on the negotiation process itself and focusing on achieving the best possible outcome rather than concentrating on winning. It was also about not missing opportunities due to lack of negotiation."



All in a day's work: Jedd Routledge (above), managing partner of Natural Oysters, pulling in a boat at the Streaky Bay lease in South Australia.

Ben Cameron (right), general manager at Cameron of Tasmania.

Both participants agree that the two-week Kimberley tour was an amazing start to the course: a physically and emotionally challenging experience with others who were at that time strangers but who are now part of their wide-ranging leadership network.

The course has recently become accredited and participants receive a Graduate Certificate in Rural Leadership from James Cook University, Queensland. F

Applications for the next ARLP open in February 2015 and details are available at: **www.rural-leaders.com.au**

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URCHIN CONTROL

PHOTO: EMMA FLUKES

ECOSYSTEMS Early warning and a proactive approach are helping Tasmania find solutions to its emerging sea urchin problem

By Emma Flukes and Sean Tracey

Since the establishment of the long-spined sea urchin, *Centrostephanus rodgersii*, in Tasmanian waters in the late 1970s, the sea urchin has spread down the east coast. In several areas along Tasmania's north-east coast they have created extensive 'barrens' – where shallow rocky reefs are stripped bare of seaweeds. Areas of incipient barrens (small patches of bare substrate) can now be found as far south as Tasman Island in the south-east.

In New South Wales, urchins have removed entire kelp beds and created bare, extensive barrens on half of the state's shallow (less than 40 metres) rocky reef habitat. Continued formation of urchin barrens on Tasmania's east coast poses the single largest ecological threat to the integrity of Tasmanian rocky reefs and their associated abalone and rocklobster fisheries.

The Institute for Marine and Antarctic Studies coordinated a recent workshop in Hobart to showcase research on, and discuss strategies to control the effects of overgrazing by, sea urchins on Tasmania's east coast. This included research from several FRDC-funded projects. Representatives from several stakeholder groups attended, spanning research, management, commercial and recreational fishing, and conservation sectors.

Research presentations centred around four main areas being considered for controlling the spread and impact of sea urchins in Tasmania: dedicated culling of sea urchins by commercial divers; culling of urchins by abalone divers as they fish for abalone; establishing a viable fishery for urchins; and enhancing population stocks of large Southern Rocklobsters (*Jasus edwardsii*), which are capable of predating emergent sea urchins on rocky reefs.

Commercial culling

Scenario 1 explored the feasibility of divers conducting targeted culls of sea urchins. A small-scale culling program is already in place in Victoria's Eastern Abalone Zone and has yielded promising results, with a significant recovery of kelp beds observed in areas subject to ongoing culling efforts (to about 15 metres depth).

A recent pilot study in Tasmania investigated the feasibility of a similar industry-implemented, spatially discrete culling program. In contrast to the Victorian cull methodology, the project in Tasmania used a systematic method that could measure the reduction in urchin density.

The results were that culling was very effective at reducing the density of urchins (91 per cent) when sites were re-surveyed 12 months after culling.

The research concluded that dedicated culling provides a highly effective method of protecting small areas of reef of high economic or commercial value, but that large-scale dedicated culling was not currently a feasible control option in Tasmania.

It was also noted that culling by divers will be effective to about 15 metres, but dive time limits activity in deeper water.

Opportunistic culling

Scenario 2 examined the effectiveness of abalone divers opportunistically culling sea urchins as they harvest abalone. Cull rates and spatial coverage achieved by divers were quantified with the use of cameras and GPS loggers.

Unsurprisingly, urchin cull rates declined as abalone catch increased and divers became increasingly preoccupied with fishing. As divers moved through an area, their collective efforts removed seven to 10 per cent of the total urchin biomass. Although this has no detectable impact on urchin grazing at the

Long-spined sea urchins grazing on reefs in Wineglass Bay, Tasmania.

'reef' scale, at a smaller 'patch' scale (one to 10 metres) this level of culling is effective in protecting small, targeted areas of reef.

Market demand

Scenario 3 explored the expansion and future development of an existing small-scale sea urchin fishery currently operating out of north-east Tasmania. Spatial targeting of this fishery to particular 'at risk' areas of reef may be an effective way to reduce the likelihood of further barrens forming.

This option is still in the early stages of exploration, but provides an exciting opportunity for economic and industry benefit while potentially helping to preserve the value of Tasmanian east-coast reefs.

A substantial increase in harvest would be needed to reduce urchin density to the level required to prevent destructive overgrazing. As with culling, this method would not protect reefs deeper than about 15 metres, due to diver limitations at greater depths.

Further research is required to determine the direct impacts of the fishery on urchin populations, but future development of the fishery may prove to be an effective option in shallow water, particularly if used in combination with other proposed control measures.

PHOTO: EMMA FLUKES

A smashed long-spined sea urchin.

Natural predation

Scenario 4 presented the concept of using natural predation by large Southern Rocklobster to help control sea urchin populations. This management scenario has been identified by large-scale field experiments and two independent ecosystem models as likely to be effective in limiting the risk of future barren formation. A recently implemented cap on rocklobster fishing on Tasmania's east coast is predicted to reduce the risk of new barren formation from 50 to 20 per cent.

However, both the field experiments and ecosystem models indicate that rehabilitation of existing extensive barrens by building the biomass of large rocklobsters is, at best, a long-term prospect, and even then is unlikely.

The workshop demonstrated, through a range of empirical, observational and modelling approaches, that preventing urchin barrens from forming in intact kelp beds was an achievable management challenge. The recent introduction of an east-coast rocklobster catch cap will assist in meeting that challenge. But recovering kelp beds once widespread barrens have formed was would be a far more difficult and long-term task.

In Tasmania the ecological threat the urchins represent has been identified at a relatively early stage in the progression from intact kelp beds to widespread barren grounds. As a result, management has been able to be 'proactive' rather than 'reactive', which will greatly enhance the chances of success in restricting further loss of kelp beds on Tasmania's east coast. It is encouraging that the target biomass of rocklobsters to both minimise the risk of ongoing barren formation to an acceptable level and to achieve optimum economic yield in the fishery are essentially the same.

The problem of managing sea urchin grazing in eastern Tasmania is both complex and multifaceted. The participation and cooperation of all stakeholder groups is required to protect east-coast reefs from sea urchin grazing, and to protect the marine productivity and the social and economic benefits derived from the reefs. F

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FRDC RESEARCH CODES: 2013/404

Combined knowledge key to congress success

CONFERENCE REPORT Traditionally focused on the technical and biological details of fisheries, a recent congress urged researchers to consider the potential of combining traditional knowledge with science

By Pele Cannon

The Joint Australian Society for Fish Biology (ASFB) and Australian Society for Limnology (ASL) Congress held in Darwin from 30 June to 4 July was a resounding success. The event brought together scientists, researchers, industry and management agencies from across the marine and freshwater spectrums.

The ASFB was founded in 1971 and provides a collegiate and supportive atmosphere for researchers. The FRDC is a proud supporter of the ASFB, and has sponsored its yearly conference for the past decade.

The opportunity this year to integrate with the ASL was welcomed – and this first joint congress was clearly useful, with strong crossover between the two fields noted. There was a clear intention from participants to continue the collaboration. More than 330 delegates from both societies attended, and more than 300 talks and posters were presented.

The plenary session for the joint congress, inspired by a special session at a previous ASFB conference, focused on indigenous involvement in fisheries research and management. The plenary was inspiring, with presentations from indigenous researchers, managers and traditional owners from around Australia, and from New Zealand and Canada.

Speakers including Julian Williams, from the Waikato-Tainui region of the South Island of New Zealand, and Kerry Prosper and Jane McMillan, from the Mi'kmaq near Nova Scotia, Canada, gave insightful presentations on their experiences engaging with fisheries management. This included activities around generating greater involvement in the management process by indigenous peoples, and changing laws and management strategies to more fairly incorporate indigenous perspectives and cultural practices.

Stan Lui, senior natural resource management officer (sea) from the Torres Strait Regional Authority, explained the Torres Strait Sea Claim, and the management and engagement structures operating in his region. Robert 'Bo' Carne, now CEO of the North Australian Indigenous Land and Sea Management Alliance, provided an overview of his experience in fisheries management in the Northern Territory. Phil Duncan from the Murray Lower Darling Rivers Indigenous Nations told of his experience negotiating water rights and cultural flows in the Murray–Darling Basin region.

Landscape transformation

Denis Rose and Adam Walker, via discussion of the Lake Condah restoration in Victoria, demonstrated the powerful transformation that can occur in a landscape by combining traditional knowledge and science.

Michael Douglas and Mona Liddy presented on the successful Daly River project in the Northern Territory, noting again the far-reaching benefits and flow-on effects of engaging indigenous communities in research projects.

Outcomes of the plenary discussion session included recognition of a need to build time into project and funding models to allow for culturally slow consultation and engagement processes, the management of expectations, and the need to consider legacy or exit strategies at the beginning of a project.

Society members were proud of the success of the plenary given its non-technical and non-biological focus – a novel approach for the ASFB.

The focus of the conference was very much on the interaction between scientific study and the end users, management, and local and indigenous communities who benefit or are affected by the outcomes or process of research.

A key theme of the congress overall was that statistical, mechanistic and qualitative models on their own are insufficient, and crossover between all three is needed to achieve useful results. As Michael Douglas and Mona Liddy pointed out, we need to be "walking together, talking together and working together".

2014 ASFB AWARD WINNERS

The Australian Society for Fish Biology Awards were presented at the congress dinner.

Early Career Research Excellence Award – John Morrongiello, CSIRO

Early Career Research International Travel Award – Chris Izzo, University of Adelaide

'Jonathon Murphy' Student International Travel Award – Rohan Brooker, James Cook University

John Lake (poster presentation) Award (junior) – Mae Noble, Australian National University (Can Murray crayfish be a key surrogate species for freshwater management?)

John Lake (poster presentation) Award (senior) – Leanne Curry, James Cook University (Environmental drivers of depth use by an exploited reef fish)

The Gerald P. Whitley (oral presentation) Award (junior) – Samuel Williams, University of Queensland (Genetic population structure of Black Marlin (*Istiompax indica*) within the central Indo-Pacific)

The Gerald P. Whitley (oral presentation) Award (senior) – Krystine Mossop, Monash University (Connectivity, phylogeography and behaviour of a desert-dwelling fish: does habitat matter?)

Victorian Marine Science Consortium Award (temperate marine ecology) – Stephanie Brodie, University of New South Wales (The oceanographic habitats of two migratory pelagic fish: dolphinfish (Mahi Mahi) and Yellowtail Kingfish)

2015 conference

Overall, the quality of presentations and posters at the joint congress was exceptional, and the well-organised timetable and social program fostered the essential camaraderie and interaction that make a gathering worth attending. In 2015, the ASFB Conference will be held in association with the 5th International Symposium for Stock Enhancement and Sea Ranching (ISSESR).

To be held at the University of Technology, Sydney, from 11 to 14 October, the 2015 conference will provide the ASFB with another excellent opportunity to bring together society members, demonstrate the high quality of members' research, and network and interact with researchers from other fields. F

Tasmanian rocklobster industry legend retires

Rodeny Treloggen has retired from the Tasmanian Rock Lobster Fishermen's Association after almost 30 years of involvement.

The long-time chief executive director of the Tasmanian Rock Lobster Fishermen's Association (TRLFA), Rodney Treloggen, has officially retired after being actively involved in the Tasmanian industry for 30 years.

Originally a fisher, he served as the TRLFA's inaugural president when it was formed in 1985. After nine years in that role he became the association's CEO, a position he has held for the past 19 years.

His commitment to the rocklobster and seafood industry were recognised when he was named a national industry icon at the 2011 Seafood Directions conference. Rodney Treloggen's passion for the rocklobster fishing industry has been second to none.

He has been willing to speak his mind (albeit colourfully at times) as a strong advocate for his industry at a state level, at the tri-state level supporting Southern Rocklobster Ltd, and nationally, at a trans-Tasman level.

Reflecting on his time in the industry, Rodney Treloggen identified the camaraderie among fishers as a highlight. He says the improvement of communications over the years has greatly benefited the industry, recalling how difficult it was to get in contact with home when he first started as a fisher.

The major changes in the rocklobster industry during his time have included moving to a quota system and opening the industry from fisher-only involvement to include a more diverse group of investors and stakeholders. An important change has been the improvement in scientific knowledge and the involvement of fishers in the science of management.

In retirement Rodney Treloggen is looking forward to some travel with his wife Christine. The industry wishes him a long and happy retirement; he is well deserving of his legend status.

John Samson, a former president of the TRLFA, has stepped into the role of CEO of the TRLFA following Rodney Treloggen's retirement. F

Queen's Birthday honours for fishing industry

Three of this year's Queen's Birthday honours recipients have been recognised for their many years of service to diverse aspects of Australia's fisheries-related industries and communities: freshwater research, game fishing and aquaculture.

Philip Spencer Lake (known as Sam) was named an Officer of the Order of Australia (AO) for distinguished service to conservation and the environment as an ecologist and freshwater scientist.

Sam Lake has served on numerous ecological advisory boards and panels and scientific societies, at a state, national and international level during his career, including a decade as the chief ecologist for the Cooperative Research Centre for Freshwater Ecology.

He has also worked as an ecological consultant, nationally and internationally, for both government and the private sector. In 2011, he was part of the team that prepared the Research Plan for Freshwater Diversity as part of the National Climate Change Adaptation Research Facility. His own research has focused on ecological communities in aquatic systems, restoration ecology, exotic invaders and the ecology of freshwater crustaceans and fish.

Now based in Melbourne, he is an Emeritus Professor in the School of Biological Sciences at Monash University.

Grahame Allan Williams has been awarded a Medal of the Order of Australia (OAM) for his service to the sport of game fishing. Based at Gymea Bay, south of Sydney, he is a life member and current president of the Game Fishing Association of Australia.

He has been an active advocate for the industry, and for the sustainability of fisheries resources, as a national and international delegate to a wide range of committees – from the Western and Central Pacific Fisheries Commission to the Commonwealth Fisheries Grey Nurse Shark Recovery Team. He is also a founding director of the Australian Recreational Fishing Foundation, established in 2012.

Noel Reginald Herbst, from Mount Warren Park in Queensland, has been awarded a Medal of the Order of Australia (OAM) for service to the Australian prawn-farming industry, and to his local community.

In 1986, he founded Gold Coast Marine Aquaculture (GCMA), which is one of Australia's largest Black Tiger Prawn farming companies, marketing its produce as Gold Coast Tiger Prawns.

In 1993, he helped to found the Australian Prawn Farmer's Association and has served on the association's executive committee.

Since 2004 Noel Herbst has been actively involved in national research to domesticate the Black Tiger Prawn.

In 2010, GCMA was the first Black Tiger Prawn farm in the world to fully stock with juveniles from domestic brood stock rather than juveniles from wild-caught brood stock.

His prawns have collected a swag of gold medals, championship and food excellence awards in recent years. He was also a finalist in the 2012 Farmer of the Year awards. F

MORE INFORMATION: Renae Tobin, 07 4781 5196
FRDC RESEARCH CODE: 2013/210

A PEOPLE-FOCUSED APPROACH

PROFILE The desire to make an impact led scientist Renae Tobin to chart a new course that could better influence fisheries policy making and public perceptions

By Lynda Delacey

Initially an impassioned environmentalist, Renae Tobin has become a committed social scientiest during the course of her career, recognising that the health of a community direcly relates to the health of the environment in which it lives.

"The relationship between society and the environment is clearest in developing countries," she says. "Generally, when people are struggling the ecosystem also starts to struggle because people must exploit it to survive. Likewise, when people feel secure about their resources they are more likely to look after them."

Now based in Townsville, at the James Cook University Centre for Sustainable Tropical Fisheries and Aquaculture and the School of Earth and Environmental Science, Renae Tobin's interest in social science developed through her undergraduate years.

"I started in marine ecology, wanting to 'save the environment' – I was young and idealistic. Marine ecology was interesting but I didn't feel like I was having any community impact. So I spent a few years doing a fisheries course with the Australian Maritime College and working with the CRC Reef Research Centre. I developed a real understanding and appreciation for fisheries research and quickly found that fishers know a lot more than researchers because they've been immersed in the marine environment for much longer."

Challenging perceptions

Working with fishers led Renae Tobin to undertake PhD research on the competition for fish that recreational fishers perceive exists with the commercial fishers in the Great Barrier Reef.

"The assumption was that recreational fishers caught more fish in areas closed to commercial fishing. But I found zero evidence to support this assumption – no matter how much data I gathered, or which angle I came at it from. And many of the recreational fishers I surveyed weren't even clear where the recreational-only fishing areas actually were."

Her study revealed that when it comes to fishing, perception shaped reality. "The public, the media, the industry and the government bodies supporting the industry are making decisions based on perception and psychology rather than hard data," she says. "It's human nature – if you're a recreational fisher, it's easier to blame someone else for why you can't catch a fish rather than the complexity of the tides, the weather, the location, the time of year or your own skill levels."

After completing her PhD, Renae Tobin converted completely to social science.

She says her "pie in the sky hope" is to see the Australian community understand the value of supporting the fishing industry. "I'd love to see the public and fishing industries stand together against the actual – and not perceived – threats to the Great Barrier Reef."

She would like to see more information available to counter the widely held perception that commercial fishers only want to exploit marine environments.

"This misperception is usually based on outdated data or things happening overseas – or just whatever makes a controversial news headline. It's frustrating because it means everything we recommend ends up in the political arena. Meanwhile, Australia has a very sustainable fishing industry that is much kinder to the environment than most forms of food production."

The good news is that social science can, and does, make a difference to policy.

Influence on policy

For example, in 2011-12 Renae Tobin worked on a regional co-management project that involved setting up local stakeholder committees in coastal regions. The newly formed Burdekin Sustainable Fisheries Alliance raised concerns about dugongs becoming entangled in fishing

1. Renae Tobin sampling Barramundi for her PhD studies.
2. Renae Tobin (right) with her mother, Vicki Partridge, happy with their catch from the reef off Townsville, 2012.
3. Renae Tobin, fishing near Townsville, 2007.

PHOTO: JAMES COOK UNIVERSITY

nets in their area. The local commercial fishers knew how to set up their nets to avoid this issue, so they worked with the Great Barrier Reef Marine Park Authority to set up a code of conduct requiring everyone fishing in the area to set up their nets in the same way.

In 2009, she was part of a multidisciplinary review funded by the Australian Department of Agriculture, Fisheries and Forestry to look at the ecological, social and economic aspects of fish spawning closures in the Coral Reef Fin Fish Fishery.

"There were nine-day closures in the months of October, November and December. Our social surveys revealed that these closures affected the way fishers normally operated. For example, in between closures, they were driven to go fishing even if weather conditions were bad. They reported that they were happy to keep some closures, but the December closure was so close to Christmas and New Year they basically had to stop fishing for three to four weeks. This obviously had a big economic impact."

Meanwhile, the ecological component of the project found the December closure was not actually providing much ecological benefit. As a result of this and other information in the review, the December closure was removed and the number of days for the remaining closures in October and November were reduced.

"To me, this was an excellent example of how combining ecological and social and economic information can influence policy," Renae Tobin says. "It shows how fisher surveys can make a real difference."

Renae Tobin also brings her focus on commercial and recreational fishing to the landmark Social and Economic Long Term Monitoring Program (SELTMP) for the Great Barrier Reef. This project is designed to help reef managers make decisions that incorporate an ongoing understanding of social and economic conditions and effects.

The SELTMP surveys reveal a truth about commercial fishing that goes against the common perception. "We asked commercial fishers what word comes to mind when they think of the Great Barrier Reef. Overwhelmingly the word was 'beautiful'. For them, it's not all about what they can harvest from these resources. It's about seeing birds and dolphins, sunrise on the water, being linked to the natural environment. Commercial fishers feel a very strong desire to conserve these things."

Her latest research project aims to help protect the Great Barrier Reef by supporting the reef's fishing communities.

Renae Tobin is looking at the factors that make some commercial fishing businesses more secure or resilient than others in the face of change. The FRDC-funded 'Adapt or Fail' study was launched in July 2013.

She says commercial fishers in the region are under increasing pressure from a range of changes – in the environment, in the economics of their businesses, and in fisheries management.

"Meanwhile, government assistance is decreasing. So the only way fishers are going to survive is if they can adapt and organise themselves. We're hoping this study can help fishers do better in the face of these changes."

Scientists noticed that different business models adapted differently to recent changes such as re-zoning cyclones Yasi and Hamish and the Queensland floods.

"Everyone assumed bigger businesses would adapt better, because that's generally the case in other industries," Renae Tobin says. "But we found the complete opposite – the bigger businesses tend to be more specialised, which means less flexibility. It was actually the more diversified businesses that adapted best. This is a fundamental challenge to the current industry philosophy." F

FISHER SURVEY

As part of the FRDC-funded 'Adapt or Fail' project, Renae Tobin is surveying commercial fishers who operate along the Queensland east coast. Fishers interested in taking part can contact her on 07 4781 5196.

MORE INFORMATION: Julian Harrington, TSIC, 03 6224 2332, tsic@tsic.org.au; www.primaryindustrieseducation.com.au
FRDC RESEARCH CODES: 2009/328, 2012/302, 2010/403

Students sample career choices on the water

PHOTO: TSIC

IMAS researcher and Working on Water co-founder Kevin Redd (second from left) talking to students.

EDUCATION Three days, 50 students and a diverse range of presenters combine to explore marine and seafood industry career opportunities

By Catherine Norwood

It is not every day that students find their classroom on the deck of a boat, sailing the River Derwent, or taste-testing fresh shellfish at a local oyster farm. But for 50 Hobart-based Year 9 students this will become their reality in October, as part of a three-day careers education program 'Working on Water'.

The initiative emerged from conversations among friends over coffee about eight years ago to become a regular event on the calendar for a diverse range of marine-related businesses and institutions.

Sam Ibbott was working as a marine scientist at the Tasmanian Aquaculture and Fisheries Institute (TAFI) and was one of those keen to introduce more young people to the many careers on offer in the seafood and maritime industries. The initial team included Emily Ogier, who was working at the Tasmanian Seafood Industry Council (TSIC), Kevin Redd, a PhD candidate at the University of Tasmania, and James Garde, the training manager at Seafood Training Tasmania.

"We wanted to bring together students from all schools who were genuinely interested in a marine career, not just speak to groups of students on a school excursion, many of whom weren't interested at all," Sam Ibbott says.

"So we ask students to actually apply for the program. Then we show them potential career pathways in marine research and management, Antarctic research, wild-catch fishing, aquaculture, naval architecture, marine policing, tourism ... We identify transferrable skills – if you have a first-aid certificate or a boat licence, or learn to dive, then it opens up a range of options across different careers."

The three-day program includes visits to CSIRO's research facilities in Hobart, including the Antarctic division, and the Institute for Marine and Antarctic Studies (IMAS) at the University of Tasmania, along with a day on a tourist boat, which takes them to salmon and oyster farming operations. There is also a visit to fish processing facilities.

"We try to include some hands-on stuff and make it fun, so when they go to an oyster farm they get to shuck some oysters and try them raw," Sam Ibbott says.

After running the program in Hobart for a few years it was expanded to Launceston, but failed to gain quite the same traction in the north, and there is now just the one program each year.

An FRDC-funded workshop four years ago helped those involved to evaluate why the program was successful, and how to make it sustainable so that it was not dependent on the enthusiasm of one or two people, or a huge financial impost on industry.

Sam Ibbott says the organising committee used to commit two full weeks each year to help organise and run the event. But now it effectively runs itself and he remains involved through the steering committee. The TSIC manages the administration and finances and participating institutions and businesses have essentially internalised the program as part of their core operations – a scheduled event in their calendars.

A manual, *Guide to 'Working on Water: from Aquaculture to Zoology' Careers Promotion Program*, was produced as part of the 2010 program review, outlining the major lessons. "For instance, we are very careful to ensure that we have good role models, 'can-do' people as presenters for the students," Sam Ibbott says.

"Although we haven't formally tracked the careers of participants, we know there have been some successful work placements and school-based apprenticeships. A couple of students have also gone on to study marine science."

The program is tweaked each year in response to feedback from students and from the Department of Education, which has been a strong supporter.

In recent years, careers advisers from local schools have joined students on tours, to expand their understanding of marine-related career options. In 2014 there will also be a special presentation about marine and seafood industry careers at the state's career advisers conference.

Sam Ibbott says that Hobart is ideally placed for such a program, with leading research and aquaculture businesses within a 30-minute drive from Hobart. However, the program has also provided a model for similar initiatives including the Seafood Industry Partnerships in Schools Program in Sydney.

The FRDC's people development program manager, Jo-Anne Ruscoe, says funding for the workshop to review the Working on Water program is part of the FRDC's larger commitment to strengthening links between education and careers opportunities.

A copy of the program manual is available from the FRDC website.

The FRDC is also a partner in the Primary Industries Education Foundation. F

Images from the pilot retail oyster promotional campaign.

PHOTOS: OYSTERS AUSTRALIA

Retail trials add spark to oyster sales

MARKETING Oysters Australia is testing the effectiveness of increasing sales by targeting customers in seafood retail stores

By Rachel King

A trial of promotional materials for oysters last year doubled oyster sales at the De Costi Seafoods store in Sydney's Chatswood Chase shopping centre, according to Doug Aprim, who was store franchisee at the time.

His was one of six De Costi stores in New South Wales to take part in the promotional pilot, which will be repeated and expanded this year and run from August to December.

There will be 20 independent seafood retailers in Sydney, Melbourne, Brisbane and Adelaide taking part this year, including members of the Australian Seafood Cooperative Research Centre (Seafood CRC) Retailers Network. The project is a collaboration involving Oysters Australia, the Seafood CRC and the University of the Sunshine Coast to further evaluate the impact of improved merchandising and point-of-sale merchandising on the sale of fresh oysters.

The initial trial included promotional display trays to hold oysters, a brochure, tray sticker and store poster. Trained, independent demonstrators conducted tastings for customers in-store and also provided training for store staff.

"The combination of point-of-sale materials and demonstrations worked," Doug Aprim says. "Sampling attracted new customers who have now become regular customers. My staff learned new skills and we are now able to offer a fresher and better-tasting oyster to our customers." The first promotion was held during winter, when oyster sales normally slow, but Doug Aprim says as a result of the promotion the usual drop-off did not eventuate.

Oysters Australia identified the need for improved oyster marketing after reviewing the results of the Seafood CRC's 2010-11 consumer research, which highlighted that oysters were being left behind other food choices.

During the past 15 years, food retailers such as butchers and bakers have transformed themselves from basic food providers with a limited range of products into specialty suppliers with value-added options and informative product labelling.

In the same period, fishmongers have added a selection of condiments, a marinara mix or fish patties, and fish fillet options that include skin on or off, fresh or frozen, Australian or imported. Occasionally there are some recipes available.

In the oyster category, the offering has hardly changed: one or two varieties, sold in half shells, by the half dozen or dozen, with little or no supplementary information for consumers at the point of sale about provenance or preparation.

During the initial trial, consumer responses were overwhelmingly positive, particularly for the demonstrations and sampling, and oyster display trays. Two-thirds of consumers typically purchased oysters on impulse, and point-of-sale materials were confirmed as critical in encouraging the impulse buy, which did not appear to cannibalise existing seafood sales.

The main problem experienced in the trial was the difficulty of accessing sales data from stores. This is not a problem isolated to De Costi franchises but is experienced in much of seafood retail. The oyster industry, like many other industries that work with retailers to test point-of-sale materials, needs sales data to determine the effectiveness of the strategy.

On completion of the initial trial with six De Costi Seafoods retailers, the Seafood CRC agreed to work with Oysters Australia to expand the pilot promotion in 2014. The cost-benefit analysis of the promotional program will determine whether it can be commercialised as part of services Oysters Australia offers to the industry. Promotional materials have been revised for the second trial and demonstrations will be run by the retailers involved, with support from the project group. Final results are expected in April 2015. F

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Movers and ...

The North Australian Indigenous Land and Sea Management Alliance Ltd has appointed ROBERT 'BO' CARNE as the new chief executive officer. Bo Carne replaces former chief executive officer, JOE MORRISON, who stepped down from his role earlier this year to take up the position of chief executive officer of the Northern Land Council.

MATT LINNEGAR is the new chief executive of the Australian Rural Leadership Foundation. He was previously chief executive officer of the National Farmers' Federation and he is a graduate of the foundation's iconic Australian Rural Leadership Program. Matt Linnegar started his new role in July and takes over from the outgoing chief executive LESLEY FITZPATRICK.

GRID-Arendal in Norway – a centre collaborating with the United Nations Environment Programme (UNEP) – has a new director. PETER HARRIS started in the role after the resignation of its long-time director, German marine biologist and Arctic expert PETER PROKOSCH. GRID-Arendal supports informed environmental decision-making and awareness-raising. Peter Harris previously served as a senior manager of the environmental division of Geoscience Australia. He has worked on climate change in Antarctica as well as serving since 2010 as Australia's member of the Group of Experts for the United Nations World Ocean Assessment.

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

Calendar of events

DATE	EVENT	MORE INFORMATION
2014		
27 September	**WINSC Annual Meeting and Conference, Canberra**	www.winsc.org.au
30 September to 2 October	**Climate Adaptation 2014 – Future Challenges, Gold Coast**	www.nccarf.edu.au/conference2014
20 to 24 October	**5th International Otolith Symposium, Mallorca, Balearic Islands, Spain**	http://ices.dk/news-and-events/symposia/otolith
11 to 12 November	**FRDC Board Meeting, Canberra**	02 6285 0400
12 to 19 November	**IUCN World Parks Congress 2014, Sydney Olympic Park**	www.iucn.org
2015		
9 to 11 February	**SeaWeb Seafood Summit, New Orleans, Louisiana, US**	www.seafoodsummit.org
10 to 11 February	**FRDC Board Meeting, Canberra**	02 6285 0400
19 to 25 February	**Aquaculture America 2015**	www.was.org
28 to 30 April	**Rocklobster Congress, Fremantle**	http://wrlc.com.au
26 to 30 May	**World Aquaculture Society Annual Conference, Jeju Island, South Korea**	www.was.org/eventCalendar.aspx
11 to 14 October	**Australian Society for Fish Biology and 5th International Symposium for Stock Enhancement and Sea Ranching, University of Technology, Sydney**	www.asfb.org.au
25 to 27 October	**Australian Seafood Industry National Conference Seafood Directions 2015, Perth**	www.seafooddirections.net.au

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or contact the FRDC on 02 6285 0400, email frdc@frdc.com.au

SEAFOOD INDUSTRY PARTNERS WITH SCHOOLS 2012/302

SIPS Phase 2 was officially launched in Sydney on 30 November 2012, and ran from Term 1 to Term 4 of the 2013 school year. The SIPS program first began in 2009 as a trial involving OceanWatch Australia's Tasmanian SeaNet officer, commercial fisher Bryan Denny, and Lauderdale Primary School in southern Tasmania. In 2010, the concept was formalised into a partnership between OceanWatch Australia, the Tasmanian Seafood Industry Council, the Tasmanian Department of Education and members of the local seafood industry.

As a result of this successful project SIPS won the 2011 Tasmanian Seafood Industry Award for Promotion. In 2012, SIPS Phase 2 began. While continuing to operate in Tasmania, the program expanded to include NSW, focusing on the metropolitan areas of Sydney, Newcastle and Wollongong. A general lack of knowledge and understanding about the Australian seafood industry and how it operates, combined with consistently negative publicity, has contributed to an overall poor public perception of the seafood industry. A lack of opportunity for industry workers to engage with their local communities and 'tell their story' has exacerbated the problem.

The core objectives of SIPS were to: facilitate educational partnerships between schools and industry operators; increase community understanding of the complexities of marine resource utilisation; and increase industry capacity to tell its story to the community. SIPS reached an audience of approximately 1700 students and 113 teachers. Feedback from schools indicated that their participation in the program had significantly improved knowledge and understanding of the seafood industry, both for students and teachers. SIPS also had a broader reach into the community through involvement in events such as fetes and shows, as well as through online and print media and publications, helping raise the profile of the seafood industry in target areas.

MORE INFORMATION: **Lowri Pryce, 02 9660 2262, lowri@oceanwatch.org.au**

CARING FOR FISHER HEALTH 2012/402

An earlier report found there was a need for specific attention to the physical and particularly the mental health of people in the Australian commercial fishing industry. This included a better understanding of the issues, logistical and social barriers to good-health practices, and avenues of health communication and treatment. The 2013 Staying Healthy study echoed the Rural Industries Research and Development Corporation Collaborative Partnership for Farming and Fishing Health and Safety program, which advocated research into health, wellbeing and resilience in rural primary industries.

These reports are coupled with widespread anecdotal accounts describing very poor physical and mental health within the fishing industry, including accounts of suicide and attempted suicide. As a contributor to a body of scholarly research, this study is supported by other literature.

MORE INFORMATION: **Tanya King, 03 5227 2149, tanya.king@deakin.edu.au**

'WORKING TOGETHER' PARTNERSHIPS 2010/404

This project has initiated a new formal partnership that includes partners from government research agencies from Western Australia, Queensland and the Northern Territory, to steer fisheries and aquaculture research in northern Australia. The Northern Research Partnership (NRP) will target cross-jurisdictional research needs and partner with other agencies where additional capability needs are required. A memorandum of understanding and terms of reference for the partnership have been finalised so that the partnership is properly directed and the group can work together to target funding opportunities to address key knowledge gaps in fisheries and aquaculture research in northern Australia.

The development of a foundation project on stock structure of coastal reef fish has also been undertaken. The development of this project has been successfully undertaken despite it addressing research priorities for only one of the partners (Northern Territory). In addition, the project will use expertise from universities in Western Australia, Queensland and the Northern Territory. The NRP has illustrated that collaborative R&D does not always need to address common priorities and that research planning can occur regionally despite the disruption caused by jurisdictional politics. Stakeholders have provided positive comment on this project as they see it as an opportunity to provide their research needs in a regional context as well as offering a framework for a more efficient use of research funds.

MORE INFORMATION: **Bryan McDonald, 08 8999 2120, bryan.mcdonald@nt.gov.au**

DIAGNOSTICS FOR MOLLUSC DISEASES 2009/315.24

In October 2013 CSIRO AAHL Fish Diseases Laboratory organised an international workshop on mollusc disease diagnosis in Geelong, Victoria. The workshop provided a forum for international experts on mollusc diseases to agree on priorities and recommendations for future research on diseases of common interest to the participating countries. During the course of the workshop four priority disease agents were identified (Bonamia, Perkinsus, Mikrocytos and OsHV-1). In addition, to address knowledge gaps, short, medium and long-term research activities were identified, some of which were common to all disease agents while others were disease-specific. Many of the short-term activities do not require extra resources and can be initiated immediately. The medium and long-term activities, however, do require further resources, and extra funding will need to be sourced.

MORE INFORMATION: **Mark S. Crane, 03 5227 5118, mark.crane@csiro.au**

GREENLIP ABALONE POPULATIONS 2010/013

An important outcome of this project has been that stakeholders – fishery managers, commercial and recreational fishers and researchers – have been provided with detailed information on Greenlip Abalone (*Haliotis laevigata*) genetic diversity, genetic structure and connectivity within and among populations. These findings should be incorporated into future management arrangements for these fisheries. Also important is that key differences in population structure and connectivity between Greenlip and Blacklip Abalone (*H. rubra*) have been identified. This outcome is particularly useful because it demonstrates that species-specific management arrangements are likely to be required to account for the different population size and structure of these two species.

The fine-scale resolution of Greenlip Abalone connectivity across the most productive reef for this species in Australia – Tiparra Reef – yielded evidence to support the long-held hypothesis that the smaller Greenlip Abalone in the southern areas of this reef contribute substantial larval numbers to the heavily fished parts of the reef towards the north and west. However, the southern areas were not the only source of recruits to Tiparra Reef. A comprehensive set of validated genetic tools are now available for genetic analyses on Greenlip Abalone and these complement a similar set for Blacklip Abalone.

MORE INFORMATION: **Stephen Mayfield, 08 8207 5427, stephen.mayfield@sa.gov.au**

EXERCISE SEA FOX: EMERGENCY DRILL 2012/044

The South Australian Government (Primary Industries and Regions South Australia), together with the SA Oyster Growers Association, led a national aquatic disease response exercise nameed 'Exercise Sea Fox'. The exercise scenario was based on a fictitious outbreak of Pacific Oyster Mortality Syndrome (POMS) and was conducted

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in three parts: a field trip, a workshop and a discussion exercise during October and November 2012 in SA. A key outcome was the development of an emergency disease response plan specific to POMS. Being an emergent disease of national priority in Australia, POMS represents a significant threat to the seafood industry. Exercise Sea Fox was successful in enhancing prevention, preparedness and response capabilities for the oyster-growing sector, providing greater food security and protection for regional communities.

MORE INFORMATION: **Shane Roberts, 08 8226 3975, shane.roberts@sa.gov.au**

BLACKLIP ABALONE HABITAT 2011/033

One of the main outcomes of this project has been the first high-resolution assessment of the extent of suitable fishing grounds derived from integrating commercial catch data with the the light detection and ranging (lidar) system in spatially explicit models of habitat suitability and fishery footprint. The airborne bathymetric lidar systems (laser scanning of the seabed) now provide high-resolution seabed 'images' in areas that were previously difficult to survey. Lidar imagery is available for the entire coastline of Victoria. Patterns of change in spatial allocation of fishing effort identified from GPS-tracked abalone diver data were also obtained and the spatial patterns of larval recruitment determined from genetic measures of relatedness within and across reef complexes at various distance classes.

MORE INFORMATION: **Daniel Ierodiaconou, 03 5563 3224, daniel.ierodiaconou@deakin.edu.au**

NATIONAL APPROACH TO HARVEST STRATEGIES 2010/061

The *National Guidelines to Develop Fishery Harvest Strategies* outlined in this report provide a national framework to support a consistent and more harmonised approach to harvest strategy development across Australian fisheries jurisdictions. Harvest strategies offer an effective fisheries management tool to integrate the ecological, social and economic dimensions of fisheries management into a single framework for fisheries management decision-making. As evidenced by their wide use internationally, and throughout Australian fisheries management jurisdictions, harvest strategies represent a best-practice approach to fisheries management decision-making. The national guidelines aim to provide practical technical assistance to all government fisheries management agencies in Australia (state, territory and Commonwealth) to develop fishery-specific harvest strategies and to facilitate a consistent and more harmonised approach across fisheries throughout Australia.

The national guidelines aim to help inform policy makers involved in the development of overarching harvest strategy policies and assist in ensuring a national best-practice approach to the development of such policies. A national approach to harvest strategy development will enable common challenges to be addressed in a consistent and coordinated manner, thereby avoiding unnecessary duplication of effort and resources, and ensuring more targeted investment in ways to address common challenges.

MORE INFORMATION: **Sean Sloan, 08 8226 8103, sean.sloan@sa.gov.au**

VIRUS CULTURE AND CRYOPRESERVATION 2012/048

This project has refined the culture techniques for *Neoparamoeba perurans*, the amoeba that causes amoebic gill disease (AGD), and has confirmed the retention of virulence in culture for up to 2.5 years, although there is some evidence of reduced virulence. Amoebae have been supplied to other researchers undertaking FRDC projects, and training provided in amoebae culture and isolation techniques. Techniques for in vitro manipulation of amoebae have been developed which will have wider applications.

MORE INFORMATION: **Philip Crosbie, 03 6324 3858, philip.crosbie@utas.edu.au**

AUSTRALIAN FISH STOCKS REPORTS 2012 2011/513

The objective of producing the first *Status of Key Australian Fish Stocks Reports* was achieved in December 2012. The reports provide the first national, scientifically robust status assessments for key Australian fish stocks. They include 49 species chapters, each describing the distribution of stocks around the country and providing stock status classifications at the biological stock level where possible. The species chapters also include some species-specific preliminary information on fishing methods, management measures, vessels numbers, catch quantities, the effects of fishing on the marine environment and environmental factors that can affect fish stocks.

Traditionally, fishery status reporting has been undertaken separately within each Australian jurisdiction for commercial wild-capture fisheries. The jurisdictional reports use differing terminology and reference points to classify fish stocks. The agreed national reporting framework for the *Status of Key Australian Fish Stocks Reports* improves consistency in reporting across jurisdictions and also allows for shared stocks (those that span the waters of more than one jurisdiction) to be assessed as single biological stocks. This recognises the biological boundaries of fish stocks rather than manmade boundaries of management units or jurisdictions.

The need for a flexible approach and for close communication with all parties involved in the compiling of this document were among the lessons learned during this work. The *Status of Key Australian Fish Stocks Reports* is available online or in PDF version on the FRDC website (www.fish.gov.au).

MORE INFORMATION: **Matthew Flood, 02 6272 3838, matthew.flood@abares.gov.au**

RESPONSES TO 2012 FISH STOCKS REPORT 2012/513

Stakeholder responses to the inaugural 2012 *Status of Key Australian Fish Stocks Reports* demonstrated the positive value and impact of these reports. Feedback suggests that the national reporting on the status of key Australian fish stocks should continue into the future. The second edition is due for release in December 2014 and will include additional species.

MORE INFORMATION: **Matthew Flood, 02 6272 3838, matthew.flood@abares.gov.au**

LONGLINE TRIALS FOR GUMMY SHARK 2011/068

The Australian Fisheries Management Authority (AFMA), in conjunction with the gillnet sector of the Southern and Eastern Scalefish and Shark Fishery (SESSF), developed a formal Sea Lion Management Strategy, which came into force on 30 June 2010 to reduce and monitor interactions between sea lions and gillnets used in the SESSF. Under the strategy, AFMA implemented long-term management measures including formal fisheries closures (covering 6300 square kilometres) around all 48 sea lion colonies, increased independent monitoring of fishing activity (from 2.4 per cent to 11 per cent) and adaptive management arrangements for further closures to respond to further fisher–sea lion interactions.

These management measures have reduced the profitability of many shark-fishing operations off South Australia, and as a result, many operators have stopped fishing in these waters or have moved to other areas. Onshore businesses that rely on catch from this fishery have also been affected.

A potential solution to this problem is a move to demersal longlines to target Gummy Sharks (*Mustelus antarcticus*). While the use of longlines will likely reduce interactions with Australian sea lions and dolphins, stakeholders have raised a number of other concerns. These include the potential to interact with seabirds, increased bycatch of conservation-dependent School Shark (*Galeorhinus galeus*), potentially high catches of fish targeted by neighbouring state and Commonwealth fisheries, and undermining the Gummy Shark management and total allowable catch arrangements, which are critically

dependent on the highly size-selective nature of the six-inch gillnet mesh size to prevent the capture of large, mature sharks and preserve the breeding population.

A brief evaluation of the economics of using auto-longlines to target Gummy Shark was conducted on the commercial vessels. Overall it appears that the method could be profitable, particularly if all byproduct could be retained for sale.

MORE INFORMATION: **Anthony Ciconte, 0438 684 999, anthony@andia.net.au**

AQUAFIN CRC – CONTROL OF PRECOCIOUS SEXUAL MATURATION IN ATLANTIC SALMON 2001/246

This project has significantly increased our knowledge of environmental influences on the timing and effects of photoperiod and temperature on maturation of Atlantic Salmon (*Salmo salar*) in Tasmania. It has provided the Tasmanian salmon industry with a range of production tools, which have been adopted to control precocious maturation and to overcome the 'harvest gap', thereby providing processors and consumers with a fresh product of uniform size (three to five kilograms head-on, gilled and gutted (HOGG)), year round.

This has been achieved through the use of artificial illumination to: delay maturation in farmed female Atlantic Salmon; increase growth rates of mixed-sex populations following seawater transfer; recondition female Atlantic Salmon kelts; and inhibit maturation in out-of-season smolts. Additionally, laboratory based trials have increased our understanding of the physiological response to the dark-phase artificial illumination in comparison to the extremely high ambient daytime intensities observed in Tasmania.

MORE INFORMATION: **Mark Porter, 07 3203 3422, mporter@ridley.com.au**

LOBSTER POTS REVIEWED 2007/250

An industry-driven project steering committee decided to trial a modified batten rocklobster pot over the reds phase of the 2007-08 season (February to June) across all zones of the Western Rocklobster Fishery. The intention of the steering committee was to design and introduce a more efficient pot to the fishery that would address the ever-increasing costs associated with landing lobster and reduce the industry's carbon footprint. If a more efficient pot were to be found, further trials would then take place to derive a calibration factor in order to ensure the biological sustainability of the stock. It was decided to stay with the original dimensions of the traditional batten pot in order to minimise the cost of uptake by the fishery. Modifications to the traditional batten pot included a parlour and two side entrances; both features have proved their worth in European and South African rocklobster fisheries. This new design pot was found to catch significantly fewer lobster over a one-day soak time, while no significant difference in catch rates was found over a two-day soak.

Various modifications were made to the new design pot in the remaining months of the season without success. One fisher decided to source and subsequently trial a long-forgotten trap used in the 1980s with great success. This trap is comparatively larger in volume with 100 per cent retention and therefore ideally suited to extended soak times. When deployed during the final two months of the 2007-08 season over two-day soaks, this trap was found to land significantly more lobsters than the traditional batten pot. Catch rates are recognised as being notoriously low at this stage of the season and there is a growing trend among fishers to end their season early, despite processors offering the highest beach price at that time.

MORE INFORMATION: **Dexter Davies, 0428 928 507, chairman@wrlc.com.au**

EASTERN KING PRAWN EVALUATION 2008/019

Stock assessment of the Eastern King Prawn (EKP) fishery, and the subsequent advice to management and industry, could be improved by addressing a number of issues. The recruitment dynamics of the EKP in the northern parts of the fishery (North Reef to the Swain Reefs) need to be clarified.

Fishers report that the size of the prawns from these areas when they recruit to the fishing grounds is resulting in suboptimal sizes/ages at first capture, and therefore localised growth overfishing. There is a need to assess alternative harvest strategies for the EKP fishery via computer simulations, particularly seasonal and monthly or lunar-based closures to identify scenarios that improve the value of the catch, decrease costs and reduce the risk of overfishing, prior to implementing new management measures. The project promoted collaborative research, assessment and management of the fishery.

MORE INFORMATION: **Tony Courtney, 07 3255 4227, tony.courtney@daff.qld.gov.au**

WESTERN ROCKLOBSTER LARVAE 2019/047

This study delivered a new understanding of the mechanisms by which the open ocean, seaward of the continental shelf, controls the health of larval rocklobsters. This will support improved predictions of the links between environmental changes and strength of the fishery. The results of this project provided several new potential predictors that modellers can use to forecast the strength of a fishery. These are highly testable and, because they are based on mechanistic oceanography, they are likely to provide a major improvement over previous work, particularly when generic correlations fail.

MORE INFORMATION: **Anya Waite, University of Western Australia, 08 6288 3082**

SEABIRDS, MAMMALS AND CLIMATE CHANGE 2010/533

This project has increased connectedness between seabird and marine mammal researchers, managers and policy makers about the range of climate impacts that are already being experienced by animals in Australian waters. Through workshops and collaborative analyses, we have increased knowledge of Australia's marine species and demonstrated, through publications, a range of analytical approaches for discerning climate impacts and (in some cases) resolving these impacts from non-climate drivers, such as bycatch in fisheries, or competition from similar species. The range of adaptation options that could be used to respond to climate-related threats to seabirds and mammals has also raised awareness amongst managers and researchers, and shifted thinking towards active intervention. Preliminary project results have been welcomed by managers at state agencies, particularly the tools developed to prioritise adaptation options. This project provides a solid foundation for testing of adaptation options, with tools to evaluate likely success, institutional barriers to success, and likely social acceptance of different adaptation options.

MORE INFORMATION: **Alistair Hobday, CSIRO, 03 6232 5310**

TORRES STRAIT AQUACULTURE 2008/326.34

Aquaculture opportunities are currently 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. The project included a visit to Pohnpei, Micronesia, in the Pacific Ocean to see the clam aquaculture farm and its community-based setup and partnership with the local indigenous population. The Darwin Aquaculture Centre was also visited to better understand the challenges of aquaculture within Australia. Lastly, Aquarium Industries in Melbourne was also visited to better understand the potential markets for farmed marine products, not only for the aquarium trade, but to better understand the process of product handling, product storage and preparation for market.

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 in the future.

MORE INFORMATION: **Frank Loban, Torres Strait Regional Authority, 07 4069 0700**

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