

FINAL REPORT

Building education and training pathways for research and development adoption

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In submitting this report, the researcher has agreed to FRDC publishing this material in its edited form.

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Executive Summary

The Building Education and Training Pathways for research and development (R&D) Adoption Project commenced in March 2017. The project explored how Fisheries Research and Development Corporation (FRDC) could more effectively engage with education and training providers to create opportunities for enhanced dissemination of the outcomes of its investment in R&D through courses and degrees. The Final Report was completed in July 2017.

Higher and vocational education and training (VET) providers are on the front line of building the education, skills and training, the industry relies on in its workforce and they provide key pathways for people seeking to pursue a career in the industry. FRDC recognised this pivotal role and wished to engage with education and training providers to explore whether they could play a bigger role in ensuring that the outcomes of FRDC R&D could be more effectively disseminated through education and training pathways.

The project was completed in two stages. The first stage was a situation analysis which provided FRDC with current intelligence on the "state of play" in higher and vocational education and training for the fishing/seafood industry. This included confirmation of the main providers, collecting data on student demand and enrolments, the courses and degrees being delivered (versus those offered and not being taken up) and threats and opportunities.

The second stage of the project engaged through face to face consultation with two higher and two vocational education providers. This process provided a more in depth understanding of the challenges faced by education providers. The challenges included declining student demand for courses as well as government funding pressures. Building on the findings of Stage 1 and 2, this report presents a set of recommendations for FRDC, which if adopted would facilitate a strengthened pathway for FRDC R&D outputs to enter education and training pathways.

The Objectives of the project were:

- i. Describe the current situation for delivery of higher and vocational education and training for the seafood industry, including identification of major providers, courses and trends in demand.
- ii. Identify how current and/or recent research is extended through vocational and higher education training systems.
- iii. Determine those critical jobs and functions where performance relies on understanding and/or application of R&D outputs.
- iv. Determine key issues or innovations addressed through FRDC's research portfolio suitable for adoption in education and training pathways.
- v. Provide recommendations to increase currency of training and education with a focus on improving pathways to adoption of knowledge and technologies generated through FRDC's investment in R&D.

The response to this project by the education providers consulted was overwhelmingly positive. The project confirmed that there are a small number of providers in VET and higher education with the capabilities and expertise, which are important and relevant to the fishing and aquaculture industries.

In both vocational and higher education, the evidence of decline in student enrolments in specialist fisheries and aquaculture studies is strong. There is a dearth of active Registered Training Providers (RTOs) delivering VET accredited courses nationwide. Markets are thin and VET providers rely on demand for a very narrow group of courses in fishing and aquaculture to remain in the space. In higher education universities are reducing the number of specialist undergraduate degrees and are generalising degrees being offered.

These thin markets and low student numbers make FRDC pursuing commercial opportunities, such as being a generator of education materials for purchase by providers, or engaging in course delivery extremely marginal. There may be subjects where FRDC could play a role in generating resources and material, such

as biosecurity, in this scenario, FRDC or its research partners would partner with an education provider who would do the delivery.

There are some positives. In VET, several of the more active RTOs have in their scope of coverage a number of states, creating opportunities for cooperative delivery of courses which could alleviate thin market issues. VET in school programs are also increasingly prevalent. In higher education, there is strong demand for PhDs, Masters, Graduate Certificates and Diplomas with excellent degree offerings available among a number of institutions. International students are a major driver of demand for these higher degrees and are an important source of revenue. Providers are also looking for opportunities to innovate their modes of course delivery, for example Master Classes in response to industry priorities like biosecurity.

The project was very successful in re-engaging higher and vocational education and training providers with FRDC and its R&D priorities. As a result, objectives one, two and five of the project have been met. The primary education and training providers with whom the project team have engaged, all indicated a willingness to build a relationship with FRDC specifically around ensuring greater application of FRDC R&D outcomes into curricula for courses and degrees.

These relationships create the foundation for a set of strategic education and training relationships for FRDC. In the vocational education and training space the key providers are Seafood Training Tasmania and the Australian Fisheries and Maritime Academy (SA) and in higher education the key providers are University of Tasmania and James Cook University. Other providers, particularly in the higher education space, are playing an important role at undergraduate level and FRDC should also reach out to those providers.

Objectives three and four of the project, will require further work to fully resolve. While a jobs matrix was developed and tested by FRDC, this did not lead to useful insights on how the current R&D portfolio aligns with existing education and training pathways. An extension or follow on to this project has been provided to FRDC which would resolve these Objectives. This Further Work is discussed in the Recommendations Section of this report and has been provided.

Introduction

On behalf of the Australian government, the fishing industry and the Australian community, the Fisheries Research and Development Corporation (FRDC) manages research and development (R&D) projects worth in excess of \$24m annually. FRDC accepts that it has a responsibility to ensure maximum benefit is gained from this investment by the three sectors of the fishing industry: commercial (wildcatch and aquaculture), recreational and Indigenous as well as delivering public good benefit to the Australian community.

In late 2016, the FRDC instigated a review of the extent of uptake of its investment in R&D by the commercial fishing, aquaculture, post-harvest and fisheries management sectors. The concern was that if there was less than optimal uptake of R&D outputs, industry would be missing out on opportunities to improve productivity, profitability and environmental sustainability. Uptake of R&D outputs was also seen as having an important role in providing industry workers with the suite of skills and knowledge demanded by the business world, domestic and international markets, a more discerning consumer and community expectations.

Higher and vocational education and training providers are on the front line of delivery for industry the skills and training they require. They are also key pathways for people seeking to pursue a career in the industry. FRDC initiated this project to engage with education and training providers to explore whether they could play a bigger role in ensuring the outcomes of FRDC R&D could be more effectively disseminated through education and training pathways.

FRDC also wished to confirm what was currently being delivered now through higher and vocational education and training programs of interest to FRDC and the industry. Data and information in the space specific to the fishing and aquaculture industries was lacking. For example, who the key training and education providers were, actual participant numbers and the characteristics of people studying, the extent training and education programs reflected outcomes of recent R&D, and how curricula was reviewed to ensure courses reflected industry needs and recent developments.

Further, while FRDC had connections with education and training providers, those links were not being actively drawn upon to encourage adoption of FRDC R&D outputs into the curricula. Full advantage was therefore not being taken of the education and training pathway, particularly that of recognised and accredited courses, as a key conduit for the dissemination of R&D.

The Building Education and Training Pathways for R&D Adoption Project commenced in March 2017. The focus of the project was to explore how FRDC could more effectively engage with higher and vocational education and training providers to create opportunities for enhanced dissemination of the outcomes of its investment in R&D through courses and degrees. The Final Report was completed in July 2017.

Objectives

- 1. Describe the current situation for delivery of higher and vocational education and training for the seafood industry, including identification of major providers, courses being offered and trends in demand. Content to include available courses, participant numbers, demand, and commencement and completion data.
- 2. Identify how current and/or recent research is extended through vocational and higher education training systems. This will include assessing the range and extent of existing industry training and education courses which make reference to R&D outcomes from FRDC, and feedback from providers about how they retain the currency of their courses and knowledge of teaching staff.
- 3. Determine those critical jobs and functions in the seafood industry where currency and performance relies on understanding and/or application of R&D outputs.
- 4. Determine key issues or innovations addressed through FRDC's research portfolio that align with critical jobs and functions in the seafood industry.
- 5. Provide recommendations to increase currency of training and education with a focus on improving pathways to adoption of knowledge and technologies generated through FRDC's investment in R&D; including development of a plan to improve how FRDC RD&E outputs can delivered through a RTO through a commercialization agreement. This plan would identify the major RTO/s that FRDC should develop agreements / partnerships with.

Method

The project was completed in two Stages over a period of three months. Stage 1 had a strong focus on intelligence gathering and building an understanding of the state of play in vocational and higher education in marine, fisheries and aquaculture education and the degree to which education providers are aware of and engage with and use FRDC research and development (R&D) outputs. Stage 2 focused on the FRDC research portfolio, the pipeline of research outputs and how they relate to jobs and priority functions within the sector. As noted below and with agreement from FRDC, the thrust of Stage 2 was modified to reflect the outcomes of Stage 1 including discussions with key education and training providers.

The learnings from the two stages were then brought together to provide FRDC with a set of recommendations which if implemented will enable it to more effectively leverage the outputs of its R&D into education pathways and to build strategic relationships with key vocational and higher education providers.

The activities proposed in each of the two stages were completed during project implementation. However, the order of some of the activities varied due to:

- the field visit schedule being adjusted to suit institution availability;
- a third field visit to Queensland being added in order to consult with James Cook University and industry;
- longer than expected time to access contact details for students and graduates (Stage 1 Activity 4); and
- changes to the jobs and functions matrix in consultation with FRDC.

Stage 1- Situational Analysis

Stage 1 consisted of a desktop review of the current education offerings being delivered by vocational and higher education providers. This was followed by in depth telephone interviews with a priority group of providers.

The desktop study identified the range of fishing and aquaculture industry education and training being offered by vocational and higher education providers (the study included the post- harvest operations and fisheries management sectors), including testing the extent to which FRDC R&D outputs inform the content of current courses.

Stage 1 consisted of five activities:

Activity 1: Project inception and confirmation of method. This included preliminary research and face-toface meetings and follow-up consultations with senior FRDC managers to confirm the boundaries of the project including need, industry sectors, outputs and outcomes, timelines, broad methodology and resource implications.

Activity 2: Identification of active industry training and education providers. Desktop research confirmed active higher education and vocational training providers offering fishing and aquaculture industry education and training programs. Data was accessed from a range of sources including the National Centre for Vocational Education Research (NCVER), government website training.gov.au, Skills Impact and university guides. Data was validated by direct telephone contact with key active training providers. Data gathered on each active provider included courses offered, type of course (eg full vocational or higher education qualification, Skill Set, non-accredited short program), participant numbers and commencement and completion numbers and trends. Industry bodies including Regional Advisory Committees (RACs) and Industry Partnership Arrangements (IPAs) were contacted to provide further intelligence on less formal training and education programs conducted by providers other than universities and in the vocational education sector, Recognized Training Organisations (RTOs).

Activity 3: In depth interviews were conducted with active training providers to understand the strengths and weakness in current education pathways in the fishing and aquaculture industries, in particular with respect of how well the current training system adopts and reflects current innovations, new knowledge and

practices available to the industry. An understanding was gained of the existing and potential barriers to adoption by training providers of FRDC R&D outputs in industry related courses offered by the respective providers. The concept of partnering with FRDC to increase exposure of R&D outputs within existing higher education and vocational training courses was tested and insights sought about how effective this may be, and how best it could be achieved through existing education and training pathways. This included identifying gaps and needs around development of new higher education or vocational courses not currently offered within the system.

Activity 4: A small number of current students enrolled in fisheries and/or aquaculture courses were interviewed to gain their insights into the current strengths and weakness of existing courses, and how they think exposure to new R&D outcomes could be best achieved within the current system.

Activity 5: The extent to which training programs reflect recent R&D outcomes was gauged. Through a series of telephone interviews with a sample of active training and education providers, information was gathered on the currency of courses offered by gauging the extent to which the courses included reference to and/or outcomes of recent fishing and aquaculture industry R&D. Feedback was also sought from providers about how aware they are of FRDC R&D outputs and the need to address ways to increase accessibility for education providers. A related activity was to identify measures used by providers to ensure currency of their training and education teams, which helped test how well current industry knowledge/innovation matches the currency of teaching material and the knowledge and confidence of those teaching it. Two case studies - from an RTO and a higher education provider - were developed to illustrate approaches adopted by providers to retain currency of programs and trainers.

Stage 2: Establish matrix of priority job roles for R&D adoption and set the foundations for education provider engagement.

Stage 2 consisted of four activities:

Activity 1: A workshop with FRDC managers was conducted to gather intelligence on recent (last 2 years) and in the pipeline R&D and brainstorm its suitability for extension into education and training system. The overall aim of the Canberra workshop was to develop a matrix of jobs critical to the industry, the key functions associated with those jobs and how R&D outputs could best be targeted into those functions.

Activity 2: A review was undertaken of other Research and Development Corporations (RDCs) approach to retaining currency of training program and adoption of their R&D outcomes through higher education and vocational education and training systems.

Activity 3. A briefing paper summarising key findings from Stage 1 was presented to FRDC and the RACs, including proposals for an enhanced role by RACs in the assessment of extension in the FRDC R&D proposal evaluation process.

Activity 4. A proposal was developed to engage higher education and vocational training providers to evaluate recent FRDC research to provide FRDC on advice on its suitability for inclusion in education pathways. This was in recognition that further information beyond that gained from Activity 1 'Mapping of FRDC's portfolio of research against critical jobs and functions' was needed to achieve the objective of assessing the suitability of current R&D projects for incorporation in education and training pathways.

Findings

FRDC invested in this project to better understand how it could more effectively support increased adoption of its R&D outputs by working through appropriate education and training pathways. Adoption of R&D requires a combination of high quality, evidence based research, supported by investment in the skills and capacity of the people who will evaluate and decide whether to apply the R&D in business, government and industry contexts.

The knowledge, education and skills of people determines their capacity to evaluate, adopt and apply R&D. Providers of accredited training and education programs in the Vocational Education and Training (VET) and higher education (universities) sectors are therefore important intermediaries who develop the knowledge and capacity of users which enable them to evaluate and adopt R&D outputs.

The key findings of this project are given below. They include broader findings along with specific findings relevant for both vocational and higher education providers. The detail behind the desktop research and consultation process is provided in the Appendices.

To enable communication of these project findings a set of four summaries have been produced for the specific audiences of FRDC Board and Executive, Higher Education, Vocational Education and RACs. The summaries are provided in the Extension section of this report. One case study each has also been prepared for VET and higher education to give a more in-depth perspective.

Broader findings

The project has confirmed that there are a small number of key providers operating in the higher education and VET sectors with capabilities and expertise of relevance to the fishing and aquaculture industries. The response to this project by the education providers consulted has been overwhelmingly positive.

Providers generally appreciated that FRDC wishes to understand how it can more effectively work with them to embed R&D outputs into educational pathways. The lead vocational and higher education providers consulted expressed a willingness to develop partnerships with FRDC to ensure FRDC R&D outcomes are embedded in their education and training programs.

In both vocational and higher education, the evidence of decline in student enrolments in specialist fisheries and aquaculture studies is strong. There is a dearth of active RTOs delivering VET accredited courses nationwide. Markets are thin and VET providers rely on demand for a very narrow group of certificates in fishing and aquaculture to remain in the space. There does not appear to be a commensurate decline in the demand for licenses/Certificates of Competency. In higher education universities are reducing the number of undergraduate degrees and are generalising and consolidating.

Retention of specialist capacity to deliver education and training for the industry is therefore under threat. All providers reported that their institutions are under pressure to rationalise teaching in subject areas where there is low demand and thin markets, as is the case in fishing, fisheries management and aquaculture. FRDC engagement with education providers was seen as a positive way of assisting institutions to support the retention of capacity and commitment to teaching in subject areas of importance to the industry.

Thin markets and low student numbers make FRDC pursuing commercial opportunities, such as being a generator of education materials for purchase by providers, or engaging in course delivery extremely marginal. There may be subjects where FRDC could play a role in generating resources and material (such as biosecurity) however a more likely scenario would be that FRDC generates these as part of a partnership approach with education providers.

There are some positives. In VET several of the more active RTOs have their scope of coverage accepted for a number of states and the Northern Territory, thus creating opportunities for cooperative delivery of courses which could alleviate thin market issues. VET in school programs are also increasingly prevalent. In higher education, there is strong demand for PhDs, Masters, Graduate Certificates and Diplomas with excellent

degree offerings available among a number of institutions. International students are a major driver of demand for these higher degrees, they make up around 1/3 of enrolments every year and are therefore an important source of revenue. Universities are also looking to innovate their modes of course delivery, such as Master Classes in response to industry priorities like biosecurity.

Higher Education Findings

State of Play

Higher education providers are moving to more generalised undergraduate courses due to continuing decline in student enrolments, in particular in specialist studies. There are a diverse range of undergraduate degrees that students can study which would create a pathway into fisheries management, fishing and aquaculture. The most prevalent undergraduate degrees are Bachelors of Science followed by Environmental Science. There is a collation in Appendix 1 across the universities approached of under and postgraduate degrees with relevance to marine science, fisheries management and aquaculture.

The decline in student enrolments is making many specialised undergraduate degrees uneconomic to offer, forcing universities to consolidate or to reassess whether they continue as providers of those specialist areas at all. Some universities consulted who are offering undergraduate degrees today are likely to have exited the space within a few years. In particular, degrees that specialise in aquaculture are under pressure in some institutions due to very low enrolments. These are institutions which previously had a strong presence in aquaculture teaching. Observations from universities about this decline is that it is due to low student awareness that there are career opportunities in aquaculture, the industry is thought to be low paying with limited career paths and there is a perception that VET is increasingly occupying the aquaculture training space.

The picture is less gloomy in the areas of marine science and fisheries management although enrolments are also declining in these areas. Universities report that most undergraduate students come to university with a very poor awareness of the career options in fisheries and marine management. Students who end up taking specialist subjects in these areas come to university with an interest in sustainability and environmental management. This creates a natural progression toward specialisation during the life of a student's degree as they become more aware of the opportunities those subject areas offer.

Universities are, however, businesses. Continued reduction of public (Federal) funding to universities increases the pressure on universities to exit subjects with public benefit orientation, such as science and environment. This places additional pressure on student enrolments in subjects which lead into careers relevant to the fishing and aquaculture industry.

The international ranking of a university is a very important focus for academic staff. Not only for their own careers but rankings are what draw students to universities, in particular, the lucrative international student market. It was noted by some academics consulted that this can lead to a tension between focus on research (which determines ranking) versus teaching. No direct connection between ATAR scores and student enrolments could be identified in the relevant undergraduate degrees relevant to FRDC. The ATAR range for Bachelor of Science degrees is between 60 to 80. The ATAR for each institution seemed to be a reflection of the ranking of the university in that discipline.

Many universities who previously offered specialist undergraduate degrees have moved to general undergraduate degrees with the ability to specialise through majors subjects or through honours. The risk that FRDC needs to be aware of is that these degrees have a broader emphasis and teach a far more limited set of units of relevance to marine science, fisheries management and aquaculture. As a consequence, in terms of subject areas with sufficient specialisation to adopt R&D outputs from FRDC, the number of subjects at undergraduate level are limited.

Some of the factors creating downward pressure on domestic student enrolments are thought to be individuals weighing up the career benefits of a specialist degree versus the perceived limited career opportunities in the fishing and aquaculture industry, poor salaries and the high cost of living when studying away from home. This results in more students choosing to study at institutions close to home.

Postgraduate enrolments are the saviour across most of the universities consulted. International students are the key driver of enrolments with this cohort of students being more than 50% of enrolments at some universities. Many universities reported having specific strategies focussed on building postgraduate enrolments as a key revenue driver. From FRDCs perspective these enrolments are important. Some international students may choose to remain in Australia and pursue careers in the local industry and the revenue they bring also plays in important role in assisting in retention of specialist teaching capacity. FRDC could consider scholarships or internship program to engage this student cohort with a view to encouraging them to work in the Australian industry.

Given the generalisation of undergraduate degrees, it seems, that Masters and above degrees could be the most fruitful target for FRDC regarding promoting the inclusion of R&D outputs into course material.

This trend was confirmed in face to face consultations with University of Tasmania and James Cook University. Together, these two universities form the backbone of teaching and specialist research capacity in fisheries management, marine science and aquaculture. Even these institutions are facing consolidation of degrees at undergraduate level and pressure from university executives to make the case for retention of the significant capacity they are carrying They both responded very positively to this FRDC project and expressed interest in further exploring the development of strategic partnerships which would deliver outcomes for FRDC in extension of R&D and would assist each university to mount the argument for retention of capacity given the funding headwinds they face..

Given the pressures described above, there is a strategic imperative for FRDC to consider whether it is a priority for FRDC to engage with higher education providers about the risks being posed to core teaching and academic capacity due to declining student numbers. The risk for the industry could be a lack of suitably qualified people to work in both public and private sector roles and loss of research capability.

Universities consulted indicated a role for FRDC could be in signalling to the executives of universities the priority courses and degrees on which the industry depends. FRDC also being "present", such as FRDC hosting annual FRDC/university briefings and the possibility of FRDC Board meetings including engagement with university executives were considered to be potentially helpful.

Lead universities also expressed interest in FRDC working with them toward promoting increased collaboration between institutions. Not only to mitigate the risk of "cannibalisation" through value degrading competition for students, but also to ensure the core research capacity for industry is retained within these institutions.

A Case Study on University of Tasmania is provided in Appendix 2.

Currency and FRDC R&D Being Taught

In terms of questions around the currency of what is being taught in universities, the view of the academics consulted was that currency was maintained through the imperative for academics to publish and advance their research careers. Academics were therefore highly current in subject areas relevant to their specialist knowledge. In terms of foundation subjects, such as those taught in first year, each university had a curriculum review process. Feedback did indicate that there would be high value in FRDC working with universities around core curricula in advanced subjects relevant to areas such as fisheries management, in order to ensure government and industry requirements were being taught in those subjects.

When asked about accessing and using FRDC R&D outputs in teaching material, nearly all academics reported that they subscribed to and found the FRDC Fish Magazine a useful way of keeping up to date on the latest research. Academics also advised they would include examples from their current research when teaching and this included FRDC funded research. A six or twelve monthly FRDC Bulletin targeted just at academic teaching staff about R&D outputs was one suggestion made to ensure teaching staff are aware of the material available. This could also include links to youtube clips and other material which could be incorporated into lectures.

University Data

A request for data on university degrees and student enrolments in relevant under and postgraduate degrees was made to the Federal Department of Education and Training who maintains the database. That data is provided in Appendix 13 along with the parameters of the request made to the Department for the search. This database cannot be interrogated by external users. Access to the data is via a written request to the Department to search the data against key words and attributes.

The data provided is for the years 2011 until 2015 and covers under and postgraduate degrees and courses which offer units relevant to fisheries and aquaculture, which were identified via a key word against heading search. The results of this data search capture all students enrolled to study broad science or environmental undergraduate degrees which include units with key words which connect them to fisheries and aquaculture. This makes the undergraduate degree data too general to enable any direct conclusions to be drawn about numbers of students who are undertaking degrees with an intended career path into fisheries and aquaculture.

The postgraduate data may have more usefulness as it captures students who are studying specialist subjects in more advanced degrees. One on one consultation with target universities however would be needed to fully understand the numbers of students within the overall postgraduate figures who are on career paths into the industry.

The data for both under and postgraduate students confirms the importance of international student enrolments as a means of maintaining specialist degree offerings. In the case of postgraduate study internationals can make up anywhere from 30% to 50% of enrolments.

There are four spreadsheets which were generated from the database search which are provided as an Attachment to Appendix 13. The spreadsheets capture the raw data for undergraduate and postgraduate enrolments and completions and includes data on student age, gender, international/domestic, mode of study and indigenous.

Insights from Universities about Students

The following provides a general snapshot of feedback received from the universities that provided the most detail about demand and student participation during the consultation process.

University of Tasmania

- Enrolments in undergraduate degrees are very poor. High transaction costs (due to a large number of lecturers being required to meet knowledge needs of the units covered across all the bachelor degrees) is driving consolidation.
- Employment opportunities for graduates are limited, versus large HECs debt.
- Any new UTAS student will be required to enrol in a 4 year degree 3 year Bachelor plus 1 year Honours and ATARS are to be increased. It is not known whether these requirements will encourage or discourage student enrolments.
- Students who wish to specialise will be encouraged to complete Graduate Certificates and Masters.
- Fewer domestic students from interstate come to UTAS. The cost of living away from home is thought to be one factor.
- Enrolments in Graduate Certificates, Masters and PhDs are mostly from overseas students.
- Industry practicum gives 3rd year students exposure to industry needs.
- Increase in enrolments in VET aquaculture courses as confirmed by National Council of Vocation and Education Research (NCVER) 2014-2015 enrolments and completions data seen as reducing demand for aquaculture degrees.

University of Wollongong - National Centre for Oceans Resources and Security

- Bachelor degrees are not offered.
- Enrolments are stable.
- Around 150 student's complete short courses specific to fishing and aquaculture each year.
- Similar number complete Bespoke Short Courses Clients include the Australian Fisheries Maritime college (AFMA) and the Australian Maritime Safety Authority (AMSA).

- Around 12 new on campus Masters enrolments each year and about 6 remote study.
- 60 to 70 undergraduates complete two Australian National Centre for Ocean Resources and Security (ANCORS) units each year under Bachelor of Law.
- PhD students are mostly international and often funded by their countries' governments as a way of building capacity.

James Cook University

- JCU has the most complete and diverse offerings of undergraduate degrees, diplomas and certificates of all universities in the fisheries management and aquaculture space. While they consider this diverse offering to be a competitive advantage, academics expressed concern that if student numbers did not improve, they too would be under pressure to consolidate
- JCU has major links with Singapore.
- JCU has in any year 100 to 150 international students with specialist interests.

Sydney Institute of Marine Science (SIMS)

- SIMS teaches a Masters in partnership with its four partner universities who deliver undergraduate degrees.
- Student intake for the Masters has been stable for the last few years at around 30, 2017 intake was 47 and consider it to be an upward trend.
- Greater than 50% of students are international coming from Mexico, India, US, SE Asia and some Europeans. It is thought the international profile of SIMS and the marketing done by partner universities attracts students.

Deakin University

- Deakin used to have a very strong undergraduate fisheries aquaculture degree program which was standalone.
- Declining student numbers has led to it being brought under Bachelor of Science with a fisheries and aquaculture major. This has changed the emphasis of the degree significantly.
- Teaching has moved mostly to the Geelong campus as more students enrol to study in Geelong than in Warrnambool.
- Marine biology has also experienced very low student numbers.
- Deakin used to host a large international cohort from broader Asia region, Mediterranean, Norway and Scotland. These students appear to have come because of Professor Sena de Silva. Since his retirement international students have stopped coming.
- The degree was opened to students in 2016 based out of the Warrnambool campus but only 5 to 7 students applied and so the degree did not proceed.
- The future of the Warrnambool campus is yet to be determined.
- Deakin hosts some PhDs with industry links, such as with the Tasmania Salmon industry. Most PhDs start as Deakin undergraduates.

Flinders University

- Flinders had been a leader in aquaculture education, along with UTAS launching one of the first aquaculture under graduate degrees 20 years ago. The first intake of that degree attracted over 200 applications. Student numbers have since been on a long term and steady decline.
- Specialist degrees have now been combined.
- Student intake is stable around 30 1st year students.
- A Masters in Marine Biology and Aquaculture by Coursework is under development with a view to attracting international students.
- 90% of students studying higher degrees are female
- Students report parents influence them toward general and not specialist degrees
- Continuing to honours is how most students specialise.

Vocational Education and Training (VET) Findings

State of play non-accredited courses

There remains a plethora of accredited and non-accredited training programs delivering skills and the underpinning knowledge required by fishing industry workers. The non-accredited courses range from industry wide and sponsored highly structured courses such as the National Seafood Leadership Industry Program to short, intensive workshops conducted by service providers.

Non-accredited courses continue to play a very important role in skilling fishing industry workers including managers as they are closely aligned with the requirements of individuals, enterprises and groups of enterprises. As well, they are highly flexible and responsive to changing needs of participants. They are particularly appropriate for extension of new technology or techniques and addressing short term skill gaps.

Data provided by RACs was insufficient to develop a comprehensive list of the range of non-accredited courses, participant numbers and frequency of delivery. Information provided by RACs, however confirmed that an extensive amount of informal training is occurring- ranging from intensive leadership and professional development programs, courses which are for specific sectors (eg virus risk management for shellfish and waste water industries,) Master Classes on packaging, antimicrobial resistance workshops for the salmon sector, food safety for wholesalers/retailers, and attendance at conferences. The norm is for these programs not to attract accreditation nor national recognition as they are not based on industry-developed and endorsed Units of Competency nor are they delivered by a Recognised Training Organisation (RTO).

State of play-accredited courses

The delivery of accredited VET programs is primarily based on nationally endorsed Training Packages. The national VET system continues to develop and maintain Training Packages including those most relevant to the fishing industry which are the Seafood Industry and the Maritime Packages.

The **Seafood Industry Training Package** (SFI11) covers workplace skill and knowledge requirements for the aquaculture, fishing operations, fisheries compliance, fishing charter, seafood processing and seafood sales & distribution sectors. The SFI11 also includes qualifications and Skill Sets covering environmental management, leadership, net construction and for vessel operators. The full list of qualifications and Skill Sets in SFI11 is included at Appendix 3.

Data provided by the National Council of Vocational Education Research (NCVER)¹ confirmed total VET program enrolments in fishing industry related VET courses declined 10% between 2014 and 2015, with course completion rates dropping from 35.6 to 28.8%². Appendix 4 compares total VET enrolments and completions in Seafood Industry Training Package qualifications (by sector) between 2014 and 2015 and illustrates the predominance of aquaculture courses, the low enrolments in higher level Certificate IV and Diploma aquaculture courses and in post-harvest courses, and that the majority of traineeship and apprenticeship enrolments in Tasmania.

The Maritime Training Package (MAR13) includes 26 VET qualifications required for workers in the marine transport industry. Of importance to the fishing and aquaculture sectors, the qualifications prepare participants to gain a Certificate of Competency (CoC) from a marine authority required to operate and maintain near coastal or ocean-going vessels including those mandatory for the commercial fishing and aquaculture sectors. For example, the Certificate II in Maritime Operations prepares graduates to gain the Coxswain Grade 1 Near Coastal CoC. Appendix 3 summarises the qualifications and Skill Sets included in MAR13.

¹ NCVER is a not-for-profit company owned by the Commonwealth and state and territory ministers responsible for vocational education and training

² Refer <u>https://www.ncver.edu.au/___data/assets/pdf_file/0031/59584/Total-VET-students-and-courses-2015.pdf</u>

To gain a complete picture of the full extent of the participation in accredited VET programs by current or intending fishing industry employees, participation rates in the Maritime Training Package courses are required as well as courses based on SFI11.

A breakdown of fishing industry participants in the range of Maritime qualifications is not available. Significant numbers of the 6,974³ enrolments in Maritime industry VET qualifications in 2014 were for those seeking a coxswain, MED or higher-level Certificates of Competency to work in the fishing industry.

Training Providers

Nationally recognised VET qualification or Statements of Attainment⁴ can only be issued by Registered Training Organisations (RTOs)⁵. The authoritative national register of RTOs for the VET sector⁶ lists 283 RTOs as having scope to deliver against SFI11. Research has confirmed the majority are not actively delivering qualifications or Skill Sets based on SFI11 but have the right to deliver some aspect of the SFI11 (for example, a short course on food safety based on Unit of Competency "Implement the food safety program and procedures"). Further investigation confirmed there are in total 12-17 active RTOs in the states and Northern Territory delivering and reporting against courses based on Units from SFI11.

Details of the active RTOs delivering against the fishing industry's Training Package are included in Appendix 5. In most states and the Northern Territory, there are only two active training providers. For Tasmania, details of several of the non-active RTOs are provided to illustrate the type of organisations which are included on the government's database as delivering against the SFI11.

Research, discussions with each active RTO and visits to Seafood Training Tasmania and the Australian Fisheries and Maritime Academy helped form the following insights:

- There is a dearth of active RTOs in each state and the Northern Territory. This reflects the thin market due to factors including total industry employee numbers, geographic spread of the industry, remoteness, transient nature of workers in some sectors, an immature training culture, and perceived relevance of course content and uncertainty re career pathway opportunities.
- The core business of several of the active RTOs has switched or strengthened to be training new/existing industry workers to gain their coxswain etc CoC rather than fishing operations, aquaculture, seafood processing etc; for example, the Australian Fisheries and Maritime Academy's South Australian operations.
- VET in school programs (Certificates I-II in Aquaculture, Certificate 1, II in Fishing Operations) are becoming increasingly prevalent and viewed by several industry members and training providers as a very positive move, with anecdotal evidence of participants joining the fishing and aquaculture industry at a higher rate than those who are not exposed to the industry as part of a VET in Schools program.
- Although there is now provision for courses based on industry-driven Skill Sets (refer Appendix 3), few appear to be on the scope of registration of RTOs, nor being delivered.
- Several of the active RTOs have their scope of registration covering several states and the Northern Territory which provides the opportunity for cooperative delivery/assessment etc. which could alleviate the challenge of thin markets.

RTOs were asked a series of questions covering the characteristics of their courses, participants and trainers.

With respect to current training programs reflecting recent R&D outcomes, RTOs deliver skills and knowledge required by their client- primarily the business sponsoring the course participant. As a

³ NCVER op cit

⁴ Statements of Attainment are provided by Recognised Training Organisations to course participants who satisfy the assessment requirements for one or more Units of Competency but not a full VET qualification.

⁵ RTOs are those training providers registered by Australian Skills Quality Authority ASQA (or, in some cases, a state regulator) to deliver vocational education and training (VET) services.

⁶ <u>www.training.gov.au</u>

generalisation, if the client farm etc are, for whatever reason not aware of or choose not to implement findings of recent R&D, the training provider is unlikely to include the outcomes of the R&D in their training programs. Courses reflected developments in technologies, techniques etc depending on their client's needs, the level of courses offered and the need to meet RTO registration requirements.

All RTOs paid attention to their **trainers retaining their professional currency**. The ways of achieving this varied, but a constant was trainers' maintaining a close and ongoing relationship with industry, and accessing the latest R&D reports, both Australian and internationally. There was consensus that the (re) formation of a Community of Practice of fishing industry trainers and educators would assist the industry's training and education sectors exposure to the most recent R&D outcomes of relevance to their training programs, as well as training and assessment methodologies etc.

There was no clear pattern in the **source and destination of participants** in the fishing industry's VET programs. Where they come from reflects the local industry. Nationally, students came from industry, service providers such as the Salvation Army, VET in School students (growing importance⁷), undertaking Traineeships, government departments (eg Border Force), overseas (including those sponsored by the Australian Government), and prisons. Sponsorship by a student's employer was the most common source of fishing industry participants in VET courses. As in most VET programs across all industries, there is a trend away from full time courses by those not in industry.

Insights based on Case Studies - RTO, students

Seafood Training Tasmania is a leading provider of accredited and non-accredited VET programs for all sectors of the fishing industry in Tasmania, and offering courses in fishing and aquaculture in mainland states. Appendix 6 is provided as a case study on one of the fishing industry's leading providers of VET courses.

To gain a picture of the characteristics and motivations of students undertaking fishing industry VET courses, interviews were held with Diploma of Aquaculture students who had recently completed their studies at a TAFE (Spencer Institute, SA) or at a not for profit RTO (Seafood Training Tasmania). A summary of the interviews is included as Appendix 7.

Other Research and Development Corporation (RDC) Findings

A review of investment by two other RDCs was undertaken to provide insights into the experiences of other RDCs who have worked to engage effectively with vocational and higher education. The two RDCs consulted were Dairy Australia and Cotton RDC. Both RDCs have a strong focus on working with education and training pathways as a mechanism for enabling the adoption of the results of investment in research and development. They also invest in education and training as part of their commitment to industry capacity building. The following summaries provide a snap shot of DA and CRDC work in education and training:

Dairy Australia (DA) Snapshot

Dairy Australia is known for its engagement with particularly vocational education and training (VET) to address skills and training needs in the dairy industry. The high profile of DA as an investor in VET is particularly due to its partnership alliance with Registered Training Organisations (RTOs) through the National Centre for Dairy Education (NCDE).

NCDE is a virtual centre made up of a network of RTOs located around the country, which is supported by DA funding. NCDE has been operating for around 10 years. There are eight RTOs who are part of NCDE. The RTOs are in dairy regions and have in-house specialist dairy education and training expertise. NCDE enjoys very strong brand recognition and was established to bring dairy education and training under one umbrella.

⁷75 students undertaking Cert I or Cert II in Aquaculture in Tasmanian schools 2016- data Seafood Training Tasmania

The NCDE partnership has provided DA with a pathway into vocational education and training, without DA having to become an RTO. This allows DA to play to its strengths in research and development, while gaining access to specialist VET skills through its partnership with RTOs.

Through the NCDE, education and career development options for those interested in working in the dairy industry are offered. This includes short courses and customised programs for dairy farming organisations, individual farmers and people in the processing and dairy service industry.

DA has recently completed a review of its investment in VET and NCDE. The following key learnings are:

Benefits

- Brand recognition.
- DA has promoted a culture of valuing education and training within the industry and has demonstrated it is investing levy funds in building industry capacity.
- NCDE provides a pathway for DA to deliver new technologies and management practices (which arise from research and development) into the industry. Through DA developed training material, accredited courses and specialist short courses.
- RTOs report that the strongest benefit of NCDE is in the network and the opportunity that the network brings to interact with DA to ensure they are delivering training that meets current industry needs. Collaboration with DA also enables trainers employed to ensure currency of knowledge and skills.
- The partnership of DA provides a *validation* of the courses being offered by NCDE RTOs giving industry confidence to purchase.

Concerns:

- Quality control of course material and course offerings across the eight RTOs who are delivering in different ways and to different standards around the country. This creates a brand association tension for DA given DA is seen by the industry as providing validation.
- Risk of exclusion of RTOs who may be able to operate as service providers to dairy industry but who are not under the NCDE umbrella. Potentially leading to DA missing delivery options and value for money.

While DA is yet to make a decision about how it will respond to these findings, advice from within DA indicates that the future will see an evolution of current arrangements. The aim is to ensure that benefits such as the RTO network are retained, while increased transparency and flexibility for DA as an investor in education and training is achieved.

DA is also exploring building a similar network across the 18 universities it has identified as being the primary service providers of higher education for the sector.

Cotton RDC Education and Training Snapshot

Cotton RDC engages both with higher and vocational education and training to support capacity building within the industry and to create the opportunity for university students who wish to enter the cotton industry to graduate industry ready.

The University of New England delivers the 'Cotton Production Course' which is a set of four units that cover the production, crop protection, and environmental management of cotton crops in the Australian industry. It has been offered for around 15 years, with the CRDC providing ongoing support through funding the lecturer position who maintains and delivers the course (around \$180K per year). The four units combine to form a Graduate Certificate in Rural Science (majoring in cotton production) or can be used

towards a series of agriculturally oriented under and postgraduate degrees. The first unit in the series 'Cotton Production' is also offered through the University of Sydney and the University of Queensland in some of their undergraduate courses.

A key part of the funded lecturer role is to engage with CRDC funded researchers to ensure the course material being delivered reflects the latest in research findings and industry innovation. This includes a residential component of the course where researchers present to and interact with students about the latest research and the implications for industry.

There is strong industry support for CRDC to continue its investment in the 'Cotton Production Course' with the investment decision made every three years. Without the financial support of CRDC, UNE would not support and deliver specialised cotton units.

Cotton Australia takes the lead on engagement with the vocational education and training (VET) for the industry. CRDC's primary interest in VET is around industry capacity building through identifying skills needs and encouraging industry training in the skills areas needed for now and into the future. CRDC takes on a strategic role – such as development of the CRDC Workforce Strategy and through research into future skills needs of the industry. This intelligence is shared with Cotton Australia and others (such as RTOs like TOCAL) to ensure VET courses align with industry need. Cotton Australia with Grains RDC has secured a \$14.7 million NSW State Government grant over 3 years to upskill those industries through accredited training. This is being done through TOCAL Agricultural College in NSW.

Recommendations

This set of recommendations if implemented as a combined set of actions, could lead to enhanced engagement of FRDC R&D outputs within education and training. In the Extension Section of this report these Recommendations have been tailored into four summaries of findings and recommendations targeted at the key audiences for this project: FRDC Board and Executive; RACs; Higher Education and Vocational Education and Training Providers.

Overarching Recommendations

- Build on the re-engagement of higher and vocational education providers stimulated by this project by completing the development of strategic partnerships that achieve mutually beneficial outcomes for FRDC and education and training providers. The focus should be around enabling strengthened incorporation of FRDC R&D outputs into curricula.
 - The higher education providers who should be most directly engaged with a partnership approach are the University of Tasmania and James Cook University. The Vocational Education and Training Providers are Seafood Training Tasmania and the Australian Maritime and Fisheries Academy (SA).
 - In higher education and vocational education and training there are a number of other universities who play an important role in undergraduate teaching. FRDC in any future work should reach out to this broader group of providers to ensure they too have opportunities to adopt and teach R&D outputs.
- Partnership agreements to be developed and negotiated with University of Tasmania, James Cook University, Seafood Training Tasmania and the Australian Fisheries and Maritime Academy (SA) The partnership focus should include:
 - Support for institutions to retain specialist capacity;
 - an enabling role for institutions in supporting uptake of FRDC R&D outputs into courses and degrees;
 - an education specialist peer review arrangement enabling FRDC to seek partner feedback on research proposals (or outputs) which are relevant to extension through education and training;
 - o a commitment to work with FRDC to facilitate outreach to other relevant institutions.
- Empower FRDC's eight Regional Advisory Committee's (RACs) to provide informed comment on the extension proposed in R&D applications during the evaluation process. Emphasis should be placed on identifying research which could be incorporated in VET or higher education pathways. An investment in RAC capacity building and preparation of guidelines to assist in this evaluation process would be required.
- FRDC Research Proposals:
 - Develop guidelines for RACs and FRDC Research Managers to assist in the identification of R&D proposals which have intended outcomes that could be relevant to extension through education and training pathways. Support guideline application with investment in capacity building of RAC members and FRDC Managers to ensure they have confidence in applying the guidelines.
 - Review structure of R&D projects funded by FRDC with a view to influencing the up-front design of those R&D projects with relevance to education and training. The aim would be to strengthen connection to education and training pathways during the life of the project, rather than waiting to extend results at the end.

- Include, as a requirement of funding Research Proposals that Project Leaders can identify how the outputs of their R&D could be incorporated into the course and degree material of their institution. This could be trialled with partner universities. For example, any project contracted with UTAS or JCU could require the researcher to explain which degree or unit the R&D outputs will be extended through. For example, a specialist seminar or written module within a unit.
- Examine introduction of an FRDC standard or accreditation for VET and higher education providers which if satisfied would enable FRDC recognition of "preferred providers" without leading to anti-competitive outcomes.
- A National Forum to be considered to facilitate strategic dialogue around core higher education subjects and curricula in fisheries management, marine science and aquaculture which must be developed and retained to support the future of the industry. This discussion should include FRDC and universities along with industry members and entities such as the Australian Fisheries Management Authority, the Federal Department of Agriculture and Water Resources and State/Northern Territory agency representation.
- Recognising the pressure institutions are under to defend retention of core degree offerings, FRDC should consider strategic engagement with executives of priority institutions to ensure the importance of retention of courses and degrees to the future of the industry is understood. This could include engagement of FRDC Executives (such as holding annual meetings with institutions) and the FRDC Board (for example holding Board meetings on the campus of priority institutions). A National Forum could also be used to raise awareness around education and training priorities for the industry.
- FRDC to facilitate dialogue between groups of providers where FRDC provides advice about what it considers to be the priorities for subjects and teaching. Industry intelligence and opportunities for collaboration to address industry needs could also be shared. The aim should be around retaining core capability, mitigating risk of value destroying competition in what is a thin market and development of new courses such as Master Classes. Master classes in biosecurity are one example where industry capacity building is a priority for FRDC and the subject represents an opportunity for training providers to collaborate in course development and delivery.
- Facilitate reinvigoration of a Community of Practice. This was supported in particular among VET trainers, which covers the fishing, post- harvest and fisheries management sectors as well as aquaculture. Being across the outputs from current and recently completed R&D would be a requirement of participation.
- To combat the barriers of place and time which work against participation in recognised fishing industry training programs, FRDC could take an enabling role among VET practitioners to encourage support for further development of centralised distance education (e-learning), together with Regional Assessment Centres.
- FRDC to consider producing an annual or six-monthly Bulletin targeted at education and training which promoted R&D outputs FRDC considers to be most relevant for incorporation in teaching material. This should include links to youtube clips and other resource material useful for teaching.
- FRDC should consider ways of engaging with PhD and Masters students as a likely cohort of students who could commit to pursue careers in the local industry. Ways of achieving this could include an annual briefing at each university by an FRDC senior staff member and scholarships to support Masters or PhD projects which offer a small grant for operating. Universities indicated this could be a low cost but powerful way of engaging student interest in subjects of importance to FRDC and priority issues, such as biosecurity.

Further Work

- FRDC to work with two university and two vocational education and training providers in order to seek their input into a review of the current FRDC portfolio of R&D and recently published final reports to assess their suitability for inclusion in the curricula of courses and degrees. University of Tasmania, James Cook University, Seafood Training Tasmania and the Australian Fisheries and Maritime Academy (SA) are suggested as the institutions that should be approached to participate in this work. A proposal for extension to complete this work has been submitted to FRDC. A copy of the proposal is provided in Appendix 8. This task would produce valuable insights about:
 - the suitability of recently completed and current FRDC R&D projects for adoption through education and training pathways;
 - the development of guidelines to assist FRDC and RACs to efficiently identify R&D which is suitable for inclusion in education and training; and
 - design aspects of R&D projects, which FRDC could require be incorporated, when first contracted, to facilitate strengthened connections with education and training.

Extension and Communication

The focus of this project was to engage FRDC Board and management, RACs and higher and vocational education providers in a dialogue toward setting the foundation for lasting partnerships which would lead to enhanced uptake of R&D outputs in education and training pathways. To enable the dialogue to continue and to set the foundation for the further work which is proposed, four summaries of findings and recommendations have been prepared which speak directly to those audiences. Each of the summaries is provided in the following Appendices.

Appendix 9: FRDC Board and management Summary and Findings

Appendix 10: RAC Summary and Findings

Appendix 11: VET Summary and Findings

Appendix 12: Higher Education Summary and Findings

Appendices

- Appendix 1: Higher Education Summary
- Appendix 2: University of Tasmania Case Study
- Appendix 3: Seafood Training Package
- Appendix 4: VET Enrolments
- Appendix 5: Active RTOs
- Appendix 6: Seafood Training Tasmania Case Study
- Appendix 7: VET Student Interviews
- Appendix 8: Project Extension Proposal
- Appendix 9: FRDC Board and Executive Summary and Findings
- Appendix 10: RAC Summary and Findings
- Appendix 11: VET Summary and Findings
- Appendix 12: Higher Education Summary and Findings
- Appendix 13: Federal Department of Education data on University Data

Building Education and Training Pathways for R&D Adoption

This Attachment captures the university consultation in detail. It summarises the courses currently being offered which are of most specific relevance to FRDC – ie these are the courses where at least units are being taught which may adopt FRDC research outputs.

A summary of observations and key ideas for FRDC have been collated at the start of the document to aid in reading.

Key Observations from University consultation:

- Student enrolments across majority of universities is in heavy decline for under graduate specialist marine, fisheries and aquaculture degrees;
- ATARS vary between 60 to 80;
- Under graduate degrees are under the most pressure of low enrolments and are either being consolidated into combined marine and fisheries degrees, or moved under Bachelor of Science degrees with majors in marine, fisheries and aquaculture. These changes shift the degree emphasis, reducing the depth of knowledge taught in areas of interest to FRDC. Now is the time for FRDC to express concern about this issue.
- The appetite of the university to offer degrees is driven by the strength and resourcing of its each academic research capability. If funding is tight, universities reduce their specialist academics, which reduce the number of specialist under graduate degrees which can be taught;
- The exception is James Cook University which is making a conscious commitment to keep open all its under graduate Bachelor degrees. They see an opportunity given their large academic research capacity and recognise consolidation in other universities is a risk for the industry;
- Student enrolments in Masters and PHD degrees is strong across every university consulted. This is supported by a large cohort of international students from a diverse group of countries;
- There was consensus that because academics must be active in their specialist research space that they tap into sources of the latest research as part of their preparation of their own lecture material. It was noted some course material (particularly base 1st year knowledge) does not get

updated regularly, versus other units – such as those related to technology, diseases etc are frequently updated;

- Many academics referred to FRDC existing communications materials as a good way of keeping up to date;
- Deakin university marine biology, fisheries and aquaculture degrees are under serious threat due to very low enrolments. The university is reviewing future of Warrnambool campus;
- When Flinders launched its specialist aquaculture degree 20 years ago there were over 200 applicants. Since there has been a steady decline, leading to a combined degree now being offered;
- Accessing the leading practices, engineering and technology in aquaculture is difficult for some academics.

Ideas for FRDC:

- Overwhelmingly positive response from universities that FRDC is seeking feedback on the current state of play and is asking how it could play a role in supporting/feeding into degree and course content;
- Existing communications materials from FRDC let them know what is in the research pipeline.
- The opportunity therefore seems to more in an engagement between FRDC and a few of the key universities to review and determine the degree programs that are needed in Australia to ensure students graduate with not only leading industry but also leading science knowledge;
- A resurrection of AquaEd by FRDC to provide a forum for RTOs and universities treading in aquaculture was suggested as something that would add value and currency to teaching;
- In addition for FRDC to signal to universities particularly those who are beneficiaries of FRDC funding, FRDC's view about priority degree programs that need to be supported. This may have an influence at university executive levels;
- The strength of student interest in the Masters and Graduate Certificate/Diploma space creates an opportunity for FRDC to engage to influence the focus of those Masters degrees to ensure sector critical and new knowledge is being taught. For example as a result of this consultation process the CEO of the Sydney Institute of Marine Science (SIMS) has identified a gap in their Masters program in fisheries

management which he has indicated he will work with NSW Fisheries and FRDC to fill;

- FRDC could also consider targeted scholarships at Masters and PHD level where it saw a need to build research capacity in key research areas needed in the industry;
- The FRDC funded project to standardise curriculum in aquatic animal health was identified as a project which brought the right players together with the right intention. However, implementation seems to have "fizzled";
- The idea of a universities forum (hosted annually or every two years by FRDC) to advance science leadership in teaching was suggested by JCU.

University Consultation and Course Summary					
Institution/People C	Courses	Observations	Comments		
University of U Tasmania – Australian Institute of Marine Science and Australian • Maritime College Jeff Wright Chris Carter Catriona MacLeod John Purser Neil Bose Louise Adams •	 Jndergraduate Degrees: Bachelor of Marine and Antarctic Science /Hobart. (3 years full time (FT)) Admission: ATAR 75 or above Bachelor of Applied Science (Marine Environment)/Launceston. (3 years FT) Admission: ATAR 60 Associate Degree in Aquaculture/Launceston. (2 years FT) Admission: ATAR 40 or above. Relevant industry experience OR Students completing relevant VET/TAFE certificate level units may be considered. Associate Degree in Applied Science (Marine Environment)/Launceston. (2 years FT) Admission: Satisfactory achievement in a minimum of four pre-tertiary subjects preferably including English, Mathematics and a Science subject OR completion of a vocational certificate III or higher in a relevant discipline OR relevant industry experience. Honours: Bachelor of Marine and Antarctic Science with Honours (1 year FT) Bachelor of Applied Science (Marine Environment) with Honours (1 year FT) 	 Bachelor Degrees are 3 years and Associate Degrees 2 years; Undergraduate degrees are to be merged into one general Bachelor degree, from 2018; Research funding drives the universities' appetite to support under and post graduate degrees; Students: Enrolments in undergraduate degrees are very poor. High transaction costs (needing a large number of lecturers to meet knowledge needs of the units covered across all the bachelor degrees) is driving consolidation; Employment opportunities for graduates are limited, versus large HECs debt; Any new UTAS student will be required to enrol in a 4 year degree – 3 year Bachelor plus 1 year Honours and ATARS are to be increased. 	UTAS is completing a major across university curriculum review with a view to making all students enrol in a four year degree – bachelor plus honours. FRDC could signal to UTAS the courses and units it considered of highest need to the sector (to ensure rationalisation does not lose critical sector knowledge needs). FRDC Fish Magazine is considered useful. Generally academics found it easy to keep informed of latest research findings Academics who are teaching are expected to keep themselves up to date, although this is not internally evaluated. Some material requires more frequent updating. An annual FRDC research update for academics forum may be useful.		

[]	
	 Admission: Candidates at least a credit average in the last three semesters (FT equivalent) of undergraduate studies. Masters by Coursework Master of Marine and Antarctic Science (1.5 years FT) Master of Applied Science (Marine Environment) (1.5 years FT) Master of Applied Science (Marine Environment) with Honours (2 years FT) Master of Environmental Governance (Oceans, Polar and Climate) (1 year FT) Admission: Australian Bachelor degree or equivalent at a recognised tertiary institution overall credit average. Alternative learning on case by case basis. Graduate Certificate Graduate Diploma Graduate Diplo
	Admission: Australian Bachelor degree or equivalent at a recognised tertiary institution. Alternative learning on case by case basis. • Joint CSIRO-UTAS PhD Program in Quantitative
	Marine Science

	Joint AAD-UTAS PhD Program in Quantitative Antarctic Science		
University of Wollongong – National Centre for Oceans Resources and Security Stuart Kaye	 Undergraduate Units: Bachelor of Law – 2 ANCORS units Short Courses: Fisheries Management Law of the Sea Maritime Regulation and Enforcement International Fisheries Law International Fisheries Trade Introduction to Fisheries Adjustment Bespoke Short Courses: Designed and delivered for specific clients Course Work Degrees: Masters of Maritime Policy (1 year FT) Masters of Fisheries Policy (1 year FT) Graduate Certificate in Maritime Studies Higher Degrees: PHD and Masters Philosophy 	 ANCORS started as JV of the Australian Navy and University of Wollongong; Expertise is governance and policy; 80 to 90% of clients are public sector – domestic and international governments; Strong focus on capacity building of governments to govern marine environments. Government funding important including Department of Foreign Affairs and Trade Some industry links – eg project proposal to FRDC – videoing of on- deck operations. Teaching is on-campus, remote and online – online supports remote students rather than being an alternative teaching platform. Students: Bachelor degrees are not offered; Enrolments are stable; Around 150 students complete Short Courses each year; Similar number complete Bespoke Short Courses – Clients include AFMA and AMISA 	 FRDC produces useful factsheets and the Fish Magazine which provide up to date information. Interaction with FRDC through research projects also keeps academics up to date. No real demand need for additional input from FRDC to ensure currency of curriculum. Important driver (in next two years) will be Federal Department of Education requiring IMPACT evaluation and reporting of research investment by Universities to justify their around 25% of funding which comes from Federal Government. Universities will therefore be more motivated to more strongly monitor and evaluate the end use and value of their research to sector. Potential role for FRDC to work with Universities on impact evaluation and reporting.

		 Around 12 new on campus Masters enrolments each year and about 6 remote study; 60 to 70 undergraduate complete two ANCORS units each year under Bachelor of Law; PHD students come from participation in Short Courses, Bespoke Courses and ANCORS government connections. Students are often funded by their countries' governments as a way of building capacity. 	
James Cook	Undergraduate Degrees:	JCU has the most complete and diverse offerings of all universities	• There is an opportunity for
University	Marine science	in the fisheries and aquaculture	Australian Fisheries
Marcus Sheaves	 Marine biology 	space.	Management Authority
	 Zoology and Ecology Graduate Diploma of Science (1 year) Aquaculture science and technology Environmental earth science Fisheries biology and management Marine biology and ecology Natural resource management Protected area management Tropical biology and conservation Graduate Certificate in Science (6 months) Aquaculture science and technology Fisheries biology and management Marine biology and ecology Fisheries biology and ecology Natural resource management Marine biology and ecology Natural resource management Marine biology and ecology Natural resource management Protected area management 	 JCU is recognising the decline of under graduate offerings by other universities so has made a commitment to keep offering theirs as they believe they are important for the sector. The teaching program is supported by significant research capacity in fisheries and aquaculture which gives them access to a large number of academics. This deep pool of researchers is what allows them to offer such a diverse and complete set of course offerings 	 discussion around the development of degrees in the area of technologically enhanced marine science. The concept is a new undergraduate degree around solving global marine problems in a technological world. Both JCU and AFMA see this as an exciting opportunity. It is thought this degree may appeal to domestic undergraduates. ICU agree there is an opportunity for an across- university engagement to

	 Tropical biology and conservation Higher Degrees Masters by Coursework (1 year) Aquaculture science and technology Environmental earth science Fisheries biology and management Marine biology and ecology Natural resource management Protected area management 	 at undergraduate, higher degree and certificate levels. JCU has major links with Singapore. JCU has in any year 100 to 150 international students with specialist interests. 	 encourage stronger science leadership/influence into the current under and post graduate offerings in fisheries and aquaculture. They would support bringing together for example UTAS/JCU/Murdoch/AFMA (there may be others). JCU is seeing growing demand for cross-cutting skills – for example they have a lot of demand for social science skills in Pacific fisheries.
University of Technology Sydney	 Undergraduate Degrees: Bachelor of Marine Biology (3 years) Admission: Australian Year 12 qualification, Australian Qualifications Framework Diploma, or equivalent Higher Degrees Master of Science (Honours) – Major in Marine Science and Management Master of Science (Honours) - Environmental Change Management Major includes fisheries Admission: Bachelor's degree, or equivalent or higher qualification, or other evidence of general and professional qualifications. Higher Degrees Master of Marine Science (SIMS) 		Phone call and email request sent to David Booth 0295144053

University of NSW	 Undergraduate Degrees: Bachelor of Science – Major Marine Science (3 years FT) Admission: ATAR 80 Bachelor of Environmental Science – Majors in Marine and Marine and Coastal Science (3 years FT) Admission: ATAR 80 Higher Degrees Bachelor of Science with Honours – Major Marine Science (1 year) Master of Marine Science (SIMS) 	•	Prof Iain Suthers 0293852065 has agreed to interview on 10 April.
Sydney Institute of Marine Science: Macquarie University; UNSW, UTS, USYD Peter Steinberg	 Higher Degrees Master of Marine Science and Management Admission: Australian level 7 bachelor's qualification or recognised equivalent in science, marine science, or a related discipline Doctoral Fellowships (offered annually) 	 The Masters is taught under the framework of SIMS as a partnership between the four universities. The capstone unit is taught at SIMS by scientists from the four partner universities. This unit will have a practical component using real-life data from IMOS (Integrated Marine Observing System). The remaining units are taught by the four partner universities with students encouraged to study at more than one of the four universities. Student intake for last few years has been stable at 30, 2017 intake was 47 and SIMS think it is an upward trend. Greater than 50% of students are international coming from Mexico, 	 Consultation with Prof Peter Steinberg Director and CEO of SIMS confirmed the Masters degree is offered in response to stronger demand for higher degrees (particularly international) than undergraduate. There is also an opportunity for FRDC from this consultation. In response to this project's making contact, Prof Steinberg looked into the teaching of "fisheries management" by the four partner universities only to discover it is not a dedicated subject in any of the universities.

		India, US, SE Asia and some Europeans. There is no firm data on why they come to SIMS, but it is thought to be in the international profile of SIMS and the marketing done by partner universities.	 Prof Steinberg believes this is a gap and is now exploring the opportunity with NSW Fisheries as to whether a second SIMS unit on fisheries management could be developed and taught. Prof Steinberg is happy to include FRDC in the development of the new unit to ensure it is reflective of the new knowledge FRDC wishes to be taught. Prof Steinberg will talk to Patrick Hone about the idea next time they meet.
Deakin University Giovanni Turchini Julie Mondan	 Undergraduate Bachelor of Science (Fisheries and Aquaculture major) Admission: ATAR 60 or 66 Bachelor of Science (Honours) Bachelor of Environmental Science (Marine Biology) Admission: ATAR 56 Higher Degree Masters and PHD in Marine Biology 	 Deakin used to have a very strong undergraduate fisheries aquaculture degree program which was standalone. However declining student numbers lead to it being brought under Bachelor of Science with a fisheries and aquaculture major. This changed the emphasis of the degree significantly. Marine biology has also experienced very low student numbers. Deakin used to host a large international cohort from broader Asia region. Mediterranean. 	 The Warrnambool campus still hosts very significant aquaculture research infrastructure. However low student numbers is making it unviable for Deakin to offer fisheries and aquaculture undergraduate degrees at that campus. Uncertainty about the future of the Warrnambool campus has also impacted student enrolments. Future of degrees are under review. Deakin remains committed to offering them

		r			
		•	Norway and Scotland. These students appear to have come because of Sena de Silva. Since his retirement international students have stopped coming. The degree was opened to students last year based out of the Warrnambool campus but only 5 to 7 students applied and so the degree was not offered. Deakin hosts some PHDs with industry links, such as with the Tasmania Salmon industry. Most PHDs start as Deakin undergraduates.	•	and so the most likely outcome is a move of both Marine Biology and Fisheries Management to the Geelong campus. It is thought Geelong's proximity to Melbourne may restore student numbers. Staff will also move to Geelong which raises questions about the future of the Warrnambool facility. A Masters of Fisheries and Aquaculture aimed at students who have completed Science or Economics degrees and who wish to specialise, is being contemplated. Deakin sees an opportunity for FRDC particularly to engage with Masters students to inspire their commitment to careers in the sector.
Flinders University	Undergraduate	•	Flinders had been a leader in	•	Access to leading industry
	Bachelor of Science (Marine Biology and		aquaculture education, launching		application of aquaculture
James Harris	Aquaculture (3 years FT)		one of the first aquaculture under		practices, engineering and
	Bachelor of Science (Marine Biology) (3 years FT)		graduate degrees 20 years ago.		technology is increasingly
	Bachelor of Science (Coasts and Oceans) (3 years		The first intake of that degree		difficult for academics.
	FT)		attracted over 200 applications;		Resurrecting AquaEd was
	Admission all three degrees: ATAR 70	•	Student numbers have since been		suggested as a key
			on a long term and steady decline;		
			1		
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	 Bachelor of Science (Honours) (Marine Biology and Aquaculture (3 years FT plus 1 year Hons) Bachelor of Science (Honours) (Marine Biology) (3 years FT plus 1 year Hons Bachelor of Science (Honours) (Coasts and Oceans) (3 years FT plus 1 year Hons) Admission Honours Degrees: ATAR 80 Higher Degrees Graduate Certificate in Science (Aquaculture) (6 months FT) Graduate Diploma in Science (Aquaculture) (1 year FT) Master of Science (Aquaculture) (1.5 to 2 years FT) Science and Environment PHDs (3 years FT) 	 Specialist degrees have now been combined; Student intake is stable at around 30 1st year students, with around 18 students graduating by 3rd year; A Masters in Marine Biology and Aquaculture) by Coursework is under development with a view to attracting international students; 90% of students studying higher degrees are female; Students report parents influence them toward general and not specialist degrees; Continuing to honours is how most students specialise. 	 intervention by FRDC which would be of benefit. The FRDC project to standardise curriculum for aquatic animal health was an excellent project which engaged the right people and had a similar intention to this project, however implementation "fizzled" and disappeared. 		
University of Sydney	 Undergraduate Degrees: Bachelor of Science majoring in Marine Science (3 years FT) Higher Degrees Master of Marine Science (SIMS) Master of Environmental Management 	•	Request sent.		
Macquarie University	 Undergraduate Degrees: Bachelor of Marine Science (3 Years) Admission: ATAR 78 Higher Degrees Master of Marine Science (SIMS) 	•	Phone call and email request to Prof Robert Harcourt		
Murdoch University	Undergraduate Degrees:Bachelor of Science: Marine Science (3 years)Higher Degrees	The Grad Cert and Master of Protected Area Management have been designed to meet	Phone call with Neil Loneragan scheduled 10 April.		

	 Marine Science with Honours (1 year) Wildlife Health and Conservation Masters (1 year) Protected Area Management Masters (1 year) Graduate Certificate in Protected Area Management (6 months) 	international competencies for protected area professionals specified by the IUCN World Commission on Protected Areas	
Curtin University	 Undergraduate Bachelor of Science (Coastal and Marine Science) (3 years FT) Admission: ATAR 70 Bachelor of Science (Environmental Management) (3 years FT) Admission: ATAR 70 Higher Degrees Master of Science (Sustainable Aquaculture) (2 years FT) Admission: Bachelor degree in science, preferably biology, and/or competency in aquaculture or a related discipline to the level of second year tertiary study. 		Phone call and email request to Jennifer McIlwain
Newcastle University	Bachelor of science: marine science (3 years FT)		No approach made

Case Study- Higher Education Sector University of Tasmania

Structure, Partnership Arrangements

The University of Tasmania (UTas) is a world class centre for research and education. Together with James Cook University, UTas is one of two main centres in Australia for the delivery of higher education programs across the fishing industry. UTas comprises five faculties plus three Special Institutes including the Institute for Marine and Antarctic Studies (IMAS), and the Australian Maritime College (AMC).

UTas is extensively involved in FRDC R&D projects and its institutes are recognised as being among Australia's leading research bodies in the fields of fisheries, aquaculture, fisheries management and marine science.

IMAS has three core research programs: Fisheries & Aquaculture, Ecology & Biodiversity, Oceans & Crysophere. These are linked by the cross-disciplinary themes of Climate change, Oceanearth systems and Oceans & Antarctic governance. In 2017, IMAS activities helped UTas achieve a world ranking of 4th for Marine and Freshwater Biology and 7th for Fisheries and Oceanology.

IMAS has extensive specialist laboratories, aquariums and experimental aquaculture facilities. The Institute has a fleet of eight small coastal craft, with access to a wide range of vessels from research partners including AMCs 35m *MV Bluefin*. There are also dedicated diving support staff.

IMAS places a very high priority on its research activities. Not only in terms of retaining the university's high international ranking, but also to meet the obligations under its service agreement with the Tasmanian Government. International rankings are a key focus of all universities consulted as most international (fee paying) students take this into account when choosing which Australian institution to enrol in.

The research imperative at IMAS creates a tension for academic staff between their strong focus on achieving research outcomes and giving their time to participation in teaching students.

Programs

IMAS offers a wide range of career options in marine and freshwater research, oceanography, aquaculture, fisheries, climate research, and environmental conservation. In 2014, Its 190 faculty members supported 185 PhD students in 3 locations across Tasmania-Hobart, Launceston and Taroona.

Undergraduate courses include:

- B Applied Science (Marine Environment) (Launceston-3 yr FT, additional honours year available).
- B Marine & Antarctic Science (Hobart-3 yr FT, additional honours year available).

- Assoc Degree in Aquaculture (Launceston-2 yr FT). Course offers students education and training in aquaculture and preparation for the workplace through a mix of vocational, scientific and technological activities together with work experience.
- Assoc Degree Applied Science (Marine Environment) (Launceston-2 yr FT).

Higher degrees include:

- Masters by coursework- Masters of Marine & Antarctic Studies, Masters of Applied Science (Marine Environment), Master of Environmental Governance (Oceans, Polar and Climate).
- Joint CSIRO-UTas PhD program in Quantitative Marine Science

UTas also offers a Graduate Certificate and a Graduate Diploma of Applied Science (Marine Environment) and a practical introduction to Marine Biology for Year 11/12 secondary students.

Through its National Institute for Maritime Education, Training & Research, AMC offers a wide range of courses, including vocational certificates, bachelor degrees and diplomas as well as postgraduate certificates and degrees including doctorates. Programs cover Maritime engineering and hydrodynamics, Maritime business and international logistics, Ocean seafaring, Coastal seafaring (deck and engine VET courses for candidates to meet the licensing requirements of AMSA).

Trends

UTas is completing a major across university curriculum review which will lead to some significant changes in course offerings. In particular, undergraduate degree offerings are being consolidated and all students when enrolling for a three year undergraduate degree will be required to also enroll in a fourth Honours year.

These changes are being driven by the declining enrolments across undergraduate programs. In the fisheries space consolidation of course offerings at undergraduate level is occurring. While four undergraduate degrees were offered in 2017, this has been consolidated down to two undergraduate degrees with a fisheries and aquaculture stream in 2018.

In terms of teaching FRDC R&D outcomes, consolidation at undergraduate level reduces the level of specialist subject students are exposed to in their first three years of university. Therefore reducing the subject areas where R&D outcomes could be incorporated. Consolidation also reduces the number of academics with the specialist teaching expertise in subjects of most interest to FRDC.

Enrollments in higher degrees – Masters and PhDs is strong. This is driven by demand from international students. While the international student space is lucrative it is also very competitive with universities innovating in their degree offerings to meet the needs of this student cohort. International students play a key role in enabling the university to retain its capacity to teach specialised subject areas and this could be an important factor for FRDC to consider when engaging with higher education to extend its R&D outcomes.

In 2018 IMAS is introducing an Associate Degree course to service the fishing and maritime industries. Tasmania has a particular challenge around the need to upskill its workers as the State's economy transitions. The Associate Degrees are IMAS's way of assisting in meeting that challenge. The two year program targets people wishing to work in the fishing and related industries or progress toward higher education studies. The curriculum will reflect the needs of the local industry, government and the university.

Qualifications- Seafood Industry Training Package (SFI11)

Qualification level: Certificate I	
SFI10211	Certificate I in Fishing Operations
SFI10511	Certificate I in Seafood Processing
SFI10111	Certificate I in Aquaculture
Qualification level: Certificate II	
SFI20511	Certificate II in Seafood Processing
SFI20611	Certificate II in Seafood Industry (Sales and Distribution)
SFI20111	Certificate II in Aquaculture
SFI20411	Certificate II in Fisheries Compliance and
	Support
SFI20211	Certificate II in Fishing Operations
Qualification level: Certificate III	
SFI30311	Certificate III in Seafood Industry
	(Environmental Management Support)
SFI30411	Certificate III in Fisheries Compliance
SFI30111	Certificate III in Aquaculture
SFI30211	Certificate III in Fishing Operations
SFI30511	Certificate III in Seafood Processing
SFI30611	Certificate III in Seafood Industry (Sales
	and Distribution)
Qualification level: Certificate IV	
SFI40111	Certificate IV in Aquaculture
SFI40411	Certificate IV in Fisheries Compliance
SFI40211	Certificate IV in Fishing Operations
SFI40311	Certificate IV in Seafood Industry
	(Environmental Management)
SFI40511	Certificate IV in Seafood Processing
SFI40611	Certificate IV in Seafood Industry Sales and
	Distribution
Qualification level: Diploma	
SFI50211	Diploma of Fishing Operations
SFI50511	Diploma of Seafood Processing
SFI50411	Diploma of Fisheries Compliance
SFI50111	Diploma of in Aquaculture

Skill Sets (14)

Abalone Diver Environmental M'ment SFISS00012 Deckhand Induction SFISS00011 Env M'ment Systems Coordinator SFISS00001

Extended Fishing Charter Operator SFISS00002 Fuish Processor Induction SFISS00010 Fisheries Resource M'ment Observer SFOSS00003 Fishing Operator SFISS00004 Industry L'ship-Resource M'ment Group M'ship SFISS00005 Industry L'ship-Sector Representation SFISS00006 Industry L'ship- Strategic Development SFISS00007 Limited Fishing Charter Operator SFISS00008 Net Construction & Repair SFISS00009 Senior Deckhand SFISS00013 Skipper SFISS00014

Qualifications-Maritime Training Package MAR13¹

Certificate Level I

MAR10313	Certificate I in Maritime Operations (General Purpose Hand Near Coastal)
MAR10413	Certificate I in Maritime Operations (Coxswain Grade 2 Near Coastal)

Certificate Level II

MAR20413	Certificate II in Maritime Operations (Marine Engine Driver Grade 3 Near Coastal)
MAR20313	Certificate II in Maritime Operations (Coxswain Grade 1 Near Coastal)
MAR20116	Certificate II in Maritime Operations (Linesperson)

Certificate Level III

MAR30913 Certificate III in Maritime Operations (Master up to 24 meters Near	r Coastal)
MAR31013 Certificate III in Maritime Operations (Master Inland Waters)	
MAR30813 Certificate III in Maritime Operations (Marine Engine Driver Grade 2	2 Near Coastal)
MAR30215 Certificate III in Maritime Operations (Marine Surveying)	
MAR30115 Certificate III in Maritime Operations (Marine Engine Driver Steam))
MAR30315 Certificate III in Marina Operations	
MAR30415 Certificate III in Maritime Operations (Marine Cookery)	
MAR30116 Certificate III in Maritime Operations (Integrated Rating)	

Certificate Level IV

MAR40513 Certificate IV in Maritime	Operations (MED Grade 1 Near Coastal)
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- MAR40613 Certificate IV in Maritime Operations (Master up to 35 meters Near Coastal)
- MAR40115 Certificate VI in Maritime Operations (Marine Surveying)
- MAR40116 Certificate VI in Maritime Operations (Chief Integrated Rating)

¹ Only Qualifications and Skill Sets of relevance to the fishing industry are listed

Diploma

MAR50713	Diploma of Maritime Operations (Master up to 80 meters Near Coastal)
MAR50613	Diploma of Maritime Operations (Marine Engineering Class 3 Near Coastal)
MAR50215	Diploma of Maritime Operations (Marine Surveying)
MAR50115	Diploma of Maritime Operations (Engineer Watchkeeper)
MAR50415	Diploma of Maritime Operations (Master up to 500 GT)
MAR50315	Diploma of Maritime Operations (Watchkeeper Deck)

Advanced Diploma

MAR60115	Advanced Diploma of Maritime Operations (Marine Engineering Class 2)
MAR60215	Advanced Diploma of Maritime Operations (Marine Engineering Class 1)
MAR60315	Advanced Diploma of Maritime Operations (Master Unlimited)

Skill Sets (selected from 10 available)

MARSS00017	Coxswains Grade 1 Skill Set
MARSS00006	Marine Engineering Class 3 Near Coastal Shipboard Safety Skill Set

Appendix 4

Seafood Industry Training Package (SFI11) Enrolments and completions by qualification²

Data	2014		2015			
Total Enrolments	1,580 (562 completions)			1,421 (410 completions)		
in VET						
qualifications	13,150 enro	olments in V	ET subjects	11,542 enr	olments in VET subjects	
Enrolments-Cert	976 (292 co	mpletions)		1,074 (397	completions)	
I-Diploma in	Cert IV, Dipl	loma = 39		Cert IV, Diploma = 40		
Aquaculture						
Enrolments- Cert	350 (113 со	mpletions)		228 (80 coi	mpletions)	
I-III in Fishing	Cert III- 32 e	enrolments		Cert III- 29	enrolments	
Operations						
Enrolments -Cert	80 (37 com	80 (37 completions) 70 (13 completions)			pletions)	
I-IV in seafood	Cert IV enrolments = 6			Cert IV enrolments = 6		
processing						
Enrolments- Cert	98 (89 completions)			34 (13 completions)		
I-IV Seafood Sales	77 enrolments in Cert IV			0 enrolmer	nts in cert IV	
& Distribution						
Enrolments- Cert	58 (Complet	tions = 56)		15 (10 com	pletions)	
III-Diploma in	38 enrolments in Cert IV, Diploma			10 enrolments in Cert IV, Diploma		
Fisheries						
Compliance						
Enrolments-Cert	8 (all Qld)			0		
IV in Env M'ment	No completions					
Apprenticeship &	By year (Tasmania in brackets)					
Traineeship						
commencements-	2011	2012	2013	2014	2015	
all qualifications	95 (49)	132 (86)	84 (49)	157 (122)	119 (101)	
Cert I-III						

² Data from NCVER- refer <u>https://www.ncver.edu.au/ data/assets/pdf_file/0031/59584/Total-VET-students-and-courses-2015.pdf</u>

Appendix 5

Active RTOs delivering fishing industry courses based on the Seafood Industry Training Package SFI11

Tasmania

(15 RTOs with SFI11 in scope as at 1March 2017)

Active RTOs	SFI11 courses Running, offering	Delivery mode	Comments
Seafood Training Tasmania (Inc) Seafoodtrainingtas.com.au	 <u>Full Qualifications:</u> Cert I, II in Aquaculture (VET in Schools program) Cert III, IV in Aquaculture. Diploma of Aquaculture Cert III in Fishing Operations Cert III, IV in Seafood Processing. <u>Short courses:</u> Workplace Health & Safety, 'Use Waders Safely' Food Safety, Finfish/Shellfish Husbandry 	Classroom based with strong emphasis on practical components inc workplace simulation	Cert IV & Diploma pgms are for those actively employed in the industry. Short courses are maximum 12 mths duration. Graduates attract Statement of Attainment. Also run Maritime Operations courses including full qualifications leading to Coxswain, Master, MED etc Certificates of Competency Have an active Traineeship program. Participate in VET in Schools.
AMC (University of Tas)	Nil- Several higher education programs include Units, particularly aquaculture.		Through its National Institute for Maritime Education, Training & Research, AMC offers a wide range of specialist courses, including vocational certificates

Tasmania-Other RTOs (examples only)

RTO	Courses running	Comment
VETIS	Cert I, II in Aqua	Yr 11, 12 VET in Schools students
Professional Diving Services	Some individual units to support diving WH&S courses for	Specialise in diver training, WH&S
	divers	
John Geoffrey Kirwan &	None currently	
Sandra Mary Kirwan		
Independent Institute	Cert III in Seafood Processing on scope	No courses currently offered in Tas
IIFP Pty Ltd		
Australia Maritime &	None currently	
Fisheries Academy		
(Others)		

West Australia (17 RTOs with SFI11 in scope as at 1March 2017)

Active RTOs	Courses Running, offering	Delivery mode	Comments
South Metropolitan TAFE southmetrotafe.wa.edu.au	<u>SFI 11</u>	Flexible, full time,	Primarily Fremantle campus.
	Cert II, III, Diploma in Aquaculture,	traineeship	Also offer wide range of maritime
	Cert II Fishing Operations	Full time, traineeship	courses leading to MED, coxswain
	Cert III in Fisheries Compliance	Correspondence. Must be employed as a Fisheries Officer	etc Certificates of Competency
	<u>Other courses</u>	Extensive practical	Preparatory course for employment
	Diploma of Marine studies (52697WA)	component (on-	& further study. Includes fishing
	PADI (number of Skill Sets)	board)	industry components

Central Regional TAFE	<u>SFI11</u>		Geraldton campus
	Cert I,II,III in Aquaculture	Full time (Cert II –	
centralregionaltafe.wa.edu	Diploma of Aquaculture	T'ship)	
.au	Cert II,III in Fishing Operations	Full time	Geraldton campus
		Classroom (Cert II-	
	Other courses:	T'ship)	
	Diploma of Marine studies (52697WA)		Geraldton Campus
		Extensive practical component (on- board	Also offer a wide range of maritime courses leading to MED, coxswain etc Certificates of Competency
North Regional TAFE	<u>SFI11</u>		
	Cert I-IV, Diploma of Aquaculture	CERT 1- VET in	Primarily Broome campus.
Northregionaltafe.wa.edu.		schools	
au	Cert I in Fishing Operations	Face-to-face &,	T'ships available Certs II-IV
		flexible delivery	
	Diploma of Fisheries Compliance		Also offer a wide range of maritime
			courses leading to MED, coxswain
		On-line	etc Certificates of Competency.

Northern Territory (12 RTOs in scope and notified delivery)

Active RTOs	SFI11 courses Running, offering	Delivery mode	Comments
Charles Darwin University cdu.edu.au	Cert II, III in Aquaculture Cert II in Fisheries Compliance Support	Part-time	Conducted short courses in water quality for oyster industry, and aquaponics in recent past.

Seafood & Maritime Industries Training Ltd smit.com.au	Currently, no courses running based on SFI11	Range of maritime courses leading to MED, coxswain etc Certificates of Competency, Baasic Radar and Shipboard Safety Skill Sets etc.
Australian Maritime &	SFI11 courses:	The Fisheries Compliance course is completed by Indigenous
Fisheries Academy	Cert II in Fisheries Compliance Support	Sea Rangers supporting the NT Government's Maritime
	Cert II in Fishing Operations	Industry Pathway which leads to jobs in the fishing and other
afa.edu.au	(Cert III in Fishing Operations to be offered 2 nd half 2017)	industries. Cert II in Fishing Operations has a focus for indigenous learners.

South Australia (16 RTOs in scope and notified delivery)

Active RTOs	Со	urses offered	Delivery mode	Comments
Australian Maritime &		SFI11 courses:	Introducing blended	AMFA specialise in offering a range
Fisheries Academy		Cert II, III in Fishing Operations	learning- self paced,	of maritime courses leading to
		Cert III in Fisheries Compliance	rolling enrolments,	MED, Master, coxswain etc
afa.edu.au		Introducing Cert II in Seafood Processing 2 nd half 2017	on/off campus	Certificates of Competency, as well
			Fishing Compliance	as related short courses. Campuses
			delivered in blocks	at Port Adelaide and Port Lincoln
			over 3 weeks	
TAFE SA		SFI Courses	On campus (Gilles	Operates from 7 main campuses
		Cert II, III in Aquaculture,	Plains) Full- time or	including Adelaide, Eyre & Yorke
Tafesa.edu.au		Diploma of Aquaculture	part-time equivalent.	Peninsulas.
			(Dip also offered at	
			Port Lincoln)	
				Also offers Cert II in Maritime
		Cert III in Fishing Operations	Full Time on campus	Operations (Coxswain Gd1 near
			(Port Lincoln)	coastal)

Victoria (15 RTOs in scope and notified delivery)

Active RTOs	Courses offered	Delivery mode	Comments
Federation Training Lakes Entrance (SEAMEC) Campus	SFI Cert II, III in Aquaculture on scope- not currently offered		Conduct Certs 1-IV in Maritime OPs
South West Institute of TAFE Swtafe.vic.edu.au	SFI11 Nil		Conduct Certs II,III in Maritime Ops. Ran short cse for local (Portland area) abalone farmers 2009.
Professional Diving Services-Smarter Safer Solutions	SFI11 Cert III in Fishing Operations		Portland- no current courses. Offer individual units (short courses) as required
Training & Quality Management Services	Cert II, III in Seafood Industry Sales & Distribution		

NSW (16 RTOs in scope and notified delivery)

Active RTOs	Courses currently offered	Delivery mode	Comments
NSW Fishing Industry Training Council (MAST) Maritimesafetytraining.co m.au	SFI11Cert III in AquacultureCert III, IV in in Seafood Industry (Sales & Distribution)(also have Cert II in Aqua, Cert II, III in Seafood Processingand Cert IV in Seafood industry (Sales & Distribution) onscope of registration)OtherCert II in Food Safety	Classroom supported by practical work, exercises	NSW- north coast to NSW/Vic border (Eden) Aqua-primarily Traineeships Conduct a range of maritime courses leading to MED, coxswain etc Certificates of Competency.

TAFE NSW- Hunter	<u>SFI11</u>	Flexible	Belmont (Newcastle) campus- May
Institute	Cert III in Aquaculture		run Semester 2 2017
Hunter.tafensw.edu.au			
North Coast Institute	<u>SFI11</u>		
	Cert II,III in Aquaculture	Flexible delivery inc on	Grafton campus.
Northcoasttafe.edu.au	Cert III in Seafood Industry (Sales & Distribution)	the job, distance	(Currently 1 student undertaking
	Short Course- Seafood Handling	learning, on line	Cert III (S&D)
			Reduced demand led to Cert IV, Dip
			of Aqua being discontinued.

Queensland (17 RTOs in scope and notified delivery)

Active RTOs	Courses offered	Delivery mode	Comments
LMC Training	<u>SFI11</u> Cert II, III in Aquaculture	Distance, online, classroom based. At	Specialise in training for prawn farming and warm water finfish
Lmctraining.com	Diploma of Aquaculture	workplace/farm.	sectors. Strong demand for WH&S short
	Offer a range of short courses leading to Statement of Attainment – including Basic Fish Health, Water Quality,		courses.
	Fish Husbandry, EMS for Aquaculture, Principles & Application of HACCP, Food Safety & Quality		
TAFE Queensland North	<u>SFI11</u>		Conduct a range of maritime
Tafenorth.edu.au	Currently nil		courses leading to MED, coxswain etc Certificates of Competency.

Case Study- VET Sector Seafood Training Tasmania

Role, Structure

Seafood Training Tasmania (STT) is one of two training and education providers servicing the fishing industry in Tasmania. Where the Australian Maritime College/University of Tasmania offers programs in the higher education sector, STT caters for the fishing industry's needs in the vocational education and training sector. Industry recognises STT as the preferred provider of fishing industry related courses for the VET sector.

STT was established by the industry in 1986 and operates as a not-for-profit Recognised Training Organisation guided by a Board whose members represent sectors of the Tasmanian seafood and maritime industries. From its training base in Hobart and with operations throughout the state, STT offers a variety of full VET qualification and short courses to meet the needs of the Tasmanian fishing and maritime industries. STT also partners with similar training organisations around Australia to develop and deliver programs tailored to meet the needs of the local industry sector and businesses.

Training programs, participants

STT offer four broad categories of courses:

- VET qualifications for the fishing, aquaculture and post -harvest sectors of the fishing industry,
- courses that lead to a Certificate of Competency issued by maritime authorities,
- recognised courses in first aid and safety, equipment and machinery operations, and
- accredited and non-accredited short courses to meet local industry sector and individual business needs.

From 2010-2015, SST offered 33 training courses for 6,431 participants. Of these, 94% were male with an average age of 35 years³. Seven percent were for fishing industry operations (not including vessel operations). At time of completing the training, 91% were employed.

For the period 2011-2016, SST enrolments in all programs has been between 1350-1720 learners annually.

For *fishing industry* courses, programs include Certificates I-IV in Aquaculture, Certificate III in Fishing Operations and Certificates II-IV in Seafood Processing. The lower level aquaculture courses are part of the VET in schools program catering in 2016 for 75 secondary students across five Trade Training Centres. The demand for specific courses varies significantly; for example in 2015 the Finfish Husbandry course had 106 course participants, up from 78 in 2014 and 33 in 2013⁴.

The importance of catering for individual businesses needs is illustrated by STT. In 2015 they developed and conducted a Fish Health course for 56 Tassal (salmon sector) employees.

Conducting courses in support of the *maritime industry* is an important component of STT's operations. From 2011-15, 67% of STT's training delivery was for first aid, safety, and training to

³ Data supplied by STT- included in Tasmanian Seafood Industry Council report "5-10 year Strategic Workforce Profile" May 2017

⁴ ibid

operate a vessel. Courses included Coxswain, MED1-3, Master (various categories) as well as Elements of Shipboard Safety, Chemical Handling and Dogging.

Approach

The majority of STT's course participants are employed. Course offerings in the fishing industry are therefore highly contextualised to meet the specific needs of the participants' employer. Inclusion in training programs of outcomes from recent R&D is dependent to a large extent on the needs of the client business.

Trainers participate in regular professional development activities to ensure they are conversant with the most recent training delivery and industry knowledge and practices. STT employs few full-time trainers relying extensively on course presenters who are employed in the industry thus current with contemporary farm/fishing/processing and business practices. To illustrate this point, for a highly successful Diploma of Seafood Industry (Aquaculture) course completed by oyster farmer managers, STT contracted a range of presenters from the corporate sector and broader seafood industry. These included successful and respected entrepreneurs from the oyster industry, high profile businessmen, risk management experts, and leaders in corporate governance and strategic planning.

STT are leaders in offering blended learning comprising on the job 1:1 training, distance learning, simulated training, workplace mentoring, as well as the more traditional off-the-job intensive and thematic residential workshops.

Recognition

In 2014 STT was recognised for its outstanding program development and delivery by winning the highly prestigious Small Training Provider of the Year category of the Australian Training Awards. Other awards have included the Australian Seafood Industry People Development Award, Tasmanian Industry Collaboration Training Award and the 2015 Tasmanian Seafood Industry Development Award.

In recognition of STT's unique approach to fostering a Diploma in Aquaculture to remote oyster farm managers, the Australian Department of Education and Training as the funding body showcased the approach. The outcomes and industry support for the 2014 program were presented in a case study which was distributed to all national Industry Skills Councils.

Summary

Through a close and ongoing relationship with the fishing industry and its businesses, Seafood Training Tasmania offers a range of highly contextualised accredited and non-accredited courses which meet the needs of the participating businesses and their employees. Flexible delivery and trainers who are across current farming, fishing, post -harvest and business practices are the keys to STT's success.

Appendix 7

Interviews with graduates of Aquaculture VET Courses

Students' Profile

All interviewees had completed the Diploma of Aquaculture through a not-for-profit RTO or a TAFE.

Mostly mature age students (majority over 33 years.), employed in oyster, barramundi or other finfish farms/hatcheries. Majority hold Limited Coxswain or similar license. Majority had previously completed Cert III/IV in Aquaculture.

1. Reasons for undertaking the course? Whose decision?

Primarily to prepare for higher level position with their current employer eg farm or hatchery manager. Decision mostly their own but with encouragement from business owner. Other reasons included:

- Short work experience had wet my appetite to find out more about the industry
- RTO explained topics to be covered, and sought our views on electives to be included
- Availability of government funding support a strong inducement (NWDF- Tasmanian students)
- An inducement was knowing the majority of course participants were from my sector (oysters). Lower level certificate courses tried to cater for diverse background of participants therefore examples etc not always relevant to me
- Keen to broaden my knowledge in what is a very diverse industry build on more skillfocussed certificate courses
- Family in the industry- encouraged me to do a higher level course to further my chances of advancement
- Keen to gain skills in running the business, to complement skills I have in working in the business

2. Intentions re doing a higher-level course in (fishing/aquaculture)? If so, what?

Majority interviewed had no plans to progress to a higher education course, but will consider specialist short programs (eg leadership, WH&S, stocking rates). Exceptions were:

- a younger course graduate (27) with a high interest in engineering, use of chemical & systems side of the industry who intends to undertake a higher education course (Flinders University),
- a young graduate who is interested in fisheries management and accepts he will need to undertake further study; and
- several who intended to upgrade their maritime license (from coxswain to M5).

3. Balance between the theory and practical components of the course? Relevance of the course to operations on your farm/hatchery?

<u>Balance</u>: Considered appropriate except for one graduate who was not in employment. He though thought the balance was good if the participant had previously undertaken the Certificate III or IV

course (much more practically oriented). Provision for self-directed learning welcomed. Comment from Tasmania graduates was that they benefitted by the majority of the course being delivered on-farm.

<u>Relevance</u>: Very high, particularly for Tasmanian graduates due to majority being from the oyster sector. Some course content directed to the owner/manager but >70% of direct relevance. Clear application on their farm/hatchery, covering current work practices.

4. Would you recommend the course to your mates?

Yes (unanimous) if the course participant had a genuine interest in the industry and understand the realities of working on a farm includes mundane, routine tasks. If no prior exposure to the industry, graduates may gain an unrealistic picture of the manager-level (and other) jobs.

5. Employment intentions after course completion?

The majority of interviewees planned on staying in the industry- advancing to or becoming more proficient as farm/hatchery manager.

One mature age graduate (50) undertook the course as a stepping stone to a career change and opening a new aquaculture venture using a disused crayfish processing facility. His plan is that the knowledge gained on the course plus a study tour to Holland will provide the essential preparation for his plans. He also accepts that to access government grants he must have industry qualifications. One regret is not having done the more practically focussed Certificate III/IV.

Other short-medium term goals included undertaking fulltime university studies in a related discipline, investigating a career in fisheries management, and for one graduate buying into the company where he is currently employed.

9. Any suggestions for improving the course(s)?

Graduates were glowing in their comments on all aspects of their respective Diploma of Aquaculture course. There were no general criticisms. Individual comments included:

- Insufficient practical for me (new to the industry)- live samples would have been good
- Stocking densities overlooked (Note: coverage of stocking densities is dependent on the Units offered in the Diploma of Aquaculture course)
- Sessions on financial management and governance "scared me a bit". These were early in the course, a lot of information in a short time and needed follow-up reading etc to make sense of it all.

Appendix 8

Project Number: 2016-418 Building education and training pathways for research and development adoption

Proposal for Extension

Extension Proposal

This proposal for extension has been prepared to address two critical needs. The first is to draw on the expertise of higher and vocational education providers to evaluate the current FRDC portfolio of research to assess its suitability for incorporation in education. The second is consultation and engagement with each RAC, and the RAC chairs (in October) to test the recommendations of the project and to discuss implementation.

Progress

The project has been undertaken in two stages. The first stage was a thorough situation analysis of the current state of play of delivery of higher and vocational education and training in areas of interest to FRDC – in particular fisheries management, aquaculture, marine science and management.

Face to face meeting were held with key providers in Tasmania, Queensland and South Australia. Stage 1 identified that there is low demand (reflected in declining enrolments) in both vocational and higher education for courses of most interest to FRDC. This places pressure on institutions to continue to offer those courses when most are operating in a declining public funding environment. FRDC engagement with education providers is welcomed. FRDCs role could be through building partnerships with providers, triggering opportunities for new consortia to form around new education products on key issues (such as biosecurity) and taking the lead on research and education priorities.

RAC members were also consulted. Feedback from RACs indicate there is an opportunity for FRDC to strengthen its focus on the extension plan of project proposals and a likely need for building the knowledge of RACs and FRDC Managers about the most effective extension options when education pathways are in mind. This project will provide recommendations for how FRDC can embed within its research proposal selection and evaluation processes an approach which will assist RACs and FRDC Managers to identify projects most suited to higher and vocational education pathways. Stage 1 is now complete.

Stage 2 is underway. Its focus is to map the FRDC portfolio against critical jobs and functions for the industry in order to understand the pathway of FRDC research. Stage 2 also aims to set the foundations for ongoing partnerships with the small number of key education providers identified in Stage 1 who have the demonstrated the capacity to work with FRDC to ensure FRDC research outcomes are embedded in education.

Rationale for Extension

In order to maximise the outcomes of Stage 2 this extension of project proposal has been prepared. The primary rationale for this extension is twofold. The first recognises that the original concept of creating a jobs and functions matrix against the FRDC research portfolio has proved problematic and has not lead to the information needed about suitability of current research for inclusion in education. The second is the strong interest expressed among those RAC members who have been consulted for a stronger focus on assessment of extension in FRDC research proposal evaluation, and for this project to assist RAC and FRDC Managers to identify research which is suitable for extension via education.

The consultants recommendation is that both of these tasks will lead to a solid foundation for FRDC moving forward. Engaging the four institutions which have been identified as the key players in fisheries and aquaculture education on current research suitability for education sends a strong signal of FRDCs commitment to implementing the outcomes of this project. It will also provide a testing ground for how well the institutions work in partnership with FRDC and with each other.

The second key part of this extension is to ensure that FRDC has internal capacity within its research selection, evaluation and management approach to be confident that research suitable for incorporation in education is identified and channelled to education providers. FRDC Managers and RACs are key players in this process who have expressed strong interest in this project, but who have also expressed concern regarding capacity and how best to incorporate efficient identification of relevant projects.

Project Extension Objectives

- Engage two higher and two vocational education providers and ask them them evaluate current and recently completed FRDC research to provide advice to FRDC on its suitability for inclusion in education pathways;
- 2. Consult each RAC at their forthcoming July/August meetings to brief them on the findings of the project and seek their input to approaches that will strengthen FRDC evaluation of extension, in particular with education pathways in mind.

Approach

1. Evaluate FRDC Research Portfolio

Engage James Cook University (JCU), University of Tasmania (UTAS), Seafood Training Tasmania (STT) and the Australian Fishing and Maritime College (AFMA) to evaluate FRDC's portfolio of research (final reports for 2016, 2017 and current contracted research) with a view to answering the following questions:

- 1.1 Identify research projects which have addressed issues relevant to current courses, degrees, units and certificates;
- 1.2 Identify the outputs/outcomes which are relevant;
- 1.3 Advise whether the communications/extension for the research outputs/outcomes enable the knowledge to be readily incorporated in education material;
- 1.4 Advise on format that would make the research able to be incorporated in education material;
- 1.5 Advise on the proportion of the FRDC research portfolio which aligns with higher and vocational education;
- 1.6 Develop a set of criteria to identify new FRDC research proposals which should be assessed with a view to incorporation in education;
- 1.7 *Agree across the four institutions on an approach for evaluation of FRDC research which will streamline identification by FRDC Managers and RACs research proposals which should include engaging with education pathways as part of their extension plan.

*it is proposed that Anwen and Ross will meet face to face with each institution to discuss their findings from the research review and to prepare a set of recommendations for implementing the recommended approach

Budget

- \$10,000 per institution as a grant toward the research portfolio evaluation (total \$40,000)
- \$12,000 to pay for an additional six consulting days each of Anwen and Ross to coordinate with education providers (Anwen Higher Ed, Ross Vocational Ed) and to prepare a report which draws together the findings from the four institutions and outlines the agreed recommended approach across the institutions
- \$5,000 travel and accommodation to allow for Anwen and Ross to meet with each institution
- TOTAL: \$57,000 ex gst

2. Engage RACs

The views of a small number of RAC members have been canvassed regarding how the current FRDC research proposal selection and evaluation process can be improved to enable the identification of research which should be incorporated in education pathways. A meeting with FRDC RAC Managers has also been held. Based on these discussions the consultants have been asked to brief each RAC at their meetings scheduled in June – August on the findings of the project and to seek feedback on implementation. There is also the opportunity to meet with RAC Chairs in October.

There are three options for engaging with the forthcoming RAC meetings: (1) the consultants provide a briefing paper with recommendations and key questions for RACs to respond to; (2) a briefing paper is provided along with a briefing by the consultants over a teleconference; (3) consultants meet face to face with RACs.

Budget

Option 1 Briefing prepared for RACs

the last option is for us to prepare a briefing paper specifically for RACs which they can discuss at their meetings and provide feedback to us via Skye and Chris.
this is a zero cost option

Option 2 Teleconference with RACs and attend RAC Chairs Meeting:

- 4 days (ie 1/2 day per meeting) for each meeting + 2 preparation days + 1 day incorporate RAC feedback + 2 days RAC Chairs October = 9 days @ \$1,320 = 11880 inc gst - travel and accommodation to attend October RAC Chairs meeting \$1,000 (for one person)

- total extension cost \$12,880 inc gst

Option 3 Face to Face RACs and attend RAC Chairs Meeting:

- 8 days for each meeting + 2 preparation/travel days + 1 day to incorporate RAC feedback in Final Report + 2 days RAC Chairs October = 13 days @ \$1,320= 17,160 inc gst - travel and accommodation estimate: flights to 8 capital city meetings \$6,000 + up to 6 nights accommodation (@\$180) = \$7,080

- total extension cost \$24,240 inc gst

Building Education and Training Pathways for R&D Adoption Project summary and recommendations for FRDC Executive and Board

Background

The FRDC aims to ensure the full benefit of its investment in research and development (R&D) is being used by the commercial fishing, aquaculture, post-harvest and fisheries management sectors. Less than optimal uptake of R&D output results in industry missing out on new opportunities including improved productivity, profitability, environmental sustainability and employee conditions and performance. Industry stakeholders view the uptake of R&D outputs as a strategic challenge to the fishing industry.

In March 2017, FRDC commissioned a project consisting of two stages:

Stage 1: Situational Analysis- describing the current situation for delivery of higher and vocational education and training across the fishing industry.

Stage 2: Set the foundation for increased extension of R&D through greater involvement of a small number of key education providers with demonstrated capacity to work with FRDC.

The Need

FRDC wishes to support increased adoption of its R&D by working through appropriate extension pathways. Enhanced opportunities are needed to position the industry's businesses and other agencies to make informed decisions regarding the extent the adoption of R&D outputs will meet their operational needs. Adoption of R&D outputs requires a combination of high quality, evidence based research, supported by investment in the skills and capacity of the people in the business who are best positioned to evaluate and apply the R&D.

The knowledge, education and skills of people working within the industry determines the capacity within businesses and other agencies to evaluate and adopt R&D. Providers of accredited training and education programs in the Vocational Education and Training (VET) and higher education (universities) sectors are therefore important intermediaries between the adoption of R&D outputs and building capacity among the industry workforce.

As a primary outcome of this project FRDC requested a set of recommendations about how FRDC could more effectively engage with vocational and higher education providers to increase extension of its R&D outputs through education pathways. The recommendations were to include advice on opportunities for FRDC to develop ongoing relationships with a small number of leading VET and higher education providers who are active in delivering courses and degrees across the fishing and aquaculture industries. Commercialisation opportunities were also to be explored.

An important requirement was that FRDC's increased engagement should have a positive influence on providers and others to ensure fishing industry related courses reflected the most recent outcomes from FRDC managed R&D.

Findings

The team completed the project through desktop research, phone and face to face consultation. Universities / marine institutes, VET Providers and a small number of Regional Advisory Committee and Industry Associations were consulted. Face to face consultation was undertaken in Tasmania, South Australia and Queensland

Broader findings include:

- There are a small number of key providers operating in the higher education and VET sectors of relevance to the fishing and aquaculture industries. Enrolments in industry related VET courses and university undergraduate programs are steadily declining.
- The lead vocational and higher education providers consulted expressed a strong preparedness to develop partnerships with FRDC to ensure FRDC R&D outcomes are embedded in their education and training programs.
- Retention of specialist capacity to deliver education and training for the industry is under threat. All providers reported that their institutions are under pressure to consolidate and rationalise teaching in subject areas where there is low demand and thin markets, as is the case in fishing and aquaculture. FRDC engagement is therefore crucial to assist institutions to motivate retention of core capacity.

Findings from those RAC members consulted included:

- All expressed a firm view that FRDC could place a stronger focus on extension.
- Although the FRDC R&D application process required proponents to indicate their approach to the extension of R&D, there is no requirement for funds to be dedicated to the proposed extension. The lack of funding commitment was considered as a factor which lead to low motivation to achieve extension outcomes.
- RACs are provided the opportunity to review and comment on R&D applications which have national, industry-wide or local impact. However, there was a view expressed that RACs could be asked to provide more assistance regarding extension than they are currently encouraged to do.
- Some capacity building among RACs and FRDC staff about what are the most effective extension mechanisms and education pathways in the industry, together with FRDC guidance on extension evaluation, would be beneficial.

Higher Education Findings:

- Higher education providers are moving to more generalised undergraduate courses. In some cases majoring in specialist subjects or a fourth honours year is being offered to enable students to specialise in marine science, fisheries and aquaculture. Most relevant undergraduate enrolments are in Bachelors of Science.
- There is no direct connection between ATAR scores and student enrolments in relevant subject areas to FRDC. The ATAR range is between 60 to 80 for Bachelor of Science and is more a reflection of the ranking of the university.
- Downward pressure on domestic student enrolments is partly driven by individuals weighing up the career benefits of a specialist degree versus the perceived limited career opportunities and salaries on offer. Students are also studying closer to home.
- Universities report that most undergraduate students have very poor awareness of the career options in fisheries management, fishing and aquaculture.
- Postgraduate enrolments are strong among many universities. International students are a key driver. This cohort of students can be as large as 50% of enrolments. Many universities have specific strategies focussed on building postgraduate enrolments as a key revenue driver. These students assist in retention of specialist teaching capacity.

- The international ranking of a university is a primary focus as it draws students to the institution. This can lead to a tension between focus on research (which determines ranking) versus teaching.
- Continued reduction of public (Federal) funding to universities increases the pressure on universities to exit subjects with public benefit orientation, such as science and environment. This places the future of fisheries management, marine science and aquaculture teaching in some institutions at risk.
- Lead universities expressed interest in increased collaboration between institutions to reduce risk of "cannibalisation" through value degrading competition for students, and to ensure core research capacity is retained within priority institutions for the industry.

Vocational Education and Training (VET) Findings:

- Courses leading to a recognised VET qualification are predominately in aquaculture. VET providers active in the fishing industry gain the bulk of their business from delivering Certificates of Competency (licenses).
- Client learning requirements, which are most typically the fishing business sponsoring the course participant, will largely determine the extent to which outputs of FRDC R&D are included in VET courses. Only if the R&D is relevant to the subject areas which the business has specifically asked for will it be included.
- The industry faces challenges of place and time. For example remoteness means the time and cost of staff participating in training can make it uneconomic for businesses to support.
- Low levels of awareness among business owners about the benefits of investing in training leads to a low culture of support for training. This limits businesses motivation to engage with training and as a consequence limits adoption of R&D outputs via training. This can be generalised as a more particular issue among smaller owner-operators versus larger corporate style entities.
- To combat the barriers of place and time which work against participation in recognised fishing industry training programs, leading VET practitioners generally support a role for centralised distance education (e-learning), together with regional Assessment Centres.

Recommendations

This set of recommendations if implemented as a combined set of actions, could lead to enhanced engagement of FRDC R&D outputs within education and training. In the Extension Section of this report these Recommendations have been tailored into four summaries of findings and recommendations targeted at the key audiences for this project: FRDC Board and Executive; RACs; Higher Education and Vocational Education and Training Providers.

- Build on the re-engagement of higher and vocational education providers stimulated by this
 project by completing the development of strategic partnerships to achieve mutually beneficial
 outcomes for FRDC and education and training providers. The focus should be around enabling
 strengthened incorporation of FRDC R&D outputs into curricula.
 - The higher education providers who should be most directly engaged with a partnership approach are the University of Tasmania and James Cook University. The Vocational Education and Training Providers are Seafood Training Tasmania and the Australian Maritime and Fisheries Academy (SA).
 - In higher education and vocational education and training there are a number of other universities who play an important role in undergraduate teaching. FRDC in any future

work should reach out to this broader group of providers to ensure they too have opportunities to adopt and teach R&D outputs.

- Partnership agreements to be developed and negotiated with University of Tasmania, James Cook University, Seafood Training Tasmania and the Australian Fisheries and Maritime Academy (SA) The partnership focus should include:
 - Support for institutions to retain specialist capacity;
 - an enabling role for institutions in supporting uptake of FRDC R&D outputs into courses and degrees;
 - an education specialist peer review arrangements enabling FRDC to seek partner feedback on research proposals (or outputs) which are relevant to extension through education and training;
 - \circ a commitment to work with FRDC to facilitate outreach to other relevant institutions.
- Empower FRDC's eight Regional Advisory Committee's (RACs) to provide informed comment on the extension proposed in R&D applications during the evaluation process. Emphasis should be placed on identifying research which could be incorporated in VET or higher education pathways. An investment in RAC capacity building and preparation of guidelines to assist in this evaluation process would be required.
- FRDC Research Proposals:
 - Develop guidelines for RACs and FRDC Research Managers to assist in the identification of R&D proposals which have intended outcomes which could be relevant to extension through education and training pathways. Support guideline application with investment in capacity building of RAC members and FRDC Managers to ensure they have confidence in applying the guidelines.
 - Review structure of R&D projects funded by FRDC with a view to influencing the up-front design of those R&D projects with relevance to education and training. The aim would be to strengthen connection to education and training pathways during the life of the project, rather than waiting to extend results at the end.
 - Include as a requirement of funding Research Proposals to include specific commitments to inclusion of R&D outputs into the course and degree material of their institution. This could be trialled with partner universities. For example any project contracted with UTAS or JCU could require the researcher to explain which degree or unit the R&D outputs will be extended through. For example a specialist seminar or written module within a unit.
- Examine introduction of an FRDC standard or accreditation for VET and higher education providers which if satisfied would enable FRDC recognition of "preferred providers" without leading to anti-competitive outcomes.
- A National Forum to be considered to facilitate strategic dialogue around core higher education subjects and curricula in fisheries management, marine science and aquaculture which must be developed and retained to support the future of the industry. This discussion should include FRDC and universities along with industry members and entities such as the Australian Fisheries

Management Authority, the Federal Department of Agriculture and Water Resources and State/Northern Territory agency representation.

- Recognising the pressure institutions are under to defend retention of core degree offerings, FRDC should consider strategic engagement with executives of priority institutions to ensure the importance of retention of courses and degrees to the future of the industry is understood. This could include engagement of FRDC Executives (such as holding annual meetings with institutions) and the FRDC Board (for example holding Board meetings on the campus of priority institutions). A National Forum could also be used to raise awareness around education and training priorities for the industry.
- FRDC to facilitate dialogue between groups of providers where FRDC provides advice about what
 it considers to be the priorities for subjects and teaching. Industry intelligence and opportunities
 for collaboration to address industry needs could also be shared. The aim should be around
 retaining core capability, mitigating risk of value destroying competition in what is a thin market
 and development of new courses such as Master Classes. Master classes in biosecurity are one
 example where industry capacity building is a priority for FRDC and the subject represents an
 opportunity for training providers to collaborate in course development and delivery.
- Facilitate reinvigoration of a Community of Practice. This was supported in particular among VET trainers, which covers the fishing, post- harvest and fisheries management sectors as well as aquaculture. Being across the outputs from current and recently completed R&D would be a requirement and outcome of participation.
- To combat the barriers of place and time which work against participation in recognised fishing industry training programs, FRDC could take an enabling role among VET practitioners to encourage support for further development of centralised distance education (e-learning), together with Regional Assessment Centres.
- FRDC to consider producing an annual or six monthly Bulletin targeted at education and training which promoted R&D outputs FRDC considers to be most relevant for incorporation in teaching material. This should include links to youtube clips and other resource material useful for teaching.
- FRDC should consider ways of engaging with PhD and Masters students as a likely cohort of students who could commit to pursue careers in the local industry. Ways of achieving this could include an annual briefing at each university by an FRDC senior staff member and scholarships to support Masters or PhD projects which offer a small grant for operating. Universities indicated this could be a low cost but powerful way of engaging student interest in subjects of importance to FRDC and priority issues, such as biosecurity.

Further Work

- FRDC to work with two higher and two vocational education and training providers in order to seek their input into a review of the current FRDC portfolio of R&D and recently published final reports to assess for suitability for inclusion in the curricula of courses and degrees. University of Tasmania, James Cook University, Seafood Training Tasmania and the Australian Fisheries and Maritime Academy (SA) are suggested as the institutions who should be approached to participate in this work. A proposal for extension to complete this work has been submitted to FRDC, a copy of the proposal is provided in Appendix 8. This task would produce valuable insights about:
 - the suitability of recently completed and the current FRDC R&D pipeline for adoption through education and training pathways;

- the development of guidelines which will assist FRDC to efficiently identify R&D which is suitable for inclusion in education and training; and
- any design aspects of R&D projects, which FRDC could require be incorporated, when first contracted to enable strengthened connections with education and training.

Building Education and Training Pathways for R&D Adoption Project summary and implications- Regional Advisory Committees (RACs)

Background

The FRDC aims to ensure the full benefit of its investment in research and development (R&D) is being used by the commercial fishing, aquaculture, post-harvest and fisheries management sectors. Less than optimal uptake of R&D results in industry missing out on new opportunities including improved productivity, profitability, environmental sustainability, employee conditions and performance. Industry stakeholders view the uptake of R&D outputs as a strategic challenge for the fishing industry.

In March 2017, FRDC commissioned a project consisting of two stages:

Stage 1: Situational analysis to describe the current state of play for delivery of higher and vocational education and training across the fishing industry.

Stage 2: Set the foundation for increased extension of R&D through greater involvement of a small number of key education providers with demonstrated capacity to work with FRDC.

The Need

FRDC wishes to support increased adoption of its R&D by working through appropriate extension pathways. Enhanced opportunities are required to assist the industries businesses and other agencies to make informed decisions about whether the adoption of an R&D output will meet their operational needs. Enabling adoption of R&D outputs requires a combination of high quality, evidence based research, supported by investment in the adoption pathway that is the most appropriate to the end use of the R&D output.

The knowledge, education and skills of people working within the industry determines the capacity within businesses and other agencies to evaluate and adopt R&D. Providers of accredited training and education programs in the Vocational Education and Training (VET) and higher education (universities) sectors are therefore important intermediaries between the adoption of R&D outputs and building capacity among the industry workforce.

As a primary outcome of this project FRDC requested a set of recommendations about how FRDC could more effectively engage with vocational and higher education providers to increase extension of its R&D outputs through education pathways. The recommendations were to include advice on opportunities for FRDC to develop ongoing relationships with a small number of leading VET and higher education providers who are active in delivering courses and degrees across the fishing industry.

An important requirement was that FRDC's increased engagement should have a positive influence on providers and others to ensure fishing industry related courses reflected the most recent outcomes from FRDC managed R&D.

Findings

The team completed the project through desktop research, phone and face to face consultation. During consultation visits to Tasmania, South Australia and Queensland, face to face meetings were held with a small number of local RAC members and representatives of fishing industry associations. The purpose of the meetings was to brief them on the work of the project and to seek their perspectives on engagement with education pathways.

Feedback from the RACs members consulted included:

- All expressed a firm view that FRDC could place a stronger focus on extension.
- Although the FRDC R&D application process required proponents to indicate their approach to the extension of R&D, there is no requirement for funds to be dedicated to the proposed extension. The lack of funding commitment was considered as a factor which lead to low motivation to achieve extension outcomes.
- RACs are provided the opportunity to review and comment on R&D applications which have national, industry-wide or local impact. However, there was a view expressed that RACs could be asked to provide more assistance regarding extension than they are currently encouraged to do.
- Some capacity building among RACs and FRDC staff about what are the most effective extension mechanisms and education pathways in the industry, together with FRDC guidance on extension evaluation, would be beneficial.

Broader findings around engagement with education and training include:

- There are a small number of key providers operating in the higher education and VET sectors. Enrolments in fishing industry related VET courses and undergraduate programs all declining.
- These key education providers have demonstrated capacity and a willingness to work with FRDC to ensure FRDC R&D outcomes are embedded in education and training programs.
- Consultation with providers has demonstrated that given most institutions are under pressure to consolidate and rationalise teaching in subject areas where there is low demand, FRDC engagement is a valuable mechanism to motivate retention of that capacity.

Higher Education

- Higher education providers are moving to more generalised undergraduate courses. In some cases a fourth honours year is being used to enable students to specialise in marine science, fisheries and aquaculture.
- Downward pressure on enrolments of domestic students is thought to be driven by individuals weighing up the career benefits of a specialist degree versus the perceived limited career opportunities and salaries on offer.
- Universities report that most undergraduate students have very poor awareness of the career options in fisheries management, fishing and aquaculture.
- Postgraduate enrolments are strong across most universities. This is driven by international students and assists in retention of specialised teaching and research capacity.
- The international ranking of a university is a primary focus as it draws students to the institution. This can lead to a tension between focus on research (which determines ranking) versus teaching.
- Continued reduction of public (Federal) funding to universities increases the pressure on universities to exit subjects with public benefit orientation, such as science and environment. This places the future of fisheries and aquaculture teaching in some institutions at risk.

• Lead universities expressed interest in increased collaboration between institutions to reduce risk of "cannibalisation" through competition for students, and to ensure core research capacity is retained within priority institutions for the industry.

Vocational Education and Training (VET)

- Courses leading to a recognised VET qualification are predominately in aquaculture. VET providers active in the fishing industry gain the bulk of their business from delivering Certificates of Competency (licenses).
- Client learning requirements, which are most typically the fishing business sponsoring the course participant, will largely determine the extent to which outputs of FRDC R&D are included in VET courses. Only if the R&D is relevant to the subject areas which the business has specifically asked for will it be included.
- The industry faces challenges of place and time. For example remoteness means the time and cost of staff participating in training can make it uneconomic for businesses to support.
- Low levels of awareness among business owners about the benefits of investing in training leads to a low culture of support for training. This limits businesses motivation to engage with training and as a consequence limits adoption of R&D outputs via training. This can be generalised as a more particular issue among smaller owner-operators versus larger corporate style entities.
- To combat the barriers of place and time which work against participation in recognised fishing industry training programs, leading VET practitioners generally support a role for centralised distance education (e-learning), together with regional Assessment Centres.

Recommendations

A set of targeted recommendations for FRDC, RACs and education providers have been developed. It is intended these recommendations, when implemented as a combined set of actions, could lead to enhanced engagement of FRDC R&D outputs within education and training.

Recommendations for RAC consideration are:

- Empower FRDC's eight RACs to provide informed comment on the extension proposed in R&D applications during the evaluation process. Emphasis to be placed on identifying research which may be suitable for incorporation in education pathways.
- FRDC to support RACs in this role by including guidelines with its research proposal selection and evaluation process which help RACs to apply filters to identify suitable projects for higher and vocational education pathways. Capacity building among RACs and FRDC staff around application of guidelines could be provided.

Related Recommendation to FRDC of specific relevance to RACs:

- FRDC to facilitate a targeted engagement with two higher and two vocational education and training providers in order to secure their input into a review of the current FRDC portfolio of R&D and recently published final reports in order to assess for suitability for inclusion in the curricular of courses and degrees. This task would produce valuable insights for FRDC about:
 - the suitability of its recently completed and current R&D pipeline for adoption through education and training pathways;
 - the development of the guidelines needed to support RAC assessment of R&D suitability for inclusion in education and training; and
 - any design aspects of R&D projects, which FRDC could require be incorporated, when first contracted to enable strengthened connections with education and training.

Other recommendations to FRDC include:

- Invest in building strategic relationships with the lead higher and vocational education providers and FRDC to achieve mutually beneficial outcomes. The partnership focus should be to motivate engagement of course and degree material with FRDC R&D outcomes, and to provide a supporting argument for providers to retain specialist capacity in core subjects which are important FRDC. The proposed lead institutions are University of Tasmania, James Cook University, Seafood Training Tasmania and the Australian Maritime College (SA).
- Other institutions also play an important role in education and training. In particular undergraduate teaching of science degrees with majors and honours in fisheries management and aquaculture. FRDC should include mechanisms to reach out these providers, drawing off the capacity developed through the strategic partnerships, in order to encourage them to also incorporate R&D in their courses and degrees.
- A related recommendation is that FRDC facilitate meetings between key groups of providers where FRDC specifies its priorities for teaching, and there is exploration of collaborative opportunities. The aim should be retaining core capability, mitigating risk of value destroying competition in what is a thin market and development of new courses such as Master Classes. Master classes in biosecurity are one example where industry capacity building is a priority for FRDC and the subject represents an opportunity for training providers to collaborate in course development and delivery.
- Facilitate reinvigoration of a Community of Practice. This was supported in particular among VET trainers, which covers the fishing, post- harvest and fisheries management sectors as well as aquaculture. Being across the outputs from current and recently completed R&D would be a requirement and outcome of participation.
- To combat the barriers of place and time which work against participation in recognised fishing industry training programs, FRDC could take an enabling role among VET practitioners to encourage support for further development of centralised distance education (e-learning), together with regional Assessment Centres.
- Examine introduction of an FRDC standard or accreditation for training and education providers which if satisfied would enable FRDC recognition of "preferred providers" without leading to anti-competitive outcomes in the sector.

Building Education and Training Pathways for R&D Adoption Project summary and implications- VET Sector

Background

The FRDC aims to ensure the full benefit of its investment in research and development (R&D) is being used by the commercial fishing, aquaculture, post-harvest and fisheries management sectors. Less than optimal uptake of R&D output results in industry missing out on new opportunities including improved productivity, profitability, environmental sustainability and employee conditions and performance. Industry stakeholders view the uptake of R&D outputs as a strategic challenge to the fishing industry.

In March 2017, FRDC commissioned a project consisting of two stages:

Stage 1: Situational Analysis- describing the current situation for delivery of higher and vocational education and training across the fishing industry.

Stage 2: Set the foundation for increased extension of R&D through greater involvement of a small number of key education providers with demonstrated capacity to work with FRDC.

The Need

FRDC wishes to support increased adoption of its R&D by working through appropriate extension pathways. Enhanced opportunities are needed to position the industry's businesses and other agencies to make informed decisions regarding the extent the adoption of R&D outputs will meet their operational needs. Adoption of R&D outputs requires a combination of high quality, evidence based research, supported by investment in the skills and capacity of the people in the business who are best positioned to evaluate and apply the R&D.

The knowledge, education and skills of people working within the industry determines the capacity within businesses and other agencies to evaluate and adopt R&D. Providers of accredited training and education programs in the Vocational Education and Training (VET) and higher education (universities) sectors are therefore important intermediaries between the adoption of R&D outputs and building capacity among the industry workforce.

As a primary outcome of this project FRDC requested a set of recommendations about how FRDC could more effectively engage with vocational and higher education providers to increase extension of its R&D outputs through education pathways. The recommendations were to include advice on opportunities for FRDC to develop ongoing relationships with a small number of leading VET and higher education providers who are active in delivering courses and degrees across the fishing industry.

An important requirement was that FRDC's increased engagement should have a positive influence on providers and others to ensure fishing industry related courses reflected the most recent outcomes from FRDC managed R&D. **Findings**

The team completed the project through desktop research, phone and face to face consultation. During consultation visits to Tasmania and South Australia, face to face meetings were held with VET providers to seek their perspectives on how FRDC could more effective engage with VET pathways to support the adoption of its R&D outputs.

Findings from VET sector consultation include:

- Enrolments in VET qualifications based on the Seafood Industry Training Package (SITP) remain low at 1421 in 2015, a decline of 10% from 2015. Completion rates remain below 30%.
- In the same period, aquaculture courses were the most popular with 76% of total course enrolments.
- Demand for VET courses comes from participants sponsored by their employers, overseas students and increasingly secondary students undertaking VET in schools programs.
- Client requirements typically being the fishing business sponsoring the course participant largely determine the extent outputs of FRDC R&D are included in courses. The prevalence of entry-level Certificate II and III courses limits the relevance of R&D outcomes to the curriculum and the scope for trainers to inject them into course delivery.
- There is an avenue to amend the Units of Competency in the Seafood, Maritime and other Training Packages to reflect changed industry practices, including those resulting from R&D outputs.
- There are a small number (typically two who are based in Tasmania and South Australia) of active RTOs delivering recognised short courses and VET qualifications in each state and the Northern Territory for the catching, aquaculture, post -harvest and related sectors of the fishing industry.
- Most active RTOs delivering against the SITP gain their main business from preparing students to qualify for their maritime Certificates of Competency (licenses).
- There was universal support from VET training providers for FRDC involvement in establishment a Community of Practice of VET trainers along similar lines to the now defunct 'AquaEd', but catering for all industry sectors.
- To combat the barriers of place and time which work against participation in recognised fishing industry training programs, leading VET practitioners generally support a role for centralised distance education (e-learning), together with regional Assessment Centres.

Recommendations

A set of targeted recommendations for FRDC, RACs and education providers have been developed. It is intended these recommendations, when implemented as a combined set of actions, could lead to enhanced engagement of FRDC R&D outputs within education and training.

Recommendations specific to Vocational Education and Training Providers:

- FRDC to work with two higher and two vocational education and training providers in order to seek their input into a review of the current FRDC portfolio of R&D and recently published final reports to assess for suitability for inclusion in the curricula of courses and degrees. This task would produce valuable insights about:
 - the suitability of recently completed and the current FRDC R&D pipeline for adoption through education and training pathways;
 - the development of guidelines which will assist FRDC to efficiently identify R&D which is suitable for inclusion in education and training; and
 - any design aspects of R&D projects, which FRDC could require be incorporated, when first contracted to enable strengthened connections with education and training.
- A related recommendation is to empower FRDC's eight Regional Advisory Committee's (RACs) to provide informed comment on the extension proposed in R&D applications during the

evaluation process. Emphasise will be placed on identifying research which should be incorporated in VET or higher education pathways.

Other recommendations being made to FRDC which are relevant to the VET sector are:

- Build on the re-engagement of VET and higher education providers stimulated by this project by developing partnerships to achieve mutually beneficial outcomes for FRDC and education and training in the sector. The focus should be around enabling strengthened incorporation of FRDC R&D outputs into the curricula of courses.
- Examine introduction of an FRDC standard or accreditation for training and education providers which if satisfied would enable FRDC recognition of "preferred providers" without leading to anti-competitive outcomes in the sector.
- Facilitate and encourage dialogue between RTOs (and other education providers) toward increased collaboration with the aim of retaining core capability, mitigating risk of value destroying competition between providers in what is a known thin market and develop new courses (eg master classes) to attract new enrolments and revenue for providers.
- Facilitate reinvigoration of a Community of Practice for VET trainers, which covers the fishing, post- harvest and fisheries management sectors as well as aquaculture. Being across the outputs from current and recently completed R&D would be a requirement and expected outcome of participation.
Building Education and Training Pathways for R&D Adoption Project summary and implications Higher Education Sector

Background

The FRDC aims to ensure the full benefit of its investment in research and development (R&D) is being used by the commercial fishing, aquaculture, post-harvest and fisheries management sectors. Less than optimal uptake of R&D output results in industry missing out on new opportunities including improved productivity, profitability, environmental sustainability and employee conditions and performance. Industry stakeholders view the uptake of R&D outputs as a strategic challenge to the fishing industry.

In March 2017, FRDC commissioned a project consisting of two stages:

Stage 1: Situational Analysis- describing the current situation for delivery of higher and vocational education and training across the fishing industry.

Stage 2: Set the foundation for increased extension of R&D through greater involvement of a small number of key education providers with demonstrated capacity to work with FRDC.

The Need

FRDC wishes to support increased adoption of its R&D by working through appropriate extension pathways. Enhanced opportunities are needed to position the industry's businesses and other agencies to make informed decisions regarding the extent the adoption of R&D outputs will meet their operational needs. Adoption of R&D outputs requires a combination of high quality, evidence based research, supported by investment in the skills and capacity of the people in the business who are best positioned to evaluate and apply the R&D.

The knowledge, education and skills of people working within the industry determines the capacity within businesses and other agencies to evaluate and adopt R&D. Providers of accredited training and education programs in the Vocational Education and Training (VET) and higher education (universities) sectors are therefore important intermediaries between the adoption of R&D outputs and building capacity among the industry workforce.

As a primary outcome of this project FRDC requested a set of recommendations about how FRDC could more effectively engage with vocational and higher education providers to increase extension of its R&D outputs through education pathways. The recommendations were to include advice on opportunities for FRDC to develop ongoing relationships with a small number of leading VET and higher education providers who are active in delivering courses and degrees across the fishing industry.

An important requirement was that FRDC's increased engagement should have a positive influence on providers and others to ensure fishing industry related courses reflected the most recent outcomes from FRDC managed R&D. .**Findings**

The team completed the project through desktop research, phone and face to face consultation. Twelve universities / marine institutes were approached with most participating in telephone consultations. Face to face consultation was undertaken with University of Tasmania and James Cook University.

Findings from higher education sector consultation include:

- All higher education and VET providers reported the same pressure of declining enrolments in courses and degrees of most interest to FRDC.
- Most universities consulted advised that they are under pressure to or already have reduced the diversity of degrees being offered in subjects of most interest to FRDC into more generalised undergraduate degrees. Most students enrol in a Bachelor of Science. Students who wish to specialise in marine science, fisheries management and aquaculture are given that opportunity through subject majors and honours years.
- One driver of downward pressure on undergraduate enrolments of domestic students is thought to be due to individuals weighing up the career benefits of a specialist degree versus the perceived limited career opportunities and salaries on offer. Students also study close to home.
- Most undergraduate students have very poor awareness of the career options in fisheries management, marine science and aquaculture.
- Postgraduate enrolments are strong among many universities. International students are a key driver. This cohort of students can be as large as 50% of enrolments. Many universities have specific strategies focussed on building postgraduate enrolments as a key revenue driver.
- The international ranking of a university is a primary focus as it draws students to the institution. This can lead to a tension between focus on research (which determines ranking) versus teaching.
- Continued reduction of public (Federal) funding to universities increases the pressure on universities to exit subjects with public benefit orientation, such as science and environment. This places the future of fisheries management, marine and aquaculture teaching in some institutions at risk.
- Some universities expressed interest in FRDC encouraging increased collaboration between institutions to reduce risk of "cannibalisation" through value degrading competition for students, and to ensure core research capacity is retained within priority institutions for the industry.
- Providers welcomed FRDC engaging in the space. FRDC could play an important role in supporting institutional rationale for retaining degrees and courses of most importance to FRDC interests and to give clear direction about retention of core subject areas of importance to the industry.
- ATAR scores do not appear to directly influence student enrolments in subject areas of interest to FRDC. ATARs range from 60 to 85 for science under graduate degrees which are the primary pathway for students studying marine science, fisheries and aquaculture.

Recommendations

A set of targeted recommendations for FRDC, RACs and education providers have been developed. It is intended these recommendations, when implemented as a combined set of actions, could lead to enhanced engagement of FRDC R&D outputs within education and training.

Recommendations for enhanced FRDC engagement with Higher Education Providers:

- FRDC to work with higher vocational education and training providers in order to seek their input into the current FRDC portfolio of R&D and recently published final reports to assess for suitability for inclusion in the curricula of courses and degrees. This task would produce valuable insights about:
 - the suitability of recently completed and the current FRDC R&D pipeline for adoption through education and training pathways;
 - the development of guidelines which will assist FRDC to efficiently identify R&D which is suitable for inclusion in education and training; and

- any design aspects of R&D projects, which FRDC could require be incorporated, when first contracted to enable strengthened connections with education and training.
- A related recommendation is to empower FRDC's eight Regional Advisory Committee's (RACs) to provide informed comment on the extension proposed in R&D applications during the evaluation process. Emphasise will be placed on identifying research which should be incorporated in VET or higher education pathways.
- Build on the re-engagement of higher education providers stimulated by this project by developing partnerships to achieve mutually beneficial outcomes for FRDC and education and training in the sector. The focus should be around enabling strengthened incorporation of FRDC R&D outputs into the curricula of courses.
- Other institutions with whom FRDC may not seek a partnership also play an important role in education and training. In particular undergraduate teaching. FRDC should include mechanisms to reach out these providers, in order to encourage them to also incorporate R&D in their courses and degrees.
- FRDC could facilitate meetings between key groups of providers where FRDC specifies its priorities for teaching, and there is exploration of collaborative opportunities. The aim should be retaining core capability, mitigating risk of value destroying competition in what is a thin market and development of new courses such as Master Classes. Master classes in biosecurity are one example where industry capacity building is a priority for FRDC and the subject represents an opportunity for training providers to collaborate in course development and delivery.
- An annual FRDC research briefing with key providers and their senior and junior academic staff would assist in institutions better understanding FRDC priorities.
- Examine introduction of an FRDC standard or accreditation for VET and higher education providers which if satisfied would enable FRDC recognition of "preferred providers" without leading to anti-competitive outcomes in the sector.
- A National Forum to be considered to facilitate strategic dialogue around core subjects and curricula in fisheries management, marine science and aquaculture which must be developed and retained to support the future of the industry.
- Recognising the pressure institutions are under to rationalise degree offerings, assist higher education institutions with their supporting rationale to university executives for retention of core subjects of importance to the industry.
- FRDC could more effectively use its research contracting process to require extension plans from universities to include specific commitments around inclusion of R&D outputs from their FRDC funded projects to be included in relevant subjects being taught.
- FRDC researcher scholarships for Masters or PhDs which offer a small grants for operating could be a powerful way of engaging student interest in subjects of importance to FRDC and priority issues, such as biosecurity.

Appendix 13

Federal Department of Education University Enrolment and Completion Data for courses related to Fisheries and Aquaculture

The Federal Department of Education maintains the database which collects data from universities regarding enrolments and completions. This database cannot be interrogated by external users. Access to the data is via a written request to the Department to search the data against key words and attributes. The details of the request made regarding data relevant to fisheries and aquaculture degree enrolments is given below.

The data requested was for the years 2011 until 2015 which is the most current data available. It covers under and postgraduate degrees and courses which offer units relevant to fisheries and aquaculture, which were identified via a key word against heading search. The implication of this data search is that in the case of under graduate degrees all students enrolled to study broad science or environmental undergraduate degrees were captured. This is consistent with the narrative gained from university consultation that the majority of students commence their studies in a broad undergraduate degree before specialisation in fisheries and aquaculture at post graduate level. It also confirms the trend of institutions away from offering specialist under graduate degrees.

There are four spreadsheets which are provided as an Attachment which capture the raw data for Undergraduate and Postgraduate enrolments and completions.

Undergraduate

A review of the undergraduate data shows that the student numbers reflect the standing (ranking) and size of each university and their faculties in science and environment. The undergraduate data does not provide a meaningful connection between students who are studying who then have an intended career path into fisheries and aquaculture. The undergraduate data also gives no insight into any appetite among universities to be provided with more specialist information from FRDC regarding R&D outcomes relevant to fisheries and aquaculture units they may be teaching.

While the enrolment data has been provided for completeness, the completions data is of most interest as it provides an indicator of the actual number of graduates who are entering the employment market who have qualifications of some relevance to fisheries and aquaculture.

A few observations from the under gradate data are:

- There is a modestly increasing trend during the period 2011-2015 of completions in science and environment degrees which include units relevant to fisheries and aquaculture reaching 4691 completions in 2015;
- Deeper analysis of why James Cook University undergraduate completions are so low is needed, particularly when compared with their strong postgraduate completion data;
- The gender balance is relatively equal;
- International students make up around 22 to 26% of enrolments. Noting this percentage increases in post graduate study to around 33%;
- There are very small numbers of indigenous students.

Postgraduate

The postgraduate data is potentially more useful as it starts to capture students completing advanced degrees with specialisation in fisheries and aquaculture. It too however would benefit from more in depth unpacking of its meaning via consultation with target institutions. The following observations are made for the target institutions who were consulted for this project. These are the intuitions identified by FRDC as having the strongest known capacity in fisheries and aquaculture specialist higher education.

A few observations from the postgraduate data are:

- Completions have been stable at around 1500 students per year completing their studies with a postgraduate degree in science and environment which includes some specialisation in fisheries and aquaculture;
- Two of FRDC's target universities James Cook University and University of Tasmania have modestly increasing completions numbers;
- Gender balance is relatively equal;
- Around 1/3 of students are international. Which confirms their importance to viability for universities to offer specialist postgraduate studies;
- The age range for most students is 20 through to 39;
- Around 469 post graduates completed studies across all of the universities consulted, this figure is fairly stable over the 2011-2015 period;
- There are very small numbers of indigenous students.

Department of Education Request for Data

Data is to be used in a Research Report for Fisheries Research and Development Corporation. The Report is investigating how FRDC can work more effectively with Higher Education to ensure adoption of the outcomes of its investments in research. FRDC is requesting data on which universities teach under and postgraduate degrees (course work) in fisheries and aquaculture along with student numbers and their backgrounds. The benefit of this research will be to ensure that university graduates entering the Australian fisheries and aquaculture sectors have been taught the latest knowledge and innovation ensuring the sustainable management of Australian fisheries and the protection of the environment.

Specifically:

- 1. Under and postgraduate degree, course and unit information with the following key words in their degree, course and unit titles:
 - a. Fisheries
 - b. Fisheries Management
 - c. Fisheries technology
 - d. Aquatic animal health
 - e. Water quality
 - f. Aquatic ecology
 - g. Seafood
 - h. Aquaculture
 - i. Marine
 - j. Maritime
 - k. Tropical biology

- I. Protected area management
- m. Environment
- n. Ecosystems
- o. Applied Science
- p. Zoology
- q. Ecology
- r. Wildlife conservation
- s. Water quality
- 2. Numbers and characteristics of students undertaking the above
- 3. Completion of units of study in the above subject areas
- 4. Data on Students participating in the above is requested on:
 - a. Gender
 - b. Age
 - c. Citizenship
 - d. Aboriginal and Torres Strait Islander indicator
 - e. Basis for admission to course;
 - f. Type of attendance (full-time / part-time);
 - g. Mode of attendance (internal, external, multi-modal)

Attachment 1

- 1. Enrolments in undergraduate degrees
- 2. Completions in undergraduate degrees
- 3. Enrolments in postgraduate degrees
- 4. Completions in postgraduate degrees

	А	В	С	D	E	F				
1	Undergraduate enrolments in fisheries and aquaculture courses by Provider, 2011-2015									
2	-	Souce: Department of Education and Training, July 2016								
3	-	17-369 Lovett								
4 5	Summary	mmary								
6			Numb	er of students in major co	ourses					
7		2011	2012	2013	2014	2015				
	James Cook									
8	University	74	91	87	100	105				
	Murdoch University									
9		829	824	823	568	354				
	of Western									
10	Australia	627	414	245	88	32				
10	University of	021		240						
11	Wollongong	100	107	91	90	104				
	Federation									
	University									
12	Australia	180	203	181	215	218				
	Swinburne									
	University of Technology									
13	reennology	312	317	302	139	137				
14	CQUniversity	195	233	226	230	177				
	Edith Cowan									
15	University	220	258	254	244	225				

	A	В	С	D	E	F
	Curtin					
	University of					
16	Technology	1579	1582	1619	1671	1843
	University of					
17	Canberra	343	361	352	307	247
	Batchelor					
	Institute of					
	Indigenous					
18	Tertiary	32	-	-	-	-
	Charles					
19	Darwin	216	205	189	153	138
	Bond					
20	University	26	29	31	35	37
	Western					
21	Sydney	431	316	300	316	347
	Charles Sturt					
22	University	914	766	681	636	587
	Australian					
	Catholic					
23	University	112	125	120	111	92
	Victoria					
24	University	442	545	635	602	97
	The University					
25	of Adelaide	248	222	220	201	129
	University of					
	New South					
26	Wales	306	317	310	339	340

	А	В	С	D	E	F
	The University					
	of Newcastle					
27		808	869	967	972	961
	University of					
	Technology,					
28	Syaney	143	148	166	181	175
	The University					
	of Queensland					
29		1675	1498	1346	1264	1175
	La Trobe					
30	University	244	263	247	238	911
	Macquarie					
31	University	224	224	222	219	247
	University of					
	South					
32	Australia	388	1504	1263	1289	1330
	Flinders					
33	University	365	311	285	270	263
	Deakin					
34	University	1043	1175	1499	1298	1162
	Griffith					
35	University	1069	1164	1157	1059	936
	The Australian					
	National					
36	University	-	9	19	23	37
	RMIT					
37	University	733	542	567	403	420

	А	В	С	D	E	F
38	Monash University	455	447	426	392	300
	The University of Melbourne					
39		2203	2341	2407	2381	2392
40	Southern Cross	629	642	625	551	474
	The University of New					
41	England	273	371	427	399	345
42	The University of Sydney	2044	1979	2069	2147	2247
43	Queensland University of Technology	-		1281	758	427
	University of the Sunshine Coast					
44		206	243	255	232	330
45	Tasmania	1332	1452	1439	1485	1446
	South Aust Institute of Business &					
46	Technology	157	138	132	-	-
47	Melbourne Polytechnic	19	24	12	6	11

	А	В	С	D	E	F
	Curtin College					
48		104	82	97	105	91
	Box Hill					
49	Institute	-	7	-	-	-
	Think:					
50	Colleges Pty	43	37	27	13	< 5
51	TOTAL	21343	22385	23601	21730	20891
52						
53						
54						

	А	В	С	D	E	F				
1	Undergraduate completions in fisheries and aquaculture courses by Provider, 2011-2015									
2	-	Souce: Department of Education and Training, July 2016								
3	-	17-369 Lovett								
4	Summary	amary								
6	o anni ai y			Number of Students						
7		2011	2012	2013	2014	2015				
	James Cook									
8	University	25	30	45	41	24				
	Murdoch									
9		196	133	158	142	138				
	of Western									
10	Australia	25	25		26	16				
10	University of	25	30	41	20	10				
11	Wollongong	14	31	19	17	22				
	Federation									
	University									
12	Australia	24	28	19	19	49				
	Swinburne									
	University of									
13	rechnology	41	50	59	45	25				
14	CQUniversity	21	28	23	29	25				
	Edith Cowan									
15	University	28	38	33	35	28				

	A	В	С	D	E	F
	Curtin					
	University of					
16	Technology	285	241	268	281	324
	University of					
17	Canberra	67	65	78	84	65
	Batchelor					
	Institute of					
	Indigenous					
18	Tertiary Education	< 5	29	-	-	-
	Charles					
19	Darwin	16	21	21	28	22
15	Bond					
20	University	< 5	9	10	10	15
	Western					
21	Sydney	178	128	44	37	59
	Charles Sturt					
22	University	147	93	96	113	114
	Australian					
	Catholic					
23	University	15	17	27	34	20
	Victoria					
24	University	57	64	43	55	26
	The University					
25	of Adelaide	40	23	28	34	27
	University of					
	New South					
26	Wales	37	60	54	54	61

	А	В	С	D	E	F
	The University					
	of Newcastle					
27		202	197	203	253	205
	University of					
	Technology,					
28	Sydney	31	44	32	57	49
	The University					
	of Queensland					
29		286	266	286	266	277
	La Trobe					
30	University	52	54	50	65	63
	Macquarie					
31	University	45	47	43	38	35
	University of					
	South					
32	Australia	40	229	198	179	260
	Flinders					
33	University	108	72	88	52	58
	Deakin					
34	University	242	283	246	338	334
	Griffith					
35	University	155	179	224	199	214
	The Australian					
	National					
36	University	9	8	5	< 5	< 5
	RMIT					
37	University	116	118	122	88	113

	А	В	С	D	E	F
	Monash					
38	University	61	72	70	120	77
	The University					
	of Melbourne					
39		250	313	329	383	567
	Southern					
40	Cross	88	92	117	97	111
	The University					
	of New England					
41	England	20	30	36	36	55
	The University					
42	of Sydney	485	413	408	452	483
	Queensland					
	University of					
43	recimology	-	-	368	284	202
	University of					
	the Sunshine					
44	Coast	39	25	31	41	59
	University of					
45	Tasmania	245	272	260	307	384
	South Aust					
	Institute of					
	Technology					
46		56	49	36	-	-
	Melbourne					
47	Polytechnic	5	5	< 5	5	< 5

	А	В	С	D	E	F
	Curtin College					
48		113	58	62	75	81
	Think:					
49	Colleges Pty	< 5	8	7	9	< 5
50	TOTAL	3872	3957	4289	4432	4691
51						
52						
53						

	F								
1 Post Graduate (coursework) enrolments in fisheries and aquaculture courses by Provider, 2011-2015	Post Graduate (coursework) enrolments in fisheries and aquaculture courses by Provider, 2011-2015								
2 Souce: Department of Education and Training, May 2016	Souce: Department of Education and Training, May 2016								
17-232 / ovett									
5 Summany									
Summary Number of students in major courses									
7 2011 2012 2013 2014	2015								
1 2011 2012 2010 2014 8 James Cook University 219 223 254	274 251								
9 Murdoch University 139 151 120	81 80								
10 The University of Western Australia - 35 64	85 90								
11 University of Wollongong 91 74 56	78 51								
12 Federation University Australia <5 <5	10 11								
13 Swinburne University of Technology 5 11 19	48 55								
14 CQUniversity 22 38 46	21 19								
15 University of Southern Queensland <5 -									
16 Edith Cowan University 59 60 50	28 25								
17 Curtin University of Technology 30 15 14	20 21								
18 Charles Darwin University 32 29 40	47 55								
19 Bond University 10 12 14	26 26								
20 Western Sydney University 46 42 41	38 30								
21Charles Sturt University223170125	95 84								
22Victoria University895532	< 5 -								
23 The University of Adelaide 47 42 26	30 32								
24 University of New South Wales 246 192 179	164 213								
25 The University of Newcastle 115 160 213	206 182								
26 University of Technology, Sydney 57 59 67	71 52								
27 The University of Queensland 233 255 286	298 254								
28 La Trobe University 13 15 23 28 13 24 244 244	6 < 5								
29 Macquarie University 214 20 108 118	213 100								
30 University of South Australia 99 100 110 21 Fit Junition in the second	110 110								
31 Flinders University 97 109 117 22 D Lis Lis Lis 24 70 07	140 ISU								
32 Deakin University 24 70 97 33 Orifith University 200 170 165	57 T7								
33 Grimith University 200 179 100 24 The Australian National University 190 175 170	160 132								
34 The Australian National University 130 170 25 DMIT University 47 44 60	100 132 207 372								
35 Rwitt Oniversity 210 130 84 36 Monach University 84 84	50 116								
37 The University of Melbourne 486 519 557	517 608								
38 Southern Cross University 35 27 24	21 17								
39 The University of New England 71 87 117	110 87								
40 The University of Sydney 352 243 183	165 150								

А	В	С	D	E	F
Queensland University of Technology	-	-	152	127	155
University of the Sunshine Coast	6	< 5	-	-	-
The University of Notre Dame Australia	6	< 5	< 5	< 5	< 5
University of Tasmania	265	262	303	348	364
TOTAL	3992	3807	4045	4239	4176
	A Queensland University of Technology University of the Sunshine Coast The University of Notre Dame Australia University of Tasmania TOTAL	ABQueensland University of Technology-University of the Sunshine Coast6The University of Notre Dame Australia6University of Tasmania265TOTAL3992	ABCQueensland University of Technology-University of the Sunshine Coast66<5The University of Notre Dame Australia60265265262TOTAL39923807	ABCDQueensland University of Technology152University of the Sunshine Coast6<5-The University of Notre Dame Australia6<5<5University of Tasmania265262303TOTAL399238074045	ABCDEQueensland University of Technology152127University of the Sunshine Coast6<5The University of Notre Dame Australia6<5<5<5University of Tasmania265262303348TOTAL3992380740454239

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	A	В	С	D	E	F					
1	Post Graduate (coursework) completions in fisheries and aquaculture courses by Provider, 2011-2015										
2	Souce: Department of Education and Training, May 2016										
3	17-232 / ovett										
4											
5	Summary										
6		Number of Students									
7		2011	2012	2013	2014	2015					
8	James Cook University	75	84	127	109	112					
9	Murdoch University	62	40	45	32	28					
10	The University of Western Australia	-	< 5	19	27	29					
11	University of Wollongong	66	58	32	52	32					
12	Federation University Australia	< 5	< 5	< 5	-	5					
13	Swinburne University of Technology	-	< 5	< 5	< 5	11					
14	CQUniversity	5	7	12	11	9					
15	University of Southern Queensland	< 5	-	-	-	-					
16	Edith Cowan University	18	18	16	17	14					
17	Curtin University of Technology	18	7	6	9	6					
18	University of Canberra	< 5	< 5	-	-	-					
19	Charles Darwin University	< 5	5	< 5	< 5	< 5					
20	Bond University	< 5	6	< 5	12	12					
21	Western Sydney University	8	13	9	12	11					
22	Charles Sturt University	51	51	44	32	18					
23	Victoria University	61	25	15	< 5	< 5					
24	The University of Adelaide	15	20	7	< 5	20					
25	University of New South Wales	96	60	75	47	69					
26	The University of Newcastle	32	42	60	/2	54					
27	University of Technology, Sydney	37	16	32	33	28					
28	The University of Queensland	12	95	96	115	108					
29	La Trobe University	22		10	9	< 0					
30	Macquarie University	02	50	54	/0	02					
31	University of South Australia	41	35	00 20	40	54					
32	Flinders University	55	40		32	01					
33	Deakin University	19	20	75	20	67					
54 25	The Australian National University	97	105	103	00	54					
35	Ine Australian National University	120	100	13	55	83					
30 27	Nivili University	03	56	13 43	20	22					
38	The University of Melbourne	162	194	199	180	253					
30	Southorn Cross University	9	184	199	7	233					
40	The University of New England	17	28	.30	41	25					
40	The University of New England		20	00		20					

	А	В	С	D	E	F
41	The University of Sydney	152	118	87	70	58
42	Queensland University of Technology	-	-	68	51	64
43	University of the Sunshine Coast	< 5	< 5	-	-	-
44	The University of Notre Dame Australia	< 5	< 5	< 5	< 5	< 5
45	University of Tasmania	93	82	85	113	137
46	TOTAL	1598	1417	1512	1495	1554
47						
48						