Centre of Excellence for Science, Seafood and Health: Management, Communication and Network

Dr Janet Howieson

April 2019

FRDC Project No 2013-711.20

ISBN **978-0-9925568-8-4**

FRDC 2013/711.20: CESSH: Management Communication and Network.

Ownership of Intellectual property rights

Disclaimer

Researcher Contact Details

Name:	Janet Howieson
Address:	7 Parker Place,
	Bentley
Phone:	0423840957
Fax:	
Email:	j.howieson@curtin.edu.au

FRDC Contact Details

Address:	25 Geils Court
	Deakin ACT 2600
Phone:	02 6285 0400
Fax:	02 6285 0499
Email:	frdc@frdc.com.au
Web:	www.frdc.com.au

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

Table of Contents

Executive Summary

This report summarises the activities of FRDC 2013/711.20 Centre of Excellence for Science, Seafood and Health (CESSH): Management, Communication and Network from 2015-2018, following the review and modification of the original CESSH application; FRDC 2013/711. This project, in association with the aligned projects 2013/711.30 (New Opportunities for Underutilised species and 2013/711.40) New opportunities for Seafood processing Waste) has resulted in >$1million allocated for five newly funded industry projects; eight early career scientists and 19 post graduate students trained in seafood post-harvest research; nine peer reviewed journal articles; 12 conference presentations; >20 presentations to industry and other stakeholder groups and at least eight new programs, products or processes commercialised.

Industry knowledge/interest in the post-harvest opportunities appeared to increase over the project with also a move by the Industry Advisory Group (IAG) towards prioritising collaborative, whole of industry priorities rather than company specific priorities. The project has also demonstrated that there is ongoing and various opportunities to leverage funding from other state and federal sources supporting food related research (for example Food Innovation Australia Limited (FIAL); Department of Health). Overall the results of this project, and the assessment by the IAG, did indicate that there is whole of industry support, appreciation and utilisation of an independent post-harvest seafood research capacity in Western Australia.

However, ongoing issues with prolonging the longevity of funding such a research centre were also identified through the project. These issues included;

a. Longevity will be enhanced if some ongoing core funding for senior staff rather than relying solely on external research grants will assist in longer term outcomes. Lack of long term security resulted in staff leaving to take up more permanent positions. However, the contrary view is that six to twelve months working in an aligned research centre is excellent training for a longer term future in an industry setting. Completion of post-graduate research projects reflect a similar ideal training opportunity.

b. The current competitive research funding situation challenges the development of a national collaborative research capacity in post-harvest seafood research. Options may be to agree to respect and support specific capacity in one organisation (a working example is Safefish in SARDI whereby core funding is provided by the host institution and external research funding targeted for specific project), or to deliver research in an agreed collaborative manner. It is suggested that a successful national model of post-harvest seafood collaboration would need to be developed under the leadership of and in conjunction with the major funders.

c. Commercialisation of post-harvest seafood research, even when the business case is positive, is often challenged by external factors such as supply, changing markets and business restructures. These challenges and recommendations are detailed in the aligned project reports 2013/711.30 and 2013/711.40, and should be taken in consideration when evaluating project outcomes. One solution to increase the commercialisation outcomes from research, has been an expectation of industry cash contribution as part of research funding applications. However, perhaps such contributions should be evaluated pending the ability of the company to provide cash: a concern is research effort being directed more towards the larger companies and away from smaller operations.

Due to no longer meeting the parameters for an independent research centre at Curtin University, and following a restructure, the activities of the CESSH have now been folded into the Discipline of Agriculture and Food, School of Molecular and Life Sciences, Faculty of Science and Engineering. Some core funding by a three year contract has been provided to Dr Howieson This restructure facilitates direct working relationships with Aquaculture, Fisheries Science, Agriculture and Food Science Curtin University academics, enabling the benefits of a whole of chain approach and expertise within the post-harvest

seafood research effort. Therefore Curtin University staff will continue to provide the research service to the seafood industry as outlined in this report.

1. Introduction

The Centre of Excellence for Science, Seafood and Health (CESSH) was established at Curtin University in 2009. The CESSH was aligned with the Seafood Co-operative Research Centre and was established with the assistance of $500,000 from the WA Government.

Between 2008 and 2013 the CESSH was a successful seafood post-harvest research centre with outputs including $3.4 million in grant funding, 21 conference presentations, 11 peer reviewed journal articles, and 32 media stories. In addition industry outcomes included four new seafood products on the market place, three new seafood branding strategies implemented (including the National Love Australian Prawns strategy), and a range of supply chain monitoring techniques and technologies implemented in various seafood sectors across Australia.

Given this success, a decision was made to provide additional funding to the CESSH through a three year Seafood CRC legacy project. Following consultation with industry and a steering committee to inform research priorities, the CESSH legacy project (CRC/FRDC 2013/711) was set up with the following sub-programs.

Sub-Program 1: Waste minimisation and management
Sub-Program 2: Retailer 2020 -
Sub-Program 3: Food policy research
Sub-Program 4: Research advisory service
Sub-Program 5: Education, communication and extension
Sub-Program 6: Collaborative manufacturing hub

In June 2015 the CESSH was reviewed and as a result Sub-Programs 1-6 were ceased and three new projects were established. These new projects were 2013.711.20 (CESSH: Management, Extension, Network), 2013/711.30 (New opportunities for underutilised species) and 2013/711.40 (New opportunities for seafood processing waste). The earlier results for Sub-Programs 1 and 6 were rolled into this new structure, and Sub-Programs 2-5 were terminated.

The Contract for the revised CESSH projects under the management of Dr Janet Howieson (2013/711.20, 2013.711.30 and 2013/711.40) was signed by Curtin in February 2015. This report summarises the activities of 2013.711.20 (noting that the other two projects have separate final reports).

2. Objectives

The objectives for FRDC 2013.711.20 are described below:

- Through post-graduate training and employment of scientists expand the research capacity within the CESSH to further support Australian seafood industry participants in analysing and improving their post-harvest supply chain performance.
- Foster, lead, enhance capacity and provide administrative support to expand the activities of the Australian seafood post-harvest research hub to better meet the needs of the Australian seafood Industry
- Provide a means for the Australian seafood industry to access post-harvest "commercial in confidence" or other technical expertise, either through CESSH or in other specific post-harvest research areas, available as part of the Australian post-harvest research hub

- Develop best practice/innovation in effectively communicating the results of the CESSH post-harvest research to the Australian seafood industry
- Demonstrate professionalism and transparency in all reporting on research sub program activities.

3. Methods, Results, Discussion

3.1 Objective 1: Training in Seafood Post-Harvest Research

Objective 1: Through post-graduate training and employment of scientists expand the research capacity within the CESSH to further support Australian seafood industry participants in analysing and improving their post-harvest supply chain performance.

3.1.1 Post-Graduate Training

Post graduate supervision of research projects related to post-harvest seafood issues has been undertaken by Dr Howieson, including Doctor of Philosophy (PhD); Master of Philosophy (M.Phil); Masters of Science (M.Sc) in Sustainable Aquaculture; and M.Sc in Food Science and Technology and Honours. Several of these students are still completing their research. Many have now taken up or returned to positions in seafood related government or company activities, with a renewed focus on safety, quality and utilisation of underutilised species or waste in their future activities.

The post-graduate students, the year of commencement, the qualification and the project titles are listed below:

<u>Post Graduate Supervision (completed)</u>

Luisa Fuentes (2012) (M.Sc (Food Science)): Evaluation of the Effectiveness of the Standard Plate Count as an Indicator of Seafood Spoilage in Finfish Fillets.

Elinsa Gilead Massawe (2013) (M.Sc (Food Science)): Optimisation of Freezing for Australian Salmon Fillets.

Carol Low (2013) (M.Sc (Food Science)): Development and Validation of Prawn Quality Indices for Cooked and Green Australian prawns.

Abubakary Saad Mbadjo (2013) (M.Sc (Food Science)): Production of High Protein Biscuits from Dried Underutilised species.

David Byrom (M.Phil) University of the Sunshine Coast: co-supervised with Professor Meredith Lawley) (2013):Moreton Bay Fresh Prawn Fishery - Customer Focus and Sustainability

Rowan Kleindienst (M.Phil) (2014):To Investigate the Links between Parasite Infestation and Fillet Quality in Farmed Yellowtail Kingfish in central Western Australia.

Felicity Denham (PhD) (2012): Environmentally Sustainable Seafood Supply Chains: Analyses, Issues and Opportunities.

Duc Minh Nguyen (2016) (M.Sc (Food Science)): Utilize Fish Waste for Fish Snack Production

Ahmad Jauhari (2016) (M.Sc (Food Science)): Fish Protein Extraction from Patagonaian Toothfish by-products using the Modified Endogenous Enzymatic Method

Andrew Tilley (2016) (Honours): Investigation of Muscle Fibre Structure, Thermally-induced Cross-linking and Muscle Toughening in Saddletail Snapper (*Lutjanus malabaricus*)

Sudeep Sasikumar (2017) (M.Sc (Food Science)): A New Value-added Product from Underutilized Australian Finfish species

Dhanya Ganesan (2017) (M.Sc (Food Science)): Functional Properties of Collagen from Skin and Scale of Barramundi (*Lates calcarifer)*

Post Graduate Supervision (current)

Marianne St Clair (2016) (PhD): Is Collaboration a Key Success Factor for Seafood Enterprise Development in Remote Indigenous communities?

Muhammad Abu Bakar Siddik (2015) (PhD): Physiological and Immunological Responses of Juvenile Barramundi (*Lates calcarifer*) fed Bio-processed Animal-based Protein Diets.

Tom Nottage (2017) (M.Sc (Sustainable Aquaculture)): Bivalve Depuration and its Potential Application in Grit Purging: an Outlook towards Benefitting Industry.

Amanda Hender (2018) (M.Sc (Sustainable Aquaculture)) To Elucidate the Growth and Development on *Lates calcarifer* (Barramundi) Ingesting Feeds made from *Cyprinus carpio* (Common Carp) fed Black Solider Fly Larvae

Adinan Issahaque (2018) (M.Sc (Sustainable Aquaculture)): The Effects of dietary Protein Source in Barramundi (*Lates calcarifer)* on Nutrient Loading in a Recirculating Aquaculture System (RAS)

Md Reaz Chaklader (2018) (PhD): Physiological Responses of juvenile Barramundi, *Lates calcarifer* (Bloch, 1790), fed Black Soldier Fly Meal, *Hermetia illucens*, based Diet.

Thi Thanh Thuy Dao (2018) (PhD): The Efficacy Of Supplementation Of Black Soldier Fly Meal (*Hermetia Illucens*) In Decapod Diets

3.1.2 Employment of Scientists

Kerri Choo commenced as the CESSH food scientist in late July 2015 and worked until 2017 at which time she accepted a position with a dairy company. Sarah Houston commenced as the CESSH Communications officer in late May 2015, but resigned in January 2016.

In addition several young and/or experienced food scientists inexperienced in seafood, have been trained during seafood research positions with Dr Howieson, later to take up positions in the food industry. These scientists have included

a. Dechen Choki: Research assistant in 2017 until she returned to Butan.

b. Dr Tuna Dincer: Research officer until 2017 from which she returned to a lecturing role at Curtin.

c. Sarah Crisp: Research assistant until 2017 when she accepted a position in the ACT as a graduate policy officer.

d. Felicity Denham: Completed her PhD with Dr Howieson in 2015 and worked as a research officer in the group until taking up a University of Tasmania postdoctoral position in late 2016.

e. Rowan Kleindienst: Completed his M.Phil with Dr Howieson and worked as a research officer until accepting a position in 2017 managing the Curtin Unversity Aquatic Research Laboratory.

f. Andrew Tilley: completed his Honours with Dr Howieson in 2016 and worked as a research officer until accepting a position with Vesco Foods in 2018.

3.2 Objective 2: Develop National Hub to Support Seafood Post-harvest Research

Objective 2: Foster, lead, enhance capacity and provide administrative support to expand the activities of the Australian seafood post-harvest research hub to better meet the needs of the Australian seafood Industry

Dr Howieson convened a meeting with 15 post-harvest scientists/administrators representing QDAFF, USC, SARDI, UTAS and Seafood CRC on the 19 May in Adelaide 2015. The outcome of the meeting was a commitment to take forward a national SEAFOOD SOLUTIONS group. The agreed objectives/purpose of the initiative were summarised as follows:

a. Help to underpin a modern, innovative, competitive and profitable Australian seafood industry that works whole of chain
b. By collaboration, increase the effectiveness of research that is undertaken
c. Build capacity to encourage young Australian scientists into the industry
d. Prevent loss of knowledge transfer/industry links/opportunity now that the Seafood CRC Company no longer in existence
e. Allow industry to have a one stop shop/solution for all their post-harvest research needs.

A capacity statement was commenced. Each participating organisation was to seek support from their institution before commencing funding application development for a post-harvest research hub. At this time it became apparent that the opportunities for a national hub were being threatened by limited funding opportunities leading to some competition between research groups. Until this issue was resolved the national hub was not considered to be feasible.

However research partnerships, shared advice and joint funding applications were examples of ongoing collaboration between other post-harvest research institutions and CESSH continued as per the following examples:

a. SARDI and SAFEFISH who worked with CESSH scientist on the Western Australian Shellfish Quality Assurance Program (WASQAP) biotoxin review and Oyster Harbour shellfish management plan review, Fight Food Waste and Fraud Co-operative Research Centre (CRC), and on seafood waste and traceability projects).
b. QDAFF (Andrew Forrest) who worked with CESSH scientists on the Food Innovation Australia Limited (FIAL) Tough Saddletail Snapper project (FRDC 2010-207).
c. CSIRO (Brisbane and Werribee) who worked with CESSH scientists on cold set binding and high moisture extrusion trials as part of 2014/704: Waste transformation for the Catering Market.
d. USC (Meredith Lawley) who worked with CESSH scientists on seafood waste utilisation surveys and value chain analysis (FRDC 2013-711.40).

In 2017 it was decided to develop a bid for a Fight Food Waste and Fraud CRC. CRC's are large collaborative research efforts, a good example of which was the Seafood CRC, which finished in 2016. Dr Howieson with Alison Turnbull from SARDI led the development of a seafood consortium within the CRC bid. Teleconferences were hosted with industry and project outlines (comprising a waste and fraud sub-program respectively) were developed with different industry groups. These outlines were developed into a single "seafood consortium" document which formed part of the successful bid submission. Collaborative effort with SARDI will continue as part of the Fight Food Waste CRC which was launched in November 2018.

3.3 Objective 3: Undertake Post-Harvest Projects for Industry

Objective 3: Provide a means for the Australian seafood industry to access post-harvest "commercial in confidence" or other technical expertise, either through CESSH or in other specific post-harvest research areas, available as part of the Australian post-harvest research hub

3.3.1 Priority Setting Process and Formation of Industry Advisory Group (IAG)

In order to define relevant industry priorities, following an invitation to 24 Western Australian seafood industry stakeholders, in November 2013 a “group explorer” consultation session was held. The workshop was facilitated by Professor Fran Ackermann, Curtin Business School and used an innovative consultative process which enabled all who participated to contribute their views via networked laptops. All participants’ issues and opportunities were then anonymously displayed on a main screen allowing them to be viewed, developed, and finalised[NS1]. The workshop also included an anonymous opportunity to indicate no, “in kind” or “cash” support of the priority projects identified.

The attendees (Figure 1) were

John Sharland (Endeavour Foods), David Carter (Austral Fisheries), Steven Hood (MG Kailis), Simon Little (Westmore Seafoods), Peter Jecks (Abacus Fisheries), Charles Francina and Daniel McCorey (Fish Trade), Drew Martin (Sealanes), Toby Abbott (Kailis Bros), Paul Catalano (Catalanos Seafoods). Apologies and request for updates were received from Richard Buczak (Central Seafoods), Arno Verboon (Fremantle Octopus) and David Thompson (Indian Ocean Lobster)

Figure 1: 2013 Group Explorer session to identify priorities

The computer driven consultative process was considered an improvement on traditional consultative processes by participants. The results of this initial consultation was used in part to prioritise CESSH research activities under the aligned projects: 2013/711.30 (New opportunities for underutilised species) and 2013/711.40 (New opportunities for seafood processing waste), but also to set new research and development priorities.

Initial participants in this group agreed to be part of the Industry Advisory Group overseeing the project. Other senior representatives of Seafood companies who are involved or could be involved in post-harvest supply chain projects were added as the project evolved.

The industry representatives who therefore agreed to be part of the IAG were

- Brett Hogan, MD, Focus Fisheries

- John Harrison, CEO, WAFIC
- Erica Starling Indian Ocean Fresh
- Peter Jecks, MD, Abacus Fisheries
- Simon Little, Westmore Fisheries
- Ross Cammilleri, Owner, Fremantle Octopus
- Richard Buczak, Central Seafoods
- David Carter Austral Fisheries
- Drew Martin Sealanes
- Toby Abbot Kailis Bros.
- Bean Goh (Australia bay Seafoods)
- Phil Clarke (Mareterrum)
- Pete Manifis (chef)

3.3.2 Industry Projects and Partnerships

A summary table of the industry partnerships for research projects under FRDC 2013/711.20; .30 and .40 between 2015 and 2018 is summarised below (Table 2). Further specific detail on the individual research projects is provided in the aligned Final Reports for and corresponding appendices for FRDC 2013/711.30 and FRDC 2013/711.40.

Table 2: Summary of aligned FRDC 2013/711.30 and FRDC 2013/711.40 project activities since FRDC 2013/711.20 was funded

Company(s)	**Brief Description of Activity**
2013-711.40: SEAFOOD PROCESSING WASTE	
SAMPI (Southern Bluefin Tuna waste)	Assist with testing of new enzyme hydrolysis process. Research to understand market opportunities and requirements. Find alternative outcomes for bones and gill plates.
Ausab.	Drying of Greenlip Abalone shuckings for potential new product development (NPD)
Kinkawooka Mussels	Stock production by enzyme hydrolysis from out of specification Blue Mussels.
Austral Fisheries	On board treatment of Patagonian Toothfish waste, possible functional food and aquaculture outcomes for toothfish waste. Banana and Brown Tiger Prawn processing alternative options.
BIOMAX Pty Ltd	Biomax is a Singapore company with a new composting process that has produced potential protein feed replacement from Patagonian Toothfish, Snapper and Atlantic Salmon waste. In collaboration, assess process, products and investigate market applicability with feed producers.
Fremantle Octopus	Use for heads and offal, cooking validation trials
Aquabotanica	Drying of swim bladders from Barramundi and other species for the China market.
Small seafood retailers eg Sealanes	Cost effective alternatives for waste processing from small seafood

Company(s)	Brief Description of Activity
and Fins.	retailers.
Paspaley Pearls	Pearl adductor muscle food safety and quality optimisation research
Westmore Seafoods	Develop a Scampi roe product.
2013-711.30: UNDERUTILISED SPECIES	
South West and South Coast Australian Salmon license holders and processors, Focus Fisheries, Catalanos Seafoods, Central Seafoods	New opportunities for Australian Salmon
Savour-life	Expensive dog treats: trial with various underutilised species
MG Kailis, Westmore Seafoods, Catalanos, Endeavour Foods, Central Seafoods	New opportunities for underutilised species from the Pilbara Finfish Trawl
Australia Bay Seafoods, Catalanos	Research to decrease tough texture and develop new products for Saddletail Snapper.
Neil Dorrington, Glen Bosman, Southern Trading Aust.	NPD for Champagne Crabs
Multiple industry partners	High Pressure Pasteurisation (HPP) for value-add WA seafood products.
Pacific West Seafoods/Better Choice Seafoods	Ribbonfish for China (now being taken forward as FRDC 2016/224 with Ewan Colquhoun as PI)

Other new industry projects funded during the term of the project are listed below. Where marked with an asterisk final reports are commercial in confidence and available on request from Curtin University on request

- CRC 2014-704: Waste Transformation for the Catering Market.
- FRDC 2015-711: New directions in Australian seafood whole of chain traceability and supply chain technologies
- WA Department of Health (2015)*: Review of Biotoxin Risk for Western Australian Seafood Products.
- WA Department of Health (2016)*: Review of the WASQAP Management Plan for the Oyster Harbour growing area.
- FIAL (2016)*: New Product Development for tough Saddletail Snapper
- WAFIC (2016)*: Development of a Seafood School Education Program
- FRDC 2016-180*: Assessment of options for Virus affected carp
- FRDC 2016-261: Investigating the use of trace element profiles to substantiate provenance for the Australian prawn industry
- FRDC 2016-180: Workshop to implement a National Approach to Australian Salmon Market Development and Supply (Approved but not Contracted).

3.4 Objective 4: Communication of Results

Objective 4: Develop best practice/innovation in effectively communicating the results of the CESSH post-harvest research to the Australian seafood industry

Research project extension and communication activities undertaken by Dr Howieson and her team are summarised below:

3.4.1 Peer Reviewed Journal Articles.

Lawley M and Howieson J (2015) What Chefs Want When Buying Australian Seafood Journal of Food Products Marketing 21: 1-11.

Denham, F Biswas W., Solah, VA and Howieson, J (2016) Greenhouse gas emissions from a Western Australian finfish supply chain J of Cleaner Production 112: 2079-2087.

Fuentes-Amaya, L.F., Munyard S., J. Fernandez-Piquer J., and Howieson J. Sensory, Microbiological and Chemical Changes in Vacuum-Packaged Blue Spotted Emperor, Saddletail Snapper, Crimson Snapper, Barramundi and Atlantic Salmon Fillets Stored at 4 ºC. (2016) Food Science and Nutrition (in press)

Howieson, JR., Hastings K and Lawley M (2016): Value Chain Analysis: An iterative and relational approach for agri-food chains. Supply Chain Management: an International Journal. 21 (3) 352-362.

Hastings K, Lawley M and Howieson J (2016) Creating value chains: The role of relationship development (2016): British Food Journal. 118:1384-1406

Johns, C, Kimber, N., Howieson J. and Lawley, M (2016). Closing the loop with a Value Chain Analysis: Evaluating the outcomes of VCA-led improvement projects: a case study of an Australian prawn fishery. British Food Journal 118: 2997-3011

Siddik MAB, Howieson, J, Ilham, I Fotedar, R (2018).Growth, biochemical response and liver health of juvenile barramundi (*Lates calcarifer*) fed fermented and non-fermented tuna hydrolysate at high inclusion levels. P*eerJ* **6**, e4870, https://doi.org/10.7717/peerj.4870 (2018)

Siddik MAB, Howieson J., Partridge, G Fotedar, F. Gholipourkanani H (2018) Dietary tuna hydrolysate modulates growth performance, immune response, intestinal morphology and resistance to *Streptococcus iniae* in juvenile barramundi, *Lates calcarifer. Scientific Reports (2018) 8:15942* | DOI:10.1038/s41598-018-34182-4*i*

3.4.2 Conference Presentations

Howieson J (2015) 3rd National Workshop on Blue Swimmer Crab, CESSH Post-harvest research and extension update for the blue swimmer crab. Perth, June 2015 (invited).

Howieson J (2015) Turning Food Loss into Profit': Seafood. Turning Food Loss into Profit workshop, Canberra April 2015 (invited).

Howieson, J., Choo, K. and Tonkin, R (2015) New Opportunities for Seafood By-Products: An Australian Perspective. World Seafood Congress Grimsby September 2015.

Howieson, J., Jenkins, H., Hollamby, K., Colquhoun. E., Lawley, M., and Gallagher, J (2015) New Directions for the Australian Prawn Industry World Seafood Congress Grimsby September 2015.

Howieson J., Jecks, P. (2015) Reaching our End User: examples from the small seafood business world. Seafood Directions Perth, October (invited)

Howieson J., Colquhoun E. (2015) If we keep doing what we have always done…. Value creation in minor fisheries., Seafood Directions Perth, October (invited)

Howieson J. (2015) Prawn QA in Australia: A Whole of Chain Approach. WCAF, Qingdao November 2015 (invited)

Choo, K. Howieson, J. (2016) Fish Waste As A Potential Aquaculture Ingredient. Australia Asia Food Innovation Conference Perth February 2016.

Howieson J (2016) High Protein Opportunities for Seafood. AIFST National Conference, Brisbane, June 2016 (invited).

Howieson J (2016) Traceability and Provenance in Seafood: The Australian Context; International Conference on Emerging Issues in Quality and Safety of Shellfish. Chennai, India, 11-12th August 2016 (invited)

Choo, K. Howieson, J (2016) The role of enzymes in value-adding to seafood processing waste. Food Engineering Melbourne, November 2016.

Siddik, MAB; Howieson, J and Fotedar R. (2018) Suitability of using tuna hydrolysate from tuna, *Thunnusmaccoyii* processing industry as an alternative fishmeal protein source for juvenile barramundi, *Latescalcarifer* (bloch, 1790). World Aquaculture Congress, Netherlands

3.4.3 Industry Meetings and Other Workshop Presentations.

Western Australian Shellfish Industry and Stakeholders: Results of WA Biotoxin Risk Assessment (two workshops in 2015)

Wheat belt Science Forum (Years 6-9): Presentation to School students about Seafood Industry (6 x 1 hour presentation) (April 2015)

Science Teachers Association of WA: Sustainable Seafood (December 2015)

Home Economics Institute of WA: Teacher Professional Training Day: Seafood Chef Training Videos (December 2015)

Home Economics Institute of WA: Teacher Professional Training Day: Sustainability Seminar: Sustainable Seafood (May 2016)

Home Economics Institute of WA: Teacher Professional Training Day: WAFIC Schools Education Program (December 2016)

Home Economics Institute of WA: Teacher Professional Training Day: WAFIC Schools Education Program (December 2017)

Australian Council of Prawn Fishers (ACPF) Board meetings (2015, 2016, 2017, 2018): Summary of Projects

Love Australian Prawns Committee Meetings (2016, 2017): Summary of Projects

South Coast Salmon Annual Management Meetings (2015, 2016): Summary of Australian Salmon research.

WAFIC Board and WA RAC (2015 and 2016): Summary of CESSH Projects

National Carp Control Plan Workshops (2017; 2018): Options for Utilisation of Carp Biomass

WAFIC Improving Community Perceptions committee: Summary of School Education Program (2016, 2017).

3.4.4 Articles in Industry Magazines

SEAFOOD MAGAZINE (Seafood CRC):

A standardised Approach to Training (March 2015)
Optimising Prawn Quality and Market Value (June 2015)

FRDC FISH MAGAZINE

Market makeover for Australian Salmon (January 2015)
New Value from Seafood (September 2016)
Australian Seafood Traceability (March 2017)
Engineering New Seafood Opportunities (March 2018)
Options to make use of carp biomass (September 2018)

3.4.5 Media

Landline ABC TV program (Australian Salmon story) (May 2017, May 2018)
ABC Radio Interview Local seafood and /underutilised species (May 2015)
ABC On-Line Story Australian Salmon stocks are healthy but no-one's biting (May 2015)
ABC On-Line Story War on Waste: Australians ignoring cheap, sustainable fish over farmed and foreign varieties (May 2015)
ABC On-Line Story: Toothfish offal might be used in detergent (October 2016)
Carp (2016/180) media in April 2018.
Trace Metal Profiling (FRDC 2016/261) media in November 2018.

3.4.6 International Collaborations and Research Exchange

China 2015: ACACA technical Exchange, invited scientist. As part of ACACA funded trip to China, lengthy discussions with Chinese processing companies and scientists in regard to waste utilisation and supply chain management.

Singapore 2015: Lead Trainer: MRFD Seafood Cold Chain management training (ASEAN countries). *r* Howieson to lead the four day training workshop for representatives from each of the ASEAN countries in Nov 2015. Dr Howieson to have ongoing involvement in this three year project until late 2017.

Singapore 2017: Lead facilitator, Seafood Cold Chain Standard Development (ASEAN)

3.5 Objective 5: Reporting

Objective 5: Demonstrate professionalism and transparency in all reporting on research sub program activities.

3.5.1 Progress Review by IAG

An IAG review meeting scheduled for July 2015 was cancelled due to some key members being unable to attend. One-on-one sessions were therefore held in August 2015 with 7 Advisory Group members to review the research and work plan and develop new priorities. This review process included a presentation by Dr Howieson on the status of the various research projects being undertaken.

A further review and priority setting meeting was held on September 2nd 2016 again facilitated by Prof Ackermann using the computer consultative method. Attendees (Figure 2) are listed below:

- Phil Clarke, Phil Emory, Mareterram
- John Harrison, CEO, WAFIC
- Asher Flynn, Fremantle Octopus
- Pete Manifis, chef
- Toby Abbot, Kailis Bros.
- John Sharland, Endeavour Foods
- Steve Davies, MPA
- Paul Catalano, Catalano Seafoods.
- Daniel McRorey, SAMP/Fishtrade

Simon Little (Westmores), David Carter (Austral), Peter Jecks (Abacus) and Drew Martin (Sealanes) were apologies but were approached to provide individual feedback on the outcomes.

Figure 2: IAG meeting on Sept 2nd 2016 at WAFIC

Dr Howieson presented on the previous 12 months results and then the participants were asked to rate the nine activity areas under two scenarios:

a. Rated in terms of anticipated and realised commercial benefits at an individual company level.
b. Rated against the activity areas contribution to building a collaborative culture, embracing shared research projects and collaboration within the seafood industry

The ratings (most valuable to least valuable) under each of the activity areas are shown below.

Rated in terms of anticipated and realised commercial benefits (individual company)

- Value-added Seafood products
- Consumer/End-user Training/education
- Underutilised species (matching products to new markets)
- New Products from seafood processing waste

- Liaison/advice with stakeholders
- Traceability and Provenance
- Supply chain monitoring/ technology to improve performance
- Post-graduate and International Training
- Value chain analysis for “improvement projects”

Rated against the activity areas contribution to building a collaborative culture, embracing shared research projects and collaboration within the seafood industry

- Consumer/End-user Training/education
- New Products from seafood processing waste
- Underutilised species (matching products to new markets)
- Traceability and Provenance
- Value-added Seafood products
- Supply chain monitoring/ technology to improve performance
- Liaison/advice with stakeholders
- Post-grad and International Training
- Value chain analysis for “improvement projects”

Following the participants were asked to identify new priority areas of work- each participant gave 2-3 suggestions which resulted in 29 contributions. These suggestions were, following group discussion allowing the relationships to be captured, then subsequently clustered into activity areas (as illustrated through the ovals in Figure 3).

Following this, distinctive activity foci were identified and prioritised according to a) support in general – blue), b) support with resources allocated e.g. $, staff time, access to equipment/processing – green, and no support – red. The results are also shown in Table 1.

Table 1: Priority Activity and Levels of Support

Priority Activity	**Blue**	**Green**	**Red**	**total**
Busting the myth to the public sector on using frozen seafood	8	4	0	12
Stakeholder Networking Platforms/Mapping: Fishing, Processing marketing.	4	7	0	11
Industry staff development programs	5	6	0	11
develop tools to encourage more to eat seafood eg preparation of seafood	8	0	0	8
Basic skills training for chefs/home cooks, through the use of social media	5	3	0	8
more work with students at all levels	3	4	0	7
education - country of labelling	5	3	1	8-1
NPD R&D that includes launch strategy and Marketing	3	4	0	7
Utilisation of white fish and Salmon waste	3	3	0	6

assessment of quality control on products throughout supply chain	2	3	0	5
Cost reduction in Processing efficiency and viability	2	2	0	4
small-scale waste utilisation at restaurant and small operator level	0	3	0	3
More training on value add product and using underutilised species	2	1	0	3

The three priorities that emerged as clear front runners were identified (blue) and are noted below according to their preference score

- Stake Holder networking platform: Fishing, Processing, Markets
- Busting the myth to the public sector on using frozen seafood
- Industry staff development programs

It is noteworthy that there was a shift in the research/activity priorities from the first meeting towards collaborative research priorities that could be expected to provide whole of industry benefits whilst not compromising individual company aspirations.

Prof Ackermann, an international expert in strategy development, collaboration and mediation, is working with Dr Howieson and the results of these meetings in a theoretical context to identify key success factors and strategic imperatives in effective primary production consultation and collaboration, using the seafood industry as a case study.

At the conclusion of the project, in November 2018, a powerpoint summary of the outputs from 2013-711.20, 2013-711.30 and 2013-711.40 from 2015 to 2018 was distributed to twenty WA seafood industry stakeholders, including all those who were part of the IAG and other companies including Kailis Bros; Catalanos; Fins; Fishtrade; Southern Trading; Mendolias; Fremantle Octopus; OGA; Ausab; Augusta wild harvest abalone; Austral; Abacus; Southern Seafood; MPA; Blue Lagoon; Mareterrum; Westmore Seafoods; Australia Bay; Endeavour Foods; and Pete Manifis. The summary was also distributed though the WA RAC network by the Chair, Brett McCallum. It was decided to distribute a powerpoint summary rather than hold a formal meeting or distribute the written reports on advice from multiple industry stakeholders. Stakeholders could then request further detailed activity specific information/reports. This powerpoint summary is attached as Appendix 1.

As a result of this summary circulation a further 12 requests were received for project reports and positive feedback comments were received from IAG members and many stakeholders. Extension of the specific sector/product specific activities from FRDC 2013/711.30 and 2013/711.40 are discussed in more detail in the relevant Final Reports.

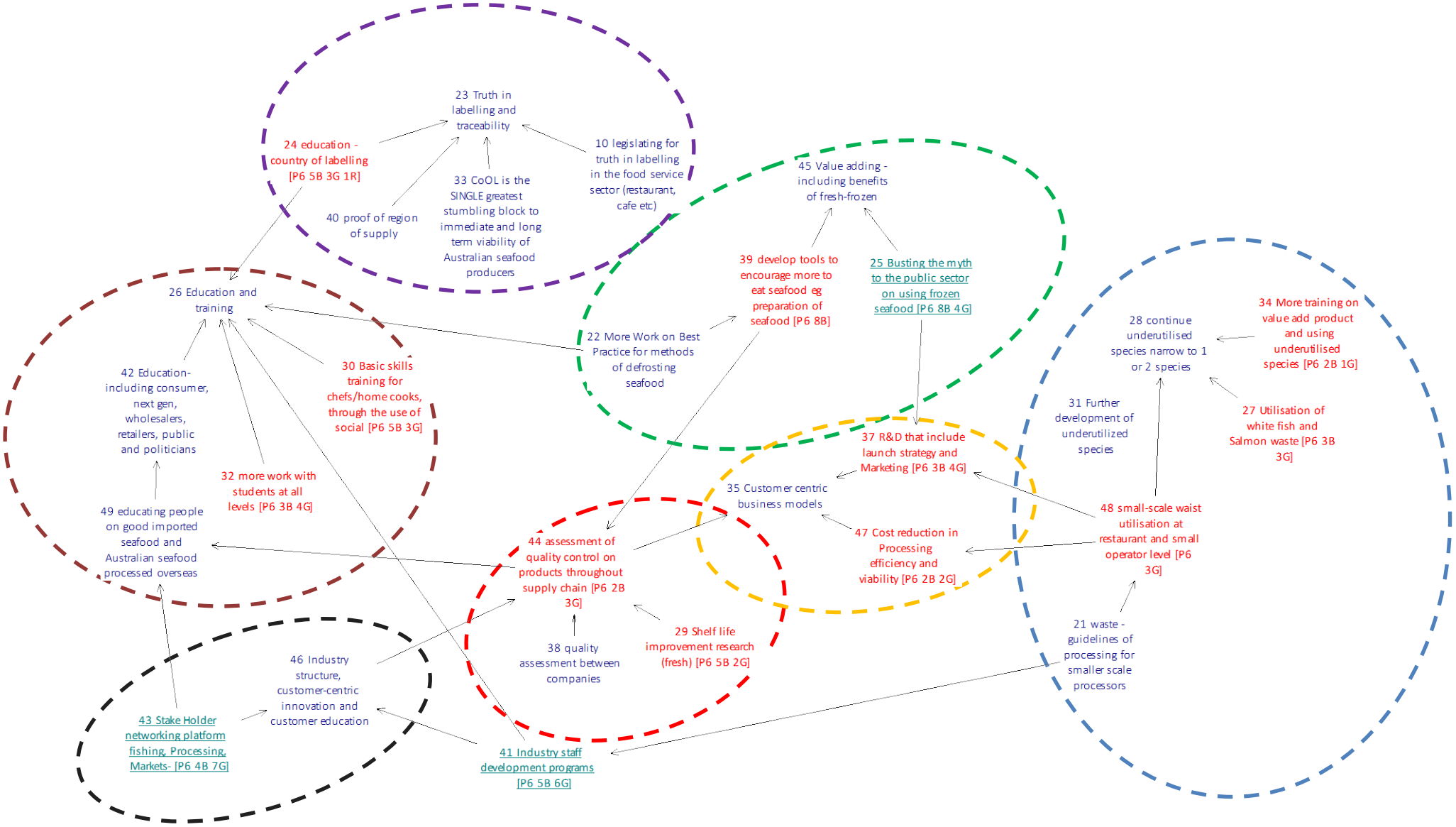


Figure 2: New research priorities from the September 2016 IAG workshop. .

4 Conclusions and Recommendations

This report summarises the activities of FRDC 2013/711.20 Centre of Excellence for Science, Seafood and Health (CESSH): Management, Communication and Network from 2015-2018, following the review and modification of the original CESSH application; FRDC 2013/711. This project, in association with the aligned projects 2013/711.30 (New Opportunities for Underutilised species and 2013/711.40) New opportunities for Seafood processing Waste) has resulted in >$1million allocated for five newly funded industry projects; eight early career scientists and 19 post graduate students trained in seafood post-harvest research; nine peer reviewed journal articles; 12 conference presentations; >20 presentations to industry and other stakeholder groups and at least eight new programs, products or processes commercialised.

Industry knowledge/interest in the post-harvest opportunities appeared to increase over the project with also a move by the Industry Advisory Group (IAG) towards prioritising collaborative, whole of industry priorities rather than company specific priorities. The project has also demonstrated that there is ongoing and various opportunities to leverage funding from other state and federal sources supporting food related research (for example Food Innovation Australia Limited (FIAL); Department of Health). Overall the results of this project, and the assessment by the IAG, did indicate that there is whole of industry support, appreciation and utilisation of an independent post-harvest seafood research capacity in Western Australia.

However, ongoing issues with prolonging the longevity of funding such a research centre were also identified through the project. These issues included;

a. Longevity will be enhanced if some ongoing core funding for senior staff rather than relying solely on external research grants will assist in longer term outcomes. Lack of long term security resulted in staff leaving to take up more permanent positions. However, the contrary view is that six to twelve months working in an aligned research centre is excellent training for a longer term future in an industry setting. Completion of post-graduate research projects reflect a similar ideal training opportunity.

b. The current competitive research funding situation challenges the development of a national collaborative research capacity in post-harvest seafood research. Options may be to agree to respect and support specific capacity in one organisation (a working example is Safefish in SARDI whereby core funding is provided by the host institution and external research funding targeted for specific project), or to deliver research in an agreed collaborative manner. It is suggested that a successful national model of post-harvest seafood collaboration would need to be developed under the leadership of and in conjunction with the major funders.

c. Commercialisation of post-harvest seafood research, even when the business case is positive, is often challenged by external factors such as supply, changing markets and business restructures. These challenges and recommendations are detailed in the aligned project reports 2013/711.30 and 2013/711.40, and should be taken in consideration when evaluating project outcomes. One solution to increase the commercialisation outcomes from research, has been an expectation of industry cash contribution as part of research funding applications. However, perhaps such contributions should be evaluated pending the ability of the company to provide cash: a concern is research effort being directed more towards the larger companies and away from smaller operations.

Due to no longer meeting the parameters for an independent research centre at Curtin University, and following a restructure, the activities of the CESSH have now been folded into the Discipline of Agriculture

and Food, School of Molecular and Life Sciences, Faculty of Science and Engineering. Some core funding by a three year contract has been provided to Dr Howieson This restructure facilitates direct working relationships with Aquaculture, Fisheries Science, Agriculture and Food Science Curtin University academics, enabling the benefits of a whole of chain approach and expertise within the post-harvest seafood research effort. Therefore Curtin University staff will continue to provide the research service to the seafood industry as outlined in this report.

Appendix 1: Power-point Summary of Outputs

AUSTRALIAN SEAFOOD COOPERATIVE RESEARCH CENTRE

Australian Government
Fisheries Research and Development Corporation

Centre of Excellence for Science Seafood and Health (CESSH) (2015-2018) (FRDC 2013/711.20., .30 and .40).

Summary of Activities (2015-2018)

Dr Janet Howieson (Curtin University)

WAFIC
WESTERN AUSTRALIAN FISHING INDUSTRY COUNCIL INC

CESSH
CENTRE OF EXCELLENCE SCIENCE SEAFOOD HEALTH

FRDC 2013/711: CESSH (History and Background)

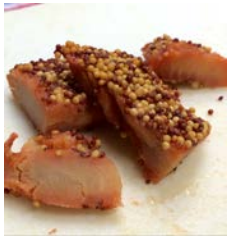
- CESSH formed in 2008 as part of Seafood CRC
  - Major Programs: Seafood and Health, Seafood Supply Chain Improvement, Education and Training (2008-2015 ~$3 million in CRC funding).
- In 2014 CRC 2013.711 was funded to continue CESSH as "legacy" project ($1.4 million from 2014-2016 from WAFIC/FRDC/CRC/Curtin) (6 sub-programs).
- February 2015 (CESSH review): 2013/711 rewritten with Seafood and Health removed from Programs
  - *2013/711.20: CESSH: Staff, Training, Communication and Network)*
  - *2013/711.30 : New Opportunities for Underutilised species*
  - *2013/711.40 New Products from Seafood Processing Waste*
- *FRDC Milestone Reporting requires final industry review of the sub-projects.*

FRDC 2013.711.30: New Opportunities for Underutilised species.

OUTPUTS (detailed reports available for interested WA industry members).

1. Australian underutilised species database listing information on 107 species classified as underutilised based on parameters of price; level of unharvested quota; market appeal

2. Australian Salmon (*Arripis trutta*): Quality, Yield And Value-Added Product Considerations
And
Options for Western Australia's Commercial Australian Salmon Fishery.



FRDC 2013.711.30: New Opportunities for Underutilised species.

OUTPUTS (detailed reports available for WA industry members).

3. Development of New Opportunities for Underutilised Finfish from the Pilbara Trawl.

4. Saddletail Snapper (*Lutjanus malabaricus*) Texture Investigation: Opening New Markets With Enzyme Treatment

5. Champagne/Spiny Crabs (*Hypothalassia acerba*): Yield and Sensory Considerations

6. High Pressure Pasteurisation (HPP) Trials for Western Australian Seafood Product (finfish; prawns; marron; crab; abalone; mussels; oysters).

FRDC 2013.711.40: New Opportunities from Seafood Processing Waste

OUTPUTS (detailed reports available on request for industry members).

1a. Literature review of opportunities from seafood processing waste.
1b. Audit of seafood processing waste production in Australia.

2. Improved Hydrolysate Production from Tuna Waste (SAMPI)
3. Options for Tuna bones from SAMPI hydrolysate process.
4. Investigation of on board strategies to Transform Patagonian Toothfish waste.

5. Strategies for Potential Utilisation of Aquacultured Abalone Waste.

FRDC 2013.711.40: New Opportunities from Seafood Processing Waste

OUTPUTS (detailed reports available for WA industry members).

6. Optimisation of Mussel Stock Production using 2nd Grade Mussels.

7. Scampi Roe Product Development

8. Optimisation of Fresh and Frozen Pearl Meat Adductor Muscle Quality

9a. Dehydration of Air Bladders from Different Species to Produce Fish Maw.

9b. Optimisation of Processing to Produce Dried Barramundi Swim Bladders.

.

FRDC 2013.711.40: New Opportunities from Seafood Processing Waste

OUTPUTS (detailed reports available for industry members).

10. Small Seafood Retailers: Waste Survey and Treatment Options.

11. Cost Benefit Framework for Understanding Economic Opportunities from Seafood Processing Waste.

FRDC 2013.711.20:Training, Communication, Networks

OUTPUTS: Training/People Development in Seafood Research and Extension

a. Mentoring Young Graduated Scientists
8 young scientists employed from 2015-2018

b. Training and School education resources
WAFIC: Home Economics Institute of Aust (seafood education resources, PD training and School programs developed for Home Economics teachers and students (vocational and TER).
Presentations to Science teachers, and Wheatbelt science forum

c. Post-Graduate Research Supervision in Seafood Related Research
(2 Honours, 4 PhD and 7 Masters students) (project summaries available on request)

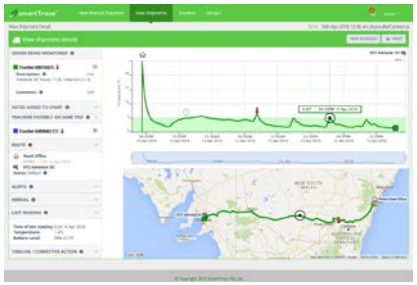
d. Domestic and International Communication of Research
magazine articles; conferences, industry meetings

FRDC 2013.711.20:Training, Communication and Networks

OUTPUTS: Advice to Industry

a. Contracted by Department of Health to Undertake Risk Assessment for Biotoxins in WA Seafood and to Review the Shellfish Management Plan for Oyster Harbour.

b. Part or Whole of supply chain monitoring/technology addition to improve performance *(real time temperature and location monitoring)*



c. Seafood Industry Participation in Fight Food Waste CRC.
d. General advice to industry and regulators on seafood related matters.

FRDC 2013.711.20:Training, Communication and Networks

OUTPUT: Develop New Seafood Industry Research Projects with Industry

FRDC 2014/704: Waste Transformation for the Catering Market (Report on Request).

FRDC 2015.711 New Directions in Australian seafood whole of chain traceability and supply chain technologies (Report on request)

Food Industry Innovation Ltd (FIAL) (2016) NPD for “tough” saddletail snapper

WAFIC (2016) Development of a School Education Program focusing on Seafood

FRDC 2016.180: Assessment of options for Virus affected carp

FRDC 2016.261: IPA ACPF, IPA APFA: Investigating the use of trace element profiles to substantiate provenance for the Australian prawn industry

FRDC. 2016/180: Workshop to implement a National Approach to Australian Salmon Market Development and Supply (Approved but not Contracted).

FRDC 2018/125 Processing Innovation to Produce Novel, Investment Ready, WA Seafood Products (Approved but not Contracted)

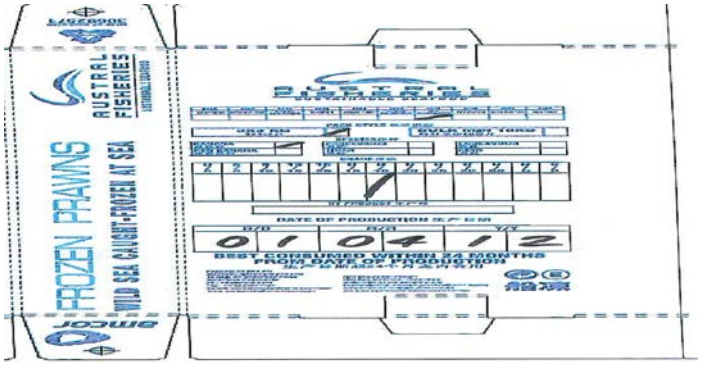
CRC 2014/704: Waste Transformation for the Catering Market

1. Extraction of Mince from finfish frames (Atlantic Salmon, Patagonian Toothfish, Pink Snapper), crustacean extracts (raw crab; lobster legs) and underutilised species (leatherjacket/shark)
2. Cold set binding of extracted mince to form “fish cakes”

3. High Moisture extrusion of (lower quality) mince extracted from finfish frames (partially successful)
4. Recipe Development and Testing (Laboratory and Pilot Commercial Scale)
5. Eight new “investment-ready” or close to “investment ready” products from finfish and crab processing waste.

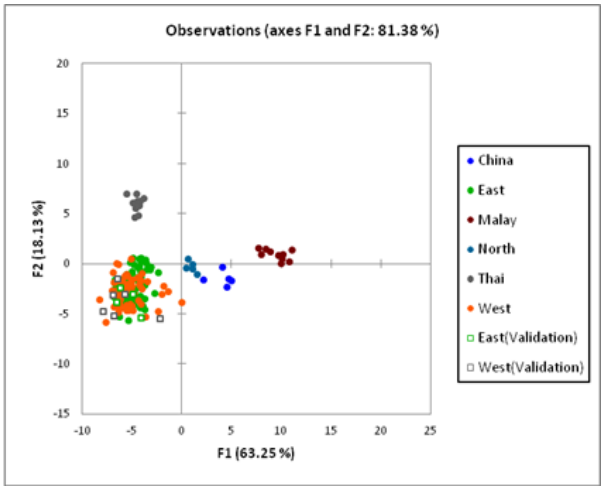
FINAL REPORT AVAILABLE ON REQUEST.

FRDC 2015/711: Whole of Chain Electronic Traceability: Trialling RFID traceability systems in the NPF (report available on request)



FRDC 2016/261 Determining Geographical Provenance based on Trace Metal Profiling (ACPF/APFA)

LOVE AUSTRALIAN PRAWNS



THANKS

Happy to chat about any aspects in person or by phone, or forward relevant reports.

Happy to take any comments about any aspects of the project and outcomes as it will assist in developing better, industry relevant post-harvest research programs.