



Department of
Primary Industries

Aquaculture Research Advisory Committee

Annual Report

July 2016 to June 2017

Professor Ian White (Chairperson)

Ms Jo Pickles (Executive Officer)



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Aquaculture Research Advisory Committee Annual Report 2016/17

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Foreword

This is the ninth Annual Report for the Aquaculture Research and Advisory Committee (ARAC). The Minister for Primary Industries approved the formation of the Aquaculture Research Advisory committee in October 2005 to provide advice on industry contributions and R&D expenditure for all aquaculture industries in NSW. ARAC's establishment was confirmed in 2006 after the completion of a NSW Government review of Boards and Committees. ARAC has replaced the Oyster Research Advisory Committee (ORAC) and the former Advisory Council on Aquaculture (ACoA).

ORAC was formally disbanded after its meeting in December 2005.

Contents

Chairperson Report.....	1
The Committee	2
Terms of Reference.....	2
Membership and Selection Process.....	2
Deputy Members	3
Committee Members in 2016/17	3
Meetings.....	4
Disclosure of Pecuniary Interests	4
Trust Accounts for the 2016/17 Financial Year.....	5
Advice on Level of Contribution	5
Advice on Level of Expenditure	5
Levy Collection	5
Expenditure Purpose and Level.....	6
Forward Budget.....	8
Recommendation on Level of Contribution	9
Aquaculture Permit Holders in NSW	9
List of Activities	10
Aquaculture Research and Development currently being undertaken by NSW Department of Primary Industries	16
Oyster Research and Development currently being undertaken in Australia	18
Aquaculture Research and Development currently being undertaken in Australia.....	22

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Chairperson Report



The above photo encapsulates the essence of aquaculture in NSW; seafood grown in pristine, regional waters using the latest technology in a beautiful, protected environment. Over the past 22 years I have been privileged to be part of an evolving aquaculture industry. Changes have been dramatic. Some have been externally forced, such as changing markets, environments, regulations, extreme events and disease outbreaks. Others arose from industry, particularly adoption of new technologies, uptake of research and implementation of institutional reforms. At the start of my involvement, there was considerable scepticism about the value of research to the industry. The introduction of new technologies, the risks posed by emergent diseases and a growing spirit of innovation have led to a broader appreciation of the contribution that research has made and continues to make to a viable, profitable and increasingly innovative industry.

During 2016/17, ARAC revised its Research Development and Extension (RD&E) Strategic Plan for the next 5 years. The framework for the plan, an 'input – output - outcome' model of investment, covers: Primary Production; Post-harvest and Market Development; Communities; People; and Adoption. It provides key performance indicators and suggested percentage investment targets for each category as well as sectoral priorities within the industry. ARAC's intention is to help guide the development and implementation of targeted RD&E to support the NSW aquaculture industry.

The plan shows that the total value of aquaculture produce sold in NSW in 2015/16 was nearly \$66M, an increase of nearly 34% in value since 2005/6. Since this decade includes the global financial crisis, this average annual increase of 3.4% per year is significant. The outbreak of Pacific Oyster Mortality Syndrome in Tasmania and the impact this has had on the South Australian Oyster industry means that there is a window of opportunity for the NSW industry, with expectations of increased value of product, provided lessons from the past and relevant research are heeded.

The spirit of co-operation in ARAC between industry members, departmental representatives and researchers is exemplary. The successes of ARAC are due to the dedication and selfless contributions of farmer members and to the professionalism and dedication of Departmental staff and researchers. ARAC is indebted to the Minister and NSW Primary Industries, the NSW Food Authority, OceanWatch, and the FRDC for their support and encouragement of sustainable and profitable aquaculture. It is a great pleasure to present this report on activities of the NSW Aquaculture Research Advisory Committee.

Emeritus Professor Ian White FTSE
CHAIR ARAC

The Committee

The Aquaculture Research Advisory Committee (ARAC) was established in October 2006 and held its inaugural meeting on 31 January 2007.

ARAC is a statutory committee that advises the Minister on the amount of contributions payable by the NSW aquaculture industries into trust accounts for aquaculture research and development and the expenditure of those trust funds. The NSW prawn aquaculture industry is not included as it pays research levies directly to the Commonwealth.

ARAC is established under Section 157 of the Fisheries Management Act 1994..

Terms of Reference

- 1 Investigate and evaluate the requirement for aquaculture research and development in NSW, after consultation with NSW aquaculture industries and with reference to NSW, Australian and overseas experience, and whether funded by the Fisheries Research and Development Corporation or otherwise;
- 2 Revise as appropriate research and development plans for NSW aquaculture research and development and promote it to the wider research community;
- 3 Advise the appropriate NSW Fisheries Research Advisory bodies and the Fisheries Research and Development Corporation on NSW aquaculture research and development matters and priorities;
- 4 Advise the NSW Minister for Primary Industries on the level of funding from industry required for aquaculture research and development in NSW and on its expenditure.
- 5 Oversee the management of annual contributions for aquaculture research collected under Section 156 of the Fisheries Management Act 1994, and placed in separate trust accounts under Section 157 of the Fisheries Management Act 1994.
- 6 Report on a regular basis, including an Annual Report based on a financial year, to the NSW aquaculture industry, the NSW Minister for Primary Industries and NSW researchers on aquaculture research and development initiatives;
- 7 Facilitate the dissemination, adoption and commercialisation of the results of aquaculture research and development; and
- 8 Promote aquaculture research and development in NSW.

Membership and Selection Process

The Fisheries Management (Aquaculture) Regulation 2012, schedule 1 provisions relating to members and procedure of committee, section 2, states:

- 1 The Minister may convene a selection committee (including representatives of the aquaculture industry) for the purpose of recommending persons for appointment as members of a committee.
- 2 The Chairperson of a committee is to be the member of the committee for the time being appointed by the Minister as Chairperson.
- 3 Section 157 (7) of the Act requires the Minister to ensure that a majority of the members of the committee are representatives of the aquaculture industry.

Industry members of ARAC are appointed by the Minister through a competitive selection process from Aquaculture Permit holders who have submitted expressions of interest to join the committee. A selection committee is appointed, comprised of a representative from the NSW Farmers Association, one representative from the Seafood CRC and the NSW Department of Primary Industries (Fisheries Division). Industry members are selected on merit.

The Chairperson is appointed to the committee by the Minister.

To aid the committee with their function, NSW Department of Primary Industries personnel attend meetings and undertake the role of facilitator and secretariat.

Deputy Members

The Fisheries Management (Aquaculture) Regulation 2012, schedule 1 provisions relating to members and procedure of committee, section 3, states:

- 1 The Minister may, from time to time, appoint a person to be the deputy of a member, and at any time revoke any such appointment.

Committee Members in 2016/17

Member			
Prof Ian White	Independent Chair	Oct 2006	Sept 2018
Ms Milada Safarik	Industry	Oct 2009	Sept 2018
Mr Tony Troup	Industry	Oct 2009	Sept 2018
Mr Russell Sydenham	Industry	Mar 2012	Sept 2018
Dr Matthew Wassnig	Industry	Sept 2012	Sept 2018
Ms Jessica Zealand	Industry	April 2014	Sept 2018
Ms Anne Loftus	Industry	Sept 2015	Sept 2018

There are six members on ARAC, four lease-based (oyster) representatives and two land-based (non-oyster) representatives, which reflects the relative sizes of the industry sectors in NSW. All members of ARAC, including the independent Chairperson, are appointed for a term of three years.

Dr Wayne O'Connor (Research Leader, Aquaculture), Dr Michael Dove (Research Scientist, Molluscs), Mr Ian Lyall (Manager, Aquaculture) and Dr Debra Doolan/Mr Ben Rampano or Dr Jeffrey Go (Aquatic Biosecurity Officer/Veterinary Officer, Aquatic Biosecurity and Risk Management) from NSW Department of Primary Industries sat as observers on the Committee for 2016/17. Ms Jo Pickles from NSW Department of Primary Industries is the Executive Officer. Mr Anthony Zammit or Mr Phil Baker (NSW Food Authority) also sat as an observer.

Meetings

Three meetings were held during the financial year 2016/17:

Member	21 July 2016	10 November 2016	4 May 2017
Prof Ian White	✓	✓	✓
Ms Milada Safarik	✓	✓	✓
Mr Tony Troup	✘	✓	✓
Mr Russell Sydenham	✘	✓	✓
Dr Matthew Wassnig	✘	✓	✓
Ms Jessica Zealand	✓	✘	✘
Ms Anne Loftus	✓	✓	✓
NSW DPI			
Dr Wayne O'Connor	✓	✓	✓
Dr Michael Dove	✓	✓	✘
Mr Ian Lyall (or rep)	✓	✓	✓
Dr Jeffrey Go	✓	✓	✘
Mr Anthony Zammit (or rep)	✓	✓	✓
Ms Jo Pickles	✓	✓	✓

Disclosure of Pecuniary Interests

Schedule 1 of the Fisheries Management (Aquaculture) Regulation 2012 sets out provisions relating to members and committee procedure. Clause 8, sub clause 1 states a member of a committee:

- a who has a direct or indirect pecuniary interest in a matter being considered or about to be considered at a meeting of the committee, and
- b whose interest appears to raise a conflict with the proper performance of the member's duties in relation to the consideration of the matter

must, as soon as possible after the relevant facts have come to member's knowledge, disclose the nature of the interest at a meeting of the committee.

No pecuniary interests were declared in this financial year.

Trust Accounts for the 2016/17 Financial Year

Advice on Level of Contribution

Section 156 of the Fisheries Management Act 1994 states a permit holder is required to contribute to the cost of administration or research or to other industry costs. Under section 157(4) of the Fisheries Management Act 1994 the Minister is to appoint a committee of persons to advise the Minister on the amount of contributions payable into any trust account. Research contributions made by the aquaculture community (excluding the prawn industry) are reported to the Minister by ARAC.

Research contributions from the oyster industry have been set at \$37.00/ha/year. The amount of research contributions billed for 2016/17 was \$127,380.00.

Research contributions from the non-oyster aquaculture industry have been set at \$28/ha/year or \$134 for a minimum of 5 ha/year. The amount of research contributions billed for 2016/17 was \$21,451.00.

The required annual contribution to the Fisheries Research Development Corporation is calculated at 0.25% average gross value of production (AGVP), based on three year rolling calculations. The contribution from the oyster industry for 2016/17 was \$85,460.00 (\$96,454.00 less the fee waiver of \$10,994.00). The contribution from the non-oyster aquaculture industry for 2016/17 was \$23,086.00 (\$26,988.00 less the fee waiver of \$3,902.00).

Advice on Level of Expenditure

Section 156 of the Fisheries Management Act 1994 states a permit holder is required to contribute to the cost of administration or research or to other industry costs. Under section 157(4) of the same Act the Minister is to appoint a committee of persons to advise the Minister on the expenditure of money in the trust account.

Levy Collection

Billing is conducted on the financial year and permit holders have the option of paying in full by 30 September or by quarterly instalments at 30 September, 31 December, 31 March and 30 June of that year.

Money held in the NSW Department of Primary Industries Crown Trust Account does receive interest.

Expenditure Purpose and Level

The allocated expenditures for the 2016/17 financial year are outlined below:

ARAC Revenue and Expenses – 1 July 2016 to 30 June 2017 WBS E116-1 Oyster Research Levy	Credit	Debit
Revenue		
Carry forward balance 30.06.2016	146,878.00	
Research Contributions billed 01.07.2016 to 30.06.2017 (with fee waivers from 2015/16 deducted)	127,380.00	
Total Revenue	\$274,258.00	
Expenses		
Internal Transfer to Committee Account		14,701.00
FRDC Contribution (reduced by fee waivers for research)		85,460.00
SOC Co Let's Get Ready to Rumble (\$10,000 over two years)		5,000.00
Bad debts		563.00
Total Expenses		\$105,724.00
Balance of Cost Centre as at 30.06.2017	\$168,534.00	

Note: Interest calculated on prorata basis: \$5,095

ARAC Revenue and Expenses – 1 July 2016 to 30 June 2017 WBS E119-1 Aquaculture [non-oyster] Research Levy		
Revenue		
Carry forward balance 30.06.2016	66,743.00	
Research Contributions billed 01.07.2016 to 30.06.2017 (with fee waivers from 2015/16 deducted)	21,451.00	
Total Revenue	\$88,194.00	
Expenses		
Internal Transfer to Committee Account		7,351.00
FRDC Contribution (reduced by fee waivers for research)		23,086.00
Total Expenses		\$30,437.00

Note: Interest calculated on prorata basis: \$858

ARAC Committee Expenses – 1 July 2016 to 30 June 2017 WBS D2492-1		
Revenue		
Carry forward balance 30.06.2016	0	
Transferred from Oyster Trust account (E116-1)	14,701.00	
Transferred from Non-Oyster Trust account (E119-1)	7,351.00	
Total Revenue	\$22,052.00	
Expenses		
Travel		12,236.00
Committee Fees		7,990.00
Consumables		1,554.00
Total Expenses		\$21,780.00

Notes

Project 116 (=E116 + AT116)

Revenues as presented in Aquaculture Trust Co. 1050 Project AT116. (This is initially collected in Co 1000, and transferred monthly to the Trust in accordance with Trust policy)

Expenses as per DPI Co 1000 Project E116. Expenses are not transferable to the Trust.

Interest earnings are credited to the Trust PC, not individual project.

Interest Calculation 4% x 16/17 Research Contribution \$127,380 = \$5,095.20

Project 119 (=E119 + AT119)

Revenues as presented in Aquaculture Trust Co. 1050 Project AT116. (This is initially collected in Co 1000, and transferred monthly to the Trust in accordance with Trust policy)

Expenses as per DPI Co 1000 Project E116. Expenses are not transferable to the Trust.

Interest earnings are credited to the Trust PC, not individual project.

Interest Calculation 4% x 16/17 Research Contribution \$21,451 = \$858.04

D2492 Committee Expenses Co 1000 Project D2492

Annual Committee Expenses are paid directly from Committee Project D2492. The annual Expense total is reimbursed from Oyster and Non Oyster Accounts E116 and E119 accounts at 67% and 33% respectively. (Journal processed in June each year)

There is no Balance c/fwd on this account .

Forward Budget

ARAC Revenue and Expenses – 1 July 2017 to 30 June 2018 Oyster Research Levy	Credit	Debit
Revenue		
Balance carried forward 30.06.2017	168,534.00	
Research Contributions billed 01.07.2017 to 30.06.2018	133,980.00	
Total Revenue	\$302,514.00	
Expenses		
ARAC Committee Expenses (internal transfer)		8,000.00
FRDC Contribution (estimate)		90,000.00
SOCo Let's Get Ready to Rumble (second payment)		5,000.00
Travel and associated costs for 1 ARAC member to represent on RAC		500.00
Total Expenses		\$103,500.00
Balance of Cost Centre as at 30.06.2018	\$199,014.00	

ARAC Revenue and Expenses – 1 July 2017 to 30 June 2018 Aquaculture [non-oyster] Research Levy		
Revenue		
Balance carried forward 30.06.2017	57,757.00	
Research Contributions billed 01.07.2017 to 30.06.2018	21,011.00	
Total Revenue	\$78,768.00	
Expenses		
ARAC Committee Expenses (internal transfer)		4,000.00
FRDC Contribution (estimate)		25,000.00
Travel and associated costs for 1 ARAC member to represent on RAC		500.00
Total Expenses		\$29,500.00

ARAC Committee Expenses – 1 July 2017 to 30 June 2018		
Revenue		
Balance carried forward 30.06.2017	0	
Internal transfers	12,000.00	
Total Estimated Revenue	\$12,000.00	
Expenses		
Travel		7,000.00
Committee Fees		4,500.00
Consumables		500.00
Total Estimated Expenses		\$12,000.00

Recommendation on Level of Contribution

On 31 January 2007, the Committee agreed the oyster research levy should increase to \$35.00/ha/yr from \$29.00 as this amount was insufficient to maintain the contribution to FRDC at 0.25% of AGVP and operate ARAC. Letters were then written to lease-based farmers explaining the reasons for the increase. An amendment in the Regulation Review was prepared and approved to raise the levy which came into effect 2008/09. The Committee has agreed that levies be reviewed on an annual basis at the first meeting in the calendar year.

Aquaculture Permit Holders in NSW

In NSW, aquaculture occurs in fresh, estuarine and marine waters. There are several classes of aquaculture permits that are issued for the different types of aquaculture, with some farms having more than one permit. Most forms of aquaculture include Intensive farming; when the species being grown is given specially prepared feeds and Extensive farming; when the natural ecosystem of the water provides feed for the species grown.

As at June 2017, there were 287 lease-based permits (primarily involved in oyster production) and 126 land-based aquaculture businesses that have 195 permits between them authorising extensive and intensive (leases), fishout, hatchery and intensive land based activities.

List of Activities

- ARAC invited Andy Myers to attend our meeting in July 2016 as an 'observer'. Andy is a part-time Extension Officer for the oyster industry that has been funded through the Local Landcare Coordinators Initiative and Oceanwatch (until mid 2019). ARAC strongly support extension activities and encourage farmer interaction.
- Steve McOrrie has a number of historic photos of the NSW Oyster Industry and arranged for some of the key photos to be digitized to ensure their survival, while a small number have been reprinted and displayed at the PSFI in the main entry way. The photos are on the ARAC webpage: www.dpi.nsw.gov.au/fishing/aquaculture/committees/arac
- The NSW DPI Aquatic Biosecurity team updated the Committee on a number of items, namely:
 - In 2016, there was a detection of Epizootic Ulcerative Syndrome (EUS) or Red spot disease in a Murray Cod facility in the Darling River. The source was not determined and no further outbreaks were noted.
 - A number of enquiries were made regarding the cultivation of black-lipped oysters in NSW. The Committee recognise the value of diversification, but care needs to be taken in regards to disease and a risk assessment is needed.
 - In 2016, farmers were asked to remain vigilant regarding detection of the POMS virus from a single oyster on a barge in Port Adelaide (the barge was immediately dry docked and isolated in an EPA approved facility). South Australia's 'POMS-free' status has been maintained.
 - Jeffrey Go attended the Aquaculture in the Murray Darling – Conference and Trade Show held in Griffith over 2 and 3 September 2016. Priority aquatic animal health issues impacting Murray Cod were discussed and a Fish Health Workshop was held.
 - POMS research is ongoing at EMAI with a laboratory infection model to assist in the selection and development of OshV-1 resistant Pacific oyster genetic.
 - CRC-P funding will be used for further investigation of potential causes of winter mortality in Sydney rock oysters and investigators will seek assistance from farmers re live affected samples.
 - Biosecurity NSW is proposing research with the Australian Animal Health Laboratory (AAHL) and Qld Dept of Agriculture and Fisheries (QDAF) to investigate the effects of thermal stress on decapod crustaceans (species to be determined) infected with White Spot Syndrome Virus (WSSV), the causative agent of White Spot Disease (WSD). The experiments will be conducted at Elizabeth Macarthur Agricultural Institute with research aiming to contribute to health screening of prawns prior to translocation for aquaculture, determine species that are susceptible to WSSV and WSD, possible alternative species for aquaculture production and risk based management of WSSV in NSW.
- ARAC provides a representative to the Research Advisory Committee (RAC) (formerly known as the FRAB) on a rotational basis. One of the RAC's key roles is to provide advice to FRDC on research proposals. Dr Matthew Wassnig has represented ARAC since late 2014 and provided our Committee with information relating to the FRDC restructure (that took place in early 2016) and the direction for the new RACs (formerly known as the FRABs).
- The Marine Waters Sustainable Aquaculture Strategy is being developed to investigate aquaculture opportunities along the coast. NSW DPI has already developed OISAS and the Land Based Aquaculture Strategy, however, this strategy will seek to support seapens, longline farming, ranching and artificial reefs.

- The NSW Aquaculture Association (NSWAA) raised the risk to Australia from illegally imported Exotic Mexican Dwarf Catfish to the Federal Minister for Agriculture and Water Resources. Unfortunately, the response was not favourable and ARAC wrote to the Minister for Primary Industries raising the issue in relation to disease and biosecurity threats to protect our aquaculture industry. The national AQUAPLAN document states there is a need to protect against ornamental species and this exotic species has the potential to bring crayfish plague to Australia.
- Minor Use Permits (MUPs) for the legal use of chemicals for aquaculture remains an unresolved issue, though an important issue nationally. The Australian Pesticides and Veterinary Medicines Authority (APVMA) administer a permits scheme that allows for the legal use of chemicals for aquaculture. Industry requires MUPs and there are trade implications without them. NSW DPI and education facilities such as schools, TAFE's and Universities require MUPs. The issue was raised with the national Aquaculture Committee to seek a resolution.
 - Ian Lyall advised there are still issues with obtaining approvals and establishing an equitable renewal/holding system for authorisations. This is exacerbated by different legislation between states. There needs to be coordination on a national basis for the approval and renewal process to ensure regulation and an equitable outcome for industry.
- Wallis Lake oyster farmers sought research on why growth rates in their estuary are declining. NSW DPI funded an extension of the NSW Oyster Strategy consultancy brief to better understand the productivity decline in Wallis Lake (in 2015). The review identified: productivity decline; production systems; marketing and training, access to business support and intra-industry collaboration as key areas that need attention.
 - A working group was established to investigate possible causes for the poor oyster performance at the major nursery areas. The working group includes representatives from NSW DPI, Great Lakes Council, Local Land Services, Office of Environment & Heritage (OEH), Wallis Lake commercial fishers and the Wallis Lake oyster industry.
 - Wallis Lake has been experiencing poor oyster growth since 2011 with production falling by around 40% by 2015.
 - In April 2016 Wallis Lake oyster farmers have, in cooperation with NSW DPI, commenced a trial of alternative farming methods at two poorly performing nursery sites. The objective was to determine if these methods offer a commercially viable alternative to currently used poorly performing post and rail lease infrastructure in these areas.
 - NSW DPI is committed to working with Wallis Lake farmers and assisting them. Mike Dove advised there are hydrological issues in the lake; with farmers asking why doesn't the lake drain like it used to; dredging used to occur but it doesn't now. One of the issues is that oysters are not getting out of the water on low tide. Are flexible farming techniques better suited than solid structures?
 - While data is constantly being assessed on oyster performance, growth and survival, it substantiates a decline in production in Wallis Lake compared to Port Stephens and the Clyde. Results of the trial should be available in late 2017.
- FRDC and NSW DPI funded research undertaken by Dr Mike Rimmer into the R&D requirements for Murray Cod production. Dr Rimmer presented his findings at the Aquaculture in the Murray Darling – Conference and Trade Show held over 2 and 3 September 2016 in Griffith. Over 120 delegates from all States and thirteen trade exhibitors attended. The conference focused on freshwater fish farming, in particular the rapidly growing Murray Cod sector. NSW DPI supported the Freshwater Native Fish Association and NSW Aquaculture Association to host the conference, which included a trade show, fish health training session and farm visits.

- Concerns were raised about logging in the catchment and the runoff into Wonboyn Lake and the effect on oyster farming. An independent soil scientist found this is a rare clay based soil and the sediment does not breakdown. The soil creates major water quality issues after rainfall. Forestry are logging 350 km² in that area and Wonboyn Lake is 6 km inland from the sea and so the runoff is not easily dispersed.
 - This item was referred by ARAC to Shellfish Committee who, after considering the draft reports from the EPA and Forestry Corporation, have written to both organisations recommending *'that water quality objectives established by the NSW Government and NSW Oyster Industry should be incorporated into the regulations/best practice guidelines of NSW Forestry (outlined in Table 4 of OISAS)'*.
 - ARAC would like to see better buffer zones from roads and waterways to minimize the effects on marine and coastal industries.

- Updates on new research were provided to the Committee, namely:
 - The CRC-P Future Oysters bid has been successful in securing \$3 million of federal funding to advance a number of industry related issues. NSW DPI will continue to assist ASI in the development of the POMS resistance in Pacific oysters as well as accelerating the SOCo breeding program, oyster disease issues, tetraploid technology for SRO and improving spawning technology.
 - In partnership with UTS, NSW DPI is undertaking studies looking at the impact of hatchery operations on the genetics of the algal cultures used to feed stock. Algae reproduce at a rapid rate (eg. daily) and this allows for significant genetic drift in response to varying culture conditions. The project hopes to determine if drift is occurring, to what extent and is it algal species specific.
 - Yellowtail Kingfish production has commenced on the Marine Aquaculture Research Lease (MARL). The first batch of 25,000, 30g fingerlings were deployed in October 2016 using boat and helicopter transfer systems.
 - Agreements for the Future Oysters CRC-P have been finalised with a range of projects commencing in NSW that will deal with issues affecting both Sydney Rock and Pacific Oysters. This will see stock performance monitoring occur over a number of NSW estuaries.
 - The nutrition research undertaken at PSFI is expanding to access new tools for evaluating the metabolic fate of nutrients within diets. Studies looking at the nutritional requirements for Grouper are also planned.
 - NSW DPI has been successful in a bid to establish a Food Agility CRC. The CRC, worth \$50 million over 10 years will address a number of agricultural challenges, including a proposed 2 year program of water quality monitoring on NSW oyster leases. The project aims to assess the potential for the NSW shellfish industry to move from rainfall to salinity based harvest area management. Improving regulatory efficiency by moving to digital and sensor-based harvest management is expected to save the NSW industry \$5.64 million in harvest closures, as well as reducing industry costs for water and meat testing, and creating hundreds of jobs in regional NSW.
 - A study by SOCo, the University of Newcastle and Avondale College was undertaken to gain further information on the relationship between motion and SRO shell and meat development. The study used motion sensors and a combination of cultivation methods that expose oysters to various levels of motion and emersion, producing a more marketable shell shape and influencing meat volumes. However, differences were not consistent across all study sites (4) suggesting that other environmental parameters are influencing shell shape and meat volume. SOCo sought ARAC support to continue the work to develop methods for farmers to determine optimum growing conditions. ARAC agreed to support the project and approved a funding request of \$10,000 over two years.

- NSW DPI's Aquatic Habitat Rehabilitation unit asked ARAC for a priority list of water quality issues and locations that industry want addressed. There are some emerging funding opportunities and the aim of this research into the importance of water quality to the oyster industry is to create a benchmark, bring it into legislation and bring change. This unit works closely with the NSW Fish Habitat Partnership (members from the Sydney Fish Market, Recreational and Commercial Fishers, Ag farmers and Oyster farmers) coming together to address common issues. A register of 'hotspots' has been developed in conjunction with Oceanwatch, DPI Fisheries, DPI Biosecurity and Food Safety. ARAC were asked to provide input and the register will now provide ongoing visibility of the issues and a resource of ideas for DPI work units and external organisations who operate in the natural resource management space.
- Oysters Australia provided regular updates on current OA FRDC R&D projects, other current projects and the CRC-P Future Oysters.
 - Anthony Zammit commented on the recently completed project 'Survey of foodborne viruses in Australian oyster'; of the 300 samples, all came back negative for norovirus - a wonderful result for industry. This research was initiated by SafeFish.
 - The National POMS Response Plan (commissioned by OA and funded by FRDC) can be found at: http://frdc.com.au/research/Final_reports/2015-406-DLD.pdf . The government and FRDC are providing up to \$984,455 to support Australian Seafood Industries (ASI) continue its selective breeding research program into the development of POMS resistant oysters.
- NSW Food Authority gave updates on the Shellfish Program activity and projects; namely, the Pipi biotoxin survey, Bacteriophage project, The Yield trial, Hawkesbury River algal blooms and a major re-write of the ASQAP Manual.
 - It is significant to note the Kalang River was closed in July 2008 following an outbreak of norovirus traced back to oysters harvested from the area. Subsequent investigations of potential sources of contamination found multiple problems with the performance of on-site sewage management systems in the catchment. Extensive remedial work has occurred including extending the Urunga sewerage system to 44 properties located on Newry Island (which is surrounded by the Kalang River harvest area). Virus testing to verify the success of the remediation was undertaken indicating negative results to the virus. The area was open for the 2016 Christmas selling season.
 - ARAC also made special mention of the FRDC report 'Survey of Foodborne Viruses in Australian Oysters' tabled by Anthony Zammit. Anthony chaired the Steering Committee and this report is a valuable contribution to the Australian Oyster Industry and sets us quite apart from other countries as a source of very safe oysters. ARAC wish to thank growers for their participation in the survey.
- The NSW Oyster Industry, through a Steering Committee set up at the NSW Shellfish Committee in 2014, initiated a strategic planning study to identify the critical impediments to improved profitability and growth of the NSW Oyster Industry and develop strategic actions to mitigate them. ARAC contributed \$10,000 to the project. The NSW Oyster Industry Strategy was developed and includes a vision and 12 strategic priorities to improve the prosperity of the industry. An Implementation Group was created (11 growers with geographically spread representation) to prioritise recommendations and develop milestones to achieve outcomes. The Group holds monthly tele-conferences and the Shellfish Committee oversees that the Strategy progresses.

- ARAC met in Nundle over 3 and 4 May 2017. The first day was set aside for the RD&E planning meeting. The ARAC RD&E Plan 2012-2017 required updating for 2017-2022 and Mr Peter Dundas-Smith kindly facilitated the meeting. Industry representatives on ARAC are asked to review the RD&E Strategic Plan each year and revise or update the priorities and discuss submissions from permit holders. The Committee agreed to hold a two day event near Tamworth to incorporate a planning meeting and an ARAC meeting. The Committee also visited Arc-en-Ciel Trout Farm at Hanging Rock, to allow occasional meetings in locations relevant to specific industry sectors. Thanks go to Russell Sydenham for hosting the ARAC visit.
- The FRDC Contribution for 2016/17 was discussed ie. the research levies that had been calculated for oysters and non-oyster aquaculture in NSW that are due to the FRDC. The money collected from oyster based levies goes to FRDC and, on advice from Oysters Australia, is used to support aquaculture research in NSW. A small portion of the levy contributes to the running of ARAC and to fund other small research activities. The contribution to FRDC is calculated at 0.25% average gross value of production (AGVP), based on three-year rolling averages. ARAC approved the dispersal of these funds to FRDC.
- ARAC now sends an SMS alert to all Aquaculture Permit holders after each of our meetings. Along the lines of 'ARAC just met' and attaching a link to the Summary of Discussions.
- NSW DPI is continuing to support a range of post-graduate students investigating Aquaculture related questions in 2016/17. Projects include:
 - a) Jackson Wilkes-Walburn (Hons UNSW). Assessing microbiome development in commercially raised Yellowtail Kingfish (*Seriola lalandi*). (Stewart Fielder)
 - b) Nguyen Viet Khue (PhD UTS). Investigation of Sydney rock oyster (*Saccostrea glomerata*) microbiomes associated with disease outbreaks. (Michael Dove)
 - c) Elizabeth Fabian (Hons UNSW). Application of stable isotope analysis and ITRAX to an understanding of nutrient assimilation in early life stage, selectively-bred Sydney rock oysters *Saccostrea glomerata* (Gould 1850). (Michael Dove)
 - d) Tuan Son Le (PhD USC). Assessment of the efficacy of bacteriophage therapy against bacterially caused aquaculture infection. (Wayne O'Connor)
 - e) Sebastian Vadillo (PhD UNSW). The interactive effect of different ontogenetic stages of the Sydney cockle (*Anadara trapezia*) on microbial community, ecosystem function and contaminant bioremediation. (Wayne O'Connor)
 - f) Shannon Burchet (Hons CDU). Managing metals in black-lip oysters (*Saccostrea mytiloides*) to support indigenous aquaculture initiatives. (Wayne O'Connor)
 - g) Samantha Nowland (PhD USC). Developing hatchery culture techniques for tropical black-lip oysters (*Saccostrea mytiloides*) in the Northern Territory. (Wayne O'Connor)
 - h) Sania Afrose (PhD UoN). Microplastics as a vector for contaminant transport in fresh water ecosystem: An ecotoxicological and molecular Assessment. (Wayne O'Connor)
 - i) Maddison Carbery (PhD UoN). Environmentally relevant risk-assessment of microplastics and complex chemical mixtures in the marine environment: Implications for human health and trophic transfer. (Wayne O'Connor)
 - j) Thi Hong Tham Nguyen (PhD UoN). Molecular cloning and characterisation of insulin-like growth factor binding protein (IGFBP) genes in the Sydney rock oyster. (Wayne O'Connor)
 - k) Rebecca Seeto (PhD UoN). TBA- Gamete storage for commercially important oysters species. (Mike Dove, Wayne O'Connor)

- l) Vu Van Sang (PhD USC). Enhanced selective breeding of the Portuguese oysters (*Crassostrea angulata*) in Vietnam and the Sydney rock oyster (*Saccostrea glomerata*) in NSW, Australia. (Wayne O'Connor)
- m) Michael Lewis (PhD Deakin University Warrnambool). Comparative digestibility of in-vivo and in-vitro techniques. (Mark Booth)
- n) Dam Thi My Chinh (PhD USC). The effects of ingredient mixtures on gene expression and microbial communities in the digestive tract of yellowtail kingfish. (Mark Booth)
- o) Angela Liu (PhD UNSW). Use of stable isotopes to evaluate ingredient utilisation in juvenile YTK. (Mark Booth)
- p) Caroline Candebat (PhD JCU). Amino acid requirements of juvenile yellowtail kingfish *Seriola lalandi*. (Mark Booth)

Information on any of these projects can be obtained by contacting the appropriate supervisor at the PSFI.

Aquaculture Research and Development currently being undertaken by NSW Department of Primary Industries

The priorities for aquaculture research are largely driven by the need to overcome constraints to profitable culture. These are assessed on the basis of the estimated potential for environmentally-sustainable growth of the industry relative to the costs and benefits involved. The key species that should be studied need to be identified and the most important aspects of their hatchery production, grow-out technology or post-harvest treatment need to be researched.

The NSW Department of Primary Industries' Sustainable Aquaculture program will continue to concentrate on the major themes identified in the current Aquaculture Research RD&E Strategic Plan. Research activities for the Sustainable Aquaculture Program are structured according to three research themes and several key research areas within each theme.

Research themes and key research areas for the Sustainable Aquaculture Program

Program / Research Theme	
Sustainable Aquaculture	
Mollusc research	Selective breeding
	Mollusc production
	Alternative species
Finfish production	Fingerling production
	Stock enhancement
Fish nutrition	Diet improvement
	Improved feeding strategies

The table on the following page identifies the current and anticipated research projects for the Sustainable Aquaculture Program Plan 2014–2018 against the research themes and key research areas. The projects relate specifically to those that DPI Fisheries is undertaking directly or through collaboration with external research providers.

Sustainable Aquaculture Program Plan 2014-2018 (C = Current, P=Proposed, A= Anticipated, F = Finished)

Priority program							
Sustainable Aquaculture	Mollusc production	Selective breeding	Sydney rock oyster breeding (SOCo support)	C	C	C	C
			Incorporation of selection for reproductive condition marketability and survival into a breeding strategy for Sydney rock oysters and Pacific oysters	C	F		
			Breeding better oysters	C	C	C	
			Adapting to climate change: Does enhanced metabolism provide heritable protection against ocean acidification and increasing temperature in oysters?	C	C	C	
			Polymicrobial involvement in oyster diseases			C	C
			Genetic solution or dilution: can selective breeding future-proof oysters		C	C	C
		Mollusc production	Mollusc hatchery production	C	C	C	C
			Improved hatchery and nursery production of flat oysters	C	C		
			Improved knowledge of molluscan diseases			C	C
		Alternative species	Building bivalve hatchery production capacity in Vietnam and Australia (Pipis, Clams, Flat Oysters)	C	C	C	C
	Finfish production	Finfish production	Promoting marine finfish aquaculture in NSW (YTK)	C	F		
			Developing marine finfish aquaculture in NSW (YTK)			C	C
			Enhanced fish production of Australian bass		C	C	C
		Stock enhancement	Evaluation of nodavirus carrying Australian bass in NSW waterways	C	C	C	C
			Mulloway stocking to enhance recreational fisheries	C	F		
			Utilisation of premium feed ingredients by Barramundi		C	C	C
	Fish Nutrition	Improved Diets	Tactical feed ingredient assessment	C	C		
			Neutraceutical assessments	C	C	C	
			Asian Seabass: Validation of aquafeeds in Vietnam	C	C	C	C
		Improved feeding strategies	Development of monogastric industries	C	F		
			Yellowtail Kingfish for Profit		C	C	C

Oyster Research and Development currently being undertaken in Australia

1	Project Title	Genetic selection for resistance to Pacific Oyster Mortality Syndrome
	Principal Investigator	Peter Kube
	Time Frame	2012 - 2016
	Funding Sources	Seafood CRC (2012/760) and CSIRO
2	Project Title	Enhancing bivalve production in northern Vietnam and Australia
	Principal Investigator	Wayne O'Connor
	Time Frame	2014 - 2018
	Funding Sources	ACIAR (FIS/2010/100)
3	Project Title	Pearl industry development in the western Pacific
	Principal Investigator	Paul Southgate
	Time Frame	2013 - 2017
	Funding Sources	ACIAR (FIS/2009/057)
4	Project Title	Developing pearl industry based livelihoods in the western Pacific
	Principal Investigator	Paul Southgate
	Time Frame	2015 - 2020
	Funding Sources	ACIAR (FIS/2014/060)
5	Project Title	Oyster Australia IPA: Pacific Oyster Mortality Syndrome – closing knowledge gaps to continue farming <i>C. gigas</i> in Australia
	Principal Investigator	Richard Whittington
	Time Frame	2015 - 2018
	Funding Sources	FRDC (2014/040)
6	Project Title	Pearl Consortium IPA: Control of reproduction of the silver-lip pearl oyster, <i>Pinctada maxima</i> .
	Principal Investigator	David Mills
	Time Frame	2012 - 2016
	Funding Sources	FRDC (2011/248) and Paspaley Pearling Company
7	Project Title	Australian edible oyster RD&E investment via Oysters Australia Strategic Plan 2014-2019
	Principal Investigator	Wayne Hutchinson
	Time Frame	2015 - 2019
	Funding Sources	FRDC (2014/405)
8	Project Title	Aquatic Animal Health Subprogram: Identifying the cause of Oyster Oedema Disease (OOD) in pearl oysters (<i>Pinctada maxima</i>), and developing diagnostic tests for OOD
	Principal Investigator	David Raftos
	Time Frame	2013 - 2016
	Funding Sources	FRDC (2013-002)

9	Project Title	Aquatic Animal Health Subprogram: Bonamiasis in farmed Native Oysters (<i>Ostrea angasi</i>)
	Principal Investigator	Tracey Bradley
	Time Frame	2015 - 2017
	Funding Sources	FRDC (2015-001)
10	Project Title	Oysters Australia IPA: the use of FRNA bacteriophages for rapid re-opening of growing areas after sewage spills
	Principal Investigator	Kate Hodgson
	Time Frame	2016 - 2018
	Funding Sources	FRDC (2015-037)
11	Project Title	Oysters Australia IPA - workshop – identifying knowledge gaps for development of the native oyster aquaculture industry in South Australia
	Principal Investigator	Xiaoxu Li
	Time Frame	2016
	Funding Sources	FRDC (2015-229)
12	Project Title	Oysters Australia IPA: genetic services for the multi-trait, single pair mated Sydney Rock Oyster breeding program
	Principal Investigator	Emma Wilkie
	Time Frame	2015 - 2019
	Funding Sources	FRDC (2015-230)
13	Project Title	Oysters Australia IPA: Australian Seafood Industries Pacific Oyster Mortality Syndrome (POMS) investigation into the 2016 disease outbreak in Tasmania
	Principal Investigator	Matthew Cunningham
	Time Frame	2016
	Funding Sources	FRDC (2015-232)
14	Project Title	Rural R&D for Profit: Easy-Open Oyster automation
	Principal Investigator	Len Stephens
	Time Frame	2016 - 2018
	Funding Sources	FRDC (2015-238)
15	Project Title	Oysters Australia IPA: Pacific Oyster Mortality Syndrome - resistant Oyster breeding for a sustainable Pacific Oyster Industry in Australia
	Principal Investigator	Matthew Cunningham
	Time Frame	2016 - 2017
	Funding Sources	FRDC (2015-239)
16	Project Title	Oysters Australia IPA: development of a national Pacific Oyster Mortality Syndrome (POMS) response plan
	Principal Investigator	Jan Davis
	Time Frame	2016
	Funding Sources	FRDC (2015-406)
17	Project Title	Pearl consortium IPA: Environmental and technical influences on pearl production from <i>Pinctada maxima</i>
	Principal Investigator	David Mills
	Time Frame	2016 - 2021
	Funding Sources	FRDC (2016-046)

18	Project Title	Pearl consortium IPA: understanding stress and its impact on pearl quality in the silver-lip pearl oyster, <i>Pinctada maxima</i> , using transcriptomic, proteomic and metabolomic tools
	Principal Investigator	Abigail Elizur
	Time Frame	2016 - 2019
	Funding Sources	FRDC (2016-232)
19	Project Title	Future oysters CRC-P: Species diversification to provide alternatives for commercial production
	Principal Investigator	Xiaoxu Li
	Time Frame	2017 - 2019
	Funding Sources	FRDC (2016-807)
20	Project Title	Future Oysters CRC-P: Advanced aquatic disease surveillance for known and undefined oyster pathogens
	Principal Investigator	Marty Deveney
	Time Frame	2017 - 2019
	Funding Sources	FRDC (2016-806)
21	Project Title	Future oysters CRC-P: Polymicrobial involvement in OsHV outbreaks (and other diseases)
	Principal Investigator	Justin Seymour
	Time Frame	2016 - 2019
	Funding Sources	FRDC (2016-805)
22	Project Title	Future oysters CRC-P: Advanced understanding of POMS to guide farm management decisions in Tasmania
	Principal Investigator	Christine Crawford
	Time Frame	2017 - 2019
	Funding Sources	FRDC (2016-804)
23	Project Title	Future oysters CRC-P: New Technologies to Improve Sydney Rock Oyster Breeding and Production
	Principal Investigator	Michael Dove
	Time Frame	2016 - 2019
	Funding Sources	FRDC (2016-803)
24	Project Title	Future Oysters CRC-P: Accelerated Sydney Rock Oyster (SRO) Breeding Research
	Principal Investigator	Michael Dove
	Time Frame	2018 - 2019
	Funding Sources	FRDC (2016-802)
25	Project Title	Future oysters CRC-P: Enhancing Pacific Oyster breeding to optimise national benefits
	Principal Investigator	Matthew Cunningham
	Time Frame	2017 - 2019
	Funding Sources	FRDC (2016-801)
26	Project Title	Development of sector-specific biosecurity plan templates and guidance documents for the abalone and oyster aquaculture industries
	Principal Investigator	Shane Roberts
	Time Frame	2016 - 2017
	Funding Sources	FRDC (2016-245)

27	Project Title	Aquatic Animal Health Subprogram: Development of standard methods for the production of marine molluscan cell cultures
	Principal Investigator	Andrew Read
	Time Frame	2015 - 2017
	Funding Sources	FRDC (2015-003)
28	Project Title	Tactical Research Fund: revision of the Australian Shellfish Quality Assurance Program manual - in light of the FRDC funded PST review report
	Principal Investigator	Clinton Wilkinson
	Time Frame	2013 - 2016
	Funding Sources	FRDC (2013-056)
29	Project Title	Future Oysters CRC-P: Management and Extension
	Principal Investigator	Graham Mair
	Time Frame	2017 - 2019
	Funding Sources	FRDC (2016-800)
30	Project Title	Oysters Australia IPA: Australian edible oyster RD&E investment via Oysters Australia strategic plan 2014-2019
	Principal Investigator	Wayne Hutchinson
	Time Frame	2015 - 2019
	Funding Sources	FRDC (2014-405)
31	Project Title	Pacific oyster feeds and feeding in South Australian waters: towards ecosystem based management
	Principal Investigator	Xiaoxu Li
	Time Frame	2014 - 2017
	Funding Sources	FRDC (2014-027)
32	Project Title	Assessing occurrence of pathogenic species of the marine bacteria <i>Vibrio</i> in Tasmanian oysters from St Helens
	Principal Investigator	Tom Madigan
	Time Frame	2015 - 2016
	Funding Sources	FRDC (2015-042)
33	Project Title	See page 25 of this report
	Principal Investigator	Justin Seymour
	Time Frame	2016 - 2019
	Funding Sources	ARC (LP160101795)
34	Project Title	See page 30 of this report
	Principal Investigator	Melanie Bishop
	Time Frame	2015 - 2017
	Funding Sources	ARC (DP150101363), Macquarie University
35	Project Title	See page 28 of this report
	Principal Investigator	Laura Parker
	Time Frame	2014 - 2016
	Funding Sources	ARC (IN140100025), University of Sydney
36	Project Title	See page 27 of this report
	Principal Investigator	Kyall Zenger
	Time Frame	2014 - 2016
	Funding Sources	ARC (LP140101001), Jame Cook University

Aquaculture Research and Development currently being undertaken in Australia



Australian Centre for International Agriculture Research (ACIAR)

Active and Pipeline ACIAR Aquaculture Projects. NB. All ACIAR-funded Projects have an Australian component with the Commissioned Organisation [responsible for administering the funds] being an Australian University or State or Commonwealth Government Department or other Statutory Organisation. *More information visit www.ACIAR.gov.au*

Project ID	
FIS/2017/003	The contribution of small-scale fisheries research to a food secure world
FIS/2017/002	Assessing production of giant freshwater prawns in reservoirs in Sri Lanka
FIS/2016/300	Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song
FIS/2016/135	Development of rice fish systems in the Ayeyarwaddy Delta, Myanmar
FIS/2016/130	Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia
FIS/2016/128	Reef colonization and socioeconomic impacts from trochus translocations to Samoa
FIS/2016/126	Half-pearl industry development in Tonga and Vietnam
FIS/2016/122	Scaling-up community based sea cucumber culture in the Philippines and northern Australia
FIS/2016/116	Estimating productivity of Indonesia's tuna fisheries resources to increase sustainable benefits
FIS/2016/052	Developing legal value chains and alternative markets for western province fisheries in Papua New Guinea
FIS/2016/049	Description and risk assessment of the bycatch communities in the Gulf of Papua prawn fishery
FIS/2016/048	Developing a bilingual web-based fish identification tool for field use in Indonesia
FIS/2015/046	Improving fishery management in support of better governance of Myanmar's inland and delta fisheries
FIS/2015/038	Improving seaweed production and processing opportunities in Indonesia.
FIS/2015/031	Fish in national development: contrasting case studies in the Indo-Pacific region
FIS/2015/006	Application of fish passage design principles to enhance sustainability of inland fishery resources in the Southeast Asian region
FIS/2014/063	Restoring damaged coral reefs using mass coral larval reseeded
FIS/2014/062	Improving technologies for inland aquaculture in Papua New Guinea
FIS/2014/061	Improving technical and institutional capacity to support development of mariculture based livelihoods and industry in New Ireland, Papua New Guinea
FIS/2014/060	Developing pearl industry-based livelihoods in the western Pacific
FIS/2014/059	Expanding spiny lobster aquaculture in Indonesia

FIS/2014/041	Quantifying biophysical and community impacts of improved fish passage in Lao PDR
FIS/2013/015	Sustainable management of sport fisheries for communities in Papua New Guinea
FIS/2012/102	Sustainable management of the shark resources of Papua New Guinea: socioeconomic and biological characteristics of the fishery
FIS/2012/101	Developing technologies for giant grouper (<i>Epinephelus lanceolatus</i>) aquaculture in Vietnam, the Philippines and Australia
FIS/2012/100	Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray-Darling Basins
FIS/2012/076 ROU14376/040	Improving community-based aquaculture in Fiji, Kiribati, Samoa and Vanuatu
FIS/2012/074 ROU14376/040	Improving community-based fisheries management in Pacific island countries
FIS/2010/100	Enhancing bivalve production in northern Vietnam and Australia
FIS/2010/098	Diversification of seaweed industries in Pacific island countries
FIS/2010/096	Evaluating the impacts of improving postharvest processing of sea cucumbers in the western Pacific region
FIS/2010/055	Building research and project management skills in fisheries staff in Papua New Guinea
FIS/2010/042	Expansion and diversification of production and management systems for sea cucumbers in the Philippines, Vietnam and northern Australia
FIS/2009/059	Developing research capacity for management of Indonesia's pelagic fisheries resources
Recently completed projects	
FIS/2016/005	Pearl industry research infrastructure recovery post- cyclone Winston, Fiji
FIS/2011/013	Culture-based fisheries development in Lao PDR and Cambodia
FIS/2010/101	Improving fish health management and production protocols in marine finfish aquaculture in Indonesia and Australia
FIS/2009/057	Pearl industry development in the western Pacific
FIS/2014/018	Understanding pearl oyster mortality in Fiji
FIS/2011/052	Improving research and development of Burmas' inland and coastal fisheries
FIS/2014/103	Pearl livelihood development in Fiji
FIS/2010/097	Exploring options for improving livelihoods and resource management in Timor-Leste's coastal communities
FIS/2015/028	Investigating the long-line nursery system for giant clam (<i>Tridacna</i> sp.) farming in Savusavu Bay, Fiji
FIS/2010/054	Mariculture development in New Ireland, Papua New Guinea
FIS/2015/034	Research support for lobster restocking in Indonesia
FIS/2014/104	Small-scale fisheries in Indonesia: benefits to households, the roles of women, and opportunities for improving livelihoods
FIS/2011/069	Technical support for pearl culture in coastal Tanzania
FIS/2010/058	Assessing economic and welfare values of fish in the Lower Mekong Basin



Australian Government
Australian Research Council

Australian Research Council (ARC)

New and ongoing research projects and fellowships funded by the Australian Research Council.

For more information visit www.arc.gov.au

Project ID	Project summary
LP160100162	This project aims to understand the effects of climate change on marine food webs, from plankton production to predation by iconic marine fauna, by integrating data on oceanographic conditions and fish distribution with the foraging patterns and breeding success of seabirds. Warming waters due to strengthening western boundary currents have unknown consequences for coastal marine food webs. Innovative prey capture signatures from accelerometers, and advanced movement models from satellite locations will show how predators locate and prey upon fish schools. Anticipated outcomes are insight into how changing resource availability in the oceans affects ecosystem resilience; improved viability for coastal industries; and ecosystem-based conservation management strategies.
LP160100730	This project intends to maximise the scope for rebuilding reef fisheries while ensuring short-term levels do not become too low. Like many developing countries, Indonesia wishes to rebuild its heavily over-exploited coral reef fisheries. Marine reserves allow fish populations to recover and replenish fished areas. However, because reserves remove fishing grounds, fish catches tend to decrease in the short-term while fish recover in reserves; a process that can take a decade. Loss of yield can be so burdensome that managers abandon fisheries. This research is intended to improve the economic security of fishers and food security, and inform World Bank and Australian aid programs.
DP170100023	This project aims to understand the mechanisms behind climate-mediated declines in kelp. Ocean warming causes the collapse of valuable temperate kelp forests globally and on both sides of Australia, but it is unknown if this is because of direct physiological effects from temperature or the indirect effects of changes in species interactions. This project will compare the direct effects of marine heatwaves to the indirect effects of range-shifting tropical herbivores and pathogens for the kelp forests of the Great Southern Reef, one of Australia's largest coastal ecosystems. This project will generate knowledge underpinning adaptation strategies for these critical ecosystems, and could enhance the capacity to respond to degradation of these natural assets.
LP160100492	Ecological valuation tools to protect seagrass during coastal development. Focussing on differences between shallow and deep seagrasses in the Great Barrier Reef, this project aims to develop a spatial valuation tool so resource managers and policy makers can minimise the effect of port development on seagrass ecosystems. Seagrasses provide ecosystem services (fisheries, nutrient cycling, primary productivity) worth trillions of dollars, but coastal development threatens this capacity. Resource managers lack accurate information about their potential effect and mitigation measures. Anticipated outcomes are protection of key marine environment and World Heritage Assets, and benefits to Australia's economy through maintenance of ecosystem services and reduced risk associated with development.
LP160100839	This project aims to develop new environmental DNA (eDNA)-based methods of managing humanity's impact on valuable marine resources. eDNA preserved in seawater provides a lens to study and monitor marine biota and ecosystems. This project will work with fisheries managers and the environmental consulting sector, and focus on sites in the Kimberley, Cocos-Keeling Islands, Fremantle and Deep-sea oil/gas sites to demonstrate the value of eDNA methods in best-practice monitoring. A multi-proxy toolkit (including eDNA) that can audit and baseline marine biota could make balancing conservation and sustainable exploitation achievable. Anticipated outcomes are improved management and monitoring of fisheries, ports and offshore oil/gas sites.
DP170101722	This project aims to forecast climate-related changes in the diversity, distribution and abundance of fisheries species. In a changing world where many people depend on oceans for food and livelihood, predicting the future distribution of fisheries species is a challenge. Native invasions and ocean warming are stressing inshore fisheries species, but rigorous empirical data and models that can reliably forecast these effects are lacking. This project intends to reveal the drivers of successful native invasions, evaluate their effect on fish diversity and productivity, and develop holistic models that forecast their effects on inshore fisheries species' near-future distribution and stocks.

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- LP160100329 This project aims to use innovative techniques to determine aspects of natural marine mammal behaviour that can be exploited, in conjunction with optimal fishing vessel operations, to minimise their interactions with commercial fisheries. Marine mammal interactions with commercial fisheries are a growing worldwide issue with both ecological (incidental bycatch and increased dependence on fisheries) and economic consequences (annual losses of tens of millions of dollars to the fishing industry). Successful solutions to reduce these interactions have remained elusive. Outcomes from this research are expected to be applicable worldwide, have substantial economic and ecological benefits, and ensure the sustainability of the fishing industry.
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- DP170102261 This project aims to assemble comprehensive long term Australian plankton records spanning 50 to 1000 years, by applying ancient DNA technology to dated sediment depth cores. Long-term data for Australian coastal and estuarine waters are sparse, so cannot be used for management of fisheries, tourism or urban development. Long-term records are essential to understand how disruptive algal and jellyfish blooms, introduced species and increased human use of coastal resources affect dynamic plankton ecosystems. This project's findings are expected to explore cyclical patterns, define range expansions and understand and manage how dynamic coastal ecosystems respond to multistressor anthropogenic change. Findings will improve understanding of how dynamic marine environments retain their biodiversity values and critical ecological functions.
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- DP170104240 This project aims to predict how changes in climate-driven species distributions affect shallow marine communities globally. Environmental change affects the structure, resilience and productivity of coastal marine ecosystems at regional and global scales. This project will combine global species distribution and trait databases, existing experimental data and targeted field sampling to develop, test and apply an integrated modelling platform to predict how global warming-driven changes in species distributions and their interactions affect the structure and dynamics of shallow marine communities. This project addresses a knowledge gap on how species' redistributions and trophic dynamics produce communities, and aims to forecast future species abundances for sustainable marine ecosystem management.
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- DP170102353 This project aims to listen in on conversations between a Great Barrier Reef sponge and its bacterial symbionts. Coral reefs thrive in nutrient-poor tropical seas by efficiently retaining and recycling essential elements. Marine sponges help coral reefs by co-operating with metabolically diverse bacterial symbionts via largely unknown mechanisms. Using an advanced genome-enabled sponge, invertebrate biology, microbiology, genomics and metabolomics, this project seeks to reveal genomic and metabolic details of the partnership, which could inform environmental restoration, pharmaceuticals and biotechnology.
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- LE170100007 This project aims to create a floating, mobile fisheries and oceanographic observing system for Eastern Australia. Australian oceanographic and fisheries research has been hampered by the lack of appropriately sized and equipped research vessels required to investigate continental shelf waters and beyond. The automated floating facility will provide data to support ongoing ARC-funded research programs in marine biogeochemistry, climate change, ocean acidification, coastal hydrology, biological oceanography, active acoustics, and fisheries resources and technology in the continental shelf and beyond. The expected outcome will bridge a major gap in fisheries and oceanographic research capacity to make observations in a critical region of the Australian marine estate and provide a stronger scientific basis for early detection of changes in seawater chemistry, biology and fisheries in priority waters experiencing rapid change.
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- DP170104668 This project aims to define how interactions between human society and herbivores influence marine ecosystem structure and function. It will analyse geographic patterns from recent systematic sampling of reef communities worldwide and study fish, macro-invertebrate and meso-grazer herbivory to identify herbivores' role in the collapse and recovery of reef ecosystems. This project will examine the match between a critical ecosystem function and community structure across local to global scales, including the identification of non-linearities and interactions involving human effects on this process. This research is expected to safeguard marine ecosystems from collapse.
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- DP170100840 This project aims to test the causes, consequences and mechanisms of female reproductive fluids in modulating fertilisation bias in a model vertebrate species, the zebrafish. Female reproductive fluids (the fluid surrounding eggs) may moderate sperm selection by females, thus facilitating mate choice at the gamete level. This project will study interactions involving sperm and female reproductive fluid in an evolutionary framework. The intended outcome is increased knowledge of these processes, and better understanding of how non-gamete factors affect fertility, which could benefit fields as diverse as human fertility and aquaculture.
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- LP160101795 This project aims to unite cutting-edge genomic and molecular biological tools with novel quantitative modelling analyses to identify the mechanisms behind oyster disease events. Oyster farming contributes almost \$100 million to the Australian economy each year and is a cornerstone of coastal communities, but has been decimated by diseases that threaten this important primary industry. While some causative pathogens have been identified, the environmental catalysts of oyster disease remain a mystery. The expected outcome of this project is an innovative coupling of tools that provides new capacity to forecast disease events, delivering the Australian oyster industry a powerful platform to predict, manage and prevent costly disease outbreaks. By identifying environmental thresholds and oyster disease danger periods, an expected outcome of this project is the development of new oyster farming strategies aimed at avoiding multi-million dollar losses associated with disease outbreaks.
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- LP160101762 This project aims to identify candidate vaccine antigens and produce an experimental vaccine against amoebic gill disease (AGD) that will benefit the Tasmanian and international Atlantic salmon aquaculture industries. AGD is the most significant health problem affecting Atlantic salmon aquaculture in Tasmania. In the last decade, AGD has become a legitimate health threat to the multibillion dollar global Atlantic salmon industry. A solution is needed before AGD fully establishes itself in the largest Atlantic salmon producing nations. The expected outcome of this project is the development of a commercial vaccine that should significantly benefit the Australian and international aquaculture industries.
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- DP170104792 This project aims to determine the molecular and cellular origins and mechanisms regulating venom production and release to establish how defensive venoms evolved in cone snails. Cone snails possess a remarkable ability to rapidly and reversibly switch between separate venoms in response to predatory or defensive stimuli, implying that these are separately evolved and regulated mechanisms. The investigators hypothesise that defensive venoms, originally evolved in the proximal venom duct to protect against threats such as cephalopod and fish predation, have been repurposed in the proximal duct to allow predators to become prey, facilitating the switch from worm to mollusc and fish hunting. The project aims to show the broad implications for the evolution of venoms in animals and discover the regulatory mechanisms driving venom peptide expression.
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- FT160100047 This project aims to solve the global problem of unsustainable coral reef fisheries by locating and learning from 'bright spots' in reefs. Bright spots are reefs in better condition than they should be, given the multiple drivers (e.g. markets and human population pressures) to which they are exposed. This project will use a global-scale analysis to identify bright spots, and field-based research to uncover the enabling social, economic and institutional conditions. Understanding these enabling conditions should help to formulate policy levers for more sustainable reef governance in other regions.
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- DP170103067 This project aims to characterise and understand cement formation in coral reefs. Coral reefs are constructed by cementing together aragonite building blocks made by corals. The main cementing agent is high-magnesium calcite, the most soluble carbonate mineral and susceptible to ocean acidification. High-magnesium calcite cements are best developed on the high energy margins of coral reefs. This project will quantify how crustose coralline algae produces high-magnesium calcite and controls the dissolution and reprecipitation of high-magnesium cements. This project intends to quantify rates of reef cementation, susceptibility to ocean acidification and warming, and possible mitigating effects of alkalinity addition.
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- DP170103372 This project aims to determine how reef degradation modifies predator-prey dynamics in fish communities, and how parental effects may help species to cope with habitat change. Live corals are ecosystem engineers that support the world's most biodiverse communities, but anthropogenic factors have led to unprecedented global declines in live coral. The transition from live to dead coral-dominated habitats is associated with a modified sensory landscape of fear for resident fishes, via chemical interference emanating from degraded coral. Inter-generational advantages would help management to regulate reef usage to promote resilience.
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- DP170104952 This project aims to understand how the heart and blood vessels evolved in mammals, birds, reptiles and fish to achieve efficiency. The heart is the most important organ for life. The project will study the structure and function of vertebrate animals' hollow and spongy hearts to show how energetics shaped their evolution. It will measure arterial holes in bone to gauge brain and bone metabolism, which opens up a new way to measure metabolism in extinct animals directly from fossils, rather than by inference from living relatives. The expected outcome is to correlate cardiovascular design and metabolic rates of organs.
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- DE170100516 This project aims to discover how evolutionary processes, biogeography and molecular change drive biodiversity patterns. Coral reefs support over 800,000 plant and animal species on <0.1% of the ocean. This project will examine how this biodiversity was formed by generating genomic data for reef building corals and reef associated fishes to reconstruct their evolutionary history. It will compare models of speciation, extinction and range change among regions to determine how those processes contribute to the formation of biodiversity gradients and regional assemblage differences. The project expects that better understanding of evolutionary dynamics will inform conservation priorities.
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- FT130100505 The overarching aim of this project is to advance knowledge on the long-term impacts of ocean acidification on marine fish and fisheries. An interrelated set of projects will be developed that tests the capacity of marine fish to adapt to projected future rises in ocean carbon dioxide and will investigate the effects of ocean acidification on apex predators and key fisheries species. The research will address critical knowledge gaps in ocean acidification research and provide advice about the impacts of ocean acidification on marine biodiversity and fisheries productivity on time scales relevant to strategic management and policy decision-making in Australia and internationally.
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- DE140100701 Coral communities of the Great Barrier Reef are facing multiple disturbances, in particular the coral-eating crown-of-thorns starfish *Acanthaster planci* (*A. planci*) that can occur as large-scale outbreaks. This project aims to provide innovative guidance in support of the management of *A. planci*, based on a metapopulation modelling framework broadly applicable to the control of marine pests. Expected outcomes include the identification of the environmental triggers of *A. planci* outbreaks; the identification of target reefs and critical thresholds of management intervention needed to limit the impact of *A. planci* under different climate and land use scenarios; and future forecasts of coral and fish biodiversity under these scenarios.
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- IH120100032 Commercial development of rock lobster culture systems: the cutting edge of aquaculture. This Research Hub will develop unique aquaculture systems, using novel engineering manufacture to mass produce lobster seed stock. A reliable, large-scale supply of seed will enable seacage culture, evaluation of wild stock enhancement and lead to sustainable food production.
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- FT130100202 Primary productivity by marine phytoplankton directly controls global climate, supports fisheries and is an indicator of marine ecosystem health. Successful management of the world's marine ecosystems rests on improving the accuracy with which primary productivity is measured and monitored. This internationally collaborative research program will develop a new sensor-based approach – fast repetition rate fluorometry – to measure different phytoplankton groups that regulate primary productivity in Australia's complex marine environments. Application of these measurements will enable more accurate monitoring of the status of Australia's marine systems to inform ocean resource management decisions in order to safeguard marine ecosystem health.
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- DP140101377 Seafood production is an important part of Australia's economy and future food security. In a dual relationship, fisheries are both vulnerable to and a cause of changes in the marine environment. This project will identify the maximum limits to Australian seafood production and will determine the impacts of future perturbations. To achieve this, the project will: combine existing rich historical data sources with state-of-the art ecosystem and fisheries models; analyse environmental impacts that will complement national fisheries stock assessments that are essential for future competitive exports; and determine our growing seafood imports and their role in Australia's and the world's food security.
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- LP140100087 Estuaries are iconic recreational areas providing both ecological habitat and millions of dollars in revenue to the tourism and fisheries industries. How estuaries respond to human pressures is highly variable with some such as the Gippsland Lakes succumbing to algal blooms, whilst other heavily nutrient laden systems such as the Werribee Estuary support extremely high fish populations. This project aims to lead to an understanding of the links between freshwater flow, blue-green algal blooms, and recruitment of a key fishery species, black bream. The outcome of the project aims to give catchment managers greater confidence in setting levels of environmental flows that will both support fish populations but also mitigate against algal blooms.
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- LP140100722 New and existing lipases will be applied to the concentration of omega-3 lipids from fish and algal oils. The primary aim of this project is to replace current chemical processes and high temperature distillation with milder enzymatic methods, providing high quality omega-3 concentrates for food and pharmaceutical purposes. The project aims to develop new immobilisation technology to enable multiple re-use of lipases for the cost effective production of omega-3 concentrates and to apply new microencapsulation strategies to the stabilisation of omega-3 concentrates, enabling the delivery of omega-3s and other bioactive ingredients to a range of food and beverage products.
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LP140101001	The primary impediment to achieving rapid genetic progress in aquaculture is an inability to accurately and rapidly identify high-performance animals for selection as parents in animal breeding programs. This project aims to develop an innovative genomic selection breeding system for the silver-lipped pearl oyster to overcome current limitations associated with traditional animal improvement methods. The use of genomic selection will not only transform the Australian pearl oyster industry, but it will also showcase the potential of genomic selection in aquaculture globally. Furthermore, knowledge gained from this project can also be applied to a variety of other Australian aquaculture species to accelerate the uptake of this technology.
LP150100934	This projects aims to develop models that can determine the ecological and economic impacts of land-use changes (e.g. agriculture) on fisheries and assess alternative land-use plans that seek to maximise economic opportunity while protecting fisheries. Fisheries support the livelihoods of 12 per cent of the world's population. Land-based activities are among the most significant threats to coral reef fisheries because sediments and nutrients degrade reefs, yet they are often ignored in fisheries management. By improving the sustainability of coastal development, biodiversity conservation, and health of fisheries, the models developed by the project could deliver socio-economic and environmental benefits for millions of people reliant upon fisheries for their livelihoods.
FT130101068	This project will integrate comparative ecological genomics (in the wild and in the lab), phenotypic data and spatially-explicit modelling approaches to assess adaptation and vulnerability of aquatic biodiversity to environmental change. It focuses on a family of Australian freshwater fishes that evolved in response to hydrological disturbance and shows contemporary patterns of biodiversity shaped by hydroclimatic variation and anthropogenic pressures. The project expects to disclose a positive correlation between family-wide adaptive capacity and variance in ecological disturbance. This work will address fundamental and novel questions about factors shaping adaptation and resilience along naturally and anthropogenically disturbed ecosystems.
LP140100412	Antarctic krill are an important species in the Southern Ocean supporting most of the Antarctic birds and mammals. A sustainable krill fishery is developing with krill products used in aquaculture and increasingly for human consumption. A new omega 3 krill oil industry has emerged and is rapidly expanding. The aim of the project is to predict the factors governing oil levels and the biochemical composition in krill which will help us understand growth, reproduction and recruitment. The research aims to also assess the possible effects of climate change on krill. Outcomes of this research aim to be used to manage the expanding krill fishery.
LP140100225	Man-made in-stream structures (for example, dams and road crossings) have contributed to major declines in native fish numbers, with more than 6,000 barriers to fish migration occurring in New South Wales alone. Recognising this, Fisheries New South Wales led the development of national guidelines for the design and construction of fish friendly road crossings. Unfortunately, these guidelines have little empirical backing. This project will integrate data on the swimming ability of Australian fish species with culvert hydrodynamic modelling to better understand fish requirements in and around road crossings. These data will strengthen national design guidelines and provide the tools engineers and planners need to balance fish migration with effective water management.
LP140100855	As Australians migrate towards the coast, the demand for recreational boating facilities such as moorings and marinas is increasing rapidly. These structures can remove habitat and fragment the seascape in a similar manner to roads and clearings in forest and grasslands. Coastal infrastructure can also reduce the quality of existing habitats and their full impact must be assessed if the diversity and function of coastal seascapes is to be conserved. This project aims to use a combination of novel modelling, surveys, and large experiments to understand how threatened seagrass, fish, and sediment habitats are altered in human modified seascapes, and to assess the success of habitat restoration following the removal of boating structures.
LP140100319	Sharks are vital components of marine ecosystems and contribute significantly to ecotourism and fisheries. Due to their slow rate of growth and reproduction, sharks are susceptible to over exploitation. A lack of knowledge regarding their behaviour and movement patterns is a key impediment to effective management. This project aims to examine social interactions and migration patterns of Port Jackson sharks using a unique combination of genetic techniques, novel acoustic tag technology, behavioural manipulations and modern social network analysis. Once verified, the approach developed can be applied to other marine predators of particular management concern. The data generated will directly inform fisheries and conservation management policy.
DP140100431	The power to recognise individuals of a species requires significant image and pattern discrimination abilities. Yet, individual recognition has been found in a huge range of species, from humans to invertebrates demonstrating its importance for social interactions. The project will investigate this ability in lower vertebrates (fish, with no visual cortex), so as to understand the underlying mechanisms of pattern discrimination. The project will also test how robust this ability is during changes in water quality (elevated carbon dioxide levels and increased turbidity). The outcomes will further our knowledge base in lower vertebrate vision and evolution, and also have implications for human vision, image analysis, and artificial vision.

IN140100025	This project will investigate the impact of environmental change on larval energetics of molluscs on the southeast (SE) coast of Australia. The SE coast of Australia is a climate hotspot characterised by rising ocean temperatures, fluctuations in salinity and we expect in the near future ocean acidification (OA). Mollusc larvae show extreme sensitivity to OA, but the impacts of other stressors remains unknown. It is predicted that OA will reduce the capacity of larvae to cope with temperature and salinity, particularly when food supply is low and in populations which have had no previous exposure to OA. Understanding the response of mollusc larvae to environmental change will support ecologically and economically significant mollusc populations over this century.
DP140101537	This project is a multifaceted, innovative cultural analysis of the crucial role of fish and fishing in feeding a growing global population. Estimates are that the world's population will be nine billion by 2050. It is imperative that innovative research strategies are developed to explore how to best respond to questions of food security in a sustainable manner. This brings challenges across numerous scales, including: changing consumer tastes, new State, Commonwealth and international regimes of marine governance, and adapting fishing communities to new forms of livelihood. This project will provide the first in-depth cultural account of the complex entanglement of the economy, the environment and the humans involved in fish and fishing.
DP140101800	Preserving biodiversity in the face of environmental degradation and climate change is the greatest challenge of our time. Although habitat fragmentation is considered a key cause of the current extinction crisis, the effects of changing habitat configuration on species persistence and recovery is almost completely unknown. Coral reefs are among the most diverse and threatened ecosystems on the planet and this project will provide the first insights into how coral reef fish diversity responds to increased subdivision and isolation of reef habitat. It will identify critical aspects of habitat change that either enhance local diversity or threaten populations with extinction and provide new ecological data to refine conservation strategies.
DP140100122	In a world where few intact reefs remain, the goal of this project is to find ways to restore degraded reefs. Recent research has identified the species responsible for removing harmful algae from coral reefs, while advances in mariculture provide us with the capacity to rear these critically important reef fish species. Combining captive rearing, experimental manipulations, and a global analysis of the functional capacity of herbivorous fishes, in intact, degraded and human-modified systems, the research will explore the potential for restoring, or boosting, the capacity of reefs to withstand disturbance. The goal is to provide the scientific knowledge required to directly modify the key processes operating on coral reefs.
LP140100428	The project aims to develop applied genetic strategies to eradicate <i>Gambusia</i> , a serious invasive pest fish species, from a Tasmanian estuary. The goal is to advance the Trojan Y chromosome model from theory to an applied solution. The project aims to employ an integrated ecological, physiological, behavioural, genetic and genomics approach, within the unique island-within-an-island status of <i>Gambusia</i> infestation in Tasmania.
DP150104006	As humans modify the biosphere, many complex landscape-level problems are emerging. New methods are required to work on these large-scale problems. The aim of this project is to develop novel methods involving trace elements and isotopes, opening up new ways to explore the large-scale connections between terrestrial ecosystems and downstream estuaries. It is planned to use these new methods to test for unexpected positive benefits of floods for estuarine fisheries. The project is significant and innovative because it develops two fundamentally new types of tracer work, one at the sediment-animal level and one at the within-molecule level. The expected outcomes include a new toolkit for tracing the hidden connections between terrestrial and aquatic ecosystems.
LP150100669	The project aims to answer key questions about the biology, ecology and sustainability of the world's manta ray species to provide the information and tools for management and conservation of these charismatic and valuable species. In particular, the project aims to determine the likely impact of climate variability and fisheries that operate to Australia's north on manta-based ecotourism in the Indo-Pacific region, as climate change and active low-value fisheries may both jeopardise a high-value ecotourism industry. The project seeks to explore geographic distributions, local and large-scale movements, population sizes, structure, and inter-connectivity in the region to assess the effect of climate and fisheries on manta ray populations.
DP150102903	This project aims to use an evolutionarily young and ecologically important fish clade to understand adaptive resilience and to test predictions derived from the 'climatic variability hypothesis' for the major climatic regions of mainland Australia. Correlative surveys along landscapes and mechanistic experimental studies will be integrated to implement a comparative evolutionary genomics framework capable of assessing the genetic basis of adaptation and the evolutionary resilience of populations and lineages. This is expected to clarify climatic and geographic correlates of adaptation across a vast area of Australia and to disentangle responses to environmental change in an emerging model system for adaptation research.

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- DP150102656 This project aims to develop innovative numerical methods to understand the dynamics, carbon export, and trophic structure of zooplankton. The trophic links between phytoplankton, zooplankton and fisheries are unknown. The size- frequency distribution of zooplankton (size spectrum) is an innovative method for estimating their growth, predation and production as food for fish. Analysis of a global synthesis of zooplankton size distributions from tropical to polar environments are expected to reveal these vital rates of pelagic ecosystems. The zooplankton rates will reveal, for the first time, the link between phytoplankton and fisheries, and will significantly improve ecosystem models and global assessments of environmental change.
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- LP150100923 This project aims to improve fisheries management of economically important baitfish by increasing our understanding of the ecosystem demand of predatory fish. The ecosystem demand of predatory fish is currently not understood, because it fails to include the considerable impact of juvenile fish, especially when they reside in an estuary. The project intends to implant acoustic transmitters, calibrated in a flume, to discover bioenergetic rates in the field by determining the diet and the size- and temperature-dependent growth and biogenetics of a predatory fish species, from juvenile to adult, from estuary to the open sea. The outcomes include an ecosystem synthesis of related pelagic fish predators from catchment to coast.
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- DP150100608 Carp gudgeons are the most abundant, widespread and biodiverse freshwater fishes in southeastern Australia. The unacknowledged presence of many cryptic species and sexually-parasitic lineages severely taints all research on this cornerstone group. This project aims to provide unrivalled evolutionary, genomic, and taxonomic insights into this new instance of vertebrate sexual parasitism, which offers a unique mix of research advantages not displayed by any other sexual/unisexual complex. The knowledge gained could impact many research fields, including evolutionary theory addressing the unexplainable prevalence of sex, native fish ecology, and environmental monitoring of the Murray-Darling Basin, an ecosystem of world significance.
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- DP150100017 Coherent structures in geophysical flows play fundamental roles by organising fluid flow and obstructing transport. For example, ocean eddies strongly influence the transportation of heat, nutrients, phytoplankton, and fish larvae, in both the horizontal and vertical direction. Many coherent structures are very difficult to detect and track by direct measurement (for example satellite observations), and current mathematical techniques cannot provide an adequate global description. This project aims to create innovative new mathematical theory and numerical methods to discover and track coherent structures over time frames of physical importance, contributing significantly to our understanding of their role in the oceans' biosphere and climate.
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- LP150100064 This projects plans to explore the causes of the worldwide decline in the highly lucrative spiny lobster fisheries that has occurred in recent decades. This decline has been attributed to ocean warming, however, the exact mechanism contributing to the demise of lobsters is not known. This project will use a hierarchy of oceanic models of increasing complexity combined with a unique spiny lobster data set to investigate the relationship between larval health, physiology and environmental variables and how this affects survival and successful recruitment into the fishery. An understanding of these complex relationships is expected to enable the first predictions of larval survival and settlement in a region of accelerated ocean warming, and provide critical information for sustainable fisheries management.
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- DP160103320 This project uses the astonishing lifecycle of lobster larvae to better define the pathways and discover the key genes that regulate crustacean metamorphosis. Where, when, why and how metamorphosis occurs in crustaceans are important factors affecting fisheries recruitment and aquaculture production. The project suggests that the current accepted paradigm for the molecular control of metamorphosis does not apply to lobsters and possibly other crustaceans where larval metamorphosis and the juvenile transformation are uncoupled. Using a unique supply of cultured lobsters and advanced molecular techniques, the project aims to develop tools to trigger and synchronise metamorphosis for use in aquaculture and invasive species management.
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- FT140100964 Environmental endocrine disrupting chemicals (EEDs) from introduced plants, pesticides and wastewater are dramatically increasing in the Australian environment. EEDs have been shown to cause dramatic reproductive and developmental abnormalities in vertebrates ranging from fish to humans. This project plans to investigate the impact that these chemicals might have on marsupial development. Marsupials have a unique reproductive strategy and how this might affect their ability to respond to EEDs is unknown. This project aims to define the effects of three of the predominant EED risks for marsupials in the Australian environment; estradiol, genistein and atrazine.
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FT140100383	In modern fish aquaculture, parasite infections threaten efficient production. Ecological problems also arise when fish farms amplify parasite populations and cause outbreaks in surrounding wild fish populations. Present control methods rarely integrate the behaviour of the host fish. This project aims to assess the behaviours of hosts and the mechanisms that lead to parasite outbreaks. It will develop behavioural approaches that separate host and parasite, reduce infection, and altering host behaviour to improve the effectiveness of treatments and minimise their environmental impacts. This project aims to create novel methods to control parasites in ways that limit their ability to evolve resistance.
IH130200013	ARC Research Hub for advanced breeding to transform prawn aquaculture. This Research Hub aims to bring together world-leading animal geneticists, research and service providers, and Australia's largest prawn farm to gather the genomic resources, commercial phenotypic data, and apply cutting-edge genetic and genomic selection methodologies, leading to the transformative improvement program for a black tiger prawn aquaculture species globally.
DP150101491	Continual recruitment of young is fundamental to the replenishment of populations, especially when a stock is fished. Existing theory suggests that species with very long planktonic larval stages disperse widely, ensuring their genes are well mixed. However, recently identified genetic differences between populations of rock lobster challenge this paradigm and demonstrate that despite larvae mixing in the ocean for years, local recruitment and/or adaptation are at play. Recent developments in genomics and bioinformatics should allow this project to understand the ecological processes underpinning these genetic signatures and determine their evolutionary implications. Such findings could direct targeted rebuilding of depleted fisheries stocks.
DP150101363	This project aims to test whether the flow of beneficial genes from farmed oysters into wild oysters can make natural oyster beds and the ecological communities that they support more resilient to environmental change. Wild oysters are critical to the function of coastal ecosystems. However, wild oyster populations are threatened by environmental change in Australia and around the world. Selectively bred oysters bearing stress resistance genotypes are now commercially farmed in many estuaries on Australia's east coast and may be used to bolster wild oyster populations. This project endeavours to develop novel genetic strategies to future-proof oysters. Thus, the outcome of this project has potential to benefit entire ecosystems that depend upon oysters.
DP150103820	The general aim of this project is to exploit the advantages of the zebrafish system and our access to the embryology of Australian shark species to generate an understanding of the basis for muscle fibre diversity and evolution. While there is some understanding of the fundamental genetic basis of how to make an individual muscle cell from a nascent myoblast there is far less knowledge on how individual muscle cells generate mature muscle types and patterns. The intended outcome of this research is to generate understanding of the complex molecular basis of muscle patterning in the simple paradigm of the zebrafish myotome that could be applied across the vertebrate phylogeny.
DP150100912	Thermal stratification is common in Australia's rivers due to our hot, drought-prone climate and high human demands relative to available supply, which has led to a significant reduction in flows relative to natural levels. Thermal stratification inhibits mixing, creating stagnant conditions characterised by low oxygen levels and increased concentrations of contaminants, leading to algal blooms, fish kills and systemic damage to ecosystems. The aim of this project is to develop predictive models for the effects of physical processes such as night-time cooling, wind, turbulence and currents on riverine thermal stratification. This is expected to enable a more accurate determination of the flow rates required to maintain the health of our river systems.
LP150100388	This project aims to use a traits-based modelling framework, incorporating variability both within and between species, to forecast the resilience of freshwater fishes in northern Australia to impending environmental change. While northern Australian rivers are among the most pristine and productive on earth, they face profound change due to human activity. Emerging evidence suggests that flexibility in functional traits (e.g. life history, physiology, behaviour, diet) may result in resilience to environmental change. This project aims to provide decision-makers with essential information and new tools to underpin future planning and resource management.
DE150100321	Climate variation will continue to impact biodiversity on our globe. Exciting new evidence has suggested that terrestrial ectotherms can minimise their vulnerability to changing temperatures by altering their thermoregulatory behaviour. Fish, unlike terrestrial ectotherms do not possess the same ability to thermoregulate and it is unclear how behavioural changes may reduce a population's vulnerability to climate change. This project aims to combine bio-logging technology, energy budget theory and climate models to predict the potential role that changing behaviours may have in reducing the vulnerability of fish populations to climate change.

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- DE150101266 This project aims to examine the effects of ocean acidification on coral reef fishes due to increasing atmospheric carbon dioxide (CO₂). Physiological performance of fish vary under elevated CO₂, but behaviour is consistently, negatively impacted. This project aims to investigate evolutionary trade-offs between behaviour and performance, physiological mechanisms key to compromising, maintaining, or enhancing metabolic performance under elevated CO₂, and the importance of habitat in how fish respond to elevated CO₂. As fish play critical roles in marine ecosystems by structuring food webs and driving ecological processes, this information will be critical for predicting the effects of ocean acidification on marine ecosystems and biodiversity.
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- DE160100247 This project will seek new fossil discoveries from Australian Devonian sediments to address questions of the origins, diversification and biogeographical dispersal of early jawed vertebrates. In particular, there is the potential to test or refine recent evolutionary hypotheses based on fossil finds from the Siluro-Devonian of southern China which served as a likely point of origin for several key vertebrate groups. Likely finds include fishes that test dermal bone-homologies between osteichthyans and placoderms, jawless fishes that may unveil details of the origin of jaws, and calibration of paleoatmospheric models via the observed size of Early Devonian fossil fishes.
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- DP160100285 This project aims to test how populations of introduced mosquitofish have adapted to local differences in water temperature (such as Tasmania versus Queensland). To what extent has natural selection (for survival) and sexual selection (the ability of males to acquire mates and/or females to resist unwanted matings) driven the local adaptation of populations? Many species have traits that evolve under intense sexual conflict – notably when males harass or coerce females into mating and females resist these attempts. It is assumed that sexual conflict traits are rarely affected by the local environment. The project will test the hypothesis that temperature can actually drive the evolution of such traits, specifically coercion and resistance to mating.
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- LP150100761 This project aims to improve our understanding of inshore ecosystems to facilitate better management of our living marine heritage. The project first aims to extend field datasets on the density and distribution of thousands of marine fishes, invertebrates and macro-algae. These will then be combined using recent advances in quantitative ecological modelling to describe transfer of biomass between species at hundreds of sites, with a primary focus on southern Australia. It is anticipated that this will provide site-level indices of major food web processes that, when combined with 'before, after, control, impact' data, will improve prediction of ecological consequences of fishing, climate change, pest outbreaks and pollution.
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- DP160103668 This project aims to investigate how environmental experiences shape phenotypes, engender variance in populations and ultimately contribute to evolution. It targets new discoveries for how environmental effects can multiply throughout ontogeny and/or propagate across generations. Although widely speculated to support new evolutionary paradigms, such knowledge lacks scrutiny according to the formal metric of quantitative genetics. This project seeks to expose guppy pedigrees to unique manipulations and reconcile adaptive evolution across captive and wild populations. The outcome is expected to address knowledge gaps in the life and human sciences and potentially inform goals in primary production and conservation.
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- DP160104292 This project intends to develop novel statistical tools for more accurate prediction by taking account of model complexity and uncertainties associated with the fitting procedure. The project also plans to develop a novel shrinkage approach via new penalty functions to avoid over-fitting and asymptotic properties. The key applications may include genetic studies where the number of predictors is large and biological experiments where multivariate and temporal data are often collected – for example economical breeding in animal and fish farming and more effectively detecting the genes of interest in genetic studies on human, animals and plants.
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- DP160104427 The project seeks to understand how different muscle populations within the embryo form and have evolved within the vertebrate phylogeny. All amniote muscles, except that of the head, derive from a transient embryonic structure termed the dermomyotome. The formation of muscle from the dermomyotome of amniotes uses a highly conserved mechanism that is distinct from that deployed by bony fish and amphibians. How the dermomyotome evolved to generate the distinct types of locomotor systems we see deployed throughout the vertebrate phylogeny remains unresolved. This project aims to contribute to an understanding of how different locomotor strategies deployed at important evolutionary transitions were generated.
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- DP160100573 The project aims to decipher the fundamental mechanisms governing stem cell specification and formation. All animals rely on stem cells to replenish, repair and regenerate tissues. Stem cells are also often a conduit to malignant tumours. This project seeks to uncover the rules governing stem cell formation through the study of a simple and ancient animal – the marine sponge *Amphimedon queenslandica*. The project plans to combine insights from the simple, experimentally-tractable sponge stem cell system with existing knowledge of stem cell specification in humans and other animals, to reveal the essential features of stem cell formation. These insights may inform future pursuits to generate, control and use stem cells in cancer and regenerative medicines.
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- DE160100668 The project aims to develop a new understanding of fundamental mechanisms responsible for coral calcification and its ability to acclimate to global warming and ocean acidification. Mineral skeleton formation by coral is the key process controlling the creation of reef structures upon which entire ecosystems depend. Despite the importance of coral to the function of reef ecosystems, how calcification works mechanistically within coral itself, and why small modifications of their physical and chemical habitat can have large effects on growth is presently poorly understood. This project seeks to provide this basic knowledge to improve our ability to assess the future of corals and help policy-makers take adequate measures to preserve coral reefs.
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- DE160101141 This project aims to measure the degree of connectivity between isolated reefs in Australia's Coral Sea and the Great Barrier Reef and identify the biological and environmental mechanisms that enhance management strategies or mitigate against disturbances. The movement of individuals in fragmented landscapes plays a central role in the ecology and evolution of species. The project seeks to measure connectivity at multiple scales and identify critical regions for the design of networks of marine protected areas. This is anticipated to improve our understanding of connectivity in marine seascapes and benefit management of important fishery species and current efforts in coral reef conservation.
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- DP160100271 The objective of this project is to advance knowledge on the healthy functioning of the coral–algal symbiosis, which defines the response of coral reef ecosystems to worldwide environmental change. Current approaches to address this problem have linked coral health to algal symbiont diversity but have been unable to resolve the fundamental symbiont functional traits that govern this link – the “key performance indicators (KPIs)”. This project plans to couple advanced physiological and functional genomics techniques to transform our understanding of how algal symbiont metabolic KPIs regulate coral growth and stress susceptibility. This may provide new diagnostic capability for the assessment of coral health and may enable us to improve coral reef ecosystem management.
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- DE160100636 This project aims to unravel microbiological processes in the ocean to help quantify the ecosystem services carried out by microbes that support our economy and environment. By recycling vital nutrients, microbes form the basis of the marine food web. In Australia, their contributions support fisheries worth \$4.2 billion. Their role in carbon cycling also controls our climate. Yet, their direct productivity remains unquantified. Technical limitations have restricted our ability to identify the key microbes most responsible for ocean carbon cycling, and to measure their impact. This project plans to combine new approaches in microfluidics, chemistry and oceanography to quantify carbon uptake by individual microbes and provide new understanding of microbe-mediated chemical cycling processes.
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- DE160101207 This project intends to quantify the role that aquatic habitats play in fisheries, and to help identify where to restore degraded aquatic habitats. Fisheries are a globally important resource but their status is declining in many regions, often because of the loss of aquatic habitats. However, the role of habitat in fishery declines is poorly quantified, and new models are needed that integrate existing datasets to attribute change in a fishery to change in its habitats. The project aims to develop a new statistical analysis to examine the role of habitat loss in the global status of fisheries and how multiple human impacts to habitats affect fisheries, to decide how we can best protect aquatic habitats.
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- DP160100372 This project aims to uncover how a ubiquitous pharmaceutical pollutant – fluoxetine, known as Prozac – alters the course of reproduction and sexual selection in a freshwater fish. Drugs used in human and veterinary medicine enter the environment and pose a serious threat to wildlife. The project plans to integrate morphological, behavioural, and experimental evolution approaches to yield insights into how fluoxetine affects sexual traits and behaviours, and how this in turn can affect offspring viability and the evolutionary process. Findings are expected to add to our understanding of how species respond to rapidly changing environments, with consequences for the persistence of populations and the survival of species in the wild.
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- DP160102460 The project aims to investigate very early Australian tetrapod trackways and conduct fieldwork to resolve the place of origin and timing of the evolution of the first tetrapods. The evolution of fishes to tetrapods was one of the key events in evolution. Studies on Northern Hemisphere fossils place an origin for the group around 380 million years ago. Australian fossils suggest a much older origin. New micro computed tomography data from Australian 3-D fossil fishes, combined with study of rare tetrapod gill arch bones, would enable us to determine the origins of tetrapod air-breathing and its ecological setting. The project may facilitate a rewriting of vertebrate evolution's most significant first step.
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DP160101539 This project aims to unlock the molecular basis of a partnership between a microscopic plant and an animal that powers coral growth. Most corals depend on microscopic algae living inside their bodies to nourish them. Most corals have to recruit new algae each time they reproduce, but only a particular strain of algae is accepted. This project aims to establish how anemones and corals identify and take in the right alga, how the alga gives them food, and how the animal hosts regulate growth of their algae to optimise food production but avoid being overrun by algae. Understanding the partnership that drives reef growth and survival may better equip us to protect this threatened resource.

DP160103387 The project aims to improve our understanding of light–matter interactions in the waters of the Southern Ocean (SO), in particular the role of phytoplankton and associated material of biological origin. Phytoplankton are the energy source for the food web and a critical component of carbon cycling in the SO. However, their dynamics in the SO cannot be quantified using satellite observations because bio-optical data processing algorithms perform poorly due to a lack of field data. This project seeks to remedy this by improving understanding of SO bio-optics, and by providing novel algorithms of known uncertainty, based on in situ data.



Fisheries Research and Development Corporation (FRDC)

The Fisheries Research and Development Corporation plans, invests in and manages fisheries research and development throughout Australia. It is a federal statutory authority jointly funded by the Australian Government and the fishing industry. *For more information visit:*

www.frdc.com.au

Project ID	Project Title
2017-093	Travel Bursary for Professional Development and Identification of Emerging Technologies
2016-807	Future oysters CRC-P: Species diversification to provide alternatives for commercial production
2016-806	Future Oysters CRC-P: Advanced aquatic disease surveillance for known and undefined oyster pathogens
2016-805	Future oysters CRC-P: Polymicrobial involvement in OsHV outbreaks (and other diseases)
2016-804	Future oysters CRC-P: Advanced understanding of POMS to guide farm management decisions in Tasmania
2016-803	Future oysters CRC-P: New Technologies to Improve Sydney Rock Oyster Breeding and Production
2016-802	Future Oysters CRC-P: Accelerated Sydney Rock Oyster (SRO) Breeding Research
2016-801	Future oysters CRC-P: Enhancing Pacific Oyster breeding to optimise national benefits
2016-503	Digital documentation of Australian Barramundi and Prawns Farms Across Australia
2016-418	National people development: Building education and training pathways for research and development adoption
2016-417	National People Development: Membership of PIEFA to support and encourage the teaching and learning in Australian schools of information related to the Australian Fishing Industry
2016-415	AAGA IPA: Management of Australian Abalone Growers Association's RD&E portfolio
2016-272	IPA ACPF APFA: Love Australian Prawns evaluation using consumer research, sales data and market insights
2016-267	Economic Impact of 2016 White Spot Disease Outbreak
2016-266	Prawn White Spot Disease Response Plan
2016-263	Social and Economic Evaluation of the Victorian Wild-catch Seafood and Aquaculture Industry – STAGE 1
2016-246	Australian Fisheries and Aquaculture Statistics 2015
2016-245	Development of sector-specific biosecurity plan templates and guidance documents for the abalone and oyster aquaculture industries
2016-201	Indigenous fishing subprogram: Business opportunities and impediments for Aboriginal community development in supportive fishing industries in the Roper River to Robinson River area of the Northern Territory
2016-200.40	Growing a profitable, innovative, collaborative Australian Yellowtail Kingfish aquaculture industry: bringing 'white' fish to the market. WA Component
2016-200.30	Growing a profitable, innovative and collaborative Australian Yellowtail Kingfish aquaculture industry: bringing 'white' fish to the market - RnD4Profit-14-01-027 - SA Component
2016-200.20	Growing a profitable, innovative and collaborative Australian Yellowtail Kingfish aquaculture industry: bringing 'white' fish to the market - RnD4Profit-14-01-027
2016-200	Rural R&D for Profit: Growing a profitable, innovative and collaborative Australian Yellowtail Kingfish

	aquaculture industry: bringing 'white' fish to the market
2016-149	Development of Aquaculture and Value-Adding Integrated with Red Meat Processing
2016-147	Development of sector-specific biosecurity plan templates and guidance documents for the Australian farmed barramundi industry
2016-068	TSGA IPA: vulnerability of the endangered Maugean Skate population to degraded environmental conditions in Macquarie Harbour
2016-067	TSGA IPA: understanding oxygen dynamics and the importance for benthic recovery in Macquarie Harbour
2016-066	Assessing compliance and efficacy of import conditions for green (raw) prawn in relation to White Spot Syndrome Virus (WSSV)
2016-054	TSGA-IPA: Pilchard orthomyxovirus fast-track proof-of-concept vaccine
2016-049	IPA APFA: detection of pesticide impacts on larval prawns in hatcheries and presence in estuarine intake water
2016-045	TSGA IPA: development of Pilchard orthomyxo virus vaccine for salmonids
2016-013	Aquatic Animal Health and Biosecurity Subprogram: Comparative pathogenicity of exotic acute hepatopancreatic necrosis disease (AHPND) and the presumptive bacterial hepatopancreatitis detected in farmed <i>Penaeus monodon</i> in Queensland
2016-011	Aquatic Animal Health and Biosecurity Subprogram: Disinfection measures to support biosecurity for infectious spleen and kidney necrosis virus (ISKNV) at aquaculture facilities
2016-009	Aquatic Animal Health and Biosecurity Subprogram: <i>Perkinsus olseni</i> in abalone - development of fit-for-purpose tools to support its management
2016-005	eSAMarine – phase 1: the first step towards an operational now-cast/forecast ocean prediction system for Southern Australia
2015-406	Oysters Australia IPA: development of a national Pacific Oyster Mortality Syndrome (POMS) response plan
2015-240	APFA IPA: RNAi treatment of broodstock to reduce disease impacts in farmed prawns
2015-239	Oysters Australia IPA: Pacific Oyster Mortality Syndrome - resistant Oyster breeding for a sustainable Pacific Oyster Industry in Australia
2015-238	Rural R&D for Profit: Easy-Open Oyster automation
2015-235	TSGA IPA: scoping study for alternative energy sources at off-shore/remote salmon farms to reduce or eliminate the need for large diesel generators
2015-232	Oysters Australia IPA: Australian Seafood Industries Pacific Oyster Mortality Syndrome (POMS) investigation into the 2016 disease outbreak in Tasmania - ASI emergency response
2015-231	AAGA IPA: obtaining approvals for abalone relaxants
2015-230	Oysters Australia IPA: genetic services for the multi-trait, single pair mated Sydney Rock Oyster breeding program
2015-229	Oysters Australia IPA -workshop – identifying knowledge gaps for development of the native oyster aquaculture industry in South Australia
2015-228	IPA Australian Barramundi Farmers Association - ABFA RD&E investment model
2015-213	Enabling land-based production of juvenile Yellowtail Kingfish in NSW
2015-043	APFA IPA: towards understanding the relationship of the distribution of the PirAB toxin DNA and <i>Penaeus monodon</i> mortality syndrome (PMMS) pathology in farmed prawns in Australia
2015-040	ABFA IPA: an assessment of the risk of exotic disease introduction and spread among Australian Barramundi farms from the importation of Barramundi products
2015-037	Oysters Australia IPA: the use of FRNA bacteriophages for rapid re-opening of growing areas after sewage spills
2015-028	RAC WA: Future proofing Western Australia's iconic Marron (<i>Cherax cainii</i>) Fishery
2015-024	TSGA IPA: Managing ecosystem interactions across differing environments: building flexibility and risk assurance into environmental management strategies

2015-005	Aquatic Animal Health Subprogram: Determining the susceptibility of Australian <i>Penaeus monodon</i> and <i>P. merguensis</i> to newly identified enzootic (YHV7) and exotic (YHV8 and YHV10) Yellow head virus (YHV) genotypes
2015-003	Aquatic Animal Health Subprogram: Development of standard methods for the production of marine molluscan cell cultures
2015-001	Aquatic Animal Health Subprogram: Bonamiasis in farmed Native Oysters (<i>Ostrea angasi</i>)
2014-408	ABFA IPA: RD&E project investment and management via ABFA strategic plan 2014-2020
2014-244	Development of a National Marketing Framework
2014-242	NEAO Subprogram: Commercialising the production of Cobia in Australia
2014-241	TSGA IPA: reassessment of intertidal macroalgal communities near to and distant from salmon farms and an evaluation of using drones to survey macroalgal distribution
2014-214	RAC WA: Investigating critical biological issues for commercial Greenlip Abalone sea ranching in Flinders Bay, Western Australia
2014-213	Developing new seafood opportunities in Victoria – scallop ranching
2014-040	Oysters Australia IPA: Pacific Oyster Mortality Syndrome (POMS) – closing knowledge gaps to continue farming <i>C. gigas</i> in Australia
2014-034	Revision of the existing AQUAVETPLAN: 'Viral Encephalopathy and Retinopathy Disease Strategy Manual'
2014-032	Improved understanding of Tasmanian harmful algal blooms and biotoxin events to support seafood risk management
2014-031	TSGA IPA: Predicting marine currents, nutrients and plankton in the coastal waters of south eastern Tasmania in response to changing weather patterns
2014-028	Mud cockle (<i>Katelysia</i> spp.) stock enhancement/restoration: practical implementation and policy evaluation
2014-002	Aquatic Animal Health Subprogram: Development of stable positive control material and development of internal controls for molecular tests for detection of important endemic and exotic pathogens
2013-303	Sponsorship of the Australian Marine Science Association (AMSA) Fisheries Symposium "Beyond Jurisdiction-based Fisheries Stock Management" 6-10 July 2014
2013-231	IPA APFA: Characterising and managing harmful algal blooms that cause production loss on Australian prawn farms
2013-221	RAC WA: Stock enhancement of the Western School Prawn (<i>Metapenaeus dalli</i>) in the Swan-Canning Estuary; evaluating recruitment limitation, environment and release strategies
2013-056	Tactical Research Fund: revision of the Australian Shellfish Quality Assurance Program manual - in light of the FRDC funded PST review report
2013-051	TSGA IPA: The Australian Aquatic Animal Health and Vaccine Centre: First Phase to Establish Atlantic Salmon Biosecure Fish Facility Capabilities and Develop Strategy for an Australian Centre of Excellence
2013-049	DAFF Aquatic Animal Welfare Working Group - Communications Coordinator
2013-027	ASBTIA: Optimising the use of praziquantel to manage blood fluke infections in commercially ranched SBT
2013-002	Aquatic Animal Health Subprogram: Identifying the cause of Oyster Oedema Disease (OOD) in pearl oysters (<i>Pinctada maxima</i>), and developing diagnostic tests for OOD
2012-024	INFORMD Stage 2: Risk-based tools supporting consultation, planning and adaptive management for aquaculture and other multiple-uses of the coastal waters of southern Tasmania
2012-020	The influence of fish movement on regional fishery production and stock structure for South Australia's Snapper (<i>Chrysophrys auratus</i>) fishery
2012-016	RAC WA: Demographic Performance of Brownlip Abalone: Exploration of Wild and Cultured Harvest Potential
2011-224	TSGA IPA: Aquareovirus (TSRV) vaccine development for the Tasmanian salmonid aquaculture industry

2011-223	TSGA IPA: development of an RLO vaccine: Proof-of-Concept to commercial application
2010-780	Seafood CRC: PhD: Molecular and quantitative genetics studies to improve breeding programs for key Australian aquaculture species
2010-313	Omega 3 Centre Membership
2010-032	TSGA IPA: Tasmanian Aquabirnavirus vaccine development: Towards achieving pan-specific protection of cultured salmonids in Australia using multivalent vaccines
Oyster Projects	
2016-808	Future Oysters CRC-P: Income from ASI; FRDC OA PIRSA Contributions; and uncommitted extension funds management project
2016-807	Future oysters CRC-P: Species diversification to provide alternatives for commercial production
2016-806	Future Oysters CRC-P: Advanced aquatic disease surveillance for known and undefined oyster pathogens
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2016-802	Future Oysters CRC-P: Accelerated Sydney Rock Oyster (SRO) Breeding Research
2016-801	Future oysters CRC-P: Enhancing Pacific Oyster breeding to optimise national benefits
2016-800	Future Oysters CRC-P Management and Extension
2016-245	Development of sector-specific biosecurity plan templates and guidance documents for the abalone and oyster aquaculture industries
2015-406	Oysters Australia IPA: development of a national Pacific Oyster Mortality Syndrome (POMS) response plan
2015-239	Oysters Australia IPA: Pacific Oyster Mortality Syndrome - resistant Oyster breeding for a sustainable Pacific Oyster Industry in Australia
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2015-037	Oysters Australia IPA: the use of FRNA bacteriophages for rapid re-opening of growing areas after sewage spills
2015-001	Aquatic Animal Health Subprogram: Bonamiasis in farmed Native Oysters (<i>Ostrea angasi</i>)
2014-405	Oysters Australia IPA: Australian edible oyster RD&E investment via Oysters Australia strategic plan 2014-2019
2014-040	Oysters Australia IPA: Pacific Oyster Mortality Syndrome (POMS) – closing knowledge gaps to continue farming <i>C. gigas</i> in Australia
2014-027	Pacific oyster feeds and feeding in South Australian waters: towards ecosystem based management
2015-042	Assessing occurrence of pathogenic species of the marine bacteria <i>Vibrio</i> in Tasmanian oysters from St Helens
2013-234	Survey of Foodborne Viruses in Australian Oysters
2012-051	Workshop to facilitate epidemiological analysis of unexplained mortality of South Australian Pacific Oyster



Australian Seafood Cooperative Research Centre (Seafood CRC)

The Australian Seafood Cooperative Research Centre is Australia's first entity to stimulate and provide comprehensive seafood-related research and development and industry leadership on a national basis. *For more information visit: www.seafoodcrc.com.au*

Project ID	Project Title
2012-760	Seafood CRC: genetic selection for resistance to Pacific oyster mortality syndrome
2015-712	Seafood CRC: sustainability Certification Australian farmed prawns
2015-711	Seafood CRC: new directions in Australian seafood whole of chain traceability and supply chain technologies
2015-707	Seafood CRC: research Travel Grant - Veterinary Student Clinical Rotation in Aquaculture Health Management (VET SC 7306RW DVM)
2014-729	Seafood CRC: improving the taste, bioavailability and efficacy of orally administered praziquantel for yellowtail kingfish with lipid nanoparticles and hybrid lipid carrier systems
2014-727	Seafood CRC: assessing histamine production in aquaculture Yellowtail Kingfish and determining the appropriateness of the predictive Food Spoilage and Safety Predictor (FSSP) histamine model for Clean Seas
2014-712	Seafood CRC: disease challenge testing at the Centre of Excellence- Scope for estimating the genetics of resistance
2014-706	Seafood CRC: Co-ordination of fish health and nutrition research for the WA Yellowtail Kingfish trial 2
2014-704	Seafood CRC: waste transformation methods for value added products for the catering market
2013-748	Seafood CRC: Future Harvest Master Class in Fisheries Economics - Revision & Extension (2013-748 Communal)
2013-729	Seafood CRC: Promoting Marine Finfish Aquaculture in NSW
2013-726	Seafood CRC: utilisation of improved varieties of soybean meal and poultry offal meal by Barramundi (<i>Lates calcarifer</i>)
2013-711	Seafood CRC: Centre of Excellence Science Seafood & Health (CESSH): Post Harvest Research Program
2013-710	Seafood CRC: securing the future of SBT propagation R&D
2012-746.40	Partnership with the Global Sustainable Seafood Initiative (GSSI) to develop an international benchmark for sustainable seafood harvesting and farming
2011-747	Seafood CRC: maximising the quality of Australian wild-caught prawns (Quality Assurance)
2011-740	Seafood CRC: addressing causes of early mortality in hatchery produced Southern Bluefin Tuna larvae
2011-726	Seafood CRC: wanted Dead or Alive: Novel Technologies for Measuring Infectious Norovirus Particles