FINAL REPORT

An Impact Assessment of Investment in FRDC Project 2015-018:

Do commercial fishery data reflect stock status in South Australia's Southern Garfish fisheries?

Peter Chudleigh, Agtrans Pty Ltd and

Talia Hardaker, ACRE Economics Pty Ltd

January 2023

FRDC Project No **2016-134**

ISBN **[Insert ISBN/ISSN – researcher to obtain]**

An Impact Assessment of Investment in FRDC Project 2015-018: Do commercial fishery data reflect stock status in South Australia's Southern Garfish fisheries?
FRDC Project 2016-134

2022

Researcher Contact Details

Name:	Peter Chudleigh
Address:	Suite 36, Benson House, 2 Benson Street, Toowong, Qld, 4066
Phone:	07 3870 4047
Fax:	Nil
Email:	peter@agtrans.com.au

FRDC Contact Details

Address:	25 Geils Court Deakin ACT 2600
Phone:	02 6122 2100
Email:	frdc@frdc.com.au
Web:	www.frdc.com.au

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

Contents

Tables

Figures

Acknowledgments

Agtrans Pty Ltd (Agtrans Research) and ACRE Economics Pty Ltd (ACRE Economics) would like to thank Patrick Hone (Managing Director), Jennifer Marshall (Cross-Functional Facilitator) and Chris Izzo (Senior Research Portfolio Manager) of the Fisheries Research and Development Corporation for facilitating contact with relevant project personnel and for their guidance and feedback throughout the Impact Assessment process.

Specific acknowledgments for helpful comments on earlier drafts and for supplying additional information are made to:

- Tony Fowler, Subprogram Leader, Finfish Fisheries, SARDI

Abbreviations

ABS	Australian Bureau of Statistics
CBA	Cost-Benefit Analysis
CRRDC	Council of Rural Research and Development Corporations
DAWR	Department of Agriculture and Water Resources
FRDC	Fisheries Research and Development Corporation
GSV	Gulf St. Vincent
OCS	Office of the Chief Scientist
PIRSA	Department of Primary Industries and Regions South Australia
R&D	Research and Development
RD&E	Research, Development and Extension
SARDI	South Australia Research and Development Institute

Executive Summary

The Southern Garfish (*Hyporhamphua melanochir*) is an important fish species in fisheries spread across Australian southern states including in Tasmania. In the past, management was based entirely on fisheries-dependent data collected from spatially limited areas. Also, very little information was available on the population size and abundance of the species in the unfished, offshore, and southern waters of the two gulfs. In South Australia, two locations (Northern Spencer Gulf and Northern Gulf St. Vincent) contribute about 90% of the Garfish annual catch; the commercial catch is significant and was valued at approximately $1.75 million per annum.

Fisheries Research and Development Corporation (FRDC) funded project 2015-018 was funded to improve the understanding as to whether the stock status as indicated by the northern fished areas was representative of the stock status of the species more broadly throughout the two gulfs, as well as to assess the connectivity between fished and unfished areas. This assessment was required to better understand the resilience of the Southern Garfish to a continuous high fishing pressure.

Important outputs of the project included:

- Assembly of information from two earlier sampling programs.
- Contemporary information on fish size, age, and reproductive status from several years of fishery independent night-time visual counting and netting of fish across 13 locations across the Gulf of St Vincent.
- Use of the size and age data in modelling to identify the likely places where spawning occurred and the possible movement of larvae.
- A conceptual model of how Southern Garfish maintain their populations in the Gulf of St Vincent.
- An enhanced understanding of the patterns of distribution and abundance of larval and adult Southern Garfish throughout Spencer Gulf.
- Interpretation of data on the extent to which commercial fishery data from Northern Gulf St Vincent are indicative of the stock status throughout the Gulf.

The key outcomes of the project were:

- Information that supported no changes to Garfish fisheries policies in Gulf St Vincent.
- The northern region of Gulf St Vincent supports the highest numbers of Garfish as well as the highest availability of a favoured seagrass, and consequently is the most heavily fished.
- The central and southern regions support lower numbers of adult fish and likely lower egg production; also, the southern populations appear to be effectively ecologically separated from the north.
- It was concluded that, as there were no ecological connections between north and south, and most commercial fishing effort occurs in the north, the use of commercial fishery data for assessing the status of Southern Garfish fisheries in South Australia remained appropriate.

However, the Marine Scalefish Fishery of South Australia subsequently has undergone a significant reform process that was implemented in July 2021 with the fisheries now managed as quota-based fisheries; this reform was driven by a number of other FRDC projects. Hence, FRDC 2015-018 did not lead directly to any significant management changes. This is because it was completed just as the whole Marine Scalefish Fishery was being reformed, and so possible changes from the 2015-018 report were overridden by much larger changes.

On the other hand, FRDC 2015-018 has contributed substantially to understanding the population biology of the species. This understanding is proving very significant in discussions relating to stock assessment processes that are currently underway in 2022 for Southern Garfish fisheries in South Australia.

Introduction

The Fisheries Research and Development Corporation (FRDC) required an annual series of impact assessments to be carried out on a sample of completed investments from the FRDC research, development, and extension (RD&E) portfolio. The assessments were required to meet the following FRDC evaluation reporting requirements:

- Reporting against the FRDC 2015-2020 RD&E Plan and the Evaluation Framework associated with FRDC's Statutory Funding Agreement with the Commonwealth Government.
- Annual Reporting to FRDC funding partners and other stakeholders.
- Reporting to the Council of Rural Research and Development Corporations (CRRDC).
- Reporting RD&E impact and performance to FRDC levy payers and other fisheries and aquaculture stakeholders as well as the broader Australian community.

In April 2017, FRDC commissioned Agtrans Pty Ltd (Agtrans) to undertake the annual impact assessments for RD&E projects funded under the FRDC 2015-2020 RD&E Plan and completed in the years ended 30 June 2016 to 2020 (FRDC Project 2016-134). Between 2016/17 and 2020/21, four series of annual impact assessments were completed. Each of the four series of assessments included a set of 20 randomly selected FRDC RD&E investments as well as an aggregate analysis across all 20 investments evaluated in each year. Published reports for the annual FRDC evaluations can be found at: https://www.frdc.com.au/frdc-project-impact-assessments-benefits-research.

The fifth and final series of impact assessments under Project 2016-134 was for a set of FRDC RD&E investments completed in the year ended 30 June 2020, the final year of the FRDC 2015-2020 RD&E Plan. As in previous years, the fifth series of impact assessments included 20 randomly selected FRDC RD&E investments. The 20 investments had a total value of approximately $5.30 million (nominal FRDC investment) and were selected from an overall population of 81 FRDC investments worth an estimated $17.66 million (nominal FRDC investment) where a final deliverable had been submitted in the 2019/20 financial year.

The 20 RD&E investments were selected through a stratified, random sampling process such that investments chosen spanned all five FRDC Programs (Environment, Industry, Communities, People and Adoption), represented approximately 30.0% of the total FRDC RD&E investment in the overall population (in nominal terms), and included a selection of small, medium, and large FRDC investments (total nominal FRDC investment of $\leq$ $50.000, $50,001 to $250,000, and > $250,000 respectively).

Project 2015-018*: Do commercial fishery data reflect stock status in South Australia's Southern Garfish fisheries?* was randomly selected as one of the 20 RD&E investments completed in 2019/20 for evaluation in the fifth series of annual impact assessments (2019/20 sample). The current report presents the Project 2015-018 analysis and findings.

Method

The annual impact assessments of FRDC RD&E investments followed general evaluation guidelines that are now well entrenched within the Australian primary industry research sector including Research and Development Corporations, Cooperative Research Centres, State Departments of Agriculture, and some universities. The approach includes both qualitative and quantitative assessment components that are in accord with the current guidelines for impact assessment published by the CRRDC (CRRDC, 2018).

The evaluation process utilised an input to impact continuum RD&E project inputs (costs), objectives, activities, and outputs were briefly described and documented. Actual and expected outcomes, and any actual and/or potential future impacts (positive and/or negative) associated with project outcomes then were identified and described. The principal economic, environmental, and social impacts were then summarised in a triple bottom line framework and validated through consultation with expert personnel and review of published literature.

Once impacts were identified and validated, an assessment then was made about whether to quantify/value any of the impacts in monetary terms as part of the project-level analysis. The decision to value an impact identified was based on:

- Data availability and information necessary to form credible valuation assumptions,
- The complexity of the relevant valuation methods applicable given project resources,
- The likely magnitude of the impact and/or the expected relative value of the impact compared to other impacts identified, and
- The strength of the linkages between the RD&E investment and the impact identified.

Where one or more of the identified impacts were selected for valuation, the impact assessment used cost-benefit analysis (CBA) as a principal tool. The impacts valued therefore were deemed to represent the principal benefits delivered by the project investment. However, as not all impacts were valued (based on the selection criteria), the investment criteria estimated for the project investment evaluated are likely to represent an underestimate of the true performance of the FRDC project. No impacts were valued for Project 2015-018.

The qualitative and quantitative analysis processes, data sources, assumptions, specific valuation frameworks (where applicable), and evaluation results were clearly documented and then integrated into a written report.

Project Background

Background

Southern Garfish (*Hyporhamphua melanochir*) is an important fish species in fisheries spread across Australian southern states and in fisheries in Tasmania. An area of concern regarding Southern Garfish fisheries in South Australia was that management was based entirely on fisheries-dependent data collected from spatially limited areas (e.g., fishable biomass recruitment rates and harvest fractions were based on the commercial catch data); furthermore, size and age structures were based on market sampling of the commercial catches. Also, very little information was available on the population size and abundance of the species in the unfished, offshore, and southern waters of the two gulfs.

The relevant South Australian Garfish fisheries are located in Northern Spencer Gulf and Northern Gulf St. Vincent. These two locations contribute about 90% of South Australia's garfish annual catch. The commercial sector accounts for nearly 80% of South Australia's total catch of southern garfish; the commercial catch was valued recently at approximately $1.75 million per annum.

Rationale for Project 2015-018

FRDC project 2015-018 was funded to improve the understanding as to whether the stock status as indicated by the northern fished areas is representative of the stock status of the species more broadly throughout the two gulfs, as well as to assess the connectivity between fished and unfished areas. This assessment was required to better understand the resilience of the southern garfish to a continuous high fishing pressure.

Project Details

Summary

Project Code: 2015-018

Title: *Do commercial fishery data reflect stock status in South Australia's Southern Garfish fisheries?*

Research Organisation: South Australian Research and Development Institute (SARDI))

Principal Investigator: Anthony Fowler, Subprogram Leader, Finfish Fisheries, SARDI

Period of Funding: July 2015 to June 2018

FRDC Program Allocation: Environment 100%

Objectives

1. To compare the size and age structures, relative abundances, and potential for egg production of Southern Garfish between fished and unfished area of Spencer Gulf, South Australia.
2. To determine pattens of relative abundance, sizes and ages of larval Southern Garfish throughout Spencer Gulf, South Australia.
3. To evaluate the suitability of commercial fishery data for assessing the status of Southern Garfish fisheries in South Australia.

   Note: The objectives changed slightly during the project. In spring 2016, the entire project was relocated from Spencer Gulf to Gulf St. Vincent. This was done in consultation with the Department of Primary Industries and Regions South Australia (PIRSA) and commercial industry representatives, to make the project more logistically tractable.

Logical Framework

Table 1 provides a description of the project in a logical framework developed for the evaluation. The project focused on Gulf St Vincent (GSV) by providing spatial information for the areas of the Gulf where hauling net fishing is permitted and where it is excluded.

Table 1: Logical Framework for FRDC Project 2015-018

Activities	<u>Activities to address Objective 1: (Size and age structures, relative abundances, and potential for egg production)</u> *Analysis of historical data* • Data from two earlier sampling programs were first analysed. The first dataset was for historical data from the commercial fishing sector between 1984 to 2017; a second set of historical data analysed was for market sample data collected over the period 2005 to 2015. *Fishery independent sampling* • A second approach was via fishery independent sampling involving night-time observations based on visual counting and dab netting of the fish. • This sampling took several years to complete and provided information on fish size, fish age and reproductive status. • A total of 13 locations were sampled across three spatial regions around the Gulf (southeast, north, and west). • Seasonal sampling by depth zone across the 13 locations was undertaken twice, once during spring/summer and once during autumn/winter.

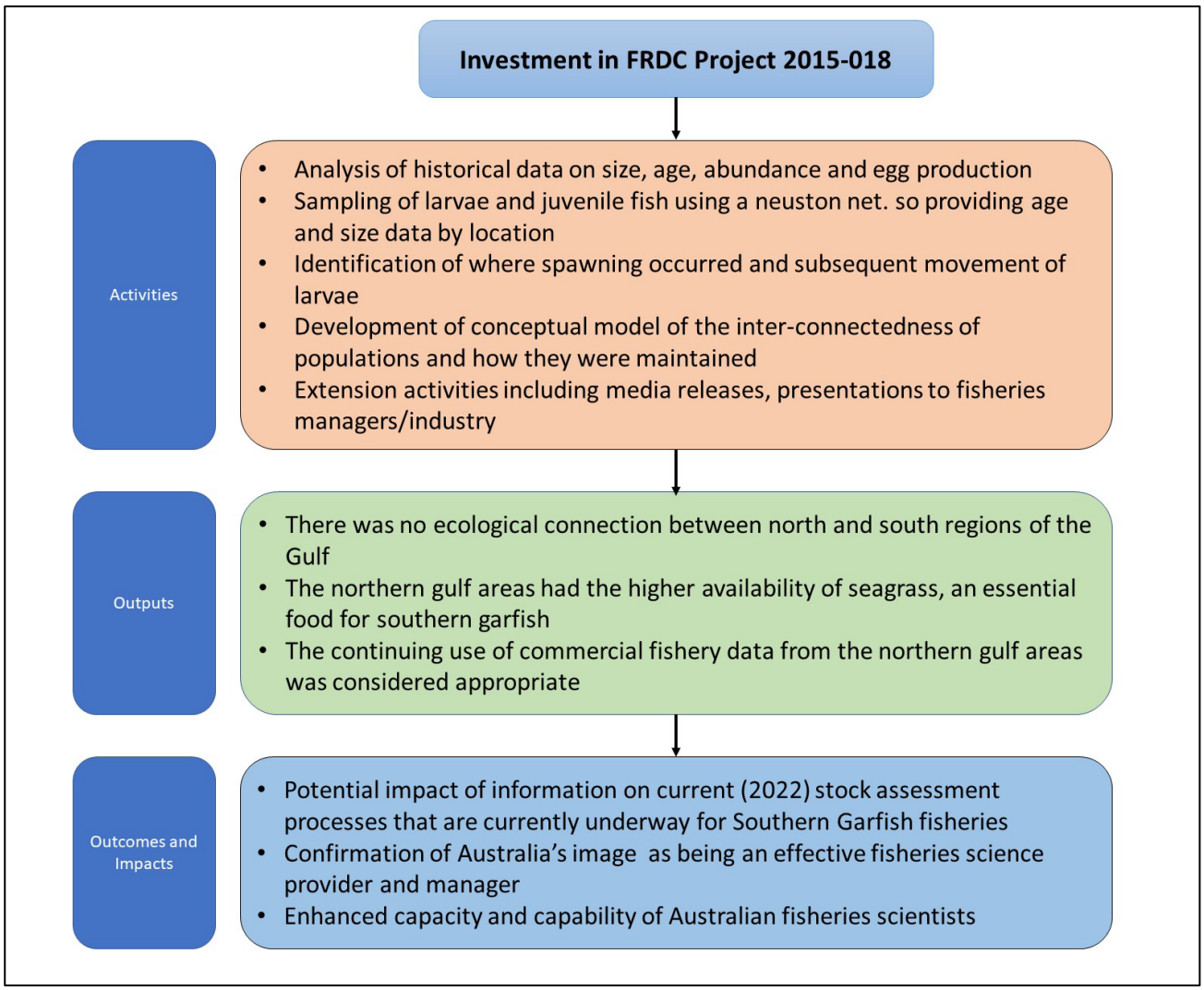
	Potential egg production around the Gulf • The spatial analysis of egg production was based on the macroscopic staging of whole gonads. • This staging was based on studying the microscopic characteristics of histological sections of a subset of ovaries; ovaries at different macroscopic stages were interpreted in terms of their state of maturity, stage of reproductive development and spawning stage, so providing information to be assembled on spawning dynamics. <u>Activities to address Objective 2 (Early life history)</u> • Activities included a single large sampling program undertaken across the GSV. • The sampling was undertaken using a neuston net (a net designed to sample plankton in the first few centimetres of the water column). • The sampling was undertaken via 5-minute tows using the nets. • A total of 127 locations were covered in the sampling, requiring two research vessels. • The larvae and juvenile fish from the nets were inspected, measured, and aged; this provided size and age data that could be used via modelling to identify the likely places where spawning occurred, and the possible subsequent movement of larvae based on local weather data. <u>Activities to address Objective 3 (Suitability of commercial fishery data)</u> • The assessment of the suitability of commercial fishery data to assess the status of Southern Garfish fisheries in the GSV was undertaken via the development of a conceptual model of how Southern Garfish maintain their populations in the GSV. • The foregoing was achieved by reference to the spatial scale over which their life history and demographic processes operate. Such information was used to describe the extent of inter-connectedness of garfish populations throughout the whole Gulf. <u>Extension</u> • A media release was published at the beginning of the project. • Annual presentations of project progress were provided to fisheries managers at PIRSA and fishing industry representatives. • Presentations were made to inter-state scientists via conferences and scientific publications.
Outputs	• Assembly of information from two earlier Information sets gleaned from earlier sampling programs over the period 1984 to 2017. • Contemporary information on fish size, age, and reproductive status from several years of fishery independent night-time visual counting and netting of fish across 13 locations across GSV and at different times of the year. • Use of the size and age data in modelling to identify the likely places where spawning occurred, and the possible movement of larvae based on local weather data. • A conceptual model of how Southern Garfish maintain their populations in the GSV. • An enhanced understanding of the patterns of distribution and abundance of larval and adult southern garfish throughout Spencer Gulf. • Interpretation of data on the extent to which commercial fishery data from Northern GSV are indicative of the stock status throughout the Gulf.

	• The northern region of GSV supports the highest numbers of garfish and consequently is the most heavily fished. • The northern region also has the highest availability of a seagrass that is an essential food resource for Southern Garfish. • The central and southern regions support lower numbers of adult fish and likely lower egg production; also, the southern populations appear to be effectively ecologically separated from the north. • The report concluded that the hauling net data that are collected in the northern part of GSV provide a good indication of stock status in this region, while the dab net data for the rest of the gulf provide an indication of stock status throughout this more extensive region. • However, the report also concluded that because of lack of connectivity in populations from north to south that it would be very difficult for the hauling net data collected in the north to be interpreted as indicative of the entire gulf. • It was concluded that, as there were no ecological connections between north and south, and most commercial fishing effort occurs in the north, the use of commercial fishery data for assessing the status of Southern Garfish fisheries in South Australia remained appropriate.
Outcomes	• The information from project 215-018 supported no changes to garfish fisheries policies in the GSV. • However, the Marine Scalefish Fishery of South Australia has undergone a significant reform process that was implemented in July 2021. The Southern Garfish fisheries are now managed as quota-based fisheries. • The above reform was contributed to by numerous other FRDC projects, primarily FRDC 2017-014, 'Informing the structural reform of South Australia's Marine Scalefish Fishery' and FRDC 2017-023, 'Ecological Sustainable Development risk assessment for lesser-known species to facilitate structural reform of South Australia's commercial Marine Scalefish Fishery' (Anthony Fowler, pers. comm., 2022). • Hence, FRDC 2015-018 did not lead directly to significant management changes. This is because it was completed just as the whole Marine Scalefish Fishery was being reformed, and so possible changes from the 2015-018 report were overridden by much larger changes (Anthony Fowler, pers. comm., 2022). • Nevertheless, FRDC 2015-018 has contributed substantially to understanding the population biology of the species. This understanding is proving very significant in discussions relating to stock assessment processes that are currently underway for Southern Garfish fisheries in South Australia (Anthony Fowler, pers. comm., 2022).
Impacts	Impacts and potential impacts include: • Potential impact on current stock assessment processes that are currently underway for Southern Garfish fisheries in South Australia. • Contribution to/endorsement of Australia's image world-wide as being an effective fisheries science provider and fisheries manager. • Enhanced capacity and capability of Australian fisheries scientists.

Pathway to Impact

A diagram describing the simplified pathways to impact for the investment in Project 2015-018 is provided in Figure 1.

Figure 1: Pathway to Impact for Project 2015-018



Nominal Investment

Table 2 shows the annual investment made in Project 2015-018 by FRDC, SARDI and PIRSA.

Table 2: Annual Investment in Project 2015-018 (nominal $)

Year ended 30 June	FRDC ($)	SARDI ($)	PIRSA Fisheries and Aquaculture (in kind) ($)	PIRSA Fisheries and Aquaculture (cash) ($)	TOTAL ($)
2016	99,272	46,683	9,701	0	155,656
2017	155,781	75,989	9,992	100,000	341,762
2018	43,888	66,104	10,292	100,000	220,284
Totals	298,941	188,776	29,985	200,000	717,702

Source: FRDC Project Agreement and FRDC Financial Acquittal

Program Management Costs

For the FRDC investment, the cost of managing the FRDC funding was added to the FRDC contribution for the project via a management cost multiplier (x1.179). This multiplier was estimated based on the share of 'employee benefits' and 'supplier' expenses in total FRDC expenditure reported in the FRDC's Cash Flow Statement (FRDC, 2017-2021). This multiplier then was applied to the nominal investment by FRDC shown in Table 2. A multiplier of x1.00 was applied to the nominal investment by SARDI and PIRSA.

Real Investment and Extension Costs

For purposes of the investment analysis, the investment costs of all parties were expressed in 2020/21-dollar terms using the Implicit Price Deflator for Gross Domestic Product (ABS, 2021). No additional costs of extension were included as the outcomes and impacts were largely driven by project activities including communication carried out within and after the project.

Impacts

Table 3 provides a summary of the principal types of impacts as listed in Table 1 and categorised into economic, environmental, and social impacts.

Table 3: Triple Bottom Line Categories of Principal Impacts from Project 2015-018

Economic	• Economic policy implications for revised stock assessment processes that are currently underway for Southern Garfish fisheries in South Australia.
Environmental	• Nil
Social	• Contribution to, and endorsement of, Australia's positive image world-wide as being an effective fisheries science provider and fisheries manager. • Enhanced capacity and capability of Australian fisheries scientists and managers.

Public versus Private Impacts

The economic impacts identified in Table 3 are indirectly related to the future effective management of the Southern Garfish in South Australia. Potentially, both private and public future impacts may be delivered by the investment in the project. The public impacts include the contribution to the social impacts. The private impacts include a contribution to those related to fishers via the revised stock assessments currently underway for Southern Garfish in South Australia.

Distribution of Private Impacts

Any future benefits to garfish fishers from the revised stock assessments will be shared across the supply chains with which the fishers interact. Any such private benefits will likely be shared by members of the various fisheries supply chains according to associated supply and demand elasticities, and result from more robust and continued sustainable management of the fishery. Hence, communities servicing garfish fishers could also be positively impacted.

Impacts on Other Australian Industries

It is expected that there would be negligible impacts on other Australian primary industries.

Impacts Overseas

The major impact overseas will be an enhanced image of Australian fisheries science and management.

Match with National Priorities

Australian Agriculture, Science, and Research Priorities

The Australian Government's National Science and Research Priorities and Agricultural Innovation Priorities are reproduced in Table 4. Project 2015-018 contributed to National Science and Research Priority 1. Further, the RD&E investment is likely to contribute indirectly to Agricultural Innovation Priority 1 because of the project's contribution to, and endorsement of, Australia's positive image world-wide as an effective and sustainable fisheries science provider and fisheries manager.

Table 4: Australian R&D Priorities

Australian Government	
National Science and Research Priorities[1]	**National Agricultural Innovation Priorities**[2]
1. Food – optimising food and fibre production and processing; agricultural productivity and supply chains within Australia and global markets. **2. Soil and Water** – improving the use of soils and water resources, both terrestrial and marine. **3. Transport** – boosting Australian transportation: securing capability and capacity to move essential commodities; alternative fuels; lowering emissions. **4. Cybersecurity** – improving cybersecurity for individuals, businesses, government, and national infrastructure. **5. Energy and Resources** – supporting the development of reliable, low cost, sustainable energy supplies and enhancing the long-term viability of Australia's resources industries. **6. Manufacturing** – supporting the development of high value and innovative manufacturing industries in Australia. **7. Environmental Change** – mitigating, managing, or adapting to changes in the environment. **8. Health** – improving the health outcomes for all Australians.	On 11 October 2021, the National Agricultural Innovation Policy Statement was released. It highlights four long-term priorities for Australia's agricultural innovation system to address by 2030. These priorities replace the Australian Government's Rural Research, Development and Extension Priorities which were published in the 2015 Agricultural Competitiveness White Paper. **1.** Australia is a trusted exporter of premium food and agricultural products by 2030. **2.** Australia will champion climate resilience to increase the productivity, profitability, and sustainability of the agricultural sector by 2030. **3.** Australia is a world leader in preventing and rapidly responding to significant incursions of pests and diseases through futureproofing our biosecurity system by 2030. **4.** Australia is a mature adopter, developer, and exporter of digital agriculture by 2030.

[1] Source: 2015 Australian Government *Science and Research Priorities*. https://www.industry.gov.au/data-and-publications/science-and-research-priorities.

[2] Source: 2021 National Agriculture Innovation Policy Statement. https://www.awe.gov.au/agriculture-land/farm-food-drought/innovation/research_and_development_corporations_and_companies#government-priorities-for-investment.

FRDC National RD&E Priorities

Through extensive consultation, the FRDC 2015-2020 RD&E Plan identified three national RD&E priorities to focus and direct FRDC investments. The three FRDC national RD&E priorities were:

1. Ensuring that Australian fishing and aquaculture products are sustainable and acknowledged to be so.
2. Improving productivity and profitability of fishing and aquaculture.
3. Developing new and emerging aquaculture growth opportunities.

Project 2015-018 addressed FRDC national RD&E priority 1 by building capability and capacity along with the project's contribution to, and endorsement of, Australia's positive image world-wide as an effective and sustainable fisheries science provider and fisheries manager.

Valuation of Impacts

None of the impacts in Table 3 were valued as information was unavailable on which to base credible assumptions. Further, the project specifically supported no changes to Southern Garfish policies at the time the project was completed.

The impacts identified in Table 3 were not valued for the following reasons (Table 5):

Table 5: Reasons for Not Valuing Impacts

Impact/Potential Impact	Reason why Impact Not Valued
Economic and environmental policy and management implications for revised stock assessment processes that are currently underway for Southern Garfish fisheries in South Australia.	There was no available information on the likely future policy changes for Southern Garfish in South Australia in 2022 and the role that the outputs of Project 2015-018 will play in any future changes.
Contribution to, and endorsement of, Australia's positive image world-wide as being an effective fisheries science provider and fisheries manager.	Credible relevant information was unavailable on which to base assumptions.
Contribution to an enhanced capacity and capability of Australian fisheries scientists.	There was difficulty with making credible assumptions for placing a financial value on the project contribution to an enhancement of the enhanced capacity of Australian fisheries scientists

Results

Investment costs and any benefits were expressed in 2020/21-dollar terms. All costs were discounted to 2021/22 (year of evaluation) using a discount rate of 5%. All analyses ran for the length of the investment period plus 30 years from the last year of investment (2018/19) to the final year of any benefits estimated.

Investment Criteria

Investment criteria were estimated in accordance with the guidelines of the Council of Research and Development Corporations (CRRDC) (CRRDC, 2018). Tables 6 and 7 show the investment criteria estimated for different periods of costs for the total investment and FRDC investment respectively. Note that, as no impacts for this project were valued, the investment criteria reporting are restricted to the Present Value of Costs (PVC).

In the interests of consistency with other project analyses, aggregation and reporting, the PVC was reported for the length of the investment period plus for different periods up to 30 years from the last year of investment. The PVC was the same for each period.

Table 6: Investment Criteria for Total Investment in Project 2015-018

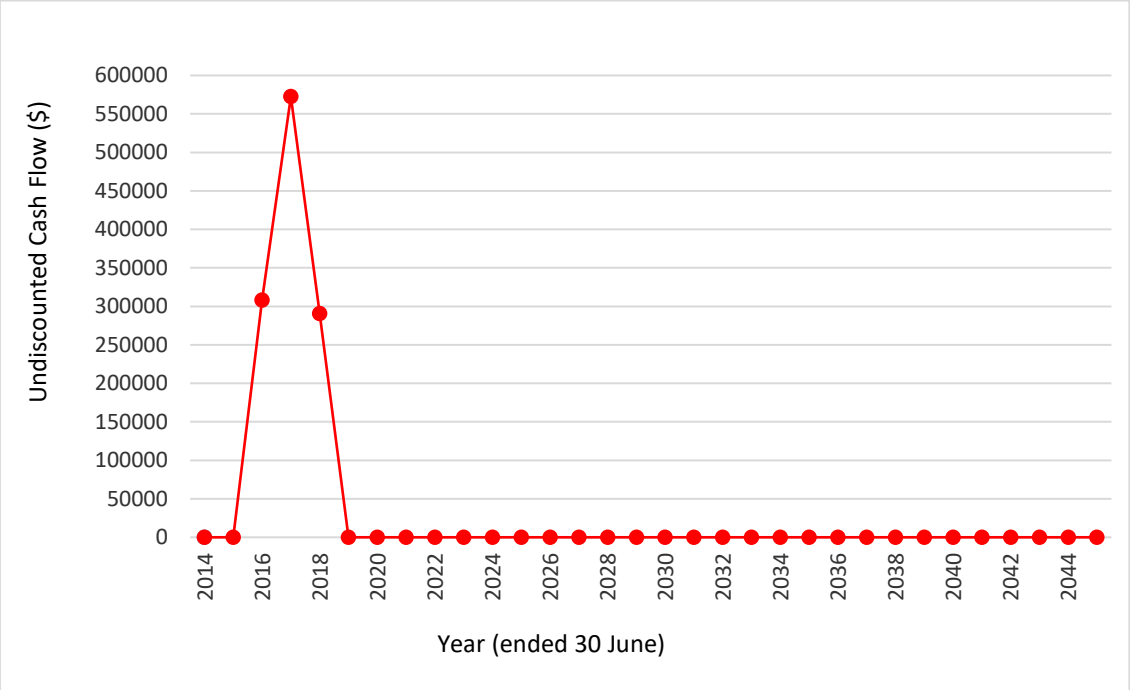
Investment criteria	**Number of years from year of last investment**						
	0	**5**	**10**	**15**	**20**	**25**	**30**
Present value of costs ($m)	1.50	1.50	1.50	1.50	1.50	1.50	1.50

Table 7: Investment Criteria for FRDC Investment in Project 2015-018

Investment criteria	**Number of years from year of last investment**						
	0	**5**	**10**	**15**	**20**	**25**	**30**
Present value of costs ($m)	0.50	0.50	0.50	0.50	0.50	0.50	0.50

The annual undiscounted cost cash flows for the total investment for the duration of investment period are shown in Figure 2.

Figure 2: Annual Cash Flow of Undiscounted Total Costs



Conclusions

Any early potential usage of the project findings was curtailed in the short-term as the Marine Scalefish Fishery of South Australia has undergone a significant reform process that was implemented in July 2021. As a result, the Southern Garfish fisheries are now managed as quota-based fisheries. This recent reform was a result of numerous other projects (not including 2015-018). The reform was driven primarily by FRDC Project 2017-014, 'Informing the structural reform of South Australia's Marine Scalefish Fishery' and FRDC Project 2017-023, 'ESD risk assessment for 'lesser known' species to facilitate structural reform of South Australia's commercial Marine Scalefish Fisheries.

However, FRDC 2015-018 has contributed substantially to understanding the population biology of the species. This understanding currently is proving very significant in discussions relating to stock assessment processes that are underway for Southern Garfish fisheries in South Australia in 2022.

As a result of the above, there were no benefits valued in the current evaluation of Project 2015-018. In present value terms, the total funding for the project over three years totalled $1.50 million (present value terms) and $0.50 million (present value terms) for the FRDC funding.

Glossary of Economic Terms

Cost-benefit analysis:	A conceptual framework for the economic evaluation of projects and programs in the public sector. It differs from a financial appraisal or evaluation in that it considers all gains (benefits) and losses (costs), regardless of to whom they accrue.
Benefit-cost ratio:	The ratio of the present value of investment benefits to the present value of investment costs.
Discounting:	The process of relating the costs and benefits of an investment to a base year using a stated discount rate.
Internal rate of return:	The discount rate at which an investment has a net present value of zero, i.e., where present value of benefits = present value of costs.
Investment criteria:	Measures of the economic worth of an investment such as Net Present Value, Benefit-Cost Ratio, and Internal Rate of Return.
Modified internal rate of return:	The internal rate of return of an investment that is modified so that the cash inflows from an investment are re-invested at the rate of the cost of capital (the re-investment rate).
Net present value:	The discounted value of the benefits of an investment less the discounted value of the costs, i.e., present value of benefits - present value of costs.
Present value of benefits:	The discounted value of benefits.
Present value of costs:	The discounted value of investment costs.

References

Australian Bureau of Statistics. (2021, June 02). Australian National Accounts: National Income, Expenditure and Product. Quarterly estimates of key economic flows in Australia, including gross domestic product (GDP), consumption, income and savings. Retrieved from Australian Bureau of Statistics: https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-national-income-expenditure-and-product/latest-release#data-download

Council of Rural Research and Development Corporations. (2018). Cross-RDC Impact Assessment Program: Guidelines. Canberra: Council of Rural Research and Development Corporations. Retrieved from http://www.ruralrdc.com.au/wp-content/uploads/2018/08/201804_RDC-IA-Guidelines-V.2.pdf

Department of Agriculture and Water Resources (DAWR). (2015). Agricultural Competitiveness White Paper. Canberra: Commonwealth of Australia. Retrieved from http://agwhitepaper.agriculture.gov.au/SiteCollectionDocuments/ag-competitiveness-white-paper.pdf

Fisheries Research and Development Corporation. (2017). *Annual Report 2016-2017.* Canberra ACT: Fisheries Research and Development Corporation. Retrieved June 2020, from https://www.frdc.com.au/about/corporate-documents/annual-reports

Fisheries Research and Development Corporation. (2018). *Annual Report 2017-18.* Canberra ACT: Fisheries Research and Development Corporation. Retrieved June 2020, from https://www.frdc.com.au/about/corporate-documents/annual-reports

Fisheries Research and Development Corporation. (2019). *Annual Report 2018-19.* Canberra ACT: Fisheries Research and Development Corporation. Retrieved June 2020, from https://www.transparency.gov.au/annual-reports/fisheries-research-and-development-corporation/reporting-year/2018-2019-52

Fisheries Research and Development Corporation. (2020). *Annual Report 2019-2020*. Canberra ACT: Fisheries Research and Development Corporation. Retrieved June 2021, from https://www.frdc.com.au/sites/default/files/2021-06/FRDC-AR-2020.pdf

Fisheries Research and Development Corporation. (2021). *Annual Report 2020-2021*. Canberra ACT: Fisheries Research and Development Corporation. Retrieved March 2022, from https://www.transparency.gov.au/annual-reports/fisheries-research-and-development-corporation/reporting-year/2020-21

Office of the Chief Scientist (OCS). (2016). Strategic Science and Research Priorities. Canberra: Commonwealth of Australia. Retrieved from http://www.chiefscientist.gov.au/wp-content/uploads/STRATEGIC-SCIENCE-AND-RESEARCH-PRIORITIES_181214web.pdf