



FINAL

**An Impact Assessment of FRDC  
Investment in Project 2012-058:  
Limiting impacts of the spread  
of urchins by rebuilding  
abalone populations**

Agtrans Research

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Project 2016-134**

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# Abbreviations

AVG	Abalone Viral Ganglioneuritis
CRRDC	Council of Rural Research and Development Corporations
EZAIA	Eastern Zone Abalone Industry Association
FRDC	Fisheries Research and Development Corporation
NSW	New South Wales
R&D	Research and Development
RD&E	Research, Development and Extension

# Executive Summary

## What the report is about

This report presents the results of an impact assessment of a Fisheries Research and Development Corporation (FRDC) investment in *Tactical Research Fund: Limiting impacts of the spread of urchins by rebuilding abalone populations*. The project was funded by FRDC over the period to August 2013 to February 2016.

## Methodology

The project was analysed qualitatively within a logical framework that included brief descriptions of activities and outputs, outcomes, and impacts. Impacts were categorised into a triple bottom line framework. Principal impacts were then considered for valuation.

## Results/key findings

While the investment did not result in any significant impacts that could be valued, the process was useful in focusing future research on the effects of sea urchins on abalone, and attempting to pre-emptively control any urchins in western Victoria.

## Investment Criteria

Total funding from all sources for the investment was \$0.10 million (present value terms). However, none of the benefits identified were valued in monetary terms. Hence, the full set of investment criteria were not estimated or reported as part of the impact assessment.

## Conclusion

The pre-emptive action by surveying sites in western Victoria, while not finding urchins, was necessary to ensure that if further urchin populations were found, effective action could be taken.

The project was key in synthesising past research. With information exchange due to the project, there may be better methods of dealing with urchins moving into the future. The future efficiency to research project 2014-224 may also have some impacts, but as the project has only just commenced, any benefits are currently unknown. There may be future impacts that can be valued from Project 2014-224, but currently, these impacts cannot be valued.

The projects impacts, while not valued, proved the project was a worthwhile investment.

## Keywords

**Impact assessment, Sea urchins, Abalone, climate change, invasive, clearance, survey, translocation**

# Introduction

The Fisheries Research and Development Corporation (FRDC) required a series of impact assessments to be carried out annually on a number of investments in 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 stakeholders.
- Reporting to the Council of Rural Research and Development Corporations (CRRDC).

The first series of impact assessments included 20 randomly selected FRDC investments worth a total of approximately \$6.31 million (nominal FRDC investment). The investments were selected from an overall population of 136 FRDC investments worth an estimated \$24.98 million (nominal FRDC investment) where a final deliverable had been submitted in the 2015/16 financial year.

The 20 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 25% 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.

Project 2012-058: *Tactical Research Fund: Limiting impacts of the spread of urchins by rebuilding abalone populations* was selected as one of the 20 investments and was analysed in this report.

# General Method

The impact assessments 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 descriptions that are in accord with the impact assessment guidelines of the CRRDC (CRRDC, 2014).

The evaluation process involved identifying and briefly describing project objectives, activities and outputs, outcomes, and impacts. The principal economic, environmental and social impacts were then summarised in a triple bottom line framework.

Some, but not all, of the impacts identified were then valued in monetary terms. Where impact valuation was exercised, the impact assessment uses Cost-Benefit Analysis as its principal tool. The decision not to value certain impacts was due either to a shortage of necessary evidence/data, a high degree of uncertainty surrounding the potential impact, or the likely low relative significance of the impact compared to those that were valued. The impacts valued are therefore deemed to represent the principal benefits delivered by the project. However, as not all impacts were valued, the investment criteria reported for individual investments potentially represent an underestimate of the performance of that investment.



# Background and Rationale

## Background

*Centrostephanus rodgersii* (urchins) can clear microalgae from reef areas. These areas are also home to other reef species, including abalone. The clearing of microalgae by urchins can greatly affect the productivity of abalone, through the removal of preferred habitat, potentially causing a loss for abalone fisheries.

There have been previous small scale removals of urchins from areas from abalone habitats, leading to a recovery of a number of abalone stocks in New South Wales (NSW), Victoria, and Tasmania.

## Rationale

The project convened workshops to synthesise and present research findings and discuss further research to focus action on how to upscale from past experience the successful clearance of urchins. The aim was to more clearly focus future research and develop effective practices for controlling urchins.

It was possible that urchins had spread to western Victoria, where abalone populations had been affected by *Abalone Viral Ganglioneuritis* (AVG) disease. There had been some sightings of urchins within western Victoria so a survey of the area was to confirm if urchins had spread to that region; if so, appropriate intervention could be facilitated.

# Project Details

## Summary

Project Code: 2012-058
Title: <i>Tactical Research Fund: Limiting impacts of the spread of urchins by rebuilding abalone populations</i>
Research Organisation: Eastern Zone Abalone Industry Association (EZAIA)
Principal Investigator: Geoff Ellis
Period of Funding: August 2013 to February 2016

## Objectives

The project objectives were:

1. Facilitate a workshop to coordinate existing research findings among jurisdictions, and plan further development and extension.
2. Implement the short-term outcomes of the workshop, particularly related to development of a survey to monitor spread of *Centrostephanus rodgersii*

Table 1 provides a brief description of the project in a logical framework.

Table 1: Logical Framework for FRDC Project 2012-058

Activities and Outputs	<ul style="list-style-type: none"> <li>• Two workshops were held in Melbourne and Mallacoota to discuss previous and current research and consider future research related to the spread of sea urchins impacting on abalone farms. Attendees were from all key jurisdictions in Victoria, Tasmania and NSW and included researchers and industry representatives.</li> <li>• One workshop was convened to coordinate past research findings on the spread of urchins. A report was produced synthesising the findings of the research that had been previously undertaken.</li> <li>• A second workshop addressed issues related to research investment and identified future research priorities for NSW and eastern and western Victoria.</li> <li>• From previous research, the workshops identified strategies that can be used to control urchin populations and to improve abalone populations in the future. Strategies included culling urchins and translocating abalone populations to more productive sites.</li> <li>• The project helped stakeholders come to the conclusion that culling urchins was effective, but that some culling practices were better than others.</li> <li>• One strategy recognised at the workshops was that culling needed to be implemented before, or ideally after the urchin spawning season to limit urchin spawning.</li> <li>• Another output of the workshops was a recommendation that more research was needed to support translocation of abalone populations to areas where populations have been lowered.</li> <li>• Another recommendation produced was that further workshops be staged so industry, researchers, and fisheries managers are kept up to date with abalone and urchin issues.</li> <li>• The workshops concluded that the research into abalone and urchins was insufficient, with a recommendation that more research should be funded researching abalone industry relocation and urchin culling.</li> </ul>
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	<ul style="list-style-type: none"> <li>• Stakeholders at the workshops identified that surveys of urchins should be carried out in the western zone of Victoria, as urchins had already been found at two sites.</li> <li>• The project designed and implemented a survey to determine estimated urchin numbers at 12 sites in western Victoria across an area of 36 hectares. No urchins were found at these sites from the survey.</li> </ul>
Outcomes	<ul style="list-style-type: none"> <li>• The outputs of Project 2012-058 helped inform the funding application and approval for the FRDC Project 2014-224 that currently is looking to re-build abalone populations in areas where the populations have been lowered by urchins, AVG, and theft.</li> <li>• Increased coordination in funding future projects</li> <li>• The workshops led to improved communications and links between researchers and industry, increasing knowledge between and within the groups.</li> <li>• Potentially, some farmers changed urchin culling practices due to the information from previous research findings presented at the workshops.</li> </ul>
Impacts	<ul style="list-style-type: none"> <li>• Enabled research investment in FRDC project 2014-224 to cover strategies to aid recovery, productivity, and re-building of abalone populations and potentially other future research.</li> <li>• Potentially increased the effectiveness of managing urchins affecting abalone populations by improved urchin culling practices.</li> <li>• Increased industry capacity to network and collaboration between producers, state governments, and improved integration between the research effort and abalone producers.</li> <li>• Potentially increased the sustainability of the abalone industry.</li> <li>• Potentially avoided duplication of future research due to more coordinated approach</li> </ul>

# Project Investment

## Nominal Investment

Table 2 shows the annual investment for the project funded by FRDC, Eastern Zone Abalone Industry Association (EZAIA), Department of Environment Land Water and Planning, Victoria and Western Abalone Divers Association.

Table 2: Annual Investment in the Project 2012-058 (nominal \$)

<b>Year ended 30 June</b>	<b>FRDC (\$)</b>	<b>EZAIA (\$)</b>	<b>OTHER (\$)</b>	<b>TOTAL (\$)</b>
2014	25,200	20,000	17,500	62,700
2015	12,600	0	3,500	16,100
2016	4,200	0	0	4,200
<b>Totals</b>	<b>42,000</b>	<b>20,000</b>	<b>21,000</b>	<b>83,000</b>

## 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 (1.115). 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, 2016). This multiplier then was applied to the nominal investment by FRDC shown in Table 2.

## Real Investment and Extension Costs

For the purposes of the investment analysis, the investment costs of all parties were expressed in 2016/17 dollar terms using the Implicit Price Deflator for Gross Domestic Product (ABS, 2016). No additional costs of extension were included as the project as its outputs were extension orientated and were publicly recorded.

# Impacts

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

Table 3: Triple Bottom Line Categories of Impacts from Tactical Research Fund: Limiting the spread of urchins workshops

Economic	<ul style="list-style-type: none"> <li>• Potentially increased the effectiveness of managing impacts of urchins on abalone populations</li> </ul>
Environmental	<ul style="list-style-type: none"> <li>• Potentially increased the probability of future sustainability of the abalone industry in NSW and Victoria.</li> </ul>
Social	<ul style="list-style-type: none"> <li>• Contributed to focusing funding for FRDC research Project 2014-224 and potentially other research investment</li> <li>• Potentially increased industry capacity to network and collaborate with one another and with researchers, along with networking between state governments.</li> <li>• Avoided duplication of research into abalone and urchins</li> </ul>

## Public versus Private Impacts

There are both private and public benefits resulting from the project. The improved management of urchins and the increased industry networking capacity are private benefits as the benefits flow largely to the abalone industry. There are public impacts, with more focused research funding as a result of the workshops.

## Impacts on other Australian industries

There may be some spillover impacts to other abalone fisheries in Tasmania, South Australia, and Western Australia, due to networking and synthesising research. There is not likely to be any significant impacts on any other Australian industries outside abalone and urchins.

## Impacts Overseas

No significant benefits to overseas parties are expected.

## Match with National Priorities

The Australian Government's Science and Research Priorities and RD&E priorities are reproduced in Table 4. The project findings and related impacts could contribute potentially to Rural RD&E Priorities 1 and 4 and to Science and Research Priorities 1 and 2.

Table 4: Australian Government Research Priorities

Australian Government	
Rural RD&E Priorities (est. 2015)	Science and Research Priorities (est. 2015)
1. Advanced technology	1. Food
2. Biosecurity	2. Soil and Water
3. Soil, water and managing natural resources	3. Transport
4. Adoption of R&D	4. Cybersecurity
	5. Energy and Resources
	6. Manufacturing
	7. Environmental Change
	8. Health

Sources: (DAWR, 2015) and (OCS, 2015)

# Valuation of Impacts

The project did not produce any quantifiable impacts so no quantitative evaluation processes were applied to estimate benefits. 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
Potentially increased effectiveness of managing urchin populations	<p>While there may have been an increase in effectiveness of managing urchin culling due to the project, the impact is likely to be small as there were already similar management improvements taking place.</p> <p>It is likely that the recommendations would have been implemented without the project, as the research into culling methods had already been released and some methods recommended were already being used. It is also unknown how the changes will influence abalone populations.</p>
Increased capacity and networking between researchers, governments, and industry	The impact is difficult to value as it is a broad impact. A valuation would require an extensive survey to determine impact of the workshops as other contributing activities would need to be accommodated.
Project 2012-058 led to more focused investment in FRDC Project 2014-224	If there are positive impacts from rebuilding abalone stocks from Project 2014-224, it would be difficult to value. This is because the project is yet to be completed or produce any major impacts at the time of writing.
Potentially increased sustainability of abalone industries in Victoria and NSW	<p>While networking and synthesising research aids in targeting research and other activities, it can be argued that the research and other activities targeting sustainability would have occurred even if Project 2012-058 had not been funded.</p> <p>It is difficult to determine the causal relationship and size of impact because of the project</p>
Avoided duplication of abalone and urchin research	There is difficulty in distinguishing past and current research costs exclusivity researching urchins and abalone. Research undertaken is often combined with other objectives relating to abalone or urchins, and the costs of the effect of urchins on abalone cannot be distinguished.

# Results

All past costs and benefits were discounted to 2016/17 using a discount rate of 5%. All analyses ran for the length of the project investment period plus 30 years from the last year of investment.

## Investment Criteria

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 benefits were valued, the investment criteria reporting is restricted to the Present Value of Costs.

In the interests of consistency with other project analyses and reporting, the Present Value of Costs was reported for the length of the investment period plus for different periods up to 30 years from the last year of investment (2015/16).

Table 6: Investment Criteria for Total Investment in the Project

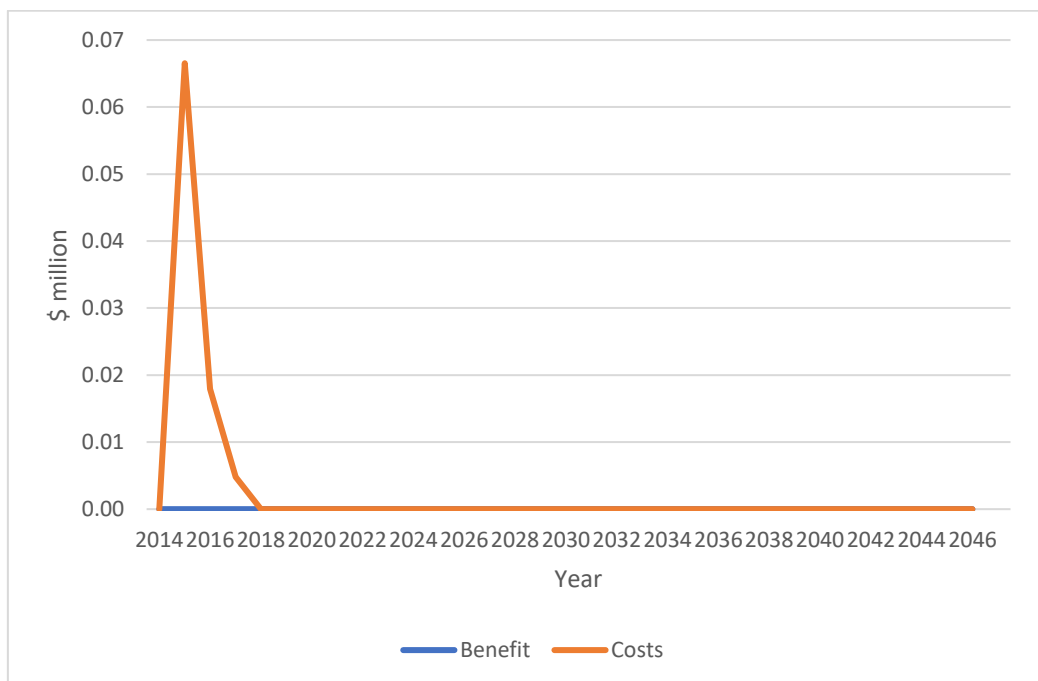
Investment criteria	Number of years from year of last investment						
	0	5	10	15	20	25	30
Present value of costs (\$m)	0.10	0.10	0.10	0.10	0.10	0.10	0.10

Table 7: Investment Criteria for FRDC Investment in the Project

Investment criteria	Number of years from year of last investment						
	0	5	10	15	20	25	30
Present value of costs (\$m)	0.05	0.05	0.05	0.05	0.05	0.05	0.05

The annual undiscounted cost cash flows for the total investment for the duration of investment period are shown in Figure 1.

Figure 1: Annual Cash Flow of Undiscounted Total Costs



# Conclusions

Total funding for the investment over the three years totalled \$0.10 million in present value terms. FRDC funding was about half of this at \$0.05 million in present value terms. While the investment did not result in any significant impacts that could be valued, the process was valuable as it enabled an improved focus on actual and potential research and industry responses to urchins.

The pre-emptive action by surveying sites in western Victoria, while not finding urchins, was necessary to ensure that if further urchin populations were found, effective action could be taken.

The project was key in synthesising past research. With information exchange due to the project, there may be better methods of dealing with urchins moving into the future. The future efficiency to research project 2014-224 may also have some impacts, but as the project has only just commenced, any benefits are currently unknown. There may be future impacts that can be valued from Project 2014-224, but currently, these cannot be valued. This is the same for any future research efficiency gains.

The projects impacts, while not valued, proved the project was a worthwhile investment.



# 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.

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