Appendix O: 2020-100: Proof-of-concept for innovative new octopus shelter pot and trigger trap designs

Background

In Western Australia (WA), octopus was historically a byproduct of the rock lobster fishery. However, targeted fishing for octopus was established in 2001. In 2010, the broad-scale introduction of the trigger trap saw a 260% increase in octopus landings in the Developing Octopus Fishery (DOF), causing a surge of interest in commercial octopus fishing. In 2024, the Australian Trade and Investment Commission estimated that the industry was worth $8.3million (Evensen, 2024). It supports more than 25 full-time vessels, two major octopus-dedicated processing facilities, and more than 150 full-time equivalent people servicing the sector from Geraldton to Esperance (Hart et al, 2016).

Octopus from WA is exported around Australia and internationally to Canada, Asia, and the UK (Evensen, 2024). The main fishery is the WA DOF, however fishing also occurs in the Cockburn Sound (Line and Pot) Managed Fishery (CSLPF) and the West Coast Rock Lobster Managed Fishery (WCRLF) (WAFIC, n.d.).

FRDC's project 2018-178 - Species identification of Australia's most significant octopus fishery - confirmed that the octopus in WA are a different species to those on the east coast of Australia and New Zealand (Collis, 2023). This research had significant scientific and marketing implications, and between 2021 and 2022, the DOF increased in value and harvest by 50% (Collis, 2023). The Fishery has also already earned Marine Stewardship Council (MSC) accreditation (Collis, 2023).

Demand for octopus continues to grow in line with growing global consumer demands for sustainable, healthy, and protein-rich foods. Estimates suggest that the industry could expand to produce between $70-80 million in annual wholesale revenue (Evensen, 2024). Thus, there is an opportunity for the industry to increase its yield, improve profitability, and expand. The development of a new innovative pot/trap could support that.

Description of the project

Table 113 Project summary of project 2020-100

Project code	2020-100
Title	Proof-of-concept for innovative new octopus shelter pot and trigger trap designs
Research Organisation	Innovation Fishing Pty Ltd
Principal investigator	Ross Cammilleri
FRDC project manager	Toby Piddocke
Period of funding	2022
FRDC investment	$100,000
FRDC program allocation	80% industry, 20% environment

Rationale	The new shelter pot designs have potential to reach greater efficiencies through the octopus entering from the top, a safer retreat from predators and ease of

	cleaning the pot. It is also hoped that the shelter pot – once the process is approved by authorities – could be baited easily.
Objectives	• Develop and retro fit a two-door entry trigger trap that simultaneously closes both entry points when triggered • Develop a new shelter pot with a top rear door where the new design creates an internal chamber that reduces predation and allows a safer retreat for the octopus • Develop a new design external/internal bait simulator that can be fitted to both passive and active traps
Activities and outputs	• Variations of the trigger trap were designed and developed. These were then tested and compared to existing designs during a 90-day "proof-of-concept" sea trial in the WA DOF • It was determined that the modified design of designing and retro fitting a two-door entry trigger trap (objective 1) did not catch more octopus than the existing design so there was no gain from this modification • It was determined that being able to open the top door did assist with cleaning (objective 2), but both pots caught equally. Based on this, changes to the existing pot design were not recommended. • The development of a new bait simulator (objective 3) encountered challenges, including silt and sand entering, slowing down the process of retrieving the fishing gear, so that trial was not continued
Outcomes	• There were no gains to the modifications, and further trials were not recommended • Learnings and results have been extended through the WA Octopus Fishery Association, WAFIC, and DPIRD (WA) research division • All data was made available to the newly established commercial octopus fisheries in Victoria and NSW and their associations
Potential impacts	• Avoided future costs of similar projects

Project investment

A breakdown of FRDC investment and contribution by others by financial year is shown in Table 114.

Table 114 Total investment in project 2020-100 from FRDC (nominal dollar terms)

Year ending June 30th	FRDC ($)	Others* ($)
2021/22	$100,000	-
2022/23	-	$65,500
Total	**$100,000**	**$65,500**

Source: Documents provided by FRDC.

*Contributions to the project cost not sourced from FRDC e.g. in-kind contributions

For the BCA, the cost of managing the FRDC funding was added to the FRDC contribution for the project using a management cost multiplier of 1.157. As per impact assessments in previous years, this multiplier was estimated based on a five-year average of the ratio of total FRDC non-project cash expenditure to project expenditure as reported in FRDC's Cash Flow Statement (FRDC Annual Reports, 2019-2023). No multiplier

was applied to the investment by other contributors, as it was assumed that project management and administration were included in the value of funding provided.

In undertaking the impact assessment, all past costs were expressed in 2023/24-dollar terms using the Implicit Price Deflator for GDP.

Summary of impacts

Table 115 below provides a summary of the expected triple bottom line impacts (economic, environmental, and social) from the project.

Table 115 Triple bottom line impacts, including those valued as part of this evaluation (in bold)

Economic	• **Avoided future trials by private companies through sharing the learnings and results** • Increased overall investment into other future R&D projects from the private sector
Environmental	
Social	• Contributed to shared findings within the industry and strengthened relationships

Public versus private impacts

The benefits identified are considered to accrue privately.

Distribution of private impacts

Private impacts are expected to be experienced by octopus fishers. Specifically, with those investing in R&D as this trial shows that adapting the trap in these ways is not beneficial.

Impacts on other Australian industries

No direct impacts to other Australian primary industries were identified.

Impacts overseas

No direct impacts overseas were identified.

Quantification of impacts

For the BCA, the identified impact of avoiding future costs associated with this line of R&D is considered. Consultation with the PI identified industry was likely to carry this research out eventually without FRDC support. Through conducting this project, it is considered that due to the extension of findings, this line of inquiry will not be pursued privately. Although not considered beneficial to reflect in this assessment's quantification, it was outlined by parties involved that having access to funding for this project will allow private R&D funds to go further into more projects, which also may have beneficial impacts.

Estimated benefits

Table 116 Benefit assumptions

Variable	Assumption	Source/ Explanation
a) Project's budget	$181,000	
b) Likely to have privately been invested within	10 years	Analyst assumption, per communication with industry
c) Annual benefit over 10 years	$18,100	a x b

Adoption costs

Considering the nature of the impact valued, no adoption costs are expected.

Counterfactual

The counterfactual assumes that there would have been investments into similar R&D within the next 10 years without this project.

Attribution

The attribution of benefits - summarised in Table 117 – considers all benefits to be attributable to this project, of which 65% is FRDC and 35% is other parties.

Table 117 Attribution of benefits for project 2020-100

Variable	Assumptions
FRDC costs	65%
Other project party costs	35%
Total	100%

Adoption

Under the counterfactual, investments were expected to occur within the next 10 years, hence, benefits of this project are realised over this period.

Results

Table 118 below presents the modelled investment performance from the project. All past costs and benefits were expressed in 2023/24-dollar terms using the Implicit Price Deflator for GDP, while all future costs and benefits were discounted to 2023/24 using a discount rate of 5%. A reinvestment rate of 5% was used for estimating the modified internal rate of return (MIRR). The analysis used the best available estimates for each variable, notwithstanding a level of uncertainty for many of the estimates. All analyses ran for the length of the investment period plus 30 years from the last year of investment (2023/24) to the final year of benefits assumed.

The results show the total investment returning a net present value (NPV) of $-0.06 million and a BCR of 0.7. Table 119 shows FRDC investment returning a NPV of $-0.04 million and a BCR of 0.7.

Table 118 Investment criteria for total investment in Project 2020-100 ($M)

Year	0	5	10	15	20	25	30
PV Benefits	$0.04	$0.11	$0.15	$0.15	$0.15	$0.15	$0.15
PV Costs	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20
NPV	-$0.17	-$0.09	-$0.06	-$0.06	-$0.06	-$0.06	-$0.06
BCR	0.2	0.5	0.7	0.7	0.7	0.7	0.7
IRR	-53%	-7%	0%	0%	0%	0%	0%
MIRR	-3%	3%	4%	4%	4%	4%	4%

Table 119 Investment criteria for FRDC investment in Project 2020-100 ($M)

Year	0	5	10	15	20	25	30
PV Benefits	$0.02	$0.07	$0.10	$0.10	$0.10	$0.10	$0.10
PV Costs	$0.13	$0.13	$0.13	$0.13	$0.13	$0.13	$0.13
NPV	-$0.11	-$0.06	-$0.04	-$0.04	-$0.04	-$0.04	-$0.04
BCR	0.2	0.5	0.7	0.7	0.7	0.7	0.7
IRR	-46%	-6%	0%	0%	0%	0%	0%
MIRR	-3%	3%	4%	4%	4%	4%	4%

The flow of total undiscounted costs and benefits from the project is presented in Figure 14 below.

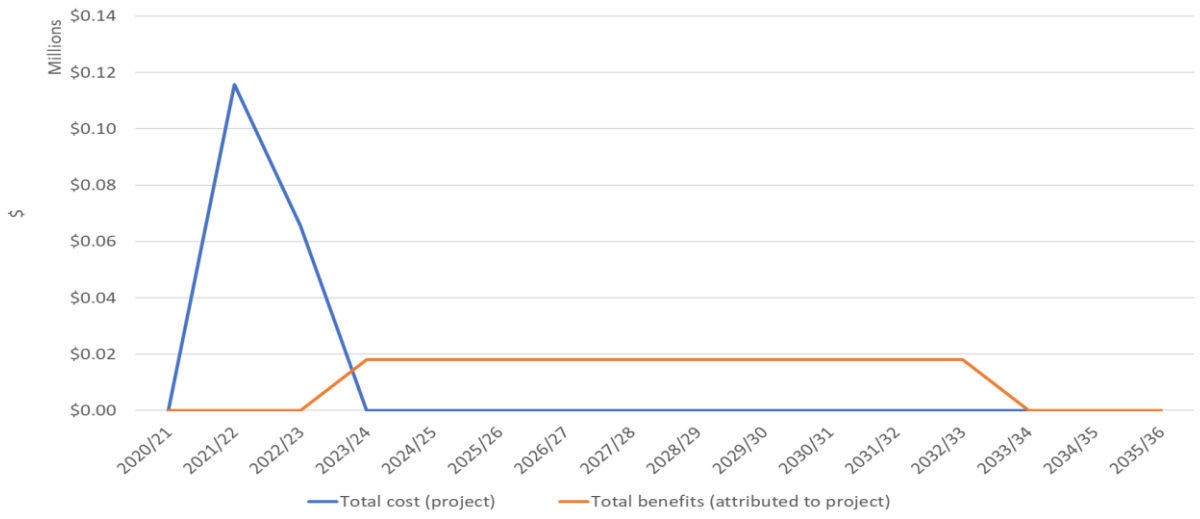

Figure 14 Flow of undiscounted costs and benefits from the project.

Sensitivity Analysis

A sensitivity analysis was carried out to determine how the investment performance (NPV, BCR and MIRR after 30 years) would change based on changes to the discount rate and other key variables. The results are presented in Table 120 below shows that NPV ($M) remains negative across modelled scenarios

Table 120 Sensitivity analysis

Changes to key variables	NPV ($M)	BCR	MIRR
Standard assumption	-0.06	0.7	4%
Discount rate			
4%	-0.05	0.8	4%
6%	-0.06	0.6	5%
Investment time period under counterfactual (years)			
5	-0.04	0.8	5%
15	-0.07	0.6	4%

Confidence ratings

The accuracy of the assessment is highly dependent on:

- The extent to which the analysis captures and quantifies the various benefits from the project, including non-market benefits (i.e. coverage of benefits), and
- The level of confidence in the accuracy of assumptions used (i.e. confidence in assumptions).

An assessment of coverage and confidence ratings for this project is presented below in Table 121.

Table 121 Coverage and confidence ratings

Factor	Rating	Comment
Coverage of benefits	High	The benefits for this project have been determined to be limited.
Confidence in assumptions	High	

Conclusions

Project 2020-100: Proof-of-concept for innovative new octopus shelter post and trigger trap designs aimed to design, develop, and trial new variations of the trigger trap. The outcomes of the project indicated that there were no gains to the modifications, and further trials were not recommended. The main impact identified was the avoidance of future costs associated with this line of R&D and the extension of these findings. This project has low value impacts, however, it should be recognised that R&D with an appropriate level of risk should expect some projects to have minimal benefit. The rationale and objectives, along with the methodologies undertaken are considered sound, with likely significant benefits if successful, however, the desired outcomes were not seen. Based on the adopted assumptions this analysis suggests the project investment has provided a negative economic benefit (BCR 0.7).

References

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Acknowledgments

GHD would like to thank Toby Piddocke, Project Manager at FRDC for their guidance and feedback throughout the impact assessment process. GHD extends particular thanks to Ross Cammilleri, Principal Investigator, Director of Fremantle Octopus Pty Ltd (Sept 19th, 2024) for their time during the project's consultation phase.