Appendix J: 2017-038: Long-term recovery of trawled marine communities 25 years after the world's largest adaptive management experiment

Background

Australia's North West Shelf (NWS) has an extensive history of commercial demersal trawling. Trawling was done mainly by the Taiwanese pair-trawlers from the early 1970s to mid-1980s when the area was part of international waters (Liu et al, 1978). The NWS shelf came under Australian jurisdiction in 1979, and domestic trawling occurred from the mid-late 1980s to the mid-1990s (Newman et al, 2018).

Trawling caused extensive impact on benthic and fish communities, reflected in a reduction of sponge bycatch and high value emperor fish stocks giving way to low value lizard fish and threadfin bream. A range of spatial management practices– where areas were closed to trawling – was introduced in the 1980s and again in the 1990s due to concerns about the impacts of trawling and to provide opportunities for domestic trap fishing (Keesing et al, 2021).

Between 1982 and1997, research was conducted to investigate the effects of spatial trawling closures on benthic habitat dynamics and overall productivity of the NWS fish stocks (Sainsbury et al, 1987; Sainsbury et al, 1988; Sainsbury et al, 1991; Sainsbury et al, 1997). This research found that in places where trawling had stopped, there had been some increase in both habitat forming organisms and the associated fish community, but the longer-term effects could not yet be determined (Sainsbury et al, 1997).

This project builds on and is closely related to the Australia-wide study (FRDC-2016-039) that developed methods to quantify the effects of trawling in the Great Barrier Reef. Understanding the long-term effects of trawling is a major issue both domestically and internationally (Keesing et al, 2021). Understanding the long-term effects is necessary for the social license of fisheries and for implementing effective management practices.

Description of the project

Table 81 Project summary of project 2017-38

Project code	2017-038
Title	Long-term recovery of trawled marine communities 25 years after the world's largest adaptive management experiment
Research organisation	CSIRO – Oceans and Atmosphere Hobart
Principal investigator	Dr John Keesing
FRDC project manager	Adrianne Laird
Period of funding	November 2017- September 2019
FRDC investment	$400,000
FRDC program allocation	50% environment, 50% industry

Rationale	To determine the extent to which ecosystems in the NWS have recovered from high levels of historical trawling effort and to compare these with areas which have been continuously fished with lower levels of effort or completely protected from trawling. To understand the long-term effects of trawling (infer the sustainability of trawling) and improve management of trawled fisheries.
Objectives	• To assess the extent of recovery for trawled communities in the NWS following extensive trawling activity before foreign fleets were excluded in 1990 and the implementation of tightly controlled spatial management of trawl and trap fishing in the early 1990s • Investigate the long term rates of recovery of habitats from foreign trawling in the 1960s, 1970s and 1980s and to evaluate how well the current spatial closures, controls on effort and fishing practices are performing from the point of view of sustaining healthy benthic habitats • Examine the prediction that areas with significantly reduced trawling will show re-established benthic habitats, with increased coverage and structural complexity of large, habit-forming filter feeder communities, as well as higher production of key fish (families: Lethrinidae, Lutjanidae), compared to areas with ongoing or historical trawling activity. The study will also take into account other environmental parameters which influence both the distribution of benthic and demersal community assemblages and their rates of recovery.
Activities and outputs	• 100 sites across the NWS were surveyed in 2017 aboard the *RV Investigator*. Sampling occurred between 30-125km offshore between Port Hedland and the Montebello Islands on the Pilbara section of the NWS, WA • Data was used from similar surveys conducted between 1982 and 1997 by CSIRO with comparisons made to the 2017 data which was able to confirm and refine the extent of the seabed recovery and stock rebuilding • The region has largely recovered from the effects of heavy/intense historical trawling • There was a regional-scale increase in the aggregate fishery stock since trawling declined from its peak in the mid-1970s – an observation consistent with an overall reduction in fishing mortality • Most areas that had trawl closures experienced an increased abundance of large benthos, indicating recovery • Some areas that had trawl closures did not experience any significant increase in fish biomass, indicating that those areas did not have historically high levels of benthic filter feeder habitat • Some areas where recent trawling remains relatively high, experienced significant biomass increases, indicating that the area had a higher benthos carrying capacity (pre-trawling), and trawling has targeted these areas due to higher levels of benthic habitat and high levels of recovery after trawling
Outcomes	• Results suggest that habitat recovery has occurred in the NWS since cessation of intense trawling in the 1970s and 1980s • Results contribute to social license of trawling as results show that under proper management, recovery is possible • Results suggest that existing levels of trawl effort and fishing are not impacting benthic habitats or fish stocks to a level which threatens the health of either • In some cases, results did not follow expectations – further exploration could be undertaken

	• Results can be applied to other trawling fisheries and is potentially the only source of such information internationally • Information from this project could be used by fishery managers
Potential impacts	• Preservation of commercial trawling value on a national scale through contributing to social license to operate • Improved scientific understanding of ecological impacts of trawling • Potential for improved fisheries management through improved scientific understanding of the impacts and recovery from trawling • Increased capabilities in research and ecosystem modelling

Project investment

A breakdown of FRDC investment and contribution by others by financial year is shown in Table 82.

Table 82 Total investment in project 2017-038 from FRDC (nominal dollar terms)

Year ending June 30th	FRDC ($)	Others* ($)
2017/18	$200,000	$5,140,900
2018/19	$50,000	$349,403
2019/20	$75,000	-
2020/21	$25,000	-
2021/22	$50,000	-
Total	**$400,000**	**$5,490,303**

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

Table 83 Triple bottom line impacts, including those valued as part of this evaluation (in bold)

Economic	• Contribution to improved social license to operate thus preserving the value of commercial trawling value on a national scale

	• Potential for improved fisheries management through improved scientific understanding of the impacts and recovery from trawling
Environmental	• Better understanding of ecological impacts and by-catch of trawling
Social	• Increased capabilities in research and ecosystem modelling

Public versus private impacts

The potential impacts identified from the project will accrue to both public and private beneficiaries. Public impacts include increases in research and modelling capabilities, which may contribute to more efficient, effective and sustainable management of trawl fisheries. The continuing social license for trawl fisheries would be largely a private benefit.

Distribution of private impacts

Any private impacts realised from this project will be distributed amongst fishers in the respective trawl fisheries areas and their supply chains.

Impacts on other Australian industries

No direct impacts to other Australian primary industries were identified.

Impacts overseas

Findings from the project have been shared internationally, with increasing the understanding of the long-term effects of trawling of major interest both domestically and internationally.

Quantification of impacts

The project was not considered to have produced any directly quantifiable impacts, so a BCA was not used to value the likely impacts. While it was recognised that the project provided an important opportunity to validate previous adaptive management arrangements put in place for the NWS and Pilbara Fish Trawl fisheries, the project itself is unlikely to lead to any direct changes in management arrangements. Similarly, while the project provides an important contribution to a broad knowledge base on the effects of trawling nation-wide, it is not possible to make credible assumptions about the attribution of this project to an improvement in social license to operate in trawl fisheries amongst this broader body of research work. Finally, it is also recognised that there were considerable social benefits arising from this in terms of building broader research and modelling capacity and capability that were not able to be quantified in a BCA.

Results

To maintain consistency for reporting and analysising projects,

Table 84 and Table 85 below displays the modelled Present Value of Costs (PV Costs) for the total investment and FRDC's contribution to the project. The PV Costs were discounted to 2023/24 using the Implicit Price Deflator for GDP. The PV Cost is displayed for the length of the investment period plus 30 years from the last year of investment (2023/24). The tables show that the majority of investment in the project came from other contributors, with FRDC contributing just 7.5% of total project costs.

The PV Costs for total investment were $7.55 million. Table 85 shows PV costs from FRDC investment were $0.57.

Table 84 Investment criteria for total investment in Project 2017-038 ($M)

Year	0	5	10	15	20	25	30
PV Costs	$7.55	$7.55	$7.55	$7.55	$7.55	$7.55	$7.55

Table 85 Investment criteria for FRDC investment in Project 2017-038 ($M)

Year	0	5	10	15	20	25	30
PV Costs	$0.57	$0.57	$0.57	$0.57	$0.57	$0.57	$0.57

Conclusions

Project 2017-038: Long-term recovery of trawled marine communities 25 years after the world's largest adaptive management experiment aimed to determine the extent to which ecosystems in the North West Shelf (NWS) and Pilbara Fish Trawl Fisheries have recovered from high levels of historical trawling effort, and to understand the long-term effects of trawling to inform fisheries management. The project surveyed 100 sites across the NWS in 2017 aboard the *RV Investigator*. The 2017 data was compared with data collected in similar surveys conducted between 1982 and 1997 by CSIRO. This comparison indicated that habitat recovery has occurred in the NWS since cessation of intense trawling in the 1970s and 1980s. The results also suggest that existing levels of trawl effort and fishing are not impacting benthic habitats or fish stocks to a level which threatens the health of either.

The project stands as an important piece of scientific research, building broader research and modelling capacity and capability, as well as contributing to national and international understanding around the effects of trawling and associated recover rates. However, these benefits were not able to be quantified in a BCA as it was not possible to make credible assumptions about the attribution of this project over related previous research, and the project is unlikely to lead to any direct changes in management arrangements.

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Acknowledgments

GHD would like to thank Adrianne Laird, Project Manager at FRDC for their guidance and feedback throughout the impact assessment process. GHD extends particular thanks to Dr Beth Fulton, Senior Principal Research Scientist with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) (September 23rd, 2024), and Darci Wallis, manager of the Northern Trawl Fishery, from the Australian Fisheries Management Authority (AFMA) (September 19th, 2024) for their time during the project's consultation phase.