**Economic Impact Assessment**

**Appendix 4:**

**An Economic Analysis of FRDC’s Investment in Theme 6: Resource Access and Allocation**

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Project Number: 2011/504 - Round 2 Evaluations

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# Executive Summary – Overview of all reports

The FRDC Five Year Plan (FRDC, 2010) divides its investment into 14 themes. The Corporation has set an impact assessment objective of evaluating in economic terms all projects in all themes over the five year period commencing in March 2011. Projects were defined as those having been completed (or substantially completed) in the five years prior to 2011.

The first population of projects was defined in January 2011 and projects were placed into each of the 14 themes. Some of the 14 themes had far more projects than others and those themes with high numbers of projects were divided into two or more clusters of projects. This resulted in 25 clusters across the 14 themes.

Evaluation of the first eight clusters was completed in October 2012 and the evaluation report provided to FRDC. In the second 18 months period (i.e. July 2013 to December 2014) a further nine of the 25 clusters were subjected to impact assessment resulting in the current summary report. The impact assessment used cost-benefit analysis (CBA) to estimate investment criteria for each cluster of projects. The nine clusters evaluated in this second round comprised:

1 cluster from theme 1 (Biosecurity and aquatic animal health),

1 cluster from theme 4 (Ecologically sustainable development),

1 cluster from theme 5 (Governance and regulatory systems),

1 cluster from theme 6 (Resource access and allocation),

4 clusters from theme 7 (Production, growth and profitability), and

1 cluster from theme 8 (Consumers, products and markets).

Each cluster comprised between seven and 50 projects. As the entity for evaluation reporting was the cluster, costs and benefits for each cluster had to be built up from information on the individual projects in the cluster. This was achieved largely through access to the FRDC data base and contact with Principal Investigators of projects, government agencies and industry personnel.

The value of total funding for each of the nine clusters (FRDC plus other investment) ranged from $3.7 million to $44.2 million, with a total value for all clusters of $137.4 million (in nominal $ terms). The FRDC nominal investment in the nine clusters analysed varied for each cluster (32.6% to 62.4% of the cluster total). FRDC contributed 40% of the total nominal investment across all nine clusters.

The majority of the benefits identified from the nine clusters (202 projects in total) were economic in nature although significant numbers of environmental and social/community benefits also were identified. The major beneficiary of the impacts of the nine clusters of research investment has been the fishing industry (51% of the number of benefits identified), with 43% of the identified number of benefits being public in nature and 6% to overseas interests. The results demonstrate the significant spillovers of benefits to the public sector from research targeted at the fishing industry. Insignificant spillover benefits to other Australian industries were identified.

A number of the identified benefits were valued, and investment criteria for each of the clusters of investment calculated. Benefits were estimated over 30 years from the final year of investment in the research. Benefits and costs were expressed in 2013/14 dollar terms, and discounted to 2013/14 using a discount rate of 5%.

The net present values (NPVs) for total investment for the individual clusters ranged from $6 million to $124 million and the Benefit-Cost Ratios (BCRs) ranged from 1.8:1 to 3.9:1. FRDC investment made up 37.9% of the total investment in present value terms, and the NPVs for FRDC investment in individual clusters ranged from $4 million to $60 million.

When all nine clusters are aggregated, the BCR for the $266.5 million investment in the nine clusters (present value terms) was 2.6:1, with the Present Value of Benefits (PVB) of $684.0 million and an NPV of $417.5 million. For the FRDC investment of $101.0 million (present value terms), the NPV was $170.2 million.

**Appendix 4: An Economic Analysis of FRDC’s Investment in Theme 6: Resource Access and Allocation**

**Background**

The FRDC currently has five programs:

1. Environment

2. Industry

3. Communities

4. People development

5. Extension and adoption

The Industry program (Program 2) is made up of five different Themes, including Resource Access and Allocation.

Theme 5: Governance and regulatory systems

Theme 6: Resource access and allocation

Theme 7: Production, growth and profitability

Theme 8: Consumers, products and markets

Theme 9: Value from aquatic resources

Theme 6 is focused on developing and maintaining access to aquatic resources, as well as managing competition between different users of these resources (FRDC, 2010). Due to the finite nature of fishery resources, R&D in this area is essential to ensure the ongoing sustainability of fisheries. To assist in achieving these goals, the following priorities have been set:

* The development of improved processes and technologies to quantify rights between different users and mechanisms for allocating shares.
* The development of methods to value the rights of recreational and customary users.
* Increased knowledge amongst diverse groups of stakeholders about each other’s expectations regarding resource access and allocation.

The projects funded in this cluster focused on the effect of Marine Protected Areas on stakeholder access, allocation between commercial and recreational users, and the socio economic nature of fishing communities. Therefore the main benefits to come from this cluster include an improved resource allocation that increases total utility for the various users of the fishery. In addition, there were also benefits relating to increased scientific capacity, avoided social costs, and enhanced sustainability of ecosystems and the environment.

**Summary of Projects**

There are 7 projects in the Theme 6: Resource Access and Allocation cluster. Table 1 gives a list of projects in the cluster and Table 2 provides a qualitative summary of each project.

Table 1: Projects Included in Theme 6

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| **FRDC Project Number** | **Project Title** |
| 1999/162 | Evaluating the effectiveness of marine protected areas as a fisheries management tool |
| 2002/223 | National atlas of fishing activities and coastal communities |
| 2003/039 | Dynamic modelling of socio-economic benefits of resource allocation between commercial and recreational use |
| 2004/247 | A scenario analysis of the social impact of the Western Rock Lobster industry management options on fleet hosting communities |
| 2006/071.20 | Evaluating the Performance of Australian Marine Capture Fisheries – Expert assessment to assess outcomes of Australian fishing management |
| 2007/053 | Regional impact assessment for the Moreton Bay Marine Park |
| 2007/050 | Developing mechanisms for the transfer and/or adjustment of rocklobster shares between sectors in Western Australia and South Australia |

Table 2: Description of each of the Seven Projects

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| **Project Number 1999/162: Evaluating the effectiveness of marine protected areas as a fisheries management tool** | |
| Project details | Organisation: University of Tasmania  Period: August 1999 to August 2007  Principal Investigator: Colin Buxton |
| Rationale | The fishing industry and FRDC had been concerned about the impact Marine Protected Areas (MPAs) generally have on the industry, and whether there were real benefits to fisheries management from the establishment of MPAs. This project tested the claims of the benefits to fisheries from MPAs. |
| Objectives | 1. To model the effects of closure on the rock lobster and abalone fisheries, with particular reference to: the redirection of effort; potential benefit in terms of additional biomass and as a recruitment source; and location, size and number of the MPAs. 2. To quantify relative abundance of selected fish, invertebrates and plant populations at representative sites prior to establishment of MPAs, and to identify changes in relative abundance following reserve establishment. 3. To develop National guidelines for the assessment of MPAs in Australia, with particular reference to exploited species. 4. To provide specific management recommendations on the appropriate location, configuration and size of MPAs that will provide effective enhancement for coastal fisheries, and, to quantify the impacts of MPAs on local fisheries where they are proposed for reasons other than enhancing the fishery. |
| Outputs | * The study showed the effects of closure on plant and animal communities in the four Tasmanian marine reserves – Maria Island, Tinderbox, Ninepin Point and Bicheno, and through a comparison with fished sites, showed some of the impact of fishing on reef communities. Changes within the protected areas over the period indicated that fishing had had a substantial influence on the demographic structure of many species, particularly those targeted by fishers. * Changes within the more remote Maria Island reserve (the largest area studied) relative to fished reference sites, included increases in the abundance of lobsters and certain fish species and increases in the mean size of rock lobsters, as well as a decrease in the abundance of prey species such as urchins and abalone. * Spatial management of fisheries has a long tradition (e.g. spawning grounds) and there are a number of fisheries that benefit from spatial closures, particularly when other forms of fisheries management are unavailable or poorly applied. The findings demonstrated the value of MPAs as reference areas for research on the biology of exploited species and in understanding the ecosystem effects of fishing. * For Tasmanian lobster and abalone fisheries where catch and effort are effectively limited, the conclusion was reached that introducing MPAs as a fisheries management tool would be inferior to the management options at the time. * A study of small-scale movement patterns of fish demonstrated the sedentary nature of the small to medium reef fish species. This suggested that relatively small MPAs (of approximately 1 km diameter) could provide adequate conservation protection for these fish. |
| Outcomes | * The information and findings from this project contributed to the general knowledge about the usefulness of MPAs. In this regard the information generated was useful in a general sense to the impacts reported from Project 2005/083 - Review and assessment of the impacts of the proposed broad areas of interest for MPA Development in the SE region (see outcomes for 2005/083). * The survey protocol agreed at a national project workshop has been used in baseline surveys undertaken in new or proposed MPAs in Western Australia, Victoria, Tasmania and New South Wales. * The Victorian State Government has since established an ongoing MPA monitoring program using the project survey protocols. * Contribution to improved designs of future MPAs. * Direct comparisons of potential MPA impacts between a wide range of areas can be facilitated. * MPA performance and ecosystem effect of fishing through temperate Australia is much better understood. * The value of MPAs as a fisheries management tool is better understood. |
| Benefits | * Contributions to a reduced impact on displaced catch in the SE Region (Project 2005/083) leading to reduced impact on industry profits and employment in SE fisheries. * Contribution to improved design of future SE MPAs with potentially lowered impacts on the gross value of fisheries affected, increased environmental and habitat benefits, or a more desirable balance between the two impacts. |

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| **Project Number 2002/223: National atlas of fishing activities and coastal communities** | |
| Project details | Organisation: Bureau of Rural Sciences  Period: July 2003 to July 2007  Principal Investigator: James Larcombe |
| Rationale | A tight schedule was set for the development of Regional Marine Plans across Australia. At the time, there was no body of data providing detailed information on the nature and extent of marine fishing activities which could be used for regional marine planning.  Little was known on the socio-economic nature of coastal communities and their degree of dependence on marine fisheries resources. Research was needed to provide a greater understanding in this area, through the provision of a basis of identifying the social impacts of proposed changes to fisheries management arrangements, and developing strategies for appropriate government interventions to reduce adverse impacts. |
| Objectives | 1. To develop a strategy for the management of national fisheries data. The strategy will focus on partnership arrangements and agreements with custodian agencies, scheduled maintenance and updating, and systems of data distribution. The strategy will refer to marine and estuarine commercial fishing and aquaculture specifically but will also consider recreational and indigenous fishing. 2. To develop a strategy for collection and collation of social data on an ongoing basis for future resource management use. 3. To undertake a one off national fisheries data collection, within the context of the National Fisheries Data Strategy development. This data will focus on catch, effort, method, location and port of landing, collected from logbooks and fishery returns. 4. To derive social, demographic and economic profiles of coastal communities from existing data (1991, 1996 and 2001 ABS census data; BRS, AFMA and ABARE data; state and local government and other data sources such as consultants reports etc.). 5. To relate mapped fisheries resource usage to coastal communities. |
| Outputs | * Detailed socio-economic and demographic profiles for eight marine regions around Australia were developed. These regions are known as Eastern Central, North Eastern, Northern Planning Area, Northern Bonaparte, North Western, Western Central, South Western and South Eastern. * A National Atlas of Marine Fishing and Coastal Communities released in the publication *Marine Matters National*. * A draft National Fisheries Data Strategy was developed through a strategy development group and the Fisheries Statistics Working Group, and the Strategy was then endorsed in February 2007. |
| Outcomes | * The National Fisheries Data Strategy renewed focus of fisheries directors and managers on the fundamental value of good data and information. * The Socio- Economic National Co-ordination Committee was in the process of developing a common set of principles for how each State should approach socio-economic data collection in the natural resource management field. * Development of a business case for an Australian Fisheries information system has been promoted through the National Fisheries Data Strategy. * Decision makers have been provided with a scientific resource which can inform both current and future marine and coastal initiatives. * Detailed socio-economic and demographic profiles for the eight marine regions have led to Marine resource decision makers and governments (at all levels) having a better and deeper understanding of the social climate in the adjacent coastal communities and their dependence on fishing. |
| Benefits | * Improved industry and scientific capacity. * Potentially reduced management costs through improved allocation of planning and research resources for MPA development. |

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| **Project Number 2003/039: Dynamic modelling of socio-economic benefits of resource allocation between commercial and recreational use** | |
| Project details | Organisation: Economic Research Associates Pty Ltd  Period: June 2003 to September 2006  Principal Investigator: John Nicholls |
| Rationale | Fisheries management at both a State and National level have, throughout time, found it difficult to be confident that decisions made would in the long run achieve socially optimal outcomes. This was because fisheries management did not have a well-defined, documented framework and tested tool that was capable of modelling how changes in key variables could impact the relative commercial and recreational usage over time, and how that could potentially affect socially optimum allocation through time.  A proposal was therefore made that a framework and set of tools be created which could evaluate resource allocation and derive socially optimal allocations in Western Australia, for the purpose of satisfying legislative objectives. |
| Objectives | 1. To develop a general framework that provides a theoretical basis for identifying key variables that impact on commercial and recreational use values over time. 2. To document a robust dynamic model capturing the significant variables that impact on these values over time and how these impact on socially optimum resource allocation through time and which allow simulations of the optimal resource allocations over time. 3. To demonstrate the application of the dynamic framework and model through three case studies associated with the FRDC supported socio-economic valuation project – Socio-Economic Valuation of Allocation Options between Recreational and Commercial use (2001/065). This will advance the outputs from such a project (2001/065) in a logical, consistent and stepwise way. |
| Outputs | * A theoretical model was built, based on the relationships that lie behind the marginal net benefits schedules for both commercial and recreational fishing. * The key variables which could change the relative commercial and recreational marginal net benefits over time were then identified. * The way the key variables affected marginal net benefits over time was considered and a dynamic framework was formed. * The dynamic framework was applied to three case studies: The Cockburn Sound Managed Crab Fishery Case Study, The Perth Abalone Fishery Case Study, and The West Coast ‘Wetline’ Fishery Case Study. * Through all three case studies, it was concluded that the dynamic model could be usefully applied, as it provided meaningful insights into direction, extent and timing of inter-sectoral stock re-allocations in the future if socially optimal allocations were to be achieved and maintained over a five year period. * Where the model indicated a unidirectional on-going adjustment in allocation in future years and quantified it, the overall change could be planned such that the resource and social costs of adjustment were minimised. |
| Outcomes | * A presentation of the model and the Perth Abalone Fishery case study results were requested by the Integrated Fisheries Allocation Advisory Committee in Western Australia so they could take the model and its results into account when they were determining the policy for the allocation of the abalone resource in Western Australia. * Seminars on the model were held for the Western Australian Fishing Industry Council. * A presentation of the model at the “Share the Fish 06” conference in Fremantle was attended by managers from the New Zealand Ministry of Fisheries. These managers requested the full documentation to consider what lessons they could learn for application to their own fisheries. * The project enabled the adoption of a more strategic approach to the development of allocation policy in a fishery. * Fisheries management were provided with an improved base to work from when developing allocation policy and strategies. * The research has influenced thinking on allocation mechanisms, highlighted the need to consider both initial and ongoing allocations (Paul Mcleod, pers. comm., 2013). * Key fisheries in WA for allocation decisions have shifted toward a more formal approach to allocation, both current and ongoing (Paul Mcleod, pers. comm., 2013). |
| Benefits | * Fisheries management has potentially been able to minimise costs including the cost of regularly measuring marginal net benefits and transaction costs for managing and policing changes of adjustments to the reallocation between commercial and recreational fishing, by quantifying ongoing and unidirectional adjustment in allocation which may occur in future years. * Socially optimal allocations (where the marginal net benefits to society from commercial and recreational use are equal) may have been achieved more easily and more often than they otherwise would have been. |

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| **Project Number 2004/247: A scenario analysis of the social impact of the Western Rock Lobster industry management options on fleet hosting communities** | |
| Project details | Organisation: University of Western Australia  Period: June 2004 to November 2007  Principal Investigator: Mathew Tonts |
| Rationale | In 2002/03, industry representatives recognised that while there was an in depth understanding on the environmental and economic impacts of Western Rocklobster in Western Australia, there was limited information on the social benefits/costs to the wide range of communities which hosted the Rocklobster.  Management of the Western Rocklobster was under review in 2006, leading to consideration to shift from input control to output control management. The importance of social consequences that the changes in management could create was recognised and it was concluded that long term sustainability could only be understood through integrated analysis of social, environmental and economic impacts. |
| Objectives | 1. To assist in the formulation of the authoritative advice based on a thorough understanding of Ecologically Sustainable Development (ESD) principles (particularly social) to the relevant minister in response to the national competition policy (NPC). 2. To establish a database of qualitative social indicators for the communities hosting the Western Rocklobster fleet that will enable an integrated socio-economic assessment of a range of industry management options. 3. To contribute to the development of a framework and predictive sustainability assessment model integrating social data with environmental and economic data for use in predicting the wider effects of management changes on host communities. |
| Activities and Outputs | * Qualitative and quantitative data on communities were collected through a number of different sources. This data included information on population, age, unemployment rates, economic diversity, people’s opinions of their communities, attitudes and perception of the rocklobster industry, and how closely the economic viability of the community was linked to the industry. * An extensive literature review was undertaken. * A postal survey of fishery licence holders was carried out in 2004 and 93 completed questionnaires were received. * Semi-structured interviews (216) were held with various stakeholders in late 2004 to early 2005. * A telephone survey of community residents was undertaken from Nov-Dec 2005. * Focus group discussions were held with 38 participants. * A series of 12 community workshops were conducted in 2006 from May-August. * Investigators situated themselves within communities to observe the nature and qualities of fishing groups and their interactions within the community first hand. * Qualitative and quantitative data collected were then integrated. * Data was used to create scenarios of ‘what might be’ and these were used to predict and assess what the social impact of changes to the fisheries management could be. * The driving forces and factors that could affect fishers’ decisions to stay or leave the fishery based on the perceptions and views of fishers on the management arrangements were identified. These included: biological factors; economic and social factors including lifestyle choices, age structure and future in fishing profession, individual wellbeing and family relationships; and community factors. * Through community workshops conducted under the project, it was apparent that community stakeholders had a strong commitment to the preservation of the fishing cultural traditions. * It was determined that rocklobster fishers were, in general, in support of maintaining status quo when it came to management – sticking with input control. * A number of recommendations were made:  1. Fishery managers and stakeholders should continue to engage in open consultation process and ongoing information flow in future discussion of fishery management arrangements. Baseline data should continue to be compiled, allowing for better understanding on the impacts management changes have on fisheries and communities. 2. The contribution of the Western Rocklobster Fishery to the development of communities along the Western Australian coast can continue to be enhanced through business groups, community leaders and industry stakeholders collaborating. Blessing of the Fleet events could be used by the fishing community to foster a positive perception of the fishing industry. The use of educational and promotional posters could demonstrate the fisheries contribution to the development of towns and WA. Providing support for local tourism initiatives capitalising on the rocklobster industry and fostering multi-stakeholder partnerships should also be considered. 3. Fishery stakeholders should take advantage of proactive media and communication campaigns to ensure they capitalise on local and regional media to generate a positive impression of the fishery and build its support for the future. |
| Outcomes | * The importance of the social dimension of to the Western Rocklobster was realised through the project by both industry managers and stakeholders. With support from industry stakeholders a proposal for an extension to the project was presented to the FRDC in October 2006. The application however was not accepted at the time (Veronica Huddleston, pers. comm., 2013). * It was addressed that under an Ecologically Sustainable Development framework, the incorporation of social dimensions of the Rocklobster fishery into management and policy needed to remain a priority. * As recommended by the project, the fishery continued intensive and open consultation, particularly during the Marine Stewardship Council recertification process in December 2006 and March 2012. Key stakeholders (commercial fishers, processors and the Western Australian government) also worked closely together to ensure sustainable operating levels, resulting in a move to an output (catch quota) management system, with full implementation of ITQs in 2010/2011. More generally, stakeholder meetings, which are coordinated by the Western Rocklobster Council and the Department of Fisheries, are open to the public to allow discussion on fisheries management issues to occur. Media outlets are also used to inform stakeholders of stock assessments and management arrangements (Veronica Huddleston, pers. comm., 2013). * In implementing the second recommendation, Rocklobster fishers, various Professional Fisherman’s Associations and Rocklobster processors have worked with community leaders and business groups to foster a positive perception of the fishery through ‘Blessing of the Fleet’. ‘Blessing of the Fleet’ is noted under Jurien Bay, Dongara and Geraldton as an activity for tourists at the Australian Coral Coast website (Veronica Huddleston, pers. com., 2013). Other noteworthy community events include:   + Kalbarri Canoe and Cray Festival   + Larry Lobster Festival   + Fremantle Fireworks Opening   + Indian Ocean Festival 2013 * In achieving the third recommendation, opportunity still exists to showcase the fisheries contribution by advertising the Professional Fisherman’s Association or Western Rocklobster Council through local documents and websites. Much of the current media attention focuses on stock assessment and the reduction of impact on the surrounding system such as the introduction of sea lion exclusion devices which minimise sea lion mortality. Local community newspapers and pamphlets do give reference to the contributions of local Rocklobster fishers (pers. comm., Veronica Huddleston, 2013). |
| Benefits | * Businesses in communities hosting the rock lobster fleets may avoid reductions in profits. * Potential for significant social benefits, including increased quality of life for residents in communities hosting the rock lobster fleets. |

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| **Project Number 2006/071.20: Evaluating the Performance of Australian Marine Capture Fisheries – Expert assessment to assess outcomes of Australian fishing management** | |
| Project details | Organisation: Ridge Partners  Period: August 2007 to July 2008  Principal Investigator: Ewan Colquhoun |
| Rationale | Australian fisheries have a wide range of plausible futures. For this reason it was decided that research should be carried out to assess where Australia was in terms of achieving the best outcome for wild-catch fisheries. A Delphi research process was undertaken, where 70 experts offered their perceptions of best use and performance gaps. |
| Objectives | 1. To estimate the benefits arising from managing fisheries to their best use and managing that use in such a way as to generate the greatest benefit to the community, then comparing those benefits against current outcomes. |
| Outputs | * A Delphi research process was carried out where an expert group gave feedback in four research rounds. * Seven components covering best use outcomes were agreed upon by 98% of the experts. These were:  1. The importance of understanding community views and expectations. 2. The need to set sustainability benchmarks, as an ecosystem which was managed to regenerate the stock level of target and other species contributed to best use outcomes. 3. Ensuring focus on effective management approaches. 4. Viewing environmental sustainability as a precondition for long-term economic sustainability. 5. Considering the links along the value chain – fishing and downstream activities. 6. The importance of acknowledging wider uses when allocating fishery shares such as the value of passive tourism. 7. Finding the right balance of shares amongst fisheries users such as commercial, recreational and customary.  * Experts pointed out issues and offered advice in moving towards best use under the five major categories: management, environment, economic performance, recreational fishing and community. * A combination of qualitative and quantitative assessment based on expert feedback was used to measure the gap between current use and best use in Australian wild-catch fisheries. * Based on expert advice, a current value for Australian wild-catch fisheries was calculated. * Experts were then asked to rate current performance on a scale of one to ten to identify the size of the gap between current and best use. * Based on the rating, an estimate for the value of Australian wild-catch fisheries performing at best use (where 10/10 is best use performance) was developed. * The difference between the current use value and the best use value (size of the economic rent gap) was suggested to be between $350-450 million per annum for Australian wild-catch fisheries. * A number of benefits which could arise from managing fisheries to their best use were determined. These benefits are:   + Environmental sustainability.   + Response to changing developments.   + Improved coordination between commercial and recreational fishing sectors.   + Improved long term economic sustainability.   + Better understanding on wild-catch fisheries by communities.   + Improved communications with communities.   + Improved management strategies. * It was determined that marine resources no longer had the capacity or resilience to service the unconstrained demands of all active and passive users. Tradeoffs were at the heart of fishery progression towards best use. * Structural barriers to change were increasingly undercutting progression to better fishery performance. * For Australian wild-catch fisheries to shift from current use to best use, incentives would need to be considered. |
| Outcomes | * Australian wild-catch fisheries were provided with a clear framework regarding the steps that needed to be taken to tackle key issues and move towards best use. * The study was expected to expand thinking about best use and fishery stakeholder’s thoughts about gaps and performance. * There has been a continual move of Fishery Management Codes of Practice and regulations that reflect incentives required to move towards best use (Ewan Colquhoun, pers. comm., 2013). Two examples include:   + The largest wild-catch fishery, the WA Rocklobster fishery has developed codes of conduct for fisherman to use gear that reduced the entanglement of whales in their fishery gear. This relies on threats of “loss of marine access” by the state regulator.   + In Recreational and Indigenous Fisheries there are projects underway to enhance governance and improve cost effectiveness. * These examples demonstrate that while incentives are being developed, they are indirect and based on best use and performance, not direct economic gain (Ewan Colquhoun, pers. comm., 2013). * A repeat of this Delphi project is currently in development by Ridge Partners (with FRDC’s committee) to determine changes/impacts since the 2009 study (Ewan Colquhoun, pers. comm., 2013). |
| Benefits | * Potentially reduced wild-catch fisheries management costs. * Potentially increased profits/reduced input costs for industry and recreational fishers. * Potentially enhanced sustainability of wild-catch fisheries. |

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| **Project Number 2007/053: Regional impact assessment for the Moreton Bay Marine Park** | |
| Project details | Organisation: Moreton Bay Seafood Industry Association  Period: June 2007 to July 2008  Principal Investigator: Linda Cupitt |
| Rationale | Following Queensland’s Environmental Protection Agency announcement to review the Marine Park (Moreton Bay) Zoning Plan (1997) in 2007, various industry regional groups came together to discuss the possible changes to the Zoning Plan. The groups reached a common goal which was to ensure any changes met conservation objectives whilst not reducing the opportunity for commercial, indigenous and recreational fishing and boating activities. This group, which formed the Moreton Bay Access Alliance (MBAA) decided to take a proactive strategy to address potential implications that changes to the Zoning plan possibly could have created.  The development of a report allowed all parties to have a common reference point in negotiations. This report aimed to validate and quantify the impact on fishing in the Moreton Bay environment and used scientific findings to push for changes to the existing Marine Park Zoning Plan. |
| Objectives | 1. To collect representative data to characterise fishery activity and support industries operating within Moreton Bay (including social and economic values for commercial, recreational and indigenous/ traditional fisheries). 2. To collect data that adequately represents biodiversity abundance and spatial structure of habitats, ecosystems and associated species assemblages within Moreton Bay (including protected species). 3. To determine the impact of fishing and boating activity on the environment via a risk based approach. 4. To develop alternative options for the Marine Parks (Moreton Bay) Zoning Plan 1997 that meet the conservation requirements of the Queensland Marine Parks Act 2004 and the ecological sustainability objectives of the Queensland Environmental Protection Agency (EPA), whilst minimising impact on fishing and boating industries (including commercial, recreational and Indigenous fisheries, boating and support industries). |
| Outputs | * Each of the main fishing sectors provided data through surveys as there was a lack of data available on the various fishing and boating activities in Moreton Bay. * A meta-analysis on all available habitat data was carried out. * A risk assessment was undertaken on the environmental values identified by the EPA. * Recreational fishing expenditure and commercial fishing production from locations throughout the Moreton Bay Marine Park (MBMP) were estimated at a spatial scale much finer than any previous existing estimates. * There was unanimous agreement on an alternative zoning solution for the MBMP which was supplied to the Government for consideration several months before the release of the Draft Zoning Plan, 2007. |
| Outcomes | * Information on habitat classifications in the MBMP were considered and incorporated by EPA in their final habitat map for the MBMP. * The Queensland Government MBMP review process was enhanced through provision of: additional economic and social data to fill knowledge gaps; an independent analysis of habitat classifications and Government proposed zoning arrangements; and industry-agreed network of green zones that would meet conservation principles. * The MBAA led to strong relationships being built between recreational, commercial and charter boat fishing sectors, along with the boating industry, when previously these groups had been rivals. * Groups across Australia have now achieved successful collaboration of rival stakeholders as they have had a blueprint to work from. * Previously held myths about the motivations of each stakeholder group, along with sustainability of various fishing techniques on both sides of the resource allocation/catch-sharing “fence” were dispelled. * A scientifically defensible case for placement of marine reserves (in locations that conserve biodiversity values, whilst minimising impact on economic and social values) was developed which formed a point of negotiation during the Government-led public consultation process. * Many of the areas suggested in the FRDC’s report to the Government were incorporated in the 2007 Draft Zoning Plan and remained in the Final Zoning Plan of 2008. * The alternative zones not adopted by the 2007 Draft Zoning Plan were instead placed in highly productive fishing grounds. * Data on commercial fishing including commercial fishers logbooks, available from DAFF in summarised form (to preserve confidentiality to fishers) and direct information from fishers collected through specially organised meeting by the Moreton Bay Seafood Industry Association was assembled after the project’s completion (David Sterling, pers. comm., 2013). * A report on the major social consequences of the Marine Park Rezoning on fishers’ lives by Dr Sylvia Shaw was made available (David Sterling, pers. comm., 2013). * Industry funded a review of impacts on the fisheries in Moreton Bay by the rezoning. This was based on available data and some analysis of the data by Dr Darryl McPhee, and compiled by Chris Thompson from Law Essential. This was sent to the Auditor-General and relevant ministers on the 17th of May 2013, but has not resulted in any action to address substantial impacts (David Sterling, pers. comm., 2013). |
| Benefits | * Reduction in conflict between stakeholders, leading to improved social wellbeing. * Minimised the reduction in profits to the fishery industry in Moreton Bay. |

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| **Project Number 2007/050: Developing mechanisms for the transfer and/or adjustment of rocklobster shares between sectors in Western Australia and South Australia** | |
| Project details | Organisation: Department of Fisheries Western Australia  Period: March 2008 to July 2009  Principal Investigator: Lindsay Joll |
| Rationale | In both South and Western Australia, the rocklobster has been a particularly valuable species. Recommendations were made by the Western Australian Integrated Fisheries Allocation Advisory Committee (IFAAC) to the minister, suggesting the recreational and commercial sector’s allocation be based on predictive proportional catches in 2009/10 and that a reallocation mechanism be developed for implementation by 2009/10. While there was significant progress on this allocation policy in Western Australia, there was little progress on the establishment of reallocation principles and mechanisms.  South Australia was facing impending new legislation which required allocation and reallocation mechanisms and it was considered essential that priority be given to investigating the development mechanisms (including market based) to achieve reallocations.  For reasons of cost effectiveness and cooperation, it was decided that a joint project between the two States should be undertaken. |
| Objective | 1. To develop a re-allocation framework for the transfer and/or adjustment of rock lobster shares between sectors. |
| Outputs | * Administrative and market approaches for design of inter-sectoral reallocation mechanisms were identified. * Seven potential reallocation mechanism options were outlined and explained in a discussion paper: * An administrative inter-sectoral reallocation mechanism where the commercial sector is managed under individual transferable quotas (ITQ). This option was based on the Department of Primary Industries and Resources South Australia (PIRSA) draft policy paper *‘Allocation of Fisheries Resources between Fishing Sectors’* released in 2009. * A market inter-sectoral reallocation mechanism where the recreational fishery is managed using traditional recreational sector management tools, a recreational sector trust fund is established and trading in catch entitlements between commercial operators and the recreational sector trust fund is permitted. * A market inter-sectoral reallocation mechanism where a recreational trust fund is established, trading in catch entitlements between commercial operators and the recreational sector trust fund is permitted, and management of the recreational sector includes the use of a market allocation mechanism. * A market inter-sectoral reallocation mechanism where individual transferable catch entitlements exist in all sectors. * An administrative inter-sectoral reallocation mechanism. * A market inter-sectoral reallocation mechanism where a representative body is established for both the commercial and recreational sectors, and reallocation arises through trading of sectoral allocations between these bodies. * A market inter-sectoral reallocation mechanism allowing for the trading of commercial effort entitlements and the recreational sectoral allocation between commercial entitlement holders and the recreational sector trust fund. |
| Outcomes | * The results produced by the project could be widely applicable to fisheries Australia-wide. * Aside from one policy amendment, PIRSA endorsed the South Australian references from the draft policy paper, on which the first of the seven potential reallocation mechanisms was based. * The Western Australian Fishing Industry Council (commercial sector), congratulated the author of the paper for an “exhaustive, well thought-out and documented examination of possible mechanisms to enable inter-sectoral reallocation.” * Recfishwest (recreational sector) claimed the document was “critically important for setting policy direction for the implementation of movement of catch shares between sectors.” * The Department of Fisheries Western Australia held a Reallocation Workshop on Wednesday, 2nd February, 2011 to discuss the most appropriate reallocation mechanisms with key stakeholder groups. * No formal reallocation mechanisms were implemented in Western Australia, though the head powers for reallocation mechanisms will be incorporated into the proposed new Western Australian Aquatic Resource Management Act (ARMA). ARMA will incorporate a rights-based framework, including a framework for the sectors to trade entitlement. A process is included by which the Minister can arrange for the allocation of excess Total Allowable Recreational Catch (TARC) and increase the TARC (Lindsay Joll, pers. comm., 2013). |
| Benefits | * Depending on the reallocation mechanisms chosen, management costs may decrease (Lindsay Joll, pers. comm., 2013). * The major benefit of reallocation mechanisms is that as community priorities for resource use change over time, reallocation mechanisms help to reduce conflict between the sectors (Lindsay Joll, pers. comm., 2013). * Potentially increased profits for the commercial sector. * Potentially increased personal utility within the recreational sector. |

**Project Investment**

The following tables show the annual investment by project for both the FRDC (Table 3) and for researchers and other investors (Table 4). Table 5 provides the total investment by year from both sources.

Table 3: Investment by FRDC by Project for Years Ending June 2000 to June 2012 (nominal $)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **Total** |
| 1999/162 | 70,961 | 213,239 | 62,484 | 0 | 0 | 31,242 | 0 | 0 | 31,242 | 0 | 0 | 0 | 0 | 409,168 |
| 2002/223 | 0 | 0 | 0 | 220,165 | 94,357 | 94,359 | 0 | 157,262 | 62,905 | 0 | 0 | 0 | 0 | 629,048 |
| 2003/039 | 0 | 0 | 0 | 0 | 30,840 | 31,328 | 76,612 | 15,420 | 0 | 0 | 0 | 0 | 0 | 154,200 |
| 2004/247 | 0 | 0 | 0 | 0 | 0 | 183,773 | 0 | 200,785 | 21,365 | 21,364 | 0 | 0 | 0 | 427,287 |
| 2006/071.20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 82,343 | 9,091 | 0 | 0 | 91,434 |
| 2007/053 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9,010 | 111,351 | 49,005 | 4,505 | 0 | 0 | 173,871 |
| 2007/050 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35,290 | 0 | 85,410 | 38,105 | 10,204 | 169,009 |
| **Total** | **70,961** | **213,239** | **62,484** | **220,165** | **125,197** | **340,702** | **76,612** | **382,477** | **262,153** | **152,712** | **99,006** | **38,105** | **10,204** | **2,054,017** |

Source: FRDC project management database

Table 4: Investment by Researchers and Others by Project for Years Ending June 2000 to June 2012 (nominal $)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **Total** |
| 1999/162 | 394,916 | 399,118 | 344,518 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,138,552 |
| 2002/223 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2003/039 | 0 | 0 | 0 | 0 | 20,000 | 10,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30,000 |
| 2004/247 | 0 | 0 | 0 | 0 | 40,567 | 81,134 | 81,134 | 40,567 | 0 | 0 | 0 | 0 | 0 | 243,402 |
| 2006/071.20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2007/053 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24,551 | 71,662 | 0 | 0 | 0 | 0 | 96,213 |
| 2007/050 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 87,100 | 75,525 | 0 | 0 | 0 | 162,625 |
| **Total** | **394,916** | **399,118** | **344,518** | **0** | **60,567** | **91,134** | **81,134** | **65,118** | **158,762** | **75,525** | **0** | **0** | **0** | **1,670,792** |

Source: FRDC project management database

Table 5: Annual Investment in Cluster (nominal $)

|  |  |  |  |
| --- | --- | --- | --- |
| **Year ending June** | **FRDC** | **Researchers and Others** | **Total** |
| 2000 | 70,961 | 394,916 | 465,877 |
| 2001 | 213,239 | 399,118 | 612,357 |
| 2002 | 62,484 | 344,518 | 407,002 |
| 2003 | 220,165 | 0 | 220,165 |
| 2004 | 125,197 | 60,567 | 185,764 |
| 2005 | 340,702 | 91,134 | 431,836 |
| 2006 | 76,612 | 81,134 | 157,746 |
| 2007 | 382,477 | 65,118 | 447,595 |
| 2008 | 262,153 | 158,762 | 420,915 |
| 2009 | 152,712 | 75,525 | 228,237 |
| 2010 | 99,006 | 0 | 99,006 |
| 2011 | 38,105 | 0 | 38,105 |
| 2012 | 10,204 | 0 | 10,204 |
| **Total** | **2,054,017** | **1,670,792** | **3,724,809** |

**Benefits**

This cluster has generated a number of different potential and realised benefits. These can be broadly separated into the following categories:

* Increased total utility for users of the resource base
* Reduced fisheries management costs
* Improved industry and scientific capacity.
* Enhanced sustainability of ecosystems and the environment, due to more sustainable operations, and reduced biodiversity impacts.
* Avoided costs to society, due to greater understanding of social impacts and community cooperation. This is assumed to be captured via reduced conflict between stakeholders, and increased quality of life for communities dependent on fishing fleets.

Table 6 summarises the major benefits by category delivered by each of the projects.

Table 6: Type of Benefit Delivered by Project

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Project** | **Type of Benefit** | | | | |
| Increased total utility | Reduced Fisheries Management Costs | Improved industry and scientific capacity | Enhanced sustainability of ecosystems and the environment | Avoided social costs |
| 1999/162: Evaluating the effectiveness of marine protected areas as a fisheries management tool | 🗸 |  |  | 🗸 |  |
| 2002/223: National atlas of fishing activities and coastal communities |  |  | 🗸 |  |  |
| 2003/039: Dynamic modelling of socio-economic benefits of resource allocation between commercial and recreational use | 🗸 | 🗸 |  |  | 🗸 |
| 2004/247: A scenario analysis of the social impact of the Western Rock Lobster industry management options on fleet hosting communities | 🗸 |  |  |  | 🗸 |
| 2006/071.20: Expert assessment to assess outcomes of Australian fishing management | 🗸 | 🗸 |  | 🗸 |  |
| 2007/053: Regional impact assessment for the Moreton Bay Marine Park |  |  |  | 🗸 | 🗸 |
| 2007/050: Developing mechanisms for the transfer and/or adjustment of rocklobster shares between sectors in Western Australia and South Australia | 🗸 | 🗸 |  |  | 🗸 |
| Frequency | 5 | 3 | 1 | 3 | 4 |

**Summary of Benefits**

Table 7 provides in a triple bottom line framework a summary of the principal types of benefits associated with the outcomes of the investment.

Table 7: Summary of Benefits in a Triple Bottom Line Framework

|  |  |  |
| --- | --- | --- |
| **Industry** | **Environmental** | **Social** |
| 1. Increased total utility 2. Reduced fisheries management costs 3. Improved industry and scientific capacity | 1. Enhanced sustainability of ecosystems and environment | 1. Avoided social costs 2. Reduced fisheries management costs 3. Improved industry and scientific capacity |

The benefits identified above have been classified into subjective beneficiary categories and a subjective estimate of their magnitudes is provided in Table 8. Benefit numbers in Table 8 refer to the benefit numbers in Table 7.

Table 8: Categories of Benefits from the Investment

|  |  |  |  |
| --- | --- | --- | --- |
| **Fishing industry** | **Spillovers** | | |
| **Other industries** | **Public** | **Overseas** |
| 1. \*\*  2. \*\*\*  3. \* |  | 4. \*  5. \*  6. \*  7. \* | 7. \* |

\*\*\* Major contribution \*\* Some contribution \* Minor contribution

**Public versus Private Benefits**

The investment will result in both public and private benefits. On the basis of the seven benefits listed in Table 7, and an equal weighting for each benefit, it could be concluded that the public benefits to Australia could make up 57% of the total Australian benefits. If the subjective weightings are taken into account (Table 8), the public benefits would make up 40% of total Australian benefits.

**Distribution of Benefits along the Supply Chain**

The majority of private benefits will initially be captured by fishers but benefits (and costs) are likely to ultimately be shared along the supply chains, including seafood consumers.

**Benefits to Other Industries**

It is unlikely that benefits will accrue beyond the fisheries industry.

**Benefits Overseas**

Overseas producers may receive minor benefits from scientific information and methods.

**Additionality and Marginality**

The investment in the projects in this cluster has been categorised as medium to high priority. FRDC contributed 53% of total funding on the seven projects (in real terms), but this varied greatly across projects. If the FRDC had not received funding from government, some of these investments would probably still have been supported by the FRDC but to a far lesser extent. Some of the investment may have been funded through other sources if the FRDC had not contributed. Further detail is provided in Table 9.

Table 9: Potential Response to Reduced Public Funding to FRDC

|  |  |
| --- | --- |
| What priority were the projects in this cluster when funded? | Medium to High |
| Would FRDC have funded this cluster if only half of public funding of FRDC had been available? | Yes, but with a lesser total investment, perhaps less than 50% of actual total investment made. |
| Would the cluster have been funded if no public funding for FRDC had been available? | Yes, but with a far lesser total investment, (0-25%) of actual total investment. |

**Match with National Priorities**

The Australian Government’s national and rural R&D priorities are reproduced in Table 10.

Table 10: National and Rural R&D Research Priorities

|  |  |
| --- | --- |
| **Australian Government** | |
| **Strategic Research Priorities (est. 2013)** | **Rural Research Priorities (est. 2007)** |
| 1. Living in a changing environment 2. Promoting population health and wellbeing 3. Managing our food and water assets 4. Securing Australia’s place in a changing world 5. Lifting productivity and economic growth | 1. Productivity and adding value 2. Supply chain and markets 3. Natural resource management 4. Climate Variability and Climate Change 5. Biosecurity   *Supporting the priorities:*   1. Innovation skills 2. Technology |

Source: DAFF (2014) & ARComm (2013)

The cluster contributes to Strategic Research Priorities 1, 3, and 5. The cluster investment was also strongly associated with the Rural Research Priorities 1 and 3 as well as both supporting priorities.

**Quantification of Benefits**

**Benefits Not Valued**

Benefits which were identified but not valued include:

* Improved industry and scientific capacity (No 3 and 7 in Table 7)
* Enhanced sustainability of ecosystems and environment (No 4 in Table 7)
* Avoided social costs (No 5 in Table 7)

The benefits which were not valued were delivered from only a small number of projects, were considered only minor in magnitude and/or were particularly difficult to value.

**Benefits Valued**

Two benefits are valued in this cluster analysis:

* Contribution to Project 2005/083: Review and assessment of the impacts of the proposed broad areas of interest (BAOI) for MPA development in SE region. This benefit covers avoided loss in profits through a change in the amount of catch displaced in the focus MPA and other MPAs and also some avoided social costs.
* Reduced fisheries management costs: Projects 2003/039, 2006/071.20, and 2007/050 all made a contribution to a reduction in the management costs of Australian wild-catch fisheries.

**Contribution to Project 2005/083**

The outcomes of project 1999/162 contributed significantly to outcomes valued from previously funded FRDC Project 2005/083: *Review and assessment of the impacts of the proposed broad areas of interest (BAOI) for MPA development in the SE region*. The contribution of Project 1999/162 arose through general knowledge provided on the usefulness of MPAs.

Three benefits were valued from project 2005/083:

* Change in the value of displaced catch in the SE region MPA
* The social costs avoided in the SE region MPA
* Improvements to other MPAs in Australia

*Changes in the value of displaced catch and social costs avoided in the SE region MPA*

The MPA in an original proposal for the SE MPA had an estimated displaced catch of $11.6 m per annum for both Commonwealth and State fisheries (Anon, 2007). Project 2005/083 contributed to a revised proposal which led to an estimated displaced GVP of $0.9 m per annum, resulting in a net gain of $10.7 m. It was noted that the rocklobster industry gained $0.4 m GVP independently of the project and therefore the reduced value of displaced catch was $10.3 m.

This figure was split into scallop and other fisheries, attributing $5.2 m savings to the scallop industry, and the remainder, $5.1 m to other fisheries (excluding the Rocklobster gains).

The issue of redeployment arose as displaced capital and labour could be redeployed elsewhere. Closure was assumed to remove nearly the entire scallop industry in the region (10% redeployed), and an average of 40% of boats and labour for other fisheries were assumed to be redeployed elsewhere. Therefore by applying the proportion of resources redeployed to the gross value of reduction is displaced catch, the economic gains for the scallop and other fisheries could be identified as $4.68 m and $3.06 m respectively.

The attribution of gains due to the project 2005/083 was assumed 90%, with only 50% of gains expected to be made without the projects occurring.

Increased unemployment and community disruption due to heavy dependence on the fishing fleet and associated servicing would have resulted in social costs for communities, families and individuals. A proportion of the structural adjustment costs paid by government could be viewed as a surrogate for avoiding such costs. An estimated one-off cost of $10 m for avoided disruption was based on one third of the total structural adjustment costs of around $30 m that would have most likely been paid by government.

The $30 m structural adjustment cost was estimated by applying a factor of 3 to the likely value of the displaced catch of about $10 m (Confidential pers. comm., DEW, 2007).

*Other MPAs in Australia*

It was likely that the lessons learned from the MPAs in the SE Region would have been used in the development of networks for the next four Australian fisheries regions to be developed with MPAs. Efficiencies gained through the SE MPA experience could result in further saved costs to the respective fishing industries. The likelihood of saved costs occurring was assumed to be 30%, with the saved cost of $2 m per annum per fisheries region, commencing every three years from 2010 onwards.

*Contribution by project 1999/162*

Project 1999/162 made a small, but significant contribution to project 2005/083 as a whole. Therefore it has been assumed project 1999/162 was responsible for 5% of the above benefits valued.

**Reduced Fisheries Management Costs**

This benefit has been valued by assuming that changes and improvements in management operations would lead to reduced management costs. The reduction in fisheries management costs was relevant for three of the seven projects within this cluster. It is expected all Australian wild-catch fisheries will receive some benefit, with the Western Australian Rocklobster fishery and the South Australian Rocklobster fishery receiving additional benefit due to the projects which focused on those fisheries specifically.

*Management Costs*

Management costs were calculated as a percentage of each fisheries gross value of production (GVP). For Commonwealth fisheries managed through AFMA, management costs were estimated as 7.2% of GVP (Cox, 2000). This proportion was used as a proxy measure for estimating the management costs of all fisheries where impact was valued. Table 11 demonstrates the application of this to each of the fisheries valued.

Table 11. Fisheries Management Costs

|  |  |  |  |
| --- | --- | --- | --- |
| **Fisheries** | **GVP (‘000) (a)** | **Management costs as % of GVP (b)** | **Annual Management Costs** |
| Australian Wild-catch Fisheries | $1,312,326 | 7.2% | $94,487,472 |
| Western Australian Rocklobster Fishery | $184,280 | 7.2% | $13,268,160 |
| South Australian Rocklobster Fishery | $81,326 | 7.2% | $5,855,472 |

Sources: (a) ABARES (2012); (b) Cox (2000)

The fisheries where benefits were valued and their relevant projects in the analysis are detailed below:

Australian Wild-catch Fisheries:

Project 2006/071.20: *Expert assessment to assess outcomes of Australian fishing management*, has reduced management costs through the application of advice supplied by experts on the management of these fisheries. It is assumed that these reductions could be up to 0.5% of management costs. In order to account for the uncertainty surrounding these impacts, an impact probability of 50% has been assumed.

Western Australian Rocklobster Fishery:

Project 2007/050: *Developing mechanisms for the transfer and/or adjustment of rocklobster shares between sectors in Western Australia* could see management costs reduced through the implementation of a new mechanism for shares between recreational and commercial use. Reallocation mechanisms will be incorporated into the proposed new Western Australian Aquatic Resource Management Act (ARMA). ARMA will incorporate a rights-based framework, including a framework for the sectors to trade entitlement. A process is included by which the Minister can arrange for the allocation of excess Total Allowable Recreational Catch (TARC) and increase the TARC (Lindsay Joll, pers. comm., 2013). Therefore there is still some confidence that management costs will be reduced, and the probability of this occurring has been assumed to be approximately 50%. If reductions do occur, they are estimated to be approximately 2% of management costs.

South Australian Rocklobster Fishery:

Projects 2007/050 is also responsible for potentially reducing management costs to the South Australian Rocklobster industry. By developing an appropriate mechanism for the adjustment of Rocklobster between commercial and recreational fishers, there is a reduction in transaction costs, as well as the costs of policing and managing new allocation policies. This is assumed to be worth 2% of total management costs. As with the West Australian industry, a 50% impact probability has been applied.

*Timing*

The projects which affected management costs finished at different times. It has been assumed that the reductions in management costs would occur one year after adjustments in management operations have taken place. These changes are expected to be implemented one year after the end of the project and endure for the life span of the fishery.

**Summary of Assumptions**

A summary of the key assumptions made is shown in Table 12.

Table 12: Summary of Assumptions

|  |  |  |
| --- | --- | --- |
| **Variable** | **Assumption** | **Source** |
| ***Benefit 1: Contribution to project 2005/083*** | | |
| *All fisheries affected by the MPA in South East Region – displaced catch* | | |
| Total gross value displaced catch – original proposal | $11.6 m per annum | Anon (2007) |
| Total gross value displaced catch – final outcome | $0.9 m per annum | Anon (2007) |
| Reduced value of displaced catch, excluding rock lobster | $11.6m – $0.9m – 0.4 million = $10.3 million | Buxton et al (2006b) |
| Proxy for social costs avoided | $10 m in 2008/09 | Agtrans Research |
| *Specific fisheries gains associated with the investment* | | |
| Contribution of catch gain from scallops | $5.2 million | Buxton et al (2006b) |
| Contribution of catch gain from other fisheries | $5.1 million | $10.3 m less $5.2 m |
| Resources engaged elsewhere with scallop industry closure | 10% | Agtrans Research |
| Resource engaged elsewhere due to impact on other fisheries | 40% | Agtrans Research |
| Proportion of actual gains made for scallops and other fisheries due to investment | 90% | Agtrans Research, after discussions with industry and DEW representatives |
| Proportion of gains made that would have been made without the investment | 50% | Agtrans Research after discussions with industry representatives and others |
| *Benefits to other Marine Protected Area Development in four more Australian fisheries* | | |
| Saving | $2 m per annum for each of four fisheries | Agtrans Research |
| Probability of saving occurring | 30% | Agtrans Research |
| Year in which each saving in other MPAs commences | Year ending June 2014 | Agtrans Research after discussions with Paul Garrett (2009) |
| *Contribution by project 1999/147 to Project 2005/083* | | |
| Percentage of benefits attributed to project 1999/147 | 5% | Agtrans Research |
| ***Benefit 2: Reduced Management Costs*** | | |
| *Management Costs* | | |
| Management Costs as % of GVP | 7.2% (average across 1992-93 to 1998-99) | Cox (2000) |
| Probability of cost reductions occurring | 50% | Agtrans Research |
| *Australian Wild-catch Fisheries* | | |
| Gross value of production | $1,312,326,000 (average for year ending June 2011) | ABARES (2012) |
| Management cost reduction | 0.5% | Agtrans Research |
| Year in which benefits begin | 2009 | Agtrans Research |
| *Western Rocklobster Fishery* | | |
| Gross value of production | $184,280,000 (average for year ending June 2011) | ABARES (2012) |
| Management cost reduction | 2% | Agtrans Research |
| Year in which benefits begin | 2008 | Agtrans Research |
| *Southern Rocklobster Fishery* | | |
| Southern Rocklobster Fishery | $81,326,000 (average for year ending June 2011) | ABARES (2012) |
| Management cost reduction | 2% | Agtrans Research |
| Year in which benefits begin | 2010 | Agtrans Research |

**Results**

All past costs and benefits were expressed in 2013/14 dollar terms using the CPI. All benefits after 2013/14 were expressed in 2013/14 dollar terms. All costs and benefits were discounted to 2013/14 using a discount rate of 5%. The base run used the best estimates of each variable, notwithstanding a high level of uncertainty for many of the estimates. Investment criteria were estimated for both total investment and for the FRDC investment alone. All analyses ran for the length of the investment period plus 30 years from the last year of investment (2011/12) to the final year of benefits assumed*.*

Tables 13 and 14 show the investment criteria for the different periods of benefits for both the total investment and the FRDC investment.

Table 13: Investment Criteria for Total Investment

(discount rate 5%)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Years since last year of investment** | | | | | | |
| **Years** | **0** | **5** | **10** | **15** | **20** | **25** | **30** |
| Present value of benefits ($m) | 3.60 | 6.92 | 9.62 | 11.73 | 13.39 | 14.69 | 15.70 |
| Present value of costs ($m) | 8.03 | 8.03 | 8.03 | 8.03 | 8.03 | 8.03 | 8.03 |
| Net present value ($m) | -4.43 | -1.11 | 1.59 | 3.70 | 5.36 | 6.66 | 7.67 |
| Benefit-cost ratio | 0.45 | 0.86 | 1.20 | 1.46 | 1.67 | 1.83 | 1.96 |
| Internal rate of return (%) | Negative | 3.3 | 6.7 | 8.2 | 8.9 | 9.3 | 9.5 |

Table 14: Investment Criteria for FRDC Investment

(discount rate 5%)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Years since last year of investment** | | | | | | |
| **Years** | **0** | **5** | **10** | **15** | **20** | **25** | **30** |
| Present value of benefits ($m) | 1.91 | 3.68 | 5.11 | 6.23 | 7.11 | 7.80 | 8.34 |
| Present value of costs ($m) | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| Net present value ($m) | -2.09 | -0.33 | 1.11 | 2.23 | 3.11 | 3.80 | 4.34 |
| Benefit-cost ratio | 0.48 | 0.92 | 1.28 | 1.56 | 1.78 | 1.95 | 2.09 |
| Internal rate of return (%) | Negative | 3.8 | 7.7 | 9.3 | 10.0 | 10.4 | 10.6 |

The annual cash flow of undiscounted benefits is shown in Figure 1 for both the total investment and for the FRDC investment.

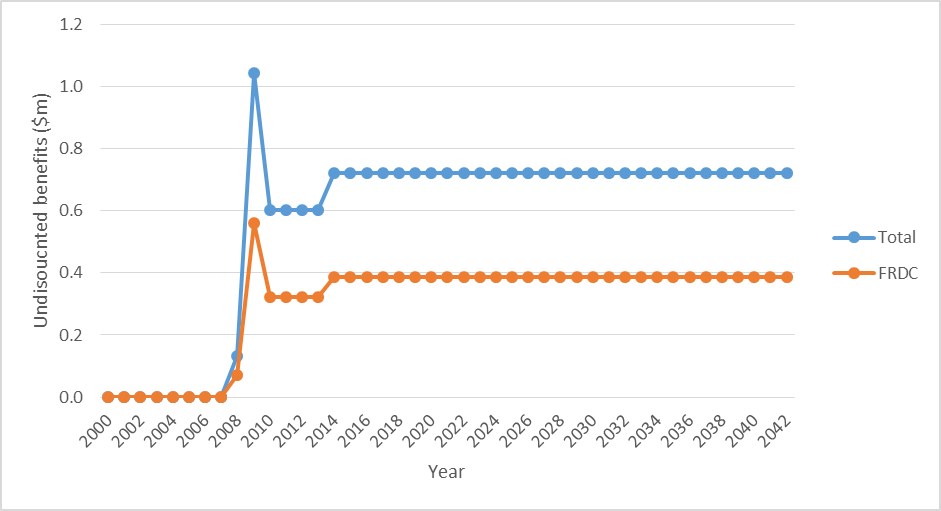


Figure 1: Annual Cash Flow of Benefits

The present value of benefits (PVB) from each source of benefits was estimated separately and then summed to provide an estimate of the total value of benefits. Table 15 shows the sources of benefits, expressed as the PVB and the percentage of total benefits.

Table 15: Source of Benefits (discount rate 5%, 30 year period)

|  |  |  |
| --- | --- | --- |
| **Benefit** | **PVB**  **($m)** | **% Total** |
| Contribution to Project 2005/083 | 6.32 | 40.3 |
| Reduction in management costs | 9.38 | 59.7 |
| Total | 15.70 | 100.0 |

Table 16 shows a subjective assessment of the different benefits against the rural research priorities. Bear in mind that this assessment refers only to those benefits that were valued.

Table 16: Benefits Valued and Rural Research Priorities

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Benefit** | **PVB**  **($m)** | **Productivity and Adding Value** | **Supply Chain and Markets** | | **Natural Resource Management** | **Climate Variability and Climate Change** | **Biosecurity** |
| % subjective allocation to each priority | | | | | |
| Contribution to Project 2005/083 | 6.32 | 65 | 0 | 35 | | 0 | 0 |
| Reduction in management costs | 9.38 | 85 | 0 | 15 | | 0 | 0 |
| Total ($m) | 15.70 | 12.08 | 0 | 3.62 | | 0 | 0 |
| Total (%) | 100 | 76.9 | 0 | 23.1 | | 0 | 0 |

**Sensitivity Analyses**

The sensitivity analysis on the discount rate (Table 17) demonstrates that the investment criteria are quite sensitive to the discount rate over the range considered. This is because of the relatively long duration of benefits assumed, and the largest proportion of costs falling at the beginning of the project. As the discount rate increases, discounted benefits decrease while discounted costs increase due to most benefits and costs occurring earlier than the year of analysis.

Table 17: Sensitivity to Discount Rate

(Total investment, 30 years)

|  |  |  |  |
| --- | --- | --- | --- |
| **Criterion** | **Discount Rate** | | |
| **0%** | **5%** | **10%** |
| Present value of benefits (m$) | 24.51 | 15.70 | 12.42 |
| Present value of costs (m$) | 4.87 | 8.03 | 13.20 |
| Net present value (m$) | 19.64 | 7.67 | -0.78 |
| Benefit-cost ratio | 5.03 | 1.96 | 0.94 |

Table 18 demonstrates that the investment criteria are only moderately sensitive to changes in the extent of management cost savings achieved in the affected fisheries. This is likely because the fisheries management cost savings make up only 60% of the total benefits estimated.

Table 18: Sensitivity to Management Cost Savings  
(Total investment, 30 years)

|  |  |  |  |
| --- | --- | --- | --- |
| **Criterion** | **Management cost savings** (Australian Wild Catch Fisheries, Western Australian Rocklobster Fishery, South Australian Rocklobster Fishery) | | |
| **Pessimistic:**  **0.25%, 1%, 1%** | **Base:**  **0.5%, 2%, 2%** | **Optimistic:**  **1%, 4%, 4%** |
| Present value of benefits (m$) | 11.01 | 15.70 | 25.08 |
| Present value of costs (m$) | 8.03 | 8.03 | 8.03 |
| Net present value (m$) | 2.98 | 7.67 | 17.05 |
| Benefit-cost ratio | 1.37 | 1.96 | 3.12 |

**Confidence Rating**

The results produced are highly dependent on the assumptions made, many of which are uncertain. There are two factors that warrant recognition. The first factor is the coverage of benefits. Where there are multiple types of benefits it is often not possible to quantify all the benefits that may be linked to the investment. The second factor involves uncertainty regarding the assumptions made, including the linkage between the research and the assumed outcomes.

A confidence rating based on these two factors has been given to the results of the investment analysis (Table 19). The rating categories used are High, Medium and Low, where:

High: denotes a good coverage of benefits or reasonable confidence in the assumptions made

Medium: denotes only a reasonable coverage of benefits or some uncertainties in assumptions made

Low: denotes a poor coverage of benefits or many uncertainties in assumptions made

Table 19: Confidence in Analysis of Resource Access and Allocation Cluster

|  |  |
| --- | --- |
| **Coverage of Benefits** | **Confidence in Assumptions** |
| Medium | Low |

**Observations for Future Investment and Evaluation**

Observations for future investment and evaluation include:

* 1. Contacting relevant personnel to provide feedback on project impacts proved to be difficult in some cases and creating time lags in completing the evaluation. This was particularly difficult due to the age of some projects, where researchers had long since moved on. It might be helpful for future evaluations if there existed a database containing the up to date contact information of key fisheries researchers.
  2. The percentage for FRDC funding of total funding for the cluster’s projects was 53%. This was well above the average percentage of 40% found for 18 clusters in 2009. The percentages are worth summarising as they may assist in assessing FRDC current and prospective roles in different R&D areas, particularly where public benefits occur but external funding is difficult to come by.

**Key Performance Indicators**

The Theme 6 key performance indicator is described in Table 20.

Table 20: Key Performance Indicator for Theme 6

|  |  |  |
| --- | --- | --- |
| **KPI** | **Description** | **Number of projects contributing** |
| 1 | Development of processes for efficient, transparent allocation of shares and associated property rights for all aquatic resource users. | 6 |

Of the projects in this cluster, six were deemed to be directly contributing towards the theme’s Key Performance Indicator. The remaining project did not make a direct contribution focussed on providing more detailed and accessible data for industry stakeholders, and as such may have made contributed through an indirect pathway.

**Conclusions**

FRDC investment in Theme 6 produced a number of benefits. Of the 7 projects in the population, the impacts from four were valued. While the major economic benefits have been valued, there were a number of benefits not valued. These include the majority of social, environmental and scientific capacity benefits, which are likely to be significant.

It is likely that many of the benefits identified from this cluster of projects may not result directly from the outputs of these projects. For those projects used to inform policy it should be recognised that several factors may be involved in informing policy, so it can be difficult to link outputs directly to impact. Furthermore, some of the projects were data collection exercises which were used to inform other research and decision making, rather than create their own direct impacts.

Overall, the investment criteria estimated for total investment in the project group of $8.03 million (present value of costs) were positive with a present value of benefits of $15.70 million, a net present value estimated at $7.67 million and a benefit-cost ratio of 1.96 to 1, all estimated using a discount rate of 5% (benefits estimated over 30 years from the final year of investment). Due to the number of minor benefits which were identified but not valued and the conservative nature of many of the assumptions made, the resulting investment criteria are likely to be a lower bound estimate of total benefits.

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**References**

ABARES (2012), *Australian fisheries statistics 2011,* Australian Bureau of Agricultural and Resource Economics – Bureau of Rural Sciences, Canberra, ACT

Anon (2007) “The South-east Commonwealth Marine Reserve Network: Regulatory Impact Statement”, Marine and Biodiversity Division, Department of Environmental and Water Resources, Canberra.

ARComm (2013), *Strategic Research Priorities,* Australian Research Committee,Accessed 5th June 2014

Buxton C.D., Haddon, M. and Bradshw, M. (2006) “Regional Impact Assessment for the Marine Protected Areas proposed for the South-East Region”, Fisheries Research and Development Corporation Final Report Project 2005/083, 198pp.

Cox, A (2000), *Cost recovery in fisheries management*, Australian Bureau of Agricultural and Resource Economics, Canberra, ACT

CRRDC (2008) *An Economic Analysis of Investment in Assessing Proposed Marine Protected Areas*

<http://www.ruralrdc.com.au/WMS/Upload/Resources/Evaluation/FRDC%20marine%20protection%20FINAL.pdf>

DAFF (2014), *Rural Research and Development Priorities,* Australian Government Department of Agriculture, Fisheries and Forestry, Accessed 5th June 2014, <<http://www.daff.gov.au/agriculture-food/innovation/priorities>>

FRDC (2010) *Investing for tomorrow’s fish:**The FRDC’s Research,**Development and**Extension Plan**2010–2015,* Fisheries Research and Development Corporation, Australian Government, Canberra, ACT