# Optimising business structures and fisheries management systems for key fisheries

**T.M. Ward**

**Project No. 2009/715**


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# Abbreviations

| | |
|---|---|
| ACA | Abalone Council Australia Ltd |
| ACE | Annual Catch Entitlement |
| AFMA | Australian Fisheries Management Authority |
| AIASA | Abalone Industry Association of South Australia |
| AWA | Australian Wild Abalone™ |
| CDR | Catch and Disposal Records |
| CL | Carapace length |
| CPUE | Catch per unit effort |
| CRA5 | New Zealand South Island Western zone Rock Lobster Fishery |
| CRC | Cooperative Research Centre |
| CSIRO | The Commonwealth Scientific and Industrial Research Organisation |
| DPIPWE | Department of Primary Industries, Parks, Water and Environments |
| ECOT | East Coast Otter Trawl |
| eCPUE | Estimation of Catch Per Unit Effort |
| ECTF | East Coast Trawl Fishery |
| EOSC | Economic Optimisation Sub-committee |
| FAO | Food and Agriculture Organisations |
| FC | Fixed costs |
| FD | Fishery-Dependence |
| FGM | Fishery Gross Margin |
| FPIs | Fishery Performance Indicators |
| FRDC | Fisheries Research and Development Corporation |
| FTEs | Full Time Equivalent |
| GOS | Gross operating surplus |
| GOV | Government |
| GPS | Global Positioning System |
| GSP | Generalised Scheme of Preferences |
| GSV | Gulf St Vincent |
| GSVPF | Gulf St Vincent Prawn Fishery |
| GVP | Gross Value of Production |
| ITEs | Individual Transferable Effort Units |
| ITF | Individual transferable fishing |
| ITQs | Individual Transferable Quotas |
| KUDs | Kernel Utilisation Densities |
| LPH | Legal Proportion Harvested |
| MCDA | Multiple Criteria Decision Analysis |
| Mey | Maximum economic yield |
| MLS | Minimum Legal Size |
| MPA | Marine Protected Area |
| MPI | Ministry of Primary Industries |
| MSC | Marine Stewardship Council |
| Msy | Maximum sustainable yield |

| | |
|---|---|
| NMFS | National Marine Fisheries Service |
| NPF | Northern Prawn Fishery |
| NPF | Northern Prawn Fishery |
| NSW | New South Wales |
| NZ | New Zealand |
| NZ CRA8 | New Zealand Southern zone Rock Lobster Fishery |
| NZ$ | New Zealand Dollars |
| NZRLFA | Northern Zone Rock Lobster Fishermen's Association Inc. |
| OHSW | Occupational health, safety and welfare |
| PI | Performance Indicator |
| PIC | Paua Industry Council |
| PIRSA F&A | Primary Industries and Resources South Australia, Fisheries and Aquaculture |
| PLOS | Public Library of Science |
| QDPI | Queensland Department of Primary Industries |
| QMA | Quota Management Area |
| QMS | Quota Management Systems |
| R&D | Research and Development |
| SA | South Australia |
| SA FARAC | South Australian Fisheries and Aquaculture Research Advisory Committee |
| SA NZRLF | South Australian Northern Zone Rock Lobster Fishery |
| SA SZRLF | South Australian Southern Zone Rock Lobster Fishery |
| SARDI | South Australian Research and Development Institute |
| SARLAC | South Australian Rock Lobster Advisory Council Inc. |
| SEPFA | South East Professional Fishermen's Association Inc. |
| SGPF | Spencer Gulf Prawn Fishery |
| SGWC | Spencer Gulf and West Coast |
| SRL | Southern Rock Lobster |
| SSA | Southern Shrimp Alliance |
| SZ | Southern Zone |
| TAC | Total Allowable Catch |
| TACC | Total Allowable Commercial Catch |
| Tas | Tasmania |
| TEPS | Threatened, endangered and protected species |
| TR | Total revenue |
| USD | American dollars |
| VC | Variable costs |
| Vic | Victoria |
| WA | Western Australia |
| WADA | Western Abalone Divers Association |

# Non-Technical Summary

Optimising business structures and fisheries management systems for key fisheries

Australian Seafood CRC Project No. 2009/715

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**PROJECT OBJECTIVES:**

1. Assess the performance and identify impediments to wealth creation in selected CRC fisheries;
2. Describe and evaluate innovative systems that have been established to improve the performance of successful fisheries worldwide;
3. Identify practical opportunities for overcoming impediments to wealth creation and improving the performance of selected CRC fisheries.

**OUTCOMES ACHIEVED AND PLANNED**

***Overall***

This project is one of a suite of studies funded by the Australian Seafood (Cooperative Research Centre) CRC and the (Fisheries Research and Development Corporation) FRDC that have contributed to the ongoing transformation of Australia's fisheries to include an explicit focus on delivering economic benefits, as well as ecological sustainability. This outcome was achieved by conducting a series of workshops that brought together key industry members and representatives, fisheries managers, scientists and economists to share knowledge and experiences and identify opportunities to improve the economic performance of Australia's prawn, Southern Rock Lobster and abalone fisheries. The project worked with three different sectors and achieved the sector specific outcomes described below.

***Prawns***

This project provided the impetus for the Spencer Gulf Prawn Fishery (SGPF) to establish an Economic Optimisation Working Group and develop a draft economic optimisation paper (July 2014). The final version of that document will provide a basis for revising the management plan for the SGPF and refining the harvest strategy for the fishery to improve economic performance. A bio-economic model for the SGPF (modified and adopted from Australian Seafood CRC Project No. 2011/750) will contribute critical information to that process of reform. A larval dispersal model developed in FRDC Project No. 2008/011 will be used to ensure that future fishing strategies seek to optimise both successful recruitment and economic performance.

Both the SGPF and Gulf St Vincent Prawn Fishery (GSVPF) have been managed using input controls without transferability for over 50 years. This project contributed to the establishment of a system of tradeable nights in the GSVPF in 2012. A refined Harvest Strategy that includes a system of tradeable units is currently being developed for the GSVPF. The refined harvest strategy being developed for the SGPF is also likely to include economic performance indicators.

Transferable units have already been established in the East Coast Otter Trawl Fishery (ECOTF). The overwhelming problem in the fishery is over-capacity. It seems unlikely that significant reduction in effort will be achieved without some form of buy-out. To be effective, such a buyout would require strong cooperation between industry and government. Currently, the Queensland trawl industry's capacity to engage with government is impeded by the absence of an association that represents its interests.

***Southern Rock Lobster***

Since this project began, there has been a major cultural shift within the fisheries that target Southern Rock Lobster off southern and eastern Australia. The strong historical focus on maximising catches has been replaced by a vision for fisheries that deliver higher profits whilst catching fewer lobsters. Targeted workshops and conference presentations conducted as part of this project contributed to this cultural change by exposing key industry leaders to the positive economic outcomes that have been achieved in lobster fisheries in New Zealand and Western Australia by reducing exploitation rates to levels that maintain/rebuild biomasses to sizes that deliver higher profits by reducing fishing costs (through increased catch rates). Two other contributions were crucial. Firstly, success over the last decade in educating lobster fishers in the principles of fisheries economics allowed industry to quickly understand the implications of what had been achieved in New Zealand and Western Australia. Secondly, the bio-economic model developed in CRC Project No. 2009/714 provided an effective tool for demonstrating to industry and fisheries managers the costs/benefits of various management scenarios, such as low/high total allowable catches and various minimum and maximum legal sizes. This bio-economic model will be used to refine the harvest strategies for Australia's fisheries for Southern Rock Lobster and ensure that future economic performance is optimised under the range of potential recruitment scenarios that the future may hold. The benefits of collecting the data required to assess economic performance, notably beach and export prices and fishing costs, are now also widely recognised.

***Abalone***

This project demonstrated that compared to most fisheries Australia's abalone fisheries have relatively limited opportunities for increasing market prices and reducing costs. It was recognised that any opportunities for improving economic performance should be considered at a national level. The potential for GPS tracking systems to transform Australia's abalone fisheries and substantially reduce the costs of fishing and various elements of fisheries management was identified at a series of workshops held in Adelaide in 2013 and 2014. It was also recognised that modifying fishing seasons had the potential to improve productivity. A joint New Zealand and Australia research workshop for abalone in August 2014 identified that a research proposal to address these opportunities would be developed.

***Conclusions***

The implementation of changes to improve profitability was beyond the scope of the present study. However, this project contributed to the introduction of a system of tradeable fishing nights in the GSVPF and assisted the SGPF to undertake a process of reform that appears likely to transform the structure and economic performance of that fishery. Similarly, this project contributed to the establishment of the strong focus on profitability which is becoming increasingly evident in the management arrangements for Australia's fisheries for Southern Rock Lobster. The project has also assisted the Australian abalone industry to identify two opportunities for improving its economic performance (i.e. reducing costs through implementation of GPS technology and increasing productivity through optimising the timing of harvests). Importantly, the abalone industry has initiated two research projects to facilitate the implementation of these reforms.

# RESEARCH SUMMARY

The project had three major elements:

1. Assess the economic performance of selected CRC fisheries.
2. Describe and evaluate the innovative systems that have been established to improve the economic performance of successful fisheries worldwide.
3. Identify practical opportunities for overcoming impediments to wealth creation and improving the performance of selected CRC fisheries.

## Prawns

*Spencer Gulf Prawn Fishery (SGPF)*

Workshops to evaluate the economic performance of the SGPF were conducted in Adelaide and Port Lincoln in February 2012. These workshops were attended by representatives of 30 of the 39 licence holders in the SGPF, as well as the fishery manager, industry members and representatives from the Gulf St Vincent Prawn Fishery (GSVPF) and East Coast Otter Trawl Fishery (ECOTF).

The objectives of these workshops were to:

- Assess economic performance of the SGPF (using the method of Anderson and Anderson 2010);
- Assess economic status of the fishery;
- Introduce industry to options for improving the economic performance of the fishery (four case studies presented by selected guests); and
- Identify options that warranted further investigation with respect to their applicability for the SGPF.

These workshops identified the need for reform and identified several options that warranted consideration: buyback/amalgamations; incorporating economics into stock assessment strategies; decision rules to achieve/retain economic efficiency; and transferable systems (e.g. quota, gear/effort units and tradeable fishing nights).

The success of the workshop led the Spencer Gulf and West Coast Prawn Fishery Management Committee to establish an Economic Optimisation Working Group. A prioritised options paper was developed to support a workshop in Adelaide in August 2012. That paper was refined following the workshop and formed the basis of an economic optimisation paper that was submitted to Primary Industries and Regions South Australia (PIRSA) Fisheries and Aquaculture in late 2014 and will be used to develop a harvest strategy to improve the economic performance of the SGPF.

*East Coast Otter Trawl Fishery (ECOTF)*

Meetings were held in Brisbane on August 2011 and June 2012 with industry, managers, scientists and economists to plan the Queensland component of the project, apply the method of Anderson and Anderson (2010) and identify options for improving the economic performance of the ECOTF. Workshops held in Cairns, Townsville, Mooloolaba and Hervey Bay in July 2012 identified that: 1) the economic performance of the ECOTF was poor; 2) resolving similar issues in the Northern Prawn Fishery (NPF) had required large investments by both government and

industry; and3) that the SGPF had benefitted from having a strong industry association and working constructively with government. Problems identified for the fishery, included:

- Over-allocation of effort (latent + active);
- Lack of profitability;
- Efficiency constraints (input controls);
- Structure of the fishery;
- Lack of industry voice for trawl sector;
- Lack of investment in the industry (vessels and people);
- Marketing/prices.

It was agreed that the most pressing problem was overcapacity and that this would only be addressed by government and industry working together. Other issues will be difficult to address until that primary issue is resolved. The lack of an industry voice and complexity of the fishery (variety of species, seasons) were identified as key impediments to adopting a stronger co-management approach. It was recognised that a range of other weaknesses in the fishery should be addressed once the issue of over-capacity was resolved.

## Rock Lobster

A workshop involving fishers, industry representatives, fisheries managers and scientists from South Australia (SA), Tasmania, Victoria and New Zealand (NZ) was held in Melbourne on 28-29 May, 2013. At this workshop, the management arrangements, status and economic performance of Australia's and New Zealand's fisheries for Southern Rock Lobster (SRL) were summarised and compared. The economic performance of Australia's largest SRL fishery, South Australia's Southern Zone Rock Lobster Fishery, was evaluated using the method of Anderson and Anderson (2010). Presentations were given on the success and limitations of strategies that have been implemented to optimise economic performance in the Western Rock Lobster Fishery (Western Australia), NZ CRA8 and CRA5 Fisheries. A presentation was given on the use of economic data and bio-economic models to evaluate and optimise harvest strategies for SRL. Extensive discussions were undertaken to identify practical options for improving the economic performance of Australia's fisheries for SRL.

The key finding of the evaluation of Australia's SRL fisheries was that the economic performance of these fisheries needed to be improved in all jurisdictions. Most of Australia's SRL fisheries are currently in a biomass rebuilding phase to improve biological, economic and/or social outcomes. It was recognised that most of the existing problems in Australia's SRL fisheries stem from a historical focus on maximising catches and a failure to adjust quickly enough to the low levels of recruitment that have occurred over the last decade. It was acknowledged that future management of Australia's SRL fisheries should focus explicitly on targeting socio-economic outcomes.

Evidence from the NZ SRL Fisheries (e.g. CRA8, CRA5) and Western Rock Lobster Fishery showed that profitability can be significantly improved by reducing exploitation rates to increase spawning biomass and reduce fishing costs (through increased catch rates). Formal harvest strategies based on exploitation rates of between 0.3 and 0.5 and that cap (or at least severely restrict) Total Allowable Commercial Catch (TACC) increases when the spawning biomass (or CPUE proxy) exceeds an agreed threshold have been very successful in increasing the profitability of SRL fisheries in NZ. Experience from WA showed that social outcomes and benefits to the community from fishing (e.g. through employment) can also be addressed by establishing TACCs that deliver high economic yields (profits) but which also provide relatively high Gross Values of Production (GVP).

It was recognised that bio-economic models are a powerful tool for evaluating the economic performance of different management options (e.g. size limits, exploitation rates). The model outputs confirmed that lowering exploitation rates and capping TACCs will deliver strong economic outcomes for Australia's SRL fisheries. Improved data for assessing the economic performance of SRL fisheries, notably beach and export prices and fishing costs, are needed in most jurisdictions (SA is the exception). The focus on profitability at the Lobster Congress in Sydney in 2013 was indicative of change in industry culture that occurred throughout the course of the project and which is being reflected in new management arrangements being established for these fisheries.

## Abalone

A workshop held in Adelaide in September 2013 identified that there are important differences among jurisdictions in key elements of Australia's abalone fisheries that affect their economic performance. For example, in Tasmania many divers lease quota whereas in other jurisdictions licence holders employ divers directly. In addition, the costs of management are recovered from industry in South Australia whereas in Tasmania there is no direct link between the license fee and the management, research and compliance costs funded by government.

Southern Rock Lobster and Pipi were used to exemplify the benefits of developing a stronger focus on economic performance. The benefits of collecting economic data were also widely acknowledged. The analysis undertaken using the Anderson and Anderson method showed that, compared to most other fisheries, Australia's abalone fisheries have relatively limited opportunities for increasing prices and reducing costs. However, reducing the costs of fishing and/or management of abalone fisheries was identified as an opportunity that required consideration at a national level.

A workshop involving industry representatives, fisheries managers and scientists from NZ and all Australian jurisdictions that harvest abalone was conducted in Adelaide in May 2014 to: 1) assess opportunities for implementing a Global Positioning System (GPS) for tracking fishing activity and 2) evaluate the benefits of changing fishing seasons to increase productivity.

It was agreed that the GPS tracking systems developed in NZ and Tasmania have the potential to reduce the costs of harvesting abalone (e.g. through identifying areas that have been recently fished), collecting fisheries data, conducting stock assessments and undertaking compliance. It was also recognised that the opportunities/benefits of adopting this technology varied among jurisdictions. Discussions regarding the potential use of the GPS tracking system for compliance purposes were particularly robust. It was recognised that the economic benefits of implementing a GPS tracking system would be maximised if adoption was coordinated at a national level, but that differing requirements among jurisdictions complicated that approach. It was agreed that a research proposal should be developed to assess the full range of benefits that a GPS tracking system could deliver (including reducing compliance costs). The concept for this proposal was further developed at a joint Australia and NZ abalone research workshop Queenstown in August 2014.

The national workshop also acknowledged the potential for increasing productivity and profitability by optimising the timing of the harvesting season. A research proposal to assess cost/benefits of this approach will also be developed at the research workshop in New Zealand.

# Progress Against Performance Indicators

KPI 1: EFFECTIVE LEADERSHIP AND CONSULTATION

**Performance Indicator**

***i) Established Leadership Team(s) with relevant expertise in fisheries, business and law.***

A wide range of experts provided leadership and direction for the project. Different teams with relevant expertise were developed for each fishery sector.

SGPF

Dr Eriko Hoshino (UTAS)
Ms Annie Jarret (Pro-Fish)
Mr Graham Stewart (Shark Bay Boat Owners Association)
Michael Harte (WWF)
Ms Danielle Adams (Clarence River Fishermen's Co-operative)
Dr Julian Morrison (Econsearch)
Dr Sevaly Sen (Profish Pty Ltd)
Dr Cameron Dixon (SARDI)

ECOTF

Dr Tony Courtney (QDAFF)
Dr Sean Pascoe (CSIRO)
Lisa Rippin (Econsearch)
Mr David Carter (NPF)
Mr Paul Watson (SGPF)

SRL

Mr Daryl Sykes (NZ Rock Lobster Industry)
Mr Malcolm Lawson (Southern NZ Rock Lobster Industry)
Dr Lisa Rippin (Econsearch)
Dr Nick Caputi (Fisheries WA)
Dr Rick McGarvey (SARDI)
Dr Caleb Gardner (UTAS)
Dr Adrian Linnane (SARDI)

Abalone

Dr Stacey Patterson (Econsearch)
Dr Ben Stobbart (SARDI)
Dr Greg Ferguson (SARDI)
Dr Jeremy Cooper (NZ)
Dr Craig Mundy (UTAS)

***ii) Established Stakeholder Advisory Group for each participating sector.***

SGPF

Mr Andrew Hogg (SGPF)
Mr Andrew Puglisi (SGPF)
Mr Neil McDonald (GSVPF)
Dr Craig Noell (PIRSA Fisheries and Aquaculture)

Mr Sean Sloan (PIRSA Fisheries and Aquaculture)

ECOTF

Mr Eric Perez (QSIA)
Mr Dave Stirling (ECOTF)
Mr Geoff Tilton (ECOTF)
Dr Eddie Jebreen (QDAFF)
Mr Darren Roy (QDAFF)

SRL

Mr Justin Phillips (SARDLAC)
Dr Annabel Jones (PIRSA Fisheries and Aquaculture)
Ms Hilary Revelle (DPIWE)

Abalone

Mr Grant Pullen (DPIWE)
Dr Lianos Triantifilos (PIRSA Fisheries and Aquaculture)
Mr Dean Lisson (ACA)
Mr Jonas Woolford (ACA)
Mr Kerry Rowe (ACA)
Joey McKibben (Tas industry)
Tom McGowan (NZ industry)

KPI 2: FINALISED AND DISSEMINATED ASSESSMENTS OF THE ECONOMIC PERFORMANCE OF FISHERIES IN EACH SECTOR (ONE CHAPTER FOR EACH SECTOR)

**Performance Indicator**

i) Completed desktop review and interviewed stakeholders in selected CRC fisheries
ii) Completed detailed description of each fishery
iii) Collected financial data on each fishery (for fisheries where data are not collected elsewhere)
iv) Assessed economic performance of each fishery using approach of Anderson and Anderson (2010)
v) Identified opportunities for increasing the profitability of CRC fisheries
vi) Conducted workshop with the Stakeholder Advisory Group for each sector

KPI 2 was a core element of this study. Details are provided in Appendices and the Research Summary.

KPI 3: FINALISED DESCRIPTIONS AND EVALUATIONS OF INNOVATIVE SOLUTIONS TO MAXIMISE WEALTH CREATION IN SUCCESSFUL FISHERIES WORLDWIDE, WITH ASSESSMENTS OF THE POTENTIAL SUITABILITY FOR CRC FISHERIES

**Performance Indicator**

i) Identified relevant fisheries worldwide with strong performance
ii) Conducted desktop reviews and interviews for each fishery
iii) Completed detailed descriptions of each fishery, focusing on issues affecting performance.
iv) Collected financial data on each fishery for fisheries where data are not otherwise available
iv) Assessed economic performance of each fishery using approach of Anderson and Anderson (2010)
v) Identified and described innovative solutions established to overcome impediments to wealth creation

vi) Conducted workshop with Leadership Team to refine assessments and identify options for improving the profitability of CRC fisheries.

KPI 3 was an element of this study. Details provided in Research Summary.

KPI 4: DESCRIBED A PATHWAY TO ADOPTION FOR FISHERIES WHERE SIGNIFICANT PRACTICAL OPPORTUNITIES EXIST TO IMPROVE ECONOMIC PERFORMANCE.

**Performance Indicator**

i) Developed and disseminated summaries of the assessments of strongly performing fisheries, focusing on aspects of their innovative approaches that could be adopted to improve the profitability of CRC fisheries

ii) Conducted workshops with each Stakeholder Advisory Group to identify the innovative operational procedures, business structures, and fisheries management systems that could be implemented in each fishery

iii) Estimated potential financial benefits of implementing these changes

iv) Identified and described the impediments to adopting these innovative approaches

v) Identify fisheries where practical opportunities exist to adopt innovative approaches to significantly improve economic performance

vi) Described the complex and inter-related changes to operational procedures, business structures and resource management systems that could be implemented to achieve major improvements in economic performance in selected fisheries

KPI 4 was a core element of this study. Description provided in the Research Summary.

KPI 5: PROPOSAL WRITTEN TO FACILITATE ADOPTION OPPORTUNITIES TO IMPROVE ECONOMIC PERFORMANCE.

**Performance Indicator**

It was agreed, that the proposal to initiate Phase 2 of this project will only be written if the Leadership and Stakeholder Advisory Groups consider and identify practical opportunities for establishing innovative approaches to significantly improve economic performance of one or more fisheries.

The SGPF has developed a draft economic optimisation paper that will be used to revise the management plan and harvest strategy. Harvest strategies for fisheries for Southern Rock Lobster are being revised to include a strong focus on economic performance. Research proposals to 1) assist implementation of GPS tracking systems and 2) optimise the seasonal timing of harvesting in Australia's abalone fisheries were developed at a joint New Zealand and Australia research workshop in Queenstown in August 2014.

# ACKNOWLEDGEMENTS

The valuable contributions made to this project by economists, industry members/representatives scientists, fisheries managers and industry members/representatives are gratefully acknowledged.

Economic input was provided by Professor James Anderson (WorldBank), Dr Julian Morrison, Dr Lisa Rippon, Dr Stacey Patterson (Econsearch), A/Professor Caleb Gardner, Dr Eriko Hoshino (UTas), Dr Sean Pascoe (CSIRO) and Dr Sevaly Sen (Profish Pty Ltd).

Members/representatives of the fishing industry that provided insights into fisheries that have implemented changes to improve economic performance include: Ms Annie Jarret (Pro-Fish), Mr David Carter (NPF), Mr Graham Stewart (Shark Bay Boat Owners Association), Michael Harte (WWF), Ms Danielle Adams (Clarence River Fishermen's Co-operative), Mr Paul Watson (SGPF), Mr Daryl Sykes (NZ Rock Lobster Industry), Mr Malcolm Lawson (Southern NZ Rock Lobster Industry) and Dr Jeremy Cooper (NZ abalone Industry), Joey McKibben (Tasmanian abalone industry) and Tom McGowan (NZ abalone industry).

Industry members/representatives that provided advice on how to maximise benefits of project included Mr Simon Clarke, Mr Andrew Hogg, Mr Andrew Puglisi (SGPF), Mr Neil McDonald (GSVPF), Mr Eric Perez (QSIA), Mr Dave Stirling, Mr Geoff Tilton (ECOTF), Mr Justin Phillips (SARLAC), Mr Dean Lisson, Mr Jonas Woolford and Mr Kerry Rowe (ACA).

Participating fisheries scientists include Dr Cameron Dixon (SARDI), Dr Tony Courtney (QDAFF), Dr Adrain Linnane (SARDI), Dr Steve Mayfield (SARDI), Dr Ben Stobbart (SARDI), Dr Nick Caputi (Fisheries WA), Dr Rick McGarvey (SARDI), A/Prof Caleb Gardner (UTAS), Dr Ben Stobart (SARDI), Dr Greg Ferguson (SARDI) and Dr Craig Mundy (UTAS).

Fisheries managers that contributed to the project included: Mr Sean Sloan, Dr Craig Noell, Dr Annabel Jones, Dr Lianos Triantifilos (PIRSA Fisheries and Aquaculture), Dr Eddie Jebreen, Mr Darren Roy (QDAFF), Ms Hilary Revelle and Mr Grant Pullen (DPIWE).

The efforts of Dr Cameron Dixon (SARDI), Mr Simon Clarke (SGPF), Dr Eddie Jebreen (QDAFF), Dr Adrian Linnane (SARDI), Dr Stephen Mayfield (SARDI), Dr Ben Stobbart (SARDI), Ms Shirley Sorokin (SARDI) Mr Dean Lisson (ACA) and Mr Jonas Wolford (ACA) in conducting workshops was greatly appreciated.

# 1. Introduction and Background

Overall, Australia has a good track record of managing commercial fisheries sustainably (e.g. Flood et al. 2012). This is because fisheries management has focused almost exclusively on biological sustainability and extensive resources have been expended to ensure that this critical outcome has been achieved. Several elements of fisheries management that have been widely identified as contributing significantly to ensuring sustainability, but which are not fully established in many other countries, are widely established in Australian fisheries. For example, limited entry has been an accepted principle for many years; access rights in the form of Total Allowable Catches (TACs) and Individual Transferable Quotas (ITQs) are widely established; co-management has been practiced for decades, albeit in a variety of forms; robust stock assessments are done regularly in most major fisheries, increasingly under transparent cost-recovery (user pays) arrangements; and the use of explicit harvest strategies (harvest control rules) is becoming widespread.

While extensive efforts have been made to ensure that Australia's fisheries are biologically sustainable, relatively limited public resources have been allocated to ensuring that the economic and social benefits that fisheries deliver to Australian communities are maximised. This is mainly because, to date, the economic aspects of fishing have been widely considered to be issues for which industry has sole responsibility. However, as commercial fisheries are based on the utilisation of community resources, and there is evidence to suggest that economic and social benefits to the Australian community are not always maximised, there is a view that government should take a role in assisting fishing industries to identify and achieve their economic and social objectives. This approach may provide economic gains to individual license holders as well as the community.

Few Australian fisheries have explicitly articulated their key economic and social objectives or priorities. As commercial fisheries essentially exist to make money, it is reasonable to assume that maximising profitability would be a high priority for most fisheries. However, while individual businesses no doubt strive for this outcome (with mixed success), structural aspects of many Australian fisheries prevent profits from being maximised at a whole of fishery scale. In some cases, economically inefficient structures are deliberately maintained to achieve either biological sustainability outcomes or, whether explicitly acknowledged or not, to deliver economic and social benefits to regional communities where there are few other viable industries.

Structural factors that impede the maximisation of profitability in many Australian fisheries include:

1) Intrinsically high infrastructure (vessels and processing facilities) and operating costs (maintenance, fuel, labour);
2) Over-capitalisation, especially in fishing vessels;
3) Input controls established to ensure sustainability that act by limiting operational efficiency, thus increasing the costs of production;
4) Business structures that dissipate earnings by promoting individualism and competition among fishers (hunter-gatherer approach) rather than collaboration to minimise costs and maximise prices (business approach);
5) High fisheries management costs, especially for research and compliance;
6) Inertia and resistance to changing the status quo.

Recent reductions in profitability resulting from increases in the costs of fisheries production (all sectors), decreases in catches (e.g. lobsters) and falling prices of some fisheries products (e.g. prawns and abalone) mean that it is now imperative to identify operational procedures, business structures and fisheries management systems that address these structural inefficiencies. A

recent FRDC study suggests that the economic performance gap for Australia's marine capture fisheries is in the order of 36-46% (Ridge Partners 2009). There is a clear need for stakeholders to explicitly identify the economic, social and ecological objectives for their fisheries and establish operational procedures, business structures and fisheries management systems that will ensure that these objectives are achieved.

This study brought together a team of fisheries experts to identify opportunities for improving the economic performance of fisheries in the Australian Seafood CRC. The team measured the economic performance of each CRC fishery and assessed the effectiveness of factors that enable wealth creation using the wealth-based fishery performance indicators developed by Anderson and Anderson (2010). We then identified innovative operational procedures, business structures and management systems that have been established to overcome impediments to wealth creation in fisheries worldwide and that are successfully generating wealth for their participants. This information was used to identify operational procedures, business structures and management/legislative systems that could be established to improve the economic performance of each participating fishery.

This project is linked to the suite of decision support tool or bioeconomic projects within the Future Harvest Theme of the Australian Seafood CRC. The decision support tools projects are focusing on decisions in the management system – i.e. the government controls. Those projects deal with government rules and stop at the point of how fishing businesses are conducted. This project moves into the area of business operations and looks at their operating environment to identify inefficiencies and develop improvements. To illustrate with examples – one application of the decision support tools projects is to determine profit maximising TACs (amongst other rules affecting harvests). Businesses operating within this rule face issues such as inefficient use of capital where there is competition for space and individual fish, lack of information on markets and patterns in catch rates, and limited ability to control expenditure on enforcement, management and marketing. If the entire fishery was operated as a single business would harvesting patterns change to improve performance? And if so, how can fisheries capture these improvements within our current system of multiple owners? Conversely, changes in the business environment may require changes to the management system. For example, in a fishery managed solely by input controls (e.g. vessel size, gear restrictions, effort limitations) the optimisation of the business structure may require major changes to the management system. This project will also identify management changes that may be required to facilitate improvements in the business structure.

## 1.1 Need

The main causes of declines in fishery performance are decreases in real prices (prawns, abalone), large increases in costs (all sectors) and, in a few cases, significant reductions in stock size and productivity (rock lobster).

In many fisheries, major improvements in economic performance will only be achieved through major and integrated changes in operational procedures, business structures and resource management systems.

Inertia and active resistance to change, within both government and industry, currently impede the implementation of the cultural shift that is required to revive ecologically-sustainable, but financially-challenged fisheries.

Major, integrated changes and cultural shifts require a clearly articulated vision for the future.

Convincing vision statements require evidence.

This project will provide the information that is needed for industry and government to develop the joint vision statements that are required to chart a clear pathway to a more profitable future for each selected fishery.

Critical information to underpin each vision statement that this project will provide includes:

1. Objective assessments of the key factors limiting fishery performance;
2. Comprehensive evaluations of the options for increasing profitability;
3. Clear advice about the complex and inter-related changes to operational procedures, business structures and resource management systems that are required achieve major improvements in fishery performance;
4. A clear pathway to adoption that recognises the inertia and resistance to change within government and industry that must be overcome for these major and integrated changes to be implemented.

## 1.2. Objectives

1. Assess the performance and identify impediments to wealth creation in selected CRC fisheries.
2. Describe and evaluate innovative systems that have been established to improve the performance of successful fisheries worldwide.
3. Identify practical opportunities for overcoming impediments to wealth creation and improving the performance of selected CRC fisheries.

# 2. Methods

Consultation and Development of Project

A Future Harvest Workshop in Melbourne in July 2008 identified the need for projects to:

(i) identify operational procedures, business structures and fisheries management systems to enhance productivity and profitability;
(ii) incorporate consideration of social objectives into fisheries management frameworks;
(iii) facilitate changes in operational procedures, business structures and fisheries management for key fisheries.

A preliminary proposal that addressed these needs was developed following a Workshop in Adelaide in December 2008. That preliminary proposal was submitted to the CRC Board in early 2009 and the concept was approved.

Following discussions with Drs Patrick Hone, Caleb Gardner and Graham Mair, it was agreed that a phased approach would be adopted for this project.

Phase 1 (current report), will identify options for improving the economic performance of selected CRC fisheries.

Phase 2 (following successful completion of Phase 1), will facilitate change in fisheries where significant practical opportunities exist to improve performance.

Workshops were conducted in Adelaide and Hobart in May 2010 to receive input from stakeholders and explain Professor Jim Anderson's system of wealth-based performance indicators. These workshops were attended by members and representatives of the rock lobster, prawn and abalone fisheries and relevant fisheries managers and scientists.

The proposal was submitted to the CRC Research Advisory Committee (RAC) for informal consideration at the meeting on 8 June 2010. Comments from the RAC were incorporated into the proposal. Drafts of the revised proposal were presented to representatives of the SA prawn, lobster and abalone industry associations. In 2010, the proposal was presented to key fisheries groups in the CRC (Australian Council of Prawn Fisheries, Abalone Council of Australia, Australian Southern Rock Lobster Industry) for comment and endorsement. All three provided in principle support for the project.

**The project had three major elements:**

1. Assess the economic performance of selected CRC fisheries.
    a) Conduct desktop review and interview industry members, fisheries managers and scientists involved in each fishery.
    b) Using agreed template, describe key elements of each fishery, especially those relevant to their economic performance.
    c) Collect financial data on each fishery using an approach that builds on the method applied by Econsearch in SA over the last decade (for fisheries where data are not being collected elsewhere).
    d) Measure economic performance and identify impediments to wealth creation for each fishery using the performance indicators developed by Anderson and Anderson (2010).
    e) Identify the best opportunities for improving the profitability of each fishery, e.g. high operational or management costs and/or poor processing, marketing and pricing.
    f) Conduct workshop with each Stakeholder Advisory Group to assist in finalisation of each assessment.
    g) Finalise and disseminate assessments of the performance of the fisheries in each sector.

2. Describe and evaluate the innovative systems that have been established to improve the economic performance of successful fisheries worldwide.
    a) Identify several fisheries worldwide (including dive, trap and trawl examples) with strong economic performance.
    b) Conduct desktop review and, where necessary, interview industry members, fisheries managers and scientists involved in each fishery.
    c) Provide detailed descriptions of each fishery using an agreed template and focusing on issues affecting economic performance.
    d) Assess each fishery using the performance indicators of Anderson and Anderson (2010).
    e) Identify the innovative solutions (i.e. business structures, operational procedures and fisheries management systems) that have been established to overcome impediments to wealth creation in economically successful fisheries worldwide, including assessments of:
        i) why innovative changes were needed;
        ii) how changes were implemented and the main impediments to change;
        iii) the main advantages of new arrangements (e.g. how do they increase efficiency, reduce costs and enhance marketing);

iv) what are the problems;
iv) how were equity and responsibility transferred (e.g. what was done with extra vessels, if any);
(v) what is the governance system;
(vi) what legislative issues needed to be addressed and what legal instruments were established;
(vii) how was the fisheries management system refined to support the new business structures and enhance marketing.

f) Conduct workshop to refine assessments and identify options for improving the profitability of CRC fisheries.

g) Finalise assessments of the economic performance of these fisheries, including detailed descriptions of the innovative solutions established to overcome impediments to wealth creation and the potential suitability of CRC fisheries (three chapters for final report)

3. Identify practical opportunities for overcoming impediments to wealth creation and improving the performance of selected fisheries.

a) Disseminate a summary of the assessments of strongly performing fisheries, focusing on innovative aspects of their approaches that could be adopted to improve the performance of selected fisheries.

b) Conduct workshops with each Stakeholder Advisory Group to identify innovative business structures, operational procedures and/or fisheries management systems that could potentially be established in each fishery.

c) Identify the impediments to adopting these innovative approaches in each selected fishery.

d) Identify fisheries where practical opportunities exist to adopt innovative approaches to significantly improve performance.

e) Summarise the changes in the fisheries management systems, business structures and operational procedures that could be realistically adopted to improve the performance of each fishery.

f) Describe a pathway to adoption for fisheries where significant opportunities exist to improve their performance.

g) Write a proposal to facilitate the adoption of these opportunities improve performance (if considered appropriate).

**Fishery Performance Indicators (Anderson and Anderson 2010)**

The wealth-based Fishery Performance Indicators (FPIs) evaluate and compare fisheries management systems. A *wealth-based fishery management system is one that is ecologically sustainable, socially acceptable and generates sustainable resource rents or profits* (Anderson and Anderson 2010). There are two types of FPIs. The first consist of *outputs* which measure factors that reflect success or failure in the creation of potential wealth from fisheries. The second consists of *input* factors that enable or contribute to the process of developing wealth-creating fisheries.

The individual measures are coded in levels from 1 to 5 (high being good) and are easy to collect and score across a wide range of fisheries. They rely on a basic set of data that is widely available (e.g., volumes and prices) and on expert assessment of qualitative indicator levels. No primary data collection is required. Inputs and outputs are grouped into broad categories that are broken into specific dimensions of wealth outputs or inputs. There are 68 measures of fishery performance (outputs) in terms ecological, economic and community sustainability.

There are 54 measures of exogenous factors (inputs) that enable fisheries to perform effectively in terms of wealth creation.

Each of the fisheries considered in this project was assessed using this framework. These evaluations were undertaken by the principal investigator on the project and the key scientist(s) and/or manager(s) for each fishery.

# 3. Results and Discussion

## 3.1. Prawns

The Australian Council of Prawn Fisheries (ACPF) suggested that the study should focus on three fisheries: Spencer Gulf Prawn Fishery (SGPF); Gulf St Vincent Prawn Fishery (GSVPF); and East Coast Trawl Fishery (ECOTF). PIRSA Fisheries and Aquaculture requested that the GSVP not be considered explicitly in this study. This request was made because of the pressing need to develop tactical responses to short term management issues in the GSVPF, whereas the CRC project was designed to address strategic opportunities.

### 3.1.1. Spencer Gulf Prawn Fishery

Representatives of the SGPF advocated their support for this study to the ACPF. The process that was established to support the SGPF to enhance its economic performance was developed at a series of meetings with the SGPF Management Committee and Research Sub-Committee in Adelaide and Port Lincoln in late 2011. Participants in these meetings included industry members (e.g. Andrew Hogg, Andrew Puglisi) and representatives (Simon Clarke, Executive Officer, SGPF), fisheries managers (Sean Sloan, Alice Fistr, Craig Noell, PIRSA Fisheries and Aquaculture), and a fisheries scientist (Dr Cameron Dixon, SARDI) to plan the approach for each fishery. This included presenting the project plan at meetings of the Research Sub-Committee and Management Committee of the SGPF.

Workshops were held in Adelaide and Port Lincoln in February 2012 to:

i) assess economic performance of the SGPF (using Anderson and Anderson model);
ii) assess economic status of the fishery;
iii) introduce industry to options for improving the economic performance of the fishery (four case studies); and
iv) identify options that warranted further investigation with respect to their suitability to the SGPF.

These workshops were attended by 30 of the 39 licence holders in the SGPF, as well as the fishery manager and industry members and representatives from the GSVPF and ECOTF (Appendix 1.1).

The review of the SGPF presented by Dr Cameron Dixon highlighted the success of the co-management approach in maintaining biological sustainability, with an average annual catch of almost 2000 t over the last decade, but noted that the GVP had declined from a high of ~$45M in 200/01 to less than $28M in 2009/10 (Appendix 1.2).

The analysis using the Anderson and Anderson (2010) presented model by A/Prof Tim Ward also suggested that the economic performance of the SGPF was relatively poor. Harvest and

asset performance were low due to inefficiencies resulting from the fishery's strong reliance on input controls (e.g. short season) and absence of framework for consolidating effort/catches to reduce costs. The analysis also identified weaknesses in the marketing system (Appendix 1.3).

The economic analysis of the SGPF by Dr Eriko Hoshino suggested that boat business profit had declined due to a combination of falling prices, caused by the high Australian dollar and increased completion from imported aquaculture prawns, and increasing costs (mainly fuel). The high value of the economic data-set provided by Ecosearch was emphasised. It was suggested that there was a need to explore alternative management options that would improve the profitability of individual operators (Appendix 1.4).

The presentation by Ms Annie Jarret highlighted the benefits of establishing individual transferable fishing rights, including: increasing access security; providing operational flexibility; balancing biological and economical sustainability; supporting cost effective management; and allowing equitable adjustments in fishing mortality. The Northern Prawn Fishery was used as a case study. The long and complex series of buy-back schemes and the introduction and evolution of tradeable effort units was described. A potential move to ITQs was flagged [and has since eventuated). The strengths and weaknesses of different transferable systems were evaluated. It was recognised that there was no perfect system and that implementation was time consuming and difficult, but worth the effort (Appendix 1.5).

Mr Graeme Stewart gave a presentation on the evolution of the prawn fisheries in Shark Bay and Exmouth Gulf. In Shark Bay, loans from the Western Australian Government were used to fund two fisheries adjustment schemes that reduced the fleet from 35 to 18 vessels with only seven owners (only 3-4 active). The operators now work collaboratively to reduce costs (e.g. buy nets in bulk). The fishery targets maximum economic yield. In Exmouth Gulf, the fishery has been taken a further step, with the fleet now owned by a single entity company (*MG Kailis*). The operational efficiencies that this structure provides were strongly emphasised (Appendix 1.6).

The Challenger Scallop Enhancement Company in New Zealand was presented as a case study of the benefits of self-governance and strong fisheries rights (Mr Michael Harte). The company was created in 1992 to establish a structure for collective capital investment. Fishers work together as co-owners, make economically efficient decisions, pay management costs, conduct research and select science providers. A Memorandum of Understanding with the NZ Ministry of Fisheries specifies the responsibility of the company. Management arrangements established in this fishery were the catalyst for changes to NZ's fisheries legislation that provided increased opportunities for devolution of management responsibilities. It was recognised that the biological sustainability and co-management performance of the SGPF provided a sound basis for greater delegation of management responsibilities. It was also suggested that the SGPF could explore the potential benefits and costs of the fishery functioning as a sole operator through collective management of harvest operations and value chain activities, as well as routine management and research activities (Appendix 1.7).

Ms Debbie Adams described the approach and benefits of the marketing and promotion activities undertaken in the Clarence River Fishermen's Co-operative. It was highlighted that many of the problems faced – e.g. declining catches, increasing costs and stagnant prices – were similar to those faced by the SGPF. Business lost ~$1.1M in 2010/11. The focus of the company was changed to emphasise the development of marketing skills, a focus on value-adding, rebranding of the product (*Yamba Prawns*) and building relationships with large buyers. Results have been positive and the focus is still being refined - away from increasing sales and revenue and towards improving profit margins. The company is also trying to establish a good mix of local, export and value-adding opportunities (Appendix 1.8).

Simon Clarke and Cameron Dixon summarised the options for improving the performance of the SGPF that were identified and discussed (Appendix 1.9). The key issues were:

- Prices too low and costs too high;
- Too many restrictions;
- Too inefficient;
- Too many boats to be profitable;
- How to get boats off the water?
- Government buy-back unlikely

*Options identified*

- Consider options for an industry buy-out
- Challenger Scallop (single company) model may be too big a step right now
- Investigate buyback options/amalgamations
- Incorporate economics into stock assessments and harvest strategies
- Decision rules to achieve/retain economic efficiency
- Need to work out optimal catch per boat and most efficient way to fish the gulf
- Reductions need to be large and fast
- Need to introduce transferable systems (e.g. quota, gear/effort units, tradeable nights)
- Industry buyout warrants consideration
- Need to also consider marketing
- Levy system for marketing an option
- Marketing is always important, but options for buyback or transferability need to be further explored

*Conclusions*

- Broad recognition of need to establish transferable system (e.g. quota, gear/effort units, tradable nights) and need to consider all options
- Need an options paper

*SGPF Response*

The outcomes of the initial workshops were discussed extensively by the SGPF Management Committee. The Committee assessed both meetings to be successful. To harness the momentum generated by the workshops a SGPF Economic Optimisation Working Group was established to identify practical options for improving the economic performance of the fishery.

*Workshop to prioritise options*

The agenda for the workshop to prioritise options for improving the economic performance of the SGPF is provided in Appendix 1.10. The SGPF briefing paper for the meeting is presented in Appendix 1.11. The meeting was attended by a broad spectrum of industry members, fisheries managers, fisheries scientists and two economists with relevant expertise and experience. Dr Julian Morrison presented an economic assessment of the SGPF that confirmed profitability has been declining due to decreases in prices and increases in costs (Appendix 1.12). Dr Morrison also presented outputs of an economic model that will be available for assessing the benefits of various management options (Appendix 1.13). The draft outcomes of the workshop are provided in Appendix 1.14.

In short, the outcomes were: 1) that an options paper would be developed that would focus on two future management options – transferable quota and gear units; and 2) to establish a

process with timelines to work with government to establish new management arrangements to improve the economic performance of the SGPF.

A draft economic optimisation paper was developed and is being considered by industry and government. The final document will contribute to revision of the management plan for the SGPF and the refinement of the harvest strategy to include economic performance indicators. The refined harvest strategy currently being developed for the SGPF is also likely to include a system of tradeable units. A bio-economic model for the SGPF that was established in related Australian Seafood CRC Project No. 2011/750 and a study of larval dispersal and recruitment funded by FRDC (Project No. 2008/011) will also assist in the refinement of the harvest strategy.

### 3.1.2. Benefits to Gulf St Vincent Prawn Fishery

When this project began it was envisaged that GSVPF would also be used as a case study. However, at the request of PIRSA Fisheries and Aquaculture and representatives of the industry it was decided the project would focus on the SGPF. This decision was made because of the pressing need to develop tactical responses to short term management issues in the GSVPF, whereas the CRC project was designed to address strategic opportunities. Because of the broad similarity of the management systems in the two fisheries (input controls) the content of these meetings and workshops were directly relevant to the GSVPF. GSVPF industry members and representatives attended several meetings and workshops for the SGPF.

As part of the project, the PI has attended various meetings to refine the harvest strategy and develop a new management plan for the GSVPF. For over 50 years, the GSVPF has been managed without the capacity to transfer effort among licenses. The involvement of industry in the SGPF meetings and workshops helped industry to understand the benefits of transferability. This project contributed to introduction of a system of tradable nights into the GSVPF in 2011/12. The harvest strategy for the GSVPF is currently being reviewed.

### 3.1.3. East Coast Otter Trawl Fishery

Meetings were held in Brisbane on 23 August 2011 with industry members and representatives (Mr Eric Perez, Mr Dave Stirling), fisheries managers (Dr Eddie Jebreen, Mr Darren Roy QDPI), fisheries scientist (Dr Tony Courtney, QDPI) and fisheries economist (Dr Sean Pascoe, CSIRO) to plan the approach to be taken in the project and identify options for improving the economic performance of the ECOTF.

A follow-up meeting was held in Brisbane on 13 June 2012 with industry members and representatives (Mr Geoff Tilton, Mr Dave Stirling). fisheries managers (Dr Eddie Jebreen, Darren Roy QDPI), fisheries scientist (Dr Tony Courtney, QDPI) and fisheries economist (Dr Sean Pascoe, CSIRO). This meeting used the expertise of those present to apply the Anderson model to the ECOTF and developed a plan for workshops along Queensland's east coast.

The agendas of workshops held in Cairns, Townsville, Mooloolaba and Hervey Bay in July 2012 are provided in Appendices 1.16 and 1.17. The workshops provided: an overview of the workshop objectives (Appendices 1.18, 1.19); an assessment of the economic performance of the SGPF using the Anderson and Anderson (2010) model (Appendix 1.20), a simple economic

analysis of the fishery (Appendix 1.21) and presentations of experiences in the Northern Prawn Fishery (Appendix 1.22) and SGPF (Appendix 1.23).

These presentations showed that: 1) the economic performance of the ECOTF was poor; 2) resolving similar issues in the NPF had required large investments by both government and industry; 3) and that the SGPF had benefitted from having a strong industry association and working constructively with government.

The workshops in Cairns and Townsville were poorly attended (~8 industry members/representatives) despite being scheduled to avoid key fishing periods and considerable efforts by QDPI staff to encourage fishers to attend. The workshop at Mooloolaba was well attended but discussions were not particularly constructive. In contrast, the workshop in Hervey Bay (Urangan) was very productive and identified some practical opportunities for improving the economic performance of the fishery (Appendix 1.24). A synthesis of the discussions at the four workshops is provided in Appendix 1.25.

In short, it was acknowledged that there were significant problems in the fishery, including:

- Over-allocation of effort (latent + active)
- Lack of profitability
- Efficiency constraints (input controls)
- Structure of the fishery
- Lack of industry voice for trawl fishery
- Lack of investment in the industry (vessels and people)
- Marketing/prices

It was agreed that the most pressing problem was overcapacity and that this would only be addressed by government and industry working together. The lack of an industry voice and complexity of the fishery were identified as key impediments to adopting a stronger co-management approach. It was recognised that a range of other weaknesses in the fishery should be addressed once the issue of over-capacity was resolved.

## 3.2. Rock Lobster

A workshop involving fishers, industry representatives, fisheries managers and scientists from SA, Tasmania, Victoria and NZ was held in Melbourne on 28-29 May 2013 (Appendix 2.1). At this workshop, the management arrangements and status of Australia's and NZ's SRL fisheries were summarised and compared (Appendix 2.1). The economic performance of Australia's largest SRL fishery, the SA Southern Zone Rock Lobster Fishery SZRLF), was evaluated using the Anderson and Anderson (2010) method (Appendix 2.2). The economic performance of Australia's fisheries for SRL were compared (Appendix 2.3) Presentations were given on the success and limitations of strategies that have been implemented to optimise economic performance in the Western Rock Lobster Fishery (Appendix 2.4), NZ CRA8 (Appendix 2.5) and CRA5 (Appendix 2.8) Fisheries. A presentation was given on the use of economic data and bio-economic models to evaluate and optimise harvest strategies for SRL (Appendix 2.7). Extensive discussions were undertaken to identify practical options for improving the economic performance of Australia's fisheries for SRL.

The comparison of the management arrangements and status of SRL fisheries identified some interesting contrasts. Most significantly, the status of New Zealand fisheries was considered to be good to excellent, but Australian fisheries were generally rebuilding to address over-fishing

or sustainably fished with rebuilding strategies in place to improve to economic and social outcomes. Importantly, there were fewer regulatory restrictions (pot limits, closed seasons) in the NZ than the Australian fisheries.

The evaluation of the SA SZRLF using the Anderson and Anderson method also identified that harvesting flexibility (seasons, gear) was limited, excess capacity was high and economic performance (return on investment) could be improved. The analysis also suggested that the landings pricing system in the fishery was not transparent and that vertical integration was low. These findings were considered be reflective of the situation in Australia's other SRL fisheries.

The economic evaluation of the fisheries showed that the quality of economic data and level of economic performance varied among jurisdictions. A long time series of detailed economic data was only available for SA. Over the last decade, the SA SZRLF had performed adequately from an economic perspective (consistently positive but with relatively low return on investment) whereas the SA NZRLF had performed quite poorly (negative return on investment over much of last decade) but has recently improved. Boat business profit was negative in the Victorian and Tasmanian fisheries in years for which data were presented (2008/09 and 2010/11, respectively). In contrast, data presented for CRA5 confirmed that this NZ fishery was performing well from an economic perspective. Similarly, the Western Rock Lobster Fishery was shown to be generating high profits despite recent reductions in recruitment. Overall, the economic performance of Australia's SRL fisheries has been relatively poor over the last decade and needs to be improved in all jurisdictions.

The Western Rock Lobster Fishery is Australia's most valuable fishery and is MSC certified (Appendix 2.5). A decline in recruitment (puerulus settlement) required large reductions in fishing effort and led to a switch to quota-based management. An assessment was undertaken to estimate Maximum Economic Yield (MEY) using predicted future recruitment (i.e. not average historical recruitment) to estimate future profits at various effort levels. Maximum profit was generated at 30-50% of 2007/08 effort level. Structural adjustment was autonomous (i.e. no government funding was provided) – fishers made commercial decisions to buy/sell/lease quota. There were significant social costs including reduced employment. Profit was increased by >60% due to the reduction in costs resulting from high catch rates when effort was reduced. TACCs set at the upper level of the optimal MEY range were identified to deliver the best returns to community through a relatively high GVP. The TACC for 2014/15 will be set to achieve socio-economic targets and will be linked to a reduction in input controls. It was noted that a larger breeding stock also provides additional resilience to variations in future recruitment.

CRA8 is the largest and most productive lobster fishery in New Zealand. It is quota managed and operates under formal decision rules or operational management procedures (Appendix 2.6). Decision rules based on a conservative exploitation rate and a TACC cap when CPUE reaches 2.0 kg per pot lift (i.e. no or limited increases in TACC) have led to rebuilding of the biomass, increased catch rates and reduced fishing costs. The presentation concluded that "*it is not all about quantity – increased abundance provides the opportunity to maximise financial returns through providing what the market wants and when*". Specific benefits include: increased returns through targeting optimal sizes, fishing areas and seasons; reduced costs through high CPUE; increased confidence and business planning; greater reinvestment and high breeding biomass providing stock resilience.

CRA5 has also targeted high stock abundance to improve catch rates, lower costs and improve profitability (Appendix 2.7). The mechanisms by which this change has been achieved and the overall benefits are consistent with those identified for CRA8. However, concerns were expressed about the reallocation of forgone commercial catches to the recreational sector or to conservation through establishment of marine parks. Both forms of reallocation have occurred in

CRA5. This case study provides evidence of the need for governments to establish legislative frameworks to address reallocation among sectors, especially when commercial fishers reduce catches to obtain socio-economic outcomes.

Results of CRC Project No. 2009/714 that developed a bio-economic modelling tool for SRL were presented at the workshop (Appendix 2.8). The model evaluated the effects of different harvest strategies on average fisher profit. The study showed that lowering exploitation rates had the strongest effect on profit, through lowering of fishing costs due to increased catch rates at higher biomasses.

The take home messages from the workshop were clear. The economic performance of Australia's SRL fisheries could be improved by establishing formal harvest strategies that reduce exploitation rates with the aim of increasing spawning biomass, reducing fishing costs and increasing profitability. These harvest strategies should also consider social outcomes and GVP provides a good measure of economic benefits to the community. There are clear benefits in collecting economic data for use in models to evaluate the economic benefits of various management options (e.g. size limits, exploitation rates). These tools should be used in the formulation of future harvest strategies for Australia's SRL fisheries.

The success of the workshop was evidenced by invitations for Tim Ward and Rick McGarvey to deliver keynote presentations at the Rock Lobster Congress 2013 which summarised outcomes of the Melbourne workshop and presented the results of bio-economic modelling study (Appendices 2.9 and 2.10). The findings of the project were extended to industry through presentations and discussions at future meetings regarding the management of Australia's SRL fisheries.

## 3.3. Abalone

### 3.3.1. Workshop 1

The first abalone workshop was held at the Chifley Hotel, Adelaide (25 September) and SARDI Aquatic Sciences, West Beach, Adelaide (26 September).

This workshop began with an introduction by Tim Ward which outlined the objectives and agenda (Appendix 3.1).

Grant Pullen (Appendix 3.2) gave a general overview of the similarities and differences among Australia's abalone fisheries. He highlighted that Australian fisheries contribute ~25% of global production and noted the large size of the Tasmanian fishery (~56% of Australian production). Grant also highlighted the stability of the Australian fisheries and the important role the legal framework has played in maintaining the fisheries (access rights, management plans, policy and harvest strategies).

Tim Ward (Appendix 3.3) gave a presentation on the economic performance of two blacklip abalone fisheries (SA Western Zone, Tasmania) based on the methods of Anderson and Anderson (2010). Most importantly the outcomes suggested that opportunities for increasing prices and reducing costs in abalone fisheries are limited compared to those in other fisheries.

Reducing the costs of fishing was identified as one of the areas of economic performance that could be improved.

Stacey Patterson (Appendix 3.4) gave an overview of the economics of abalone fisheries and the outcomes of recent research conducted in Tasmania. Stacey noted that the value of abalone fisheries in Australia has decreased over time, and that the real price has almost halved since 2000. Management costs in South Australia have increased from 4% to 8% from 2000 to 2012. Noting the Tasmanian experience, the difficulty in obtaining good quality economic data was highlighted. It was suggested that further exploration of the use of economic data in harvest strategies should start with South Australia where Econsearch has a long term and reliable dataset.

Discussions following the presentations focused on the complexity of abalone fisheries due to the interplay between license holders, divers and processors. It was acknowledged that in order to optimise performance there would be a need for a high level of vertical integration which should include processors and an understanding of the Chinese market. The complication of including social and economic information in harvest strategies was also discussed, emphasising the difficulties in obtaining reliable information and the importance of lifestyle to many members of the abalone industry, which may not always be in line with economic optimisation (e.g. love of fishing important to many divers, happiness index more important than economics). There was agreement that reducing the cost of fishing was one of the main areas in which the fishery could improve performance.

The second day started with a presentation by Jeremy Cooper (Appendix 3.5) on the New Zealand experience with GPS tracking of divers and the subsequent data management system that has been developed for the Paua fishery. The system provides the potential for divers to target fishing in areas that have not yet been fished during the current season and provides a unique opportunity to increase the efficiency of fishing. Importantly the cost of the system is relatively low, it is highly automated and provides the option for gathered information to be split between users depending on access rights (e.g. it can be filtered between licence holders, compliance, managers and scientists). A benefit of the system was also the ability to automatically incorporate shell measurements made onboard into the database and lodge Catch and Disposal Record (CDR) forms. The presentation was well received and the potential of the system to provide benefits to industry was highlighted. In particular the benefits identified included more efficient fishing and a potential reduction in compliance and data management costs.

Ben Stobart (Appendix 3.6) gave a presentation on the benefits that changing the timing of the fishing season could provide to industry. Greenlip abalone weigh more and bleed less if caught in autumn. Thus, the same quota (weight) can be taken while leaving more abalone in the water, or the same number of abalone can be taken with an increased quota. This approach was recognised as one way to improve the performance of the greenlip abalone fishery, although the support of processors and the complexities of marketing abalone caught in autumn need to be addressed.

Greg Ferguson (Appendix 3.7) described the pipi (cockle) fishery in South Australia, which is one of the few examples where economic information is incorporated explicitly into a harvest strategy. This is a good example of a fishery in which volume is not equivalent to profit; GVP has increased despite reductions in catch. In 2012, fishers had the option to increase the TACC but did not adopt it as there was no evidence profit would be increased. Research into 1) modified atmosphere packaging to extend product shelf life has also helped this fishery and 2) targeting size classes to match market requirements have also improved the economic performance of the fishery.

Finally, Rick McGarvey gave a case-study presentation on the economics of the rock lobster fishery, highlighting the importance of data in management decision making and the complexities involved in incorporating costs. Within this fishery, increases in profit can be realised by reducing exploitation rates and promoting increases in abundance which result in higher catch rates (reducing costs).

The last session of the workshop was dedicated to open discussion around the messages delivered during the presentations and options for improving the economic performance of abalone fisheries. Amongst other things, the discussion focused on:

- How the aquaculture industry has influenced the dynamics of the wild caught abalone fishery, reducing price and changing the way wild abalone is marketed;
- The difficulties and costs involved in collecting reliable economic information and the value of the information already available for SA;
- The significant potential to improve the economic performance of abalone fisheries by adopting the automated GPS logging systems;
- The potential to improve fishing efficiency using biological information and the need for further data on the seasonal biology of blacklip abalone.

### 3.3.2. Primary outcomes from initial workshop

The three primary outcomes from the workshop were: (1) development of a proposal to hold a 'follow-up' workshop focused on discussions of a national 'roll out' of the GPS logger system; (2) consider the development of a research proposal to obtain data on the seasonal biology of blacklip abalone; and (3) review the abalone bio-economic modeling project.

The first two outcomes were identified as the best chance of improving the economic performance of the Australian abalone fisheries.

### 3.3.3. Workshop 2

The second abalone workshop was held at SARDI Aquatic Sciences, West Beach, Adelaide (1-2 May 2014). The agenda for the meeting is provided in Appendix 3.8 and a list of attendees in Appendix 3.9.

The first day began with a welcome and introduction by Tim Ward, which identified expectations and potential outcomes. Written advice from Harry Peeters, Victoria was tabled and delgates were requested to familiarise themselves with the views of the Victorians who were unable to attend the workshop. Dean Lisson confirmed the importance of the workshop to industry, highlighting the opportunity it presented to adopt the advances in the GPS logger system made by Craig Mundy in Tasmania and Jeremy Cooper in New Zealand, noting the potential to merge these to a single, comprehensive system suitable for broad application across Australia and NZ.

The introduction was followed by a series of presentations from New Zealand (Jeremy Cooper, Erin Breen and Tom McGowan) and Tasmania (Craig Mundy, Grant Pullen and Joey McKibben). These presentations set the scene for subsequent discussions.

Jeremy Cooper talked about the New Zealand experience with GPS tracking of divers and the subsequent data management system that has been developed for the Paua fishery (Appendix

3.10). The system provides the potential for divers to target fishing in areas that have not yet been fished in the season and thus provides a unique opportunity to increase fishing efficiency, and reduce operating costs. Importantly the cost of the system is relatively low, it is highly automated and provides the option for gathered information to be split between users depending on access rights (e.g. it can be filtered between licence holders, compliance, managers and scientists). An advantage of the system is also the ability to automatically incorporate shell measurements made on board into the database and lodge Catch and Disposal Records (CDR) forms.

The driver to develop the system was industry, but other parties see the potential benefits and are now becoming interested as part of the process to improve sustainability, management and compliance. Jeremy highlighted that the scale of management and automation will be key issues to the future of the system, and that there were still elements of the system that require further work for it to be fully automated.

Erin Breen provided a concise view of the New Zealand management perspective (Appendix 3.11). She touched on what the system can achieve, what it could be used for and accountability issues. Most importantly, Erin discussed the relevance of ownership of the system and the data it provides. While its advantages and applicability to assessments seem clear, there are considerable complexities that arise when you decide to use the system for management and compliance. Erin identified that if this system was to be used for compliance, ownership could probably not reside with industry, as managers would require the capacity to control and audit the system.

The level of adoption also becomes an issue as ideally it should be around 100%, particularly if electronic reporting is considered. Thus a lot of consideration would be required to move the use of the system beyond the assessment level. Erin also highlighted the value of the system for self-management. For example, variable size limits are hard to manage at a government level and require a large investment of staff time, but the system would allow fishers to apply relevant size restrictions, by mutual agreement, within their allowed size limit. Diver Nathan Adams from Western Australia agreed that this capacity would have helped them implement voluntary size restrictions as trust between divers was a key issue to obtaining agreements within industry.

Tom McCowan presented the “divers perspective” on the New Zealand system. His presentation highlighted the day to day complexities of running the system and issues that still require further attention (Appendix 3.12). Within the New Zealand fishery, differences in fishing practice affect the data that can be obtained. For example, some divers dive from the shore and thus don’t have the units with them to record bag retrievals, which affects their ability to accurately apportion catch to GPS tracks. Hardware also needs fine tuning and will need to be very adaptable if it is to be adopted by other jurisdictions. In New Zealand, diver opinion is still polarised, but there is expectation that as divers start to see the benefits these attitudes will change.

The Tasmanian system was presented by Craig Mundy (Appendix 3.13). Although the ultimate objective is similar to that in New Zealand, Craig’s approach has been to concentrate less on the hardware and more on data manipulation and analysis to document the potential for the GPS data to improve the precision and reduce the cost of stock assessments. Importantly, Craig has a good dataset to work on because in Tasmania there is now an 85% data return and use of the loggers has been compulsory for two years. The data not provided is the result of equipment failure (5%) and diver non-compliance (10%).

One advantage of the system is accurate estimation of CPUE from GPS records (termed eCPUE). In addition, Craig provided seven examples on the use of spatial data to generate alternative new performance measures. These were site fidelity (metric is dives within 50 m of site), short dives (dive <= 15 minutes), big swims, swimming speed, reef productivity, reef area fished and concentration curves (i.e. the shape of curves provide an estimation of how the most productive areas are performing. Other measures considered were the ratio between exploitation rate and replenishment time, hotspot analysis and depth profiles. This new level of information and accuracy provides significant potential to develop new PIs.

Grant Pullen gave a general overview of the introduction of the GPS loggers into the Tasmanian fishery (Appendix 3.14). In Tasmania, the system was introduced to improve the TACC setting process and management of the fishery and the use of the loggers was made compulsory. Grant also pointed out that the resourcing needed to support the use of loggers is not insignificant and there needs to be funding in place to deal with breakages, management of the loggers and data processing.

Grant's talk gave a good insight into the complexity of managing the abalone fishery in Tasmania, and the challenges that arose when working through the process of making GPS data loggers compulsory for fishers. For example, how should you deal with divers who do not want to adopt the new system and how do you manage equipment failures without adversely affecting fishers? The solution in the case of Tasmania was a good example of careful discussion with fishers to address their needs and ensuring access to replacement equipment was as easy and convenient as possible.

The final presentation for the day was from Joey McKibben who provided a Tasmanian divers perspective on the logger system. Initial concerns of divers mainly focused on privacy of the data, compliance, equipment failure and how it would be managed. One surprising and unexpected obstacle was insurance which arose because, following an accident, there was concern that insurance companies may use logged information to the detriment of divers. This highlights the importance of open dialogue with all users of the system to make sure any obstacles to implementation are considered. As the system has been rolled out in Tasmania most of these issues have been resolved and the system has increasingly been accepted. Joey was optimistic about the benefits the GPS logger system is giving and confirmed that divers and license holders are now seeing the benefits. These include divers being able to see their own data, its use to set quotas and relevance to compliance and management.

Subsequent discussions around the presentations were diverse and the main topics can be summarised as follows:

1. Economics of the system

How cost effective is the system? What are the costs outside hardware development? It was pointed out that a cost benefit analysis has not yet been carried out. However, Dean Lisson commented that there was no point in doing such an analysis until a reliable system could be developed. Once the system was fully functional a cost benefit analysis could be done, allowing recommendations for a package that was both reliable and cost effective. From the Industry perspective there was interest in the savings in research costs that could result from the new system (especially SA).

2. Use of the system for TACC setting and management

How good is such a system for obtaining predictive information to aid TACC setting? Edward Abraham reminded attendees that at this early stage in the project, with only two years data

available, it was a hard question to answer. Craig Mundy pointed out that being able to understand the capacity of particular reef systems to support catch through time would be invaluable for TACC setting. There was also discussion around the use of the system to set variable size limits which would be relatively easy for industry to implement voluntarily within permitted limits, but harder for managers to achieve due to legislative complexities.

3. Hardware development

The New Zealand model, where industry has been leading the development of hardware, is probably the most efficient as the process may have taken longer if run by government. This is because Government is constrained by procurement rules and the need and complexity of undertaking development around legislative requirements.

4. Performance indicators

What performance indicators can come out of the new system and how much better are they than the current ones? There was unanimous agreement that eCPUE derived from GPS loggers would be a lot more reliable than traditional CPUE that is derived from times entered in return forms. Craig Mundy highlighted a suite of possible new PIs for which there was a great deal of interest, particularly from industry and managers. However, it was agreed that before these indicators could be adopted they would need to be "ground truthed" against traditional information, tested with several years' data, as independent as possible and that their interpretation would have to be clear.

5. Data confidentiality and ownership

This is a critical issue and needs to be clearly established prior to any parties obtaining access to data. Data access rights will also need to change depending on what the information is to be used for. All parties agreed that the GPS data is confidential and its storage and use rules need to be agreed by all. Any breaches of confidentiality would be a significant obstacle to its use. It was very clear that if the system was to be used for anything other than stock assessment the complexities escalate because legislative requirements come into play. At this point data ownership becomes a critical issue for managers.

6. System flexibility is a key requirement

Adoption of the GPS system across jurisdictions will be heavily reliant on adapting the system to work within the peculiarities of each fishery and the different management and legislative umbrellas. There was general consensus that while there were still many issues to address, the current systems being developed in New Zealand and Tasmania could be adapted to jurisdictional requirements without too much difficulty. In addition, it was clear that automation would be essential to promote acceptance and continued use of any system developed.

Following this general discussion, a matrix of jurisdictions and components was used to identify areas common to all states that could be used to best direct the focus of future GPS logger research (Appendix 3). There was consensus across all states that the system would be a great asset for stock assessment, particularly due to the perceived greater reliability of eCPUE and the opportunities to develop new, potentially more informative, PIs. There are also benefits to fishers in being able to see their own information and use it to plan their activities. However, as discussion moved to the remaining components (quota management, enforcement and compliance) it was clear that the complexities around legislation and enforcement would be a significant obstacle to implementation of the system.

It was agreed that the best way forward would be to develop the system as a fishery data collection tool and pursue the more complex quota management and enforcement issues progressively at a later stage.

Discussion focused on developing three subsequent projects:

1) Implement the GPS logger system to the South Australian Southern Zone abalone fishery.

The Southern Zone only has six licenses operating and they are already using spatial management, vessel monitoring system (VMS) and also measuring shells. This makes them ideal candidates for a low-cost, pilot project to evaluate the implementation of the GPS system and perform a cost-benefit analysis. The results can be used to highlight the benefits and facilitate adoption in other jurisdictions.

2) Implementation review of GPS logger system.

This project had multiple components (Appendix 4), but the key objective would be to identify and document, across jurisdictions: (1) what has been done (including considering those FRDC projects already underway); (2) future needs from a GPS logger system for managers/industry/researchers (i.e. support tool for industry and/or data for stock assessment and PIs); (3) the need for common hardware and software platforms; (4) legislative and other impediments to implementation; (5) set up and maintenance costs; and (5) data collection needs, access and privacy. Based on the degree of commonality across jurisdictions, this project would also seek to develop the specifications for a common hardware/software platform and engage with suitable contractors (e.g. Scielex, Zebratech) to develop a prototype. This will facilitate a co-ordinated approach with systems adaptable to each jurisdiction's needs whilst avoiding duplication.

3) Ongoing development of performance indicators and the use of GPS information in stock assessments.

This was considered a natural extension to current FRDC Project (i.e. 2011/201 - Implementing a spatial assessment and decision process to improve fishery management outcomes using geo-referenced diver data). The need to consider a national rollout of the approach was recognised. It was agreed that a proposal should be considered/developed following completion of current project.

The final session for the workshop changed focus to consider the potential for the use of blacklip abalone biological information to maximise harvest strategies. As an introduction to the subject, Ben Stobart gave a presentation on the benefits that changing the fishing season of greenlip abalone could provide to industry. Greenlip abalones weigh more and bleed less if caught in autumn. Thus, it is possible to either catch the same quota while leaving more abalone in the water, or catch the same number of abalone and increase the quota. This is one way to improve the performance of the fishery for greenlip that is already being trialled by the Western Zone fishery in South Australia.

Discussion focused on developing a subsequent project for blacklip abalone. Whilst there was broad support across jurisdictions represented, it was considered that the project should largely be undertaken in SA, linking to the (limited) available data from Tasmania and Victoria. It was noted that the SA Fisheries and Aquaculture Research Advisory Committee has ranked this project as a high priority.

## 3.4 Comparison of the fisheries and synthesis of findings

### 3.4.1. Fishery performance and impediments to wealth creation

The analysis using the Anderson and Anderson (2010) method provided clear insights into the differing strengths and weaknesses of the fisheries considered in this study (Figure 1). The SGPF performed well scoring less than four out of five in only two of the eleven output categories (harvest asset performance and post-harvest asset performance). In contrast, the ECOTF scored above four out of five in only two of the eleven categories (post-harvest industry performance and processing owners and managers). These differences reflected the sound biological position, but declining economic performance of the SGPF and the generally poor state of the ECOTF. The SZRLF scored less than four out of five in four of the eleven categories (harvest performance, harvest asset performance, risks and post-harvest asset performance) which reflects the recent declines in both the biological status and economic performance of the fishery. The two abalone fisheries that were assessed performed well, with only harvest performance and harvest asset performance being scored at less than four. Excess capacity was the main driver of poor harvest performance; low harvest asset performance reflected recent declines in revenue and asset value.

In terms of inputs (Figure 2) all fisheries performed poorly in terms of gender reflecting the relatively low involvement of women in the Australian fishing industry. The SGPF scored very low (one) in terms of harvest rights, reflecting lack of a tradeable unit, and less than four for markets and market institutions, reflecting in part the lack of vertical integration in the industry. The ECOTF scored less than four in seven of the fifteen categories, performing poorly in terms of participation and collective action, management methods and markets and marketing institutions. The SZRLF and abalone fisheries performed well in most categories, the two notable exceptions being collective action and markets and marketing institutions.

The lack of economic data from most jurisdictions impeded comparison of the long-term economic performance of fisheries outside SA. However, overall it is clear that declining real prices and rising costs have caused long-term declines in the economic performance of most of the fisheries considered in this project. For example, declines in prices and increases in costs, especially fuel, have resulted in declining returns on capital investment in both the SGPF and GSVPF over the last 10 years (Appendix 1). In the SGPF, recent returns on investment have been low and in the GSVPF returns had been negative for six out of the last seven years. The recent economic performance of the two SA lobster fisheries presented a strong contrast, with the Southern Zone consistently generating returns on investment of 2-6%, while the Northern Zone has generated negative returns over much of the last decade (Appendix 2). SA abalone fisheries continue to generate positive returns on investment but these have decreased in size over time due to a steady decline in real prices.

In several fisheries, the generally poor economic outlook is exacerbated by the presence of a large number of licences in the fishery and declines in the biological status of the resource. The key issues that need to be addressed vary among fisheries. In all cases there is a need to reduce fishing costs; opportunities for achieving this goal vary among fisheries. There is also a need to continue efforts to develop new products and markets; however, these efforts alone are unlikely to entirely address the current economic pressures.

### 3.4.2. Systems that have improved the economic performance of relevant fisheries

Several trawl fisheries that have previously addressed issues similar to those affecting the SGPF, GSVPF and ECOTF were used to demonstrate how economic performance can be improved. In the Northern Prawn Fishery, fishing costs have been reduced and marketing and prices improved following the introduction of individual transferable fishing rights. This re-structure was achieved through a long and complex series of costly buy-back schemes that involved significant government funding. In the Exmouth Gulf and Shark Bay Prawn Fisheries, government funded buy-outs were also undertaken to reduce the number of license holders in the fisheries. In the Shark Bay Fishery, 3-4 active fishers act co-operatively, whereas in the Exmouth Gulf Prawn Fishery all licenses are now owned by a single company. The most extreme example of consolidation of a fishery is the NZ Challenger Enhancement Company, where fishers operate collectively within a single corporate entity. In the Clarence River Prawn Fishery, poor economic performance has been addressed by the more traditional approach of collective marketing through a fishermen's co-operative.

Individual transferable fishing rights have already been established in Australia's lobster fisheries so alternative approaches to improving economic performance needed to be identified. Lobster fisheries in Western Australia and New Zealand (CRA8, CRA5) were used to demonstrate the benefits of focusing on economic performance rather than maximising catches. In each case, the economic performance of these lobster fisheries was improved by reducing exploitation rates to maintain/rebuild the biomasses to levels that maintain/improve catch rates. A bio-economic model developed in a related project (CRC 2009/714) was used to demonstrate the relative economic benefits of changes to current management arrangements (including lower exploitation rates).

For abalone fisheries, it was recognised that: 1) there are relatively few opportunities to improve economic performance as fishing costs are already low and prices are quite high; and 2) opportunities that exist should be evaluated from at least a national perspective and there may be benefits in collaborating more extensively with NZ. GPS systems currently being developed in parallel in NZ and Tasmania were recognised as having the potential to transform Australia's abalone industries by reducing the costs of both fishing and fisheries management and improving the precision and accuracy of future stock assessments. It was also recognised that there are opportunities to improve the productivity of Australia's abalone fisheries by changing fishing seasons to coincide with periods when individuals are largest and flesh quality highest.

### 3.4.3. Opportunities for improving economic performance

The benefits of establishing individual transferable fishing rights within the SGPF and GSVP are recognised by both industry and government. Information collated as part of this project contributed to the development of an economic optimisation paper that will provide direction for future amendments to the management plan for the SGPF. These amendments will include individual transferable fishing rights. The management plan for the GSVP will also be revised and is likely to incorporate similar change. In the ECOTF, the issues of over-capitalisation are so large that it seems likely that significant government investment will be needed to address this issue.

The benefits of establishing a focus on economic performance is now recognised by fishers who target SRL in southern Australia. Harvest strategies are currently undergoing revision in several fisheries and likely to include lower exploitation rates that address reductions in recruitment

levels over the last decade and help to maintain/rebuild biomasses to levels which support high catch rates. The bio-economic model developed in a related project (CRC 2009/714) will inform that process.

Research proposals are being developed to assist the implementation of GPS tracking systems and changes to harvesting season that will improve the economic performance of Australia's abalone fisheries. The development of these proposals has been endorsed by the ACA and fisheries managers in key jurisdictions.

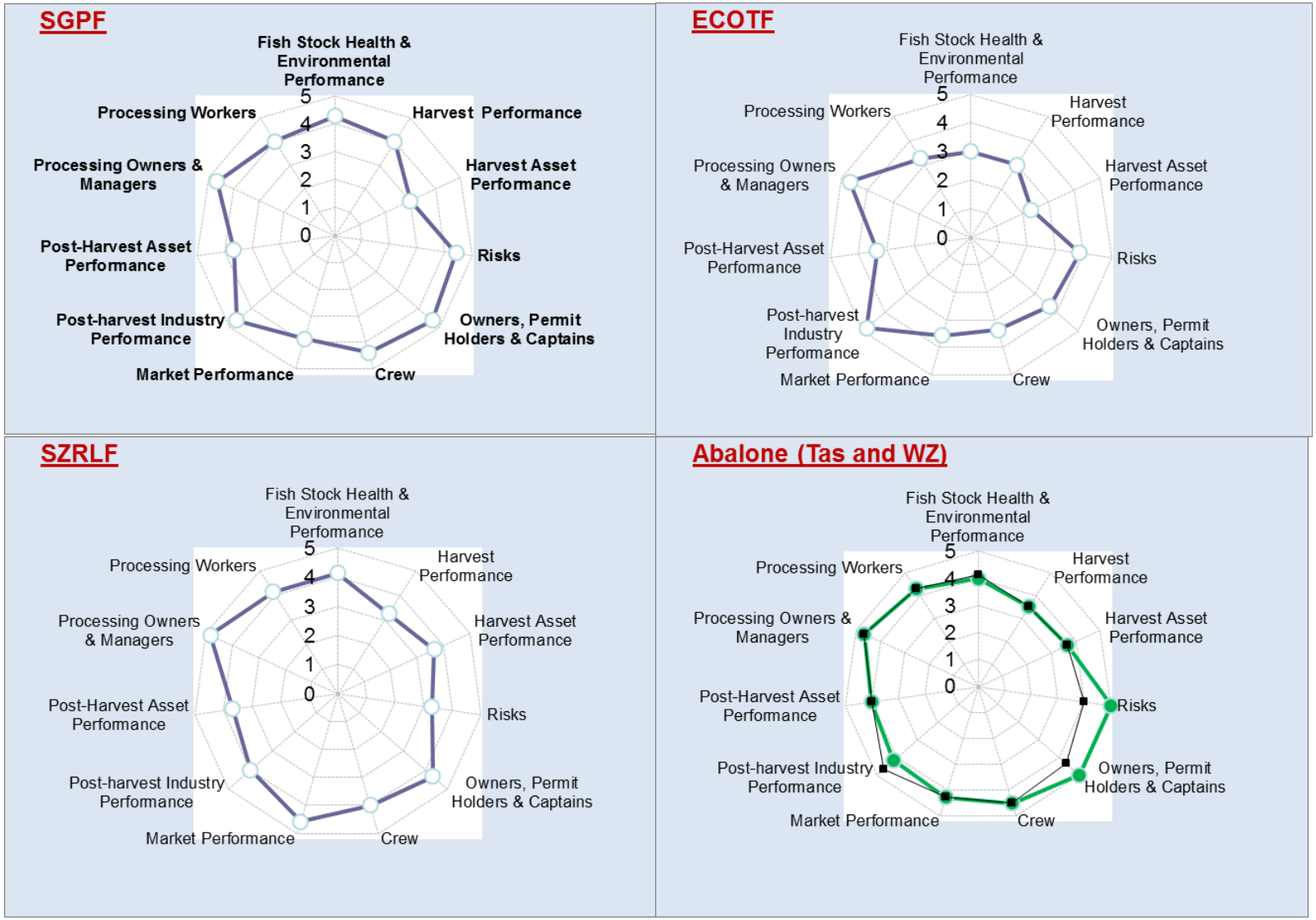


Figure 4.1. Performance Indicators of wealth creation and accumulation (outputs). Tasmanian abalone in black. SA Western Zone in green. Scale 1 to 5, with high values reflecting good performance.

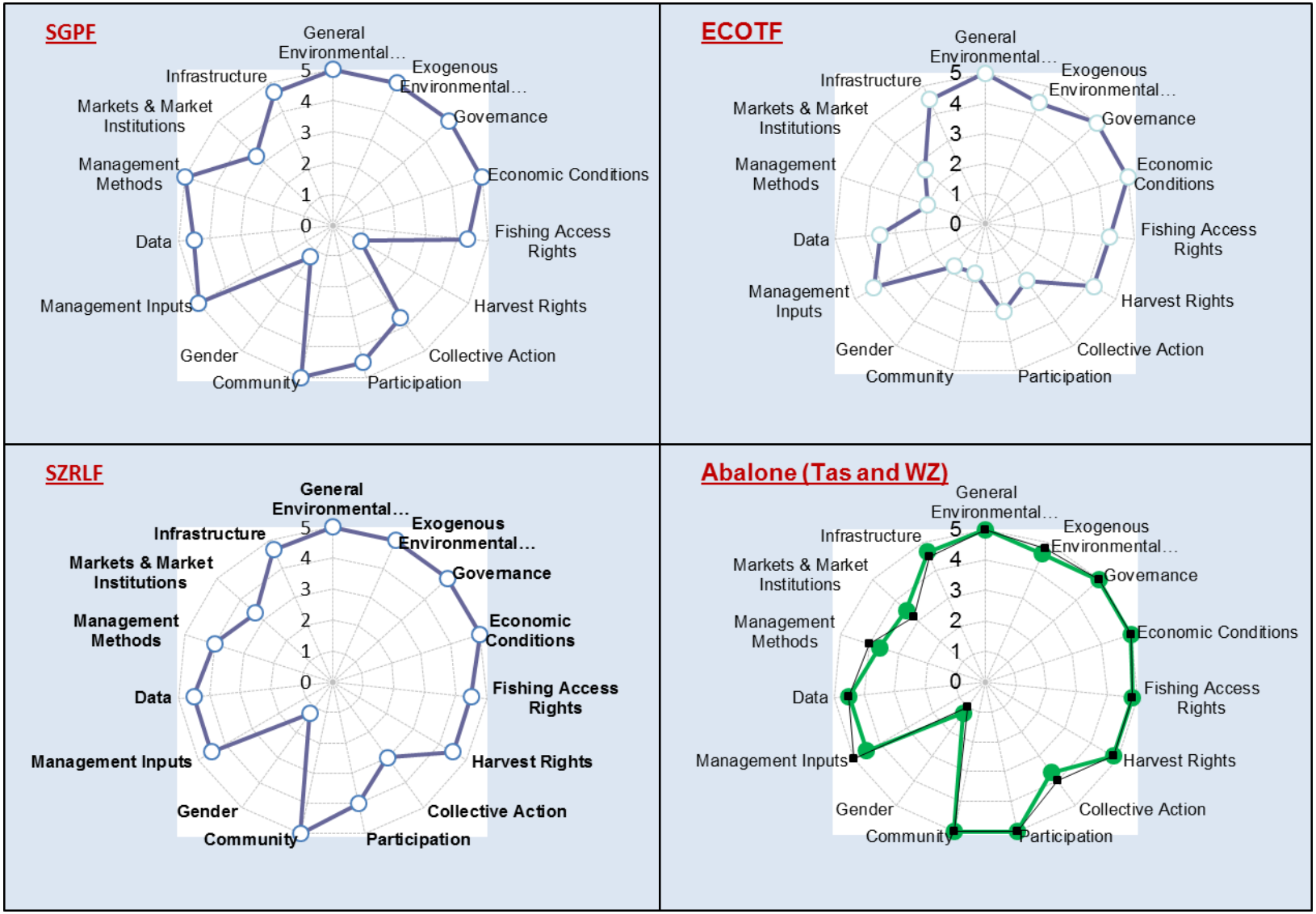


Figure 4.2. Performance Factors that enable wealth creation (inputs). Tasmanian abalone in black. SA Western Zone in green. Scale 1 to 5, with high values reflecting good performance.

# 5. Benefits, Adoption and Planned Outcomes

## 5.1. Overall

This project is one of a suite of studies funded by the Australian Seafood CRC and the FRDC that have contributed to the ongoing transformation of Australia's fisheries to include an explicit focus on delivering economic benefits as well as ecological sustainability.

This outcome was achieved by conducting a series of workshops that brought together key industry members and representatives, fisheries managers, scientists and economists to share knowledge and experiences and identify opportunities to improve the economic performance of Australia's prawn, SRL and abalone fisheries.

## 5.2. Prawns

This project provided the impetus for the Spencer Gulf Prawn Fishery (SGPF) to establish an Economic Optimisation Working Group and develop a draft economic optimisation paper (July 2014). The final version of that document will provide a basis for revising the management plan and refining the harvest strategy to improve economic performance. A bio-economic model for the SGPF (adopted from a model developed by Dr Michael O'Neill, CRC 2011/750) will contribute critical information to that process of reform. A larval dispersal model developed in FRDC Project No. 2008/011 will be used to ensure that future fishing strategies optimise both successful recruitment and economic performance.

Both the SGPF and Gulf St Vincent Prawn Fishery (GSVPF) have been managed using input controls without transferability for over 50 years. This project contributed to the establishment of system of tradeable nights in the GSVPF in 2012. A refined harvest strategy that includes a system of tradable units is currently being developed for the GSVPF. The refined harvest strategy being developed for the SGPF may also include a system of tradeable units and economic performance indicators.

Transferability has already been established in the East Coast Otter Trawl Fishery (ECOTF). The overwhelming problem in the fishery is over-capacity. It seems unlikely that significant reduction in effort will be achieved without some form of buyout. To be effective, such a buyout would require strong cooperation between industry and government. Currently, industry's capacity to engage with government is impeded by the absence of an association that represents the interests of the trawl sector.

## 5.3. Rock Lobster

Since this project began, there has been a major cultural shift within the fisheries that target Southern Rock Lobster off southern and eastern Australia. The strong historical focus on maximising catches has been replaced by a vision for fisheries that deliver higher profits by catching fewer lobsters. This project contributed to this cultural change by exposing key industry leaders to the positive economic outcomes that have been achieved in the lobster fisheries in

New Zealand and Western Australia by simply reducing exploitation rates to levels that maintain/rebuild biomasses to sizes that deliver higher profits by reducing fishing costs (through increased catch rates). Two other contributions were crucial. Firstly, Associate Professor Caleb Gardner's success over the last decade in educating lobster fishers in the principles of fisheries economics allowed industry to quickly understand the implications of what had been achieved in New Zealand and Western Australia. Secondly, the bio-economic model developed by Dr Richard McGarvey in CRC Project No. 2009/714 provided the perfect tool for demonstrating to industry and fisheries managers the costs/benefits of various management scenarios, such as low/high Total Allowable Catches and various minimum and maximum legal sizes. This bio-economic model will be used to refine the harvest strategies for Australia's fisheries for Southern Rock Lobster and ensure that future economic performance is optimised under the range of potential recruitment scenarios that the future may hold. The benefits of collecting the data required to assess economic performance, notably beach and export prices and fishing costs, are now also widely recognised.

### 5.4. Abalone

This project demonstrated that, compared to most fisheries, Australia's abalone fisheries have relatively limited opportunities for increasing prices and reducing costs. It was recognised that any opportunities for improving economic performance that do exist should be considered at a national level. The potential for GPS tracking systems to transform Australia's abalone fisheries and substantially reduce the costs of fishing and/or various elements of fisheries management was identified at a series of workshops held in Adelaide in 2013 and 2014. It was also recognised that modifying fishing seasons had the potential to improve productivity. Following a joint New Zealand and Australia research workshop in August 2014, research proposals to address these opportunities were developed.

# 6. Conclusion

The process of transforming Australia's fisheries to include an explicit focus on economic performance is well underway. However, there is an ongoing need to improve the economic performance of all of the fisheries considered in the current project. Most fisheries have made some efforts to improve and/or maintain prices by developing new products and enhancing marketing systems. These initiatives are needed and should continue, but alone are unlikely to resolve existing and future weaknesses in economic performance. In the fisheries considered, there has generally been less focus on reducing costs; largely because this is a more difficult task and in some cases would require major changes to existing operational, management or business systems. Opportunities for reducing costs vary among fisheries; these opportunities and some of the key issues impeding reform are outlined below.

The greatest need to reduce costs was identified in the prawn fisheries, where real prices have fallen as a result of competition from aquaculture products and sustainability is largely managed through input controls that create operational inefficiencies and increase fishing costs. In the SGPF and GSVPF, three options for addressing the current economic problems were identified: 1) buying-out of some the existing licences; 2) establishing an overarching corporate structure comparable to the Challenger Scallop Enhancement Company; and 3) introducing individual transferable fishing rights. The South Australian Government has indicated that it will not contribute funding to buy-back schemes and initial modelling suggests that industry funded buy-outs may not be economically viable at this point in time. Although the benefits of establishing a

single company to run each or both fisheries are widely recognised, it seems very unlikely the consensus among industry members required to adopt this approach will be obtained in the foreseeable future. It seems clear that the only viable option for reforming South Australia's prawn fisheries is to introduce individual transferable fishing rights. This has already been done in the GSVPF, where a system of tradeable fishing nights was introduced in 2012. However, the limitations of nights as a tradeable unit (e.g. not a good measure of effort) and the need to consider alternative effort/catch units are acknowledged by both fisheries managers and industry. The economic optimisation paper developed by the SGPPF identifies the strengths and weaknesses of various tradeable units and will help to guide the reform of the current management framework.

The study also identified the need to improve the economic performance of Australia's SRL fisheries, where catches have declined over the last decade due to widespread reductions in average recruitment and price volatility has been high because of the strong dependence of the industry on a single market (Hong Kong/China). Industry efforts to expand markets for SRL over the last decade have met with limited success. Experiences in other lobster fisheries show that economic performance can be improved by reducing exploitation rates to levels that maintain/rebuild biomasses to sizes that support high catch rates. There is widespread agreement among Australian fisheries managers and industry members that future harvest strategies for SRL should be refined to include a focus on economic performance and that this process of reform should utilise information provided by the bio-economic modelling tool developed in CRC Project No. 2009/714. It is also recognised that the incorporation of economic performance indicators into future harvest strategies will require the collection of economic data (e.g. fishing costs and beach prices).

Like prawns, the prices paid for abalone have fallen over the last decade due to competition from aquaculture products. To address this issue, industry has established a stronger focus on marketing initiatives, especially in China. This project introduced the Australian abalone industries to two other opportunities for improving economic performance (i.e. reducing costs through implementation of GPS technology and increasing productivity through optimisation of the timing of harvests). Following this project the abalone industry has initiated two research projects to facilitate the implementation of these opportunities into Australia's abalone fisheries.

This project is one of a suite of studies funded by the Australian Seafood CRC and the FRDC that have contributed to the ongoing transformation of Australia's fisheries to include an explicit focus on delivering economic benefits as well as ecological sustainability. This cultural change has extended beyond the three sectors considered in this study. A good example of this transformation is the South Australian Pipi Fishery, which now has formal economic PIs in its harvest strategy. Importantly, in the three sectors considered here industry is now working with fisheries scientists and managers to initiate further reforms to improve economic performance.

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# Appendices

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