Appendix 2. Rock Lobster

Optimising business structures and fisheries management systems for key fisheries

T.M. Ward

Project No. 2009/715

February 2015
This project was conducted by the South Australian Research and Development Institute

This report may be cited as:

Copyright, 2015: The Seafood CRC Company Ltd, the Fisheries Research and Development Corporation and the South Australian Research Development Institute.

This work is copyright. Except as permitted under the Copyright Act 1968 (Cth), no part of this publication may be reproduced by any process, electronic or otherwise, without the specific written permission of the copyright owners. Neither may information be stored electronically in any form whatsoever without such permission.

The Australian Seafood CRC is established and supported under the Australian Government’s Cooperative Research Centres Program. Other investors in the CRC are the Fisheries Research and Development Corporation, Seafood CRC company members, and supporting participants.

Office  Mark Oliphant Building, Laffer Drive, Bedford Park SA 5042
Postal  Box 26, Mark Oliphant Building, Laffer Drive, Bedford Park SA 5042
Tollfree 1300 732 213 Phone 08 8201 7650 Fаксimile 08 8201 7659
Website www.seafoodcrc.com ABN 51 126 074 048

Important Notice
Although the Australian Seafood CRC has taken all reasonable care in preparing this report, neither the Seafood CRC nor its officers accept any liability from the interpretation or use of the information set out in this document. Information contained in this document is subject to change without notice.
# Table of contents

Appendix 2.1. SRL Workshop Agenda ............................................................................................................. 4
Appendix 2.2. Summary of SRL fisheries ......................................................................................................... 5
Appendix 2.2. Southern Zone Rock Fishery: Fishery Performance Indicators ............................................... 8
Appendix 2.3. Economic Indicators for the Southern Rock Lobster Fisheries .............................................. 12
Appendix 2.4. WA Rock Lobster Fishery ....................................................................................................... 19
Appendix 2.5. CRA8 Fishery ......................................................................................................................... 26
Appendix 2.6. Bioeconomic decision support tools for Southern Rock Lobster ........................................ 32
Appendix 2.7. New Zealand Perspective ....................................................................................................... 40
Appendix 2.8. Improving economic performance: findings of an Australian Seafood CRC study ............ 41
Appendix 2.9. Using data in bioeconomic models to identify profitable harvest strategies .................... 45
Appendix 2.1. SRL Workshop Agenda

Improving the performance of CRC fisheries through review and reform of operational procedures, business structures and fisheries management systems.

Rock lobster workshop

Date: Tues-Wed, 28-29 May, 2013
Venue: DownTowner Hotel, 66 Lygon Street, Carlton, Victoria 3053 (Tel: 03 9663 5555, email: res@downtowner.com.au)

Agenda
Day 1 (28 May)
11.00 - Welcome and expectations from workshop (Tim Ward)
11.10 - Key differences and similarities in SRL fisheries (Hilary Revelle and Anabell Jones to present and lead a brief discussion)
   The main objective here is to recognise that the fisheries are different – especially wrt governance/business/management structures but also operationally – and that these differences will have implications for improvement options that may be suitable in each case. Experience in prawns suggests we need to make it clear from the start that we understand these differences exist. This will also provide a good background for the Anderson analysis.
11.30 - Issues impeding profitability of SRL fisheries: Anderson Analysis (Tim Ward, SARDI)
   This talk will identify impediments to economic performance using Jim's method. Results can be compared with perceptions of industry/government/other stakeholders.
12.10 - Summary of economic status/trends in SRL fisheries – (Lisa Rippon, Econsearch)
   We have most of the data available for Australian fisheries. Don’t have much for NZ. Lisa could you pls liaise with Malcolm/Daryl to get the relevant information).

Lunch (1-2 pm)
2.00 – WA lobster story: how a reduction in catch increased profitability (Nick Caputi, Fisheries WA)
2.30 – New Zealand CRA 8 – another good news story (Malcolm Lawson, CE, CRA8)
3.30 – Bio-economic modelling: tools for assessing effectiveness of options (Rick McGarvey)
4.00 – The challenges of MEY (Daryl Sykes)
4.30 – Group Discussion (All)

Evening – Workshop Dinner for informal discussion on issues and options (Venue TBA)

Day 2 (29 May)
9.00 - Synthesis of issues and options identified during Day 1 (Tim Ward)
9.30 - Facilitated discussion of options that may be suitable for improving the economic performance of each SRL fishery (All)
12.30 Summary of Workshop outcomes (Tim Ward)
1.00 – Workshop conclusion

Attendees
A/Prof Tim Ward (SARDI), A/Prof Caleb Gardner (IMAS), Dr Adrian Linnane (SARDI), Dr Nick Caputi (WA Fisheries), Dr Rick McGarvey (SARDI), Malcolm Lawson (CRA8), Daryl Sykes (CRA5), Annabel Jones (PIRSA), Hilary Revelle (DPIWE), Melissa Schubert (VicDPI), Gary Steele Craig Lawry (South Australian industry), Garry Kerr, Robert Rattray, Michael Blake, John Sansom (Tasmanian industry).
# Appendix 2.2. Summary of SRL fisheries

<table>
<thead>
<tr>
<th>Commercial Fisheries arrangements</th>
<th>NEW ZEALAND</th>
<th>Victoria</th>
<th>South Australia</th>
<th>Tasmania</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Commercial Management zones</strong></td>
<td>Nine - separate TACC set for each - TAC set for seven</td>
<td>East, West</td>
<td>Northern, Southern</td>
<td>State-wide TACC, spatial management for seasons</td>
</tr>
<tr>
<td><strong>Access commercial</strong></td>
<td>3 tonnes minimum ace</td>
<td>Limited licence</td>
<td>Limited licences</td>
<td>Limited licences</td>
</tr>
<tr>
<td><strong>Commercial gear</strong></td>
<td>Baited pots</td>
<td>Baited pots</td>
<td>Baited pots</td>
<td>Baited pot</td>
</tr>
<tr>
<td><strong>Pot limits</strong></td>
<td>None</td>
<td>Max 140 pots/boat</td>
<td>100/80 pots/boat</td>
<td>By boat length or tonnage and no of quota units</td>
</tr>
<tr>
<td><strong>Tacc 11/12</strong></td>
<td>All nz 2847 tonnes</td>
<td>66 (ez) 240 (wz)</td>
<td>1250 (sz) 345 (nz)</td>
<td>1103.24 tonnes</td>
</tr>
<tr>
<td><strong>TACC decision period</strong></td>
<td>01 April to 31 March</td>
<td>Operation of Management Procedure</td>
<td>Annually</td>
<td>Annually</td>
</tr>
<tr>
<td><strong>TACC determined by</strong></td>
<td>Operation of Management Procedure</td>
<td>Minister’s Delegate (Fisheries Victoria ED)</td>
<td>Minsters Delegate (PIRSA ED)</td>
<td>Minster, (statutory consultation with com and rec peak bodies and advisory committees)</td>
</tr>
<tr>
<td><strong>Performance Indicators in TACC decision</strong></td>
<td>CPUE</td>
<td>Egg production, available biomass, commercial CPUE</td>
<td>Commercial CPUE (primary), Recruit CPUE (secondary)</td>
<td>Egg production, legal size biomass, total biomass, commercial CPUE</td>
</tr>
<tr>
<td><strong>Effort limit</strong></td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Mls</strong></td>
<td>Varies but most at 54/60 mm tail length</td>
<td>110 (male), 105 (female)</td>
<td>98.5 (sz) 105 (nz)</td>
<td>110 (male) 105 (female)</td>
</tr>
<tr>
<td><strong>Season</strong></td>
<td>12 months other than CRA 3 and CRA 7</td>
<td>Male: Nov - Sept, female: Nov - end May</td>
<td>June-Sept (SZ), June-Oct (NZ)</td>
<td>Male Nov – Sept/ Oct, female Nov – Apr</td>
</tr>
<tr>
<td><strong>Berried females prohibited</strong></td>
<td>Yes</td>
<td>Prohibited (closed season females 1 Jun - 15 Nov)</td>
<td>Prohibited</td>
<td>Prohibited</td>
</tr>
<tr>
<td><strong>Soak time limit</strong></td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Vms</strong></td>
<td>None</td>
<td>No</td>
<td>Yes (nz) no (sz)</td>
<td>No</td>
</tr>
<tr>
<td><strong>Fishery Stock Assessment (period, empirical, model based)</strong></td>
<td>Modelled at 5 season cycles</td>
<td>Model based</td>
<td>Model based</td>
<td>Model based</td>
</tr>
<tr>
<td>Fishery Status</td>
<td>NEW ZEALAND</td>
<td>Victoria</td>
<td>South Australia</td>
<td>Tasmania</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td>----------</td>
<td>-----------------</td>
<td>---------</td>
</tr>
<tr>
<td>Fishery Status</td>
<td>Good to excellent all nine management areas</td>
<td>rebuilding</td>
<td>Sustainably fished (both zones)</td>
<td>Sustainably fished but rebuilding to improve economic and social outcomes</td>
</tr>
<tr>
<td>pot lifts 11/12</td>
<td>n/a</td>
<td>EZ 114,000, WZ 475,000</td>
<td>NZ 287,480 potlifts, SZ 1,285,289 potlifts</td>
<td></td>
</tr>
<tr>
<td>total catch 11/12</td>
<td>2748 tonnes</td>
<td>EZ 66 tonne, WZ 240 tonne</td>
<td>NZ 307 t, SZ 1,242 t</td>
<td>1/3/12 - 29/2/13 1100t</td>
</tr>
<tr>
<td>Governance structure</td>
<td>Fisheries Act, regulatory framework</td>
<td>Fisheries Management Act, Fisheries Regulations.</td>
<td>Fisheries Management Act, Fisheries Regulations.</td>
<td>Living marine Resources Management Act, Management Plan (Rules)</td>
</tr>
<tr>
<td>Management structure</td>
<td>Gov department; collectives of rights holders</td>
<td>Gov Dept,(management, licensing, monitoring and compliance) liason between Minister's office, research providers, industry.</td>
<td>Gov Dept,(management, licensing, monitoring and compliance) liason between Minister's office, research providers, industry.</td>
<td>Gov Dept,(management, licensing, monitoring and compliance) liason between Minister's office, research providers, industry, police</td>
</tr>
<tr>
<td>Process to change a management measure</td>
<td>Regulatory with consent of Parliament; statutory by Gazette Notice; and/or by Act amendment</td>
<td>Consultation with comm and rec sectors. Reg changes require approval from Governor in Council. Act changes must be approved by Parliament.</td>
<td>No statutory consultation requirements, however understood that changes would not be passed if consultation had not occurred.</td>
<td>Statutory consultation with com and rec industry associations, and fishery advisory committees for any change not in the m’plan. To make a change to a rule – statutory process inc 1 month public consultation and pass thru both houses of Parliament</td>
</tr>
<tr>
<td>Recreational Fisheries arrangements</td>
<td>NEW ZEALAND</td>
<td>Victoria</td>
<td>South Australia</td>
<td>Tasmania</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------</td>
<td>----------</td>
<td>-----------------</td>
<td>----------</td>
</tr>
<tr>
<td>Access Recreational</td>
<td>Open access</td>
<td>Recreational Fishery Licence (unlimited)</td>
<td>Pot licences, (max 2 per person)</td>
<td>Recreational Fishery Licence (unlimited)</td>
</tr>
<tr>
<td>Recreational bag limit</td>
<td>Yes - 6 lobsters per person per day</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Boat limit</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Recreational Possession limit</td>
<td>Only in one small area</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Recreational gear</td>
<td>3 pots per person - max 6 per vessel</td>
<td>Hand, hoop nets</td>
<td>Baited pots, hand, drop net</td>
<td>Baited pot, hand, hoop net</td>
</tr>
<tr>
<td>Recreational lobster identification, tail clipping, etc</td>
<td>None</td>
<td>Tail clipping/hole punched (landed whole)</td>
<td>Tail clipping</td>
<td>Notional</td>
</tr>
<tr>
<td>Recreational TAC</td>
<td>An allowance in setting tacs</td>
<td>Notional</td>
<td>Same as commercial</td>
<td>Same as commercial</td>
</tr>
<tr>
<td>Season</td>
<td>All year</td>
<td>Same as commercial</td>
<td>46 vessels NZ, 160 vessels SZ</td>
<td>Yes</td>
</tr>
<tr>
<td>Potting and diving - proportion varies across all nine management areas</td>
<td>Not much</td>
<td>Some</td>
<td>204 vessels, 10-20m, owner operators, fishers who lease all quota annually, employed skippers</td>
<td>Not much</td>
</tr>
<tr>
<td>Processing sector</td>
<td>10 major corporate entities</td>
<td>Numerous</td>
<td>15 companies handle about 90% of the land catch</td>
<td></td>
</tr>
<tr>
<td>Vertical integration</td>
<td>Limited other than for ACE ownership</td>
<td>Co-management policy developed</td>
<td>Co-management policy not much</td>
<td></td>
</tr>
<tr>
<td>Co management</td>
<td>Attempted but not fully implemented</td>
<td>None</td>
<td>Some</td>
<td>Nothing formal</td>
</tr>
<tr>
<td>Industry Association</td>
<td>Yes</td>
<td>SIV, vrfish</td>
<td>SARLAC, SEPFA, NZRLFA</td>
<td>TRLFA</td>
</tr>
</tbody>
</table>
Appendix 2.2. Southern Zone Rock Fishery: Fishery Performance Indicators

**Guiding Principles**

- **COMMERCIAL FISHING is a BUSINESS and should create wealth.**

- Ecological sustainability is NECESSARY, but NOT SUFFICIENT for commercial fisheries to generate sustainable income and create wealth.

- Community sustainability is necessary for sustainable wealth creation.

**The creation of a Wealth-Based Fisheries Performance Indicator System gives stakeholders who rely on fisheries for their livelihood critical information to make the case for better fisheries management based on a broader set of criteria incorporating governance and economic factors.**

**A wealth-based fishery management system is one that is ecologically sustainable, socially acceptable and generates sustainable resource rents or profit.**

**Purpose: The Fishery Performance Indicators (FPIs) are designed to evaluate and compare the world’s fisheries management systems based on their ability to generate sustainable wealth.**

**The Performance Indicators are designed to incorporate the Three ‘Sustainability’ Necessary for Wealth Creation:***

1) Economic Sustainability

2) Ecological Sustainability

3) Community Sustainability
Characteristics of Indicator Components

- Readily Available
- Accurate
- Quantifiable
- Relevant
- Understandable

The Fishery Performance Factors: Inputs Enabling Wealth Creation

- 39 components covering 8 dimensions:
  - Macro Factors: Environmental, Economic & Community
  - Access Rights
  - Harvest Rights
  - Collection Action
  - Management & Inputs
  - Management Participation
  - Markets and Market Institutions
  - Infrastructure

Two Parts – Outputs and Inputs

1) Performance Indicators of wealth creation and accumulation (outputs)
2) Performance Factors that enable wealth creation (inputs)

The Fishery Performance Indicators - Outputs

- 54 components covering 11 dimensions:
  - Fish Stock Health & Environmental Performance
  - Harvest Performance
  - Harvest Assid Performance
  - Rigs
  - Owners, Permit Holders & Captains
  - Crew
  - Market Performance
  - Processing & Support Industry Performance
  - Post-harvest Asset Performance
  - Processing Owners & Managers
  - Processing Workers

Component 1: Ecological Sustainability of Fisheries

- Fish Stock Health & Environmental Performance
- Status of Critical Habitats
- Percentage of Species Overfished
- Overfishing or Declining
- Stability
- Biodiversity
- Productivity
- Resilience
SZ ROCK LOBSTER FISHERY:
FISHERY PERFORMANCE INDICATORS

- FPIs capture issues in SZRLF audit trail

Performance:
- Stock size
- Harvesting flexibility limited (season, gender)
- Entrée capacity is high
- R&D (Research & Development)

Constraints:
- Limits on flexibility of harvesting
- Few harvest organization influence on business and marketing
- Limited transparency of landings pricing system
- Limited vertical integration
Appendix 2.3. Economic Indicators for the Southern Rock Lobster Fisheries

Economic Indicators for the Southern Rock Lobster Fisheries

Seafood CRC
Southern Rock Lobster Workshop
28-29 May 2013
EconSearch Pty Ltd

Overview
- South Australia
  - Northern Zone
  - Southern Zone
- Victoria
  - Eastern Zone
  - Western Zone
- Tasmania
- New Zealand

Data Sources
- SA data collected every 3 years for Economic Indicator reports to PIRSA
- Vic, Tas sourced as part of the Seafood CRC Rock Lobster bioeconomic modelling project
- NZ data sourced from Daryl Sykes

Potential Economic Indicators
- Gross value of production and prices
- Cost of management
- Boat level financial performance indicators
  - income
  - operating costs
  - profitability
  - return on investment

Catch and GVP in the SA Rock Lobster Fisheries

<table>
<thead>
<tr>
<th>Year</th>
<th>Southern Zone (tonnes)</th>
<th>Northern Zone (tonnes)</th>
<th>South Australia (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000/01</td>
<td>1,716</td>
<td>1,716</td>
<td>1,716</td>
</tr>
<tr>
<td>2001/02</td>
<td>1,717</td>
<td>1,717</td>
<td>1,717</td>
</tr>
<tr>
<td>2010/11</td>
<td>1,718</td>
<td>1,718</td>
<td>1,718</td>
</tr>
</tbody>
</table>

GVP, Price and Catch Indices Northern Zone Rock Lobster (1997/98 =100)
GVP, Price and Catch Indices Southern Zone Rock Lobster (1997/98=100)

Survey Results
- Financial performance indicators
  - Income, costs and profitability as an average per boat
- Economic impact of the fishery
  - Direct and flow-on economic benefit created as a result of the operations of the fishing industry
- Economic rent

Cost Shares (Northern Zone)

Fee per Licence Holder, SA Rock Lobster Fisheries

Financial Performance Indicators – Income and Profit (Northern Zone)

Fee as a Proportion of GVP, SA Rock Lobster Fisheries

Financial Performance Indicators – Return on Investment (Northern Zone)
**Rock Lobster Exports from SA, Proportion of Total Catch, 1995/96 to 2011/12**

**Rock Lobster Exports from SA by Product Type, 1995/96 to 2011/12**

**Rock Lobster Exports from SA by Destination Country, 1995/96 to 2011/12**

**Survey**
- **Eastern Zone**
  - Dominated by 1 business, that owns half the quota but no boats.
  - 2 completed surveys
- **West Zone**
  - Initially 8 licence holders indicated to Vic DPI they would participate
  - 6 completed surveys
  - Dislike of a series of quota cuts, cautious licence holders

**Survey**
- **Eastern Zone**
  - <1% of TACC
- **West Zone**
  - ~17% of TACC

**Exchange rates and SA Rock Lobster prices, 1997/98 to 2011/12**

**Catch and GVP**

<table>
<thead>
<tr>
<th>Year</th>
<th>Western Zone (tonnes)</th>
<th>Eastern Zone (tonnes)</th>
<th>Victoria (tonnes)</th>
<th>Western Zone ($)</th>
<th>Eastern Zone ($)</th>
<th>Victoria ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997/98</td>
<td>450</td>
<td>14,826</td>
<td>87</td>
<td>2,267</td>
<td>519</td>
<td>18,708</td>
</tr>
<tr>
<td>1998/99</td>
<td>450</td>
<td>14,826</td>
<td>87</td>
<td>1,972</td>
<td>555</td>
<td>18,525</td>
</tr>
<tr>
<td>1999/00</td>
<td>515</td>
<td>16,125</td>
<td>75</td>
<td>2,408</td>
<td>580</td>
<td>18,535</td>
</tr>
<tr>
<td>2000/01</td>
<td>554</td>
<td>16,825</td>
<td>73</td>
<td>2,068</td>
<td>627</td>
<td>22,111</td>
</tr>
<tr>
<td>2001/02</td>
<td>445</td>
<td>19,195</td>
<td>69</td>
<td>2,585</td>
<td>850</td>
<td>21,799</td>
</tr>
<tr>
<td>2002/03</td>
<td>428</td>
<td>17,210</td>
<td>70</td>
<td>1,874</td>
<td>482</td>
<td>18,389</td>
</tr>
<tr>
<td>2003/04</td>
<td>435</td>
<td>12,135</td>
<td>64</td>
<td>1,974</td>
<td>469</td>
<td>13,733</td>
</tr>
<tr>
<td>2004/05</td>
<td>419</td>
<td>12,274</td>
<td>64</td>
<td>1,952</td>
<td>471</td>
<td>14,028</td>
</tr>
<tr>
<td>2005/06</td>
<td>435</td>
<td>13,527</td>
<td>55</td>
<td>1,951</td>
<td>465</td>
<td>15,546</td>
</tr>
<tr>
<td>2006/07</td>
<td>325</td>
<td>12,820</td>
<td>51</td>
<td>2,081</td>
<td>578</td>
<td>14,581</td>
</tr>
<tr>
<td>2007/08</td>
<td>319</td>
<td>15,325</td>
<td>53</td>
<td>1,952</td>
<td>509</td>
<td>14,496</td>
</tr>
<tr>
<td>2008/09</td>
<td>241</td>
<td>14,722</td>
<td>41</td>
<td>2,075</td>
<td>292</td>
<td>13,987</td>
</tr>
</tbody>
</table>
A total of 20 responses were received which represented 8 per cent of the total active vessels in the fishery.
Catch and GVP

<table>
<thead>
<tr>
<th>Year</th>
<th>TAC (tonnes)</th>
<th>Value of Catch</th>
<th>TACC (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008/9</td>
<td>1,128</td>
<td>52</td>
<td>1,553</td>
</tr>
<tr>
<td>2009/10</td>
<td>1,403</td>
<td>59</td>
<td>1,553</td>
</tr>
<tr>
<td>2010/11</td>
<td>1,512</td>
<td>64</td>
<td>1,524</td>
</tr>
<tr>
<td>2011/12</td>
<td>1,427</td>
<td>46</td>
<td>1,524</td>
</tr>
</tbody>
</table>

GVP, Price and Catch

Financial Performance, 2010/11

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Gross Income</td>
<td>$849,500</td>
</tr>
<tr>
<td>Total Variable Costs</td>
<td>$544,287</td>
</tr>
<tr>
<td>Total Fixed Costs</td>
<td>$295,216</td>
</tr>
<tr>
<td>Total Gross Profit</td>
<td>$209,987</td>
</tr>
<tr>
<td>Total Operating Expenses</td>
<td>$185,180</td>
</tr>
<tr>
<td>Net Profit</td>
<td>$24,807</td>
</tr>
</tbody>
</table>

Licences

- The Government imposes a cost recovery levy of $110.20 per tonne per annum
- General Industry levy was $129.00 per tonne per annum
- Rock Lobster Industry levy was $106.00 per tonne per annum
- Total levy per tonne (average across nine zones) = $345.20
- Total levies paid = $964,356 (Approx 0.5% GVP)

Rent, 2010/11

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010/11</td>
<td>$65,190</td>
</tr>
</tbody>
</table>

Financial Performance – CRA 5, 2011/12

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Income</td>
<td>$83,924</td>
</tr>
<tr>
<td>Less Labor</td>
<td>$4,795</td>
</tr>
<tr>
<td>Less Cash Costs</td>
<td>$53,824</td>
</tr>
<tr>
<td>Less Depreciation</td>
<td>$6,984</td>
</tr>
<tr>
<td>Less Operational Cost of Capital (50%)</td>
<td>$5,774</td>
</tr>
<tr>
<td>Economic Rent</td>
<td>$8,190</td>
</tr>
</tbody>
</table>

New Zealand
### Summary, 2011/12

<table>
<thead>
<tr>
<th></th>
<th>South Australia</th>
<th>Tasmania</th>
<th>Victoria</th>
<th>New Zealand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (t)</td>
<td>4,284</td>
<td>2,105</td>
<td>1,070</td>
<td>262</td>
</tr>
<tr>
<td>Gross Value of Production ($m)</td>
<td>86.66</td>
<td>52.90</td>
<td>13.90</td>
<td>164.70</td>
</tr>
<tr>
<td>Average Price (HOS/kg)</td>
<td>19.60</td>
<td>14.60</td>
<td>14.92</td>
<td>53.31</td>
</tr>
<tr>
<td>Number of licensed operators</td>
<td>249</td>
<td>150**</td>
<td>121</td>
<td>255</td>
</tr>
</tbody>
</table>

* 2008/09
** Number of active licences

### Summary, 2011/12

<table>
<thead>
<tr>
<th></th>
<th>South Australia</th>
<th>Tasmania</th>
<th>Victoria</th>
<th>New Zealand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Value of Production ($m)</td>
<td>279.00</td>
<td>197.00</td>
<td>35.00</td>
<td>333.00</td>
</tr>
<tr>
<td>Average Price (HOS/kg)</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Number of licensed operators</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

* 2008/09
** 2010/11
*** NE$5

### Economic Indicators for the Southern Rock Lobster Fisheries

Seafood CRC  
Southern Rocklobster Workshop  
28-29 May 2013  
EconSearch Pty
Appendix 2.4. WA Rock Lobster Fishery

**Economic effect of moving to Maximum Economic Yield in western rock lobster fishery**

**Nick Caputi**
Simon de Lestang, Peter Stephenson, Chris Reid, Alex Hepp & Jason How

Southern rock lobster workshop: 28 May 2013

---

**Background**
- Australia's most valuable single species fishery (US$200-300m)
- First fishery MSC certified
- Map?

---

**Economic effect of moving to Maximum Economic Yield in Western Australian rock lobster fishery**

**Nick Caputi**
Chris Reid, Simon de Lestang, Peter Stephenson

World Fisheries Congress, Scotland: 10 May 2012

---

**Overview**
1. Maximum economic yield (MEY) assessment
   - 2008 under effort control
2. Catch/effort reductions due to low recruitment
   - 2008/09 & 2009/10 (effort control)
   - 2010/11 & 2011/12 (TTO control)
   - Economic assessment of effort reductions
   - Assess effect of implementing MEY
3. MEY assessment under quota control (2013)
   - Harvest strategy
   - 2014-15 quota

---

**Economic effect of effort reductions and Maximum Economic Yield**

**Nick Caputi**
Chris Reid, Simon de Lestang, Peter Stephenson

November 2011

---

**Seafood CRC project**
- 3 year project
- Objectives
  1. Estimate catch & effort to achieve optimum economic yield
  2. Evaluate intra-annual market-based management strategies
  3. Evaluate economic effect of current & proposed management changes
Maximum Economic Yield (MEY) assessment 2008

- Maximise ‘profit’ over long-term (6 yr)
- ‘Profit’ = Revenue – Fishing Costs
- Fishing Costs
  - Fixed costs (vessel depreciation)
  - Variable costs (bait, fuel, crew)

Costs in MEY assessment

- Assessing profits to economy overall not just fishing operators/unit owners
- Cost included:
  - Resources directly producing fishing effort
  - Vessel, bait, fuel, crew
- Assessing level of effort required if you were sole owner of fishery

Western rock lobster MEY Assessment (2008): step 1

1. Stock assessment model
   - Puerulus abundance: catch prediction 3-4 yr
   - Predicted future recruitment in model NOT average recruitment
   - Predicted catch (2009/09–2013/14) at different levels of fixed effort
**Stock assessment model:**
Expected Aver. Catch (6 yr) v Effort

- Prediction of recruitment 4 of 6 years
- Long-term: 50% effort decline = ~10% catch decline

**Average NPV Profit v. Effort:**
(sensitivity analysis)

**Additional Profit (6 yr) v. Effort**

- Additional $46 million pa at MEY

**MEY Sensitivity analysis:**
Prices & cost

- Max Profit (MEY) at 30-50% of 2007/08 effort
- Costs up 20%: MEY effort decreases ~10% (i.e. 20-40% of 2007/08 effort)
- Prices up 20%: MEY effort increases ~10% (i.e. 40-60% of 2007/08 effort)

**Average NPV Profit v. Effort**
(fixed lobster price)
**Effort reductions: 2008/09 – 2010/11**
- Effort reduction due to low puerulus settlement
- Before poor year classes entered fishery
- Protect future spawning stocks
- Ensure carryover into poor catch years
- Nominal effort reduction
  - 2008/09: 55% of 2007/08 effort
  - 2009/10: 27% of 2007/08 effort
  - 2010/11: 29% of 2007/08 effort (ITQ)
- MEY effort (30-50% of 2007/08 effort)
- 35-40% reduction in vessels
- Fishers made commercial decisions (sell/lease out or buy/lease in entitlements)
- No government compensation

**Rock lobster price (USD) v. catch**
- Higher % catch sold live with lower catch
- MEY assessment assumed fixed price

**Effect of effort reduction on: catch, effort, catch rate**

**Catch, effort changes v. 2007/08 effort**

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual Profit (1000s)</th>
<th>Vessel No.</th>
<th>Actual Catch (t)</th>
<th>Predicted Catch: 07/08 effort</th>
<th>Catch rate kg/potlift</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/08</td>
<td>8106</td>
<td>460</td>
<td>8942</td>
<td>8942</td>
<td>1.1</td>
</tr>
<tr>
<td>08/09</td>
<td>4576 (-44%)</td>
<td>395 (-14%)</td>
<td>7594 (-24%)</td>
<td>7594</td>
<td>1.7</td>
</tr>
<tr>
<td>09/10</td>
<td>5204 (-73%)</td>
<td>294 (-36%)</td>
<td>8969 (-34%)</td>
<td>8923</td>
<td>2.7</td>
</tr>
<tr>
<td>10/11</td>
<td>2380 (-71%)</td>
<td>279 (-39%)</td>
<td>7433 (-26%)</td>
<td>7433</td>
<td>2.3</td>
</tr>
</tbody>
</table>

**Beach Price**
- ACU price impacted by landings, exchange rates and quota
- 56 premium under quota (product quality, high % live export, reduced peak catch, high grading, extended season)

**Average NPV Profit v. Effort**
- Additional £70 million pa at MEY for variable price
Change in revenue, costs, ‘profits’ v. maintaining 2007/08 effort

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue decline (Sm)</th>
<th>Cost decline (Sm)</th>
<th>Change Profit (Sm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008/09</td>
<td>31</td>
<td>-44</td>
<td>+13</td>
</tr>
<tr>
<td>2009/10</td>
<td>42</td>
<td>81</td>
<td>+49</td>
</tr>
<tr>
<td>2010/11</td>
<td>(&lt;30)</td>
<td>(&gt;90)</td>
<td>(&gt;60)</td>
</tr>
</tbody>
</table>

*Revenue higher than predicted with fixed price
*Improved economic performance after 1-2 yr

MEY analysis

1. Estimate Catch and effort from a range of LPH values
2. For each LPH scenario
   - Determine Income (Catch x [South Price])
   - Determine Costs
     - Expenses (per vessel x 5 vessels) = $60,000 - $100,000
     - Profit (profits x 5 vessels) = $15,000 - $20,000
   - Profit margins (range)
3. Profit (Income - Costs)
4. Net Present Value (future profits discounted @ 10% year^-1)
5. MEY - range of LPH scenarios whose NPV is the greatest

*Relatively robust against assumptions

MEY assessment 2013: quota controls

- Harvest rate:
  - Legal proportion harvested (LPH)
  - Catch/Average legal biomass
- Assess different levels of LPH (5 years)
- Outputs per year:
  - Catch, effort & catch rate
  - Catch value (GVP)
  - MEY Profit = GVP - Costs (discounting future profits)
  - Egg production

Vessel Numbers per area

MEY sensitive to assumptions about vessel numbers (sensitivity analysis)

Related to effort levels (fishing)

Secondary objective (socio-economic)

- Tradeoff between catch, effort, CUE, GVP, costs, employment

Additional information (Social benefits?)

- Wide range of catch falls within ‘MEY’ range
- Significant variation in catch, CUE, vessel numbers
- Increasing GVP = social benefits with greater GVP (more employment boats / community benefits etc.)
Example of Social/Economic information

1. Target MEY is maintains Industry's profitability
2. Within MEY target large GVP to maximise benefits to state.

Southern Assessment (example)
Current levels of protection (77 mm, Serson and max day)

Example of Social/Economic information
(Current input controls)

<table>
<thead>
<tr>
<th>LPH</th>
<th>TACC</th>
<th>MEY</th>
<th>GVP</th>
<th>CPUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.20</td>
<td>3110</td>
<td>$0.32</td>
<td>$110</td>
<td>1.60</td>
</tr>
<tr>
<td>0.25</td>
<td>3990</td>
<td>$0.45</td>
<td>$148</td>
<td>1.40</td>
</tr>
<tr>
<td>0.30</td>
<td>4880</td>
<td>$0.51</td>
<td>$175</td>
<td>1.42</td>
</tr>
<tr>
<td>0.35</td>
<td>5750</td>
<td>$0.60</td>
<td>$194</td>
<td>1.30</td>
</tr>
<tr>
<td>0.40</td>
<td>6650</td>
<td>$0.71</td>
<td>$211</td>
<td>1.30</td>
</tr>
<tr>
<td>0.45</td>
<td>7550</td>
<td>$0.77</td>
<td>$236</td>
<td>1.28</td>
</tr>
<tr>
<td>0.50</td>
<td>8560</td>
<td>$0.82</td>
<td>$254</td>
<td>1.30</td>
</tr>
<tr>
<td>0.55</td>
<td>9580</td>
<td>$0.87</td>
<td>$276</td>
<td>1.35</td>
</tr>
</tbody>
</table>

Target = Where profit (economic) and GVP overlap

2014/15 TACC (using socio-economic target)
(changing input controls)

- Target maintains a similar TACC range under different controls but keep Tar Spot and herring female rules

Example using same TACC (6500 t)

- Remove max size or setose (cpue increases ~ 5%)
- Change min size (76 mm) (cpue increases ~ 7%)
- Remove max size & setose (cpue increases ~ 2%)
- Remove min & setose & (76 mm) (cpue increases ~ 5%)

- Significant economic benefit to industry ($1.5 m)
- High grading?
- Whale interactions?

Summary

- MEY assessment: economic optimum ~ 30-50% of 2007/08 effort
- Effort reductions due to low puerulus
- Economic effect of effort reductions
  - Fishery ‘Profit’ increase $120-50m pa
- MEY assessment under catch quotas
  - Harvest rate (LPH ~0.40)
- Socio-economic target considered
- Spawning stock above threshold level
- Reduced ecosystem effect
- Social cost: reduced employment
General issues MEY

- Advantages
  - Lower fishing effort at MEY
  - Lower fishing costs
  - Higher catch rates
  - Higher profits
  - Higher spawning stock
  - Reduced ecosystem effects on bycatch, habitat, protected species, etc

- Disadvantages
  - Social cost
  - Reduced vessel numbers, employment
  - Slightly lower catch

Future research

- Costs 2010/11 (individual catch limits)
  - Effort distribution by month changed
  - Lobster prices, bait & fuel costs changed

- Economic assessment 2010/11

- Assess MEY under catch quota
  - Effect of fixed vs. variable quota

- Assess different monthly distributions of catch & effort on MEY
  - Sensitivity analysis (what if scenarios)

- Industry input into assessment
Appendix 2.5. CRA8 Fishery

**THE CRA8 FISHERY**

Malcolm Lawson

---

**Management of Rock Lobster Fisheries In New Zealand**

- Quota Management System (QMS) since 1994
- Eligibility requirements when QMS was introduced
- QMS operates on quota shares and ACE – Annual Catch Entitlement
- 100 million shares are allocated for each quota management area. Quota holdings are expressed in shares
- Quota shares have a weight equivalent
- Quota shares generate ACE. Which is expressed in kieorgams

---

**Allocation Formula**

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Allowable Catch (TAC)</td>
<td>1053 t</td>
</tr>
<tr>
<td>Non-Commercial Allowances</td>
<td></td>
</tr>
<tr>
<td>- Customary</td>
<td>30 t</td>
</tr>
<tr>
<td>- Recreational</td>
<td>33 t</td>
</tr>
<tr>
<td>- Other fishing related mortality</td>
<td>28 t</td>
</tr>
<tr>
<td>Total Allowable Commercial Catch (TACC)</td>
<td>962 t</td>
</tr>
</tbody>
</table>

---

**NZ Rock Lobster 2007 – 2012 Statistics NZ**

<table>
<thead>
<tr>
<th>Component</th>
<th>2007 (tonnes)</th>
<th>2012 (tonnes)</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>TACC</td>
<td>121</td>
<td>223</td>
<td>82</td>
</tr>
<tr>
<td>Export Destinations by Value (NZ$M) All Species</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>117</td>
<td>353</td>
<td>+202</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>179</td>
<td>119</td>
<td>-32</td>
</tr>
</tbody>
</table>
**CRA8 Fishery Facts**
- Largest rock lobster Quota Management Area in NZ
- Total Allowable Commercial Catch is largest of all rock lobster QMAs – 34%
- Largest geographically
- Most valuable QMA across all inshore species in NZ
- Market-driven fishery

**CRA8 Participants**
- Quota Share Owners
  - Fishing
  - Non Fishing
    - Investors
    - Ex Fishermen
- ACE Fishermen
- Processors/Exporters

**CRA8 Rules**
- Minimum legal size applies
- Females carrying eggs cannot be taken
- Escape gap size in pots applies
- Minimum 3 t ACE required
- Full 12 month season
- No pot limits
- Females can be taken when not carrying eggs
- Males can be taken at all times
- High-grading is allowed

**Quota Share Owners - Fishing**
- Hold a large secure capital base
- Almost all purchase additional ACE annually
- Commonly enter into “tonne for tonne” deals with processors
- Have negotiating power
- Ability to seek and sell at best prices

**CRA8 Profile**
- 118 quota share owners
- 87 vessels
- 1 (soon to be 5) processing/export companies
- Current ACE purchase cost: ~ $52K per tonne
- Current quota share purchase cost: ~ $600K per tonne equivalent
- Average beach price: $68K - $75K per tonne
- Sales of quota shares are infrequent
- Operated since 1998 under decision rules (Operational Management Procedures)

**Quota Share Owners - Non Fishing**
- Investors
  - Aiming for best Return On Investment (ROI) - 1%
  - Capital gain possible through:
    - Increase in TACC (weight value of shares)
    - Increase in ACE price
    - Increase in share trading price

- Ex Fishermen
  - Some look for maximum ROI
  - Others take a benevolent approach:
    - discounted ACE price to new entrants
ACE Fishermen
- Reliant on access to ACE on an annual basis to remain in the fishery
- Subject to market rates for ACE
- Limited capital base
- Little negotiating power
- The most economically exposed sector

The Case for Fishermen to Purchase More Quota Shares
- Current price of quota shares is ~ $600K per tonne equivalent
- Current ACE price ~ $52K per tonne
- With contribution of some capital towards the purchase price
  - annual repayments are similar to ACE price
  - ability to use it in "tonne for tonne" deal
- Additional capital asset vs "lease"

Processors/Exporters
- All own quota shares directly or through shareholding companies
- Have large capital base
- Financial ability to secure ACE from non fishing quota share owners
- Large influence on ACE prices
- Ability to substantially increase throughput via "tonne for tonne" deals
- Ability to finance private ACE transactions for fishermen
- Payment/Repayment of ACE recovered from beach price

Bio-Economic Modelling
- Carried out in 2005
- During period of rapid rebuild of the fishery
- Biological model projected catches and CPUE but did not project costs or revenues
- Marrying of economic model to biological model enabled evaluation of current management strategy on net industry profitability
- 20 year projections of catch and effort vs revenues and costs

Ngai Tahu Seafoods Development Pool
- Quantity of ACE placed into development pool
- Divided amongst participants
- Also provide wet fish ACE to secure year round economically viable portfolio for participants
- 5 year period - subject to conditions - provides certainty for investment in boat/year
- ACE is at discount rate - 30% of beach price
- Expectation that participants will demonstrate investment in the fishery

However
- Results are only valid while the current management strategy is in place
- Any change in indices, parameters, rebuild targets, timeframes etc of the OMP invalidate the bio-economic modelling
What Has Happened? 2002 - 2012

- CPUE: 0.94W/kg - 2.8 kg (highest 2003: 3.82 kg)
- TACC: 35 t - 952 t (highest 2009/10 1019 t)
- No. of Vessels: 69 - 65
- Average Catch Per Boat: 8.2 t - 4.1 t
- No. Of Processors: 3 - 4
- Quota Trading Price: $NZ280K - $NZ540K per tonne
- ACE Purchase Price: $NZ160K - $NZ290K per tonne

Landing Comparisons by Month

Shift of Effort

<table>
<thead>
<tr>
<th>Month</th>
<th>05/06</th>
<th>06/07</th>
<th>07/08</th>
<th>08/09</th>
<th>09/10</th>
<th>10/11</th>
<th>11/12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>0.6</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>13</td>
<td>13</td>
<td>15</td>
<td>14</td>
<td>34</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>46</td>
<td>41</td>
<td>37</td>
<td>39</td>
<td>28</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>23</td>
<td>21</td>
<td>22</td>
<td>21</td>
<td>28</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>32</td>
<td>35</td>
<td>28</td>
<td>26</td>
</tr>
</tbody>
</table>

Stock Assessment and Management Procedure Review

Considerations

- Has the current MP been successful?
  - provided certainty for the fishery
  - provided certainty for business planning
  - enabled profitability
- Plateau level
- TACC vs CPUE
- Plateau parameters
- Intermediate step: 5% at 2.6 kg
- Annual operation
- Retention of relativity between CPUE and plateau parameters
It's Not All About Quantity
Abundance Provides The Opportunity To
Maximize Financial Returns - Where
Providing What The Market Wants
And When

- Increased returns through targeting size, areas and time of year
- Reduced costs through high CPUE
- Confidence – business planning
- Reinvestment
- Additional benefits – high breeding biomass
Appendix 2.6. Bioeconomic decision support tools for Southern Rock Lobster

Seafood CRC Economics project: “Bioeconomic decision support tools for Southern Rock Lobster”

Project Overview
Presented to RL Workshop
Downtowners, Melbourne
28 May 2013

Goal of the Seafood CRC Bioeconomics Project

- The idea of this Seafood CRC project is to focus on that objective of maximising economic return to the fishery.
- Specifically, the task is to build economic analysis tools to test management ideas for enhancing lobster fishing industry profit.

Two goals of fishery management:

- Sustainability: Making sure, in biological terms, that the lobster population remains healthy. In SA, most management effort has been focused on sustainability.
- Economic return: To make sure, in economic terms, that the fishery achieves the highest possible economic output, as profit, from sustainable exploitation of that resource.

Seafood CRC Economics project: “Bioeconomic decision support tools for Southern Rock Lobster”

South Australian Lobster Fishery Management Plan Objectives:

- The Management Plan states its 3rd objective as follows:
  Profitability
- Decision rules that achieve stock recovery produce higher catch rates, and
- Higher catch rates lead to higher profitability.

Project Overview

- This Seafood CRC bioeconomics project will involve
  - 3 principle states that cannot interact: size, age, and stock
  - Using economic data on costs and prices
  - Combine these with the existing length-based model used for stock assessment
- Project Goal: To build a tool that can estimate economic outcomes (average profit to fisher) in addition to biological performance indicators, under various management harvest strategies.
- Industry, PIRSA, and scientists, and more specifically, industry bodies and the Research Sub-Committee, can propose specific strategies.
- The model can be used to test their performance.

Use LenMod

- The project will use a well-developed fishery modeling tool we currently deploy for yearly stock assessment. This model looks at the lobster population and the fishery harvest.
- This length-based model (ROCK), written by André Pent and further developed and maintained by SARDI and UTAS, is used in all 3 states for stock assessment.
- This assessment model describes the fishery population dynamics, which is the hardest part of the bioeconomic modeling task.

32
Extending fishery model to account for economics

- To extend the population model to evaluate different harvest strategies, with higher profit as a principal objective, two economic sub-models are added:
  - price per kg landed:
  - costs of harvesting that product:
  - Gross revenues from landed seafood product are computed directly as catch (by month and lobster size) times price.
  - Profit is gross revenues minus fishing costs.

Fishing Costs

- In SA, we are fortunate to have an extensive high-quality data set of fishing costs, from EconSearch interviews with the fishing industry.
- Based on 3-yearly surveys of fisheries, these are updated yearly in annual economic reports on the two fisheries (SZ and NZ RL).
- EconSearch reports break costs down between fixed and variable:
  - only variable costs are reduced when fewer pots are set in a given season.
- An EconSearch economic survey was also carried out in Tasmania this year.

Price Data

- Price data, from processors, are gathered and reported by SARDI statistics as a monthly mean price.
- Monthly price data allow the analysis of harvest strategies to account for:
  - monthly variations in which catch is taken, and
  - time closures.
- Price is broken down by different lobster size grades, using fisher-suggested price splits.

Harvest Strategy Evaluation

- A range of harvest strategies can be tested using this decision-support tool.
- Strategies that can be evaluated include:
  - different decision rules for setting the yearly TACC.
  - seasonal closures (for lobsters).
- Scenarios can also be tested for:
  - What if lower price comes out of China?
  - What if recruitment stays lower than average for a while?
  - What if fuel costs rise?
- In these scenarios, how can we get the best economic return?

Price by size

- Data are not gathered regularly about size-dependence of price.
- Analysis of Tasmanian processor price data by Eriko Hoshino also show a price split at 2kg.
- We use the monthly average price from processors, and modify it to incorporate the price split.
- Under one scenario for price split, it is assumed:
  - In SZ, 25% lower price for lobsters > 2 kg
  - In NZ, 20% lower price for lobsters > 2 kg.

How long-term average profit is calculated

- For each strategy, we compute the long-term profit over the next 20 years.
- Profits from years farther into the future are given less weight (they’re ‘discounted’) in the 20-year sum of profits.
- This overall discounted profit sum (net present value or NPV) is the principal measure of profit that we will report back to the steering committee for each strategy tested.
Current project status

- The lobster fishery economic modelling project started in July 2011.
- Final report is due at the end of 2013.

4 Policies

- We first put the model through its paces by testing broadly different approaches to managing a fish stock.
- This compares the performance of different methods or (call them) policies for managing this lobster population:
  - size policies: min and max size limits
  - constant quotas
  - quotas that vary so as to mimic constant exploitation rates.

Projection Model Verification

- To verify that the projection model is in full agreement with the assessment model, we made sure that the projections give the same outputs as the historical estimates.
  - plug the same Recruitment time series.
  - assume the same catches.
- This verified that the projection model recreates the past going forward if the same inputs are used in the future as in the past.

4 Policies: Size limits

- For the size strategies, we assume no catch or effort controls other than a yearly maximum number of potlifts:
  - SZ: yearly effort max = 1,675,928 potlifts
  - NZ: yearly effort max = 567,322 potlifts
- The ‘default’ run for the 4 policy comparison uses this maximum potlift numbers per season with the current min size of 98.5 mm CL.
- The default strategy is used in the scatterplots and elsewhere as the basis for comparison.

Overview of Results in this Talk

- We consider 3 sets of strategies in what follows:
  - Comparing 4 broadly different ways (‘policies’) to manage a fish stock,
  - Comparing the harvest control rule adopted in the SZ management plan with the best performing of the 4 policies above,
  - 98.5 minimum size in the NZ.

Net Present Value for 4 Policies
Results for size policies: Min limit
- A 5 mm increase in the minimum size limit to 103.5 gave generally positive outcomes:
  - Increase egg production by 23%
  - Increase long-term average catches by a bit, ~4%
  - There is a yield-per-recruit trend
  - A quite substantial increase in NPV over baselines of about 30%
- The substantial increase in NPV results from small increases in revenue (or small reductions in costs), giving a bigger change in their difference, which is profit.

Why do size policies have relatively modest impact?
- Effort maxes out at the upper limit.
- So variable costs also reach high levels.
- But CPUE biomass has no chance to recover;
  total catches stay quite ordinary.
- So yearly profits are generally a lot lower than for strategies which lower exploitation rates because costs remain high.
- Also, the benefit as stock recovery is relatively modest.

4 Policies: Size policies do less well

Profit (NPV) versus Variation in Yearly Catch for 4 Policies

Profit (NPV) versus Catch for 4 Policies
Summary for Policies: Comparing constant TACC w an HCR that seeks a constant exploitation rate.
- Policies that vary quota to mimic constant exploitation rate have higher financial return.
- They also give higher catches overall. This occurs with model stock biomass steadily rising at these (lower) levels of exploitation.
- But those policies which vary yearly quota in proportion to abundance have high yearly variation.

Net Present Value: Comparing current SZ HCR w a linear HCR both seeking a constant exploitation rate.

Lowering Size Limit in NZ to 98.5.
- NZ representatives on the Res Sub Comm requested that we test a lower size limit.
- 98.5 is the minimum size in the SZ.

Summary: SZ HCR and a linear HCR both seeking constant exploitation rate.
- The model expects CPUE to generally rise under both Current HCR and a purely linear rule.
- Current HCR (the current management plan) has the advantage of lower yearly variation in TACC.
- Overall, the current HCR performed well. The levels of exploitation seem about right for these model-sampled historical (1993-2010) levels of recruitment.
Future Work
- The SA rock lobster fishery management plans are scheduled for review in 2014.
- This project could potentially be extended for use during that review.
- It fulfills stated objectives of the Management Plans, profitability with sustainability, as noted earlier.
- It also falls within Objective 2 of SRL Ltd’s Strategic Plan.

Acknowledgments
We thank SRL Ltd, the Seafood CRC, Caleb Geach, Andre Punt, SARIAC, SEPIFA, NZRLFA, lobster fishermen in Tasmania and South Australia, and by the 2010/11 NZ and NZ management working groups.

Lowering Size Limit in NZ to 98.5:
Outcome summary
- In the NZ, changing size limits did have a measurable effect.
- In the NZ, lowering size has minimal impact.
- Possible reasons:
  - exploitation rates are lower,
  - NZ length selectivity is slightly (~10-15%) lower at those smaller sizes 98.5 than 105, and
  - taking a few more smaller lobsters means slightly higher price, but a slightly lower catch in weight.
Proposal for Extension of Project
- Industry may wish to support this potential continued use of this modelling tool to find strategies that can enhance fishery-wide profitability.
- If so, we will submit a pre-proposal to the SRL RD&E committee who will review proposals in July.
- Q: Thoughts?
  - On this work, and
  - the idea of its extension.

What industry can do to participate
- This project is designed to involve industry at several stages.
- One possible contribution would be to help us obtain more detailed information about the price split(s).
- A second important role is to suggest management strategies for testing.
  - Do you have any ideas for ways to manage these fisheries in such a way as to enhance industry profitability?

SA Steering Committee
- Originally the SA Rock Lobster Steering Committees were the old management working groups.
- The SA project seeks a new Steering Committee currently.
- Discussions will be held with SRL in the near future, and will include consultation with the new SA R L MACC, to decide on a new form for the SA Steering Committee of this project.

What industry can do to (cont.)
- Economic survey: fishing costs.
- An important input to these models are the estimates of fishing costs.
- EconSearch is currently undertaking their survey of fishers (done every 3 years).
  - More participants improve economic information, about costs and profitability, that go into the models.

Current project status (cont)
- You may wish to begin developing ideas for harvest strategies to test.
- Some strategies that these modelling tools can test, and compare, for how much long-term revenue they generate, include
  - different fixed levels of TACC
  - different versions of the existing industry-proposed harvest control rule, now implemented in both zones.

Acknowledgments
We thank SRL Ltd, the Seafood CRC, Caleb Gardner, SEPF, NZRLFA, and lobster fishermen in Tasmania and South Australia.

This project was unanimously supported in both NZ and S2 management working groups.
Future Work

- SRL Ltd’s Objective 2 states:

Objective 2: Optimize fisheries production

Priority issues to be addressed under this Objective will be:

- 1. Harvest strategies to optimize returns through improved management.
- The first key Deliverable under this Objective is
- 1. Bio-economic modeling to identify harvest strategies that maximize profitability within sustainability limits.

Results for size policies: Max limit

- A max size limit (145, 160 & 175 mm CL), above which lobsters are returned to the water, was the worst performing policy.
- It gave:
  - Nearly identical egg production as the baseline since females never reach these maximum sizes.
  - Lower catch from throwing back large males.
  - Thus lower profit (as lower TIPV).
  - (Nearly) 50% lower to a maximum size limit of 145 mm.

Steering Committee

- The selection of which strategies to evaluate lies with the project Steering Committee.
- The Steering Committee will receive the results and pass these back along to fishers.
- The Tasmanian Steering Committee has been serving in that role for several years now.
- The new SA RL MAC Research Sub-Committee will serve as the project Steering Committee.
Appendix 2.7. New Zealand Perspective

Catches used in 5 year projections – based on current TACC and current estimates of removals

<table>
<thead>
<tr>
<th>Scenario</th>
<th>commercial</th>
<th>recreational</th>
<th>illegal</th>
<th>illegal</th>
<th>customary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1</td>
<td>350</td>
<td>105</td>
<td>5</td>
<td>49</td>
<td>10</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>350</td>
<td>110</td>
<td>3</td>
<td>49</td>
<td>10</td>
</tr>
</tbody>
</table>

TAC 467 t.

Customary 40 t.

Amateur 40 t.

Illegal 37 t.

COMMERCIAL 399 t.

2012-13 Season Review

Catch - Current vs Last Year-to-date - April Stocks

From 1-Apr-2011 to 31-May-2012 and
From 1-Apr-2012 to 31-May-2013

Date of Report 19-Apr-2013

<table>
<thead>
<tr>
<th>Fishstock</th>
<th>TACC</th>
<th>Last Year</th>
<th>This Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSRA1</td>
<td>133,062</td>
<td>130,447</td>
<td>130,915</td>
</tr>
<tr>
<td>CSRA2</td>
<td>236,683</td>
<td>228,896</td>
<td>232,986</td>
</tr>
<tr>
<td>CSRA3</td>
<td>105,300</td>
<td>163,918</td>
<td>192,139</td>
</tr>
<tr>
<td>CSRA4</td>
<td>451,950</td>
<td>466,280</td>
<td>466,049</td>
</tr>
<tr>
<td>CSRA5</td>
<td>350,000</td>
<td>349,951</td>
<td>349,959</td>
</tr>
<tr>
<td>CSRA6</td>
<td>340,000</td>
<td>359,478</td>
<td>349,394</td>
</tr>
<tr>
<td>CSRA7</td>
<td>53,460</td>
<td>46,653</td>
<td>53,856</td>
</tr>
<tr>
<td>CSRA8</td>
<td>962,000</td>
<td>981,189</td>
<td>987,346</td>
</tr>
<tr>
<td>CSRA9</td>
<td>47,008</td>
<td>48,968</td>
<td>47,003</td>
</tr>
</tbody>
</table>

Quota Shares Traded

Quota Share Transfer Prices Year-to-date - April Stocks

From 1-Apr-2012 to 31-May-2013

<table>
<thead>
<tr>
<th>Fishstock</th>
<th>Quantity Traded (shares)</th>
<th>Total Number</th>
<th>Low</th>
<th>Average</th>
<th>High</th>
<th>Calculatio n Number</th>
<th>Average 6 per tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSRA1</td>
<td>655,959</td>
<td>2</td>
<td>$0.95</td>
<td>$0.98</td>
<td>$1.01</td>
<td>14</td>
<td>$608,432.49</td>
</tr>
<tr>
<td>CSRA2</td>
<td>657,286</td>
<td>1</td>
<td>$0.95</td>
<td>$0.98</td>
<td>$1.01</td>
<td>14</td>
<td>$608,432.49</td>
</tr>
<tr>
<td>CSRA3</td>
<td>12,623,247</td>
<td>28</td>
<td>$1.03</td>
<td>$1.70</td>
<td>$3.94</td>
<td>24</td>
<td>$369,246.95</td>
</tr>
<tr>
<td>CSRA4</td>
<td>6,539,074</td>
<td>4</td>
<td>$0.95</td>
<td>$0.65</td>
<td>$1.19</td>
<td>4</td>
<td>$101,083.33</td>
</tr>
<tr>
<td>CSRA5</td>
<td>2,714,072</td>
<td>17</td>
<td>$4.23</td>
<td>$5.14</td>
<td>$5.96</td>
<td>15</td>
<td>$334,729.73</td>
</tr>
</tbody>
</table>

Annual Catch Entitlements Traded

ACE Transfer Prices Year-to-date - April Stocks

From 1-Apr-2012 to 31-May-2013

<table>
<thead>
<tr>
<th>Fishstock</th>
<th>Total Traded (kg)</th>
<th>Total Number</th>
<th>Low</th>
<th>Average</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSRA1</td>
<td>229,074</td>
<td>104</td>
<td>$20,490.20</td>
<td>$35,828.46</td>
<td>$79,024.30</td>
</tr>
<tr>
<td>CSRA2</td>
<td>350,570</td>
<td>109</td>
<td>$22,400.00</td>
<td>$26,144.92</td>
<td>$35,000.00</td>
</tr>
<tr>
<td>CSRA3</td>
<td>335,012</td>
<td>112</td>
<td>$28,169.00</td>
<td>$42,742.68</td>
<td>$52,000.00</td>
</tr>
<tr>
<td>CSRA4</td>
<td>775,712</td>
<td>235</td>
<td>$27,627.00</td>
<td>$56,184.80</td>
<td>$70,499.99</td>
</tr>
<tr>
<td>CSRA5</td>
<td>450,351</td>
<td>139</td>
<td>$22,030.00</td>
<td>$43,687.10</td>
<td>$55,520.00</td>
</tr>
<tr>
<td>CSRA6</td>
<td>627,586</td>
<td>234</td>
<td>$22,000.00</td>
<td>$47,360.25</td>
<td>$56,000.00</td>
</tr>
<tr>
<td>CSRA7</td>
<td>126,978</td>
<td>65</td>
<td>$22,012.00</td>
<td>$47,266.50</td>
<td>$55,000.00</td>
</tr>
<tr>
<td>CSRA8</td>
<td>1,263,731</td>
<td>391</td>
<td>$22,012.00</td>
<td>$47,266.50</td>
<td>$55,000.00</td>
</tr>
<tr>
<td>CSRA9</td>
<td>76,658</td>
<td>88</td>
<td>$23,025.30</td>
<td>$42,470.98</td>
<td>$55,000.00</td>
</tr>
</tbody>
</table>

AREA CLOSURES

Impacts on commercial rock lobster fishing ‘buffered’ by high levels of stock abundance

“Good thing/bad thing”

Partnerships and Commitments
Appendix 2.8. Improving economic performance: findings of an Australian Seafood CRC study

**Improving economic performance: findings of an Australian Seafood CRC study**

Associate Professor Tim Ward
September 2013

**Guiding Principles of FPIs**

- Commercial fishing is a business and should create wealth
- Ecological sustainability is necessary, but **NOT** sufficient, for commercial fisheries to generate sustainable income and create wealth
- Community sustainability is necessary for sustainable wealth creation

**Objectives**

1. Assess economic performance and identify impediments to wealth creation in CRC fisheries – prawns, SRL, abalone (Anderson analysis, economic evaluation)

2. Describe and evaluate systems that have been established to improve the economic performance of successful fisheries (CRAB, WAFU)

3. Identify practical opportunities for overcoming impediments to wealth creation and improving economic performance (stakeholder workshops, bio-economic model – related CRC project)

**Two parts – outputs and inputs**

1) Performance Indicators of wealth creation and accumulation (outputs)
   - 62 components, 11 dimensions

2) Performance Factors that enable wealth creation (inputs)
   - 45 components, 8 dimensions

Components – categorical measures 1-5

5 = very good
1 = very poor

**Fishery Performance Indicators**

James L. Anderson\(^1\) and Chris Anderson\(^2\)
University of Rhode Island

\(^1\) Narragansett, \(^2\) University of Washington

Prepared for The International Coalition of Fisher Associations (ICFA), Moscow, 2000

**SZRLF – outputs, indicators of wealth creation**
**SZRLF - FP1s**

- FP1s capture issues in SZRLF quite well
- Performance
  - Stock OK?
  - Harvesting flexibility limited (season, gear)
  - Excess capacity is high
- ROI (Asset/sellings)?

**Constraints**
- Low harvest organisation influence on business and marketing
- Limited transparency of landings prising system
- Limited vertical integration
- Highly dependent on a single market

**SZRLF - Economic analysis**

**Economic Rent - SA Lobster Fisheries**

NB: Nominal $, not equivalent for CPI

Dr. Lisa Ripper
NZ CRA8 FISHERY
Rules
- Quota since 1993
- Minimum legal size
- Females carrying eggs cannot be taken
- Escape gaps in pots
- Full 12 month season
- No pot limits
- Females taken when not carrying eggs
- Males can be taken at all times
- High-grading is allowed

Take home message from CRA8
It's Not All About Quantity
Abundance Provides the Opportunity To
Maximise Financial Returns Through Providing
What The Market Wants And When
- Increased returns through targeting size, areas and time of year
- Reduced costs through high CPUE
- Confidence – business planning
- Reinvestment
- Additional benefits – high breeding biomass

Conservative Decision Rules after 1997

WA Rock Lobster - Puerrorus settlement
- Catch prediction 3-4 years ahead
- Early management intervention

Effect of effort reduction on:
catch, effort, catch rate
- 35-40% reduction in vessels
- Catcher made commercial decisions (all hands/hears)
- No government compensation
- MEY whet (15-20% of 2007/08)
- From 2013

Highly successful rebuilding strategy
1. Target MEY to maximise industry’s profitability
2. Within MEY target larger GVP to maximise benefits to state

Workshop Conclusions

- Exploitation rate of about 0.3 seems to be a good target for lobster fisheries
- Current exploitation rates too high in several Australian fisheries
- Lower catches can mean higher profit
- Trade-off between profitability (industry benefit) and GVP (community benefit)
- Economic data is critical to optimising fishery performance – most Australian fisheries have poor economic data
- Bio-economic models are a valuable tool but need good data
- Model structure and inputs need to be tailored to specific circumstances
- Models should be re-run regularly to assess changing situations
- Harvest Strategies should include socio-economic PIs
Appendix 2.9. Using data in bioeconomic models to identify profitable harvest strategies

Using Data in Bioeconomic Models to Identify Profitable Harvest Strategies
Rick McSharry
SARDI Aquatic Sciences

How to achieve reliable management decision making
- So here’s the question: How to best manage these lobster fisheries?
  - It’s a question that matters—some management policies work a lot better than others.
  - We use tools to find fishery management strategies that enhance net financial return to the fishing industry.
  - Also to enhance:
    - egg production, and
    - total catch.

Increasing industry profit
- The goal of this work is to find ways to make the Jasus edwardsii fisheries in Southern Australia (SA & Tas) more profitable.
- The task of the project is to develop modelling tools to achieve that objective.
- This is not about individual fishing businesses. It’s about fishery management overall—size limits, and how to set quota.

South Australian Lobster Fishery Management Plan Objectives:
- The Management Plan states its 3rd objective as follows:
  - Profitability
    - Decision rules that achieve stock recovery produce higher catch rates; and
    - Higher catch rates lead to higher profitability.

How to achieve reliable management decision making
- So here’s the question: How to best manage these lobster fisheries?
  - It’s a question that matters—some management policies work a lot better than others.
  - We use tools to find fishery management strategies that enhance net financial return to the fishing industry.
  - Also to enhance:
    - egg production, and
    - total catch.

Cold Hard Fact: That’s how to base the most reliable management decision making
- Ideally, we want to make those management decisions based on cold hard facts—if possible.
- In the case of these lobster fisheries, the cold hard facts come in the form of data.
Data on the South Australian lobster fisheries

- Here are data sources available for the SA lobster fisheries:
  - Catch total (in weight, monthly, from logbooks)
  - CPUE (by month, from logbooks)
  - Catch in number landed (by month, from logbooks)
  - Sex ratios (pot sampling)
  - Length frequencies (pot sampling)
  - Tag-recaptures (for growth)
  - Beach price
  - Fishing costs, fixed and variable.
  - The puerulus index is not yet used in modelling.

South Australian Lobster Fishery Management Plan Objectives:

- The Management Plan states its 3rd objective as follows:
  - Profitability
    - Decision rules that achieve stock recovery produce higher catch rates; and
    - Higher catch rates lead to higher profitability.

Price Data

- Lobster beach price data, reported by processors, are summarised by SARDI Statistics branch as a monthly mean price.
- Monthly prices allow the analysis of harvest strategies to account for:
  - monthly variations in when catch is taken, and
  - time closures.
- Price is broken down into two lobster size grades, larger lobsters bringing a lower price.

What questions can a model like this answer?

- How much might catch rates rise if a quota is reduced?
  - (Or decline if it is increased?)
- If catch rates go up, how many fewer pot lifts are needed to take a given catch?
- What cost savings can be gained by setting fewer pot lifts?
- How much would profits rise?
- But how much would landings revenue be reduced, in the short term, before catch rates rise?

Fishing Costs

- South Australian fisheries are fortunate to have an extensive high-quality data set of fishing costs, from EconSearch interviews with the fishing industry.
- Based on 3-yearly surveys of active fishers.
- These data permit us to break costs down between fixed and variable:
  - only variable costs are reduced when fewer pot lifts are set in a given season.
- An EconSearch economic survey was also carried out in Tasmania this year.

4 Policies

- These are four widely-used policies for managing a fishery.
  - Specifically, we present results for the South Australian Southern Zone lobster population:
  - The 4 policies tested were:
    - size limit policies, minimum and maximum size;
    - constant quotas;
    - quotas that vary so as to approximate a constant exploitation rate.
Lowering Size Limit in NZ to 98.5: NPV

Model fit to data: CPUE
- This shows the Southern Zone fit of model biomass to monthly logbook CPUE.

Summary
- So model results are showing that size limits are not a major factor in managing these lobster stocks.
- The model is basically saying that what really matters in managing this lobster stock is how hard you fish it.
  - One way to quantify that is by the harvest fraction, the amount of the available biomass harvested per year.
- So for lobster fisheries, that basically comes down to how many pot lifts get set every year.
- And when quotas are set yearly, in such a way as to try and keep the harvest fraction roughly constant, the best economic outcomes are achieved.
- When recruitment is lower, higher profit is obtained by fishing at a lower exploitation rate.

Model fit to data: Catch in number landed
- This shows the Southern Zone fit of model catch in number to monthly data from logbooks.

Acknowledgments
We thank SRL Ltd, the Australian Seafood CRC, Caleb Gardner, Andre Punt, SEPFA, NZRLFA, and lobster fishermen in Tasmania and South Australia.

Model fit to data: length frequencies
- Southern Zone fit of model length frequency proportions to pot sample data.
Extending fishery model to account for economics

- To extend the population model to evaluate different harvest strategies, with higher profit as a principal objective, two economic submodels are added:
  - price per kg landed:
  - costs of harvesting that product.
- Gross revenues from landed seafood product are computed directly as catch (by month and lobster size) times price;
- Profit is gross revenues minus fishing costs.

Two goals of fishery management:

- Sustainability: Assuring that the lobster population remains healthy; enhancing egg production. In many fisheries, management focus has been on sustainability.
- Economic return: To target strategies that achieve the highest possible economic output, as profit, from sustainable exploitation of that seafood resource.
- Both objectives are important.
- And sometimes, both are achieved by the same management strategies.

Current SZ HCR which approximately seeks a constant exploitation rate

Goal of bioeconomic modelling project

- To build a modelling tool that can estimate economic outcomes (average profit to fishers), under various management harvest strategies.
- Biological performance indicators are also estimated.