Summary of empirical Harvest Control Rule for the Torres Strait tropical rock lobster (TRL) fishery

Éva Plaganyi, Roy Deng, Darren Dennis, Robert Campbell, Mick Haywood, Trevor Hutton, Mark Tonks
Average catch and how to scale up or down

TRL Total Catch (t)

2011 | 2012 | 2013 | 2014 | 2015

Catch (t) Average

Should catch go up or down
Indicators to tell us how many lobsters there will be next year: (A) Survey data

Pre1 lobster abundance

Pre0 lobster abundance
Indicators to tell us how many lobsters there will be next year: (B) CPUE data

Catch rates TIB

Catch rates TVH
Use information from all 4 indicators

- Slopes all based on trend using last 5 years’ data
- Use a mathematical trick (logs) to dampen trends to reduce very large changes in RBC

$$RBC_{y+1} = wt_s1 \cdot (1 + s_{y\text{presurv.1}}) \cdot \overline{C}_{y-4,y} + wt_s2 \cdot (1 + s_{y\text{presurv.0}}) \cdot \overline{C}_{y-4,y}$$
$$+ wt_c1 \cdot (1 + s_{y\text{CPUE.TVH}}) \cdot \overline{C}_{y-4,y} + wt_c2 \cdot (1 + s_{y\text{CPUE.TIB}}) \cdot \overline{C}_{y-4,y}$$
eHCR Rule selected by the TRLRAG

\[ \text{RBC} = \text{Combined Average Slope of Indicators} \times \text{Average Catch} \]

Ensure RBC is never greater than 1000t

Precautionary check in rare bad years: if Preseason 1+ index is very low then perform a stock assessment immediately

Check eHCR performing as expected by running a full stock assessment every 3 years

\[ \text{eHCR} = \text{Empirical Harvest Control Rule} \]
Revised HCR spreadsheet

A. Instructions

- Cells shaded light yellow can receive entered values. Cells shaded light blue show results, but cannot be changed.
- Enter data updates in the yellow-shaded cells in Section B below. Example values have been entered for 2016. These need to be changed to the real values when these are available. Data will be provided annually.
- Total Catch to be entered = TIB+TVH+PNG catch in tons (live weight).
- Preseason survey indices = the standardised values obtained from the November survey; the last 5 values of each series need to be checked.
- CPUE = the standardised values obtained from the analyses run in October; note that if the earlier values change in the standardisation, the last 5 values of each series all need to be updated for the calculations below.
- The resulting 2017 recommended biological catch (RBC) calculated using the Harvest Control Rule is shown in Section C, together with comparative values for the 2015 and 2016 HCR RBCs for comparison. Historical TACs and the 2017 RBC are plotted compared to the historical average TAC.
- Consolidated historical and entered data are summarised in Section D and the Survey and CPUE regressions through the recent data are plotted.
- Further information on the HCR is provided in Section E.

(Spreadsheet by CSIRO, contact Dr Eva Plaganyi-lloyd: Eva.Plaganyi-lloyd@csiro.au)

B. Data Entry Section

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Catch</th>
<th>Preseason 0+</th>
<th>Preseason 1+</th>
<th>CPUE_TIB</th>
<th>CPUE_TVH</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>562.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>571.8</td>
<td>1.18</td>
<td>2.80</td>
<td>1.21</td>
<td>1.01</td>
</tr>
</tbody>
</table>

C. RBC Calculator

<table>
<thead>
<tr>
<th>Year</th>
<th>RBC</th>
<th>Forecast RBC</th>
<th>RBC-Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>724.2</td>
<td>604.3</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>681.4</td>
<td>606.8</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>624.1</td>
<td>539.3</td>
<td>77.1</td>
</tr>
</tbody>
</table>

D. Consolidated Catch, Indices and RBCs table

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Catch</th>
<th>Preseason 0+</th>
<th>Preseason 1+</th>
<th>CPUE_TIB</th>
<th>CPUE_TVH</th>
<th>TAC (AUS AND PNG) CALCULATED FOR NEXT YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>429.7</td>
<td>0.64</td>
<td>5.76</td>
<td>0.76</td>
<td>0.69</td>
<td>471 744</td>
</tr>
<tr>
<td>2007</td>
<td>756.6</td>
<td>0.97</td>
<td>4.60</td>
<td>0.86</td>
<td>0.96</td>
<td>842 744</td>
</tr>
<tr>
<td>2008</td>
<td>505.4</td>
<td>1.10</td>
<td>2.53</td>
<td>0.88</td>
<td>0.83</td>
<td>751 744</td>
</tr>
<tr>
<td>2009</td>
<td>388.4</td>
<td>0.89</td>
<td>0.63</td>
<td>1.00</td>
<td>1.14</td>
<td>450 744</td>
</tr>
<tr>
<td>2010</td>
<td>718.7</td>
<td>1.10</td>
<td>1.14</td>
<td>1.33</td>
<td>1.75</td>
<td>853 744</td>
</tr>
<tr>
<td>2011</td>
<td>893.2</td>
<td></td>
<td>2.17</td>
<td>1.38</td>
<td>1.51</td>
<td>803 744</td>
</tr>
<tr>
<td>2012</td>
<td>697</td>
<td>1.26</td>
<td>1.41</td>
<td>1.36</td>
<td>1.77</td>
<td>964 744</td>
</tr>
<tr>
<td>2013</td>
<td>604.2</td>
<td>1.26</td>
<td>1.17</td>
<td>1.26</td>
<td>1.41</td>
<td>871 744</td>
</tr>
<tr>
<td>2014</td>
<td>682.4</td>
<td>1.26</td>
<td>5.27</td>
<td>0.90</td>
<td>0.91</td>
<td>616 744</td>
</tr>
<tr>
<td>2015</td>
<td>563.3</td>
<td>1.12</td>
<td>6.72</td>
<td>0.86</td>
<td>0.58</td>
<td>769 744</td>
</tr>
<tr>
<td>2016</td>
<td>571.8</td>
<td>1.18</td>
<td>2.80</td>
<td>1.21</td>
<td>1.01</td>
<td>796 744</td>
</tr>
<tr>
<td>2017</td>
<td>624</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>624 744</td>
</tr>
</tbody>
</table>
Need 2 flowcharts

Year 1

End Nov

HCR limit triggered?

YES → Stock Assessment

Assess < limit?

YES → End March

NO

NO → HCR TAC

Year 2

End Nov

HCR limit triggered?

YES → HCR TAC

NO

NO → HCR limit triggered?

YES → Close Fishery

NO → Survey + assessment showing above limit ref point

Year 3

End Dec

End Nov

Mid Dec

Assess < limit?

YES → End Dec

NO

NO → HCR TAC
Fishery Closed

Compulsory Mid-season Survey (June)

Compulsory Pre-season Survey (Nov)

Compulsory Stock Assessment (Dec)

> Limit? (Dec)

NO

Fishery Open Asses. TAC (Jan 1)

YES
Thank you

Oceans and Atmosphere
Dr Éva Pláganyi
Principal Research Scientist
Brisbane, Australia

+61 7 3833 5955
e eva.plaganyi-lloyd@csiro.au
w www.csiro.au

Team Members
Darren Dennis
Rob Campbell
Roy Deng
Mick Haywood
Trevor Hutton
Mark Tonks
Kinam Salee
Nicole Murphy