Survey of orange roughy spawning aggregations on the Cascade Plateau – 2007

Ian Knuckey and Russell Hudson

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Published: Fishwell Consulting Pty Ltd
22 Bridge St Queenscliff VIC 3225

ISBN: 978-0-9756006-7-2

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Executive Summary

The Cascade Plateau is currently Australia’s largest orange roughy fishery and the only one that remains open to commercial fishing. Scientific surveys of the Cascade Plateau have been undertaken since 1998 using industry vessels as a research platform. Since 2003, these survey vessels have been required to use a calibrated 38 kHz Simrad ES60 acoustic sounder which has enabled a quantitative snapshot estimate of the spawning biomass to be made. The first formal stock assessment of the fishery was made in 2004, incorporating the first of these quantitative acoustic results.

The Deepwater Resource Assessment Group (DeepRAG) together with CSIRO oversees the data collection, analysis and assessment pertaining to all Australian orange roughy stocks. DeepRAG recognises that at some point in the future, a multi-frequency towed-body acoustic estimate of the Cascade Plateau spawning biomass will be required to get a more accurate biomass estimate which better distinguishes the acoustic signals of orange roughy from those dominated by other fish species. Until this occurs, it has been agreed that annual quantitative acoustic and biological surveys of the spawning aggregation should continue using industry based 38 kHz, hull-mounted echosounders. These low level, low cost surveys of the Cascade Plateau stock are required to guard against unexpected collapse of the stock while building up a time-series of acoustic biomass indices that can be incorporated into the stock assessment and enable changes in stock to be detected. It is also expected that they will provide a baseline of information upon which a high precision deep-water towed body acoustic survey can be developed.

This report details the results and observations of the 2007 Cascade Plateau survey.

Based on the timing of previous spawning aggregations on the Cascade Plateau, the survey aimed to take place between mid June to early July. There were no landings of Cascade fish immediately prior to the start of the 2007 survey to help inform the start date; the survey began at midnight on the 23rd June 2007. Multiple acoustic transect grids and thirteen survey shots were conducted over the next seven days, and the survey concluded at midnight on 30th June. All shots were carried out in the south-east of the plateau. A total of 45,800 kg of orange roughy was caught during the survey with shots ranging from 100–13,000 kg. The largest catches were observed near the end of the survey when aggregations were larger and more stable. Oreos and “black” sharks comprised the bulk of the ‘other species’ caught but accounted for less than 3% of the total catch.

The lengths of 1871 female and 1092 male orange roughy were measured. Mean lengths of females and males were 43.6 cm and 39.3 cm respectively. Apart from the main mode of fish around 44 cm for females and 42 cm for males, there was a mode of smaller fish ~35cm evident in the 2007 samples that had not been witnessed in previous years. A total of 978 otoliths were collected from orange roughy at Cascade Plateau.

Gonad staging was conducted on samples from all survey shots. Partially spent males and females appeared in the trawl catches from shot 2 and increased in proportion throughout the survey. Spent females only appeared in the samples in large numbers during shot 8, and increased in frequency to a maximum of about 50% in shot 12. All indications are that the survey was undertaken over the peak spawning period as required.

The temperature by depth profiles were collected for each shot. The thermocline was at about 200 m depth and most tows were conducted in water with temperatures of 7.2–7.6 C.

All of the objectives of the project were achieved, although the quality of the acoustic data for biomass estimation will not be able to be determined until the analysis is conducted.
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Introduction

The Cascade Plateau has been fished since 1996 and is currently Australia’s largest orange roughy fishery. Scientific surveying of the Cascade Plateau on a quota-for-charter basis has been undertaken since 1998. From that time until 2002 the acoustic system comprised a unit that digitised and recorded the acoustic signal from the survey vessel’s 28 kHz commercial fisheries sounder. This form of acoustic data has been used to give a qualitative description of the fishery, however it has not been possible to use this data for quantitative biomass estimates using established echo-integration techniques. In 2003 a vessel with a calibrated 38 kHz acoustic system was used, allowing a quantitative snapshot biomass estimate to be made. The first formal stock assessment of the fishery was made in 2004, incorporating the results of this first quantitative acoustic survey. This assessment was updated based on the results of the 2005 acoustic survey. The Deepwater Assessment Group has agreed that annual quantitative acoustic and biological surveys of the spawning aggregation should continue until current biomass estimates are refined. They also recommended that future survey work at the Cascade Plateau should be based on vessels with a calibrated 38 kHz echo-sounder system.

The deep-water assessment group identified the need to carry out low level, low cost monitoring of the Cascade Plateau stock to:

- guard against unexpected collapse of the stock in case the current harvest rate has been grossly overestimated.
- build up a long enough time-series to enable changes in stock to be detected.
- provide acoustic biomass indices that can be incorporated into the stock assessment;
- provide a baseline of information upon which a high precision deep-water towed body acoustic survey can be based.

This reports details results and observations of the 2007 Cascade Plateau survey.

Objectives

1. Collect biological measures of length, sex, maturity stage and otoliths and record bycatch species, number and weight.
2. Provide a broadscale survey of the greater Cascade region
3. Provide localised adapted mapping surveys of main spawning aggregation
4. Study school dynamics of main spawning aggregation throughout the survey period;
5. Provide sufficient acoustic data from a 38 kHz hull mounted echosounder for a quantitative snapshot biomass estimate (including an estimate of error) to be made of the main spawning aggregation.
6. Investigate the distribution of orange roughy over the greater Cascade region.

Material and Methods

Based on the timing of previous spawning aggregations of orange roughy on the Cascade Plateau (Figure 1), it was anticipated that the survey would take place between mid June to early July. Usually, industry intelligence and port samples are gathered prior to the commencement of the survey to ensure that the spawning build up is proceeding as in previous years, but during 2007 there were no landings of Cascade fish prior to the start of the survey, so only verbal indications of the spawning condition of the fish were received.
Survey Procedures

Vessel criteria
The survey vessels were selected based on a number of criteria including being a Cascade orange roughy quota holder, capable of remaining at sea on the Cascade Plateau for up to ten days, have a skipper with extensive experience in fishing for orange roughy in SE Australia and have an ES60 38 kHz echosounder. It was advantageous if one vessel also had a 28 kHz echosounder, but this was not essential.

Echosounder requirements:
The 38 kHz echo-sounder was required to have the following specifications:
- Simrad ES60 echosounder with a 38 kHz split beam ES38B transducer;
- Software version 1.4.3.64 or higher;
- At least 30 Gbyte hard drive space;
- Other sounders (For example 28 kHz commercial sounders): Either synchronised to the ES60 or turned off during survey operation.

The 28 kHz echo-sounder was required to have the following specifications:
- be suitable for the installation of Echolistener hardware in the wheel-house.

The 38 kHz echo-sounders (and 28 kHz) on survey vessels were calibrated prior to the surveys.

Acoustic procedures:
A survey manual titled “Protocols and procedures for surveying orange roughy from industry vessels” was been developed by CSIRO Marine Research to provide the specific detail on survey procedures and protocols (Ryan, 2004). The manual identifies two types of surveying to be conducted; a minimum of 2 preferably 4–8 localised acoustic mapping of schools when the aggregations are at their largest; and a broadscale acoustic survey suitable for echointegration.

Biological and environmental measurements
Biological measures that are necessary inputs for the snapshot acoustic-based biomass estimates were collected so they were as representative as possible of the acoustically surveyed fish. To do that, trawl shots were taken to optimise the spatial and temporal match between biological and acoustic measures. The researcher aimed to optimise the timing and the use of the available research catch quota to meet the needs of the acoustic surveys. Based on historical surveys, it was suggested an appropriate sampling regime should endeavour to collect two five-tonne shots per day over the ten day period of the survey (100 t). This should provide sufficient representative samples across the spawning period. The acoustic biomass estimates will be based on aggregated roughy schools. Therefore trawl shots were likewise be aimed at aggregated orange roughy. The list below details the required biological and environmental measures. Other biological measurements (eg. otolith collection or description of seasonal dynamics) were required for input into the stock reduction model or to be used as biological indicators for the fishery.

The survey manual “Protocols and procedures for surveying orange roughy from industry vessels” details how the fish length should be measured, how to assess the stage of development of the male and female gonads and the acoustic group of bycatch species.

Targets for data collection
1. Orange roughy length, sex, and gonad stage measurements of 250 per shot,
2. Otoliths (orange roughy only) collected from 1000 fish.
3. Classify bycatch (by number and weight) species group to give catch composition percentage of each acoustic species group.

4. Provide latitude and longitude of trawl shots and the length of warp let out. Estimated green weight of orange roughy and total bycatch weight.

Results and Discussion

The calibration of the Saxon Progress was conducted on the 20th June 2007 near Tinderbox.

The vessel departed Hobart at 19:00 on the 21st June 2007 arriving at the Cascade Plateau 24 hours later at 19:00 on the 22nd June 2007. The vessel Saxon Onwards was still fishing the area. The skipper indicated most of the fish he had captured were from the western side of the plateau in about 680 m of water.

The survey began at midnight on the 23rd June 2007 and was terminated at 24:00 on the 30th June 2007. The Saxon Progress conducted commercial fishing for a further 36 hours and then returned to port on 3rd July 2007. The acoustic data collected by the survey is currently retained by the consultants Diversity (Principal Geoff Diver) and Fishwell Consulting. Logbook details, comments and observations of the progress of the survey are presented in Appendix B. Significant events recorded on the ES60 echosounder are presented in Appendix C.

In summary:

- Weather conditions were slightly different from what would normally be expected with a few days of easterly winds. Some fishers suspect catches generally fall off when the weather moves round into an easterly direction;
- Fish aggregations were observed in the south/south-east corner of the plateau with a movement into shallower and colder waters in the south-east. Few aggregations were observed in the ‘spawning box’;
- Early acoustic grid surveys were difficult to accomplish with marks being small and unstable, and generally dissipating before a localised survey was completed;
- The most consistent, largest aggregations/marks were observed on the night of the 29/6/07 and the morning of the 30/6/07. These marks were well surveyed.
- Having only recently been fitted, the skipper was not familiar with the Simrad EK60 sounder and did not agree with the settings prescribed in the sounder’s manual.

Thirteen trawl shots were conducted during the 2007 Cascade Plateau survey (Table 1). All shots were carried out in the south-east of the plateau. All but one shot were undertaken at night. Species composition of catches is shown in Table 2. Catches of orange roughy ranged 100–13,000 kg, with the largest catch observed near the end of the survey when aggregations were larger and more stable. Oreos (mostly spikey oreos) comprised the greatest portion of the ‘other species’ caught (2.0% of the total catch), with catches ranging 2.5 kg–158 kg per shot (Table 2). Sharks were the second most commonly caught bycatch (mostly black shark) making up about 0.4% of the total catch.

Gonad staging was conducted 11 days prior to the survey beginning; and during each of the 13 survey shots (Figure 2). Fish sampled prior to the survey were clearly not at the spawning stage with very few spent specimens observed. At least 250 fish were staged from each of the 10 shots that caught sufficient number of fish, while all fish were stage in shots 1, 6 and 11.
Partially spent (stage 8) males and females appeared in the trawl catches from shot 2 and increased in proportion throughout the survey. Spent (stage 6) females only appeared in the samples in large numbers during shot 8, and increase in frequency to a maximum of about 50% in shot 12. The proportion of males to females varied considerably between shots.

The lengths of 1871 female and 1092 male orange roughy were measured from the Cascade Plateau (Table 3). Mean lengths of females and males were 43.6 cm and 39.3 cm respectively (Figure 3). A total of 978 otoliths were collected from orange roughy at Cascade Plateau.

The temperature by depth profiles for each shot are shown in Figure 4. Most towing was conducted in water with temperatures of 7.2–7.6 C. Surface waters ranged about 12–13 C and the thermocline was at about 200 m depth.

Objectives 1, 2, 3, 4 and 6 of the project were met. As a biomass estimate has not been undertaken from this data, it is not clear whether sufficient data has been collected to achieve objective 5. While the two observers aboard the vessel felt the aggregations were large and well surveyed, it was their first year of conducting orange roughy surveys.

Acknowledgments

We appreciate the dedicated work of Geoff Diver who provided valuable on-shore support and coordination during the survey and to Ben Ford who was the scientific observer in charge of the collection of acoustic data. We would like to thank Jamie Dunkley Price, skipper of the FV Saxon Progress and Jim Collins owner of the Saxon Progress for their assistance and input, along with the efforts of the crew of the vessel in the collection of biological data. Thanks also to Tim Ryan for his technical support on acoustic data collection and data logging.

We also received input and cooperation from all the owners and skippers of the roughy fleet and Tasmanian processors, especially the unloading staff and factory staff of Poulos Brothers at Macquarie Wharf.

References


Table 1. Date, location and duration of trawl shots conducted during the 2007 Cascade Plateau survey.

<table>
<thead>
<tr>
<th>Shot</th>
<th>Date</th>
<th>Start Latitude</th>
<th>Start Longitude</th>
<th>Depth start–fin</th>
<th>Start time</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>23/06/2007</td>
<td>43° 59.53</td>
<td>150° 27.44</td>
<td>684–688</td>
<td>19:05</td>
<td>0:05</td>
</tr>
<tr>
<td>2</td>
<td>24/06/2007</td>
<td>43° 59.176</td>
<td>150° 27.07</td>
<td>708–729</td>
<td>20:29</td>
<td>0:05</td>
</tr>
<tr>
<td>3</td>
<td>25/06/2007</td>
<td>43° 59.20</td>
<td>150° 27.22</td>
<td>699–719</td>
<td>0:24</td>
<td>0:07</td>
</tr>
<tr>
<td>4</td>
<td>25/06/2007</td>
<td>43° 59.33</td>
<td>150° 27.73</td>
<td>715–749</td>
<td>15:58</td>
<td>0:10</td>
</tr>
<tr>
<td>5</td>
<td>25/06/2007</td>
<td>43° 58.79</td>
<td>150° 27.31</td>
<td>650–756</td>
<td>0:15</td>
<td>0:17</td>
</tr>
<tr>
<td>6</td>
<td>26/06/2007</td>
<td>43° 59.44</td>
<td>150° 27.96</td>
<td>671–681</td>
<td>7:40</td>
<td>0:05</td>
</tr>
<tr>
<td>7</td>
<td>26/06/2007</td>
<td>43° 59.45</td>
<td>150° 27.80</td>
<td>736–761</td>
<td>20:32</td>
<td>0:06</td>
</tr>
<tr>
<td>8</td>
<td>27/06/2007</td>
<td>43° 59.25</td>
<td>150° 28.36</td>
<td>654–708</td>
<td>2:45</td>
<td>0:12</td>
</tr>
<tr>
<td>9</td>
<td>27/06/2007</td>
<td>43° 59.38</td>
<td>150° 27.63</td>
<td>667–685</td>
<td>21:59</td>
<td>0:08</td>
</tr>
<tr>
<td>10</td>
<td>28/06/2007</td>
<td>43° 59.30</td>
<td>150° 27.89</td>
<td>659–677</td>
<td>5:35</td>
<td>0:05</td>
</tr>
<tr>
<td>11</td>
<td>28/06/2007</td>
<td>43° 59.28</td>
<td>150° 26.45</td>
<td>669–692</td>
<td>22:45</td>
<td>0:07</td>
</tr>
<tr>
<td>13</td>
<td>30/06/2007</td>
<td>43° 59.227</td>
<td>150° 27.54</td>
<td>657–699</td>
<td>0:13</td>
<td>0:13</td>
</tr>
</tbody>
</table>

Table 2. Catch (kg) of orange roughy and bycatch by species group during 2007 Cascade Plateau survey.

<table>
<thead>
<tr>
<th>Shot</th>
<th>Orange roughy</th>
<th>Oreos</th>
<th>Sharks</th>
<th>Whiptails</th>
<th>Morid cods</th>
<th>Misc. high</th>
<th>Misc. low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>2.5</td>
<td>0.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2,000</td>
<td>60.0</td>
<td>10.3</td>
<td>1.3</td>
<td>0.5</td>
<td></td>
<td>1.2</td>
</tr>
<tr>
<td>3</td>
<td>4,000</td>
<td>16.5</td>
<td>38.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>7,000</td>
<td>82.0</td>
<td>6.5</td>
<td>1.8</td>
<td>4.4</td>
<td>0.7</td>
<td>0.1</td>
</tr>
<tr>
<td>5</td>
<td>1,500</td>
<td>157.6</td>
<td>47.6</td>
<td>1.0</td>
<td>35</td>
<td>2</td>
<td>4.3</td>
</tr>
<tr>
<td>6</td>
<td>600</td>
<td>53.0</td>
<td>3.3</td>
<td>0.8</td>
<td>3.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>5,000</td>
<td>22.6</td>
<td>8.2</td>
<td>1.0</td>
<td>1.6</td>
<td>0.7</td>
<td>0.07</td>
</tr>
<tr>
<td>8</td>
<td>2,000</td>
<td>144.0</td>
<td>18.6</td>
<td>4.6</td>
<td></td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>7,000</td>
<td>34.9</td>
<td>2.2</td>
<td>3.3</td>
<td></td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2,500</td>
<td>21.5</td>
<td>18.0</td>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>400</td>
<td>59.9</td>
<td>3.0</td>
<td>1.3</td>
<td></td>
<td>1.6</td>
<td>3.7</td>
</tr>
<tr>
<td>12</td>
<td>700</td>
<td>123.0</td>
<td>16.5</td>
<td>0.5</td>
<td></td>
<td>1.3</td>
<td>1.8</td>
</tr>
<tr>
<td>13</td>
<td>13,000</td>
<td>157.6</td>
<td>2.3</td>
<td>1.6</td>
<td>5.1</td>
<td>6.5</td>
<td>0.3</td>
</tr>
<tr>
<td>Total</td>
<td>45,800</td>
<td>935.1</td>
<td>173.5</td>
<td>17.3</td>
<td>53.5</td>
<td>12.8</td>
<td>13.97</td>
</tr>
</tbody>
</table>
Table 3. Number of fish measured, mean standard length, standard deviation of length and number of otoliths collected from St Helens Hill.

<table>
<thead>
<tr>
<th>Sex</th>
<th>No. Fish</th>
<th>Mean length (cm)</th>
<th>S.D. of length</th>
<th>No. otolith collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (61%)</td>
<td>1871</td>
<td>43.6</td>
<td>3.7</td>
<td>390</td>
</tr>
<tr>
<td>Male (39%)</td>
<td>1092</td>
<td>39.3</td>
<td>4.4</td>
<td>588</td>
</tr>
<tr>
<td>Total</td>
<td>2963</td>
<td>42.0</td>
<td></td>
<td>978</td>
</tr>
</tbody>
</table>

Figure 1. Cascade Plateau region showing broader survey area and expected location of localized spawning aggregation.
Figure 2. Percent of males and female orange roughy at each reproductive stage during pre survey and shots 1–13 of the 2007 Cascade Plateau survey.
Figure 2 cont. Percent of males and female orange roughy at each reproductive stage during pre survey and shots 1–13 of the 2007 Cascade Plateau survey.
Figure 2 cont. Percent of males and female orange roughy at each reproductive stage during pre survey and shots 1–13 of the 2007 Cascade Plateau survey.
Figure 3. Length frequency of male and female orange roughy captured during the 2004–2007 Cascade Plateau surveys.
Figure 4. Temperature depth profiles of shots 1 to 13 of the 2007 Cascade Plateau survey.
Appendix A. Protocols and procedures for surveying orange roughy from Industry vessels

ES60 echosounder system requirements

Standard installations of the Simrad ES60 echosounders may need either software or hardware upgrade, or both, if they are to be suitable for survey work. Vessel owners will need to provide echosounder system specification to determine if upgrade(s) are necessary. Sources of noise and interference need to be eliminated as much as possible. Conventional 28 kHz fisheries sounders need to either be synchronised with the ES60 38 kHz or turned off during the survey. A marine electronics specialist is needed to run synchronisation lines between sounders.

CSIRO Marine Research can work through these matters with the vessels owners. System requirements should be checked as soon as possible after the vessels have been selected to ensure there is adequate time to check the systems and upgrade where necessary. The cost of any upgrades is the responsibility of the selected vessel.

Vessel calibration

The ES60 38kHz sounder on the vessels should be calibrated prior to the survey. Calibration has to be carried out in calm, deep (>20 metres) water. The approximate location of the vessel transducer needs to be known. If transducer location is not known it should be established prior to leaving port. Calibration typically takes 4-6 hours plus steaming time to the calibration site. Suitable calibration sites are Tinderbox channel or Port Arthur.

Biological measures in support of acoustic snapshot biomass estimates

Biological measures that are necessary input for the snapshot acoustic biomass estimates need to be as representative as possible of the acoustically surveyed fish. Therefore trawl shots should be taken to optimise the spatial and temporal match between biological and acoustic measures. The researcher must aim to optimise the timing and the use of the available research catch quota to meet the needs of the acoustic surveys. The acoustic biomass estimates will be based on aggregated roughy schools. Therefore trawl shots should likewise be aimed at aggregated orange roughy. Table 4 details the required biological and environmental measures. Other biological measurements (eg. otolith collection or description of seasonal dynamics) are required for input into the stock reduction model or biological indicators for the fishery will be requested on a needs basis. Data sheets are shown in Figure 5 and Figure 6.
Table 4. Description of measurements.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Output(s)</th>
<th>Purpose</th>
<th>Measurement details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>Length/freq histograms</td>
<td>Length/target strength histogram to apply mean target strength to echointegration calculation</td>
<td>Orange roughy Minimum 100 length Up to 200 lengths if time permits</td>
</tr>
<tr>
<td>(Orange roughy and bycatch)*</td>
<td></td>
<td>Convert length to weight via existing empirical algorithms to apply mean fish weight to echointegration calculation</td>
<td>Bycatch Up to 100 lengths per acoustics species group</td>
</tr>
<tr>
<td>Sex (orange roughy only)</td>
<td>Sex ratio</td>
<td>Characterize sex ratio over space, time and school characteristics (eg aggregated, dispersed)</td>
<td>Note sex with taking roughy lengths</td>
</tr>
<tr>
<td>Gonad stage</td>
<td>Spawning condition throughout survey</td>
<td>Monitor progress of spawning event over the survey period</td>
<td>Note stage when taking length measures. Stage according to NIWA protocol</td>
</tr>
<tr>
<td>Otoliths</td>
<td>Extracted otolith to be aged by CAF</td>
<td>Age frequency distribution</td>
<td>Length/sex.stage/shot number + extracted otoliths</td>
</tr>
<tr>
<td>(orange roughy only)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acoustic species group</td>
<td>Classification of bycatch by number according to acoustic classification</td>
<td>Apportioning acoustic signal to the various acoustic species groups</td>
<td>Allocate individual fish to acoustic species group as per Appendix 2: Acoustic groups for trawl classification</td>
</tr>
<tr>
<td>Trawl location + catch details</td>
<td>Lat/lon of trawl on the ground</td>
<td>Characterise spatial distribution and dynamics of aggregations.</td>
<td>Record shot number, date/time, vessel lat/lon, start trawl depth, end trawl depth, vessel heading, estimated wire out as per sheets in Appendix 1. Draw estimated trawl line on the reverse of the data entry sheet.</td>
</tr>
<tr>
<td></td>
<td>Estimated roughy green weight + total bycatch weight</td>
<td>Georeference biological measures</td>
<td></td>
</tr>
</tbody>
</table>

**Environmental measurements**

*Seawater absorption loss*

Ideally CTD casts down to orange roughy depths (800m) should be made to allow calculation of seawater absorption loss. In practice this may not be possible from industry vessels.
Figure 5. Cascade Plateau trawl shot data entry sheet.
Figure 6. Back side of Cascade Plateau trawl shot data entry sheet.
Appendix B. Cascade Plateau logbook comments

21/06/07
Leave port 19:00

22/06/07
07:00 – Heading 76°
   Swell 2.5 – 3 m confused
   Wind 20 – 30 kts SW
   Seas 1.5 m confused
   Cloud 100%
13:00 – Heading 80°
   Swell 2.5 – 3 m confused
   Wind 20 kts
   Seas 1.5 confused
   Cloud 90%
17:00 – Heading 76°
   Swell 3 – 4 m SSW
   Wind 30 kts WSW
   Cloud 90%
19:00 – Arrive Cascade. Jamie has talk with Col (Saxon Onwards). He has almost 110t on board. Didn’t get any huge shots, mainly scratching around. Catching fish mostly in the 680m depth. Temperature at bottom in about 7.4°C, slightly warmer than last year (5.8 – 6.2). Boat has 130 on board so will try to get another 20 t tonight. Most of the fish has been on the western side of Cascade, not spawning box.

23/06/07
00:00 – Searching southern end of cascade plateau. No marks found.
   Echoview file = L0013 – D20070622 – T140638
05:30 – Starting to head up along east, was a small sign that could have been fish around 640m southern end.
07:20 – Heading 101°
   Swell 2 – 3 m
   Wind 15 – 20 kts SW
   Cloud 95%
   Bar 1027
Still no marks
07:35 – 688 – 705 m = first decent marks
   = Event 13
12:00 – Nothing to report. Jamie is fiddling with the Simrad so it appears similar to Furuno. Only picking up feed soundings. Swell starting to come out of the west, wind is dropping back. Asked Jamie to note Simrad settings for future reference.

- Swell 2 – 3 m WSW
- Wind 15 – 20 kts SW
- Cloud 80%
- Bar 1029
- Seas 1 – 1.5 m

Echoview file = L0013 – D20070623 – T015220

16:30 – This afternoon Jamie saw a couple of promising marks at about 15:30. Busy doing a bit of maintenance, will head back and look tonight. The marks located off the southern part of cascade.

Echoview file = L0013 – D20070623 – T062342

- Swell 2 m
- 15 kts SW
- Cloud 80%
- Bar 1028
- Seas 1 – 1.5 m

16:55 – A good mark

    Event 15

    Echoview = L0013 – D20070623 – T062342

**24/06/07**

01:10 – Just passed a couple of big marks in the south at 630m depth.

    Echoview = L0013 – D20070623 – T143208

04:15 – Looking in east, pretty quiet. Current marks probably not orange Roughy. Last guy on watch lost interest and let the boat meander.

D20070623 – T180912 = Small mark on screen, probably Blue Eye (just off bottom)

07:45 – Heading 59°

    Swell 1 – 2 m SW
    Wind 5 – 10 kts W
    Cloud 95%
    Bar 1032

No recent marks

12:00 – Guys doing a bit of maintenance, increasing speed to decrease likelihood of pinups

    Heading 38°
    Swell 2 m
Seas 1 – 1.5 m
Wind 10 kts SW
Bar 1031
Cloud 90%

Some life mid-water, Jamie not sure what it is.

17:00 – No signs, heading back round the south west searching pattern.
   Swell 2 m
   Seas 1 m
   Wind NW
   Cloud 95%
   Bar 1030

18:45 – Found marks on the bottom, Jamie suspects they are blue eye at 650 m depth
D20070624 – T083756

19:25 – Seen a small mark, looks like roughy. Survey area then put a shot through – get about 2 t of roughy. Jamie picks a large mark to the south west. Looks huge, 2 mile long – Catch about 5 t roughy, very little bycatch. Few more partially spent fish appearing. Jamie remarks not used to colour scheme of ES 60. Different to Furuno.

25/06/07

09:25 – Swell 2 m confused
   Seas 1.5 m
   Cloud 50%
   Wind 15 kts NW

10:50 – Have just gone through huge mark 640 m depth in SSE.
D20070625 – T000124

13:40 – Swell 1 – 2m confused
   Seas 1 – 1.5 m
   Cloud 30%
   Wind 10 – 15 kts NW
   Bar 1028

Picking up a lot of blue eye on bottom, strong red marks in shallow waters.
D20070625 – T024419

16:30 – Nice mark. Shot away for shot number 4. Went through mark, caught about 8 t of roughy
   Swell 1 – 2 m SW
   Seas 1 – 1.5 m
   Cloud 40%
Wind NW 10 – 15kts

26/06/07

07:00 – Shot away. Turns out a poor shot when towing, nothing on sounder. Managed to scratch up 1.5 t with large bycatch. Jamie thinks they are coming up to shallower ground from the south.

Swell 1.5 – 2 m confused
Seas 1.5 m
Cloud 95%
Wind 15 – 18 kts NNW

 Shoot away in the south east go through strong (red) mark.

Shot 6 net came fast and got torn. Repaired between hauling and dropping catch into hopper

14:30 – Very quiet. Wind has gone round to the north east, rain and very few marks. Why is it whenever the wind comes up from the east the fish go off? Or maybe because of afternoon.

Swell 1.5 – 2 m confused
Seas 1.5 m
Cloud 90%
Wind 15 – 18kts NNE (or ENE?)

19:40 – Currently surveying in the south for a shot. The fish appear deeper tonight than previous. In about 720 m, last night about 700 m, night before 680 m. Wind has dropped off.

23:00 – Did a screen grab, lots of life. Jamie remarked life is appearing a lot more at night.

27/06/07

02:15 – Have just passed through one huge mark. Marked it on the event screen. About to shoot in a lot shallower water on top of the cascade in the south east. During shot no big marks on net sonde. Moderate tide from south east. Jamie thinks roughy may be outswimming net, last shot or two have had fish still kicking in the hopper.

13:37 – Very grey and wet. Thought we were going to do another shot this morning but Jamie held off. Didn’t think it was worth it.

Swell 1 – 1.5 m confused
Seas 1 m
Wind 10 kts ENE
Bar 1026

Lots of scatter on sounder, Jamie thinks its feed.

15:30 – Heading 270°

Swell 1 – 1.5 m
Wind 5 – 10 kts NE
Bar 1026
Cloud 98%

Searching around spawn box, not really any marks about.
Jamie still not happy with settings on Simrad – too much background scatter. Needs a consistent setting to be prescribed – the ones that are recommended are crap.

Prescribed – TVG = 65
   Fish gain = 70
   School gain = 70
   Bottom gain = 60

Used – TVG = 70
   Fish gain = 44
   School gain = 0
   Bottom gain = 75

18:50 – Marks starting to appear. SEE LOG FOR DIAGRAM.

Port door was repaired this morning, three weights were half hanging out. Don’t know how long it was like this for.

28/06/07
05:00 – Shot this morning, strong plumes. Caught 2.5 t, total now 36.5 t. Proportion of spent coming up – lots of males.
13:00 – Messy day, not much on sounder. Lots of feed.
   Swell 2 m SE
   Seas 1.5 m
   Wind 20 kts ESE
   Bar 1021
   Cloud 100%
21:50 – Most marks been about a mile, except south of spawning box. Been difficult with marks, haven’t been very stable, mostly moving around. Suggest marks Jamie used in survey are used for next year.
Event 30 = Marks, getting ready to shoot
Shot was poor, approx 200 kg roughy. One of the sweeps broken, net tore. Current took the net the wrong way and net ripped.

29/06/07
02:07 – Guys fixing the gear, have located large plume (T012904) (south east 670 m) will survey it out then shoot gear. = 43° 58.719S, 150° 28.143E. SEE LOG FOR DIAGRAM.
04:17 – Shoot away (T173623). Been a strong sign 3 km long. SEE LOG FOR DIAGRAM.
Jamie thinks they are moving from the deeper waters up north to the cooler waters in the shallows as night progresses.
Approx 07:30 – Had power trouble, Auxillary #1 dropped out, aux #2 started. Was processing catch from shot 12 at the time. Therefore couldn’t send email report for shots 11 and 12 as inmarsat was down. Echoview and logging data seem ok.
2007 Cascade Plateau orange roughy survey

08:15 – Wind 15 kts SSE
   Bar 1012
   Swell 1 – 2 m confused
   Cloud 100%
12:30 – Swell 1 – 2 m confused
   Cloud 100%
   Wind 18 kts SSE
   Bar 1006

Still having power problems – Jamie really pissed off with boat and ready to head in. Also pissed off with survey, unlikely to catch quota.

21:40 – Very quiet. Jamie remarked that fish are appearing later and later in the evening.

23:00 – Just seen first big marks for the night. Marks are appearing later each day. Marks seem to form quickly. Build up over 30 – 40 minutes, before that is just feed looking layer near the bottom. Hard to get really solid survey as the SEE LOG FOR DIAGRAM finds the fish but going back through, the fish have usually moved and marks hard to find. SEE LOG FOR DIAGRAM.

30/06/07

03:40 – Seeing the best marks yet, huge running from 650 m to 720 m contours. SEE LOG FOR DIAGRAM.

04:45 – Marks still good, best yet. Jamie doing excellent transects.

10:35 – Swell 2 m
   Seas 1 – 1.5 m
   Cloud 50%
   Wind 15 kts SW

13:15 – Small marks during the day. Not really seen this before. Mostly SE corner 714 m depth.

14:10 – Following the same mark in a NW direction up the SE side of the plateau.

22:55 – This shot will not be a survey shot???? (Not covered enough, Jamie wants to catch fish) Marks are nothing flash.

Comments

Every year pre-spawning movements are different. Last year came in from SW as in this year, but odd year is come from east.

In north get fish at cascade over January and February.

More work can be done in pre survey.

Show last years survey results, discuss where fish caught and movements.

Returned to port approx 04:00 on 3rd July 2007.

Otoliths – collected approx 300 over survey, further approx 400 in port (03/07/07).

Approx 58t of roughy caught over survey, further approx 20t caught in 2 or so days after.
Diversity sea boxes stored at Andrews (Pud) house between Cascade and St Helens surveys.
Liner left on board Saxon Progress between Cascade and St Helens surveys.
Appendix C. Significant events recorded by the echosounder

NOTE: Everything operating on Hobart Local Time except Echoview running on GMT (=Hobart – 10hrs).

L001 – L005 = calibration (20/06/07).
L006 = Check operation in Port (21/06/07).
E001 – E005 = Check event marking during calibration.
L007 = Recheck operation (21/06/07).
L008 = Recheck operation, moved computer (21/06/07).
E006 = Demonstrate event marker (21/06/07).
L009 = Check GPS working (21/06/07).
L0010 = Leave Hobart, start recording.

Echoview file = D20070621 – T085316 = Start recording leave Hobart.
E0010 = Changed bi 500 settings on simrad (approx 11:00, 21/6).
L0013 = Restarted logging after changing bi 500 port settings.
Echoview file = D20070621 – T130408.
E0011+ 0012 = Reached CascadePlateau (22/06/07, 18:52).
Echoview file = D20070622 – T083733.
E0013 = First decent mark, still small though.
E0014 = Mark.
Echoview = L0013D20070623 – T043507.
E0015 = Large mark, start of survey (see figure below).
E0016 = About to do shot 1.
Echoview = L0013 D20070623 – T081215
E0017 = Group of marks, 24/06/07 (see figure below).
Marks 15:35 (see figure below). Jamie thinks they are probably blue-eye, slightly different colour to last night.

Log 152942

E0018 = Mark, start survey 19:27 24/06/07 (see figure below).
E0019 = Shooting shot 2 (see figure below) Big mark near spawn box.

About to do shot 3 (see figure below).
25/6/07 10:50 going through huge mark (see figure below).

E0021 = Start survey over mark. (15:05, 25/06/07) Shot 4 (see figure below).
Big mark 21:10 25/06/07 (see figure below).

E0022 = Big mark – during survey before shot 5 (see figure below).
Big mark during survey before shot 5 (see figure below).

E0023 = Shooting shot 6 (see figure below).
First mark for the day ~17:45 26/6/07. Possibly due to weather kicking in (see figure below).

Roughy aggregating at different times each evening and in slightly different areas, ie 20:00, 16:00, then 17:30. Always just south east of spawn box.

E0024 = Shot 7. About to shoot (see figure below).
June 26 23:00  a lot of life around southern end mostly 680 depth.  
About to shoot shot 8. (27/06/07,02:15).  
Event 25 = Circle marks plume (see figure below).
Event 25 = Circle marks plume (see figure below).

No big marks seen on net sonde during trawl.

27 June 19:05 this is the mark for spot B we are currently surveying (see log) 184456 (see figure below).
E0026 = About to shoot shot 9. Was going to wait for the big marks that usually turn up after shooting but was taking too long (see figure below).

June 28 5:00 shot 10 had a look in spawning box this morning no signs came down to sw slopes plenty life (see figure below).
June 28. Quiet all day weather picking up from the south east at 18:55 starting picking up these marks. A bit further north than last night, on more eastern slopes (see figure below).

June 28 21:50. Found them huge plume in the south west (see figure below).
Event 30 = About to start shot 11. 22:12, 28/06/07 (see figure below).

29/6/07
Fixing gear sweep broke currently mapping out this mark to the south east (see figure below). Will survey it out then shoot the gear.
Shot 12. This was a large mark spotted about 02:00 starting to disperse. The signs have been larger in the earlier part of the evening (see figure below).

Event 31 = Big marks found 23:00 29/06/07 (see figure below). Currently surveying through it on slopes of south.
Event 32 = Whole lotta nice marks. Part of survey before shot 13 (see figure below).

About to start shot 13 (see figure below).
Some big marks found after shot 13 (see figure below).

Some more big marks (see figure below).
Event 34 = Some marks during the day. Unusual (13:16, 30/06/07) (see figure below).

Event 35 = About to do shot 14. Marks only just starting to show up (see figure below). Fishery opens up again at midnight.
Event 36 = Shot 15 commercial shot going to head through where we saw that big mark last night (see figure below).

1/07/07 (12:45) Total of 4 or 5 commercial shots last night. Most were 400kg to 1t. Last shot was 25t.

2/07/07 – Steaming back to port 11:30. 2 or 3 shots last night. No big catches.