Preliminary Tristan Group Biomass Survey Leg1 results including data from the 2015 season

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Summary

This paper reports the updated biomass indices obtained from the annual (Leg1) biomass survey at each island. The index shows a slight overall downward trend for Inaccessible, which is also evident also for Tristan (but larger there) and for Gough (though there only for the more recent years). In contrast, there has been a sharp recent increase for Nightingale. There have been some changes over time in the size distribution, the most marked of which is a steady decrease in the mean length at Tristan. The percentage of females in the catch at Gough is about double that at the other islands.

Introduction

A number (16) of biomass surveys has been completed thus far at each of the four islands of the Tristan da Cunha group. Table 1 lists the months during which each of these surveys were undertaken at each of the four islands. For each season there has traditionally been a Leg1 survey carried out around Aug/Sept and then a further Leg2 survey conducted around Feb/Mar. This document provides a brief summary of the biomass index data collected thus far for the Leg1 surveys, including the most recent 2015[1] data – although note that the 2015 catch-at-length data are not yet available, and this document will be updated once they do. For stock assessment purposes, it has been decided that the operating models will fit to the Leg1 biomass survey index and catch-at-length data only. Leg2 surveys will be discontinued. The rationale for this decision was that whilst the Leg1 surveys were consistently undertaken at the start of each season, the timing of the Leg2 surveys tended to vary somewhat, particularly with respect to the amount of catch that had been taken at the time of the Leg2 survey. It is considered therefore that the Leg2 surveys would not be readily comparable from season to season.

[1] The split season is denoted by the first year, i.e. 2013 refers to the 2013/14 season.

Methods

Biomass index

At each island a number of transects is set (e.g. Tristan has eight transects) – Table 1 lists the number of transects for each island. On each transect, nine traps are set – 3 inshore, 3 middle of each transect and 3 offshore. The total number of lobsters and the biomass caught from each of the nine traps has been recorded by James Glass (pers. commn). Thus for each survey at Tristan, there are 8 transects x 9 traps = 72 values of a biomass index in terms of numbers caught per trap.

For each transect (*s*) the average of the reported biomass indices for the nine traps is obtained ($\overline{B}_s$). (This analysis treats transects rather than traps as the sampling unit, both because of possible spatial correlation (non-independence) along a transect, and because lobster density may vary with depth so that the survey design is such as allows this variation to be integrated out.)

The following are then calculated where *n* is the pertinent number of transects :

Mean biomass index $\overline{B}_s = \frac{\sum_s \overline{B}_s}{n}$

Standard deviation $sd = \sqrt{\frac{n\sum \overline{B}_s^2 - (\sum \overline{B}_s)^2}{n(n-1)}}$

Standard error $se_m = \frac{sd}{\sqrt{n}}$

The mean and 95% confidence intervals for the mean biomass index calculated for each Leg1 survey are plotted in Figures 1a-d. To avoid confidence intervals overlapping zero, the assumption has been made of distribution lognormality with $CV = \frac{se_m}{\bar{B}_s}$

Results and Discussion

Biomass index

Table 2 reports the mean biomass survey index values with their associated CVs. The mean and 95% confidence intervals for the mean biomass index calculated for each Leg1 survey are plotted in Figures 1a-d.

Figures 1a-b show declines in the latest 2015 biomass survey indices at both Inaccessible and Nightingale, though the index for Nightingale remains high relative to earlier values. The Tristan biomass index is also slightly lower for 2015 (Figure 1c) and for Gough (Figure 1d) the 2015 value is very similar to the previous years' value (2014) (though slightly down).

Table 1: Months during which the surveys completed thus far for the four islands have taken place. Leg 1 surveys are shown in bold.

	Tristan	**Nightingale**	**Inaccessible**	**Gough**
Season 2006/07 Leg 1	**Sep 2006**	**Sep 2006**	**Sep 2006**	**Oct 2006**
Season 2006/07 Leg 2	Feb 2007	Feb 2007	Feb 2007	Feb 2007
Season 2007/08 Leg 1	**Sep 2007**	**Sep 2007**	**Sep 2007**	**Oct 2007**
Season 2007/08 Leg 2	Mar 2008	Mar 2008	Mar 2008	Feb 2008
Season 2008/09 Leg 1	**No surveys due to factory fire**			
Season 2008/09 Leg 2	Feb 2009	Feb 2009	Feb 2009	Feb 2009
Season 2009/10 Leg 1	**Sep 2009**	**Sep 2009**	**Sep 2009**	**Sep 2009**
Season 2009/10 Leg 2	Mar 2010	Mar 2010	Mar 2010	Apr 2010
Season 2010/11 Leg 1	**Sep 2010**	**Sep 2010**	**Sep 2010**	**Sep 2010**
Season 2010/11 Leg 2	Mar 2011	Mar 2011	Mar 2011	April 2011
Season 2011/12 Leg 1	**Aug 2011**	**Aug 2011**	**Aug 2011**	**Sep 2011**
Season 2011/12 Leg 2	Feb 2012	Feb 2012	Feb 2012	Feb 2012
Season 2012/13 Leg 1	**Sep 2012**	**Aug 2012**	**Sep 2012**	**Sep 2012**
Season 2012/13 Leg 2	Mar 2013	Feb 2013	Feb 2013	Jan 2013
Season 2013/14 Leg 1	**Sep 2013**	**Aug 2013**	**Aug 2013**	**Sep 2013**
Season 2014/15 Leg 1	**Sep 2014**	**Sep 2014**	**Sep 2014**	**Sep 2014**
Season 2015/15 Leg 1	**Aug 2015**	**Aug 2015**	**Aug 2015**	**Sep 2015**
# Leg1 transects *n*	8	4	5	8

Table 2: Leg1 mean biomass survey index values, with associated CVs in parentheses.

	Tristan	**Nightingale**	**Inaccessible**	**Gough**
2006	31.60 (0.21)	13.86 (0.15)	17.80 (0.23)	8.03 (0.31)
2007	40.23 (0.13)	20.31 (0.19)	16.33 (0.21)	11.15 (0.28)
2008	-	-	-	-
2009	26.64 (0.13)	16.31 (0.05)	14.98 (0.36)	26.47 (0.26)
2010	25.49 (0.14)	14.00 (0.26)	10.98 (0.55)	11.15 (0.32)
2011	28.36 (0.14)	4.63 (0.51)	16.60 (0.19)	16.39 (0.26)
2012	17.96 (0.14)	18.10 (0.19)	9.51 (0.22)	9.11 (0.27)
2013	17.14 (0.13)	23.50 (0.19)	12.64 (0.30)	13.07 (0.30)
2014	18.82 (0.17)	30.92 (0.11)	12.22 (0.22)	8.50 (0.28)
2015	15.63 (0.18)	23.61 (0.21)	9.27 (0.36)	8.31 (0.33)

Figure 1a: Biomass indices (in terms on the average mass caught per trap) for the Leg1 surveys for **Inaccessible**. The means and (and assumed log normal) 95% confidence intervals are shown.

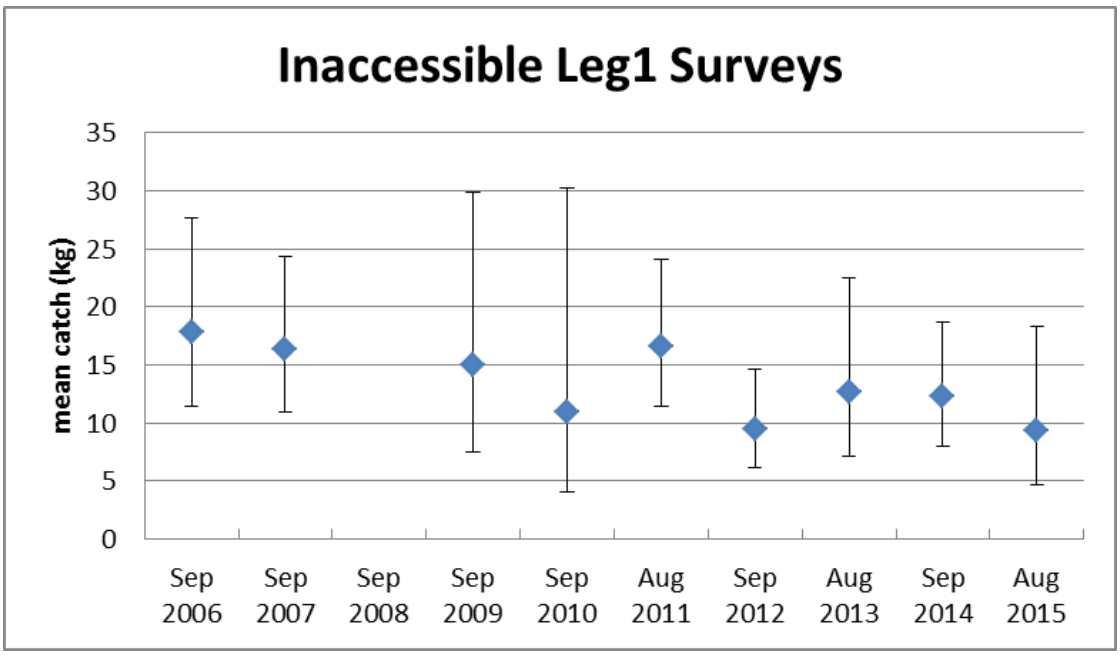

Figure 1b: Biomass indices (in terms on the average mass caught per trap) for the Leg1 surveys for **Nightingale**. The means and (and assumed log normal) 95% confidence intervals are shown.

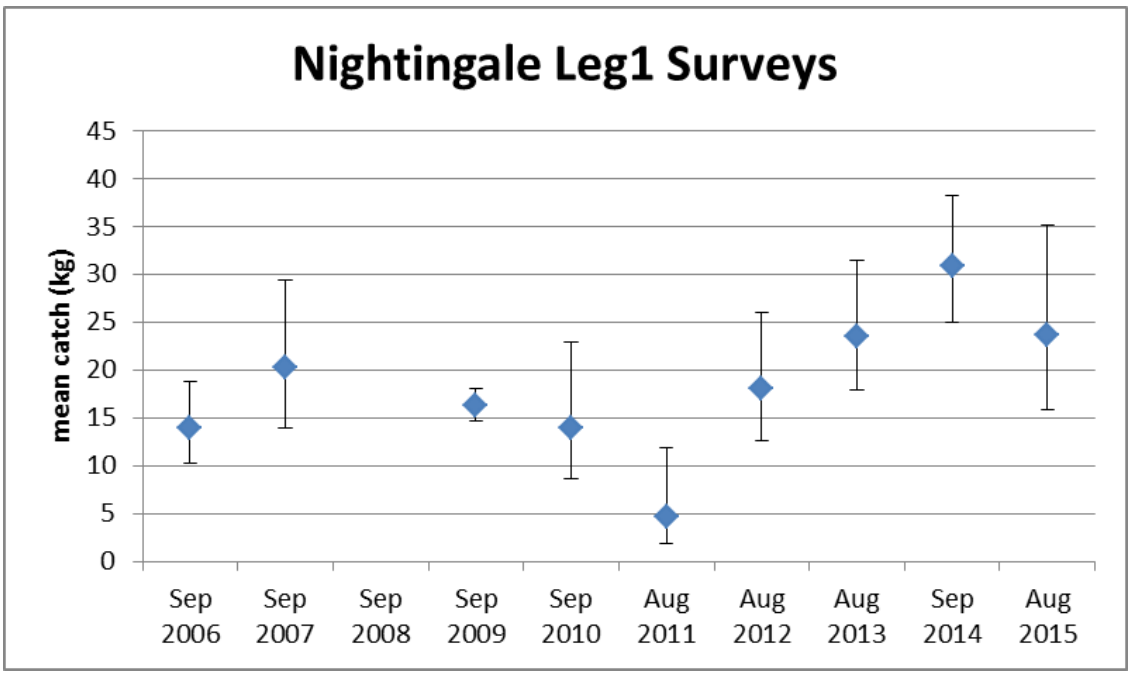

Figure 1c: Biomass indices (in terms on the average mass caught per trap) for the Leg1 surveys for **Tristan**. The means and (and assumed log normal) 95% confidence intervals are shown.

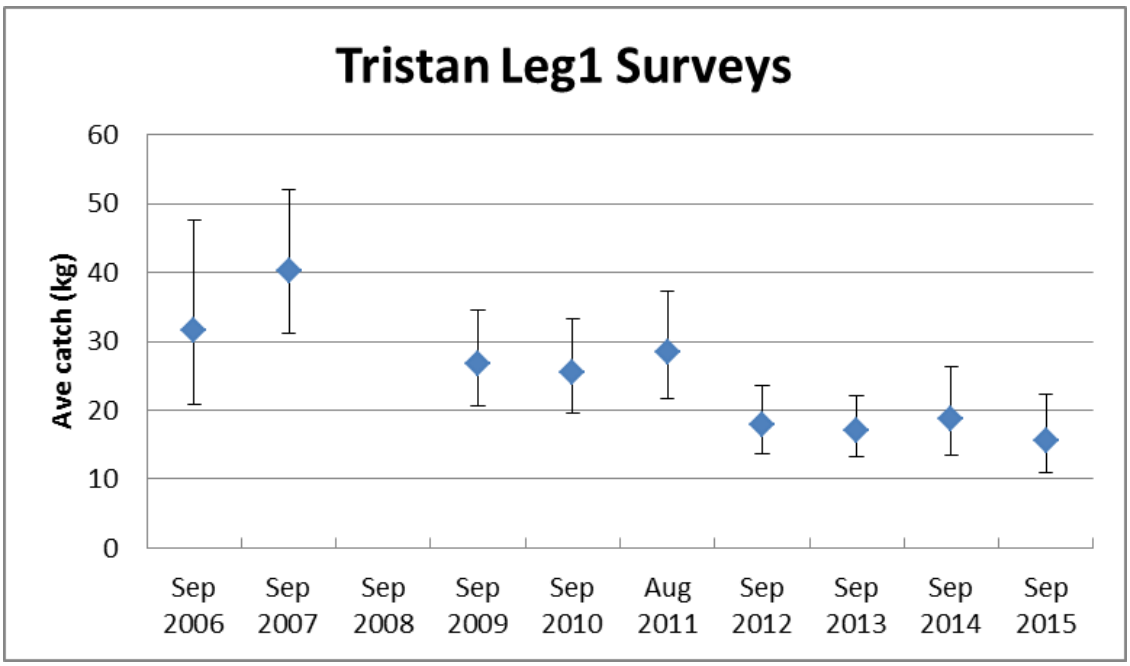

Figure 1d: Biomass indices (in terms on the average mass caught per trap) for the Leg1 surveys for **Gough**. The means and (and assumed log normal) 95% confidence intervals are shown.