A Summary of the Tristan Biomass Index Survey results to date

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Introduction

A number (12) of biomass surveys has been completed thus far at each of the four islands of the Tristan da Cunha group. Table 1 provides the months during which each of these surveys was undertaken at each of the four islands. For each season there is usually a Leg 1 survey carried out at around Aug/Sept and then a further Leg 2 survey conducted around Feb/Mar. This document aims to provide a brief summary of the biomass index data collected thus far.

Note that the March 2011 surveys at the inner islands were conducted just prior to the OLIVA incident.

Methods

At each island a number of transects are 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 mid-shore 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.)

If n is the number of transects, then the following are calculated:

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

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

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

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

Discussion

It is interesting to note that the average biomass index (per trap) across all surveys for each island are:

Tristan = 24.56 kg

Inaccessible = 12.14 kg

Nightingale = 12.16 kg

Gough = 9.44 kg

From the plots in Figures 1a-d a similar pattern is clear across all four islands. It is evident that biomass indices are larger for Leg 1 surveys which are undertaken during the Aug/Sep period, than for Leg 2 surveys undertaken during the Feb/Mar period. The same pattern is evident in the month factors estimated in GLM analyses of commercial CPUE data (Johnston *et al.* 2010; 2012). There are likely to be a number of biological factors (e.g. moulting cycle) and physical factors (e.g. weather conditions) which are driving these features. The only exception is the Sep 2011 (post OLIVA) survey at Nightingale which is the lowest on record and which yielded only about the same result as did the Mar 2011 survey.

Table 2 provides a summary of the 2011 and 2012 survey results relative to earlier years in a way that allows for the monthly pattern in CPUE. The key result from this Table is the indication that while abundances at Tristan and Inaccessible hardly changed (relative to previous averages) from March and September 2011, there was a decrease of about 50% at Nightingale where the OLIVA grounding and soya spill occurred between the two surveys. Regarding the two 2012 surveys, the variances are high, nevertheless both Inaccessible and Tristan are down (compared to average of previous years). However, Nightingale is considerably up – this being consistent with the test fishing data results. What this means exactly is unclear, and it is unlikely to be a true reflection of the actual biomass going decreasing or increasing so fast, but rather more to do with the “availability” of the lobsters over this time.

Reference

Johnston, S.J., Brandao, A. and D.S. Butterworth. 2012. GLMM- and GLM-standardised lobster CPUE from the Tristan da Cunha group of islands for the 1997-2010 period. MARAM document, MARAM/Tristan/2012/Jun/07.

Table 1: Months during which the surveys completed thus far for the four islands took place.

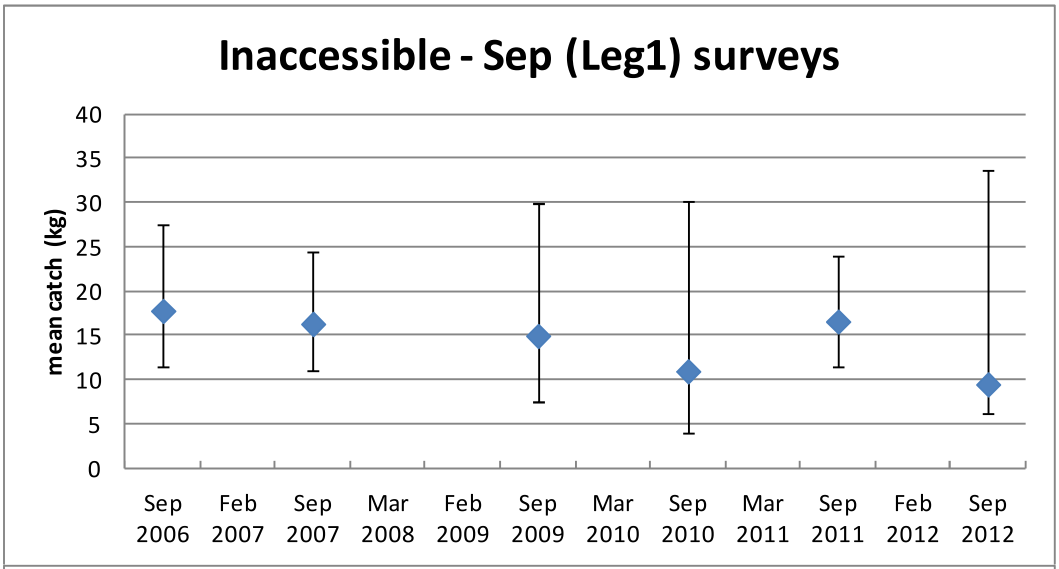
	Tristan	**Nightingale**	**Inaccessible**	**Gough**
Season 2006/07 Leg 1	Sep 2006	Sep 2006	Sep 2006	Oct 2006
Season 2006/07 Leg 2	Feb 2007	Feb 2007	Feb 2007	Feb 2007
Season 2007/08 Leg 1	Sep 2007	Sep 2007	Sep 2007	Oct 2007
Season 2007/08 Leg 2	Mar 2008	Mar 2008	Mar 2008	Feb 2008
Season 2008/09 Leg 1	No 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	Aug 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	? 2012
# transects *n*	8	4	5	8

Table 2: Ratios of recent survey results (for 2011-2012) to inverse variance weighted averages over all previous years, with standard errors shown in parentheses

	Feb/Mar 2011	Sep/Oct 2011 (Post OLIVA)	Feb 2012 (Post OLIVA)	Aug/Sep 2012 (Post OLIVA)
Inaccessible	0.98 (0.42)	1.05 (0.25)	0.68 (0.64)	0.60 (0.60)[#]
Nightingale	0.59 (0.12)	0.29 (0.15)	1.26 (0.54)	1.13 (0.36)[#]
Gough	1.04 (0.40)	1.54 (0.46)	1.44 (0.56)	0.80 (0.58)
Tristan	0.94 (0.14)	0.98 (0.15)	0.66 (0.38)	0.62 (0.42)

the “historic” period omits the Sep 2011 value.

Figure 1a: Biomass indices (in terms on the average mass caught per trap) for the various surveys for **Inaccessible**. The means and (and log normal) 95% confidence intervals are shown. The top plot shows results for the September surveys, and the bottom plot shows results for the Feb/Mar surveys.



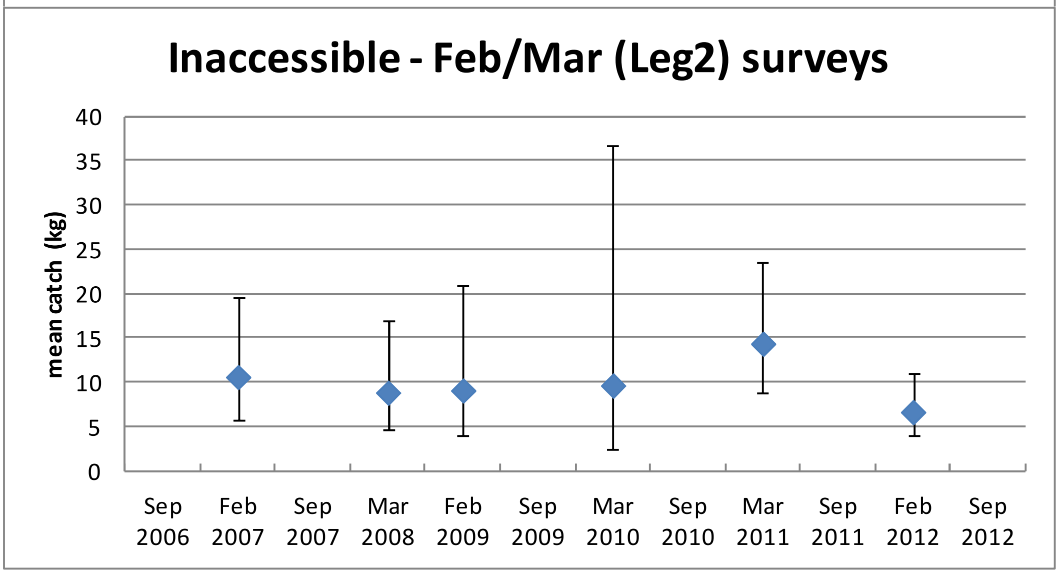
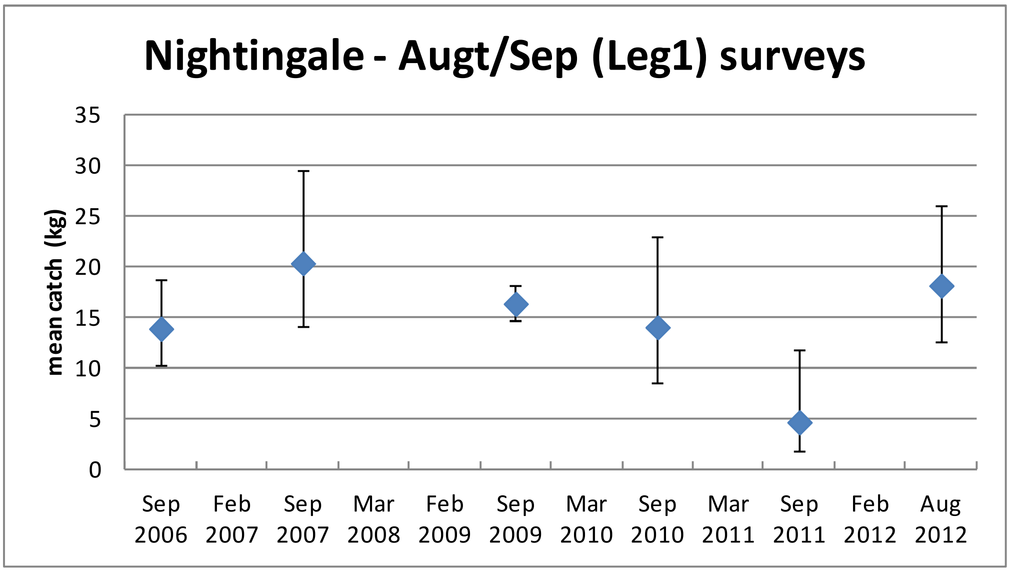


Figure 1b: Biomass indices (in terms on the average mass caught per trap) for the various surveys for **Nightingale**. The means and (assume log normal) 95% confidence intervals are shown. The top plot shows results for the September surveys, and the bottom plot shows results for the Feb/Mar surveys.



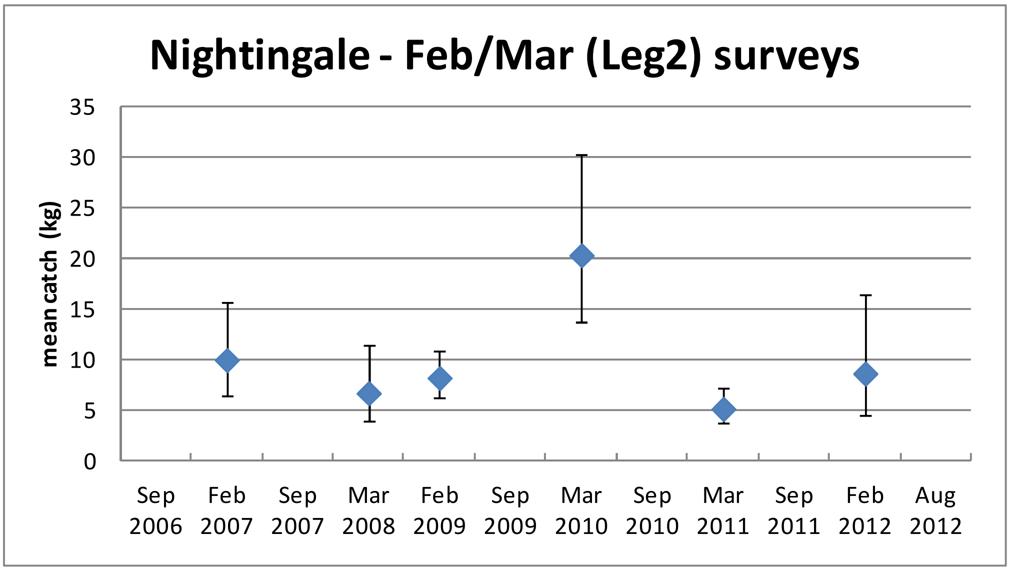
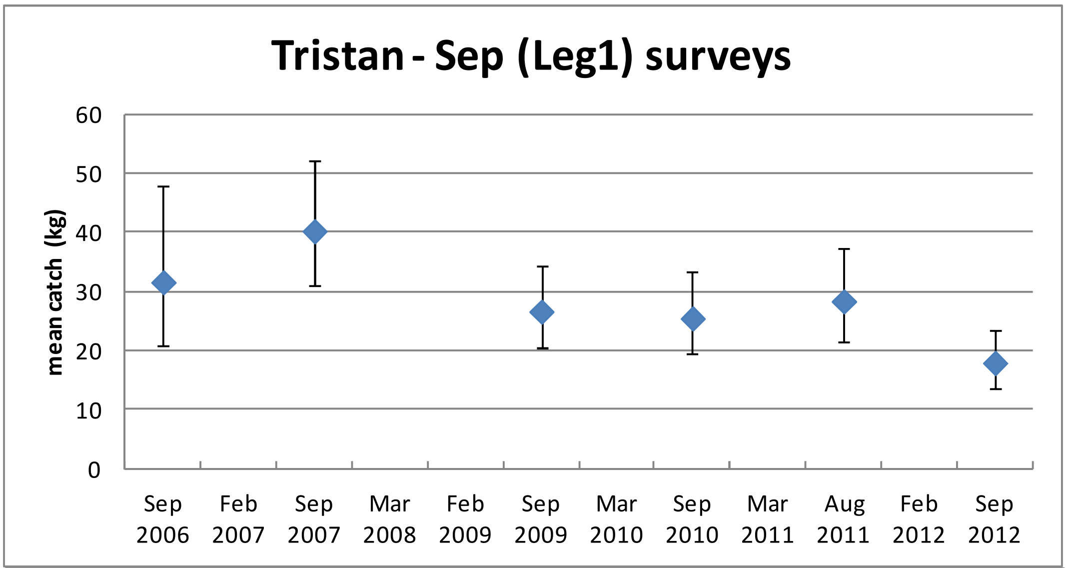


Figure 1c: Biomass indices (in terms on the average mass caught per trap) for the various surveys for **Tristan**. The means and (assume log normal) 95% confidence intervals are shown. The top plot shows results for the September surveys, and the bottom plot shows results for the Feb/Mar surveys.



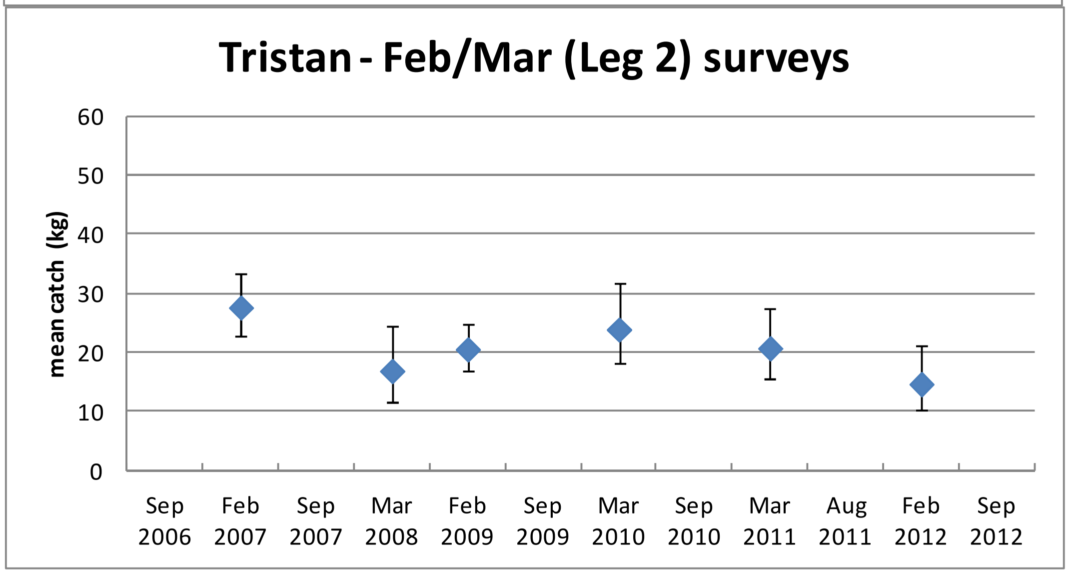


Figure 1d: Biomass indices (in terms on the average mass caught per trap) for the various surveys for **Gough**. The means and (assume log normal) 95% confidence intervals are shown. The top plot shows results for the Aug-Oct surveys, and the bottom plot shows results for the Feb-Apr surveys.