Tristan powerboat CPUE efficiency

S.J. Johnston and D.S. Butterworth

MARAM

Department of Mathematics and Applied Mathematics

University of Cape Town

Tristan CPUE at the fisherman level

This document aims to inform on how certain important factors related to the Tristan powerboat CPUE data could influence the recent CPUE trend. Here we explore the influence the individual fisherman may have on the annual CPUE index.

The powerboats at Tristan are usually manned by a team of two fishermen. This team may change over time and during a season. The catch and effort database currently has records of both fishermen for each "pull" for the 2005-2014 period. In order to treat the fishermen as individual factors, the catch rate for the two fishermen in a "pair" was assumed to be equal.

The average CPUEs for each fisherman and season were calculated. Note that the various 2014/15 season "names" which Erik MacKenzie has indicated were only casual stand-ins have been removed, and data corrected for different names used for the same person.

Blue indicates fishermen who have been active over the whole 2005-2014 period,

Green indicates those fishermen active ONLY in the 2005-07 period (and presumably retired), and

Red indicates the "novice" fishermen who have only started fishing in 2013 or 2014 season.

Figure 1 plots the average CPUE per fisherman for each season, ranked from highest to lowest.

Please note that the ONLY reason these plots have been created is to identify particularly in the last few seasons i.e. 2013 and 2014 here, if the novices tend to perform below average, i.e. are the red columns more to the right hand side of the plot, or are they evenly spread throughout the plot.

The idea behind this initial analysis was to give some indication whether it is worth adding the fishermen "names" as a co-variate in the CPUE GLM analyses conducted on the Tristan catch and effort database, as there may be some impact the different fishermen have on the CPUE values themselves, i.e. assuming all fishermen are equal (as we currently do) may bias perceptions of the trend in lobster abundance indicated by existing analyses of CPUE data.

GLM analysis

A GLM analysis was applied to the same dataset described above in the form:

$\ln(CPUE) = constant + season\_factor + name\_factor$

The resultant CPUE is expressed as $e^{constant + season\_factor}$, and compared with the normal GLM standardized CPUE that was most recently updated in MARAM/Tristan/2015/MAY/06 (where no name_factor is used, though a month_factor is).

Figure 2 shows a plot of the most recent normal GLM CPUE series for Tristan ("GLM 2015 normal") with the GLM described in this document which includes the fisherman names as a factor ("GLM with names"). The "GLM with names" series was renormalized to the 2005-2007 values of the "GLM 2015 normal series".

Both series indicate a 29% drop from 2013 to 2014, though the decline from the peak around 2006 to the present time is less when the individual fisherman efficiency is taken into account.

If more analyses are to be conducted on this aspect of CPUE, one possible consideration is to allow for a proportionally lower efficiency for each fisherman in the first year he fishes to account for initial learning effects.

Figure 1: Rankings of fishermen efficiency as defined by average CPUE per day.
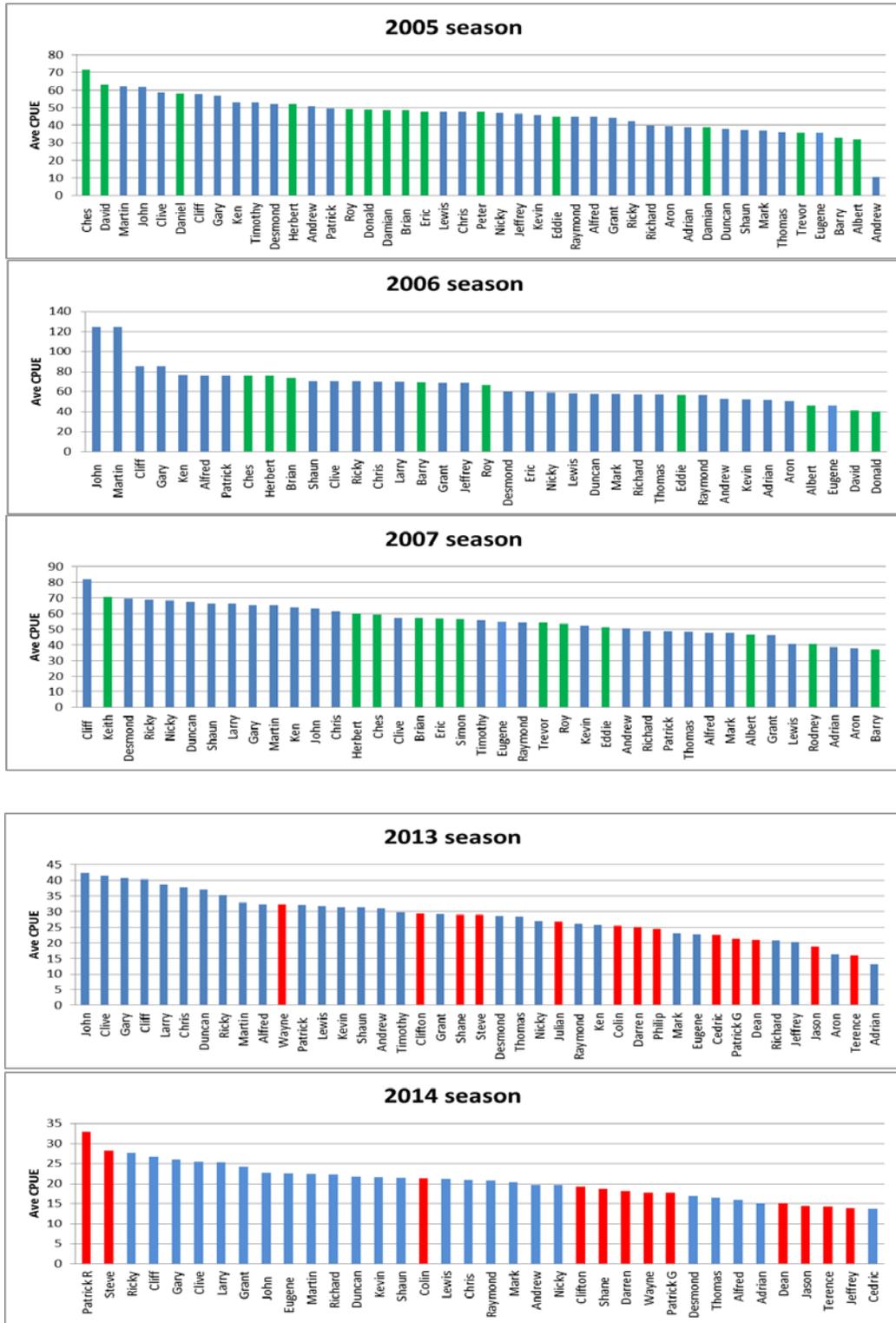
Figure 2: Comparative plot of the most recent normal GLM CPUE series for Tristan (GLM 2015 normal) with the GLM described in this document which includes the fisherman names as a factor (GLM with names). The "GLM with names" series was renormalized to the 2005-2007 values of the "GLM 2015 normal series".