The application of the species splitting algorithm derived from observer data to the offshore hake catch and effort data

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Summary

An algorithm derived from the application of research survey data has been used to separate the hake catches by species. This algorithm has been used since 2004 to produce species-specific catches and CPUE data for input to the stock assessment model given that catches are recorded on a species-aggregated basis in log books. The algorithm was recently updated (OLRAC, 2013a) and includes data for the period 1985-2012.

An alternative data source for splitting the catches by species is that of the observer program. An algorithm was subsequently developed utilizing these particular data, which cover the period 2002-2012. OLRAC (2013b) noted that the observer-based algorithm estimates a much higher proportion of *M. paradoxus* at depths of less than 300 m than does the survey-based algorithm. Analysis of the data by depth shows that very few trawls are sampled at depths of < 200 metres in the observer data. The demersal surveys, on the other hand, have a very high proportion of trawls sampled in those depth ranges. It was therefore concluded that the survey data are a more reliable predictor of species composition in shallow waters. Some hypotheses were put forward as possible candidates for explaining the differences in the results from the two data sources, namely:

1. Misspecification of the length range of hake that correspond to the small, medium and large size catagories used for reporting commercial catches.
2. A different distribution by length in the survey data compared to the commercial data, for the small, medium and large size ranges.
3. Different fishing locations for shallow water trawls in the commercial data compared to the survey data.

Although the differences between the two data sources have not yet been resolved, the Demersal Working Group agreed that the species-splitting algorithm developed using the observer data be considered for sensitivity in the development of OMP 2014, and the results from its application are reported here.

The species splitting algorithm

The algorithm utilizes a GLM with a binomial distribution and a logit link function (OLRAC, 2013). Both west and south coast data were modelled using the equation:

$$P = \frac{e^{\psi}}{1+e^{\psi}} = \frac{1}{1+e^{-\psi}} \quad \textbf{(1)}$$

with $$\psi = \mu + \lambda_{sizeclass} + \gamma(depth) \quad \textbf{(2)}$$

where: P is the proportion of ***Merluccius paradoxus***;

μ is the intercept;

$\lambda_{sizeclass}$ is the size class specific parameter*;*

γ is the constant of proportionality in the linear relationship assumed with depth*;*

The application of the model of equation (1) to the observer data yielded the parameter estimates shown in Table 1, which are then used to split the hake catches by species. Details of the models applied to standardize the CPUE data are available in Glazer (2013a), while the methods applied to split the catches by species and coast are reported in Glazer (2013b).

Results

Standardized CPUE trends as a result of the application of the observer-derived species splitting algorithm are shown in Figures 1 and 2 for *M. paradoxus* and *M. capensis* respectively and are compared to those from the survey-derived species splitting algorithm (Glazer, 2013c).

Updated catches derived from the application of the observer-derived species splitting algorithm are shown in Figure 3 and are compared to the catches derived from the survey-derived species splitting algorithm (Glazer, 2013c).

References:

OLRAC. 2013a. A further update of the hake species splitting model. Unpublished Working Group Document *FISHERIES/2013/FEB/SWG-DEM/12*, and associated ADDENDUM (Updated parameter estimates for the hake species split model). 16pp+1pp.

OLRAC. 2013b. Alternative estimates of the hake species splitting model biased towards observer data. Unpublished Working Group Document *FISHERIES/2013/SEP/SWG-DEM/47*. 11pp.

Glazer,J.P. 2013a. Offshore hake species- and coast-specific standardized CPUE indices. Unpublished Working Group Document *FISHERIES/2013/AUG/SWG-DEM/26*. 11pp.

Glazer, J.P. 2013b. Separating the offshore hake catches by coast and species. Unpublished Working Group Document *FISHERIES/2013/AUG/SWG-DEM/25*. 5pp.

Glazer, J.P. 2013c. Updated CPUE and catch analyses for OMP 2014. Unpublished Working Group Document *FISHERIES/2013/SEP/SWG-DEM/49*. 10pp.

Table 1: Model parameter estimates for the hake species-splitting model as derived from an analysis of observer data (taken from Tables 2 and 5 of OLRAC (2013b)).

Parameter	Estimates	
	West Coast	**South Coast**
μ	-2.687	-1.866
λ_{small}	3.058	2.889
λ_{medium}	1.41	1.356
λ_{large}	0	0
γ (meters)	0.01	0.01

Figure 1: *M. capensis* standardized CPUE utilizing the 2013 species splitting algorithms derived from an analysis of a) survey data and b) observer data respectively. Each index has been normalized to its mean.

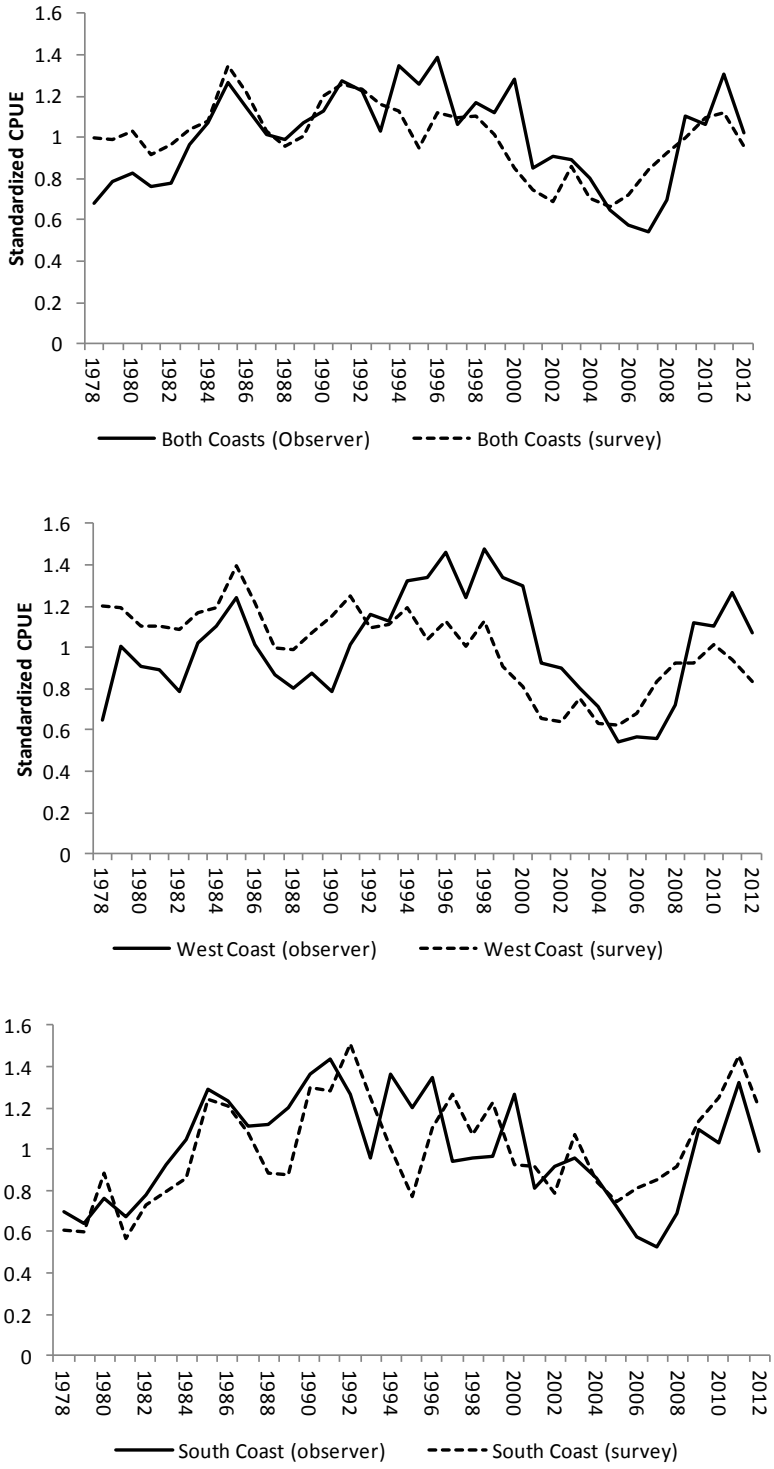

Figure 2: *M. paradoxus* standardized CPUE utilizing the 2013 species splitting algorithms derived from an analysis of a) survey data and b) observer data respectively. Each index has been normalized to its mean.

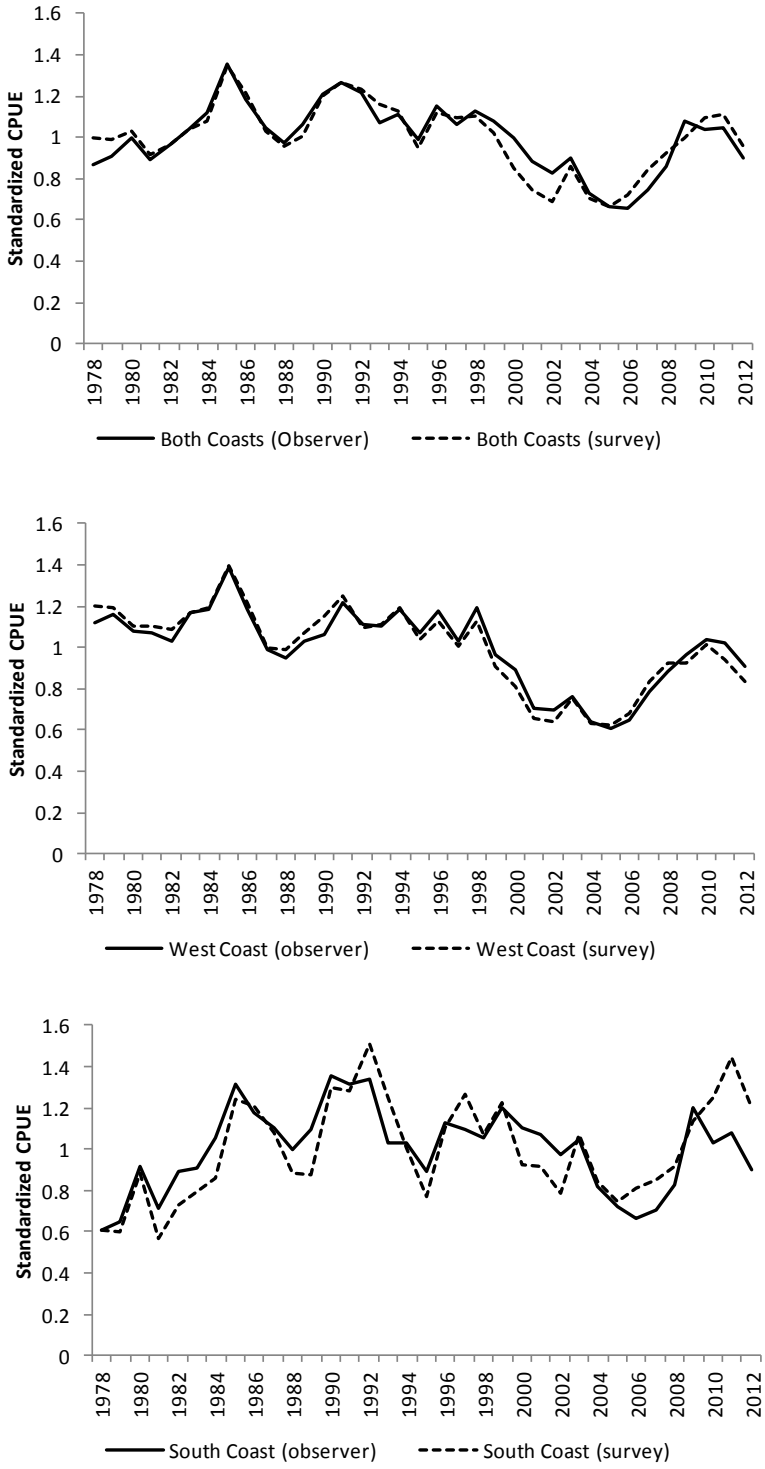

Figure 3: Catches per species and coast utilizing the 2013 species splitting algorithms derived from an analysis of a) survey data and b) observer data respectively.