

## Proposed Sardine and Anchovy Stock Structure and Some Other Major Assessment Hypotheses

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The agreed schedule for revision of the current sardine-anchovy Operating Management Procedure (OMP) requires the pre-2010 data to be considered in conditioning the Operating Models (OMs) for OMP testing to now have been finalised (de Moor 2010). That deadline also relates to the broad alternative stock structure assumptions to be considered. This document sets out these assumptions as currently understood by the authors to confirm their agreement within the SWG-PEL.

### Anchovy

- 1) A single anchovy stock will be considered. The single area modelled will correspond to the area west of Port Alfred. Given this assumption, changes in distribution within this area over the period under consideration will not impact the population model to be used. To the extent that estimates or projections may be required (for example for models linking penguin dynamics to fish abundance in a smaller region), this can be achieved through proportional allocation by area by use of historical estimates for these proportions from past survey results.

### Sardine

- 1) A single sardine stock will be considered. The single area modelled will correspond to the area west of Port Alfred. Given this assumption, changes in distribution within this area over the period under consideration will not impact the population model to be used. To the extent that estimates or projections may be required (for example for models linking penguin dynamics to fish abundance in a smaller region), this can be achieved through proportional allocation by area by use of historical estimates for these proportions from past survey results.
- 2) Two discrete sardine stocks will be considered. A “western” stock will be modelled to be distributed throughout the “western area”, defined as the area west of Cape Agulhas. An “eastern” stock will be modelled to be distributed throughout the “eastern area”, defined as the area east of Cape Agulhas. The two stocks will be assumed to be independent and the model will assume no mixing between the stocks. Previous work suggested that the existing data could be reasonably explained by this hypothesis (de Moor and Butterworth 2009a), with the observed

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“peak” in abundance in the early 2000’s explained by a larger increase in the “eastern” stock than the “western” stock.

3) Two partially overlapping sardine populations will be considered. The two discrete stock hypothesis will be amended to allow for mixing in the following manner (de Moor and Butterworth 2009b):

a) Movement of recruits from the “western” stock to the “eastern” stock in the November in which they become 1-year-olds<sup>1</sup>. This movement is proposed to be biomass-dependent, i.e. the greater the “western” stock biomass, the greater the migration of recruits to the “eastern” stock. Alternatively this could be dependent on the recruit biomass, i.e. a greater migration of recruits would occur during years of good recruitment to the “western” stock.

b) Movement of adults from the “eastern” stock to the “western” stock in the November in which they become 2+-year-olds. This movement is proposed to be independent of the stock biomass in a random effects type model framework (the process of fitting the model to the data will indicate to what extent this movement occurred each year)..

c) Recruitment to the “western” stock depends on the spawning biomass of the “western” and “eastern” stocks.

Previous attempts at fitting a model of two partially overlapping sardine populations to the available data were not successful (de Moor and Butterworth 2009b); however this will be attempted again with the updated data set, which will now include ageing data that have recently become available.

## General

The biomass west of Port Alfred will be used, retaining the assumption for base case models that the proportion of sardine and anchovy west of Port Alfred has been unchanged over time. Only once between 2003 and 2008 when the November cruises have extended east of Port Alfred was a substantial sardine biomass found east of Port Alfred (26% of total observed biomass in 2003, compared to <3% in 2004 and 2005 and <1% in 2006, 2007 and 2008).

Possible changes in natural mortality over time will not be taken into account in the base case, but this may be considered for robustness tests.

Note that the MP developed will not, indeed cannot be population-specific, because it must be applicable whether there are either one or two populations present. Thus the MP will output TACs for the full SA coastline; it may, however, have a spatial allocation component.

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<sup>1</sup> If such movement does occur, it is likely to be continuous throughout the year. This assumption is made in the interests of keeping the model simple.

Initial computations will need to be carried out prior to any decision being taken as to whether the MP developed and/or OMs used to test the MP will need to treat sardine bycatch on the west coast (reflecting harvesting of the “west” population only) differently from that on the south and east coasts.

### **References**

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