Overview of Sardine Documents

C.L. de Moor* and D.S. Butterworth*

Correspondence email: *carryn.demoor@uct.ac.za*

Below lists a short overview of the sardine documents for the December 2016 MARAM International Stock Assessment Workshop.

Background documents

MARAM/IWS/DEC16/Sardine/BG1: This document.

MARAM/IWS/DEC16/Sardine/BG2: de Moor CL and Butterworth DS. 2016. Response to the review panel report for the 2015 International Fisheries Stock Assessment Workshop : Sardine.

- Lists the recommendations from the Panel of the 2015 workshop that relate to sardine, together with responses on progress made.

MARAM/IWS/DEC16/Sardine/BG3: de Moor CL and Butterworth DS. 2015. Assessing the South African sardine resource: two stocks rather than one?

- Motivates reasons for a two mixing stock hypothesis, and details the "first attempted" two mixing stock hypothesis.

MARAM/IWS/DEC16/Sardine/BG4: de Moor CL, Coetzee J, van der Westhuizen JJ and van der Lingen C. 2016. A record of the generation of data used in the 2016 sardine and anchovy assessments.

- Details all the data used to condition the sardine and anchovy OMs. Primarily for background interest or cross reference purposes. Further details of parasite data provided in MARAM/IWS/DEC16/BG5.

MARAM/IWS/DEC16/Sardine/BG5: van der Lingen CD. 2016. A description of parasite data (2010-2015)

- Used to condition the sardine two mixing stock OM.
- Details tetracotyle-type metacercariae (TTM) parasite infection prevalence-at-length data collected for sardine west and east of Cape Agulhas during annual biomass surveys, 2010-2015, presently used in assessments.
- Details parasite infection intensity-at-length data collected for sardine west and east of Cape Agulhas during annual biomass surveys, 2010-2015, that may be used in future assessments.

MARAM/IWS/DEC16/Sardine/BG6: de Moor CL and Butterworth DS. 2016. Assessment of the South African sardine resource using data from 1984-2015: Results at the joint posterior mode for the single stock hypothesis.

- Results for a single stock hypothesis for sardine. Assumes hockey-stick S/R relationship. Primarily for background interest or cross reference purposes.

MARAM/IWS/DEC16/Sardine/BG7: de Moor CL. 2016. Assessment of the South African anchovy resource using data from 1984-2015: results at the posterior mode.

- Anchovy assessment. Although this review will focus primarily on the sardine OM, the MP is a joint sardine-anchovy MP. Primarily for background interest or cross reference purposes.

* MARAM (Marine Resource Assessment and Management Group), Department of Mathematics and Applied Mathematics, University of Cape Town, Rondebosch, 7701, South Africa.

MARAM/IWS/DEC16/Sardine/BG8: de Moor CL. 2016. Excluding survey estimates of recruitment on the South Coast from the two mixing stock hypothesis for South African sardine.

- A sensitivity test in which south coast recruitment data are excluded from the likelihood. In response to recommendations from December 2015 (see MARAM/IWS/DEC16/BG2). This shows recruitment to the south stock is of the same order of magnitude as that estimated when the south coast data are included.

MARAM/IWS/DEC16/Sardine/BG9: de Moor CL. 2016. Testing robustness of the two mixing stock hypothesis for South African sardine to parasite prevalence data between 20 and 22 degrees.

- A sensitivity test in which additional parasite prevalence data are included in the likelihood. In response to recommendations from December 2015 (see MARAM/IWS/DEC16/BG2). This shows the estimated proportions of sardine moving in some recent years are different (95% Hessian based CIs do not overlap) when these data are included.

MARAM/IWS/DEC16/Sardine/BG10: de Moor CL and Butterworth DS. 2014. OMP-14.

- Please refer to pages 13-21 for Harvest Control Rules currently used in the sardine-anchovy OMP

MARAM/IWS/DEC16/Sardine/BG11: SAPFIA 2016. SAPFIA comments on the socio-economic implications of spatial management and the development of OMP-17 in the Small Pelagic fishery

- Briefing the workshop on socio-economic implications of spatio-temporal TAC fluctuations emanating from proposed changes in the sardine OMP

Primary papers

MARAM/IWS/DEC16/Sardine/P1: de Moor CL, Butterworth DS and van der Lingen CD. The Quantitative Use of Parasite Data in Multi-Stock Modelling of South African Sardine (*Sardinops sagax*).

- Sardine two stock OM, showing that including parasite prevalence-by-length in the likelihood improves the precision with which movement can be estimated. The accepted version is under CJFAS copyright, this is the originally submitted manuscript.

MARAM/IWS/DEC16/Sardine/P2: de Moor CL and Butterworth DS. 2016. Assessment of the South African sardine resource using data from 1984-2015: Results at the joint posterior mode for the two mixing-stock hypothesis.

- Full details of sardine two-stock OM. Assumes a hockey stock S/R relationship.

MARAM/IWS/DEC16/Sardine/P3: Coetzee JC. 2016. Estimation of the effective proportion of sardine biomass contributing to putative western stock recruitment by including the proportion of eggs transported to the West Coast nursery area from South Coast spawning areas.

- Evaluation of annually varying proportions of south coast biomass contributing to west coast recruitment, in the two mixing stock OM for sardine, based on the hydrodynamic model.

MARAM/IWS/DEC16/Sardine/P4: de Moor CL. 2016. An alternative two mixing stock hypothesis for South African sardine.

- Allowing for some south stock SSB to form part of the west stock “effective” SSB in the two mixing stock OM for sardine, based on MARAM/IWS/DEC16/Sardine/P3.

MARAM/IWS/DEC16/Sardine/P5: de Moor CL. 2016. The two mixing stock hypothesis for South African sardine without an assumed stock-recruit relationship.

- Removing the assumed stock recruitment relationship from the two mixing stock OM for sardine to allow for a variety of relationships to be explored more readily through fitting to assessment outputs.

MARAM/IWS/DEC16/Sardine/P6: Butterworth DS. 2016. A Draft Framework for Assigning Probabilities to Alternative Assumptions concerning the Contribution of Sardine Spawning Biomass on the South Coast to Recruitment on the West Coast.

- Puts forward a framework for combining sources of information on the extent to which south coast spawning biomass contributes to west coast recruitment of sardine to provide a basis to weight alternative hypotheses.

MARAM/IWS/DEC16/Sardine/P7: Butterworth, DS, van der Lingen CD, Coetzee J and de Moor CL. 2016. The present agreed hypothesis for South African sardine stock structure.

- The current stock structure hypothesis for sardine.

MARAM/IWS/DEC16/Sardine/P8: van der Lingen CD, Coetzee JC and McGrath A. 2016. Data for informing the choice of a prior for the contribution of South Coast spawner biomass to West Coast recruitment.

- Evaluates one component of uncertainty in the estimation by the hydroacoustic model of the proportion of recruits from south coast spawning that contribute to west coast recruitment.

MARAM/IWS/DEC16/Sardine/P9: Butterworth DS and Ross-Gillespie A. 2016. An assignment of probabilities to alternative assumptions concerning the contribution of sardine spawner biomass on the South Coast to recruitment on the West Coast

- An update of MARAM/IWS/DEC16/Sardine/P6

MARAM/IWS/DEC16/Sardine/P10: OLRAC SPS. 2016. A statistical basis for estimating the proportion of South Coast spawning biomass that contributes to West Coast recruitment and of West Coast spawning biomass that contributes to South Coast recruitment.

- Another approach to estimate the extent to which south coast spawning biomass contributes to west coast recruitment of sardine to provide a basis to weight alternative hypotheses.

MARAM/IWS/DEC16/Sardine/P11: de Moor CL. 2016. An alternative method to estimate the contribution of south coast spawning to west coast sardine recruitment

- Yet another approach to estimate the extent to which south coast spawning biomass contributes to west coast recruitment of sardine to provide a basis to weight alternative hypotheses.
- Note the proportion estimated is taken to relate to recruits and not spawner biomass.

MARAM/IWS/DEC16/Sardine/P12: de Moor CL, Butterworth DS and Coetzee JC. 2016. Alternative hypotheses of west to south movement considered for South African sardine

- The alternative hypotheses considered for future proportions of age-1 sardine that move. MoveR and MoveB are the options most favoured by the SPSWG.

MARAM/IWS/DEC16/Sardine/P13: Vracken C, Butterworth DS. 2016. Some insights into sardine sustainable yield rates.

- A coarse first attempt to estimate and compare sustainable yield to spawning biomass ratios for sardine stocks worldwide.

MARAM/IWS/DEC16/Sardine/P14: de Moor CL. 2016. Draft simulation testing framework to be used during the development of OMP-17.

- Details the equations used to simulation project sardine and anchovy population dynamics from November 2015 to November 2036.
- While some parts of this framework (highlighted in grey) are still to be updated since the last OMP, it is expected these will not have a high influence on projections, particularly w.r.t. comparing between e.g. alternative movement hypotheses or alternative proportions of south coast spawning contributing to west coast recruitment.

MARAM/IWS/DEC16/Sardine/P15: de Moor CL. 2016. Initial simulation projection results assuming a no future catch scenario

- Shows preliminary sardine and anchovy biomass projections under a no catch scenario, assuming either a single stock hypothesis for sardine, or a two mixing stock hypothesis without any contribution of south coast spawning to west coast recruitment.

MARAM/IWS/DEC16/Sardine/P16: OLRAC SPS 2016. Comments on a recent hypothesis about the spatial structure of the sardine stock

- Raises some issues arising from the present favoured hypothesis for sardine stock structure