RESPONSE TO THE REVIEW PANEL REPORT FOR THE 2015 INTERNATIONAL FISHERIES STOCK ASSESSMENT WORKSHOP: HAKE PREDATION

Andrea Ross-Gillespie

Note: Comments on progress are inserted in *red italics underneath each recommendation*.

Hake

Predation modelling

C.1 (*) The Panel notes that the some of the runs of the model that included inter-species predation and cannibalism led to poor fits to the historical (ICSEAF) catch-rate series.

These fits were considerably improved in the final version of the model (see MARAM/IWS/DEC16/Hake Pred /P2).

C.2 (H) The model should be set up to mimic the trend in the historical (ICSEAF) catch-rate data because major reductions in catch-rates are an important characteristic of southern African hake fisheries between the early- to mid-1960s and mid-1970s.

Done – see immediately above.

C.3 (H) The data on the proportion of the diet of each hake species by length-class should be based on the predicted relative weight of *Merluccius capensis*, *M. paradoxus* and other species in the diet, rather than on the number of stomachs with more than 50% hake. Appendix B outlines an approach based on the methods of Punt and Leslie (1995) for predicting the mass of hake and other species at ingestion. The diets should be calculated by hake species length-class, and using depth and latitude strata, with the results by strata weighted by numbers inferred from surveys.

Done – see Appendix 5.B of MARAM/IWS/DEC16/Hake Pred/BG1.

C.4 (M) Select appropriate weights in the likelihood function for the proportions of hake prey in the diets of hake predators of various lengths if there is evidence for overdispersion. The approach of Francis (2011) could be considered (but only one iteration of the algorithm needs to be conducted).

Following the revised calculations for the proportion of hake in the diet of hake (Appendix 5.D of \MARAM/IWS/DEC16/Hake Pred/BG1), the likelihood contributions for these proportions have become much more comparable with other likelihood components in the model, so that no adjustment was made. This should, however, be considered further in the future.

C.5 (H) The model is unable to predict the species and age composition of the diet of hake predators adequately. The model should therefore be modified as follows:

- allowance should be made for predation rate to differ between prey species and ages in the predation function;
- the preference function should be normalized to sum to 1 across all hake prey species;
- the plus-group should be extended from 10+ to 15+; and

- the weights assigned to the diet data should be explored as it appears that the diet data are overweighted relative to the quality of the fits to those data (see recommendation C.4 above).

The preference function is prey-species-specific and has been normalised to sum to 1 across all hake species. The plus-group has been extended to age 15+. As mentioned for C.4, the negative log-likelihood component for the proportion of hake in the diet of hake was much more comparable once these proportions had been revised, but the matter of weighting may need some further attention in the future.

C.6 (M) Develop the diet data based on predator age rather than predator length, given that most hake for which stomach content data are available are aged. Use of such data in the model should simplify the fitting process (because the model computes predation by predator age).

This is yet to be taken further.