

## REPORT OF THE SECOND PART OF THE PHASE II WORKSHOP ON ASSESSMENT MODELLING OF HAKE IN ECOFISH

DTU Aqua, Charlottenlund Castle, 26-28 May 2014

### 1. Opening

*a) Welcome and operational arrangements*

The workshop was held in the Garden Room of Charlottenlund Castle over 26-28 May 2014. Beyer welcomed participants on behalf of DTU and explained the operational arrangements for the Workshop. Annex A provides a list of participants.

*b) Appointment of Chair*

Beyer was appointed Chair.

*c) Appointment of rapporteurs*

Butterworth served as rapporteur.

*d) Adoption of agenda*

The draft agenda was adopted

*e) Documents available*

Documents considered at the workshop are listed in Annex B.

### 2. Final updated Reference Case and proposed Reference Set for SA hake OMP revision

These two papers by Rademeyer and by Rademeyer and Butterworth (see Annex B) were provided for background information on recent developments in the South African hake assessment process.

### 3. Review of pertinent ECOFISH deliverables, including SAM comparison

The following agreements were reached concerning deliverables (see also Annex C).

*a) D1.3: Comparison of the basic SCAA and SAM methods*

This would be addressed through a paper under development which compares the application of the two approaches to the Namibian hake resource.

*b) D1.7: Provide details of the SCAA box model developed with lists of its results for key hake dynamics and management-related quantities*

Two forms of box models are currently under consideration. The first is that reported by Rademeyer (see Annex B) at the December 2013 meeting; this models movement of hake

within South Africa explicitly using a 9-box model, in which selectivity reflects only gear effects at younger ages and all older hake are assumed to be equally available within each stratum (box). The second form (discussed further in section 5 below) uses a box structure to account for the possible presence of multiple stocks of each of the two hake species off South Africa and Namibia, and includes additional boxes to allow for regions where more than one stock of a species is present (i.e. overlapping distributions). Details of the structures of both these model types are to be discussed and finalised during the December 2014 workshop with an international review panel present. That workshop will take account of discussions at the planned November workshop, which will in particular be considering the implications of analyses of genetic data. The international panel will provide recommendations on the prioritisation of future work using these approaches, with the aim of best addressing the question of the possible need for joint management of the hake populations off South Africa and Namibia. As stated in the ECOFISH objectives, trans-boundary assessment models are needed to be able to address this question; data from both the South African and Namibian fisheries will be needed for input to these models (see also section 8). Work on implementing these models with the detailed structures agreed at the December workshop is to commence shortly thereafter.

*c) Progress with SAM-SCAA comparison*

An initial comparison presented to the workshop showed considerable differences in the trajectories for spawning biomass estimated by the SCAA and SAM approaches, particularly for the period preceding 1980 for which the SCAA trajectory was much higher. After considerable discussion and experimentation with alternative runs, the main reasons for these differences were thought to have been identified. To provide an improved basis for comparison, the following steps were agreed for the two approaches (applied to an agreed set of the same data):

- The SAM model would be adjusted to be able to take account of the ICSEAF CPUE series for the pre-1980 period (effectively utilising the associated effort information to inform the values of fishing mortality over this period).
- The SCAA model would utilise input settings (e.g. for selectivities) determined during the workshop to secure improved fits to the data. Furthermore, the available code was refined during the workshop to allow for estimation of a starting numbers-at-age vector, rather than the current assumption of unexploited equilibrium when catches commenced. This would be implemented for the comparison, as the SAM model is not yet able to apply such a condition.

The report of this comparison would provide the deliverable required, and would be submitted for publication in the African Journal of Marine Science.

#### **4. SAM developments for future work**

*a) Progress on extension to two-stocks and fitting to length data, and comparison to simpler version of current SA hake assessment*

The SAM model has been re-implemented from scratch to replace AD Model Builder with Template Model Builder (TMB) as the underlying estimation tool. This has resulted in an increase in speed by a multiplicative factor of about 60, which is a necessary step towards handling the extra computational burden associated with multi-stock/multi-species models with the state-space approach.

Presently work is in progress, through use of a test case, on extending SAM to be able to utilise catch-at-length instead of catch-at-age input information. Performance is less than ideal, but this is to be expected as at the moment no age-length key information is being utilised.

*b) Future development/comparison plans*

In extending this work to hake (and first for the simplified situation – the SA west coast only with two species but only a single offshore trawl fleet - for which Rademeyer had provided data) it was agreed that the order of development should provisionally be as follows.

- i) Incorporating age-length key data.
- ii) Extending to two species (first for the simplified situation).
- iii) Extending to allow for multiple fleets (e.g. longline in addition to trawl for hake)
- iv) Extending further to the multi-stock overlap models for hake off both SA and Namibia (see section 5 below), which requires a multiple box structure.
- v) Attempting to model of movement of hake explicitly.

## **5. March biology/stock structure meeting report**

The meeting report was introduced and discussed. In particular the plan to further develop the stock structure assumptions at a meeting in November given finalised genetic results, and then to finalise these together with the specifications for taking the associated assessment computations forward, was agreed.

Particular attention was drawn to Figure 11 of the workshop report (reproduced as Annex D) which illustrated the different stock structure hypotheses as initially formulated. It was pointed out that these plots showed only the broad stock-structures to be considered; further sub-structure, related to both biological and fleet behaviour considerations, would be incorporated at the detailed modelling stage.

## **6. Hake movement models**

*a) Review of Rademeyer movement model presented at December 2013 meeting*

Plots illustrating the proportional movements between strata at the end of each year shown in the mixing matrices estimated in fitting this model to the data were presented and explained (one of these plots is shown in Annex E). It was suggested that at the planned November and

December meetings, similar plots showing either the numbers moving in a particular year, and if possible on average over years, be presented.

*b) GeoPop input*

An explanation was provided of certain technical difficulties encountered in the latent cohort GeoPop estimation procedure; these are receiving attention. It was agreed that a gear selection effect be included explicitly, rather than attempt to fit this in the model fitting process.

## **7. Other issues (Interaction between WP1 and WP2)**

The trawl intercalibration method using the simplified GeoPop method is to be completed and a paper submitted before the biology workshop in November (Thygesen et al. in prep., see Annex F). The results of this work, i.e. conversion factors for *Africana* old to *Africana* new gear by length for both hake species will be used in WP2 Task 2 for analyzing the environmental effects on survey catch rates.

Growth and ageing conclusions on hake are to be reported at the biology workshop in November (S Paulus *et al.*) following a workshop in Copenhagen August 2014 (to be attended, *inter alia*, by S Paulus, K Hüsey, F Alemany and NG Andersen).

Work on the incorporation of hake inter- and intra- species predation into the assessment models is continuing, and will be reported upon at the December workshop.

The stable isotope work conducted under task 2.4 is not expected to deliver information which can be factored directly into an assessment conducted under WP1. However the results are expected to be presented at the November biology workshop.

## **8. Plans to move to joint SA-Namibian assessments**

The workshop noted that the availability of the data required for these coming assessments should be already ensured under BCC data policy agreements.

## **9. Adoption of report**

The report was adopted by participants on Wednesday 28 May at 1-43 pm.

## **10. Closure**

Participants thanked DTU Aqua for their excellent hospitality throughout the meeting.