MARAM INTERNATIONAL STOCK ASSESSMENT WORKSHOP – 8-12 DECEMBER 2008, UCT

Summary Remarks by External Panel (A E Punt and A D M Smith)

Note: Within each section, the order of the suggestions for further work is broadly indicative of relative priority.

A. Hake

A.1. The basis for how the age and length data are collected from surveys and the commercial fishery needs to be fully documented (along the lines of MARAM IWC/DEC08/S/1). Furthermore, the basis on which the raw data are aggregated for use in stock assessments and the OMP (to the extent this has not already been done) should be fully documented.

A.2. A sex-structured population dynamics model should be fit to the conditional age-at-length data (age-length keys) and length-frequency data (by sex when such data are available). The growth curve (and the variation in length-at-age) should be estimated within the assessment.

A.3. The reasons for the relative depletion of the two species should be explored by setting up an assessment model which only includes catch data, pre-specifies natural mortality and selectivity, and sets the recruitment deviations to 0, and then adds each data source in a "forwards selection-like" manner. The impact of how the values for parameters for *M. capensis* (such as those which determine selectivity) affect the assessment outcomes for *M. paradoxus* can be explored by also conducting assessments separately for each species. The aim is to identify which data source(s) is the primary determinant of the current estimate of the relative status of the two species.

A.4. The priority for future ageing work should be reading ages for both surveys (January, west coast; May south coast) every second year (in the first instance) working backwards from the present. Data are to be provided for assessments by August 2009. The data for multiple readers should be analysed to estimate ageing error matrices (e.g. by reader), and these matrices then included in the stock assessment. An analysis should be undertaken which explores whether any covariates (e.g. length) explain whether an otolith is readable or not.

A.5. The data from longline sampling could be used to estimate differences in density and age-structure between trawlable and untrawlable areas.

A.6. The work towards a spatially structured assessment based on spatial patterns in age and length structure should continue.

A.7. A study to relate survey catch rates to environmental variables should be undertaken with a view to reducing the coefficients of variation for the survey estimates.

A.8. The existing data on histology should be used as the basis to fit a logistic curve relating maturity against age and length. This curve should be included in future assessments.

B. Sardine

B.1. The evaluation of OMPs for sardine and anchovy in combination should include a spatially-structured operating model for sardine in which there are east and west populations, in which age-0 abundance by population is related to local spawning biomass, and in which there is density-dependence in the rate at which age 1 animals move from west to east.

B.2. The estimates of biomass and the length-frequency from the acoustic surveys depend on the length-frequency from trawling. However, in some cases, the sample size for the trawl length-frequency data is low, but the associated biomass is high. Rules should be developed to identify such cases and what length-frequency should be used in these cases (e.g. the length-frequency for the stratum in which the trawl takes place).

B.3. The impact of trends in M should be explored using robustness tests in which M is time-dependent and age-specific. Alternative values for M for the years prior to 2000 should be set as (pre-specified) proportions of those estimated or specified for the years from 2000. Furthermore robustness tests should be conducted in which M is density-dependent (a linear function of biomass, perhaps with a time-lag). Allowing for density-dependence in M would provide a more natural basis for projections.

B.4. The impact of age-reading error should be explored using data for the years during which multiple age-readers read the same otoliths. Also, the survey and commercial age-compositions for a compatible spatial domain should be compared.

B.5. Age-compositions should be compared based on the raw age samples and those derived from age-length keys multiplied by length-frequency distributions.

B.6. The decision regarding how and whether the age data should be included in the assessment should be made following completion of tasks B.2, B.4, and B.5.

B.7. The CVs for the survey indices of abundance in the operating model should be based on the results of fitting a piecewise linear function to the actual survey and abundance data.

B.8. Consideration should be given to exploring geostatistical/spatial (e.g. GAMS) methods for analysing the data from acoustics, and whether changes to when trawling takes place can reduce uncertainty given logistic constraints.

C. Humpback whales

C.1. The initial analyses for humpbacks should be based on four conceptual models (resident, migrant; sabbatical, tourist). Operating models should be based on the last three of these four models.

C.2. The analyses to be presented at the February 2009 IWC humpback workshop should be based on four variants of the sabbatical operating model and two estimation methods. The operating models should consider the impact of uncertainty in the true visitation rate and the number of animals which are marked. The two estimation methods should be based on the 'resident' and 'sabbatical' models.

C.3. The estimation methods are based on the Bayesian paradigm. For efficiency reasons within a simulation testing framework, they should continue to be implemented using the Sample-Importance-Resample method.

D. Penguins   (Note: This omits issues deliberated and subsequently incorporated in analyses presented to the 12 December meeting of MCM's Pelagic Working Group.)

D.1. The evaluation of the impact of the anchovy-sardine OMP should be extended to a Bayesian analysis, primarily because the estimates of the parameters which determine the relationship between reproductive success / survival and prey biomass are very imprecise and because the slope parameters of these relationships are bounded below by 0.

D.2. To assist insight, intrinsic rates of increase for penguins should be plotted against parameters such as reproductive success and survival which depend on prey biomass.

D.3. Projections of impacts of alternative OMPs should be made across a range of scenarios for future sardine and anchovy dynamics, which could have implications for distributional shifts and longer term stock trends.

D.4. Stakeholder engagement should be pursued to develop further statistics to evaluate penguin performance.

E. Kingklip

E.1. Kingklip exhibit dimorphic growth; there would be value in moving to a sex-structured assessment model, especially if the model is to be fitted to the length-frequency data.

E.2. Existing information that might shed light on stock structure for kingklip, including spawning locations, age-specific life history parameters, and trends in abundance and mean age and size should be compiled.