International hake workshop held

The BENEFIT 2004 stock assessment workshop was held during January at UCT. The sponsors of the workshop were the Benguela Current Large Marine Ecosystem (BCLME) Programme, and the South African National Research Foundation. The Namibian Hake Association and the SA Deep Sea Trawling Association also sponsored two social functions for participants.

A Steering Committee consisting of Doug Butterworth, Rob Leslie, Ian Hampton, Di Loureiro and Carola Kirchner, arranged the workshop and chairman, Dr Tony Smith, opened the meeting.

The purpose of the workshop was to critically review past assessments and management procedure evaluations with respect to South African and Namibian hake; to consider possibilities for including multi-species effects in assessments, particularly hake cannibalism and interspecies predation; and to make recommendations for future research.

The workshop was also to review progress in regard to the assessment and OMP evaluations for the Namibian fur seals based on the recommendations made during the BENEFIT 2002 workshop.

Some strategic issues were discussed. It was agreed that there is strong support for the planned BENEFIT project to exchange samples and methodologies between Namibian and South African age-determination scientists.

It was concluded that:

- sampling programmes aimed at improving understanding of multi-species interactions need to be balanced with data collection and analysis needs related to the single-species assessment process, prior to being initiated.
- understanding of multi-species and ecosystem interactions is still at a relatively early stage and a range of modelling approaches needs to be considered when addressing these issues.
- evaluation of management controls is not restricted to *TAC*s, but might also include input controls and time/area closures, though perhaps only for the longer term.
- given the possibility of a shared *M. paradoxus* stock between South Africa and Namibia, thought needs to be given to how TAC sharing arrangements might best be developed should such an eventuality arise.

Other issues

- Even though stock assessment methods can be modified to account for missing catch-at-age data, every effort should be made to obtain annual catch-at-age information.
- The assumption of a single stock of *M. capensis* off South Africa is more plausible than separate south and west coast stocks.
- Similarly, the assumption of a single stock of *M. paradoxus* off South Africa is more plausible than separate south and west coast stocks.
- There is support for research into environmental and behavioural effects.
- Multispecies/ecosystem studies and the choice of multispecies models need to be linked to scientific goals and / or management objectives.
- For objectives related to broad-scale questions regarding the structure of the ecosystem Ecopath / Ecosim models could be used.
- Disagreements between the predictions of single- and multi-species models can be informative and lead to the generation of hypotheses for system behaviour.
- While a revised OMP for the South African hake populations show output *TAC*s disaggregated by species (and perhaps by area), it is not proposed that allocations comprise species-specific quotas to a rights holder. Management options that might best achieve the desired species split of the overall catch still need to be proposed and evaluated.
- Assessment of the implications of MPAs for biodiversity conservation needs a dedicated workshop and will need to consider the implications of bycatch.
- Changes in survey strategy towards coast-wide surveys should be considered. Existing surveys should not be modified unless analyses indicate this will improve their utility in the short- to medium-term.
- The existing phased decline could serve as a default basis to determine a 2005 TAC recommendation for South African hake, unless strong contrary evidence was put forward.

In a formal report the following recommendations were made with respect to **South African hake**:

- The catch by the handline sector and its species-, sex- and size-structure should be monitored.
- The observer data should be used to test the validity of the algorithms for splitting the past commercial trawl catches among species and should take the fish size as well as depth of capture into account.
- The lower bound imposed on the residual standard deviation for the CPUE data should be increased appreciably.
- A new OMP for South African hake should be developed through tests, based on a joint model with Namibia for the two hake species. Given the time needed to conduct the associated evaluations, this OMP could not be ready for implementation before late in 2005.
- The observer programme for South Africa needs to provide regular and reliable information on the species-split of the hake catch.
- The spatial and temporal trends in the catch and effort data for the longline fishery should be analysed.
- Comparison of the hake-specific biological impacts of trawling and longlining needs to be updated in the light of further information now available.
- Industry should be consulted to develop alternative hypotheses regarding the levels and spatial distribution of the historical catches.
- Research should be conducted to determine the spatial and temporal dynamics of hake spawning and early life history using surveys.
- A seal scat-based index of hake recruitment should be developed for South African hake, along the lines of that of Namibia.

Conclusions regarding both hake species

- Methods should be applied to validate the ageing of hake and a workshop on ageing techniques for hake is required.
- Attempts to develop informative prior distributions for the catchability coefficient, should be pursued and evaluated for use in stock assessments.
- The spatial distribution of the catch-rate information should be included in papers that standardise catch and effort information.
- In view of the uncertainty regarding the value for natural mortality, when evaluating OMPs, a series of scenarios should be constructed that lead to a range of values, eg. (a) allowing for changes over time in carrying capacity, and (b) adjusting the historical catch-rate data.

continued on page 12

from page 11

- Hake scientists should be encouraged to collaborate with population geneticists to address stock structure issues, especially those related to trans-boundary questions.
- Easy explanations of the development and implementation of OMPs to managers and industry, must be developed.
- The cost-benefit of the OMP approach relative to other approaches needs evaluation.
- Issues related to catch-effort standardisation should be explored.
- The sensitivity to ignoring the recent catch-rate index and to considering alternative relationships between standardised catch-rate and exploitable (essentially the fishable) biomass should be considered when evaluating OMPs.
- The assessment model should be applied using early data to assess whether assumptions – that the stock-recruitment relationship has not changed over time and that the population was at pre-exploitation equilibrium at the start of exploitation – may be constraining the fit to the recent catch-at-age and catch-rate data.
- The OMP development process should include tests that reflect possible trophic interaction effects.
- Existing data should be examined to better characterise the relationship between length (and age) and maturity / effective spawning potential (fecundity). Research (e.g. through longline-based tagging) should be conducted to provide more information on longshore movement.
- The value of using the variances estimated from the application of GLMM models to the catch and effort data to weight the catch-rate indices should be investigated.
- An analysis should be applied to examine the correlation structure of the model parameters.
- As a first attempt to address hake-multispecies interactions, existing models should be adapted to provide estimates of the predation mortality on hake that is generated by the two hake species.
- Novel, cost-effective ways of estimating suitability (prey preferences) should be explored.
- The OMP evaluation process should be used to evaluate the potential benefits of additional data collection, e.g. of genetics data.
- Alternative indices of hake recruitment (e.g. along the lines of the Namibian seal scat-based index of hake recruitment) should be developed.