MASTS Small Grant Report Summary

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SG8 Title: Novel assessments of West of Scotland demersal stocks

1) how the money was spent

The main objective of the proposed work was to demonstrate the use of novel methods for the analysis and assessment of major fish stocks and enhance the quality of scientific advice for management. In February 2012 (22-29th) there was a benchmark assessment workshop in Aberdeen to consider West of Scotland cod and whiting stocks. Funding was used for travel between Glasgow and Aberdeen for the preparation of analyses for the workshop and travel and subsistence while attending the workshop itself. Money was also used to attend a course on the use of WinBUGS which was the main software tool in the development of the assessment models.

Work carried out included:

- Collation of all the relevant data including research vessel data and catch composition data
- Development of models of natural mortality including seal predation based on size
- Formulation appropriate priors for the Bayesian analysis
- Full analysis of the cod and whiting stocks, quantifying uncertainty
- Preparation of three working papers for the workshop
- Preparation of a paper for publication

2) key findings

Two working papers were presented on the assessment of West of Scotland cod using an age structured model fitted within a Bayesian framework.

The main differences between the assessments described in these papers and previous ICES assessments is the inclusion of all four available surveys and modelling natural mortality as a function of mean weight . The full assessment also differs from ICES in the inclusion of all years of catch at age data.

The analysis of research vessel survey data alone suggests that fishing mortality has gradually increased since 1985 but began to decline around 2006. The estimated trends in Spawning stock biomass (SSB) are very similar to those from the last ICES assessment in 2011.

When the model was re-run including commercial catch data the trend in F is similar but, the 95% Credible Interval is extremely large indicating that the recent trend in F is almost completely unknown.

The model allows for the estimation of catch misreporting if it is assumed that the surveys are free of catchability trends. Conditioned on this assumption the model estimates typical levels of missing landings at about 2-4 thousand tonnes but the 95% CI is very large and for many years misreporting cannot be distinguished from noise.

The assessment in model introduced weight dependent natural mortality, M, for this stock for the first time. One of the main reasons for making this change is to overcome the inconsistency between the earlier fixed values used compared to the adjacent North Sea stock for which estimates of M from multispecies analysis are used. The estimated values from the new Bayesian assessment are the very similar multispecies values in the North Sea.

Attempts to use the model to estimate predation mortality due to seals were only partially successful. A simple model assuming that predation is a random encounter process indicated that the mortality was about half that due to fishing. However, the fit to the seal predation data was very poor and the estimates are not considered reliable.

A similar analysis was undertaken for West of Scotland whiting and reported in a third working paper. This also provided evidence for much higher values of natural mortality than had previously been used for whiting and indications that catch misreporting could be as much as three times the reported catches.

3) impacts and outputs/expected outputs of the work

The main impact of the work was that standard ICES values for natural mortality were changed to include the mortality-weight relationship, not only for West of Scotland cod and whiting but also all stocks considered at the workshop. This changes the estimates of important management reference points such as Maximum Sustainable Yield (MSY), minimum biomass and maximum fishing mortality thresholds.

A major focus of the work was to evaluate the use of research vessel data only methods as misreported catches make catch dependent assessment methods unreliable. The work done for the workshop indicated that for some stocks the survey only methods worked well and a manuscript for publication on this subject is nearly ready for submission to a peer reviewed journal.

4) how being part of MASTS enhanced this work

This work was dependent on collaboration with Marine Scotland Science both for the access to data and for access to the ICES workshop. Since both MSS and the University of Strathclyde are partners in MASTS, the Alliance played an important role in facilitating the work. Without the small grant it would not have been possible to participate in the workshop and the impact of the analysis would have been much lower.

5) new collaborations that have been made as part of this work

Although there is a long standing relationship between Strathclyde and MSS this work established a new collaboration between specific individuals who have not previously undertaken joint work. As a result of this collaboration Strathclyde has funded a studentship to work with MSS on the impact of seals on major demersal fisheries using some of the techniques developed in this project.