

Annex 03 – Special Requests

NEAFC Request for advice regarding blue whiting

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The Request

The North-East Atlantic Fisheries Commission (NEAFC) has noted that ICES in its blue whiting forecast for 2014, assumed the level of recruitment in 2013 to be the same as that in 2012 rather than the geometric mean of the years 1981-2010, which means the spawning biomass in 2015 might be overestimated.

Furthermore, NEAFC noted that the distribution of spawning biomass estimates using the stochastic forecast model is both wide and skewed, which in its view could lead to an overestimation of the F values that are deemed precautionary.

ICES is requested to review the assumptions and performance of the stochastic forecast model. ICES is also requested to assess whether or not there are any implications with respect to the reliability of its previous evaluations of the various options to revise the management plan, as outlined in special requests 9.3.3.1 and 9.3.3.7 of June and October 2013 respectively.

Background

In the forecast derived with the stochastic model, the distribution of the spawning stock is both wide and skewed and the lower quantiles of the distribution are tight. This leads to the concern that the spawning stock biomass values corresponding to probability levels in the lower tail of the distribution may be overestimated and thus resulting in too high F values being erroneously found to be precautionary.

Results and conclusions

The SAM model provides uncertainty of fishing mortality and stock numbers in the final year estimates that can only be fully applied in a stochastic short-term forecast. The default stochastic projections applied for SAM assessments are carried out by projecting the final year's SAM estimates of stock numbers ($\log(N)$) and fishing mortality ($\log(F)$). Using the variance-covariance matrix of those estimates, a high number (1000) of replicates of the initial stock numbers and fishing mortalities are randomly drawn, such that the variance and co-variance between stock N and F are maintained. Due to additional information affecting recruitment (qualitative use of recruitment indices from surveys not used by SAM), the initial stock estimate for age 1 and age 2, and future recruitment can optionally be raised by an input factor. The 1000 replicates are then simulated forward according to the management options. The forecast result presented in the option table is finally derived from the median of the 1000 replicates.

Compared to a deterministic forecast the stochastic forecast gives slightly higher estimates of TAC and SSB. For this year's advice the TAC for 2015 is estimated 4-5% higher and SSB in 2016 is 8-9% higher. The difference is due to the assumed log-normal distributed stock number. The median of the projected stock N is unbiased compared to the stock N from a deterministic forecast, but the median of quantities like yield and SSB, which is the sum of several age groups N weighted by e.g. F , mean weight and

proportion mature, will be higher. The difference between the stochastic and deterministic values increases by when there is more uncertainty around the stock numbers and fishing mortalities used for the forecast.

In the evaluations carried out to answer special requests 9.3.3.1 and 9.3.3.7 the HCS software was used (ICES 2013). These simulations did not directly run a SAM model for each year. Instead, assessment errors were generated matching the level observed in the most recent (at the time) SAM assessment for the stock. This was done by taking the true stock numbers according to the population model and using an autoregressive model with a combination of a year factor and an age factor noise terms to generate errors in the terminal stock numbers. This is to mimic not only year to year uncertainty in the 'assessed' stock numbers, but also some retrospective error.

As is done in practice, the 'assessed' stock numbers are projected forward to the TAC year to get the TAC. This projection is deterministic, based on the point estimates, with specified assumptions for catches or fishing mortalities, according to the harvest rule under study.

At WGWIDE, the default SAM stochastic forecast has been applied for the last three years. For this year however, a deterministic version was applied for advice to match that used in the MSE evaluation (ICES advice 2013). The conclusion that a HCR with target $F=0.30$ is precautionary, is sensitive to the choice of forecast model. This conclusion is dependent on the use of a deterministic forecast, and may no longer be valid should a stochastic forecast, with a TAC estimated 4-5% higher than in the MSE, is applied in reality. Due to time constraints it is not possible to correct the evaluation and re-estimate a precautionary target F . Therefore ICES uses a deterministic forecast this year which is consistent with the assumptions in the management strategy evaluation.