ECOREGION North Sea
SUBJECT Joint EU–Norway request to evaluate the long-term management plan for whiting in the North Sea

Advice summary

ICES advises that updating the target F from 0.3 to 0.15 within the current management plan is considered precautionary under the assumption that recruitment stays within a medium–low range[1]. A target F of 0.15 is similar to the fishing mortality estimates for 2012 and 2013 and is expected to lead to an average yield in the range of the observed yield in the last decade.

Request

In 2012, the ICES revision of the North Sea whiting natural mortality rate resulted in a rescaling of the assessment estimates of spawning biomass and exploitation rate and resulted in the current joint EU-Norway long-term management plan thresholds and target fishing mortality being unsuitable.

In 2013 ICES is also conducting a benchmark analysis of the stock data and assessment methodology. Consequently, based on the results of 2013 North Sea whiting benchmark, assessment and subsequent scientific advice, ICES is requested to recommend the necessary changes to the joint EU-Norway long-term management plan required to achieve its stated objective of providing sustainable fisheries with high and stable yields in conformity with the precautionary approach.

Elaboration on ICES advice

Until additional information becomes available, it is considered that the lowest observed SSB (SSB in 2007, 184 000 t) can be used as a provisional B_{lim} reference point. On the basis of the 2013 assessment (June 2013 advice; ICES, 2013a), updating the target F from 0.3 to 0.15 within the current management plan leads to around 5% probability of SSB falling below B_{lim}, which is considered precautionary. This is under the assumption that recruitment stays within a medium–low range. A target F of 0.15 is similar to the fishing mortality estimates for 2012 and 2013 and is expected to lead to an average yield in the range of the observed yield in the last decade.

Natural mortality (approximately 0.6) is estimated in a recently updated multispecies assessment (ICES 2011b) and is similar to the highest value of observed fishing mortality in the early 1990s, and much higher than current estimates of fishing mortality. Considering that much of the stock dynamics are driven by natural mortality, future biomass cannot be ascertained from changes in fishing mortality alone. This means that a target F slightly higher than 0.15 might not jeopardize the sustainability of the stock. For example, a target F of 0.2 would lead to around 10% probability of SSB falling below B_{lim}, under the assumption that recruitment stays within a medium–low range.

The basis for the evaluation is a medium–low recruitment scenario, which encompasses most of the observed recruitment range in the time-series, but excludes the highest peaks. Under a more pessimistic recruitment scenario, similar to that observed in 2003–2007, probabilities of SSB falling below B_{lim} would increase substantially and could reach up to around 20% for a target F of 0.15 and 40% for a target F of 0.2. Preliminary information suggests that recruitment in 2013 could be very low.

Given the uncertainty in recruitment trends, and the sensitivity of this evaluation to the multispecies assessment results, a management plan should be reviewed every three to five years.

Suggestions

With the pivotal role played by whiting in the North Sea foodweb, both as a predator and a prey, it is necessary to further develop the integration of whiting advice within an overall multispecies framework. New insights about sources of natural mortality other than those predation processes already included in the multispecies assessment (including predation on pre-recruits), would improve the understanding of the true balance between natural and fishing mortality.

[1] A medium–low recruitment range encompasses most of the observed recruitment range in the time-series, but excludes the highest peaks.

Development of a more advanced management plan would require a collaborative process with stakeholders. In a previous management plan evaluation (ICES, 2011a), similar probabilities of SSB falling below B_{loss} could be reached with either a low target F with TAC constraint, or a higher target F if the management plan included a sliding scale for F based on recruitment trigger points and a more flexible TAC constraint.

Basis of the advice

Background

In September 2010, a response from ICES to the joint EU–Norway request on the management of whiting in Subarea IV (North Sea) and Division VIId (Eastern Channel) stated that "maintaining fishing mortality at its current level of 0.3 would be consistent with long-term stability if recruitment is not poor" (ICES, 2010). The EU and Norway then agreed on an interim management plan for whiting at this total fishing mortality, conditional on a 15% TAC constraint.

Subsequent simulations performed in 2010 showed that if recruitment remained around the low 2003–2007 values for a protracted period, there would be an increasing risk of the stock declining below the lowest recorded biomass. Another joint EU–Norway request was sent to ICES in 2011, seeking advice on how to quantify poor recruitment and appropriate management responses in this case. ICES (2011a) advised that the target F of 0.3 would need to be reduced at low recruitment in order not to exceed a 5% probability of SSB falling below B_{loss} or, alternatively, that a constant $F = 0.27$ also resulted in around 5% probability of SSB falling below B_{loss} irrespective of changes in the recruitment regime, but provided that recruitment remained within the range of observed values.

However, this target was never used as the basis for the ICES catch advice, as the later 2011 results of the North Sea multispecies model (ICES, 2011b) updated natural mortality estimates, and this resulted in considerable revisions of historical abundance and fishing mortality estimates for whiting. This invalidated the previous harvest control rule evaluations and the previous target F was no longer considered applicable. As an interim measure, ICES has used a 25% downscaling of the target F in the plan (0.3) as the basis for advice in 2012 and 2013. The scaling factor corresponded to the proportional change in F between the 2011 and 2012 assessments, generating an interim target F of 0.225 (0.75×0.3). On the basis of the 2011 multispecies model results, ICES also published for the first time in 2013 some important multispecies considerations for the integrated management of North Sea stocks (ICES, 2013b). These considerations emphasized that whiting was the most sensitive stock in the multispecies assessment model, due to complex direct and indirect predation effects, and that no single management strategy would continuously and simultaneously maintain all stocks above precautionary single-species biomass reference points. A new approach may be needed to define what precautionary means in a multispecies context.

The purpose of the present joint EU–Norway request is to obtain an updated target fishing mortality for the single-species management plan for whiting in the North Sea and Eastern Channel, accounting for the latest knowledge on multispecies considerations.

Results and conclusions

During the historical assessment period (starting in 1990), lower recruitment values have been observed around the years with lower biomass. However, based on the short time-series available it is not possible to evaluate whether these lower values should be considered impaired or not. Until additional information becomes available, it is then considered that the lowest observed SSB (SSB in 2007, 184 000 t) can be used as a provisional B_{lim} reference point, below which the stock dynamics are unknown.

A management plan was agreed in 2011 based on fishing at $F_{2–6} = 0.3$ and a 15% TAC constraint. This plan was based on a previous assessment (ICES, 2011a) with a considerably lower natural mortality than estimated in the present evaluation; the stock was therefore predicted to be smaller, the fish more long-lived, and the effects of fishing on the stock greater.

The results of the present management strategy evaluation (Darby, 2013) are shown in Figure 6.3.5.2.1 and Table 6.3.5.2.1 (medium–low recruitment scenario) and Figure 6.3.5.2.2 and Table 6.3.5.2.2 (low recruitment scenario). The figures show landings, SSB, $F_{2–6}$, and recruitment (age 1) with target $F = 0.15$ and 15% TAC constraint, for the historical assessment period and the forward simulation period. The tables show results with target F at 0.15 or 0.2, and 15% TAC constraint, for the first five years of the simulation period (2014–2018) and the first 20 years of the simulation period (2014–2033).

With a medium–low recruitment scenario, the probability of SSB falling below the provisional B_{lim} (184 000 t) is about 4–5% for target $F = 0.15$ and about 8–11% for target $F = 0.2$. Both probabilities increase substantially under a low

recruitment scenario. Average landings are a bit higher with target F = 0.2 than with target F = 0.15 and, as expected, they are in both cases lower under a low recruitment scenario.

Methods

The evaluation was based on stochastic simulations identical to those used in evaluations of the management plan from 2011. Recruitment is modelled by randomly alternating different Beverton–Holt recruitment regimes corresponding to low, medium, and high recruitment. Recent recruitment has not been high. Therefore, the current evaluation is based on equal probability of being in the medium or low recruitment regimes, but a more pessimistic scenario of low regime only was also tested.

Different values of target F were investigated within the framework of the current management plan (always including a 15% TAC constraint).

Discards proportions-at-age are assumed constant in the evaluation, and are based on data from recent years. Variable discard rates-at-age depending on the fishing mortality values were not considered in the evaluation. The future EU landing obligation is likely to affect the fishing pattern, but the direction and magnitude of this are unknown and potential changes could, therefore, not be taken into account in the evaluation.

Sources

Darby, C.D. 2013. An evaluation of long-term management strategies for North Sea whiting. ICES CM 2013/ACOM:73.

ICES. 2010. Joint EU–Norway request on the management of whiting in Subarea IV (North Sea) and Division VIId (Eastern Channel). *In* Report of the ICES Advisory Committee, 2010. ICES Advice 2010, Book 6, Section 6.3.3.3.

ICES. 2011a. Joint EU–Norway request on a future long-term management plan of North Sea whiting. *In* Report of the ICES Advisory Committee, 2011. ICES Advice 2011, Book 6, Section 6.3.3.2.

ICES. 2011b. Report of the Working Group on Multispecies Assessment Methods (WGSAM), 10–14 October 2011, Woods Hole, USA. ICES CM 2011/SSGSUE:10. 229 pp.

ICES. 2013a. Whiting in Subarea IV (North Sea) and Division VIId (Eastern Channel). *In* Report of the ICES Advisory Committee, 2013. ICES Advice 2013. Book 6, Section 6.4.34.

ICES. 2013b. Multispecies considerations for the North Sea stocks. *In* Report of the ICES Advisory Committee, 2013. ICES Advice 2013. Book 6, Section 6.3.1.

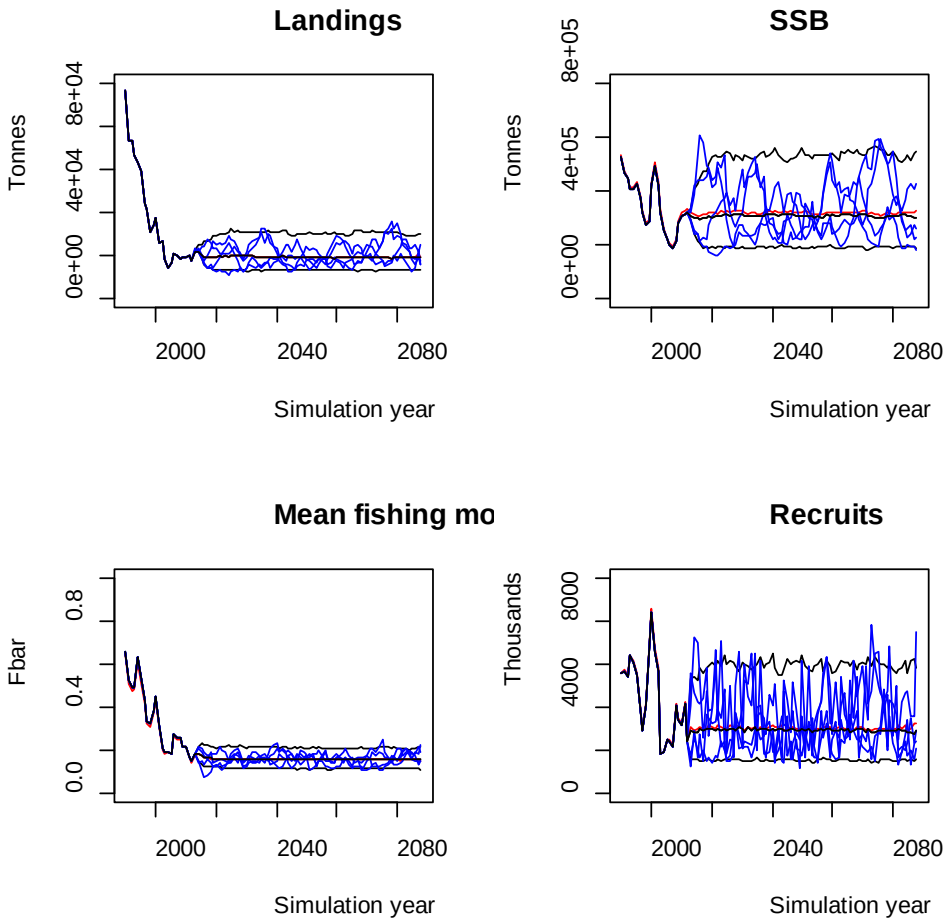

Figure 6.3.5.2.1 Whiting in Subarea IV and Division VIId. A medium–low recruitment scenario with a constant target fishing mortality of 0.15 and 15% TAC constraint. The graphs show the median, 5th, and 95th percentiles (black) of realized landings, spawning-stock biomass, fishing mortality, and recruitment. Management perceptions are shown in red, and four example iterations are in blue.

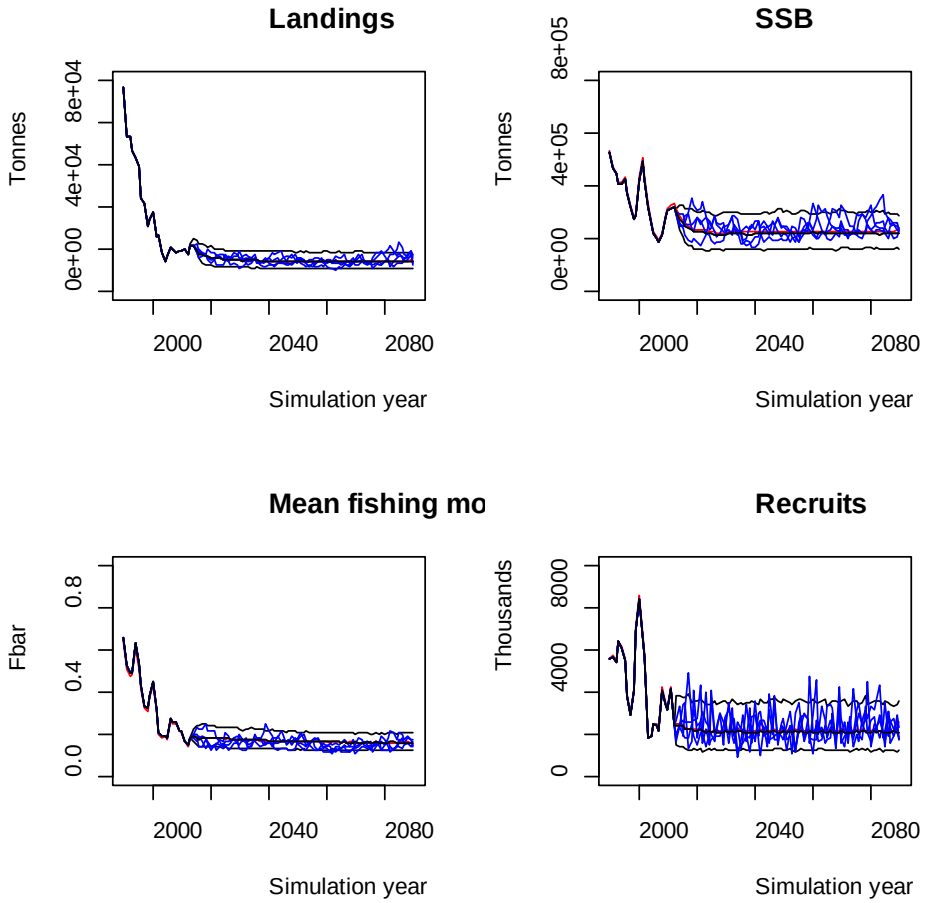

Figure 6.3.5.2.2 Whiting in Subarea IV and Division VIId. A low recruitment scenario with a constant target fishing mortality of 0.15 and 15% TAC constraint. The graphs show the median, 5th, and 95th percentiles (black) of realized landings, spawning-stock biomass, fishing mortality, and recruitment. Management perceptions are shown in red, and four example iterations are in blue.

Table 6.3.5.2.1 Whiting in Subarea IV and Division VIId. A medium–low recruitment scenario with two different values of target F (0.15 and 0.20) and 15% TAC constraint. Probability (maximum percentage of iterations in any year) that spawning-stock biomass is reduced below different thresholds, and associated average realised F, landings, discards, and interannual TAC variability (TAC iav).

F target	**0.15**	
Realised F	0.16	
	Probabilities Maximum P(SSB < Threshold)	
Threshold (tonnes)	years 2014–2018	years 2014–2033
160 000	1%	2%
170 000	1%	3%
180 000	3%	4%
190 000	5%	6%
Landings (tonnes)	20 319	20 328
TAC iav	3%	1%
Discards (tonnes)	10 543	10 491

F target	**0.2**	
Realised F	0.22	
	Probabilities Maximum P(SSB < Threshold)	
Threshold (tonnes)	years 2014–2018	years 2014–2033
160 000	3%	5%
170 000	4%	7%
180 000	6%	10%
190 000	10%	14%
Landings (tonnes)	25 217	24 183
TAC iav	3%	1%
Discards (tonnes)	13 424	13 006

Table 6.3.5.2.2 Whiting in Subarea IV and Division VIId. A low recruitment scenario with two different values of target F (0.15 and 0.20) and 15% TAC constraint. Probability (maximum percentage of iterations in any year) that spawning-stock biomass is reduced below different thresholds, and associated average realised F, landings, discards, and interannual TAC variability.

F target	**0.15**	
Realised F	0.16	
	Probabilities Maximum P(SSB < Threshold)	
Threshold (tonnes)	years 2014–2018	years 2014–2033
160 000	3%	8%
170 000	5%	12%
180 000	10%	19%
190 000	18%	28%
Landings (tonnes)	18 857	16 159
TAC iav (%)	7%	2%
Discards	9 421	8 334

F target	**0.2**	
Realised F	0.22	
	Probabilities Maximum P(SSB < Threshold)	
Threshold (tonnes)	years 2014–2018	years 2014–2033
160 000	8%	20%
170 000	15%	30%
180 000	21%	38%
190 000	27%	49%
Landings (tonnes)	23 285	19 255
TAC iav	7%	3%
Discards (tonnes)	11 978	10 404