

### EC request on additional stock projections for North Sea herring

This is in response to an EC request dated 2 August 2006 referring to a letter from the Pelagic RAC of 14 July 2006. The request is for additional projections of yield and SSB on North Sea autumn spawning herring for 8 specific options, ICES Secretariat is pleased to present the calculation given below. These calculations do not change the management advice given by ICES in June 2006.

*"In order to comply with the Precautionary Approach, fishing mortality would have to be reduced on juveniles (to about 0.05) and on adults (to about 0.20) so as to bring SSB back to  $B_{pa}$  in 2008. Catches corresponding to such a reduction in fishing mortality would be of the order of 275 000 t from all fleets"*

The calculations are based on the input data that were used for the short term calculations presented in the ICES advisory report (Extracts of the ICES Advisory Report June 2006). However, projections that are this far into the future (2010, options 5-8) are quite imprecise because the calculations are based on assumptions of recruitments and growth that fluctuate markedly between years; the projections are at best indicative of trends.

The specification of the assumptions for the runs is slightly incomplete.

1. It is stated that the  $F_{0-1}$  should be 0.05, and the catches for fleet A and C are specified, but there is still a trade-off between fleets B and D, which both exploit mostly juveniles. In the calculations done, two scenarios for fleet D are presented, as it was done in the ordinary ICES advice.
2. It is assumed that the misreporting applies to 2006. All catches that go into the predictions are actual catches, hence the assumption is that the actual catch in 2006 will be 477 000 tonnes, which is 5% above the agreed TAC of 454 000 tonnes. It is not quite clear whether the scenarios one would like to see for 2007 should assume an actual catch in 2007 higher than the TAC emerging from a reduction of the 2006 TAC. For simplicity, the actual catches for 2007 were set as percentages of the assumed actual catch in 2006, i.e. it is assumed that the actual catch is reduced proportional to the formal TAC. The actual numbers are given below.
3. For practical reasons, it is assumed that the catches in 2008 will equal those in 2007 in scenarios 1-4 and that the catches in 2010 will be equal to those in 2009 in scenarios 5-8. This assumption only has an effect on the calculation of SSB in 2008 (or 2010), but some assumption for these years has to be made because the herring spawns late in the year.
4. All numbers refer to the stock of North Sea Autumn Spawning Herrings only, in line with the calculations in the standard ICES advice.

Scenarios 1-4 were run with the following specifications:

*Catches assumed in 2006:*

Fleet A: Catch = 477 000 t: 5% above the TAC of 454 000 t  
Fleet B:  $F = 0.05$ : As requested – close to what was assumed by ICES  
Fleet C: Catch = 24 000 t: As requested  
Fleet D: Catch = 12 900 t

For 2007 and 2008

Fleet A: Catch = 477 000 t reduced by percentages as indicated:

15%: 405 000

20%: 382 000

25%: 358 000

30%: 334 000

Fleet B: F adjusted to give  $F_{0-1} = 0.05$

Fleet C: Catch = 24 000: As requested for 2006, and equal to the high option in previous predictions

Fleet D: Catch = 12 900: Previous options

*Recruitment:* 26 980 mill individuals which is the current estimate of the most recent year class (the 2005 year class having 0 winter rings in 2006). It should be noted, however, that this estimate, which is somewhat higher than estimates of other recent year classes, relies entirely on a single survey observation. This survey observation indicates clearly that this is another weak year class, but the actual magnitude of this year class will become clearer as more observations form it are obtained in 2007 and onwards.

*Natural mortalities, weights and maturities at age:* As in previous predictions.

*Selection at age by each fleet:* As in previous predictions.

The results for scenarios 1-4 are given in the table below. Note that the high option of 12 900 t for fleet D takes a large proportion of the total  $F_{0-1}$  of 0.05. Hence, if the intention is to keep the total F on juveniles as low as 0.05, one may have to consider the trade-off between fleets B and D, which are the main contributors to mortality on the juveniles.

With these caveats ICES offer the following results:

**Numbers in bold italics are those specified.** The others are consequences of these specifications.

**Assumptions for 2006**

F-values by fleet and total						Catches by fleet				SSB2006
FA	FB	FC	FD	F 0-1	F 2-6	CA	CB	CC	CD	SSB2006
0.317	0.050	0.017	0.013	0.082	0.342	<b>477.1</b>	<b>16.6</b>	<b>24.0</b>	<b>9.1</b>	1355.2

**Results for the prediction year 2007**

F-values by fleet and total						Catches ('000t) by fleet				SSB (mill.t)	
FA	FB	FC	FD	F 0-1	F 2-6	CA	CB	CC	CD	SSB2007	SSB2008
Option 4 30% reduction											
0.26	0.01	0.02	0.02	0.05	0.29	334	5	24	13	1.2	1.1
Option 3 25% reduction											
0.29	0.01	0.02	0.02	0.05	0.31	358	5	24	13	1.2	1.1
Option 2 20% reduction											
0.31	0.01	0.02	0.02	0.05	0.34	382	5	24	13	1.1	1.0
Option 1 15% reduction											
0.33	0.01	0.02	0.02	0.05	0.36	405	5	24	13	1.1	1.0

Scenarios 5-8 are dealt with in the following way:

1. Fleet D is fixed to a catch of 12 900 t per year
2. Fleet B is adjusted in order to get an overall F on ages 0-1 of 0.05.

The TACs (in kt) for the various scenarios are:

Reduction of TAC 2007 compared to	TAC 2007	TAC 2008 equal to a 15% reduction of the	TAC 2009 equal to a 15% reduction of the

TAC 2006		TAC 2007	TAC 2008
15%	405	344	293
20%	382	325	276
25%	358	304	259
30%	334	284	241

The outlook for the various options are:

A 30% reduction in TAC from 2006 to 2007									
	FA	FB	FC	FD	CA '000t	CB '000t	CC '000t	CD '000t	SSB (mill. t)
2008	0.24	0.02	0.01	0.02	284	5	24	13	1.1
2009	0.20	0.02	0.01	0.01	241	5	24	13	1.2
2010	0.19	0.01	0.01	0.01	241	5	24	13	1.2

A 25% reduction in TAC from 2006 to 2007									
	FA	FB	FC	FD	CA '000t	CB '000t	CC '000t	CD '000t	SSB (mill. t)
2008	0.27	0.02	0.01	0.01	304	5	24	13	1.1
2009	0.23	0.02	0.01	0.01	259	5	24	13	1.1
2010	0.22	0.02	0.01	0.01	259	5	24	13	1.1

A 20% reduction in TAC from 2006 to 2007									
	FA	FB	FC	FD	CA '000t	CB '000t	CC '000t	CD '000t	SSB (mill. t)
2008	0.30	0.01	0.01	0.02	325	5	24	13	1.1
2009	0.26	0.02	0.01	0.01	276	5	24	13	1.1
2010	0.25	0.01	0.01	0.01	276	5	24	13	1.1

A 15% reduction in TAC from 2006 to 2007									
	FA	FB	FC	FD	CA '000t	CB '000t	CC '000t	CD '000t	SSB (mill. t)
2008	0.33	0.01	0.01	0.02	344	5	24	13	1.0
2009	0.29	0.01	0.01	0.02	293	5	24	13	1.0
2010	0.29	0.01	0.01	0.01	293	5	24	13	1.0