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SCIENTIFIC, TECHNICAL AND ECONOMIC COMMITTEE FOR FISHERIES (STECF)

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Opinion by written procedure

Request for in-year management advice for sandeel in the North Sea

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MAY 2010

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OPINION OF THE SCIENTIFIC, TECHNICAL AND ECONOMIC COMMITTEE FOR FISHERIES BY WRITTEN PROCEDURE

Request for in-year management advice for sandeel in the North Sea

MAY 2010

Background and request to STECF

The EU has fixed a preliminary TAC of 200,000 t for sandeel to be fished in EU waters of ICES divisions IIa, IIIa and subarea IV in 2010. The preliminary TAC shall be revised by the Commission as early as possible based on advice from ICES and the STECF on the size of the 2009 year class of North Sea sandeel applying the following harvest control rule:

$TAC_{2010} = -333+R1_{2010}*3,692$
where $R1_{2010}$ is the number of age 1 sandeel in billions on 1st January 2010.

If the TAC calculated using the harvest control rule exceeds 400,000 t, the TAC shall be set at 400,000 t.

ICES advises that on the basis of the experimental fishery for sandeel from 1 April - 6 May, the size of the 2009 year class is 159 billion individuals at age 1. This gives applying the harvest control rule agreed by the EU a TAC of 253,000 t for 2010.

STECF is requested to review all of the available data from the fishery, and to advise the Commission on an appropriate TAC level for 2010.

STECF Observations

The fishery on sandeel

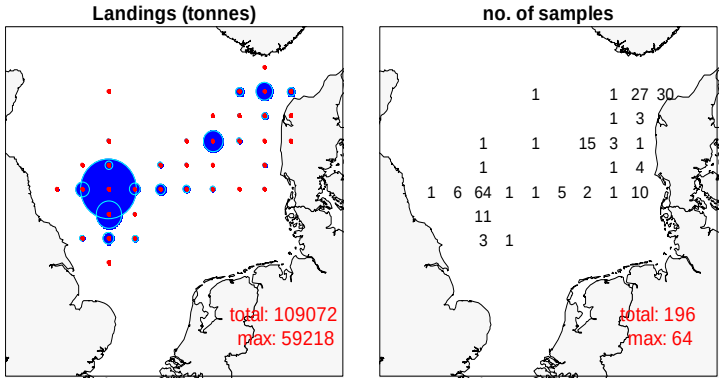
The allocation of the preliminary EU TAC of 200,000 t after quota swapping is app.:

Denmark	143.5 kt
Faeroe Islands	2.5 kt
Germany	10.0 kt
Lithuania	2.0 kt
Norway	20.0 kt
Sweden	20.0 kt
UK	3.6 kt

In addition to the preliminary TAC set by the EU, at the beginning of 2010, Norway fixed a preliminary TAC of 20,000 t for the Norwegian waters of the North Sea. Since then, Norway has chosen not to accept the advice from ICES and based on very high catch rates observed in the Norwegian fishery, has increased the preliminary Norwegian TAC to 50,000 t for 2010.

Only data on the Danish fishery in 2010 was available to the STECF. However, with a share of the preliminary EU TAC of 70 %, STECF considers the Danish fishery to be representative of the EU Fishery. The Danish fishery was opened on 1 April and up to 18 May, Danish vessels have taken approximately 85 % of their preliminary quota (115,000 t in the North Sea and 8,500 t in the Skagerrak).

The Danish fishery has been concentrated in a band stretching from the Dogger Bank area to the Skagerrak (Fig. 1). The spatial distribution of catches has been wider in 2010 than observed in 2008 and 2009.

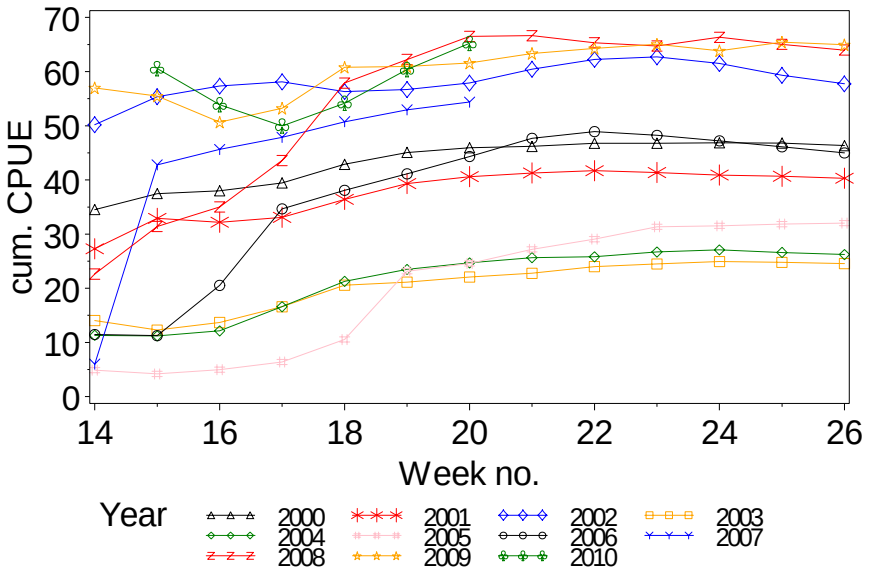


Figur 1. Landings weight from all available trips (left hand panels) and number of biological samples (right hand panels) by ICES rectangle for the Danish North Sea sandeel fishery. The area of the "bubbles" illustrates landings weight. The total landings weight (total:) and the maximum landing weight (max:) per rectangle are given as text. Similarly, for the total and maximum number of samples by ICES rectangle.

The catch per unit effort (cpue) in tonnes by week in the Danish fishery is shown in figure 2. During April 2010, cpue was relative stable at or below the levels observed in 2008 and 2009. In May 2010 cpue increased to very high levels.

Age 1 sandeel constitute 94% of the catches in 2010. In 2009 age 1 sandeel accounted for app. 50 % of the catches.

The mean weight of age 1 sandeel was very low in April but has increased to around average in May.



Figur 2. Standardised cumulative CPUE in tonnes per day of sandeel (all age groups) by week and year in the Danish fishery.

Estimation of the number of age 1 sandeel

In its response to the Commission's request on in-year management advice on the sandeel in the North Sea, ICES has estimated the strength of the 2009 year-class of North Sea sandeel to 159 billion individuals at age 1. Using this estimate, the HCR agreed by the Council gives a TAC for 2010 of 253,000 t.

Table 1 and Table 2 below summarize the results of the real time monitoring presented by ICES in 2009 and 2010. In 2009 (Table 2), the cumulative cpue of age 1 sandeel in week 18 was 3.352 million per day. In 2010 (Table 1), the cpue of age 1 sandeel was 9.812 million or three times the cpue observed in 2009.

Table 1. ICES advice 2010 (copied from section 6.3.3.1, ICES advice 2010, book 6)

Week number	Dates (day/month–day/month)	Cumulative Mean weight (g)	Cumulative CPUE (number caught per standardized day absent, in millions)	Cumulative Estimated age 1 sandeel numbers in the sea (billions)	Standardised CPUE (tonnes/day)
15-16	01/04-22/04	2.46	12.778	183	34.6
17	01/04-29/04	2.68	11.777	164	34.4
18	01/04-06/05	3.12	9.812	159	36.0

Table 2. ICES advice 2009 (copied from section 6.3.3.1, ICES advice 2009, book 6)

Week number	Dates (day/month–day/month)	Cumulative Mean weight (g)	Cumulative cpue (number caught per standardized day absent)	Cumulative Estimated age 1 sandeel numbers in the sea (billions)
14-15	01/04–15/04	5.50	3 754 898	166

16	01/04-22/04	5.86	3 571 885	150
17	01/04-29/04	5.86	3 375 399	129
18	01/04-04/05	6.11	3 352 815	130

The number of age 1 sandeel used in the ICES advice is estimated using a regression between the age 1 estimate from the stock assessment and the cpue of age 1 sandeel observed during the real time monitoring period. STECF notes that the mismatch between the observed cpue and the estimated number of age 1 sandeel in 2009 and 2010 is due to differences in the time series used by ICES in the cpue – recruitment regression in the two years:

1. In the advice from ICES for 2010, the regression between the recruitment estimate and the CPUE (age 1) is based on catch per unit effort data from 1999 until 2009. In the ICES advice for 2009, the regression used data from 1999 to 2005 and from earlier years (1991 and 1994);
2. Furthermore, in the 2010 advice from ICES. the age 1 estimates used for the regression are taken from the 2009 ICES assessment, while data from the 2006 assessment were used by ICES in its 2009 advice.

STECF considers that it is appropriate to use the most recent time series of recruitment and cpue estimates in establishing the regression for estimating the strength of the 2009 year-class.

STECF notes that the ICES Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK) which is responsible for the assessment of the North Sea sandeel stock uses two commercial tuning fleets in the assessment; one for the northern North Sea and one for the southern North Sea. Usually, the two tuning fleets are given equal weight in the assessment. However, in its 2009 report, the WGNSSK noted that conflicting signals of stock abundance by age were obtained from the different fleets. As the proportion of effort in the Northern area has decreased considerably over the last five to ten years and the Norwegian EEZ which contributes most to the Northern area was closed to sandeel fishery in 2006 and 2009, the WGNSSK considered that the use of equal weighting of the two tuning fleets was inappropriate and therefore chose to weight the contribution of each fleet using a weighting factor inversely proportional to the variance in cpue for each fleet as is generally done in ICES assessments. The choice of assessment method has a significant effect on estimate of the size of the 2009 year class and hence on the TAC. The assessment using equal weighting for the tuning fleets (unweighted assessment) gave lower stock estimates for the years 2005-2009 than the assessment in which the fleets were weighted in proportion to the inverse of the variance in cpue (weighted assessment). The differences are most marked in the recruitment estimates and greatest in the terminal year (2009 year-class). The ICES advice for 2010 is based on the unweighted assessment results. However, recognising that the assessment forming the basis for the 2010 advice was very uncertain ICES decided that a benchmark assessment of the stock should be carried out in September 2010.

The results from the unweighted assessment gives an estimate of 159 billions 1-group sandeel in the sea for week 18, which according to the agreed equation for calculating the TAC (Council Regulation (EC) 23/2010 ANNEX IID) equates to a TAC of 253 000 tonnes in 2010. Using the results from the weighted assessment suggested by WGNSSK, would give 202 billions 1-group sandeel in 2010 and a TAC of 400,000 tonnes applying the agreed HCR. However STECF is unable to objectively determine which assessment method is most appropriate.

STECF notes that up to week 18 of 2010 the mean weight of 1-group sandeel in the commercial fishery catches was very low. However data received from the Danish authorities up to week 20 of 2010 now indicate that the mean weight of 1-group sandeel has reached average levels.

STECF reviewed additional information on recruitment (age group 0) from the Danish Dredge survey undertaken in November-December each year since 2003. The survey utilises a modified scallop dredge to measure the relative abundance of sandeels in the seabed after the time 0-group sandeels have been recruited to the adult population and the whole of the population is assumed to reside in the seabed. Standardized dredge catch rates by year and ICES square and the mean commercial catch rates by square are shown in Table 3. The index for the 2009 year class is the highest in the time series. STECF notes that to date, these data have not been used in the ICES assessment but are likely to be incorporated as part of the benchmark assessment in September 2010.

Table 3. Standardised catch rates by rectangle for sandeel in the Danish dredge survey and recruitment index (age group 0). The recruitment index is the average dredge catch rates weighted by the commercial CPUE.

ICES square	2004	2005	2006	2007	2008	2009	Mean CPUE
37F0		0.97	1.93	0.28	0.65	0.36	254.953
37F1	0.52	1	0.42	1.48	0.97	4.87	191.39
37F2	0.13	1.29	2.11	1.79	0.27	0.86	150.842
38F1	0.14	1.3	1.01	0.77	0.46	3.21	186.829
38F6		1					57.085
39F1	0.59	1.42	0.69	0.05	0.11	3.58	209.255
39F3	0.44	2.19	0.09	2.16	0.01	1.27	124.217
39F4	0.95	1.5	0.64	2.03	0.02	1.15	106.937
40F5	0.37	0.79	0.21	2.87	0.11	3.38	97.241
41F5	0.26	0.84	0.35	2.65	0.22	1.99	124.919
42F3		1	0.57	1.79		0.78	72.276
42F4			0.01	0.01	1.99		229.634
42F7	0.18	0.97	2.35	1.82	0.57	0.85	66.177
43F4					0.99	1.02	107.779
43F5			1.34	0.67	0.47	1.08	105.526
43F6			1.83	0.12	0.96	0.26	112.606
43F7	0.28	0.58	2.2	1.82	0.17	0.4	93.339
44F4				1.1	0.9		72.132
Recruit index	53.15	156.55	141.29	153.75	86.41	250.9	

STECF advice

Given the unresolved uncertainty in the assessment results and the discrepancy in the year-class strength estimates using the different methods (weighted or unweighted tuning fleets), STECF is unable to provide a reliable estimate of the size of the 2009 year class. Consequently, an appropriate TAC for 2010 corresponding to the agreed harvest rule in Council Regulation (EC) 23/2010 ANNEX IID cannot be reliably calculated. However STECF considers that given the wide spatial distribution of the fishery and very high cpue of age 1 sandeel on all fishing grounds in 2010 including the northern grounds, the ICES estimate of the strength of the 2009 year-class of sandeel in the North Sea (159 billion) is likely be an underestimate. As a consequence the TAC for 2010

using the ICES estimate and the agreed harvest rule in Council Regulation (EC) 23/2010 ANNEX IID (253,000 t) may also be underestimated. STECF has no objective means to determine the magnitude of any potential underestimation of the strength of the 2010 year-class and is unable to provide objective advice on an appropriate TAC for North Sea sandeel for 2010.

STECF agrees with the concerns raised by ICES on the validity of the current modelling approach and its reliance on a single index to provide advice on the TAC for sandeel and recommends that alternative methods to give in-year advice for North Sea sandeel should be investigated at the benchmark workshop on sandeel to be hosted by ICES on 6-10 September 2010.

ANNEX I.

ICES ADVICE 2010, BOOK 6, PAGES 4-7

ECOREGION NORTH SEA
SUBJECT EC request on in-year management advice for sandeel in the North Sea

Request

The European Community (EC) requested ICES to provide further advice to allow EC to apply the procedure described in COUNCIL REGULATION (EC) No 23/2010, ANNEX IID.

ICES understands the method referred to in the request as the method for setting the TAC for sandeel in the North Sea as suggested by ICES in its advice on harvest control rules and long-term management strategies for sandeels (ICES 2009). The TAC calculated by this method shall apply to all catches of sandeel (EC and Norway).

Annex IID prescribes a Real-Time Monitoring (RTM) fishery of sandeel from 1 April to 6 May 2010 to estimate the abundance of the 2009 year class. These estimates are used in the formula

$$TAC_{2010} = -333 + 3.692 * N1$$

where N1 is the real-time estimate of age group 1 sandeel in billions derived from the exploratory fishery in 2010; the TAC is expressed in 1000 tonnes.

The estimation of the 2009 year class (N1) is as previously outlined in ICES (2009).

ICES response

Based on real-time monitoring data available from weeks 15 to 18 in 2010, the estimated stock size of age 1 sandeels in 2010 is approximately 159 billion individuals and the estimated mean weight of an age 1 sandeel in 2010 is 3.12 g. Using these estimates, the calculated 2010 TAC value based on the formula above is 253,000 t.

Technical Background

This response is based on 2010 data from the Danish fishery (extracted from the Danish Fishery Directorate's database on 6 May 2010). No data from the Norwegian fishery were available. Total landings of 45 809 t, have been reported so far this year of which 26 636 t was used for estimation of the standardised catch-per-unit-effort (CPUE). Logbook information from 62 trips and data from 65 biological samples of sandeel landings obtained between 1 April and 6 May 2010 were used to estimate the abundance of the 2009 cohort of sandeels at age 1.

International landings during April-May 2010 were concentrated in a band stretching from the Dogger Bank area to the coast of the northern Jutland. The maps in Figure 6.3.3.1.1 indicate the spatial distribution of the sandeel harvests and samples during the real-time monitoring period in 2010. The spatial distribution of landings was wider than in 2008 and 2009. Based on real-time monitoring data from weeks 15 to 18 in 2010, the estimated stock size of age 1 sandeels in 2010 is 158.708 billion individuals and the estimated mean weight of an age 1 sandeel in 2010 is 3.12 g. Using these estimates the TAC for 2010 is estimated at 253,000 tonnes by the agreed procedure described in COUNCIL REGULATION (EC) No 23/2010, *ANNEX IID*.

The standardized CPUE in 2010 was relatively stable over the monitoring period – varying from 39.7 t day^{-1} in week 15 to 39.2 t day^{-1} in week 18. Statistics for age 1 sandeel in 2010 are presented below. Values by weeks are based on cumulative data, including the given week.

Week number	Dates (day/month–day/month)	Cumulative Mean weight (g)	Cumulative CPUE (number caught per standardized day absent, in millions)	Cumulative Estimated age 1 sandeel numbers in the sea (billions)	Standardised CPUE (tonnes/day)
15-16	01/04-22/04	2.46	12.778	183	34.6
17	01/04-29/04	2.68	11.777	164	34.4
18	01/04-06/05	3.12	9.812	159	36.0

In contrast to the previous years, CPUE was decreasing in weeks 16 and 17 from the opening of the fishery. However, contrary to previous years, the CPUE had not stabilised between weeks 17 and 18. For week 19, a 50% increase in CPUE was observed compared to week 18 (Table 6.3.3.1.1). During the beginning of the RTM period the sandeel CPUE was apparently affected by low stock availability. Sandeel remains buried in the sediment out of reach for the fishery when the availability of food is low The very low mean weight observed in combination with a low oil content of the sandeel indicate that sandeel have had poor feeding conditions so far in the spring 2010. This might be linked to the relative cold winter, which might have delayed the spring bloom of zooplankton and the availability of sandeel to the fishery.

In providing in-year advice last year, ICES raised concerns about the validity of the current modelling approach and its reliance on a single index. A benchmark workshop on sandeel will be hosted by ICES on 6-10 September 2010 to further investigate these concerns and to fully evaluate available life-history data (including stock weights). For the present, ICES provides the requested in-year management advice using the established methodology.

Sources

Christensen, S. 2010. Real-time monitoring of the North Sea sandeel fishery in 2010. Final report. 13 pp.

ICES 2009. Report of the *ad hoc* Group on Sandeel - II, 19-21 October 2009, ICES HQ. ICES CM 2009/ACOM:51

Table 6.3.3.1.1 **Fishing effort and CPUE used for real-time monitoring of the North Sea sandeel fishery.** Effort is given as number of fishing trips and as days absent from harbour standardised to a 200 GT vessel. CPUE is calculated as catch weight per standardised days absent. The week number is calculated such that week 1 includes the first 7 days of 2010.

	Week no								
	15			16			17		
	no. of trips	stand. days absent	stand. CPUE (t/day)	no. of trips	stand. days absent	stand. CPUE (t/day)	no. of trips	stand. days absent	stand. CPUE (t/day)
GT									
000-099	.	.	.	.	.	.	1	1	37.0
100-199	.	.	.	5	14	42.2	6	13	40.9
300-399	6	74	45.0	4	44	40.4	3	40	43.2
400-499	4	68	38.6	5	81	29.1	7	94	32.4
500-599	2	34	40.6	2	36	33.2	2	41	29.5
all	12	176	41.7	16	175	33.8	19	190	34.7

	Week no								
	18			19			all		
	no. of trips	stand. days absent	stand. CPUE (t/day)	no. of trips	stand. days absent	stand. CPUE (t/day)	no. of trips	stand. days absent	stand. CPUE (t/day)
GT									
000-099	16	13	40.0	4	4	53.0	21	18	42.5
100-199	8	16	39.1	4	10	35.3	23	53	39.6
300-399	5	56	41.1	2	17	68.4	20	231	44.6
400-499	9	128	43.8	5	40	64.0	30	412	39.4
500-599	4	61	49.5	2	20	90.5	12	192	44.9
all	42	274	44.0	17	92	66.9	106	907	42.0

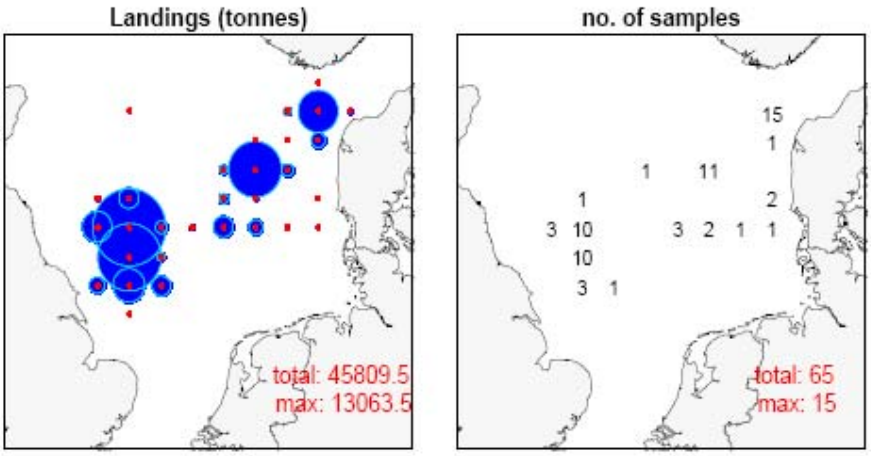


Figure 6.3.3.1.1. Landings weight from all available trips (left hand panel) and number of biological samples (right hand panel) by ICES rectangle for the Danish North Sea sandeel fishery in 2010. The area of the *bubbles* illustrates landings' weight. The total landings weight (total) and the maximum landing weight (max) per rectangle are given as text (unit tonnes). Similarly, for the total and maximum number of samples by ICES rectangle.

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Abstract
The Scientific, Technical and Economic Committee for Fisheries gave its opinion by written procedure in May 2010 on request by the European Commission on in-year management advice for sandeel in the North Sea.

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