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**REPORT OF
THE SCIENTIFIC, TECHNICAL AND ECONOMIC
COMMITTEE FOR FISHERIES**

**EVALUATION OF THE REPORT OF THE
Ad hoc Working Group on Sandeel Fisheries**

**“Estimate of the abundance of the 2005 year-class
of North Sea sandeel”**

Scientific, Technical and Economic Committee for Fisheries (STECF) evaluated and endorsed this report by correspondence in May 2006

This report does not necessarily reflect the view of the European Commission and in no way anticipates the Commission's future policy in this area.

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1. Background

The Council of the EU agreed a fishing effort regulation for vessels fishing for sandeel in the North Sea and the Skagerrak during its December 2005 meeting (Council regulation (EC) No 51/2006 of 22 December 2005). According to this regulation specified levels of the 2005 year-class abundance will be used to establish the final catch limits and fishing effort for fisheries exploiting sandeel in 2006. The Commission will implement the regulation with advice from the Scientific, Technical and Economic Committee for Fisheries (STECF).

The STECF *ad hoc* working group on Sandeel Fisheries worked by correspondence to estimate the size of the 2005 year-class using methodology developed by the group in 2004 and further modified in 2005. For this purpose DIFRES gathered data and used the agreed model on a weekly basis starting 1 April 2006 to estimate the abundance of the 2005 year-class. To ensure quality assurance of the data and model output this information was exchanged between WG members (DIFRES, CEFAS and FRS) on a weekly basis.

The report of the STECF ad hoc sub-group on Sandeel fisheries to estimate the strength of the 2005 year-class is given in Annex I.

2. Findings of the ad hoc Working Group on sandeel fisheries.

Using the methodology endorsed by STECF in its 20th report, cumulative catch per unit of effort (CPUE) data up to and including week 18 of 2006, the STECF ad hoc Working Group on Sandeel Fisheries estimates the strength of the 2005 year-class as 532×10^9 individuals at age 0. Using CPUE data up to and including week 17, which is the period used previously by STECF, the estimate of the strength of the 2005 year-class is 507×10^9 individuals at age 0.

3. STECF Comments and recommendations

STECF notes that the ad hoc Working Group is required to work with very demanding time constraints and is to be commended for providing the report efficiently and on time.

Based on the report of the ad hoc WG, STECF makes the following observations:

1. The fishery for sandeel in 2006 commenced in week 14 (after the opening of the fishery on 1 April, 2006) but fishing effort was lower than in previous years. A total of 10 fishing trips were undertaken in week 14, 2006, compared with 29 trips and 24 trips for the same weeks in 2004 and 2005 respectively.
2. There was almost no fishery in weeks 15 and 16 of 2006, which was also the case in 2005.
3. There was a large increase in the number of fishing trips week in 17 in 2006 (36 trips) which appears to have been maintained in week 18, although the total number of trips for week 18 was not known when the WG produced its report. In 2005 the large increase in fishing trips occurred from week 18-19 (8-35 trips), two weeks later than in 2006.
4. STECF is unable to attribute the reduction in effort at the start of the 2006 fishing season to any single cause, but notes the claims by the Danish fishing Industry that as in 2005, high fuel prices and a low water temperature are the main reasons for the low fishing activity seen in the start of 2006 together with a low oil content in the sandeel at the start of the season.
5. Landings of sandeel up to week 18 in 2006 were caught mainly in 2 areas; the Elbow Spit and Dogger Bank grounds. Landings in many previous years of the fishery were taken over a more extensive geographical range. However, the distribution in 2006 is not exceptionally

limited, considering the low level of effort observed. The WG argues that the restricted geographical extent of the fishery in 2006 could reflect low sandeel abundance in other areas or that fishing conditions in the Dogger Bank area was good and that there are now fewer vessels competing for the best grounds, since the fleet has significantly decreased in recent years. STECF agrees that these are plausible explanations. However, if the restricted geographical extent of the fishery in weeks 14-18 of 2006 is a reflection of reduced sandeel abundance elsewhere an equally plausible explanation is that this may be a reflection of a reduced distribution of the stock as a whole. Furthermore, if the geographical extent of the fishery was restricted because these were the only areas where sandeel could be found in commercially viable quantities, this may also be an indication of a reduced stock.

6. Total effort in April 2006 was much lower than that observed for the historical year range the method is based on. Landings in April 2006 were 21.000t, which is 23% of the average April landing for the period 1996-2005 and 67% for the period 2003-2005.
7. As stressed in its 20th report of April 2005, STECF notes that changes in temporal or spatial distribution of effort might cause the CPUE-based implementation of the harvest control rule to give erroneous classification (i.e. the year-class strength estimate derived from the model will be unreliable). Furthermore, the CPUE based rule is dependent on the assumption that effort should be dispersed in the same manner as was observed over the period 1990-2004. Given that the timing and geographical extent of the fishery in 2006 is different to that for 1990-2004, coupled with the fact that both effort and landings in 2006 is low, STECF agrees with the findings of the ad hoc WG that there is therefore a potential model error on the estimate of the 2005 year-class i.e. the model assumptions may have been violated.
8. STECF therefore concludes that there is a high risk that its estimates of the strength of the 2005 year-class of North Sea sandeel at age 0 are over-estimates. STECF also concludes that taking into account all of the available information from the commercial fishery up to week 18 of 2006, it is reasonable to assume, that the 2005 year-class strength at age 0 was at least as strong as the preceding 2003 and 2004 year-classes, which were estimated at 345 billion and 324 billion respectively.

4. STECF Recommendations for the North Sea Sandeel fishery for the remainder of 2006

Context of the STECF recommendations

In arriving at its recommendation STECF wishes to stress that it has not considered the potential economic consequences of any management decision arising from its recommendations, and that no economic evaluations have been undertaken to assist in formulating its advice. STECF supports the idea that the economic consequences of potential management measures should be evaluated as fully as possible in order to inform the decision-making process. However, in the present case STECF is asked to provide an estimate the strength of the 2005 year-class of sandeel, which is to be applied to an agreed harvest control rule that also takes no account of the economic consequences of the subsequent action.

The agreed harvest rule for 2006 is given in Annex IID of Council Regulation (EC) 51/2006 of 22 December 2005, which states that the maximum number of kilowatt-days and the TAC and quotas for sandeel in zones IIa (EC waters), IIIa, and IV (EC waters) shall be revised by the Commission as early as possible based on advice from the STECF on the size of the 2005 year class of North Sea sandeel, in accordance with the following rules: (text is paraphrased):

(a) where STECF estimates the size of the 2005 year class of North Sea sandeel to be at or above 500 000 million individuals at age 0, no restrictions in kilowatt-days shall apply for the remaining of 2006 and the TAC for 2006 shall be fixed at 600 000 tonnes;

(b) where STECF estimates the size of the 2005 year class of North Sea sandeel to be between 300 000 million and 500 000 million individuals at age 0, the number of kilowatt-days shall not exceed the level in 2003 and the TAC for 2006 shall be fixed at 300 000 tonnes;

(c) where STECF estimates the size of the 2005 year class of North Sea sandeel to be below 300 000 million individuals at age 0, fishing with demersal trawl, seine or similar towed gears with a mesh size of less than 16 mm shall be prohibited for the remainder of 2006. However, a limited fishery shall be allowed in order to monitor the sandeel stocks in ICES Division IIIa and Subarea IV and the effects of the closure. To this end the Member States concerned shall, in cooperation with the Commission, develop a plan for the monitoring fishery

STECF Recommendations

1. Given that there is sufficient evidence that the estimates of the strength of the 2005 year-class of sandeel at age 0 derived using the agreed methodology and data up to weeks 17 and 18 are likely to be overestimates, STECF **recommends** that they should not be accepted as a true reflection of the size of the 2005 year class and hence should not be used to automatically invoke the harvest rule agreed in Annex IID of Council Regulation (EC) 51/2006 of 22 December 2005.
2. STECF also **recommends** that catches in 2006 should be restricted to a level that is predicted to result in the SSB being above B_{pa} (600,000 t) in 2007, under the assumption that the 2005 year-class strength at age 0 was less than 507 billion.
3. STECF concludes that it is reasonable to assume that the 2005 year-class strength at age 0 was at least as strong as the preceding 2003 and 2004 year-classes, which were estimated at 345 billion and 324 billion respectively and notes that this conclusion implies automatic implementation of option b) of the harvest rule. However STECF notes that implementation of option b) of the harvest rule could result in catches up to 300,000 t, which would offer no assurance that SSB in 2007 will be above B_{pa} .
4. In keeping with the ICES advice, and accepting that the 2005 year-class at age 0 was at least as strong as the 2003 and 2004 year-classes, STECF notes that there is a real possibility that SSB in will be above B_{pa} in 2007 if effort and catches in 2006 are limited to the levels observed in 2005. This implies that catches in 2006 should be limited to about 170,000 t.
5. STECF stresses the importance of rapid action to regulate the fishery
6. In the absence of any agreed long-term harvest control rule for North Sea sandeel, STECF continues to support the concept of in-year management for this stock.
7. STECF **recommends**, that alternative management and assessment methods for North Sea sandeel are evaluated, including the utility of alternative harvest control rules and closed areas taking into account ecosystem-orientated management aims.

ANNEX I.

5. Report of the *Ad hoc* Working Group on Sandeel Fisheries “Estimate of the abundance of the 2005 year-class of North Sea sandeel”

Participants

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Estimate of the abundance of the 2005 year-class of North Sea sandeel

The Council of the EU agreed a fishing effort regulation for vessels fishing for sandeel in the North Sea and the Skagerrak during the last December meeting (Council regulation (EC) No 51/2006 of 22 December 2005). According to this regulation specified levels of the 2005 year-class abundance will be used to establish the final catch limits and fishing effort for fisheries exploiting sandeel in 2006. The Commission will implement the regulation with advice from the Scientific, Technical and Economic Committee for Fisheries (STECF). The STECF *ad hoc* working group on Sandeel Fisheries worked by correspondence to estimate the size of the 2005 year-class using methodology developed by the group in 2004 and further modified in 2005. For this purpose DIFRES gathered data and used the agreed model on a weekly basis starting 1 April 2006 to estimate the abundance of the 2005 year class. To ensure quality assurance of the data and model output this information was exchanged between WG members (DIFRES, CEFAS and FRS) on a weekly basis.

This report uses data extracted from the Danish Fishery Directorate's database on the 8th May. This year the Danish sandeel fishery was opened on the 1st April, in accordance with a national regulation that was introduced in 2005. Only 10 trips were carried out in week 14 of 2006. This number is much lower than the 29 trips in 2004 and 24 trips in 2005. As in 2005, there was almost no sandeel fishery in weeks 15 and 16 of 2006. In week 17 and 18 the number of trips was much higher than in 2005 (2005 week 17 - 4 trips; week 18 - 8 trips; 2006 week 17 - 36 trips; week 18 - 16 trips so far recorded). The large increase in effort from week 16 to 17 indicates a late start of the sandeel fishery in 2006. The trends in effort and CPUE seen in 2006 are comparable to those in 2005, when a similar large increase in effort occurred from week 18 (8 trips) to week 19 (35 trips), after which the effort stayed on a high level the next weeks. Landings (IN 2006 ?) were mostly from the Elbow Spit and Dogger Bank grounds. Whilst this area is generally important at this time of year the distribution of April and May landings have been more extensive in many years. This could reflect low sandeel abundance in other areas or that fishing conditions in the Dogger Bank area was good and that there are now fewer vessels competing for the best grounds since the fleet has significantly decreased in the last years.

As in 2005 the fishing industry claims that high fuel prices and a low water temperature are the main reasons for the low fishing activity seen in the start of 2006. The sea surface temperatures in April 2006 were close to long term average but about 1° C below those in 2005 (see www.bsh.de). The April sea temperatures in itself is not considered as a limiting factor on sandeel feeding behaviour, but it is possible that the biomass of zooplankton may influence feeding behaviour of sandeel and the availability of the sandeels to the fishery. Analyses carried out by Danish fish meal

factories shows, that the oil content was at a lower level in the start of the 2005 fishing season compared to the average situation in the time period 1995-2004. In the start of the 2006 fishing season the oil content was at an even lower level than in 2005, but in 2006 the oil content reached the average level for the time period 1995-2004 one week earlier than in 2005. This indicates that sandeels were available to the fishery later in 2005 and 2006 than in previous years, and that the fishery in 2006 may peak sooner than in 2005, since the time sandeels return to the sand is related to their condition.

Total effort in April 2006 was, as in 2005, much lower than that observed for the historical year range the method is based on. Landings in April 2006 were 21.000t, which is 23% of the average April landing for the period 1996-2005 and 67% for the period 2003-2005. There is therefore a potential model error on the estimate of the 2005 year-class.

The working group has produced abundance estimates based on data for weeks 14 to 18 using the agreed methodology. The abundance of the 2005 year-class is estimated to be $507 \cdot 10^9$ and $532 \cdot 10^9$ individuals at age-0 in week 17 and 18, respectively (Figure 1). Previous estimates for the 2003 and 2004 year-classes have only estimated abundance up to week 17. Based on the biological sampling this year-class represents well over 90% of the landings. Although only 49 of the target of 100 samples was reached the high percentage of 1-group sandeels in the catches (>90%) suggests that the uncertainty of the estimate of the 2005 year-class is at a low level compared to the average CV of 10-15% that was estimated for most previous years. The 0-group estimate for week 18 is based on 72 trips with a total standardised effort at 773 days at sea. The year-class estimates for weeks 17 and 18 are not final. CPUE data for week 18, representing a total catch of about 5000t of sandeels, still has to be entered in the Fishery Directorate's database. Further, additional information about the catch composition (biological samples) for weeks 17 (up to 15 samples) and 18 (up to 4 samples) will be available when the samples have been worked up. Details with respect to data used to estimate the size of the 2005 year-class can be found in appendix 1.

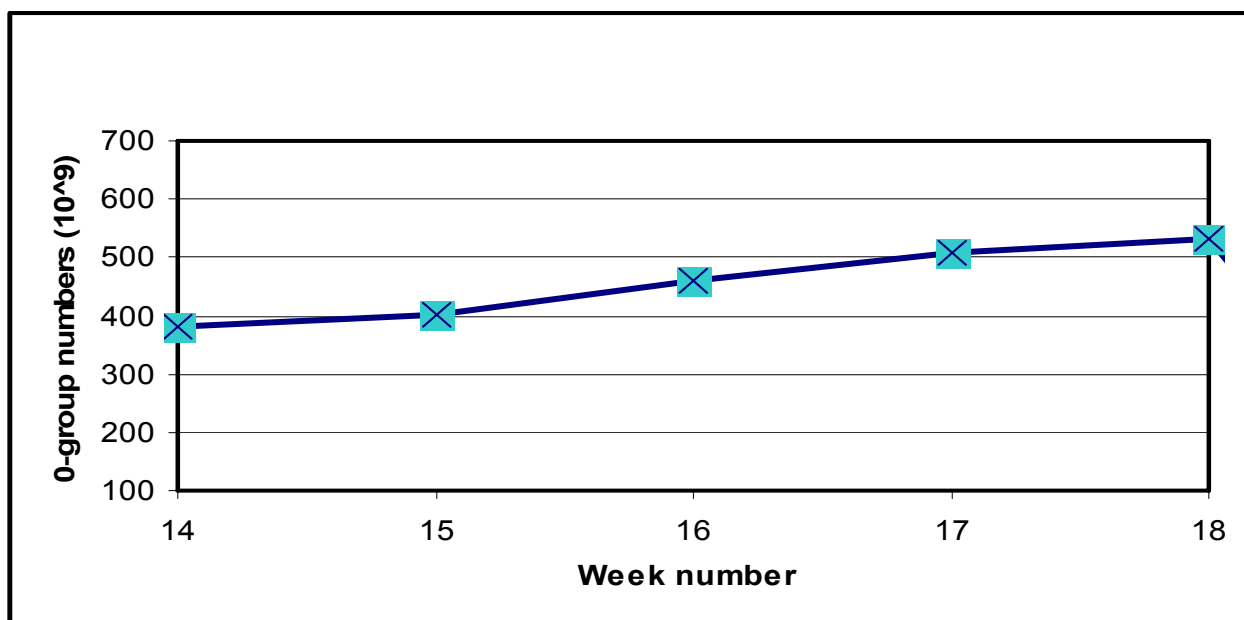


Figure 1. Abundance estimate of the 2005 year-class at age 0 sandeel by week of 2006.

Appendix 1 . Real time monitoring of the Danish Sandeel fishery, 2006.

This appendix documents the sampling activity and results of Danish Real Time Monitoring programme. For methodology, the reader is referred to the STECF Report of the ad hoc Working Group on Sandeel Fisheries, DIFRES, Charlottenlund Castle, Denmark, 8-10 February 2005.

The effort and CPUE for the 50-600 BT vessels included in the analysis are presented in Table 1. Table 2 presents the number of biological samples by week and Table 3 the number of fish length measured and aged.

Data from 16 out of the total 88 trips in April were not used for CPUE analysis as they did not meet the criteria for inclusion with respect to vessel size, gear or maximum days absent. For the remaining 72 trips, almost all of the effort is from weeks 17 and 18. CPUE for the whole period is rather stable between vessels size classes, indicating that the applied standardisation method is reasonable.

A total of 49 biological samples from the landings were used (Table 2) and a total of 8516 sandeels have been measured and 3838 otoliths have been taken for age determination (Table 3). The sampling covers the fishery well, however the planned 100 biological samples has not been reached yet due to the low number of landings.

All major landings by ICES rectangle have been sampled up to week 16 (Figure 1 and Table 1). Presently 21 and 12 samples from respectively 36 and 16 landings in weeks 17 and 18 have been included in the estimation procedure.

The length distributions of weeks 14 and 15 (Figure 2) show that the catches mainly consist of sandeels smaller than 12cm (Figure 2) of which more than 98% are 1-group sandeels (Table 4). From week 16 2-group and older sandeels become more abundant in the catches coincident with an increase in mean length and mean weight of 1-group sandeels. In week 18 an increase in the proportion of 1-group sandeels was observed. An increase in the mean weight of 1-group sandeels is observed over the whole period monitored.

Table 1.

Fishing effort and CPUE used for real time monitoring of the Danish North Sea sandeel fishery in 2006. 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 2006.

	Week no											
	14			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)	no. of trips	stand. days absent	stand. CPUE (t/day)
GT												
000-099	.	.	.	1	1	9.9	2	2	11.3	2	2	12.5
100-199	.	.	.	.	.	.	1	3	16.1	2	9	24.4
200-299	3	22	10.2	.	.	.	3	20	15.9	9	95	29.9
300-399	5	37	9.5	.	.	.	3	43	34.4	15	200	31.0
400-499	2	22	7.4	.	.	.	.	.	.	5	71	33.3
500-599	.	.	.	.	.	.	.	.	.	3	59	35.5
all	10	81	9.1	1	1	9.9	9	68	27.5	36	436	31.5

	Week no					
	18			all		
	no. of trips	stand. days absent	stand. CPUE (t/day)	no. of trips	stand. days absent	stand. CPUE (t/day)
GT						
000-099	2	1	22.0	7	6	13.9
100-199	.	.	.	3	12	22.0
200-299	4	30	33.0	19	167	26.2
300-399	4	56	33.4	27	336	29.5
400-499	4	68	26.0	11	161	26.7

	Week no					
	18			all		
	no. of trips	stand. days absent	stand. CPUE (t/day)	no. of trips	stand. days absent	stand. CPUE (t/day)
500-599	2	32	29.8	5	91	33.5
all	16	188	30.0	72	773	28.4

Table 2.

Number of biological samples from the Danish North Sea sandeel fishery.

	no. of samples
week	
14	9
15	1
16	6
17	21
18	12
All	49

Table 3.

Number of fish length measured (len.) and aged (age) by week. Length classes are given as half cm groups (SCM).

	Week no.										All	
	14		15		16		17		18			
	len.	age	len.	age	len.	age	len.	age	len.	age	len.	age
Length												
14	.	.	1	1	.	.	.	.	.	.	1	1
15	4	4	9	9	.	.	1	1	.	.	14	14
16	15	15	35	10	1	1	9	9	.	.	60	35
17	51	43	49	10	4	3	25	24	3	3	132	83
18	170	86	72	10	12	11	80	54	3	3	337	164
19	238	91	41	10	20	15	161	105	29	38	489	259
20	309	91	24	10	51	33	309	135	63	52	756	321
21	260	90	10	10	80	53	480	170	151	89	981	412
22	242	83	9	9	132	60	513	179	250	104	1146	435
23	176	85	4	4	179	60	511	175	283	113	1153	437
24	103	73	2	2	162	57	477	176	303	117	1047	425
25	44	45	.	.	117	60	384	165	299	120	844	390
26	19	19	2	2	56	37	258	133	282	114	617	305
27	10	10	.	.	18	18	166	113	140	89	334	230
28	3	3	.	.	18	18	104	64	50	49	175	134
29	5	5	.	.	12	15	84	27	18	18	119	65
30	1	1	1	1	7	7	85	28	8	8	102	45
31	4	3	.	.	3	3	77	25	2	2	86	33
32	.	.	.	.	3	3	41	10	1	1	45	14
33	1	1	.	.	2	1	38	14	1	1	42	17
34	1	1	.	.	3	2	15	5	.	.	19	8
35	.	.	.	.	1	1	8	3	1	1	10	5
36	.	.	.	.	.	.	2	1	.	.	2	1
37	.	.	.	.	.	.	2	2	.	.	2	2
38	1	1	.	.	.	.	1	1	1	1	3	3
All	1657	750	259	88	881	458	3831	1619	1888	923	8516	3838

Table 4.

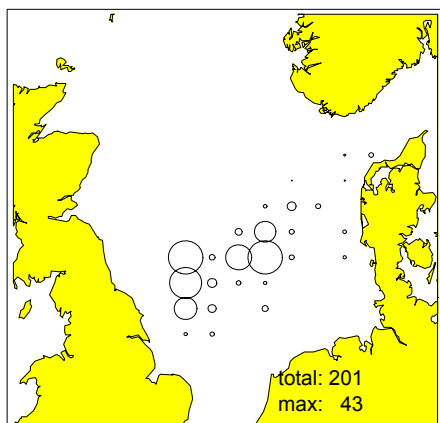
1-group mean weight at age and mean CPUE of 1-group sandeels in Danish landings in 2006. Values by weeks are based on cumulated data including the given week.

Week number	Mean weight (g)	CPUE (Numbers per standardized day absent)	Proportion 1-group (% of total catch numbers)
14	2.8	3,184,138	98.3
15	2.8	3,260,320	98.3
16	3.5	4,449,094	95.3
17	3.9	5,851,064	91.2
18	4.2	5,855,900	92.7

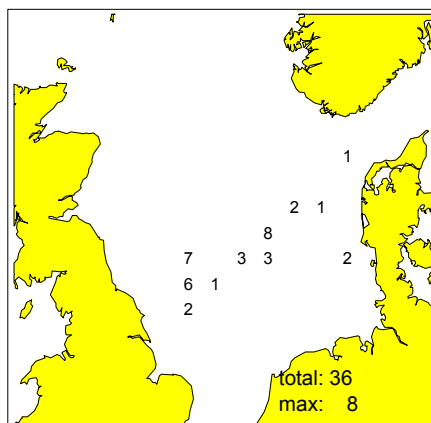
Figure 1.

Landings weight (up to and including week 17 and part of week 18) and number of biological samples (up to and including week 16 and part of week 17 and 18) by ICES rectangle for the Danish North Sea sandeel fishery 2006. The area of the “bubbles” illustrates landings weight (unit 100 ton). 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.

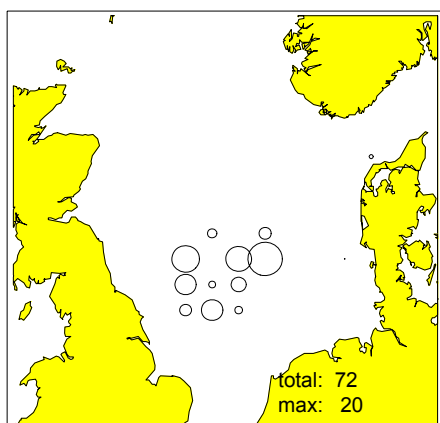
Landings (100 t) April



no. of samples April



Landings (100 t) May



no. of samples May

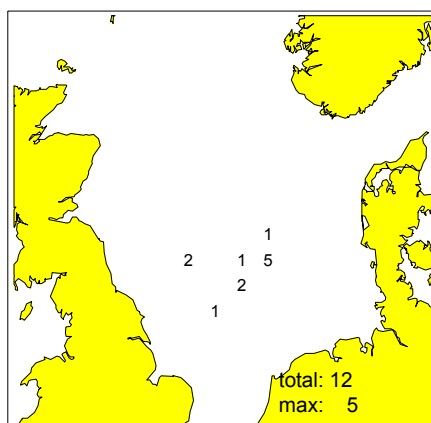
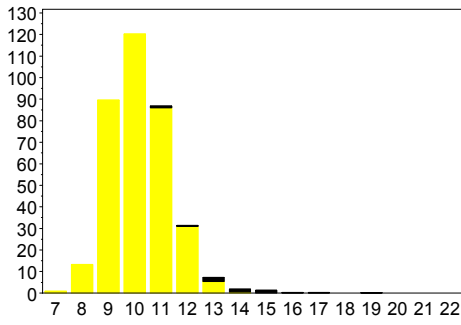


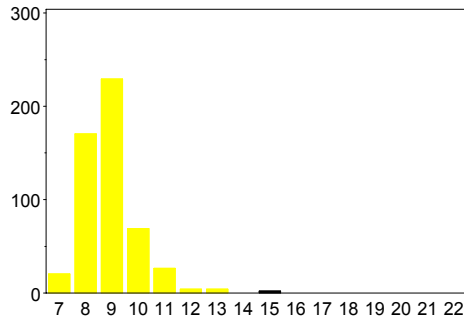
Figure 2.

Age-length distribution of sandeels by week of 2006. The length distribution by week represents one kg sandeel. Individual samples within a week have been weighted equally. Number of sandeels are presented by length (cm) – age 1 as yellow (light shaded) age 2 and older as black. The graphs for weeks 17 and 18 are preliminary.

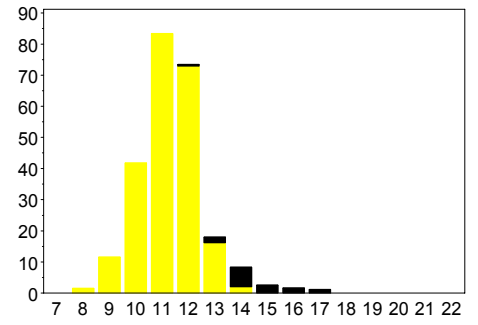
Week 14



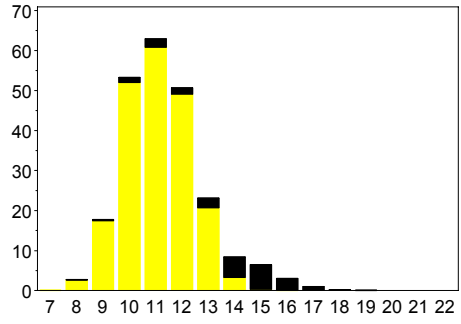
Week 15



Week 16



Week 17



Week 18

