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Report of the Working Group on Beam Trawl Surveys (WGBEAM)

16–19 MAY 2006

HAMBURG, GERMANY

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

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Executive Summary

The Working Group on Beam Trawl Surveys (WGBEAM) is responsible for collating and summarising the results of beam trawl surveys carried out in the North Sea, English Channel, and Celtic Sea and in the Irish Sea. At its meeting in 2006, WGBEAM prepared and reported population abundance indices for all areas where surveys are undertaken covering both coastal and offshore regions.

The WG particularly concentrated on a review of the spatial and temporal coverage of the inshore surveys in the North Sea as these are combined to provide an international index used in the WGNSSK. It was noted that there have been marked changes in the timing and area coverage of some surveys. These changes are not reflected in the way in which the combined index is derived. The **WG recommended** that a more detailed re-evaluation of the inshore surveys should be undertaken and reported back to the next meeting.

The WG responded to a request from AMAWAC to provide information on the general characteristics of the surveys, including their performance, internal consistency and long-term changes in distribution. The WG considered that individual assessment WGs were best able to evaluate the performance of survey indices but reviewed the consistency of year classes across key ages for the North Sea, and area VII plaice and sole stocks. As expected, recruiting year classes (O and 1-gp) were sampled less effectively by the offshore surveys than the older age groups. On the issue of long-term changes in distribution, the only stock where significant changes in distribution have been identified is North Sea plaice which has shown a marked offshore movement of juveniles. In view of this shift, an analysis of plaice distribution in the Irish Sea was carried out to investigate whether similar changes were evident there. The results are considered preliminary but indicate that there may have been a shift into deeper water, particularly in recent years. However, the analysis is sensitive to the depth range used and the WG **recommended** that further work is undertaken to clarify this.

The WG considered that a number of general issues related to data quality, gear standardisation and sampling protocols were similar to those discussed in the IBTSWG. The WG felt that there should be a closer link with IBTSWG and **recommended** that the Chair of WGBEAM attend the next meeting of IBTSWG.

1 Introduction

Fisheries independent beam trawl surveys using research vessels were established in the 1980s by countries bordering the North Sea to monitor stocks of plaice and sole. Collation and analysis of some of the data derived from these surveys was undertaken by the Study Group on Beam Trawl Surveys, which in 1998 was re-established as the Working Group on Beam Trawl Surveys. Although the initial focus of its efforts was in the North Sea and Eastern Channel, the Working Group now evaluates all major surveys in Subarea IV and VII.

The Working Group comprises regular participants from all countries involved in the surveys Belgium, Germany, Netherlands and the UK. An annual report describing the surveys and summarising the distribution and catch rate of fish species has been produced every year since 1990.

1.1 Terms of Reference

The **Working Group on Beam Trawl Surveys** [WGBEAM] (Chair: R Millner, UK) will meet in Hamburg, Germany from 16–19 May 2006 to:

a) prepare a progress report summarising the results of the 2005 beam trawl surveys;

b) calculate population abundance indices by age-group for sole and plaice in the North Sea, Division VIIa and Divisions VIId-g;

c) further co-ordinate offshore and coastal beam trawl surveys in the North Sea and Divisions VIIa and VIId-g;

d) describe and evaluate the current methods for calculating population abundance indices with emphasis on the inshore surveys;

e) continue the work on developing relative catchabilities and gear efficiencies of the different gears, refer to WGFTB;

f) continue work of developing and standardising an international database of beam trawl survey data and co-ordinate such activities with those of the IBTSWG;

g) continue the work on collating information on the epibenthic invertebrate bycatch during beam trawl surveys into a common database and discuss which summary results should be reported;

h) develop protocols and criteria to ensure standardisation of all sampling tools and surveys gears.

WGBEAM will report by 30 June 2006 for the attention of the Living Resources and the Resource Management Committees, and ACFM.

1.2 Participants

A complete list of participants at the WGBEAM meeting is given in Annex 1 of the report.

2 Results of offshore surveys 2005

2.1 Coverage of the area

The coverage of the area by each of the participating countries' surveys and the number of stations sampled in 2005 is shown in Annex 4, Figures 2.1.1–2.1.4. Belgian figures differ slightly from earlier maps due to corrections of location.

2.2 Population abundance indices

Tables 2.2.1 and 2.2.2 give the catch rate by age for sole and plaice from each of the offshore survey areas separately, updated with the survey indices for 2005. Tables 2.2.3 and 2.2.4 provide the results of the inshore surveys and Tables 2.2.5 and 2.2.6 give the mean length at age for sole and plaice from the Netherlands BTS. A minor revision of the Dutch DFS, SNS and BTS indices was carried out in 2006, affecting the indices in Tables 2.2.3 and 2.2.4. This revision consisted of some database corrections (which affects total catch numbers), and a different approach in dealing with size classes that were caught but not included in the ageing samples (which affects catch numbers per age-group). Although the figures have slightly changed, the overall trends in year-class strength were not affected. The altered approach of assigning fish of a certain size class to an age class when age data are missing has also slightly affected the estimated mean length per age class (Tables 2.2.5–2.2.6).

Table 2.2.1: Catch rate of sole from Netherlands and UK surveys in the North Sea and VII d, a, e, f and g.

Netherlands: sole (N.hr^-1/8m trawl) North Sea (IV) RV "Isis"*.

YEAR/AGE	0	1	2	3	4	5	6	7	8	9	10+
1985	0.00	2.65	7.89	3.54	1.67	0.62	0.28	0.00	0.00	0.00	0.00
1986	0.00	7.88	4.49	1.73	0.83	0.59	0.22	0.11	0.00	0.02	0.09
1987	0.04	6.97	12.55	1.83	0.56	0.58	0.22	0.23	0.06	0.00	0.02
1988	0.00	83.11	12.51	2.68	1.03	0.12	0.15	0.13	0.10	0.01	0.13
1989	0.49	9.02	68.08	4.19	4.10	0.68	0.13	0.24	0.00	0.05	0.03
1990	0.02	22.60	22.36	20.09	0.61	0.68	0.51	0.08	0.06	0.01	0.01
1991	0.69	3.71	23.19	5.84	6.01	0.10	0.14	0.06	0.04	0.01	0.03
1992	0.01	74.44	23.20	9.88	2.33	2.90	0.06	0.14	0.07	0.02	0.07
1993	0.02	4.99	27.36	0.99	4.37	2.38	4.30	0.02	0.09	0.06	0.07
1994	0.87	5.88	4.99	15.42	0.13	1.41	0.09	1.01	0.01	0.00	0.01
1995	0.46	27.86	8.46	7.04	6.72	0.48	0.91	0.31	0.97	0.05	0.00
1996	0.17	3.51	6.17	1.91	1.49	2.49	0.31	0.41	0.05	0.30	0.06
1997	0.59	173.94	5.37	3.23	0.80	0.77	0.40	0.11	0.04	0.05	0.06
1998	0.31	14.12	29.21	2.00	1.35	0.08	0.02	0.42	0.00	0.00	0.00
1999	6.60	11.41	19.26	16.63	0.63	2.06	0.33	0.22	0.65	0.00	0.32
2000	0.13	14.46	6.53	4.21	1.59	0.28	0.15	0.06	0.01	0.16	0.07
2001	9.98	8.17	10.71	2.34	1.68	0.74	0.08	0.04	0.03	0.00	0.18
2002	6.36	21.90	4.17	3.43	0.91	0.36	0.36	0.02	0.06	0.00	0.07
2003	0.35	10.76	10.55	2.51	1.75	0.38	0.20	0.34	0.00	0.02	0.00
2004	0.66	3.65	4.40	3.62	0.63	0.65	0.12	0.07	0.07	0.00	0.01
2005	0.09	2.98	3.36	2.41	1.39	0.14	0.14	0.08	0.05	0.00	0.02

***Revised see text**

Netherlands: sole (N.hr^-1/8m trawl) North Sea (IV) – RV "Tridens".

YEAR/AGE	0	1	2	3	4	5	6	7	8	9	10+
1996	0.00	0.51	1.66	0.45	0.24	0.58	0.15	0.30	0.01	0.15	0.05
1997	0.00	0.08	0.08	0.15	0.08	0.02	0.00	0.00	0.02	0.00	0.00
1998	0.00	0.44	2.29	0.58	0.37	0.25	0.18	0.19	0.00	0.08	0.02
1999	0.01	0.52	0.57	1.26	0.12	0.26	0.03	0.00	0.13	0.02	0.21
2000	0.01	0.35	0.70	0.48	0.65	0.06	0.04	0.05	0.01	0.08	0.02
2001	0.00	1.04	1.83	0.82	0.60	0.34	0.01	0.01	0.01	0.00	0.03
2002	0.03	0.90	1.05	1.88	1.80	0.21	0.78	0.12	0.00	0.00	0.21
2003	0.09	1.19	2.75	0.35	0.36	0.22	0.04	0.12	0.02	0.01	0.03
2004	0.00	0.05	0.62	0.72	0.10	0.23	0.05	0.10	0.00	0.00	0.05
2005	0.00	0.02	0.41	0.45	0.49	0.12	0.16	0.14	0.00	0.00	0.07

Table 2.2.1: Continued.

United Kingdom: sole (N.hr^-1/8m trawl) Eastern Channel (VIId).

Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10+**
1988	0.0	8.2	14.2	9.9	0.8	1.3	0.6	0.1	0.1	0.2	0.2
1989	0.0	2.6	15.4	3.4	1.7	0.6	0.2	0.2	0.0	0.0	0.7
1990	0.0	12.1	3.7	3.7	0.7	0.8	0.2	0.1	0.2	0.0	0.1
1991	0.0	8.9	22.8	2.2	2.3	0.3	0.5	0.1	0.2	0.1	0.1
1992	0.0	1.4	12.0	10.0	0.7	1.1	0.3	0.5	0.1	0.2	0.6
1993	0.0	0.5	17.5	8.4	7.0	0.8	1.0	0.3	0.2	0.0	0.4
1994	0.0	4.8	3.2	8.3	3.3	3.3	0.2	0.6	0.1	0.3	0.3
1995	0.0	5.2	16.9	2.1	3.8	2.2	2.4	0.2	0.3	0.2	0.2
1996	0.0	3.5	7.3	3.8	0.7	1.3	0.9	1.1	0.1	0.5	0.4
1997	0.0	19.0	7.3	3.2	1.3	0.2	0.5	0.4	0.9	0.0	0.7
1998	0.1	2.1	20.9	2.3	0.9	0.9	0.1	0.3	0.0	0.1	0.3
1999	1.2	25.5	9.0	12.4	2.6	1.5	0.7	0.2	0.9	0.8	0.5
2000	0.1	11.0	26.8	5.3	4.6	1.4	0.7	0.4	0.0	0.2	0.9
2001	1.2	8.5	25.1	11.2	1.9	2.4	0.8	0.6	0.3	0.1	0.9
2002	0.0	46.1	18.4	8.5	5.2	0.4	1.0	0.5	0.2	0.0	0.7
2003	0.0	8.5	33.8	6.4	3.7	1.7	0.4	0.5	0.2	0.0	0.8
2004	1.9	10.5	10.8	10.2	2.3	1.9	1.4	0.5	0.6	0.2	0.8
2005	0.0	30.9	7.6	3.3	4.6	1.9	1.1	.06	0.1	0.4	05

United Kingdom: sole (N.hr^-1/8m trawl) Western Channel (VIIe).

Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10+**
1989	0.0	0.2	2.5	4.9	4.3	1.5	1.6	0.7	0.3	0.3	0.4
1990	0.0	0.6	1.7	3.1	1.3	1.0	0.3	0.6	0.1	0.2	0.5
1991	0.0	0.3	7.9	2.9	2.1	1.0	0.8	0.3	0.7	0.2	0.7
1992	0.0	0.2	5.8	11.6	1.5	1.3	0.5	0.3	0.2	0.4	0.5
1993	0.0	0.3	2.7	5.4	5.4	1.0	0.5	0.3	0.2	0.1	0.7
1994	0.0	0.1	1.7	3.3	2.4	1.4	0.2	0.3	0.0	0.1	0.3
1995	0.1	1.1	1.5	1.9	1.7	1.0	1.3	0.2	0.2	0.2	0.5
1996	0.0	1.9	4.7	2.4	1.0	1.3	0.7	0.6	0.1	0.0	0.4
1997	0.2	3.0	5.5	5.1	1.7	0.5	0.6	0.5	0.4	0.2	0.6
1998	0.0	0.9	6.0	4.4	2.6	0.9	0.3	0.4	0.2	0.3	0.4
1999	0.0	0.9	4.4	5.5	2.0	1.0	0.2	0.2	0.1	0.1	0.7
2000	0.0	0.9	5.3	2.9	2.0	1.1	0.6	0.2	0.1	0.2	0.3
2001	0.0	0.6	7.8	5.9	2.2	1.3	.4	0.5	0.2	0.0	0.3
2002	0.00	0.48	1.33	4.18	1.64	0.85	0.36	0.06	0.06	0.00	0.24
2003	0.00	2.49	6.70	3.78	3.84	2.16	0.54	0.22	0.16	0.22	0.22
2004	0.00	0.54	3.30	4.16	1.41	1.41	0.86	0.70	0.43	0.11	0.43
2005	0.00	0.36	4.30	1.53	2.02	0.44	0.42	0.27	0.07	0.08	0.16

Table 2.2.1: Continued.

United Kingdom: sole (N.hr^-1/8m trawl) Bristol Channel (VIIf).

AGE	0	1	2	3	4	5	6	7	8	9	10+
1988	3.7	10.0	40.3	6.0	2.3	0.7	0.0	0.0	0.0	0.0	1.0
1989	22.0	34.0	50.7	27.0	3.0	2.3	1.0	0.7	0.3	0.3	0.7
1990	4.2	53.8	43.8	7.0	2.2	0.6	1.0	0.4	0.0	0.0	0.2
1991	4.8	36.0	77.3	10.1	2.5	2.2	0.6	0.0	0.4	0.2	0.1
1992	0.6	58.0	38.2	20.5	4.4	2.7	1.4	0.1	0.2	0.1	0.6
1993	0.7	24.2	51.2	6.1	3.3	0.4	0.2	0.2	0.1	0.1	0.2
1994	0.1	51.4	52.1	16.1	2.8	1.3	1.1	0.0	0.0	0.4	0.4
1995	4.3	16.3	29.4	6.6	1.6	0.9	1.6	0.4	0.3	0.3	0.5
1996	0.7	22.5	30.2	7.6	3.4	0.7	0.4	0.5	0.4	0.4	0.4
1997	4.8	64.9	27.8	2.9	1.7	2.1	0.7	0.5	0.8	0.0	0.7
1998	12.0	105.6	57.5	6.9	1.1	1.7	0.9	0.3	0.1	0.7	0.7
1999	3.5	358.2	35.2	4.7	2.0	0.8	0.5	0.8	0.3	0.0	1.1
2000	1.8	128.3	173.3	4.9	3.4	0.6	0.0	0.3	0.1	0.3	0.5
2001	2.6	42.8	72.3	31.7	2.7	0.8	0.3	0.3	0.1	0.0	1.2
2002	0.8	66.2	27.0	12.7	12.3	1.2	0.7	0.2	0.4	0.0	0.7
2003	1.2	38.7	53.4	6.7	4.6	6.7	1.0	0.4	0.3	0.0	0.1
2004	5.8	75.3	37.2	14.0	1.9	2.3	5.0	0.3	0.2	0.0	0.5
2005	6.5	54.7	34.1	7.5	3.9	1.1	0.7	2.6	0.1	0.2	0.1

United Kingdom: sole (N.hr^-1/8m trawl) in Irish Sea (VIIa).

AGE	0	1	2	3	4	5	6	7	8	9	10+
1988	0.2	8.8	24.3	23.3	43.8	8.6	4.6	0.1	0.0	0.0	0.0
1989	2.0	15.8	25.9	22.1	9.9	25.0	4.9	1.8	0.0	0.0	0.2
1990	0.9	122.7	53.8	12.1	4.0	9.5	15.2	2.6	1.4	0.6	0.1
1991	0.3	13.2	105.2	17.0	2.8	1.1	2.1	8.4	2.3	0.2	0.3
1992	0.1	14.9	26.2	53.9	14.3	6.2	1.2	0.5	7.9	1.7	0.8
1993	0.0	3.6	13.3	7.0	11.3	2.7	1.0	0.4	0.7	1.9	0.9
1994	0.0	1.7	17.9	10.0	4.3	6.5	2.4	0.7	0.5	0.2	1.6
1995	1.8	13.2	8.8	11.2	4.8	2.2	2.9	0.6	0.3	0.1	1.2
1996	0.2	46.2	8.3	2.5	5.8	3.3	1.7	2.1	0.6	0.2	0.7
1997	0.5	65.7	39.8	4.9	1.8	3.9	1.9	1.1	2.3	0.6	0.8
1998	0.5	35.9	44.2	21.9	2.5	0.6	2.2	1.8	0.3	1.5	0.9
1999	0.3	29.6	22.4	23.2	18.0	2.5	1.1	2.1	0.4	0.6	1.9
2000	0.0	15.8	41.2	10.3	12.0	6.3	1.1	0.1	0.8	0.4	1.6
2001	0.3	5.2	17.6	15.1	4.6	5.6	3.6	0.5	0.2	0.7	0.9
2002	0.1	15.1	7.6	7.8	9.2	3.0	4.7	2.8	0.1	0.1	1.1
2003	0.4	17.0	16.5	3.8	6.7	6.0	2.3	2.6	1.5	0.1	0.8
2004	0.0	22.1	17.9	9.5	2.0	4.5	3.4	3.0	1.2	1.4	0.9
2005	0.1	3.5	11.8	5.6	2.6	1.0	2.2	2.0	0.4	0.7	1.4

Table 2.2.2: Catch rate of plaice from Netherlands and UK surveys in the North Sea and VII d, a, e, f and g.

Netherlands: plaice (N.hr^-1/8m trawl) North Sea (IV) RV “Isis”*.

AGE	0	1	2	3	4	5	6	7	8	9	10+
1985	134.65	115.58	179.90	38.81	11.84	1.37	1.05	0.36	0.17	0.10	0.25
1986	9.30	667.44	131.77	51.00	8.89	3.29	0.43	0.34	0.13	0.04	0.21
1987	44.13	225.82	764.29	33.07	4.77	2.04	1.02	0.35	0.09	0.07	0.31
1988	29.62	680.17	146.99	182.31	9.99	2.81	0.81	0.46	0.04	0.11	0.25
1989	31.86	467.88	319.27	38.66	47.30	5.85	0.83	0.31	0.66	0.13	0.07
1990	11.50	115.31	102.64	55.67	22.78	5.57	0.80	0.21	0.37	0.26	0.17
1991	4.38	185.45	122.05	28.55	11.86	4.26	5.71	0.26	0.22	0.10	0.12
1992	7.72	176.97	125.93	27.31	5.62	3.18	2.66	1.14	0.26	0.05	0.09
1993	54.79	124.76	179.10	38.40	6.12	0.93	0.81	0.63	0.47	0.17	0.08
1994	145.59	145.21	64.22	35.24	10.87	2.86	0.64	0.86	0.96	0.40	0.03
1995	92.03	252.16	43.55	14.22	8.11	1.20	0.87	0.36	1.13	0.22	0.13
1996	209.78	218.28	212.32	23.02	4.83	3.40	0.92	0.05	0.17	0.13	0.12
1997	22.71	**	**	19.91	2.79	0.22	0.39	0.17	0.12	0.00	0.03
1998	242.98	342.51	431.90	47.40	8.91	1.44	0.75	0.14	0.08	0.11	0.09
1999	198.94	305.90	130.00	182.52	3.65	2.11	0.14	0.14	0.03	0.03	0.09
2000	178.94	277.61	74.40	31.38	23.99	0.61	0.17	0.54	0.03	0.01	0.06
2001	625.88	222.71	78.44	19.39	9.97	9.47	0.29	0.14	0.04	0.04	0.18
2002	239.01	541.25	47.74	16.05	5.37	2.73	1.42	0.09	0.14	0.00	0.10
2003	170.42	126.11	170.08	10.78	5.94	1.52	1.21	0.68	0.11	0.10	0.02
2004	127.32	226.32	41.54	65.84	6.97	2.86	1.50	1.02	3.46	0.00	0.01
2005	180.00	162.22	74.76	8.65	22.15	1.78	1.50	0.30	0.23	0.50	0.31

*** Revised (see text)**

**** Missing due to ageing problems**

Netherlands: plaice (N.hr^-1/8m trawl) North Sea (IV) – RV “Tridens”.

YEAR/AGE	0	1	2	3	4	5	6	7	8	9	10+
1996	0.00	1.59	5.59	4.40	3.30	2.37	1.84	0.83	0.53	0.18	0.55
1997	0.00	*	*	10.41	3.95	2.84	1.93	0.47	1.10	0.42	0.60
1998	0.02	0.56	30.14	9.93	5.57	2.68	1.35	0.91	0.79	0.31	0.42
1999	0.29	2.39	8.29	36.93	6.47	2.65	2.13	0.60	0.77	0.33	0.15
2000	0.09	4.64	9.45	12.74	17.23	2.94	1.89	1.08	0.95	0.25	0.62
2001	0.32	0.67	6.93	9.05	7.23	7.67	1.21	0.69	0.48	0.60	0.61
2002	0.01	18.48	13.54	11.27	6.87	4.23	4.43	0.74	0.72	0.34	0.98
2003	0.35	4.11	34.84	11.91	8.57	4.75	2.72	3.97	0.70	0.70	1.64
2004	0.01	5.68	10.33	28.59	7.98	4.87	2.34	1.04	2.52	0.38	1.35
2005	0.05	6.99	22.99	11.12	15.93	2.75	5.37	1.57	0.53	3.42	2.43

*** Missing due to ageing problems.**

Table 2.2.2: Continued.

United Kingdom: plaice (N.hr^-1/8m trawl) Eastern Channel (VIId).

AGE	0	1	2	3	4	5	6	7	8	9	10+
1988	0.0	26.5	31.3	43.8	7.0	4.6	1.5	0.8	0.7	0.6	1.2
1989	0.0	2.3	12.1	16.6	19.9	3.3	1.5	1.3	0.5	0.3	1.7
1990	0.6	5.2	4.9	5.8	6.7	7.5	1.8	0.7	1.0	0.8	0.4
1991	0.0	11.7	9.1	7.0	5.3	5.4	3.2	1.2	1.0	0.1	1.2
1992	0.0	16.5	12.5	4.2	4.2	5.6	4.9	3.4	0.7	0.5	0.7
1993	0.1	3.2	13.4	5.0	1.7	1.9	1.6	2.0	2.8	0.4	0.6
1994	1.2	8.3	7.5	9.2	5.6	2.0	0.8	0.9	1.8	1.2	0.8
1995	0.0	11.3	4.1	3.0	3.7	1.5	0.6	0.6	1.3	0.8	0.8
1996	13.6	13.2	11.9	1.3	0.7	1.3	0.9	0.4	0.3	0.4	2.8
1997	0.7	**	**	4.2	0.7	0.3	0.3	0.2	0.2	0.2	1.9
1998	0.3	11.4	27.3	7.0	3.1	0.3	0.2	0.2	0.1	0.0	1.0
1999	1.6	9.2	11.6	15.7	2.8	0.9	0.1	0.0	0.2	0.1	0.6
2000	1.2	17.9	24.9	14.6	19.1	4.5	1.7	0.5	0.3	0.4	2.2
2001	4.9	21.6	26.7	16.2	9.3	14.6	2.9	0.8	0.4	0.3	1.9
2002	2.0	34.0	22.1	12.2	5.7	2.5	5.4	1.3	0.1	0.2	1.0
2003	2.5	7.4	30.5	7.7	3.5	1.7	1.1	2.2	0.7	0.1	0.4
2004	12.2	45.3	18.3	17.6	4.5	1.0	0.6	0.6	1.5	0.1	0.1
2005	0.5	17.5	41.6	17.3	12.7	3.8	1.3	0.9	0.6	1.1	1.6

United Kingdom: plaice (N.hr^-1/8m trawl) Western Channel (VIIe).

AGE	0	1	2	3	4	5	6	7	8	9	10+
1989	0.0	0.8	2.2	10.6	7.5	1.4	0.2	0.3	0.2	0.1	0.3
1990	0.0	0.8	1.1	7.0	3.4	2.4	0.0	0.2	0.1	0.1	0.3
1991	0.0	0.6	0.8	1.4	2.7	2.1	1.6	0.7	0.1	0.0	0.3
1992	0.0	4.3	1.0	1.4	0.5	1.3	0.7	0.5	0.1	0.2	0.2
1993	0.0	0.7	2.4	3.3	1.1	0.5	1.2	0.7	0.6	0.0	0.1
1994	0.0	0.8	0.8	3.6	1.2	0.4	0.2	0.5	0.6	0.3	0.0
1995	0.3	2.1	1.7	1.9	2.1	0.5	0.2	0.3	0.2	0.1	0.2
1996	5.4	2.3	3.9	1.3	0.8	0.9	0.2	0.0	0.1	0.3	0.4
1997	10.4	8.1	4.8	8.1	0.9	0.3	0.6	0.3	0.1	0.0	0.4
1998	0.1	5.7	5.2	4.7	3.2	0.4	0.2	0.2	0.1	0.0	6.0
1999	5.1	2.0	2.1	8.2	2.1	1.3	0.1	0.1	0.3	0.1	0.1
2000	0.0	3.3	2.7	5.7	7.0	1.6	1.0	0.0	0.1	0.0	0.3
2001	4.1	1.4	2.8	1.9	3.9	3.7	0.8	0.6	0.0	0.1	0.2
2002	0.00	6.00	3.21	2.97	0.85	1.03	1.39	0.18	0.06	0.00	0.12
2003	0.76	1.19	4.54	3.08	1.78	0.38	0.70	1.14	0.38	0.16	0.16
2004	0.00	1.14	2.16	4.00	1.62	0.70	0.43	0.32	0.65	0.11	0.22
2005	1.19	1.22	2.97	3.59	2.53	0.54	0.12	0.13	0.19	0.08	0.10

Table 2.2.2: Continued.

United Kingdom: plaice (N.hr^-1/8m trawl) Bristol Channel (VIIf).

Age	0	1	2	3	4	5	6	7	8	9	10+
1988	0.0	12.8	45.2	11.5	0.0	0.3	0.3	0.0	0.0	0.3	0.0
1989	0.3	34.3	52.2	12.0	2.5	0.8	0.0	0.3	0.0	0.0	0.0
1990	2.4	32.2	43.0	12.8	3.0	1.2	0.0	0.0	0.4	0.0	0.2
1991	0.2	101.9	4.0	7.9	2.5	1.5	0.4	0.0	0.1	0.0	0.0
1992	0.4	57.3	36.1	1.5	0.6	1.8	0.2	0.6	0.0	0.0	0.2
1993	0.5	14.1	12.6	5.2	0.2	0.6	0.1	0.1	0.0	0.0	0.0
1994	17.5	15.4	4.8	2.4	1.3	0.1	0.0	0.0	0.0	0.0	0.0
1995	0.1	31.4	11.0	2.1	0.5	1.0	0.1	0.0	0.0	0.3	0.0
1996	1.2	32.0	41.8	4.8	0.1	0.4	0.1	0.0	0.0	0.0	0.0
1997	1.1	34.3	15.2	5.2	0.7	0.3	0.1	0.1	0.0	0.0	0.0
1998	0.7	31.5	18.2	6.7	1.5	0.5	0.3	0.0	0.0	0.0	0.1
1999	24.9	22.1	11.7	4.3	2.9	1.4	0.0	0.0	0.1	0.0	0.0
2000	11.2	46.1	8.1	4.3	0.8	0.8	0.0	0.3	0.0	0.0	0.0
2001	3.8	26.6	18.5	2.3	1.2	0.4	0.5	0.2	0.0	0.0	0.0
2002	0.1	14.6	19.1	10.0	0.9	0.6	0.2	0.3	0.1	0.0	0.0
2003	5.6	9.7	10.2	6.2	2.5	0.3	0.2	0.1	0.1	0.3	0.0
2004	16.1	25.6	3.6	3.2	1.6	0.2	0.1	0.1	0.2	0.0	0.2
2005	0.2	29.3	14.0	3.4	1.0	1.7	0.4	0.1	0.0	0.0	0.1

United Kingdom: plaice (N.hr^-1/8m trawl) Irish Sea (VIIa).

Age	0	1	2	3	4	5	6	7	8	9	10+
1988	2.9	72.6	145.3	30.8	1.2	6.8	1.2	0.5	0.0	0.1	0.8
1989	5.9	41.3	67.6	64.8	11.3	1.4	3.4	0.3	0.0	0.0	0.1
1990	63.4	146.9	36.7	19.9	9.1	4.8	4.1	0.2	0.1	0.9	0.3
1991	6.7	60.4	59.8	8.1	4.4	0.1	0.9	1.8	0.1	0.0	0.4
1992	4.8	50.7	96.1	38.0	2.0	2.1	1.5	1.6	0.1	0.0	2.0
1993	9.3	168.5	155.4	38.7	13.0	2.0	1.9	1.0	0.4	0.4	0.6
1994	14.6	207.0	124.6	81.4	17.5	5.6	1.4	1.4	0.6	0.2	0.6
1995	17.8	249.7	101.0	38.8	32.2	2.9	1.5	0.6	0.4	0.4	0.3
1996	6.3	144.0	69.3	20.4	9.1	7.1	2.3	1.0	0.1	0.4	0.5
1997	33.3	169.2	98.1	41.4	13.5	7.4	6.1	2.7	0.9	0.5	0.9
1998	23.8	124.4	112.1	41.9	1.6	10.4	4.9	4.3	1.1	0.5	1.2
1999	52.9	108.2	106.4	61.8	28.1	13.3	4.8	3.2	2.1	2.0	0.3
2000	61.3	200.4	81.7	44.0	34.6	16.3	3.6	3.0	1.6	1.5	0.9
2001	34.2	121.5	88.4	28.1	15.9	13.1	6.1	2.1	1.2	0.8	0.3
2002	8.1	155.6	147.0	83.5	31.9	16.2	17.4	7.1	2.1	2.4	1.7
2003	47.4	146.6	182.0	95.8	52.0	14.9	11.5	7.3	2.8	1.2	0.9
2004	58.8	194.6	110.6	103.3	52.7	37.3	10.5	8.5	6.4	2.1	2.9
2005	61.1	104.3	155.9	62.1	42.0	30.4	20.2	5.3	3.9	3.9	1.5

Table 2.2.3: Indices of juvenile sole abundance from inshore beam trawl surveys. Abundance indices are given as numbers per 1000 m^2 (Netherlands, Belgium and Germany) and as millions of fish sampled (UKYFS and international index).

	UKYFS (VIId)		UKYFS (IVc)		Netherlands DFS*		Belgium DYFS		Germany DYFS		International (IV)	
Age	0	1	0	1	0	1	0	1	0	1	0	1
1970					25.7945	1.96						
1971					19.9641	0.9718						
1972					0.4957	0.1057						
1973					6.8762	0.2506	3.82	0.01				
1974					1.34	0.511	0.20	0.05	0.21	0.31		
1975					9.8999	0.1224	6.44	0.02	3.79	0.47		
1976					3.4671	0.1977	1.23	0.08	0.55	0.35		
1977					1.1462	0.234	0.77	0.10	2.8	0.93		
1978					2.5009	0.0182	8.27	0.01	3.1	0.43		
1979					10.6402	0.0395	63.91	0.02	1.33	0		
1980					20.9438	1.0474	12.97	6.64	3.56	2.73		
1981	0.11	0.45	32.06	5.99	16.78	0.43	0.92	0.55	2.1	0.87	293.93	13.39
1982	4.63	0.36	26.99	4.02	17	0.6	14.20	0.77	1.11	0.17	328.52	14.28
1983	25.45	1.52	70.66	5.64	4.14	0.73	3.65	0.80	2.14	1.28	104.38	20.32
1984	4.33	4.04	59.84	11.3	9.18	0.26	5.49	0.80	1.14	0.36	186.53	11.89
1985	7.65	2.94	20.53	2.8	16.13	0.09	16.27	0.16	0.03	0.18	315.03	3.43
1986	6.45	1.45	28.98	3.1	3.47	0.26	2.47	0.97	0.31	0.7	73.22	10.47
1987	16.85	1.38	20.87	1.89	30.83	0.27	2.36	0.05	1.27	0.4	523.86	6.43
1988	2.59	1.87	35.55	9.7	1.81	0.56	0.67	0.49	3.17	7.11	50.07	35.04
1989	6.67	0.62	47.2	3.78	3.63	0.22	1.06	0.13	0.43	2.12	77.80	11.59
1990	6.7	1.9	36.82	12.27	0.52	0.17	0.35	0.05	0.23	1.37	21.09	11.25
1991	1.81	3.69	22.72	19.69	22.88	0.02	2.17	0.01	0.87	0.37	391.93	8.26
1992	2.26	1.5	33.45	5.21	0.89	0.53	0.08	0.39	0.19	2.06	25.30	17.90
1993	14.19	1.33	36.42	24.46	0.8	0.03	0.25	0.03	0.12	0.51	25.13	10.67
1994	13.07	2.68	27.32	9.14	3.57	0.01	0.65	0.12	0.15	0.81	69.11	6.18
1995	7.53	2.91	33.55	13.04	0.26	0.12	1.71	0.09	0.09	0.99	19.07	9.82
1996	1.85	0.57	50.16	6.78	1.79	0.01	5.20	0.47	0.55	0	59.62	3.99
1997	4.23	1.12	14.87	4.91	2.17	0.31	1.40	0.82	0.03	3.3	44.08	19.02
1998	7.97	1.12	37.99	2.12	**	**	3.63	2.70	0.18	0.32	**	**
1999	2.63	1.47	19.02	7.67	**	**	2.13	0.43	0.1	0.25	**	**
2000	1.16	2.47	13.54	9.76	0.59	0.03	0.56	0.10	0.12	0.08	15.51	4.53
2001	4.75	0.38	39.83	2.31	2.81	0.02	9.91	0.62	0.05	0.1	84.62	3.40
2002	4.45	4.15	32.48	7.76	1.4	0.04	12.19	4.33	0.18	0.43	65.38	18.36
2003	4.55	1.44	14.41	4.9	0.72	0.12	0.75	0.44	0.1	0.07	18.47	5.34
2004	10.19	3.65	68.81	3.16	0.29	0.03	10.98	2.33	0.05	0.01	54.51	8.95
2005	9.97	4.07	22.53	10.42	1.42	0.03	6.10	1.33	0.99	***	***	***

*** Revised (see text)**

**** No (valid) survey**

***** Data not yet available**

Table 2.2.4: Indices of juvenile plaice abundance from inshore beam trawl surveys. Abundance indices are given as numbers per 1000 m^2 (Netherlands, Belgium and Germany) and as millions of fish sampled (UKYFS and international index).

	UKYFS (VIId)		UKYFS (IVc)		Netherlands DFS*		Belgium DYFS		Germany DYFS		International (IV)	
Age	0	1	0	1	0	1	0	1	0	1	0	1
1970					22.02	9.97						
1971					16.04	2.31						
1972					4.83	5.35						
1973					3.16	10.05	1.21	0.0128				
1974					2.23	2.32	0.01	0.3048	14.38	5.38		
1975					4.35	3.63	1.12	0.0169	9.02	10.31		
1976					7.76	4.64	0.18	0.0787	37.09	2.22		
1977					3.98	7.25	0.13	0.1738	39.12	19.74		
1978					8.06	3.90	1.47	0.1315	26.37	10.94		
1979					18.09	8.98	1.49	0.6257	22.21	14.61		
1980					5.85	11.13	0.11	0.5916	21.48	35.06		
1981	0.55	0.11	59.24	5.95	29.9	8.57	1.69	0.11	34.3	14.33	605.96	169.78
1982	0.58	0.06	11.65	13.15	24.98	15.94	0.54	0.57	6.37	14.47	433.67	299.36
1983	10.71	0.77	74.11	6.86	19.65	8.77	1.02	0.37	26.41	7.32	431.72	163.53
1984	3.62	0.41	76.52	10.85	11.65	6.76	0.45	0.19	6.01	1.04	261.80	124.19
1985	5.18	1.16	48.33	13.74	40.16	5.25	3.76	0.15	5.51	1.81	716.29	103.27
1986	12.53	1.08	23.62	17.93	10.48	15.88	1.60	0.81	3.38	4.68	200.11	288.27
1987	13.95	1.07	20.38	5.41	28.49	11.25	3.16	1.80	13.46	1.32	516.84	195.87
1988	9.31	0.81	28.12	7.72	16.22	5.97	0.72	1.77	14.93	4.74	318.36	116.45
1989	2.26	0.7	27.8	12.9	22.92	6.37	0.38	0.13	19.09	4.89	435.70	125.72
1990	4.73	0.52	31.75	10.25	23.78	6.85	2.39	1.21	23.59	3.18	465.47	130.13
1991	1.34	0.43	14.89	9.06	26.97	7.65	1.19	0.19	21.24	10.79	498.49	152.35
1992	2.92	1.09	26.16	5.64	19.55	6.82	0.31	0.20	4.72	12.03	351.59	137.08
1993	5.77	0.64	43.1	7.96	13.49	3.8	0.14	0.13	3.86	2.73	262.26	75.16
1994	12.63	0.59	19.14	9.38	25.15	0.93	1.03	0.33	7.71	3.42	445.66	30.60
1995	7.42	2.47	51.58	11.65	7.29	0.98	2.83	0.79	10.44	5.56	184.51	37.74
1996	1.22	0.72	60.16	4.07	25.44	6.77	14.25	0.31	41.77	0.45	572.80	116.89
1997	1.2	0.26	11.19	5.48	6.37	10.94	2.02	4.46	16.67	10.71	117.49	193.22
1998	5.23	0.29	40.26	0.92	**	**	3.01	1.74	8.11	1.36	**	**
1999	4.83	0.16	14.38	1.65	**	**	1.20	1.79	2.94	1.07	**	**
2000	0.29	0.72	10.57	4.82	9.3	0.17	1.48	1.10	10.28	1.18	183.83	11.31
2001	2.52	0.05	76.96	0.74	23.4	0.17	1.63	0.63	27.47	0.24	499.05	5.00
2002	0.33	1.61	40.04	4.59	10.4	0.08	4.73	5.28	1.12	2.9	213.17	19.20
2003	8.2	0.16	30.24	3.15	19.11	0.32	2.95	1.35	9.2	0.26	361.14	11.08
2004	12.2	1.46	6.54	1.63	10.68	0.57	4.84	2.16	4.7	0.45	199.77	15.34
2005	3.00	0.21	13.80	5.07	6.55	0.1	4.35	0.30	2.68	***	***	***

*** Revised (see text)**

**** No (valid) survey**

***** Data not yet available**

Table 2.2.5: Mean length-at-age for sole in the North Sea based on BTS.

YEAR/AGE	0	1	2	3	4	5	6	7	8	9	10+
1985		17.2	23.6	27.6	31.8	31.0	31.6				
1986		17.3	23.3	27.3	30.0	32.9	36.1	36.5		40.0	40.2
1987		16.7	24.2	28.1	32.9	33.3	34.3	33.0	38.0	9.4	
1988		16.4	21.1	28.2	31.1	32.2	31.6	37.0	33.5	35.0	41.3
1989		17.5	23.0	26.0	27.8	30.1	35.0	35.9		21.3	37.0
1990		18.0	22.7	27.0	31.9	34.5	33.4	33.2	40.4	43.0	45.0
1991	9.6	20.0	24.0	26.8	30.4	33.4	34.9	35.4	39.0		45.0
1992		18.2	20.8	26.8	28.3	30.6	31.3	36.4	35.0	40.6	31.9
1993	8.7	19.5	22.9	24.0	26.3	26.1	26.2	38.0	31.3	35.4	38.2
1994	13.7	19.4	22.5	25.6	31.7	27.1	27.4	32.3	46.0		34.0
1995	11.5	18.5	22.8	24.3	26.9	30.8	30.9	28.3	27.8	42.3	
1996	8.9	19.1	23.2	25.5	26.6	28.2	26.5	27.0	30.7	32.3	35.1
1997	9.8	17.9	25.1	26.9	27.7	29.0	33.9	29.3	30.6	31.0	37.9
1998	11.1	19.1	23.7	24.0	28.4	27.1	30.0	31.2			
1999	9.1	19.4	23.1	26.1	26.4	26.1	33.3	28.5	27.9	32.0	28.4
2000	8.4	18.8	22.6	27.0	28.0	28.8	28.0	32.7	30.0	28.3	29.6
2001	7.3	18.9	23.1	25.4	27.3	29.2	26.2	28.0	26.3		25.3
2002	8.4	17.6	21.7	24.8	26.1	29.8	28.8	25.5	30.8		32.8
2003	12.6	19.0	22.9	25.8	27.1	26.3	27.8	26.1		25.0	27.3
2004	10.7	19.5	24.0	27.0	29.2	30.3	34.0	29.2	34.9		30.5
2005		19.8	23.3	25.7	28.7	28.3	31.7	30.2	27.5		43.5

*** Not available.**

Table 2.2.6: Mean length-at-age for plaice in the North Sea based on BTS.

YEAR/AGE	0	1	2	3	4	5	6	7	8	9	10+
1985	8.1	16.4	24.2	28.9	32.9	37.8	41.0	43.1	41.4	44.1	49.1
1986	9.2	16.5	23.4	28.4	30.6	36.8	38.7	38.6	38.8	42.4	48.2
1987	9.7	15.4	21.8	26.9	33.9	35.9	37.3	40.2	44.5	42.7	44.3
1988	9.4	15.5	22.1	26.0	31.1	36.2	39.3	41.7	51.0	46.1	51.8
1989	10.4	16.0	22.1	28.5	29.2	28.5	41.1	42.0	43.2	41.9	50.4
1990	8.4	16.7	22.9	26.9	30.5	35.6	38.5	42.6	41.7	41.2	45.1
1991	11.9	16.9	23.6	26.8	31.1	33.0	36.2	36.9	34.3	46.8	46.9
1992	11.1	17.1	22.6	28.2	30.3	33.0	32.1	35.7	39.2	44.8	47.0
1993	10.9	16.9	21.3	25.5	31.1	35.3	36.9	37.3	40.2	45.8	45.5
1994	10.5	16.9	23.1	27.3	27.2	34.7	36.3	38.1	31.0	44.3	48.4
1995	10.6	17.4	24.1	29.5	33.6	36.2	36.5	34.2	37.2	37.8	46.2
1996	9.5	16.9	22.6	28.6	32.7	35.0	37.8	43.9	35.8	42.4	48.1
1997	8.8	14.6	16.7	28.3	32.5	35.5	37.8	42.5	44.2	0.0	47.7
1998	9.9	15.9	20.6	22.5	28.4	35.1	39.9	40.6	48.7	42.3	49.3
1999	10.2	16.4	20.2	24.8	32.2	34.7	41.0	42.7	43.0	47.4	44.4
2000	10.2	17.4	22.4	25.1	27.4	31.7	38.9	23.3	43.7	45.0	42.7
2001	11.0	18.0	22.6	27.2	28.6	31.6	38.1	42.6	38.1	51.0	47.5
2002	11.6	17.0	22.7	27.2	29.6	32.0	35.4	35.6	43.3	0.0	29.7
2003	11.4	18.0	22.1	28.5	29.6	32.8	34.4	36.3	28.7	30.0	20.0
2004	10.9	17.3	22.8	27.7	32.7	32.3	35.9	33.4	41.3		40.5
2005		17.3	21.3	26.2	25.9	31.8	31.4	36.6	35.7	35.7	

2.3 Changes in population abundance

2.3.1 Distribution of juvenile plaice in the Irish Sea and North Sea

Recent reports (Grift *et al*., 2004) have shown a change in distribution of juvenile plaice in the Wadden Sea away from shallower inshore waters to deeper, further offshore waters. In this section data from the eastern Irish Sea has been analysed in order to ascertain whether similar distribution changes are occurring in this area.

The abundance of 1 year old plaice taken from UK beam trawl survey in the Irish Sea in September-October were analysed over the time period 1993 to 2004. The analysis was based on a similar approach to that used in Grift *et al*. (2004) except that the data were analysed by haul depth rather than distance from the coast as this information was not available to the WG. The data were arranged to show the logged number of fish caught at depth each year, and were restricted to depths of < 25 meters as there were few stations deeper than this. A linear regression was fitted to the plots of abundance against depth for each year and the slopes from each year’s data plotted against time to enable changes throughout the time period to be examined.

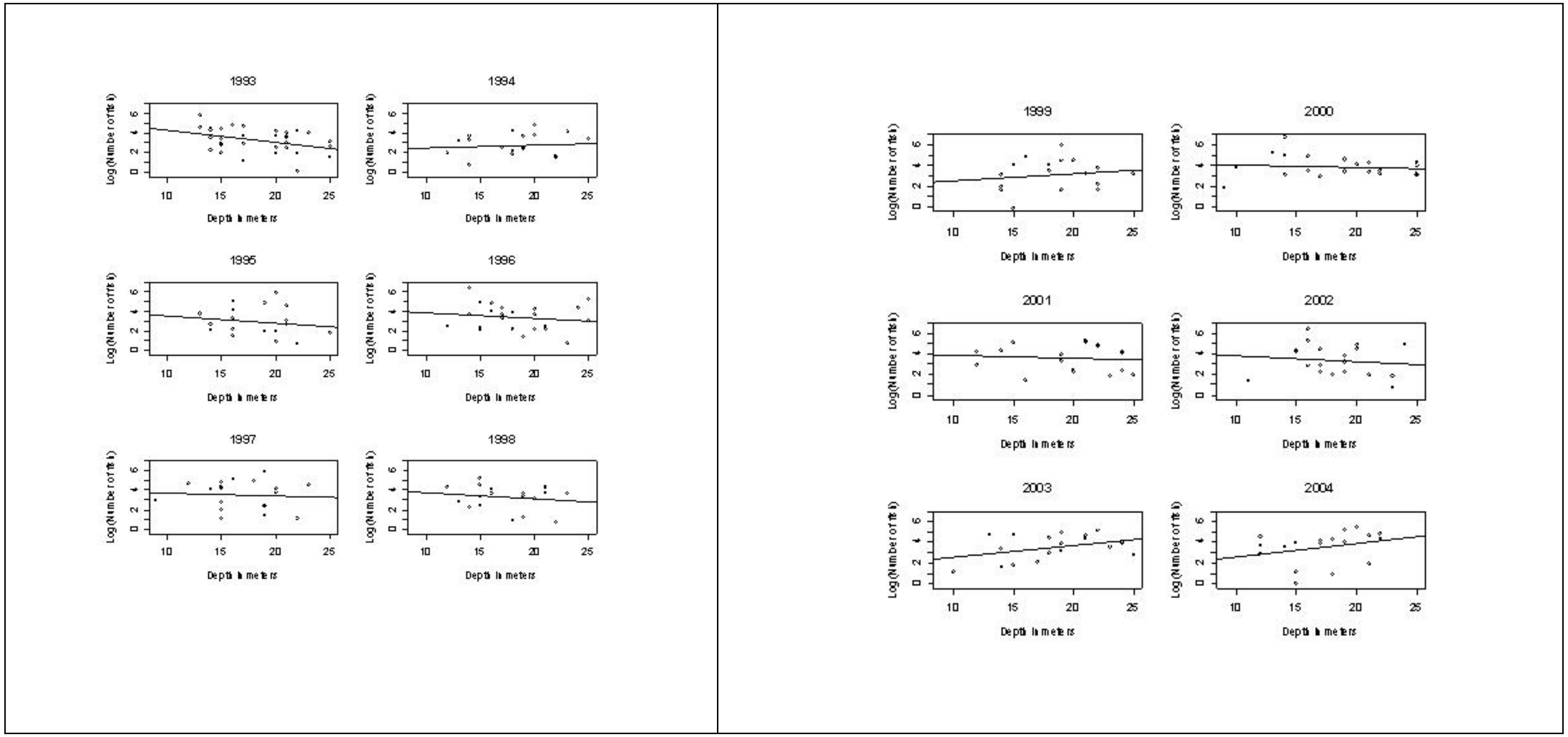


Figure 2.3.1: Changes in distribution with depth of 1-gp plaice in the Irish Sea from 1993–2004.

Figure 2.3.1 shows the log number of plaice plotted against depth and the fitted slope of the distribution. The gradient is quite variable throughout the time period, with the strongest negative result (decline in abundance with depth) occurring in 1993, and the strongest positive results (increase in abundance with depth) occurring in 2003 and 2004.

If confirmed, this would be evidence of a change in plaice distribution in the Irish Sea towards deeper water.

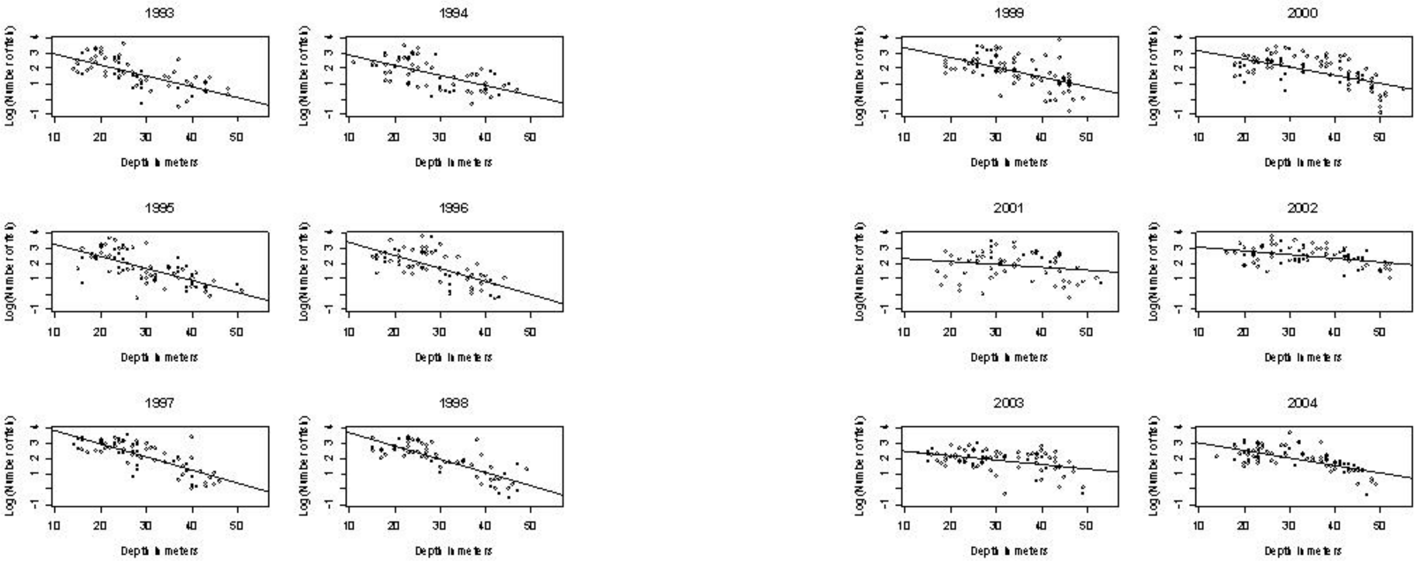


Figure 2.3.2: Changes in distribution with depth of 1-gp plaice in the North Sea from 1993–2004.

For comparison, a similar analysis was undertaken for the North Sea plaice data. The results are given in Figure 2.3.2. The data is more consistent in the North Sea with a strong decrease in abundance in the early years and a relatively marked change in the period 2000–2004 indicating a clear shift in distribution offshore.

In the Irish Sea, the model is strongly influenced by the first and last two year's data and the **WG recommends** that a more detailed analysis should be undertaken.

2.4 Abundance and distribution of fish and benthos species

2.4.1 Fish species

The yearly abundance per subarea of the main fish species in numbers per hour fished standardised to 8-meter beam trawl, are shown in Tables 2.4.1–2.4.12. The distribution is shown in maps per species in Annex 5. The figures in the tables by division have changed compared with the data in last year's report, because of a re-calculation of the UK data. For the roundfish areas, some figures in the tables changed as well, partly due to the change of the UK data. For Belgium and Germany some minor changes have been made (e.g. adding of additional stations in some statistical rectangles).

The WG evaluated the time series for plaice, sole and dab for possible trends. In Subarea VIId (Table 2.4.2), there were no trends in the CPUEs of plaice, sole or dab, although dab remains at a relatively low level compared with the period 1990–1994. In Subarea VIIe (Table 2.4.3), the abundance of plaice were stable with the exception from 1997 to 2001 where the average in CPUE was approximately twice the average. There was no apparent trend in the CPUE for sole. Dab were also stable over the period except for a sharp increase in 2001–2003 reaching up to 2.5 times the average before declining to around average over the next two years. In Subarea VIIf, there were no trends for plaice and dab but sole showed a strong increase between 1998–2000, reaching over 2.5 times the long-term average in 1999. In Subarea VIIa (Table 2.4.1), the abundance of plaice and dab steadily increased over time reaching approximately two to three times the abundance recorded in the early 1990s. The abundance of sole however shows a decrease over the whole time period, reaching a minimum value at one third of the long-term average in 2005. The relatively low average catch rates of sole and plaice in VIIe (15fish/hr/8m beam trawl) compared with 350/hr/8m for plaice in VIIa and 146/h/8m for sole in VIIf implies that the survey is not fully sampling the nursery areas for these species or that the stocks in VIIe are significantly smaller than the stocks in VIIa, VIId and VIIfg.

In the North Sea, the data has been separated by Roundfish (RF) area. For both plaice and dab, peak numbers occur in RF 6 and 7 along the east coast of the North Sea (Tables 2.4.9 and 2.4.10) whereas for sole the more southerly areas (RF 4.6 and especially 5) are more important. In Roundfish Area 6 the abundance of all three species has declined since the mid 1990s and is at historically low levels. In Roundfish Area 7 catch rates are very variable from year to year but all three are at or close to minimum levels over the past 5 years. In the most southerly area which is most important for sole, all three species have remained stable after increasing in the early 1990s.

Table 2.4.1: Abundance of fish species (per hour fishing) in Subarea VIIa per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AMERICAN PLAICE (LR DAB)	10	1	1	2	4	8	4	14	4	3	2	1	1	1	11	2
ANGLERFISH (MONK)	1	2	2	4	3	3	3	2	2	2	1	2	4	2	2	3
BRILL	2	2	1	2	1	1	2	1	1	1	1	2	1	1	1	1
COD	25	10	4	23	15	8	8	6	1	10	11	5	2	1	8	7
COMMON DRAGONET	131	149	211	197	175	134	127	141	123	162	188	103	124	164	155	97
DAB	398	348	224	381	549	480	412	586	516	772	724	758	634	1271	1168	801
EUROPEAN PLAICE	220	142	180	298	273	272	246	358	341	371	456	399	466	546	588	491
FLOUNDER (EUROPEAN)	2	1	2	1	1	1	1	2	2	1	1	4	1	2	1	2
GREY GURNARD	46	47	99	90	81	43	45	56	51	56	50	48	33	48	50	45
HADDOCK	1		1	1	12	2	8	4	3	11	3	6	1	7	17	10
JOHN DORY	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LEMON SOLE	3	2	3	13	11	13	9	12	10	8	8	10	11	14	12	7
LESSER SPOTTED DOGFISH	15	19	27	23	19	18	20	40	34	29	27	38	35	32	62	38
LESSER WEEVER FISH	9	24	51	45	55	52	19	33	29	26	57	17	33	20	25	18
POGGE (ARMED BULLHEAD)	56	37	44	65	57	52	46	39	38	32	42	30	35	32	55	30
POOR COD	170	82	92	219	124	151	104	139	94	179	162	72	94	232	335	204
RED GURNARD	1	6	3	4	6	3	5	9	10	11	10	11	9	14	12	10
RED MULLET		1	1	1		1		1	1	1	1	1	1	1	1	1
SCALD FISH	17	37	36	40	47	33	46	40	49	66	101	94	112	124	97	95
SOLE (DOVER SOLE)	129	174	161	76	66	59	78	128	112	89	93	62	51	56	66	31
SOLENETTE	96	249	146	210	196	248	167	240	230	284	304	303	596	304	417	250
THICKBACK SOLE	8	20	34	30	24	22	26	24	27	26	37	28	31	28	38	20
TUB GURNARD	5	7	15	8	7	7	9	9	13	10	11	10	9	12	10	11
TURBOT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
WHITING	51	45	78	98	83	171	82	124	101	87	60	80	65	83	207	118

Table 2.4.2: Abundance of fish species (per hour fishing) in Subarea VIId per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
ANGLERFISH (MONK)	1			1	1		1	1	1						1	1
BRILL	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1
COD			1	1	1	1	1	1	1	1	1	1	1	1	1	1
COMMON DRAGONET	124	211	270	220	297	123	203	254	489	274	184	210	167	184	154	105
DAB	46	83	187	66	129	68	47	69	33	51	35	62	64	92	69	28
EUROPEAN PLAICE	51	59	66	58	35	31	63	66	111	53	70	76	71	65	98	80
FLOUNDER (EUROPEAN)	1	5	12	4	2	2	15	3	3	3	5	4	8	9	8	7
GREY GURNARD	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1
JOHN DORY		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LEMON SOLE	7	3	3	7	11	13	8	3	2	1	4	7	8	12	7	8
LESSER SPOTTED DOGFISH	3	5	7	11	6	6	5	10	5	6	5	6	9	5	8	9
LESSER WEEVER FISH	10	5	11	12	11	5	10	5	8	9	12	14	8	9	16	13
POGGE (ARMED BULLHEAD)	15	24	41	41	43	35	26	53	20	32	19	38	44	33	34	14
POOR COD	177	81	59	49	96	97	69	55	50	95	40	54	45	79	105	60
RED GURNARD	8	8	7	7	12	9	12	7	11	9	12	13	9	14	12	8
RED MULLET	1		1	1		1	1	1	1	1	1	1	1	1	1	1
SCALD FISH	6	18	13	15	10	6	8	10	8	14	8	7	9	12	22	10
SOLE (DOVER SOLE)	30	47	37	58	33	27	29	38	32	55	43	44	64	57	40	41
SOLENETTE	103	187	156	186	175	77	145	140	92	153	84	90	89	119	155	94
THICKBACK SOLE	2	4	6	9	7	6	8	9	10	8	9	17	12	19	14	10
TUB GURNARD	4	2	5	6	4	3	2	3	3	4	2	3	3	5	3	2
TURBOT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
WHITING	1	1	6	1	2	4	1	1	1	1	3	2	9	1	6	4
WHITING POUT (BIB)	270	38	49	33	61	46	64	91	136	91	20	67	15	139	60	46

Table 2.4.3: Abundance of fish species (per hour fishing) in Subarea VIIe per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
ANGLERFISH (MONK)	1	1	1	2	1	2	1	1	1	1	1	1	2	2	1	3
BRILL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
COD			1		1			1	1	1	1	1	1	1		
COMMON DRAGONET	13	42	1	1	1	1	1	1	1	1	2	15	134	206	189	9
DAB	17	12	8	10	32	21	20	19	16	20	10	42	56	34	15	19
EUROPEAN PLAICE	19	10	14	9	9	9	15	34	20	21	22	27	15	13	12	12
FLOUNDER (EUROPEAN)				1		1	1		1	1	1	1				
GREY GURNARD	6	3	2	4	10	3	6	3	6	12	8	1	8	12	6	9
HADDOCK						1							1	1	1	
JOHN DORY	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1
LEMON SOLE	2	2	1	1	1	1	1	1	1	1	1	1	2	2	3	1
LESSER SPOTTED DOGFISH	9	2	1	14	11	15	13	28	20	27	13	25	15	23	22	25
LESSER WEEVER FISH	1	1	1	1	1	1	1	1	1	1	1	1	5	8	4	1
POGGE (ARMED BULLHEAD)	1	1	1	1	1	1	1	1	1	1	1	1	14	16	15	2
POOR COD	9	31	5	1	1	1	1	1	1	8	5	6	66	202	112	26
RED GURNARD	34	8	23	33	51	31	25	21	21	31	28	10	31	34	44	30
RED MULLET	1	1	1	1	1	2	2	2	1	4	2	4	1	7	3	3
SCALD FISH	2	1	1	1	1	1	1	1	1	1	1	6	68	94	85	4
SOLE (DOVER SOLE)	10	20	22	13	11	9	13	18	16	15	14	19	9	19	15	10
SOLENETTE	1	1	1	1	1	1	1	1	1	1	1	20	339	444	369	8
THICKBACK SOLE	5	2	1	1	1	1	1	1	1	1	3	4	101	133	112	8
TUB GURNARD	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1
TURBOT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
WHITING	1	12	5	11	2	4	4	7	4	2	1	5	5	4	1	13
WHITING POUT (BIB)	13	17	11	8	4	1	5	14	8	2	1	1	5	1	2	2

Table 2.4.4: Abundance of fish species (per hour fishing) in Subarea VIIf per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
ANGLERFISH (MONK)	1	3	11	5	5	3	2	1	1	9	1	2	6	2	3	5
BRILL	2	3	2	1	2	3	2	2	1	1	4	1	1	1	1	2
COD	1	1	1	1	1	1	1	1	1	2	3	1	1		1	1
COMMON DRAGONET	19	40	76	44	119	50	86	46	40	74	87	43	36	45	65	59
DAB	63	78	153	99	167	83	105	81	123	179	125	118	94	98	107	150
EUROPEAN PLAICE	95	122	101	28	37	41	72	48	60	69	69	58	49	38	58	48
FLOUNDER (EUROPEAN)	1	1	1	1	2	2	1	1	1	1	3	5	3	1	1	1
GREY GURNARD	15	52	85	53	45	25	23	24	33	56	62	42	43	32	21	45
HADDOCK					1		1	1			1		1	1	1	1
JOHN DORY	1	2	1	3	1	1	1	2	1	3	2	6	3	3	3	3
LEMON SOLE	2	2	3	4	9	6	12	5	4	6	7	9	17	21	19	11
LESSER SPOTTED DOGFISH	69	86	101	41	40	32	34	47	51	84	47	37	47	24	98	33
LESSER WEEVER FISH	1	3	1	3	3	3	3	1	2	3	8	4	3	4	6	9
POGGE (ARMED BULLHEAD)	1	2	3	7	3	4	5	3	16	11	9	7	8	14	19	11
POOR COD	306	294	335	251	113	113	122	167	381	323	297	80	155	349	275	269
RED GURNARD	1	5	1	6	10	7	9	6	1	4	5	11	11	12	19	8
RED MULLET	2	1		1	1	1	1	1		3	2	3	1	9	2	15
SCALD FISH	1	2	1	1	3	3	4	3	1	2	3	4	4	9	10	13
SOLE (DOVER SOLE)	113	137	130	68	110	53	59	89	189	417	313	165	128	120	156	97
SOLENETTE	107	280	153	116	247	116	111	69	141	246	184	153	125	197	460	486
THICKBACK SOLE	7	27	31	23	24	23	23	16	10	23	28	15	17	12	14	8
TUB GURNARD	9	7	13	2	9	7	6	6	11	21	10	8	11	11	13	11
TURBOT	1	2	1	1	2	2	1	1	1	5	3	1	2	1	1	2
WHITING	81	87	123	138	53	55	91	141	73	178	68	20	63	42	106	93
WHITING POUT (BIB)	242	100	29	11	5	7	15	158	114	54	12	17	42	22	28	7

Table 2.4.5: Abundance of fish species (per hour fishing) in Subarea VIIg per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AMERICAN PLAICE (LR DAB)				22	87	56	42	22					11	15	21	24
ANGLERFISH (MONK)				13	26	19	9	5	7	9		3	6	9	6	5
BRILL	4		4	1	1				4							1
COD				1	1	1	1	1		3				1		
COMMON DRAGONET		4	4	51	97	60	42	40	33	67	4	65	32	27	195	96
DAB		4		75	65	51	43	98	183	340	4	92	40	39	15	76
EUROPEAN PLAICE		12	4	7	7	8	11	18	52	28	12	4	6	7	3	12
GREY GURNARD		32	4	62	99	49	38	25	128	133	8	87	46	61	23	47
HADDOCK				18	44	16	20	17	1	67		21	29	3	8	100
JOHN DORY				1	1		1		3	5			3	1	3	3
LEMON SOLE				13	19	16	13	6	16	4		4	1	3	3	2
LESSER SPOTTED DOGFISH			8	10	14	17	15	46	4	36	8	139	207	20	47	46
LESSER WEEVER FISH		4			1		1									1
POGGE (ARMED BULLHEAD)				19	10	12	5	16	29	41		16	97	15	22	5
POOR COD	6	468	180	126	68	52	52	162	139	215	232	57	108	77	273	300
RED GURNARD				3	2	1	1	2	3	1		3			2	
SCALD FISH				53	44	41	44	21	87	71		1	12	11	17	16
SOLE (DOVER SOLE)	6	60	16	13	13	11	8	23	11	53	28	81	16	33	37	33
SOLENETTE			4	49	44	38	9	21	125	95						
THICKBACK SOLE		8		52	68	65	47	36	61	176		80	133	57	153	49
TUB GURNARD		4					1	1	1	1				1		1
TURBOT	2		4	1		1			3		4	4	2	1	1	1
WHITING	10	108	40	43	19	33	29	124	95	793	308	167	47	53	145	118
WHITING POUT (BIB)		12	4		1			7	1				1	1		3

Table 2.4.6: Abundance of fish species (per hour fishing) in roundfish area 1 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AMERICAN PLAICE (LR DAB)									17	177	150	101	116	142	218	180
ANGLERFISH (MONK)									3	9	4	1	7	12	4	3
COD									31	7	5	5	8	2	9	5
COMMON DRAGONET										1		1	1	1		1
DAB									5	109	73	68	54	98	111	83
EUROPEAN PLAICE									12	10	8	7	5	11	4	17
GREY GURNARD									4	25	7	3	16	19	15	22
HADDOCK									45	102	132	56	58	24	48	39
LEMON SOLE									15	20	9	10	20	8	13	24
LESSER SPOTTED DOGFISH														1		1
POGGE (ARMED BULLHEAD)											1	1		1	4	1
POOR COD													1	20	1	1
TURBOT									1							
WHITING									11	27	66	11	34	11	35	4

Table 2.4.7: Abundance of fish species (per hour fishing) in roundfish area 2 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AMERICAN PLAICE (LR DAB)							182	189	564	219	265	182	255	257	188	142
ANGLERFISH (MONK)							1	2	2	2	3	2	1	1	1	1
COD							49	10	13	10	7	4	4	5	2	5
COMMON DRAGONET							1		1	1	2	1	1	1	3	7
DAB							179	268	648	240	270	336	443	450	462	197
EUROPEAN PLAICE							7	29	39	19	19	14	27	26	25	23
GREY GURNARD							33	40	44	20	31	32	22	27	34	29
HADDOCK							32	20	23	33	113	55	21	19	12	11
JOHN DORY								1							1	
LEMON SOLE							10	10	26	11	16	18	17	21	29	29
LESSER WEEVER FISH										1	1	1	1			
POGGE (ARMED BULLHEAD)							3	1	2	2	4	3	4	4	4	3
POOR COD											1		1	1		2
SCALD FISH									1	1	1	1	3	2	3	8
SOLE (DOVER SOLE)									1	1					1	
SOLENETTE									1			1		1	1	2
THICKBACK SOLE										1	1					1
TURBOT									1		1	1			1	
WHITING							19	11	30	11	16	16	12	13	11	7
WHITING POUT (BIB)													1			

Table 2.4.8: Abundance of fish species (per hour fishing) in roundfish area 3 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AMERICAN PLAICE (LR DAB)							91	66	75	121	101	142	91	117	116	143
ANGLERFISH (MONK)							5	5	3	5	5	3	4	12	7	5
COD							9	13	4	2	5	4	9	24	23	55
COMMON DRAGONET							5	3	2	9	27	15	20	29	25	13
DAB							98	119	143	427	297	192	199	262	306	193
EUROPEAN PLAICE							28	37	65	101	58	57	101	114	125	116
FLOUNDER (EUROPEAN)										1				1		
GREY GURNARD							42	48	48	92	64	58	68	113	70	54
HADDOCK							110	165	68	143	166	187	86	75	49	79
JOHN DORY														1		
LEMON SOLE							22	23	34	33	42	31	50	119	54	62
LESSER SPOTTED DOGFISH									1	1	2	2	1	3	1	3
POGGE (ARMED BULLHEAD)							9	9	21	19	46	13	22	17	18	28
POOR COD							1	1	6	1	8	1	5	45	4	3
RED GURNARD												1		1	1	
SCALD FISH										1	1	1	1	1	1	1
SOLE (DOVER SOLE)										1			1		1	1
THICKBACK SOLE							1		1	4	5	2	1	5	2	5
TURBOT									1	1	1				1	1
WHITING							45	107	117	90	146	55	112	146	57	56
WHITING POUT (BIB)												1				

Table 2.4.9: Abundance of fish species (per hour fishing) in roundfish area 4 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AMERICAN PLAICE (LR DAB)							39	66	73	100	60	63	56	65	54	53
ANGLERFISH (MONK)							2	1	2	2	2	1	2	1	1	1
BRILL				11	3	4	4	3	1	1	1		1	1	1	1
COD			16	21	3	20	13	176	9	4	4	3	12	3	7	13
COMMON DRAGONET	64		16	28	16	4	55	14	25	32	69	23	83	70	144	171
DAB	68		48	632	253	582	692	598	222	592	588	488	376	600	381	564
EUROPEAN PLAICE	4		72	187	67	518	70	84	35	96	93	75	81	203	131	155
FLOUNDER (EUROPEAN)							1									
GREY GURNARD	4				5	48	157	46	40	141	52	88	31	35	52	110
HADDOCK						12	28	36	29	9	36	37	15	10	5	7
LEMON SOLE	60		24	91	48	174	92	158	34	36	56	53	85	62	48	56
LESSER SPOTTED DOGFISH										1					1	
LESSER WEEVER FISH			8	11	16	10	77	4	6	19	33	7	17	76	63	16
POGGE (ARMED BULLHEAD)	16		24	112		33	80	9	2	27	41	10	92	61	57	168
POOR COD				3				2	1	1	1	1	3		12	5
RED GURNARD			64	32	16	34										
RED MULLET									1		1		1			
SCALD FISH						30	75	11	2	15	18	20	12	34	25	92
SOLE (DOVER SOLE)			80	69	152	260	75	57	55	38	65	17	64	24	9	22
SOLENETTE						78	74	61	9	5	16	12	4	33	4	33
THICKBACK SOLE											1					1
TUB GURNARD			8	27		6					1		1		1	
TURBOT						2		1			1	1		1		1
WHITING				40	25	252	49	73	166	17	85	42	78	67	19	22
WHITING POUT (BIB)				64	84	16	17	36	2	6	22	5	53	4		

Table 2.4.10: Abundance of fish species (per hour fishing) in roundfish area 5 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AMERICAN PLAICE (LR DAB)													1			
ANGLERFISH (MONK)			1							1	1			1		1
BRILL	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1
COD	1	1	3	1	7	3	4	37	5	3	2	3	3	1	2	5
COMMON DRAGONET	49	22	3	84	69	135	71	7	60	64	50	38	43	53	53	58
DAB	80	40	322	97	174	367	406	484	194	320	292	249	249	245	165	287
EUROPEAN PLAICE	29	30	35	35	73	97	81	98	87	75	68	65	117	78	51	86
FLOUNDER (EUROPEAN)	9	4	2	1	4	11	6	10	2	8	8	6	32	7	1	3
GREY GURNARD	8	12	29	9	36	22	28	45	26	32	10	10	15	5	9	19
HADDOCK									1		1					
LEMON SOLE	12	19	7	37	74	57	88	50	27	19	24	32	33	23	16	13
LESSER SPOTTED DOGFISH	8	14	4	8	3	3	3	2	4	4	14	5	20	7	26	4
LESSER WEEVER FISH	33	38	69	69	55	114	144	44	46	41	44	17	52	53	91	53
POGGE (ARMED BULLHEAD)	37	30	11	49	144	129	84	29	24	18	48	37	45	54	45	52
POOR COD	131	145	19	19	26	23	9	6	12	20	10	30	28	22	89	41
RED GURNARD	1	1	3	1	1	16	4	2	1	1	1	1	1	1	1	2
RED MULLET		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SCALD FISH	21	5	78	49	26	133	69	47	34	45	46	28	41	41	45	109
SOLE (DOVER SOLE)	125	141	54	228	330	195	135	230	167	200	192	146	163	245	127	249
SOLENETTE	31	4	125	30	13	150	170	121	81	60	98	48	64	59	27	73
THICKBACK SOLE		1		1				1	1			1	1	1	1	1
TUB GURNARD	1	1	4	9	2	1	1	1	1	1	2	1	2	2	2	4
TURBOT	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1
WHITING	76	15	26	78	79	83	73	79	221	104	118	85	130	77	114	79
WHITING POUT (BIB)	135	78	17	35	211	187	56	71	186	303	81	196	77	169	131	80

Table 2.4.11: Abundance of fish species (per hour fishing) in roundfish area 6 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AMERICAN PLAICE (LR DAB)	3	2	1	1	2	2	3	8	34	14	6	4	9	5	8	6
ANGLERFISH (MONK)			1	1	1	1	1				1	1	1	1		1
BRILL	2	1	3	3	2	1	1	2	2	1	2	1	1	1	1	1
COD	5	10	3	1	11	9	9	25	4	1	3	2	1	1	1	3
COMMON DRAGONET		1	1	5	13	155	21	112	124	116	68	68	129	98	68	39
DAB	1937	1143	1176	1140	1075	769	1483	1391	1387	1275	988	935	798	853	542	542
EUROPEAN PLAICE	524	668	625	657	599	526	785	1214	1076	817	590	1209	759	501	451	440
FLOUNDER (EUROPEAN)	10	16	5	9	5	8	10	12	5	2	3	4	4	5	6	6
GREY GURNARD	24	24	35	35	61	37	36	37	60	95	44	25	37	36	36	43
HADDOCK				1		1			1		1	1	1	1	1	1
JOHN DORY					1		1								1	1
LEMON SOLE	2	2	1	3	14	10	10	86	7	6	5	8	10	18	10	4
LESSER SPOTTED DOGFISH	1	1	1		1			1		1	1		1	1	1	1
LESSER WEEVER FISH	28	24	35	61	66	79	62	57	123	64	52	74	54	67	64	44
POGGE (ARMED BULLHEAD)	45	62	63	43	158	132	60	189	168	41	50	60	92	60	54	23
POOR COD	3	1	1	1	1	5	2	1	6	2	1	1	2	2	6	1
RED GURNARD		1	1	1		1	2	1	1	1	1	1	1	1	1	1
RED MULLET	1	1	1	1	4	2	1	1	1	13	1	2	4	10	2	1
SCALD FISH	93	70	79	191	92	84	20	43	91	89	78	140	168	226	233	164
SOLE (DOVER SOLE)	89	52	139	82	53	62	30	161	82	51	40	42	75	34	16	17
SOLENETTE	79	77	131	178	166	141	37	90	68	297	397	220	269	149	192	131
THICKBACK SOLE	1	1				1			1			1			1	1
TUB GURNARD	8	6	14	13	11	6	6	4	7	4	6	5	5	8	6	7
TURBOT	5	4	4	3	5	3	2	3	3	3	5	3	3	4	3	3
WHITING	370	72	79	80	121	110	40	53	219	172	179	270	104	81	55	33
WHITING POUT (BIB)	27	3	7	2	7	34	5	57	54	101	23	16	13	14	14	5

Table 2.4.12: Abundance of fish species (per hour fishing) in roundfish area 7 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AMERICAN PLAICE (LR DAB)	27	28		73			184	75	200	63	116	88	126	70	63	25
ANGLERFISH (MONK)		1					3	1	2	1	2	1	1	1	1	1
BRILL				1			1	1	1	1	1			1	1	
COD	1	3		2			101	15	18	3	15	7	7	17	3	1
COMMON DRAGONET							6	1	11	9	7	3	5	33	28	6
DAB	2799	1532		3382			1646	467	1622	574	2849	649	473	742	732	213
EUROPEAN PLAICE	871	692		286			200	291	644	215	671	89	92	155	145	48
FLOUNDER (EUROPEAN)	7	3		1			6	2	1	1	1			1	1	1
GREY GURNARD	110	86		92			84	34	111	63	251	51	36	27	27	29
HADDOCK							3	5	2	5	46	13	2	4	3	2
LEMON SOLE	8	3		1			10	9	8	2	7	8	10	10	7	2
LESSER WEEVER FISH				5						1			1	1		
POGGE (ARMED BULLHEAD)	35	52		84			27	9	25	4	24	5	2	13	11	1
POOR COD								1								
SCALD FISH	5	18		21					4	3	54	15	10	38	57	9
SOLE (DOVER SOLE)	16	12		9			4	1	7	2	10	2	1	1	1	1
SOLENETTE	5	3		24			2	1	1	1	27	13	14	168	211	8
TUB GURNARD	3			2			5	6	3	1	2	1	1	1	1	1
TURBOT	2	1		1			1	1	1	1	4	1	1	1	1	1
WHITING	659	152		89			11	2	9	9	43	153	25	12	10	3
WHITING POUT (BIB)	1															

2.4.2 Benthos

Tables 2.4.13 to 2.4.19 show numbers sampled per hour per year for 13 frequently recorded epifauna species by roundfish area. Dutch (1990–2005), Belgian data (2002–2005), German (1999–2005) and English data (1990–2005) have been used. Compared to last year's report the tables with epifauna have also changed, because data from all countries have been incorporated in the dataset. Previously only data from the Netherlands was available. Data on benthos has only been collected systematically in area VII for a short period of time and no trends are yet apparent. However in the North Sea, data is available from 1990 and it is evident that there have been some noticeable increases particularly in the large starfish (*Astropecten irregularis*) as well as in the swimming crabs (*Liocarcinus* spp). Figure 2 4.1 shows the trends in abundance relative to the mean for two starfish (*A. irregularis* and *Asterias rubens)* and for swimming crabs in RF areas 4, 5,6 and 7. There is wide variation in abundance over the period and no clear trends, although numbers of *A. irregularis* and *Liocarcinus* have increased substantially in RF6 since 2001 and in RF5 since 2005.

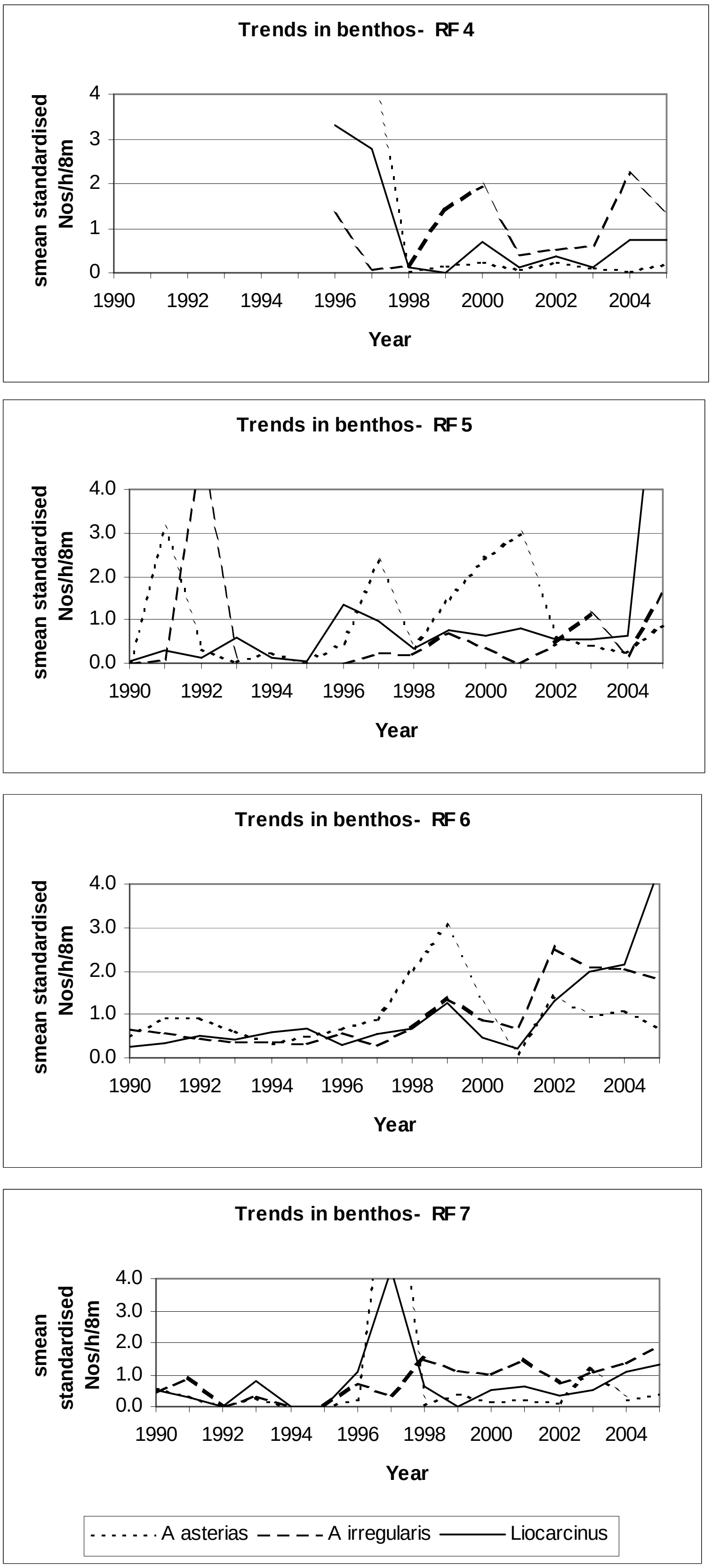


Figure 2.4.1: Trends in abundance of selected benthos species.

Table 2.4.13: Abundance of 13 epibenthos species (per hour fishing) in roundfish area 1 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Aphrodita aculeata									120		483	104	79	154	82	46
Asterias rubens									618	770	166	254	213	1080	16	23
Astropecten irregularis									270	368	5607	2035	2853	9776	160	402
Buccinum undatum									8		36	20	50	220	26	41
Cancer pagurus														16		
Corystes cassivelaunus																
Echinocardium sp.									1920	4	176	40	46	63	10	
Liocarcinus depurator									96		214	52	113	109	88	27
Liocarcinus sp.									138		112	22	67	42	20	48
Nephrops norvegicus									12		204	43	69	571	16	8
Ophiothrix fragilis													422	94		33
Ophiura sp.									30	1888	285	114	98	154	14	36
Pagurus sp.									36		104	126	327	732	62	232

Table 2.4.14: Abundance of 13 epibenthos species (per hour fishing) in roundfish area 2 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Aphrodita aculeata							341	358	101		148	223	244	121	126	100
Asterias rubens							16677	73481	106	769	1514	967	769	820	950	951
Astropecten irregularis							13163	6900	823	4101	5968	5091	2389	2465	3935	3561
Buccinum undatum							1322	111	150		203	337	208	184	288	393
Cancer pagurus							20	20			4	4	6	12	12	5
Corystes cassivelaunus							1008	1461	8	43	57	37	36	62	291	57
Echinocardium sp.							1156	380	74	321	226	420	226	156	579	391
Liocarcinus depurator									194	460	22	443	493	103	268	341
Liocarcinus sp.							967	6405	210		306	142	246	103	210	184
Nephrops norvegicus								48				117	50	12	19	4
Ophiothrix fragilis									251		857	207	1523	703	12	163
Ophiura sp.							17114	4199	87	446	190	85	121	49	60	32
Pagurus sp.							491	174	100		219	252	186	245	314	336

Table 2.4.15: Abundance of 13 epibenthos species (per hour fishing) in roundfish area 3 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Aphrodita aculeata							280	1104	120		195	120	84	68	121	105
Asterias rubens							9082	51659	790	1896	1214	1807	4998	2692	176	359
Astropecten irregularis							9568		66	490	648	768	460	720	160	653
Buccinum undatum							432	6400	64		41	29	54	63	78	53
Cancer pagurus							14	628	7	6	27	12	48	52	13	10
Corystes cassivelaunus										8						16
Echinocardium sp.							7968		81	67	63	104	368	16	7	16
Liocarcinus depurator									36	64	219	151	115	656	601	426
Liocarcinus sp.							965	19479	121		124	70	235	273	481	370
Nephrops norvegicus									76	385	264	637	39	1170	89	1032
Ophiothrix fragilis									84		120	22	1808	2837	20	11
Ophiura sp.							992	52245	118	713	124	401	846	120	219	260
Pagurus sp.							144	1536	173		279	142	195	580	394	281

Table 2.4.16: Abundance of 13 epibenthos species (per hour fishing) in roundfish area 4 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Aphrodita aculeata							1848		40		229	130	136	38	80	81
Asterias rubens							21296	24910	226	822	1180	372	1277	596	143	1154
Astropecten irregularis							1456	80	178	1547	2144	436	578	687	2445	1457
Buccinum undatum							192		48		1526	47	147	62	22	86
Cancer pagurus							6	10	29	17	37	60	22	14	13	40
Corystes cassivelaunus									22	51	81	45	26	65	77	122
Echinocardium sp.							2560		9	200	24	16	16		50	225
Liocarcinus depurator													614	68	8	75
Liocarcinus sp.							5133	4274	175		1059	215	542	220	1136	1143
Nephrops norvegicus							32				12		16	32	4	4
Ophiothrix fragilis									53		77013	23	186	10	148	103
Ophiura sp.							528	1488	43	182	201	69	259	58	121	46
Pagurus sp.							160	272	55		439	150	245	221	401	590

Table 2.4.17: Abundance of 13 epibenthos species (per hour fishing) in roundfish area 5 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Aphrodita aculeata	48		16	24			152	157			176	4	576	43	361	2645
Asterias rubens	32	10295	1049	97	872	24	1512	7221	1107	4818	7950	9771	2124	1373	865	2943
Astropecten irregularis		43	2488					128	112	368	195		242	581	80	823
Buccinum undatum	16	245	629	142	32		48	144		1059	72	12	263	122	279	1571
Cancer pagurus	9	21	5	6	1	2	17	7	286	113	532	2434	132	18	69	18
Corystes cassivelaunus			505	51					12	64	49	28	36	28	63	82
Echinocardium sp.	72	2609	6300	53	392		133	262	4		64	356			7	28
Liocarcinus depurator									553	42	5264	9020	171	492	250	260
Liocarcinus sp.	208	1746	775	3268	784	256	7419	5260	1950	4149	3435	4469	3004	3007	3465	45443
Nephrops norvegicus			5				16	1		18						
Ophiothrix fragilis									64		331	16	1600	454466		
Ophiura sp.	160	536	915	121	416	112	341	124	31	893	691	105	30249	163	182	1549
Pagurus sp.	648	2244	769	791	472	360	536	1096	57	2643	349	85	378	237	255	949

Table 2.4.18: Abundance of 13 epibenthos species (per hour fishing) in roundfish area 6 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Aphrodita aculeata	212	241	541	291	433	196	795	899	213	401	389	658	334	453	325	356
Asterias rubens	4009	7396	7529	4964	2852	3912	5308	7250	16076	24168	10136	753	11615	7785	8856	5701
Astropecten irregularis	4001	3407	2651	2268	2127	2023	3510	1640	3918	8055	5139	4021	14578	12222	12001	10768
Buccinum undatum	77	113	68	67	248	66	212	44	943	265	243	28	39	119	148	31
Cancer pagurus	2	2	1	6	2	4	116	7	25	14	15	14	73	26	18	23
Corystes cassivelaunus	134	206	275	130	427	188	720	554	201	465	275	250	242	600	510	528
Echinocardium sp.	2614	2546	1296	2270	1398	952	1582	13518	224	5503	699	621	1746	3113	1381	580
Liocarcinus depurator											228	191	192	681	443	321
Liocarcinus sp.	1777	2391	3715	3106	4211	4971	2196	4109	4900	9319	3313	1621	9591	14438	15762	32050
Nephrops norvegicus	20	132	214	69	34	2	45	277	62	53	2637	15	175	114	171	60
Ophiothrix fragilis	96	99	36	16	16	40	112		50	656	97	232	100	52	101	108
Ophiura sp.	574	9370	6487	4350	14599	698	44197	18436	4658	12706	5841	433	2047	1217	1335	1051
Pagurus sp.	327	293	285	282	509	168	473	304	704	520	450	116	320	401	232	296

Table 2.4.19: Abundance of 13 epibenthos species (per hour fishing) in roundfish area 7 per year.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Aphrodita aculeata	320	371		304			638	32	258		348	1544	566	499	1015	135
Asterias rubens	3404	1948		1549			1318	51328	387	2258	849	1171	760	7040	1395	2467
Astropecten irregularis	2265	4679		1934			3934	1920	7924	5975	5311	7940	3838	5747	7164	10011
Buccinum undatum	48			6			21	1690	237		417	560	478	650	399	326
Cancer pagurus	1	129		4			8	13	4	14	20	60	12	4	4	11
Corystes cassivelaunus	64	443		81			7080	512	32	172	446	611	215	89	128	181
Echinocardium sp.	41593	44889		7294			2221	160	104	1848	1228	6280	1046	1205	5322	656
Liocarcinus depurator											212	138	207	300	509	166
Liocarcinus sp.	484	255		797			1056	4148	596		523	609	336	526	1045	1268
Nephrops norvegicus		1		5			30			252	28	414	55	227	664	166
Ophiothrix fragilis	192			16					188		21	112	4	21	16	28
Ophiura sp.	1333	2571		48			1744	4480	299	417	365	224	238	274	278	66
Pagurus sp.	201	238		203			349	373	151		163	498	400	745	469	209

3 Coordination and standardisation of beam trawl surveys

3.1 Offshore beam trawl surveys

The WG reviewed the available beam trawl surveys, which are used to derive indices of year class strength for plaice and sole. Table 3.1.1 lists the existing surveys, which include all the surveys using heavy beam trawls and covering mostly offshore but also some inshore stations in the North Sea and ICES area VII. Although the surveys are intended to sample the youngest age groups of plaice and sole they also catch the older ages and can provide indices for those. At the present time all indices provided to assessment Working Groups from the offshore surveys are derived from separate surveys. This is mainly because there is relatively little overlap between the areas surveyed apart from in the North Sea and because different gears are used by each country to cope with differing ground conditions. In the North Sea, there is some overlapping between the Netherlands, Belgium and the UK particularly the southern North Sea (IVc) but at present this overlap is not used in estimating a combined index.

Gear: The Netherlands surveys are mainly on sandy grounds where tickler chains are most effective for flatfish. In the southwestern North Sea and in area VII, grounds tend to be much harder and it is necessary to use beam trawls with chain mats rather than tickler chains. This approach follows common commercial fishing practice in the areas surveyed. There is much greater standardization between countries in gear deployment. All countries tow for 30 minutes and use a towing speed of 4 knots. In all countries except Germany, cod end mesh is fixed at 40 mm.

Most countries have written protocols for setting up and rigging gear in a standard way but there was a lack of a clear audit trail for ensuring gear had been checked prior to a survey. The **WG recommended** that a survey protocol should be established along the lines of the one used in the IBTS (see Section 6).

Period of survey: The survey period has been relatively stable since the start of the survey but some changes have taken place in the Dutch offshore surveys. The SNS has started some 10–15 days earlier since 1996 than in the period prior to this. The BTS is also approximately 5 days earlier since 1996 compared with the period 1989–1995. The English BTs in VIId has also been earlier by around one week in the period since 2000.

Table 3.1.1: Details of the beam trawl surveys currently undertaken by each country.

	BELGIUM	GERMANY	NETHERLANDS	NETHERLANDS	UK	UK	UK
Survey area:	IVb and c west	IVb east	IVb and c east	Central N Sea	VIId	VIIe	VIIa, f and g
Year survey started:	1992	1991	1985	1996	1988	1988	1988
Dates:	August	mid August	end August	end August	late July	late Sep/early Oct	Sept
Usual start date	week 33	week 32	week 32/33	week 35	week 30	week 39/40	week 36/37
Number of survey days	10	11	20	16–20	15	8	21–24
Ship:	RV Belgica	RV Solea	RV Isis	RV Tridens	RV Corystes	MFV Carhelmar	RV Corystes
Ship length:	50 m	42 m#	28 m	73.5	53 m	22 m	53 m
Beam trawl length:	4 m	7 m	8 m	8 m	4 m	4 m	4 m
Number of beams fished:	1	2	2	2	1	2	1
Trawl duration (min):	30	30	30	30	30	30	30
Tow speed (knots):	4	4	4	4	4	4	4
Cod end liner stretched mesh (mm):	40	44	40	40	40	40	40
Number of ticklers:	0	5	8	8	0	0	0
Gear code:	BT4M	BT7	BT8	BT8S	BT4FM	BT4FM	BT4FM
Attachment:	*	(none)	(none)	**	*	*	*
Station positions:	fixed	pseudo-random	pseudo-random	pseudo-random	fixed	fixed	fixed
Av No stns/yr	53	63	88	63	100	57	94
Benthos sampling since:	1992	1992	1985	1996	1991	1992	1992

 # new vessel since 2004; previously 35m

*** chain mat and flip-up rope**

**** flip-up rope only**

Area of survey grid: The survey area from which abundance indices have been calculated has been unchanged over the time period of the surveys. However some changes to the overall extent of the survey have occurred as noted below:

Belgium: Fixed grid, no change since start of survey

Germany: Westerly stations in deeper water were discontinued in 2004 and some more southerly stations included.

Netherlands: i) Isis – no changes; ii) Tridens– some rectangles where gear damage has occurred regularly have been omitted and alternative rectangles included. This has not affected the stations used to calculate abundance indices for assessments.

UK: i) VIId – Some deep water stations have been excluded where flatfish rarely caught. ii) IVc – additional stations in deeper water included from 2004 onwards but not sampled in 2005 due to lack of time. No impact on abundance indices as not yet utilized for assessments; iii) VIIe – some additional stations added and impact on abundance indices is being evaluated; iv)

VIIf,g – stations off SE Ireland have been excluded in recent years as not part of prime stations used for calculating abundance indices; v) VIIa – standard grid has been maintained.

3.2 Inshore surveys

Table 3.2.1 lists the inshore and near-shore surveys together with the geographic area covered, the gear used and the date started.

The inshore surveys are carried out by Belgium (Demersal Young Fish Survey – DYFS), Germany (DYFS), the Netherlands (Demersal Fish Survey – DFS) and UK (Young Fish Survey-YFS). These surveys are combined to derive an international index of abundance, which is used in estimating recruitment for plaice and sole in the ICES WG on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK). The level of standardisation for these surveys had not been reviewed since the surveys were combined in the 1980s (ICES, 1985). Therefore last year the WG made a first step toward an evaluation of the standardisation of the inshore surveys and this work was continued during this year's WG. The focus this year was mainly on the continental inshore surveys.

The Sole Net Survey (SNS) is a near-shore survey which is only carried out by the Netherlands. The SNS abundance indices of plaice and sole for age groups 0–4, are used by WGNSSK for estimating recruitment and/or for tuning of the XSA model.

Table 3.2.1: Inventory of the inshore beam trawl surveys.

COUNTRY	NETHERLANDS (SNS)	NETHERLANDS (DFS)			ENGLAND (YFS)	BELGIUM (DYFS)	GERMANY (DYFS)	
Geographical Area	Scheveningen (NL) to Esbjerg (DK)	Wadden Sea	Scheldt Estuary	Dutch coast to Danish coast	Eastern/South-Eastern English Coast	Belgian Coast	Niedersachsen Wadden Sea + Elbe Estuary	Schlesweig-Holstein Waddensea
Ship	Tridens / Isis	Stern / Waddenzee	Schollevaar	Isis / Beukels / WR17 / GO28	Chartered vessels	Hinders / Broodwinner	Chartered vessels	Chartered vessels
ship size (m)	73m / 28m	21m / 21m	21m	± 28m	8–10m	27m	12–16m	12–18m
Date started	1969	1970	1970	1970	1973	1970	1972	1974
Sampling Period	Apr/May ('69–'89) Sept/Oct	Apr/May ('70–'86) Sept/Oct	Apr/May ('70–'86) Sept/Oct	Apr/May ('70–'86) Sept/Oct	Sept/Oct	Sept/Oct	Apr/May ('74–'04) Sept/Oct	Apr/May ('74–'04) Sept/Oct
Usual Start date	12 Sept	29 Aug	5 Sept	26 Sept	1 Sept	1–14 Sept	15 Sept	5 Sept
Number of days per period	8–9 within 2 weeks	20 within 5 weeks	12 within 3 weeks	16 within 5 weeks	3 surveys x 8 days	7 within 2 weeks	5	5 – 7
Beam trawl type	6m beam trawl	3m shrimp trawl	3m shrimp trawl	6m shrimp trawl	2m beam trawl	6m shrimp trawl	3m shrimp trawl	3m shrimp trawl
Tickler Chains	4	1	1	1	3	0	0	0
Mesh size net	80mm	35mm	35mm	35mm	10mm	40mm	32mm	32mm
Mesh size codend	40mm	20mm	20mm	20mm	4mm	22mm	18mm	18mm
Speed fished	3.5–4 knots	3 knots	3 knots	3 knots	1 knot	3 knots	3 knots	3 knots
Time Fished	15 min	15 min	15 min	15 min	10 min	15 min	15 min	15 min
Approx. number of stations per year	55	120	80	100	82	33		
Target species	0– 4 group sole and plaice	0–1 group sole and plaice	0–1 group sole and plaice	0–1 group sole and plaice	0–1 group sole and plaice	0–2 group sole and plaice	0–1 group sole and plaice	0–1 group sole and plaice
Catch rate and LF distribution	All fish species	All fish species *Crangon*	All fish species *Crangon*	All fish species *Crangon*	All fish species	Commercial fish species *Crangon* (1973–92, 2004–05)	All fish species *Crangon*	All fish species *Crangon*
Catch rate	Epibenthos (quantity)	Epibenthos (quantity)	Epibenthos (quantity)	Epibenthos (quantity)	*Crangon* (volume)	*Crangon* (weight)	Epibenthos (quantity)	Epibenthos (quantity)
Age data for plaice and sole	All years	All years	All years	All years	Since 2003	None	None	None

3.2.1 Changes in spatial coverage

Sampling during the inshore surveys (Dutch-DFS, German-DYFS, Belgian-DYFS and UK-YFS) is stratified by area and depth zone. The area definitions are shown in Figures 3.2.1.1 for the continental areas and in Figure 3.2.1.2 for the UK areas. Different depth classes are defined for the UK areas (0–2, 2–6, 6–12, 12–20 m), the Wadden Sea areas (0–6, 6–12, 12–20 m) and the remaining areas (0–5, 5–10, 10–15, 15–20 m).

The Dutch SNS survey design is based on transects in the near-shore areas 601–608, 630,640, 660 and 671–673 (Figure 3.2.1.1). The spatial coverage of the SNS survey was reduced in 1989, when the sampling in the northern areas 671–673 was discontinued. Other than this, the spatial coverage of the survey has remained unchanged. The SNS abundance indices have not been affected by the change in 1989 because the northern areas were never included in the indices.

The coverage by area and year for the continental inshore surveys is documented in Annexes 8 and 9, and summarised in Table 3.2.1.1. These tables and maps are preliminary because the information currently available in the database is not yet complete.

In the 1970s and 1980s the D(Y)FS surveys covered both inshore areas as well as near-shore areas along the continental coasts; all areas mapped in Figure 3.2.1.1 with the exception of areas 671-673 were sampled using D(Y)FS gear. The “SNS transects” with area codes 601–608, 630, 640 and 660 were sampled during the Dutch surveys using DFS and SNS gear simultaneously, but after 1989 only the SNS sampling was continued. The DFS samples taken in these areas up to 1989 were reassigned to areas 401–407 in the database (in order to be compatible with the DFS area-codes).

The German-DYFS data in the national database are currently incomplete; area-codes are not yet available for many hauls in the period before 1997 and only since 1974 does the sampling fit within the sample strategy of the DYFS. Therefore the time series for several areas appear to be shorter than they really are and it has been decided that the starting year should be taken as 1974. Area 413 was surveyed in the early part of the time series but then was no longer sampled again until 2005. The results for area 413 in 2005 indicate that it may be important for juvenile plaice and the WG **recommended** that this area continues to be sampled in the DYFS in future years. The Belgian-DYFS is restricted to area 400 and the number of hauls per year is listed in Annex 8.

For all countries, sampling in some areas has been variable (area 408 has been sampled in 19 of the 32 years and area 612 has been sampled in 20 of the 36 years), sampling in other areas stopped (area 631 was not surveyed after the Grevelingen dam was built), or was reinitiated (area 413).

The changes and variability in spatial coverage over time has caused inconsistent area coverage in the time series of abundance indices. Areas 601–608, 630, 640 and 660 (sampled until 1989), area 631 (sampled until 1986), and areas 408 and 612 (variable sampling) are all included in the calculation of the indices, whereas areas 412 and 414 which have been sampled consistently since 1977 are not included. Reconsideration of which areas to include in the calculation of the abundance indices is clearly necessary.

In 1998 and 1999 sufficient coverage of the total area surveyed by the Dutch-DFS was not achieved (areas 405–407 were not sampled). Therefore the Dutch indices and hence the international indices were declared invalid for 1998 and 1999.

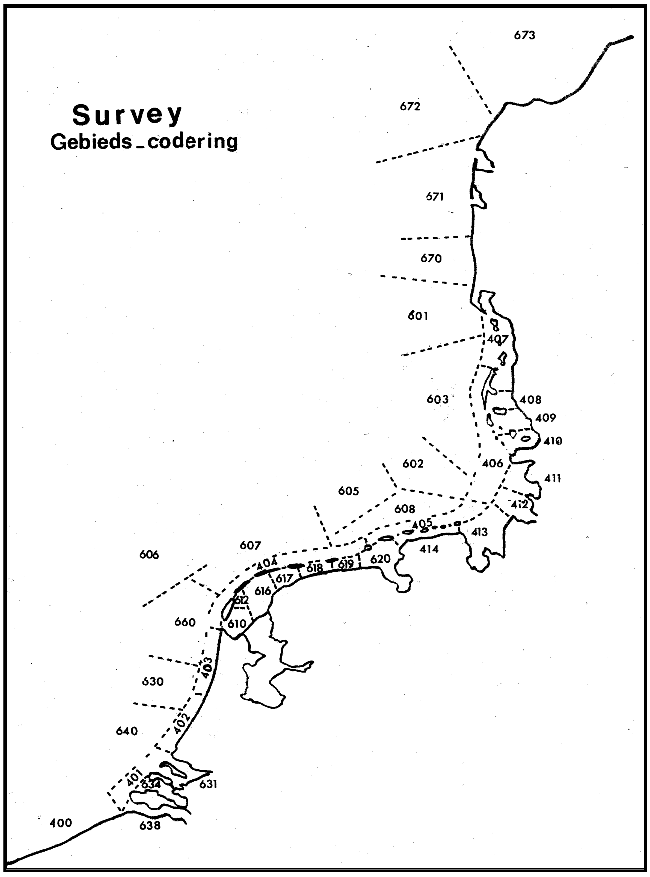


Figure 3.2.1.1: The D(Y)FS and SNS area definitions.

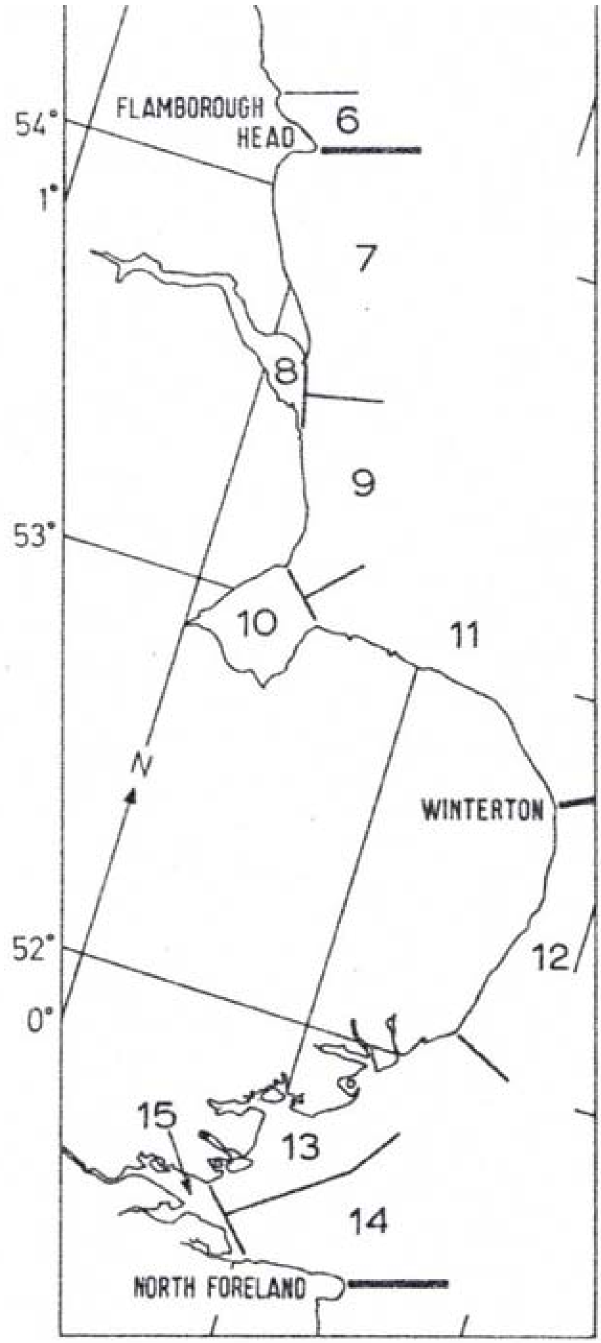


Figure 3.2.1.2: The EYFS area definitions.

Table 3.2.1.1: Spatial coverage by country and year for the continental inshore surveys (summary of Annex 8).

Area's	Country	Index-area	Coverage in
400	Bel	yes	1973-2005
401-405	NL	yes	1970-2005, except 1998(404-405), 1999(405) and 2001(401)
406-407	NL	yes	1970-2005, except 1997, 1998, 1999 and 2002
405	Ger *	no	1997-2005
406	Ger *	yes	1974-2005
408	Ger *	yes	1974-1984, 1990-1992, 1994-1995, 1998, 2000
409-411	Ger *	yes	1974-2005, except 1985(409, 411), 1988-1989(409)
412	Ger *	no	1977-2005
413	Ger *	no	2005
414	Ger *	no	1997-2005
631	NL	yes	1970-1986
634, 638	NL	yes	1970-2005
610, 616-620	NL	yes	1970-2005, except 1992(619)
612	NL	yes	1973-1978, 1980-1987, 1991-1992, 1996, 1998, 2004-2005
601-608, 630, 640, 660	NL	yes	1970-1989

***The German data are preliminary (area-code not available for many hauls in period before 1997).**

As mentioned earlier the survey design of the inshore surveys is based on stratification by area and depth class. For the continental surveys, the number of hauls by depth class and year is presented for each region and country in Annex 9 and summarised in Figure 3.2.1.3. This information is not yet available for the UK-YFS. Note that the German data prior to 1997 are incomplete.

Ideally all depth classes should be sufficiently sampled in all years and areas, but in reality this is not the case. This is inevitable for the shallow Wadden Sea where very few samples are taken in the 12–20 m depth class. The 6–12 m zone is sampled sufficiently in the Dutch Wadden Sea, but poorly sampled in the German-Danish Wadden Sea.

In the 1970s, The Dutch-DFS and Belgian-DYFS insufficiently covered the shallowest depth class in the coastal areas and Scheldt estuary. Therefore, the weighting factor for these strata was set to zero in the calculation of the abundance indices (see Section 3.2.4 and ICES, 1985). Sampling levels of the shallowest depth class in the areas along the Belgian coast and in the Scheldt estuary improved in approximately 1984 and this sampling level has been more or less maintained until the present. In the coastal areas along the Dutch coast and in the German Bight, sampling levels in the shallowest depth class were at a higher level in the 1980s and early 1990s, but these strata are insufficiently covered in the most recent years.

The German-DYFS mainly covers the German and Danish Wadden Sea within the islands, but samples are also taken in areas 405 and 406 (German Bight in Figure 3.2.1.3) and from 1997 (data are incomplete for the period before 1997) onwards all depth strata are sufficiently covered.

Both the Netherlands and Germany fish in areas 405 and 406, but the sampling grid is very different. The Dutch samples are spread out over a larger area further offshore, whereas the German samples are more concentrated and taken further inshore. Therefore the German and Dutch data only partly overlap and are mainly complementary.

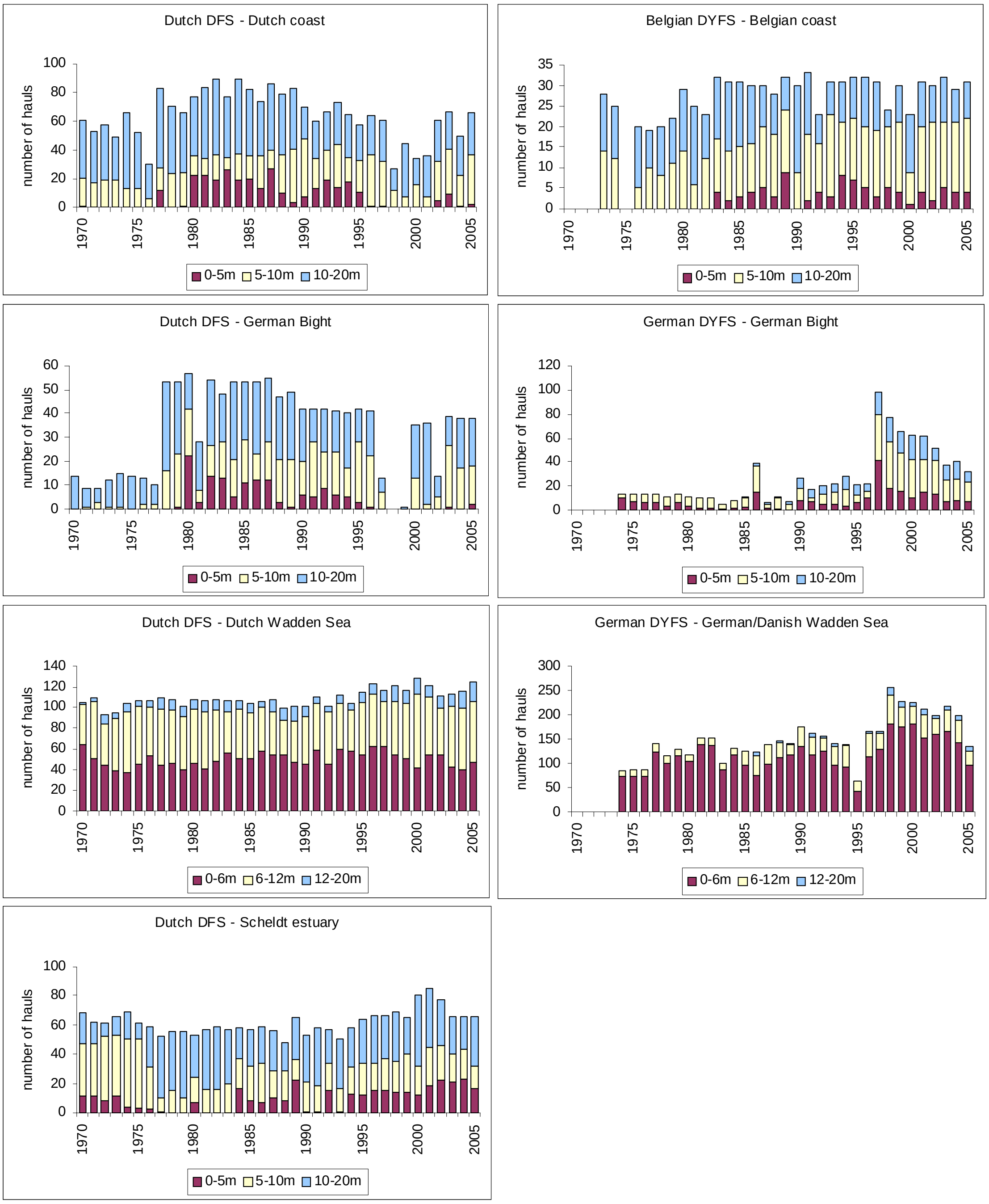


Figure 3.2.1.3: Number of hauls per depth class and year for each region and country (summary of Annex 9). Note that due to missing area-codes only part of the German data is plotted in the period 1974–1996.

3.2.2 Changes in the sampling period

At present, the inshore and near-shore surveys are only carried out in autumn (Sep-Oct). Spring surveys used to be carried out for the Dutch SNS (1969–1989), the Dutch DFS (1970–1986) and the German DYFS (1974–2004). The sampling period of the autumn surveys are presented in Figures 3.2.2.1 and 3.2.2.2. At present the UK-data are only available electronically for the period 2001–2005.

The aim is to carry out the surveys at the same time each year, however most surveys show a shift in the sampling period. The Dutch surveys show a breakpoint in 1980 and the sampling period has shifted forward by approximately 1–2 weeks since then, except for the DFS in coastal waters which has shifted backwards by approximately 2 weeks. The Belgian DYFS has also shifted forwards by about 2 weeks. Only the German DYFS is carried out in more or less the same period, excluding a few outliers. The UK surveys have remained relatively stable although in recent years there has been a tendency to start up-to a week earlier in order to complete and work-up the survey in time for the WGNSSK meeting in late September.

In theory a fixed sampling period for an annual survey is optimal because this should exclude variation caused by different stat times. However as inter-annual variability in seasonal patterns occurs, it is impossible to exclude this source of variation. A shift of 2 weeks is relatively small compared to the observed inter-annual variability in seasonal patterns, and therefore the shifts in sampling period are not considered to be too severe. Nevertheless, all countries should aim at consistency in the sampling period.

The sequence in which the stations are sampled will also affect the consistency of the sampling period at the area level. All countries except Germany fish their stations in more or less the same sequence every year.

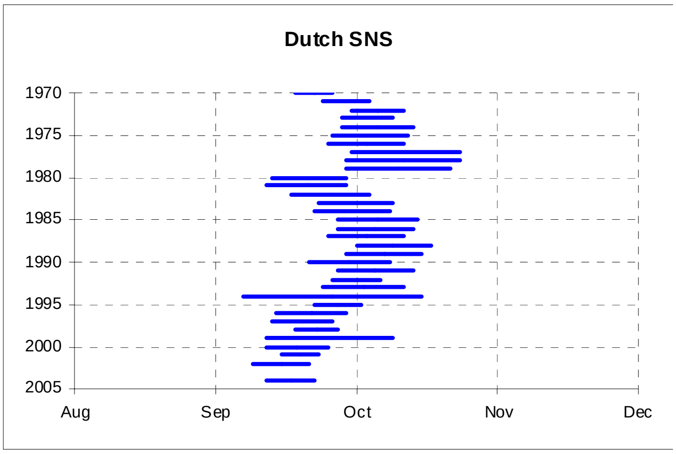


Figure 3.2.2.1: Sampling period (range) of the near-shore survey (SNS).

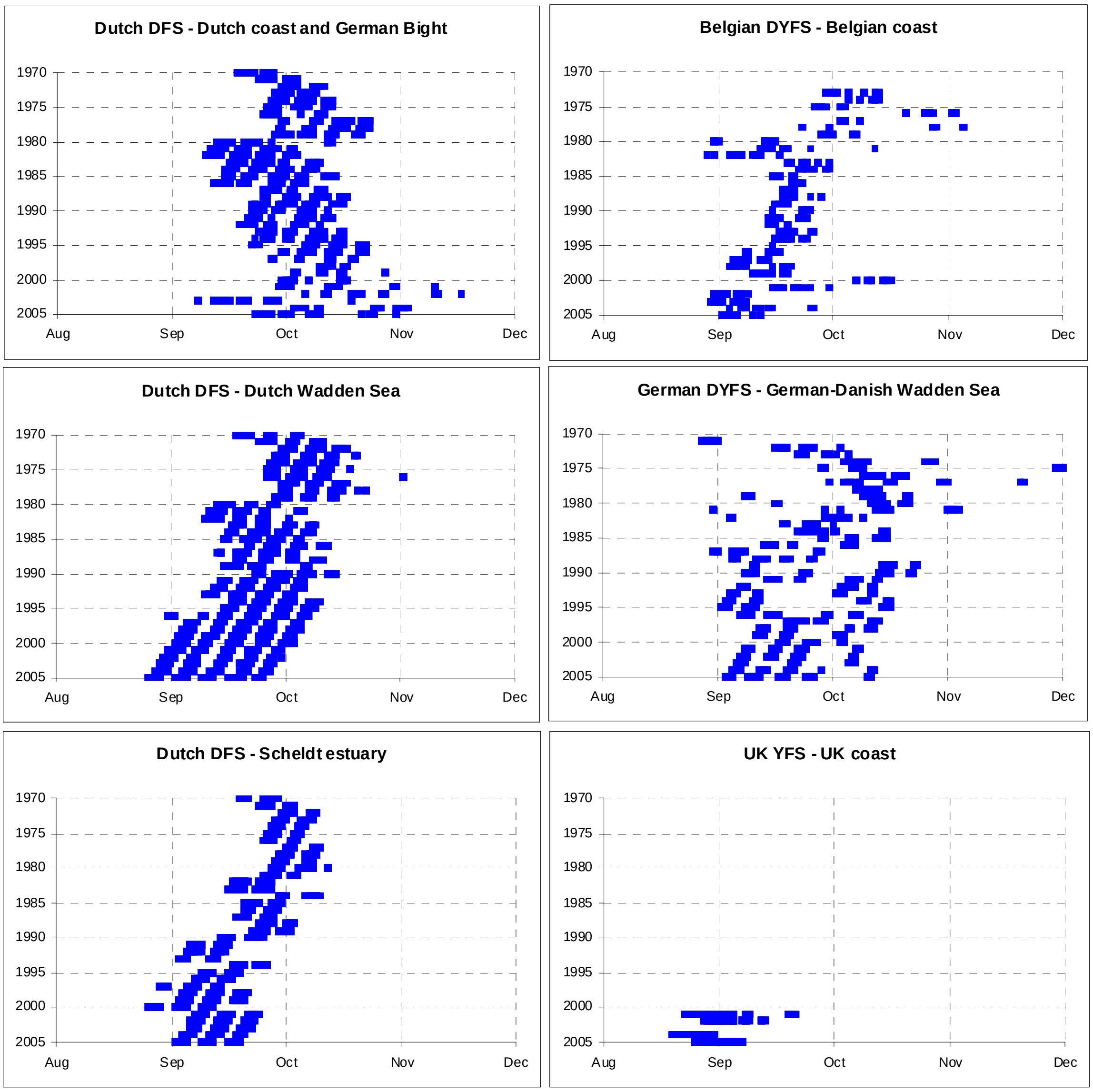


Figure 3.2.2.2: Sampling period (days) of the inshore surveys (Dutch-DFS, German-DYFS, Belgian-DYFS and UK-YFS) carried out in autumn. Note: UK-YFS data are only available electronically for the period 2001–2005.

3.2.3 Data collection and processing

Catch data

In all countries more or less the same procedure is adopted for fish sampling, i.e. the catches are sorted out on board of the vessel and for each haul catch numbers and length frequency distributions (cm below) are recorded. In the case of large catch numbers a random sub-sample of the catch is measured. All countries except Belgium measure all fish species, only the commercial fish species are sorted out and measured in the Belgian samples.

Differences between the countries exist in the epibenthos sampling. The Netherlands and Germany record catch numbers for selected taxa of epibenthos and measure *Crangon crangon* samples (mm below). Belgium and UK do not sample epibenthos other than *Crangon crangon*. On the UK surveys only catch rates (volumes) are recorded. On the Belgian surveys catch rates (weight) are recorded, and length (mm below) was measured in the years 1973–1992 and since 2004. Since 1997 the Germans do not measure *Crangon crangon* on board anymore, a sub-sample is frozen and analysed at the laboratory using image analysis and/or digital measuring equipment.

Trawl and environmental data

All countries record the following basic trawl data for each haul:

- position
- date
- time
- area-code
- water depth
- haul duration
- trawl distance

Trawl distance is an important parameter as the DFS/DYFS/YFS catches are generally standardised to numbers per 1000m^2. Nowadays all countries use DGPS for estimation of the trawl distance. Previously either meter-wheels (UK, Germany) or less precise positioning devices such as DEC and GPS (Belgium, the Netherlands) were used. Although these basic trawl data have always been recorded, part of this information is currently not available digitally.

Different environmental parameters are recorded by the different countries (Table 3.2.3.1).

Table 3.2.3.1: Environmental data collected during the inshore and near-shore surveys.

	NL-SNS	NL-DFS	BEL-DYFS	GER-DYFS	UK-YFS
surface temperature	by haul	by haul	-	for selected hauls	by haul
surface salinity	occasionally	occasionally	-	for selected hauls	-
oxygen	-	-	-	-	occasionally
visibility (secchi)	-	by haul	-	for selected hauls	-
sediment	-	-	-	-	by haul
wind force and direction	by haul	by haul	by haul	by haul	by haul
tidal phase	-	by haul	by haul	by haul	-
CTD profile temperature	-	by haul since 2002	-	-	-
CTD profile salinity	-	by haul since 2002	-	-	-
CTD profile turbidity	-	by haul since 2002	-	-	-

Age data

The Netherlands and since 2003 the UK, collect samples for age determinations. These length stratified samples are taken by area (Figures 3.2.1.1 and 3.2.1.2). The otoliths are removed from the fish and stored for age determinations in the laboratory. Otoliths are collected for plaice and sole (UK and the Netherlands), and dab, flounder, turbot and brill (The Netherlands). Plaice and sole are aged routinely; the other species are only aged if required within specific projects.

Conversion length distributions to age distributions

When age data are available (see Table 3.2.1 above), the catch numbers by haul and size class are converted to catch numbers by haul and age group using age-length-keys (ALK's). These ALK's are area-based (see Figures 3.2.1.1 and 3.2.1.2). The ALK for area 401 is also used to convert the Belgian data (adjacent area 400).

If no age data are available the length-frequency-split is used to distinguish between 0-, 1- and 2+ group fish. The population abundance indices of 0- and 1-group plaice and sole as provided to the ICES WG on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK) are based on the autumn sampling period, except in the case of the German data. In this case the autumn survey is used to estimate the abundance of 0-group fish and the spring survey is used to estimate the abundance of 1-group fish. As the spring survey was aborted in 2004, now only 0 group abundance estimates are available for the German-DYFS.

3.2.4 Population abundance indices

The DFS/DYFS/YFS population abundance indices are calculated for 0- and 1-group plaice and sole. First the national indices are calculated. Then these indices are combined and raised to produce an international abundance index. This international index is used for estimating recruitment of plaice and sole in the WGNNSK.

The Dutch-DFS and Belgian DYFS are worked up together as follows:

- Hauls taken after dark are eliminated for the calculation of the sole indices
- The catch numbers by length class are converted to catch numbers by age group (see Section 3.2.3)
- The catch numbers (by age group) per haul are standardised into catch numbers per 1000 m^2.
- The areas are grouped into larger regions: Belgian coast, Dutch coast, German Bight and Dutch Wadden Sea.
- The numbers per 1000 m^2 are averaged for each region-depth stratum (e.g. Belgian coast - depth class 0–5m).
- For each country, the overall average is calculated weighted by the relative surface area of the stratum (Table 3.2.4.1).

The German DYFS indices are calculated as follows:

- Hauls taken after dark are not eliminated for the calculation of the sole indices
- Only the samples from areas 406 and 408–411 are selected for calculating the indices
- The catch numbers by length class are converted to catch numbers by age group (see Section 3.2.3)
- The catch numbers (by age group) per haul are standardised into catch numbers per 1000 m^2.

- The numbers per 1000 m^2 are averaged (no weighting by area-depth strata).

The UK YFS indices are calculated as follows:

- The catch numbers by length class are converted to catch numbers by age group (see Section 3.2.3)
- The catch numbers (by age group) per haul are standardised into catch numbers per 1000 m^2.
- The numbers per 1000 m^2 are averaged for each area–depth stratum.
- For each stratum, the mean numbers per 1000 m^2 are raised to total numbers by multiplying with surface area (Table 3.2.4.1).
- The total numbers per stratum are summed up for the whole survey area (areas 7–16)

The international indices are then calculated as follows:

- The Dutch-DFS, Belgian DYFS and German DYFS indices are raised from numbers per 1000 m^2 to total numbers by multiplying with the total surface area covered by each country (the UK-YFS index is already raised to total numbers).
- The total numbers are corrected for differences in gear efficiency (multiplied with factors in Table 3.2.5.1)
- The corrected total numbers are summed up over all countries

The Dutch DFS is by far the most important component of the international index, because the international index is area-based and the Dutch survey covers the largest area.

The SNS population abundance indices are calculated for 0- to 5-group plaice and sole. The WGNSSK uses age groups 0–4 (plaice) and 1–4 (sole) for estimating recruitment and/or tuning of the VPA. The SNS indices are calculated according to the following procedure:

- The catch numbers by length class are converted to catch numbers by age group (see Section 3.2.3)
- The catch numbers (by age group) per haul are standardised into catch numbers per 100 fishing hours.
- The standardised catch rates are averaged for each transect (area-code)
- The means are averaged over all transects.

Table 3.2.4.1: Surface areas and area based weighting factors for the inshore surveys.

COUNTRY	REGION	DEPTH CLASS	WEIGHT	KM^2
NL + Bel	Wadden Sea	0–6	0.048	866
		6–12	0.014	250
		12–20	0.007	123
		>20	0	
	Scheldt estuary	0–5	0	
		5–10	0.009	154
		10–20	0.009	167
		>20	0	
	Dutch Coast	0–5	0	
		5–10	0.052	934
		10–20	0.269	4881
		>20	0	
	German Bight	0–5	0	
		5–10	0.103	1876
		10–20	0.399	7233

COUNTRY	REGION	DEPTH CLASS	WEIGHT	KM^2
		>20	0	
	Belgian Coast	0–5	0	
		5–10	0.045	817
		10–20	0.047	844
		>20	0	
NL + Bel	Total		18.14	18145
UK	Total	0–2	1*	472
		2–6	1*	1096
		6–12	1*	1952
		12–20	1*	3474
Ger	Total		1.56	1559
* already raised to total area				

3.2.5 Gear efficiency

Gear correction factors as used for standardization within the inshore survey components are based on a series of experiments carried out on the Dutch and English coasts through 1975–1980, as summarized by the 0-Group North Sea Flatfish WG in their Tables 3.1, 3.2 and 3.3 (ICES C.M. 1985/G:2), comparing 2-m, 3-m-, 6-m beam trawls, with and without ticklers for the 3- and 6-m trawls, partly for both seasons. The resulting raising factors are listed in their Table 3.4 (also in text Table 3.2.5.1 below).

Table 3.2.5.1: Relative gear efficiencies from ICES C.M. 1985/G:2.

	DUTCH-DFS	UK-YFS	GERMAN-DYFS	BELGIAN DYFS
plaice 0-group	1	0.75	1.22	1.22
plaice 1-group	1	1	1	1
sole 0-group	1	0.3	1.59	1.59
sole 1-group	1	0.35	1.88	1.9

The experimental methodology was variable in the respect to repeated / simultaneous hauls. The latter could not be performed when different gears needed different towing speeds (Comparison 2- vs. 3-m beam: In these cases, additional variability may have been introduced through unreliable tow length estimates by the meter wheel). Values for plaice, sole, 0- and 1-groups, and different seasons were analyzed separately.

Of the 22 gear comparisons listed, 11 show no significant differences between mean catches (paired t-test for log-transformed values, omitting paired zeroes). In the case of no significance, ratios <> 1 were accepted when the effect was consistent over gears. Geometric or arithmetic means were used to calculate the ratio of catches, the former approach as to cope with large between-haul variability.

WGBEAM had available raw data from two of the listed experiments (2m vs 3m gear, Oct. 1978 and 1980). A re-analysis of these data sets was done in order to demonstrate the effects of the options and decisions chosen by the 0-Grp. WG, and to test some alternative approaches.

An ANOVA for the 1980 data set (Dutch Wadden Sea), including both age groups and using untransformed and logged data (Table 3.2.5.2) shows no significant gear effects for plaice, as in the original analysis. However for the logged data for sole, the gear effect is significant, as opposed to the original analysis. It still remains to be discussed how to derive a correction factor which is in line with the log transform.

Table 3.2.5.2: Results of ANOVA from 1980 data comparing 2m, and 3m trawls.

	PLAICE		SOLE	
	untransf.	log	untransf.	log
Effect				
	P	p	p	p
STATION	0.0047	<.0001	0.3838	0.0317
AGE	0.0002	<.0001	0.0005	<.0001
GEAR	0.5980	0.0900	0.0787	0.0392
GEAR*AGE	0.4306	0.3554	0.0866	0.2121

3.2.6 Recommendations for further work

- For a proper evaluation of the inshore surveys a complete database is required. The WG recommends that all primary data of the inshore surveys should be made available before the next WG. Primary data (by haul) are:
  - Position
  - Area-code
  - Date
  - Depth
  - Haul distance
  - Haul duration
  - Country / gear specifics
  - LF distribution plaice and sole including raising factors to total catch
  - If available, age distribution for plaice and sole

Other data that are considered important are:

- Quality control procedures
- Planimetry data – needed especially for updating German surveys where no depth strata are available. This is particularly necessary for estuarine areas, although less urgent for coastal areas.
- review the selection of German and Dutch data used in the index to take account of additional survey areas not fully utilised
- review the weighting factors used to raise population numbers in the shallowest depth classes. – The coverage is still inadequate in some areas and the sensitivity of the abundance indices to inclusion or exclusion of these depth strata should be reviewed.
- consider standardising the calculation of national indices
- re-analyse German-Dutch data from areas 405 and 406 where overlap between the surveys offers the opportunity to study gear efficiency

In relation to the inshore surveys, the WG recommended that:

i) all primary data from national surveys should be provided to the WG in the correct format by 31 March 2007.

ii) further analysis of the area raising factors should be carried out

iii) gear efficiency comparisons between different surveys should be undertaken by analysis of survey areas where overlap between gears occurs and by undertaking further comparative survey work

iv) the extension of the survey area by Germany in the Weser estuary and along the Danish coast should be continued, if possible.

4 Evaluation of population abundance indices

Historically, survey indices have been used mainly for estimating year class abundance of recruiting year classes. Increasingly as commercial catch data has become less reliable; surveys have become more important for tuning assessments and in some cases may be the only data used to derive stock estimates. Recently, ICES listed the information that it felt working groups needed from survey groups (ICES, 2006). This included:

v) The characteristics of the survey (distribution, etc.)

vi) The likely performance of the survey as abundance index.

vii) Internal consistency, precision and accuracy of the surveys.

viii) Long term changes in distribution by year class.

ix) Survey catchability.

In addition, the survey WGs are asked to provide guidance on the calculation of and how to cope with abundance indices from surveys with recent low catches of certain species, because of the decreasing abundance of these species.

4.1 Performance of offshore survey indices

WG Beam did not evaluate the performance of survey indices against VPA estimates of stock abundance. It was felt that the separate assessment working groups were better placed to decide the most appropriate analyses to carry out and the most appropriate time period over which to compare the data.

4.2 Internal consistency

Internal consistency was examined by looking at trends in cohorts at ages 0 to 6 as appropriate for each survey. The approach used was to plot the logs of the year classes at subsequent ages. A linear trend line was calculated and the R^2 tabulated. The WG was aware that this approach is only a preliminary attempt to review the data as no detailed statistics such as residual plots or confidence limits on the analyses were examined.

For the offshore surveys which are used for tuning, ages 1–6 were analysed. In the case of the inshore surveys which are designed to sample only the recruiting ages, the analysis was undertaken on the 0 and 1-gp indices. The results are shown in Figures 4.2.1 and 4.2 2.

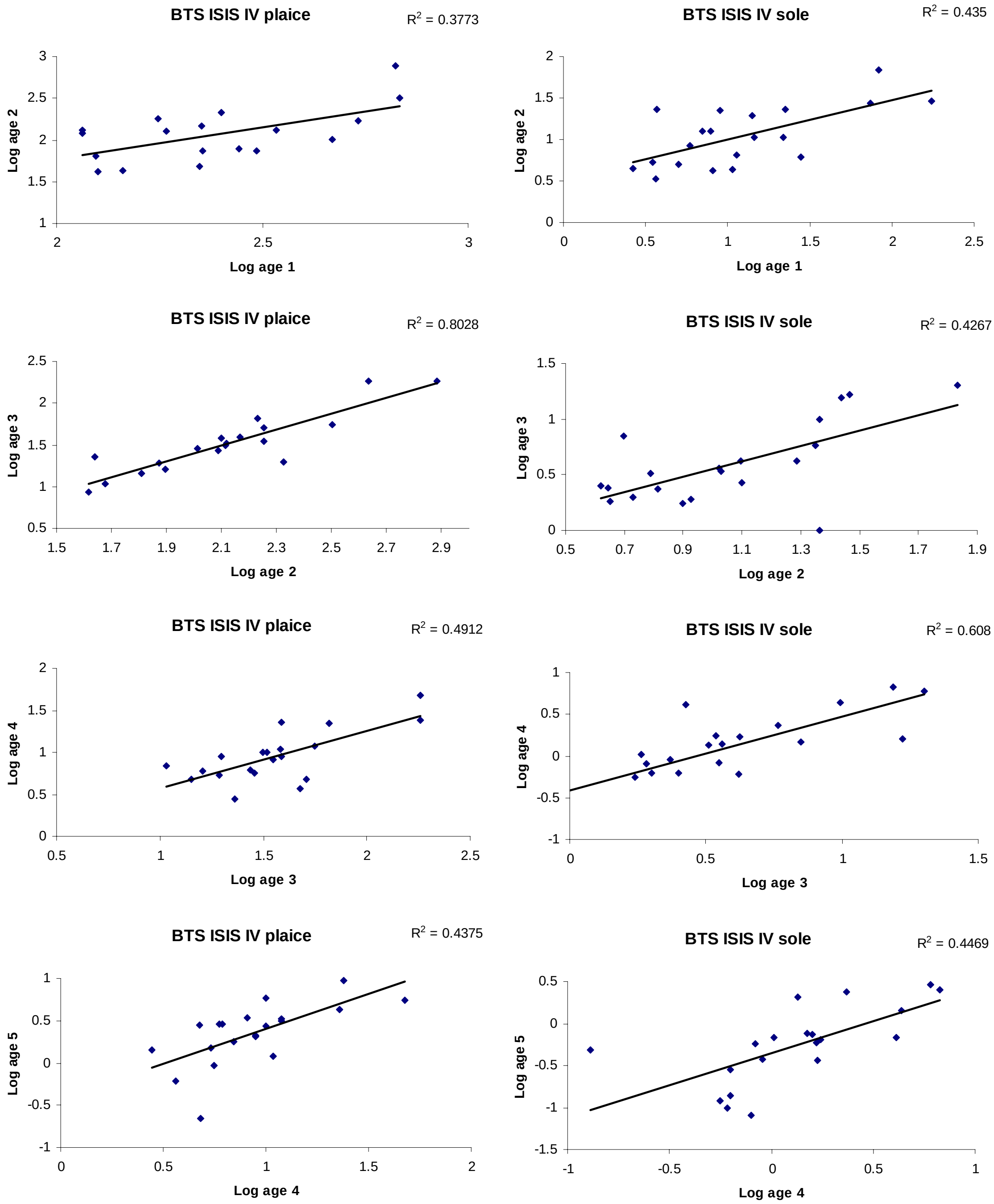


Figure 4.2.1a: Correlation between year class abundance for Netherlands BTS indices.

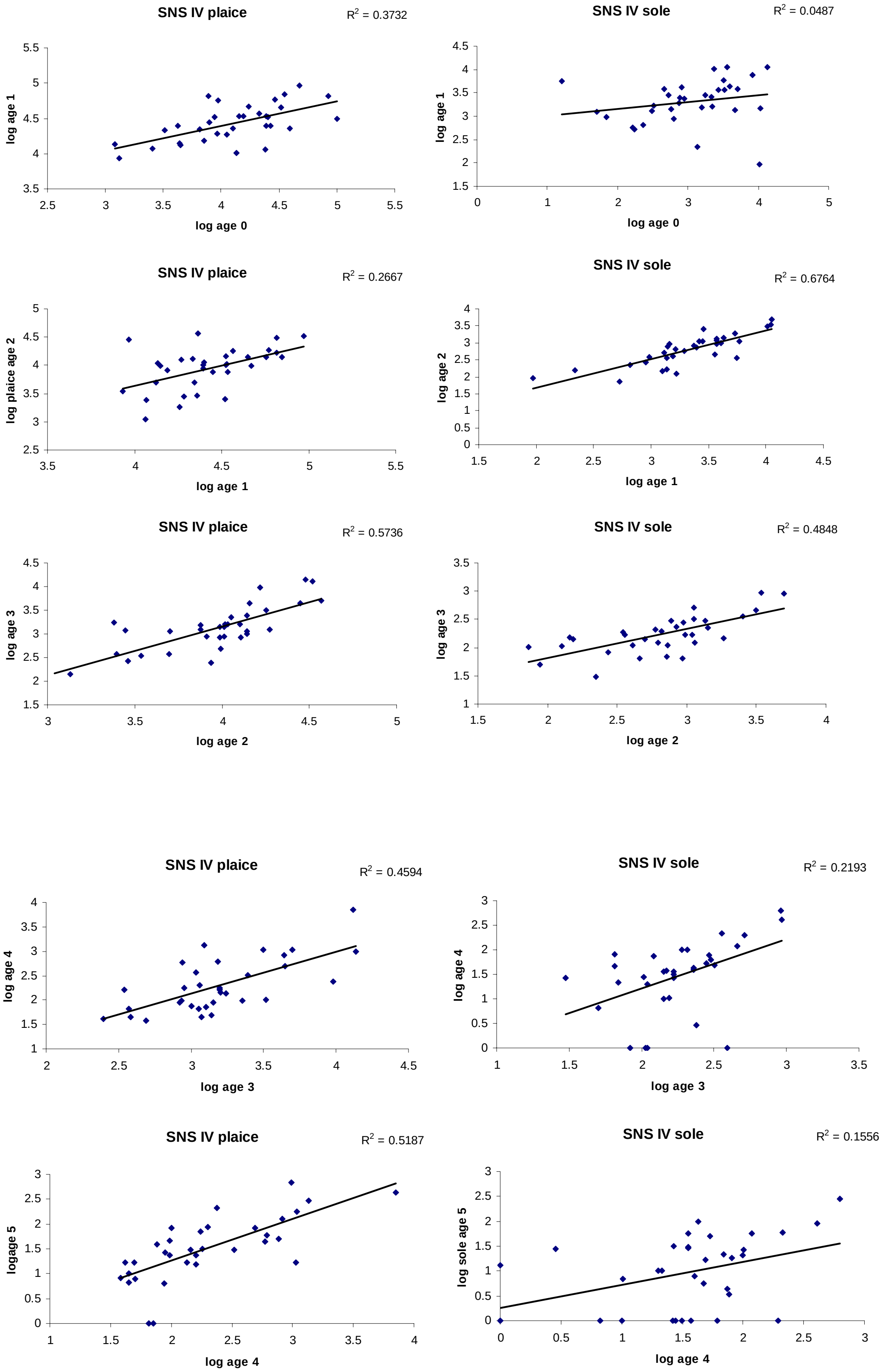
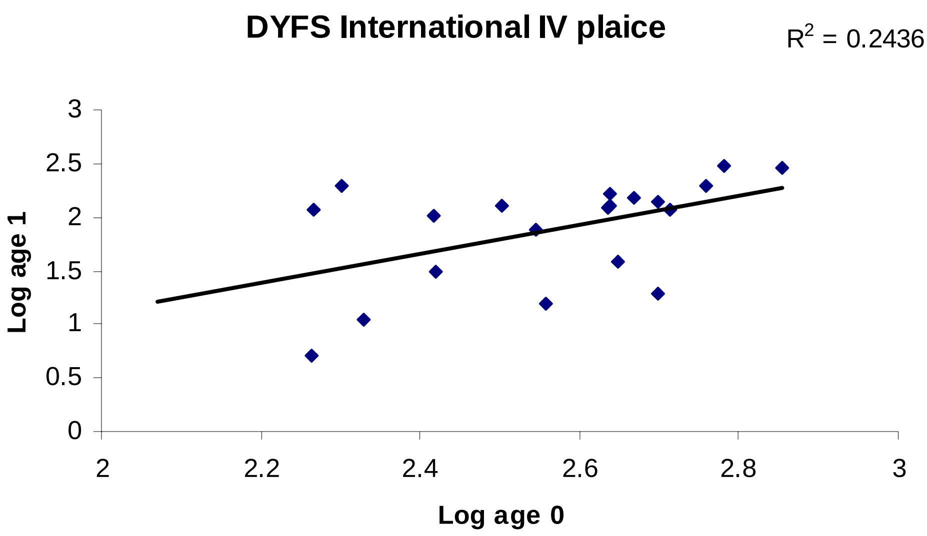


Figure 4.2.1b: Correlation between year class abundance for the Netherlands SNS.



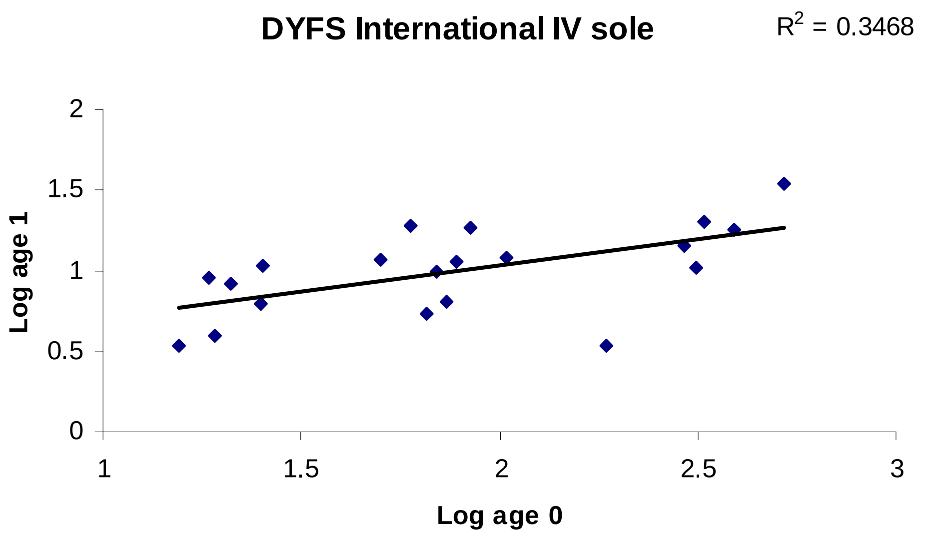


Figure 4.2.1c: Correlation between year class abundance for the International combined Demersal Young Fish Survey.

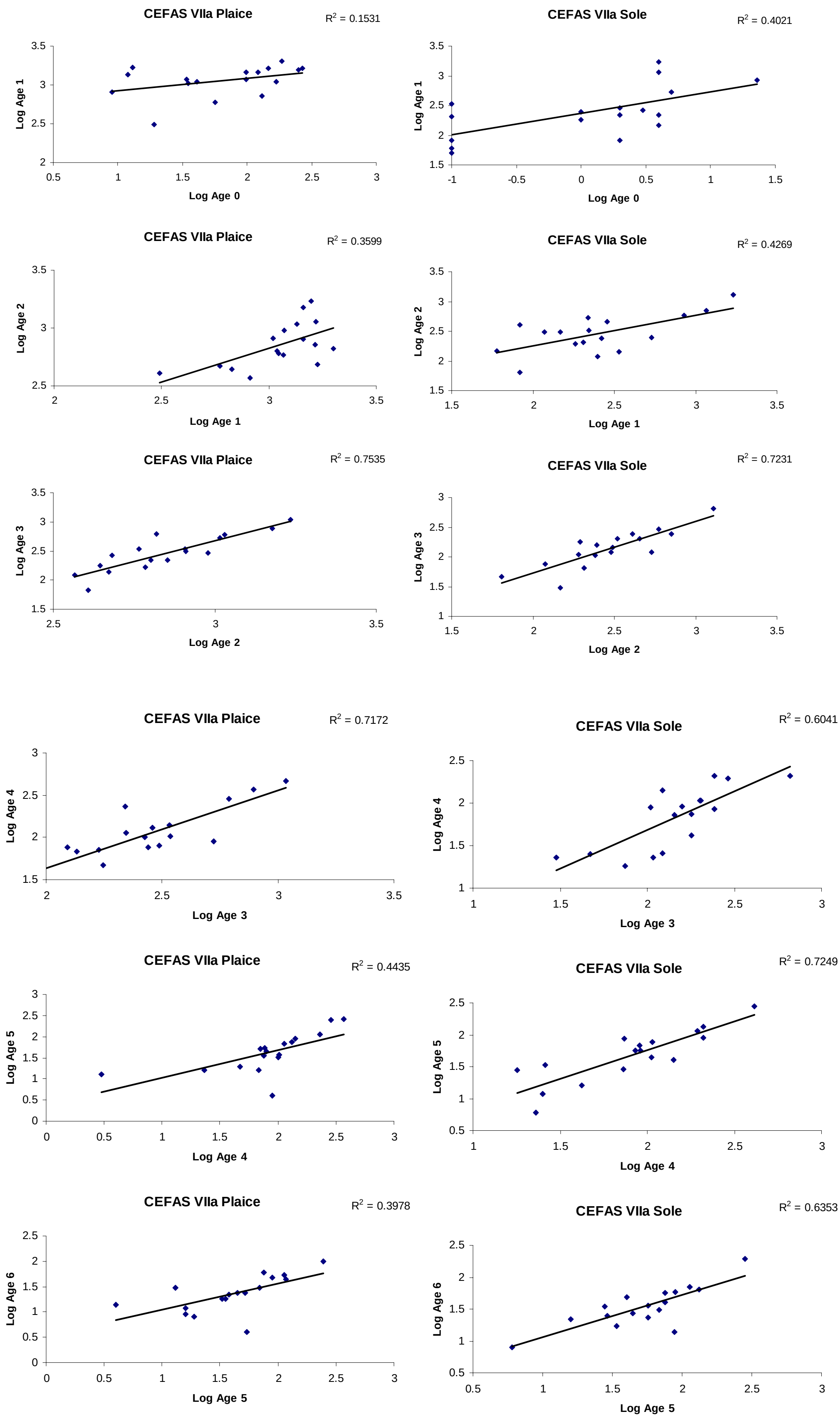


Figure 4.2.2a: VIIa - Correlation between year class abundance from UK BTS for plaice and sole.

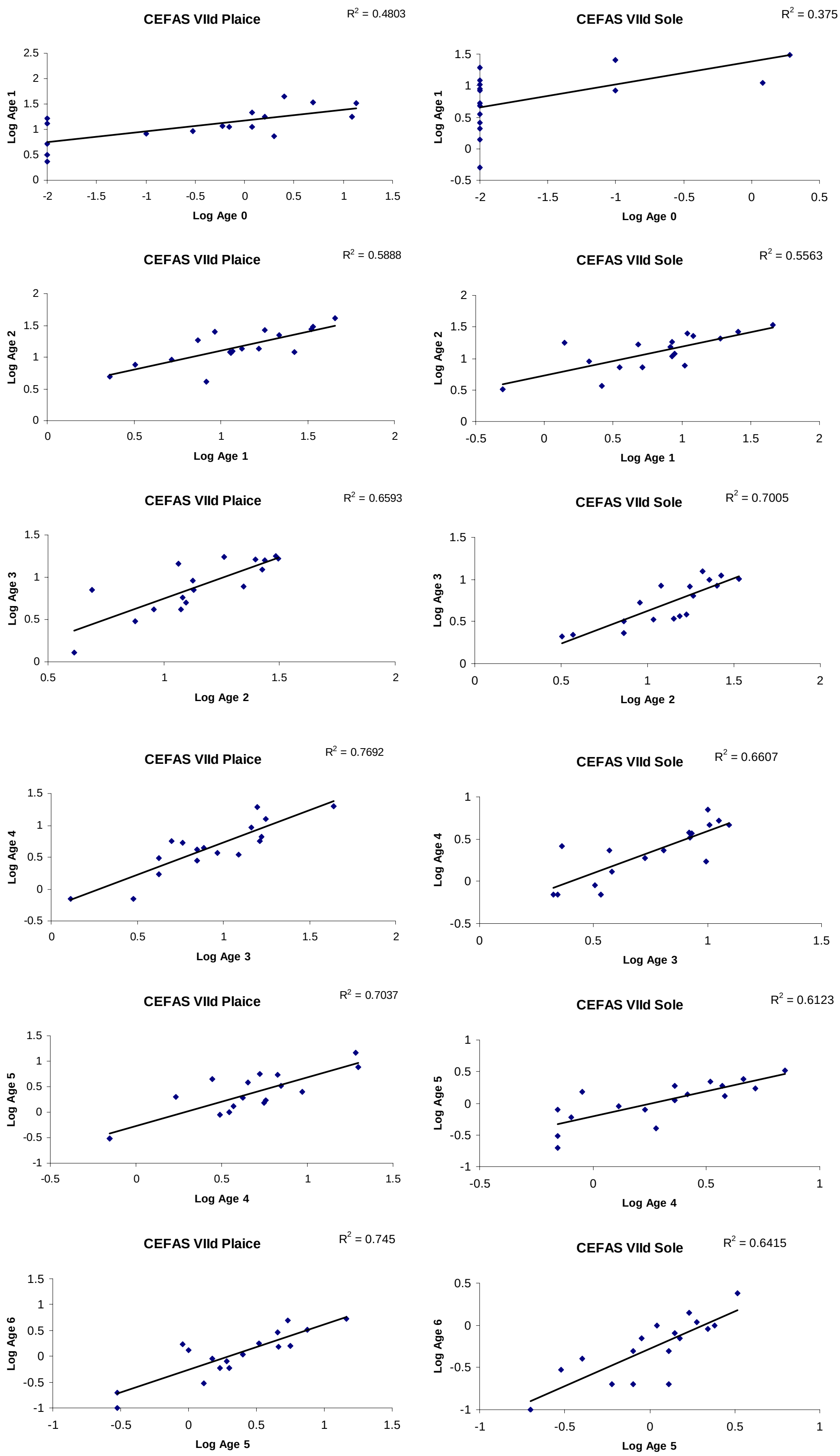


Figure 4.2.2b: VIId - Correlation between year class abundance from UK BTS for plaice and sole.

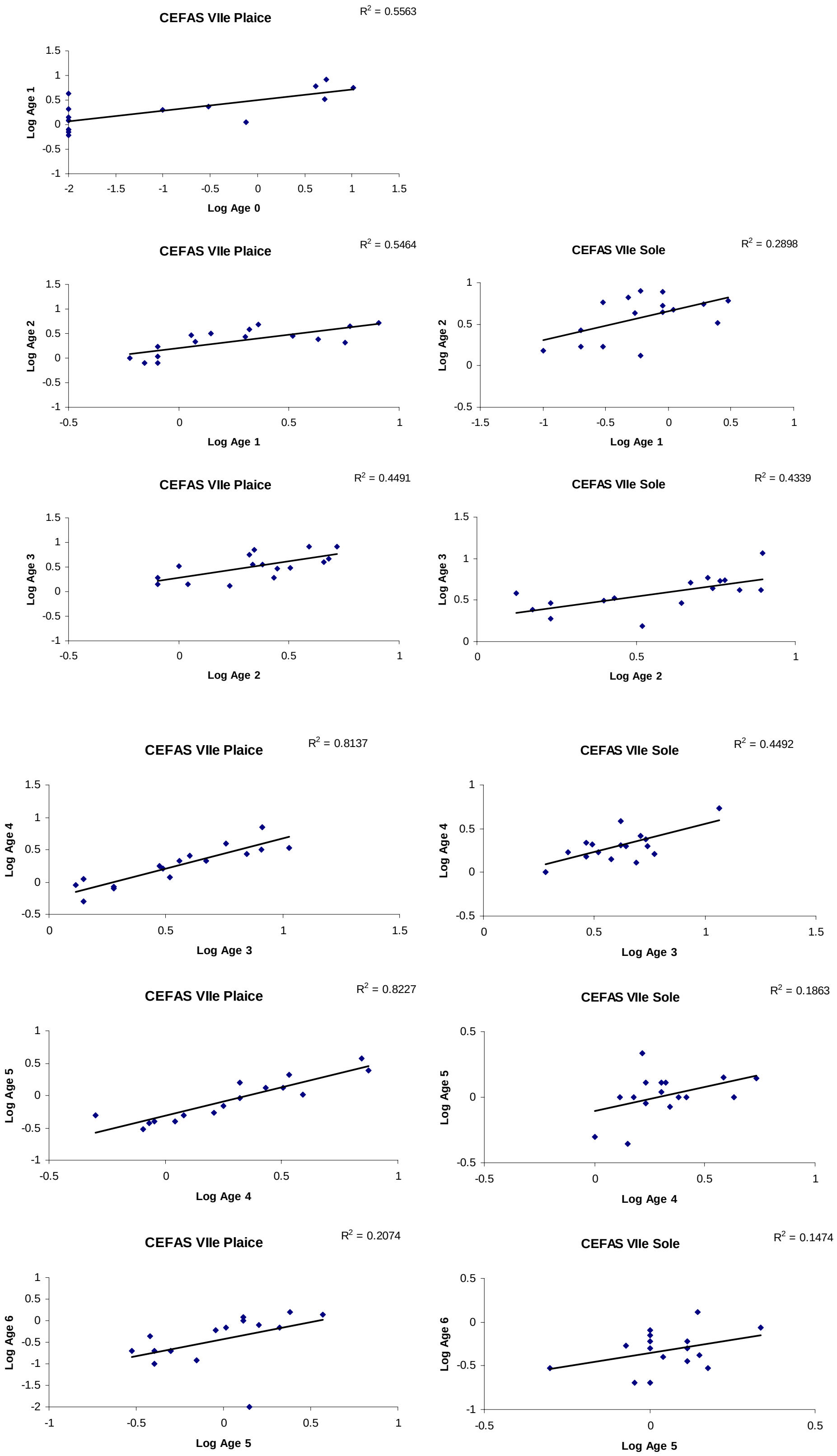


Figure 4.2.2c: VIIe - Correlation between year class abundance from UK BTS for plaice and sole

4.2.1 North Sea

The calculations for the Beam Trawl Survey (BTS) in the North Sea are based on 20 data points (Figure 4 2.1a and text Table 4.1). Age 0 of plaice and sole was not included as their catchability is regarded as poor since the survey is mainly offshore. The R^2's are above 0.4 for the ages 1–5 for sole. The correlation for plaice is poor for the ages 1–2 with an R^2 of 0.38. Age 2–3 scores 0.80 and the values drop to around 0.45 for ages 3–5. For the Dutch Sole Net Survey (SNS) in Area IV, more than 30 data points for sole resulted in an R^2 of 0.049 for age 0–1 (Figure 4.2.1b). This low value may be due to the low catchability of 0-age sole in the survey which does not sample the shallow inshore areas. The R^2 increases to 0.68 for age1–2 and 0.48 for age 2–3. The R^2 values drop again for the older ages but this may be caused to the appearance of zero's values in the data series. For plaice the correlations between ages 0–1 and 1–2 are 0.37 and 0.27 respectively and improve to about 0.5 for ages 2–5.

For the combined International Demersal Young Fish survey in the North Sea, 20 data points were available for the comparison between abundance at ages 0 and 1, and these gave an R^2 of 0.35 and 0.24 for sole and plaice respectively (Figure 4.2.1c and text table).

R^2 VALUES	SOLE					PLAICE				
	0–1	1–2	2–3	3–4	4–5	0–1	1–2	2–3	3–4	4–5
DYFS International IV	0.35					0.24				
SNS IV	0.05	0.68	0.48	0.22	0.16	0.37	0.27	0.57	0.46	0.52
BTS ISIS IV		0.44	0.43	0.61	0.45		0.38	0.80	0.49	0.44

4.2.2 Area VII stocks

VIIa sole and plaice (Figure 4.2.2a): The 0-gp index is relatively noisy and in several years inconsistent with estimates of abundance at older ages. In particular in 1995 and 1996, the 0-gp index estimated large and weak year classes respectively, which were not found at 1 or older. There is an improvement in the correlation between ages 2 and 3 compared with age 1 and 2, further suggesting that the survey estimates the older year classes more effectively. The survey appears to be very poor at estimating age 0 and 1-gp. There is a substantial improvement in the correlation between age 2 and 3.

VIId sole and plaice (Figure 4.2.2b): The 0-gp index is very variable for both sole and plaice and correlates poorly with the 1-gp with R^2 values of 0.38 and 0.43 respectively. There is an improvement with age, and for age 2 and older, the index is relatively consistent in estimation of year class abundance with R^2 values between 0.56 and 0.76.

VIIe sole and plaice (Figure 4.2.2c): For plaice the best relationship between successive year classes is on the older ages (3–4 and 4–5) with R^2 values of 0.8. The sole index has a relatively poor internal consistency at all ages. The best correlations are for ages 2/3 and 3/4 with R2 of 0.4.

VIIf, g sole and plaice: The 0-gp index is again quite variable. The one and older ages are moderately consistent and the strong 1998 year class appears to have been consistently estimated ages 0,1 and 2 but overestimated at age 1. There is no improvement in correlation between age 2 and 3 compared with age 1 and 2. For plaice, the 0-gp index is unreliable, over-estimating some large year classes and significantly under-estimating other years. There is an improvement in correlation between age 2 and 3 compared with age 0 and 1

4.3 Impact of long term changes in distribution

Recent analyses indicate that there has been a shift in the distribution of plaice along parts of the eastern coast of the North Sea with juvenile plaice (mainly 1gp) moving further from the continental coast and into deeper water (Grift *et al*., 2004). No analyses have been carried out to investigate whether a similar movement offshore has occurred on the English North Sea coast. The impact of these movements on the estimation of year class abundance form the surveys are not clear. It is likely that the plaice 1gp indices will be affected since it is mainly this year class which has been affected. In particular, the combined international DFS index is likely to show changes related to a reduction in catchability of juvenile plaice as the survey covers only the inshore distribution of plaice. No similar movement of sole has been observed.

The WG was not aware of significant changes in distribution of plaice and sole in any of the areas surveyed in area VII. However, following indications that there has been an offshore movement of juvenile plaice in the North Sea, an analysis was carried out to investigate whether similar movements were evident in VIIa (see Section 2.3.1). Some evidence for an offshore shift was found but the data are too preliminary to advise on likely impacts on the estimation of abundance from the survey.

4.4 Survey catchability

The WG regarded this issue as relating specifically to changes in catchability as a result of changes to survey gear or to aspects of the survey design such as changes in survey timing. The offshore surveys have been very consistent in terms of the gear used and area of the survey covered each year (see Section 3.1). The timing of the surveys has been more variable.

5 Compliance with DATRAS

Data from the offshore surveys should be provided directly to ICES for inclusion in the DATRAS database. For data from the inshore surveys the WG agreed that there was still a need for internal checking before they can be added to the DATRAS database.

Progress at sending data to ICES has been slow and only the Netherlands has provided haul and length information for the period 1985–2005. The historic age data will be provided by the middle of 2006.

No beam trawl data from other countries has yet been sent to ICES and the WG hoped that this would be given greater priority in future.

6 Protocols and criteria for standardisation

A range of procedures and national survey manuals are used by each country to ensure standardisation of survey protocols and maintenance of data quality. However, in order to improve transparency to external users of the survey data, the WG felt that a more structured approach to survey methods and procedures should be in place. The **WG proposed** that a Survey Manual should be developed based on the one used by the IBTS WG. The contents for an example manual are shown in Annex 7. The manual will require a considerable amount of time and effort by each institute involved in the surveys and Cefas had agreed to make a start on coordinating the collection of material during 2006. A first draft of the manual will be prepared for the next meeting of WGBEAM in 2007.

7 References

Grift, R.E., Tulp, I., Clarke, L., Damm, U., McLay, A., Reeves, S., Vigneau, J., Weber, W. 2004. Assessment of the ecological effects of the Plaice Box. Report of the European Commission Expert Working Group to evaluate the Shetland and Plaice boxes. Brussels. 121 pp.

ICES. 1985. Report of the 0-Group North Sea Flatfish Working Group. ICES CM 1985/G:2.

ICES. 2006. Report of the Annual Meeting of Assessment Working Group Chairs (AMAWGC), 30 January –3 February 2006, ICES Headquarters, 69pp.

Annex 1: List of participants

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Annex 2: Recommendations and ToRs for 2007

RECOMMENDATION	ACTION
1. The **WG recommended** that a more detailed analysis should be undertaken to determine whether there have been changes in distribution of plaice in the Irish Sea (VIIa) and other areas. (see Section 2.3).	WGBEAM participants
2. The WG recommended that (see Section 3.1): i) all primary data from national surveys should be provided to the WG in the correct format by 31 March 2007. ii) further analysis of the area raising factors should be carried out iii) gear efficiency comparisons between different surveys should be undertaken by analysis of survey areas where overlap between gears occurs and by undertaking further comparative survey work iv) the extension of the survey area by Germany in the Weser estuary and along the Danish coast should be continued, if possible.	all WGBEAM participants
3. The WG **recommended** that a Survey Manual should be established along the lines of the one used in the IBTS (see Section 6).	WGBEAM participants

The **Working Group on Beam Trawl Surveys** [WGBEAM] (Chair: R Millner, UK) will meet in Ostend, Belgium from 11–15 June 2007 to:

a) Prepare a progress report summarising the results of the 2007 beam trawl surveys;

b) calculate population abundance indices by age-group for sole and plaice in the North Sea, Division VIIa and Divisions VIId-g;

c) further co-ordinate offshore and coastal beam trawl surveys in the North Sea and Divisions VIIa and VIId-g;

d) describe and evaluate the current methods for calculating population abundance indices with emphasis on the inshore surveys;

e) continue the work on developing relative catchabilities and gear efficiencies of the different gears;

f) continue work of developing and standardising an international database of beam trawl survey data and co-ordinate such activities with those of the IBTSWG;

g) continue the work on collating information on the epibenthic invertebrate by-catch during beam trawl surveys into a common database and discuss which summary results should be reported;

h) Develop protocols and criteria to ensure standardisation of all sampling tools and surveys gears.

WGBEAM will report by 31 August 2007 for the attention of the Living Resources and the Resource Management Committees, and ACFM.

Supporting Information

PRIORITY:	Essential. Beam trawl surveys provide essential abundance indices for the assessments of North Sea and area VII plaice and sole stocks.
SCIENTIFIC JUSTIFICATION AND RELATION TO ACTION PLAN:	WGBEAM is particularly active in addressing the ICES' action plan Goal 1 issues. The beam trawl surveys are an important source of information (for various taxa only) that allows quantification of stock structure, dynamics, and spatial distribution of commercially and ecologically important demersal fish as well as epibenthic invertebrate species. The aim is to develop a standardized monitoring program that can adequately deliver this information. ToRs a) and b) are standard tasks for WGBEAM i.e. collating data in a standardised manner and making the data and extractions of the data accessible to the scientific community. The results can be used for tuning assessments and ecosystem monitoring. [Action number 1.2.2] ToRs c) and d) WGBEAM has previously concentrated on offshore beam trawl surveys. There continues to be a need to focus on the coastal beam trawl surveys which have been less effectively coordinated, despite providing an index for the assessment of plaice and sole. [Action number 1.11] ToR e) Further work in developing and applying relative catchabilities between the different surveys is necessary in order for the beam trawl survey database to be used for the whole area covered by the surveys. [Action number 1.11 and 1.13.4] ToR f) Additional work is needed to ensure data from all the surveys can be provided to ICES in compliance with DATRAS [Action number 6.1] ToR g) The bycatch of epibenthic invertebrates in the beam trawl surveys can provide information on both the abundance and distribution of these species. For most of these species this is the only regular source of information. WGBEAM aims at making this information available. [Action numbers 1.2.2 and 6.1] ToR h) The WG will assist in developing standard protocols for sampling, survey design and implementation. [Action numbers 1.11 and 1.13.1]
RESOURCE REQUIREMENTS:	The research programmes which provide the main input to this group are already underway, and resources already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
PARTICIPANTS:	Experts actively involved in the beam trawl surveys should participate.
SECRETARIAT FACILITIES:	None
FINANCIAL:	No financial implications
LINKAGES TO ADVISORY COMMITTEES:	The Terms of Reference are set up to provide ACFM with the information required to respond to requests for advice/information from NEAFC and EC DGXIV. ACE
LINKAGES TO OTHER COMMITTEES OR GROUPS:	Resource Management Committee, in particular IBTSWG , WGNSSK, WGNSDS & WGSSDS
LINKAGES TO OTHER ORGANISATIONS:	None
SECRETARIAT MARGINAL COST SHARE:	ICES: NEAFC: EC 75:10:15

Annex 3: Action Plan Audit

Year	Committee Acronym	Committee name	Expert Group	Reference to other committees	Expert Group report (ICES Code)	Resolution No.		
2006/07	LRC	Living Resources Committee	WGBEAM	D, ACFM				
Action Plan	Action Required	ToR's	ToR	Satisfactory Progress	No Progress	Unsatisfactory Progress	Output (link to relevant report)	Comments (e.g., delays, problems, other types of progress, needs, etc.
No.	Text	Text	Ref. (a, b, c)	S	0	U	Report code and section	Text
1.2.2	Quantify the changes in spatio-temporal distribution of the stocks of important species in relation to environmental change, using survey and commercial data.	prepare a progress report summarising the results of the 2005 beam trawl surveys;	a)	S			2006/G:, section 2	
1.2.2	Quantify the changes in spatio-temporal distribution of the stocks of important species in relation to environmental change, using survey and commercial data. [OCC/LRC/RMC/BCC/DFC]*	calculate population abundance indices by age-group for sole and plaice in the North Sea, Division VIIa and Divisions VIId–g;	b)	S			2006/G:, section 2	
1.11	Continue to improve the coordination, conduct, and analysis of oceanographic and biological surveys to assure their accuracy and precision. [LRC/RMC/OCC/MHC/DFC]	further coordinate offshore and coastal beam trawl surveys in the North Sea and Divisions VIIa and VIId–g;	c)	S			2006/G:, section 3	some progress but more inter-sessional work needed
1.11	Continue to improve the coordination, conduct, and analysis of oceanographic and biological surveys to assure their accuracy and precision. [LRC/RMC/OCC/MHC/DFC]	describe and evaluate the current methods for calculating population abundance indices and consider possibilities of delivering improved indices;	d)	S			2006/G:, section 3 & 4	further review strata raising of inshore surveys at next WG
1.11	Continue to improve the coordination, conduct, and analysis of oceanographic and biological surveys to assure their accuracy and precision. [LRC/RMC/OCC/MHC/DFC]	continue the work on developing relative catchabilities of the different gears used in the surveys;	e)	S			2006/G:, section 3	some progress but furter work necessary
1.13.4	Promote the development and use of new survey designs, data analysis methods, acoustic instrumentation and survey gears.	describe and evaluate the current methods for calculating population abundance indices with emphasis on inshore surveys;	d)	S			2006/G:, section 3 & 4	some progress on inshore surveys
6.1	Integrate and expand databases to support ICES programmes within a well-defined data management policy. [CONC/MCAP/all Science Committees]*	continue work of developing and standardising an international database of beam trawl survey data and coordinate such activities with those of the IBTSWG	f)	S			2006/G:, section 5	inshore surveys still require extensive preparation
1.2.2	Quantify the changes in spatio-temporal distribution of the stocks of important species in relation to environmental change, using survey and commercial data. [OCC/LRC/RMC/BCC/DFC]*	continue the work on collating information on the epibenthic invertebrate by-catch during beam trawl surveys into a common database and discuss which summary results should be reported;	g)	S			2006/G:, section 2	analysis of time series shows some changes in abundance
6.1	Integrate and expand databases to support ICES programmes within a well-defined data management policy. [CONC/MCAP/all Science Committees]*	continue the work on collating information on the epibenthic invertebrate by-catch during beam trawl surveys into a common database and discuss which summary results should be reported;	g)	S			2006/G:, section 2	
1.11	Continue to improve the coordination, conduct, and analysis of oceanographic and biological surveys to assure their accuracy and precision. [LRC/RMC/OCC/MHC/DFC]	develop protocols and criteria to ensure standardisation of all sampling tools and surveys gears.	h)		O		2006/G:, section 6	proposal to develop standard survey manual
1.13.1	Improve the standardisation and performance of survey gears.	develop protocols and criteria to ensure standardisation of all sampling tools and surveys gears.	h)		O		2006/G:, section 6	as above

Annex 4: Sampling coverage of the area

Figure 2.1.1 Total number of beam trawl hauls per rectangle.
Total hauls in 2005 (above) and total for 1992–2005 (below) for BEL .

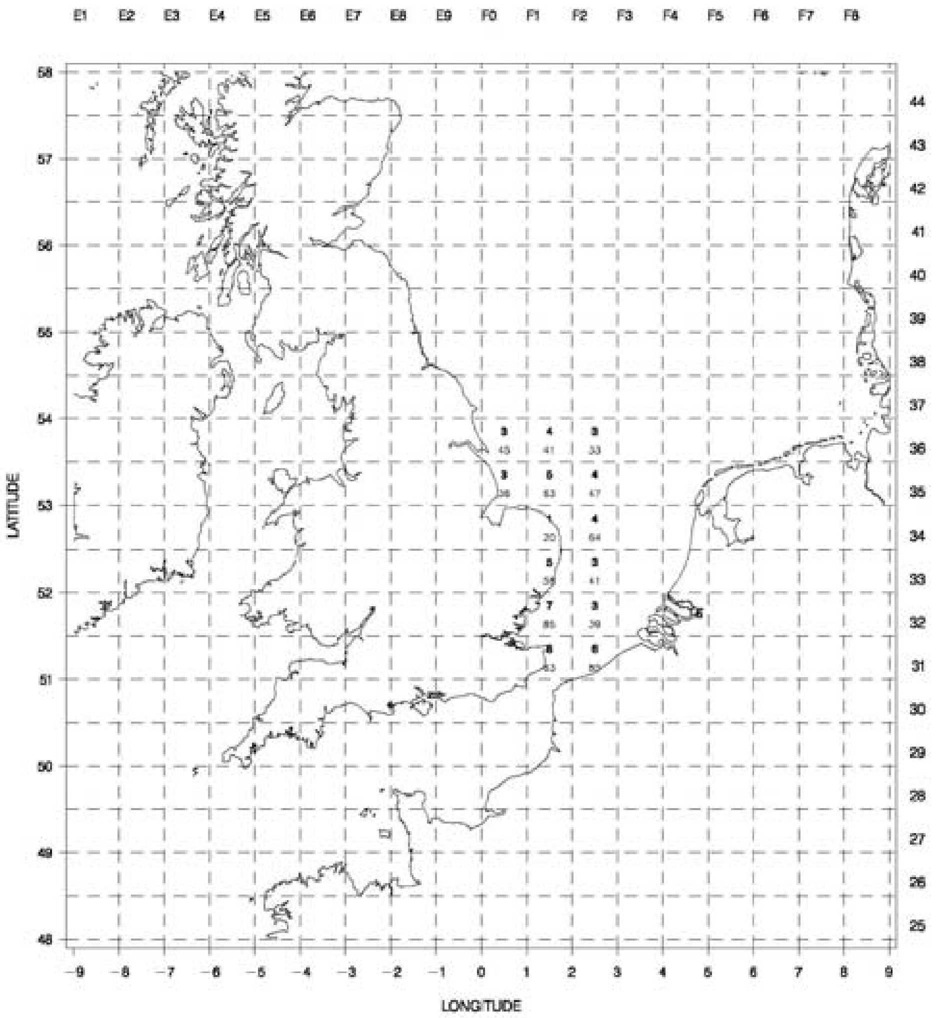


Figure 2.1.2 Total number of beam trawl hauls per rectangle.
Total hauls in 2005 (above) and total for 1990 – 2005 (below) for ENG .

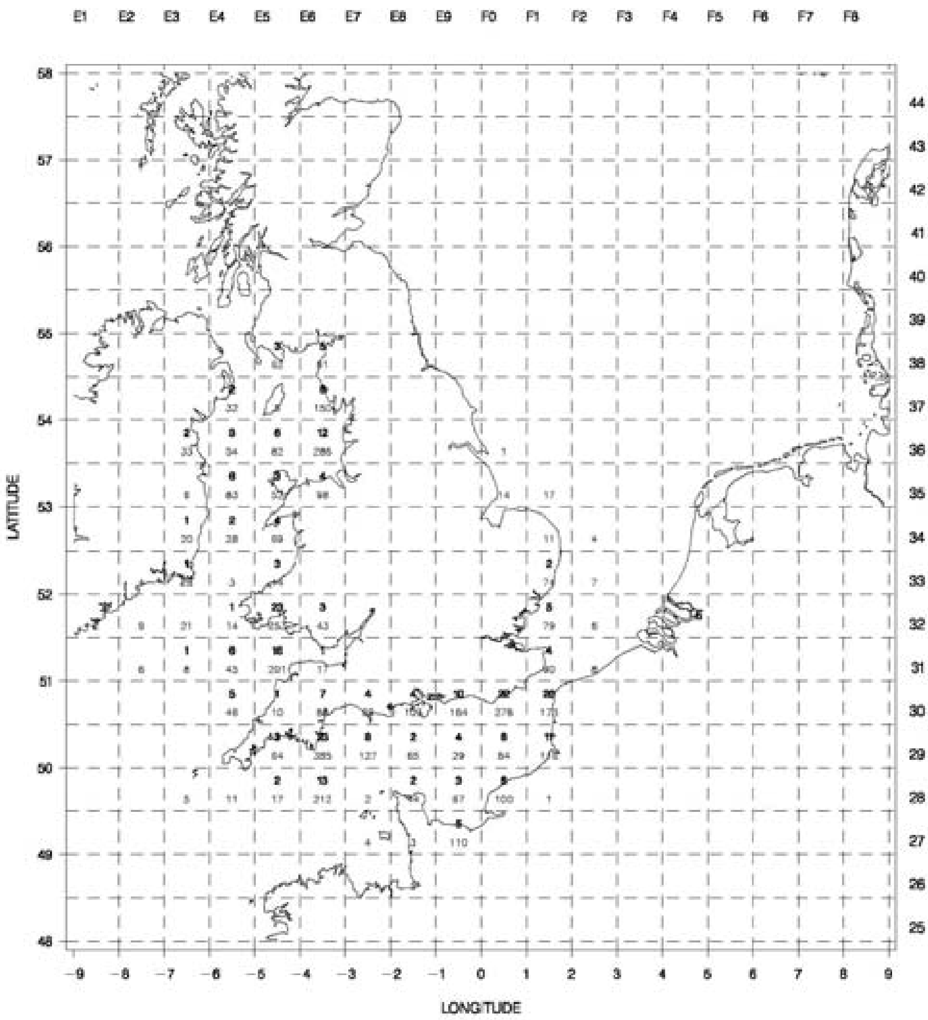


Figure 2.1.3 Total number of beam trawl hauls per rectangle.
Total hauls in 2005 (above) and total for 1997 – 2005 (below) for GFR .

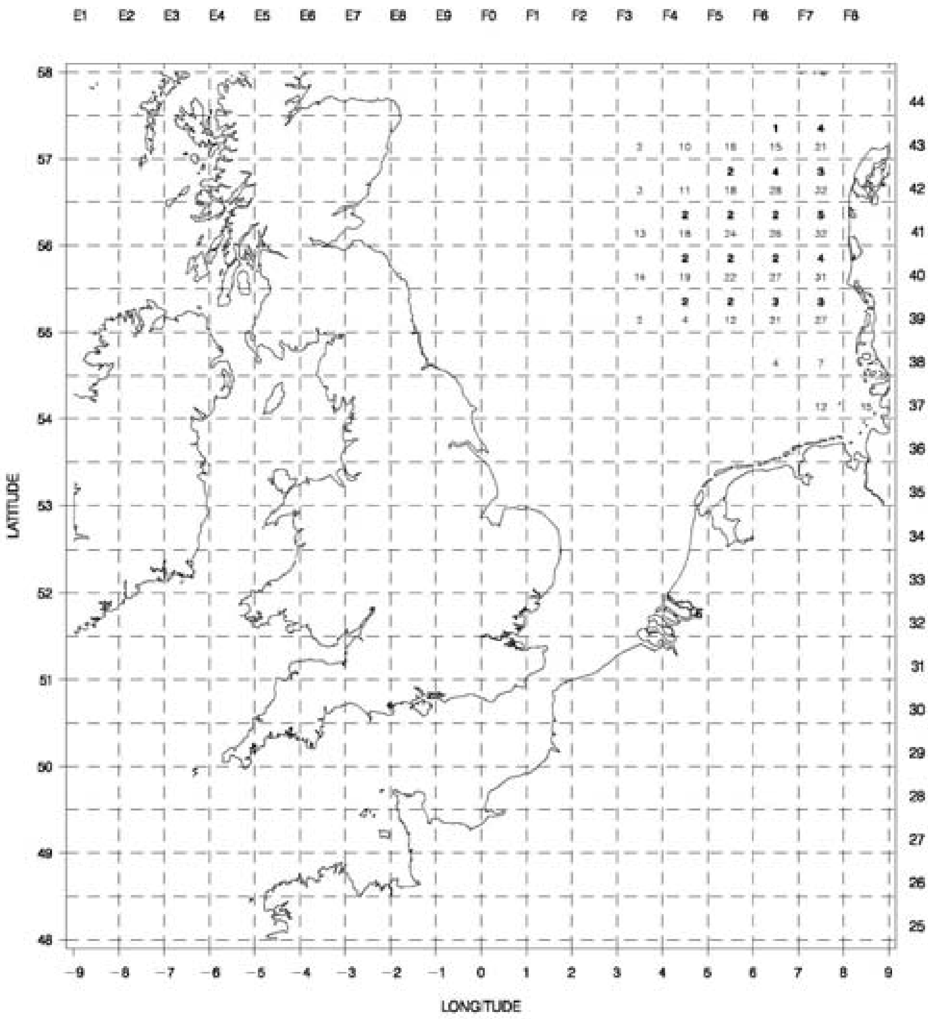
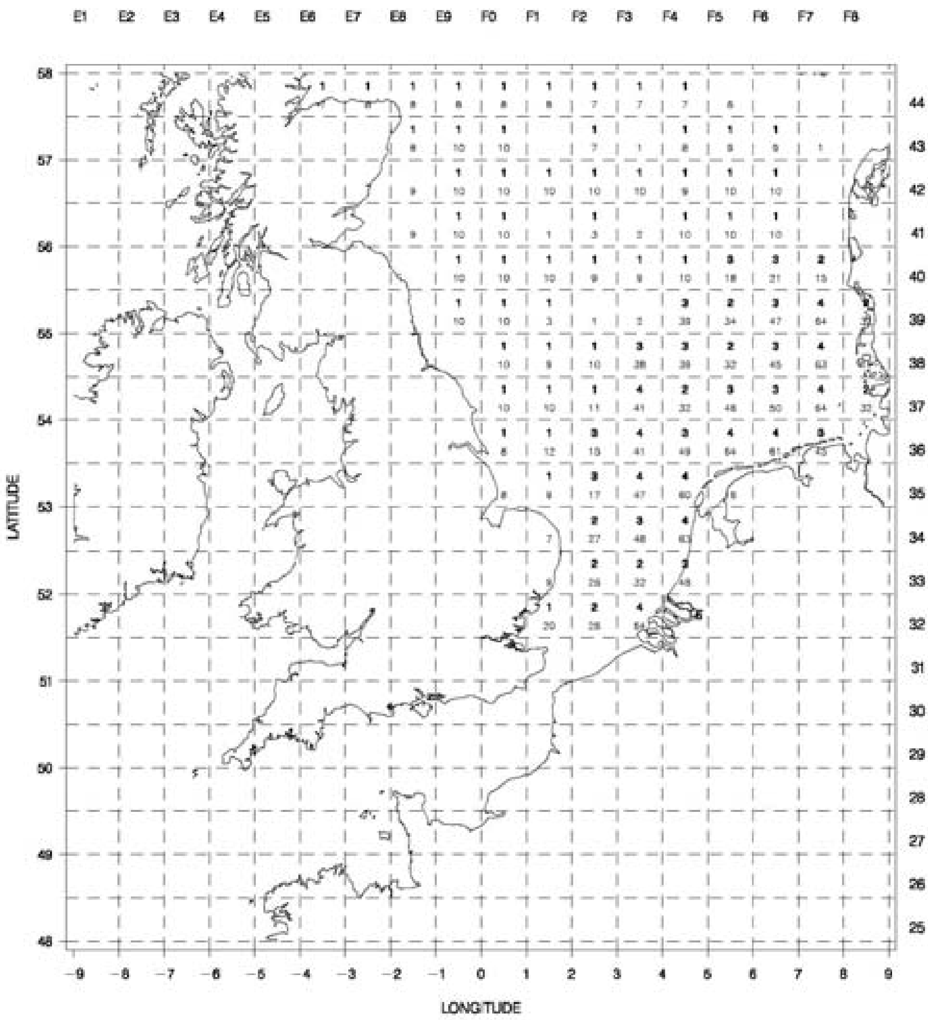


Figure 2.1.4 Total number of beam trawl hauls per rectangle.
Total hauls in 2005 (above) and total for 1990 – 2005 (below) for NED .



Annex 5: Spatial distribution of fish species

Figure 2.3.1 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+' = < 0.5)
Dab

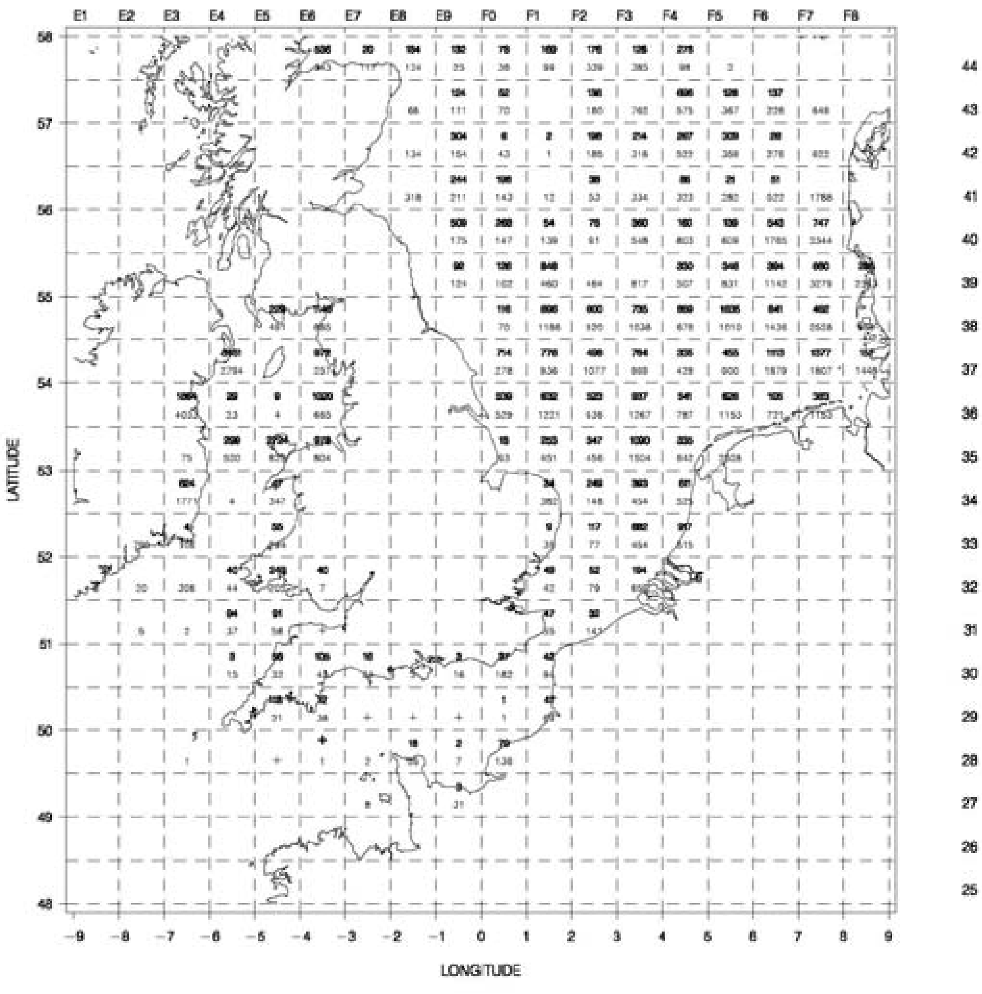


Figure 2.3.2 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+' = < 0.5)
Sole

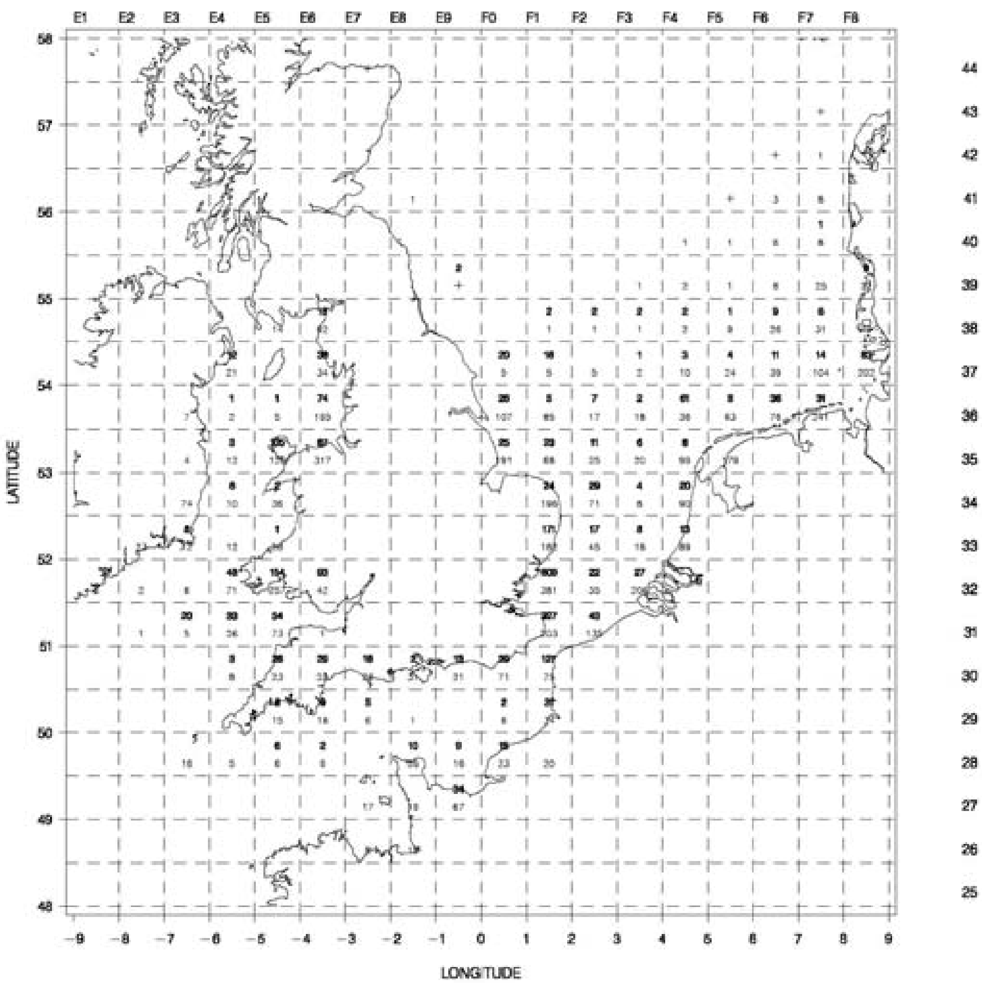


Figure 2.3.3 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+' = < 0.5)
Plaice

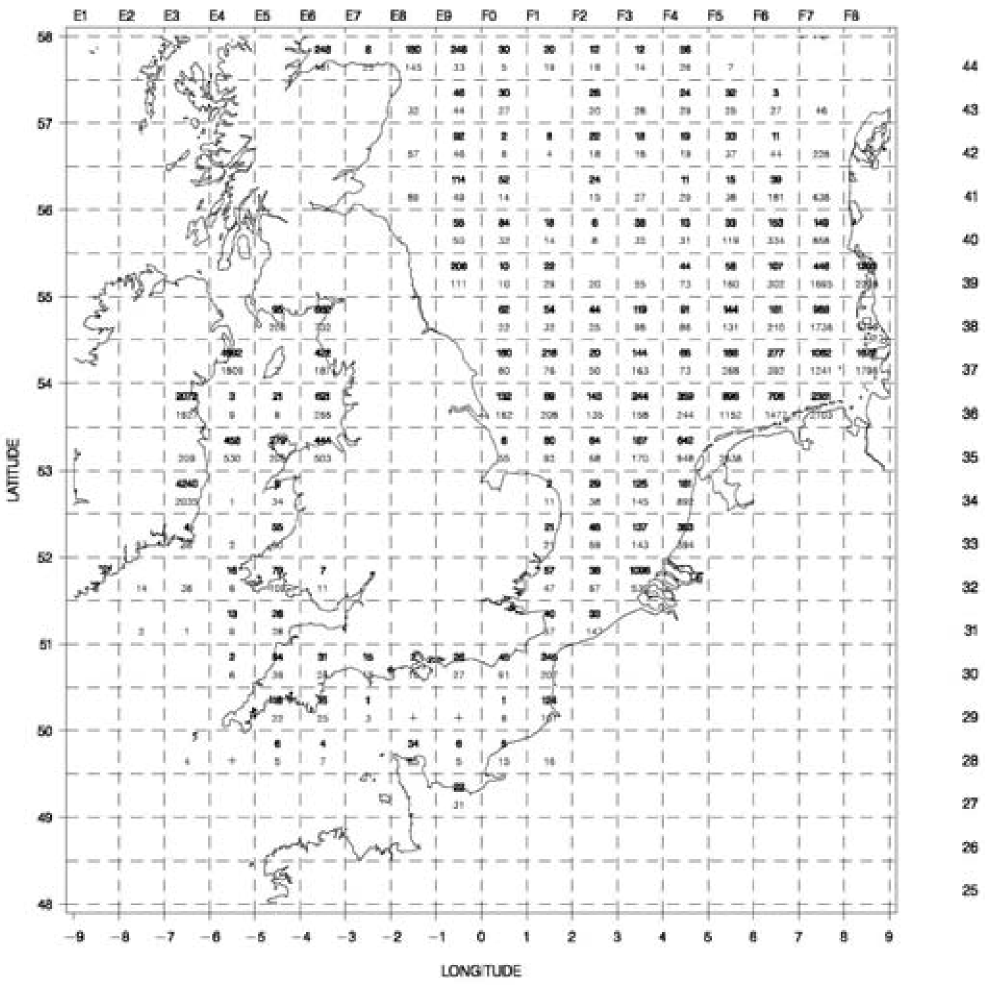


Figure 2.3.4 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Turbot

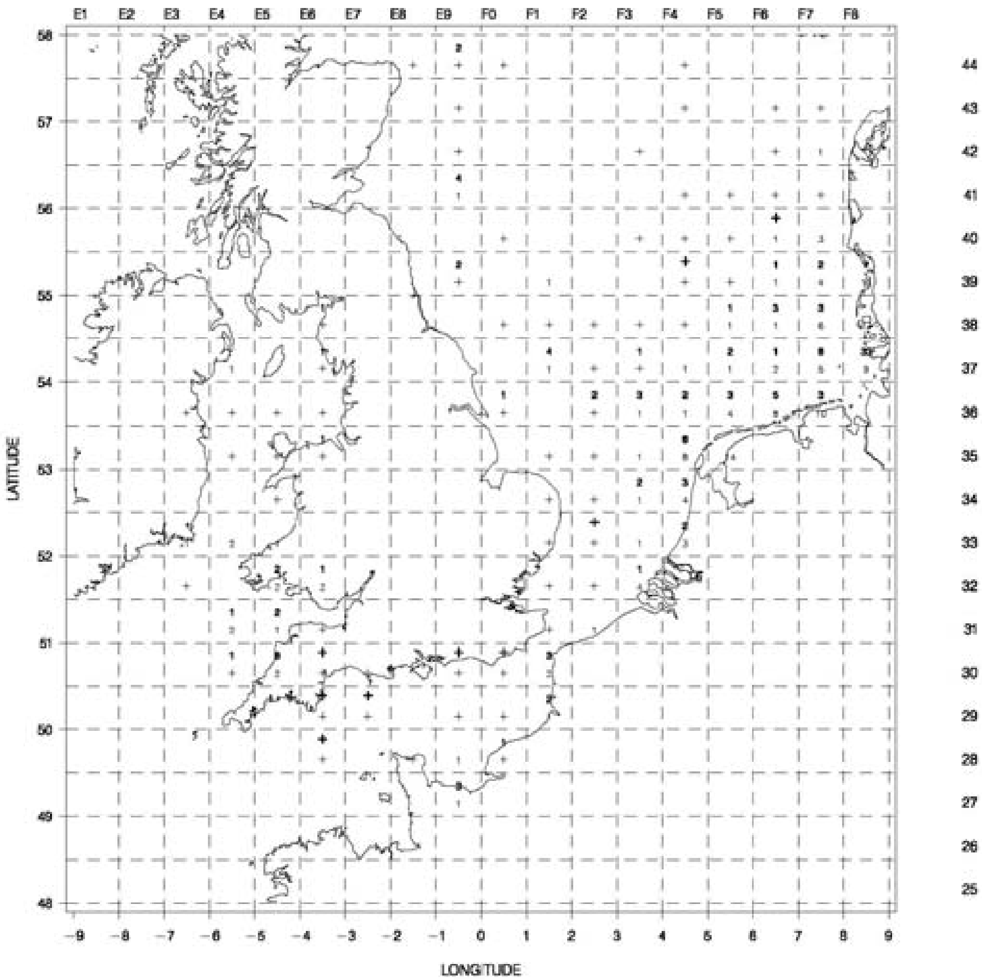


Figure 2.3.5 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Brill

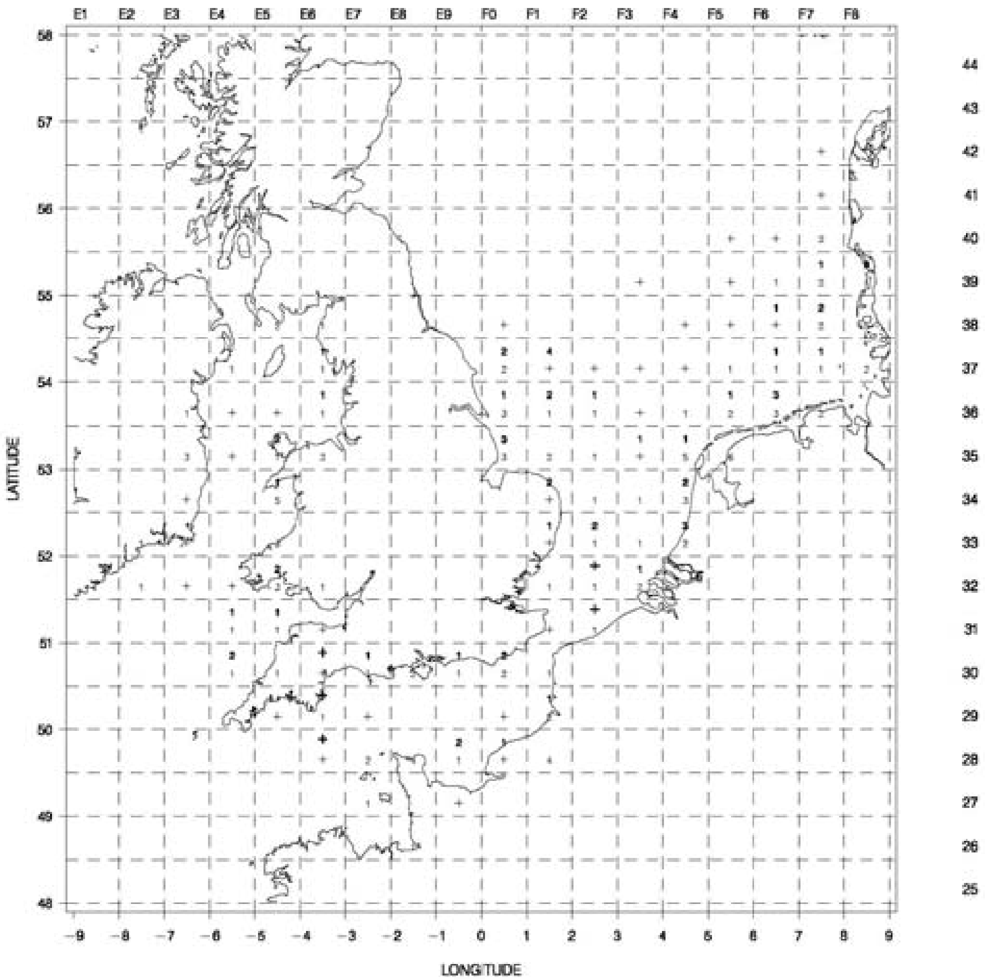


Figure 2.3.6 International Beam Trawl Surveys 1990−2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Scaldfish

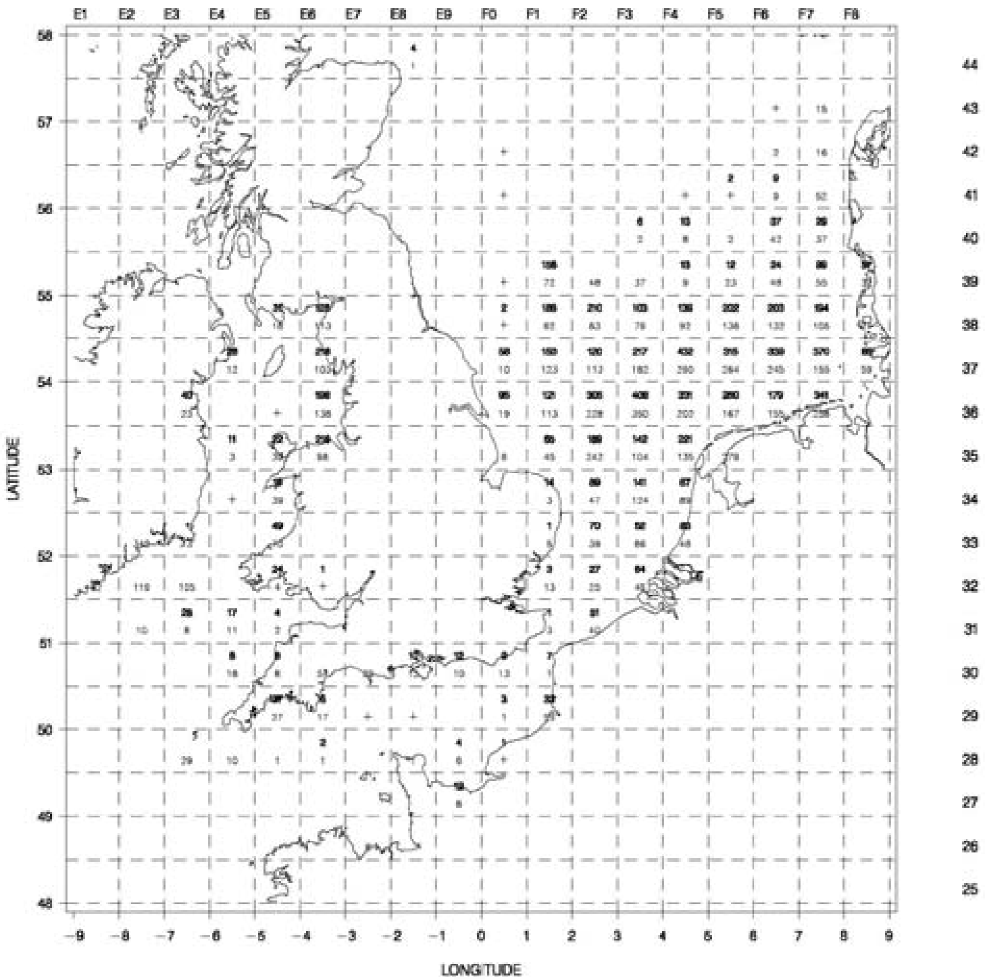


Figure 2.3.7 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Lemon sole

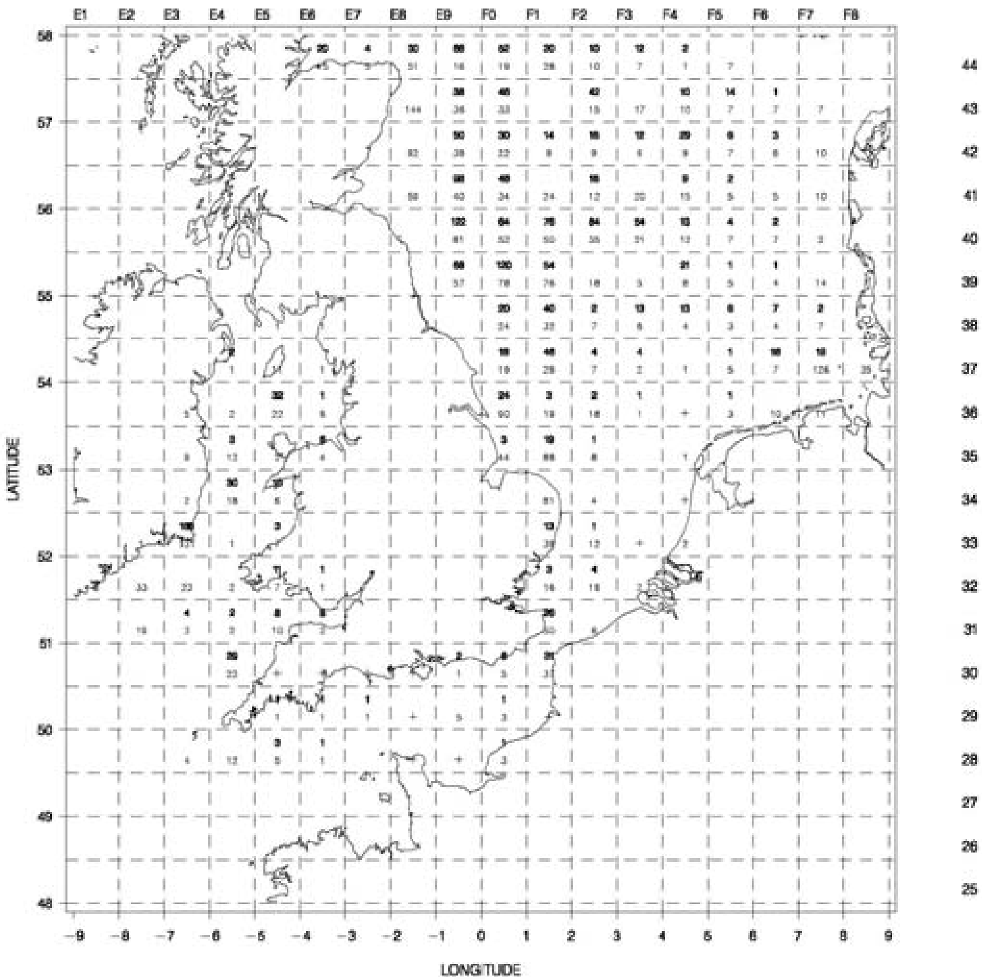


Figure 2.3.8 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
American plaice (Long rough dab)

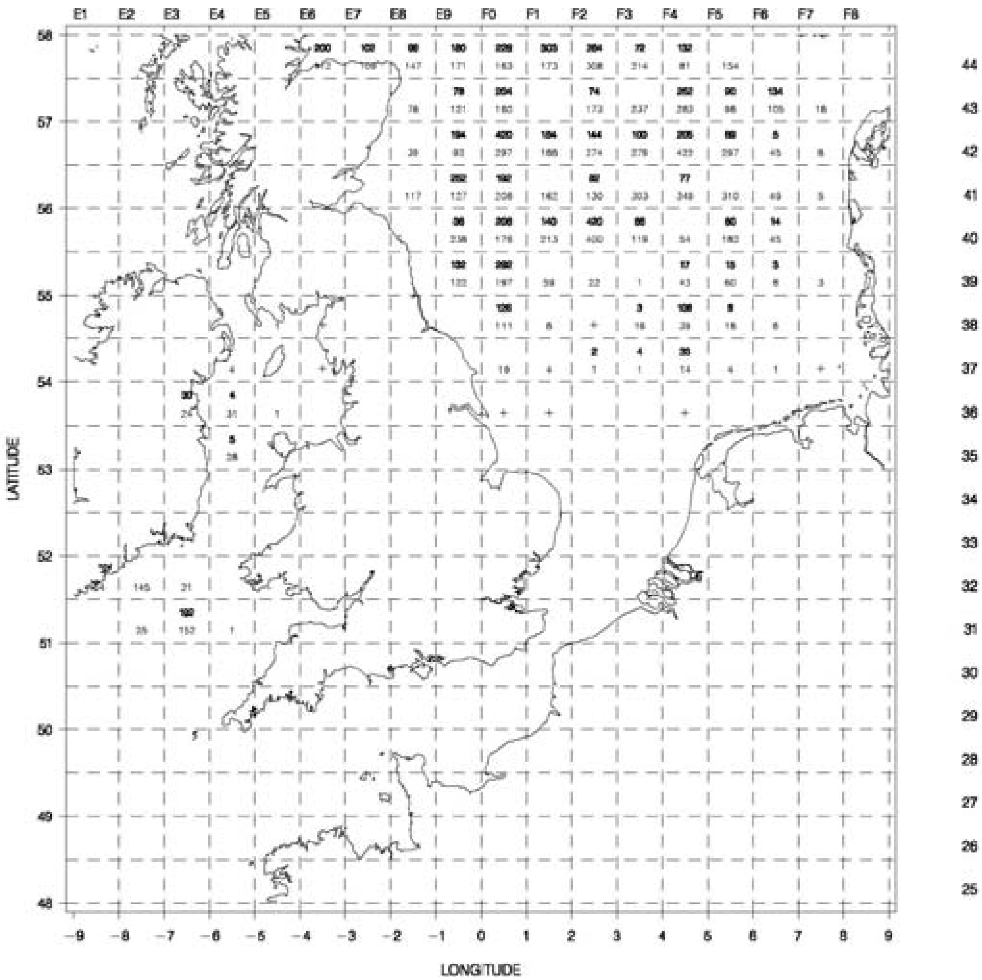


Figure 2.3.9 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Flounder

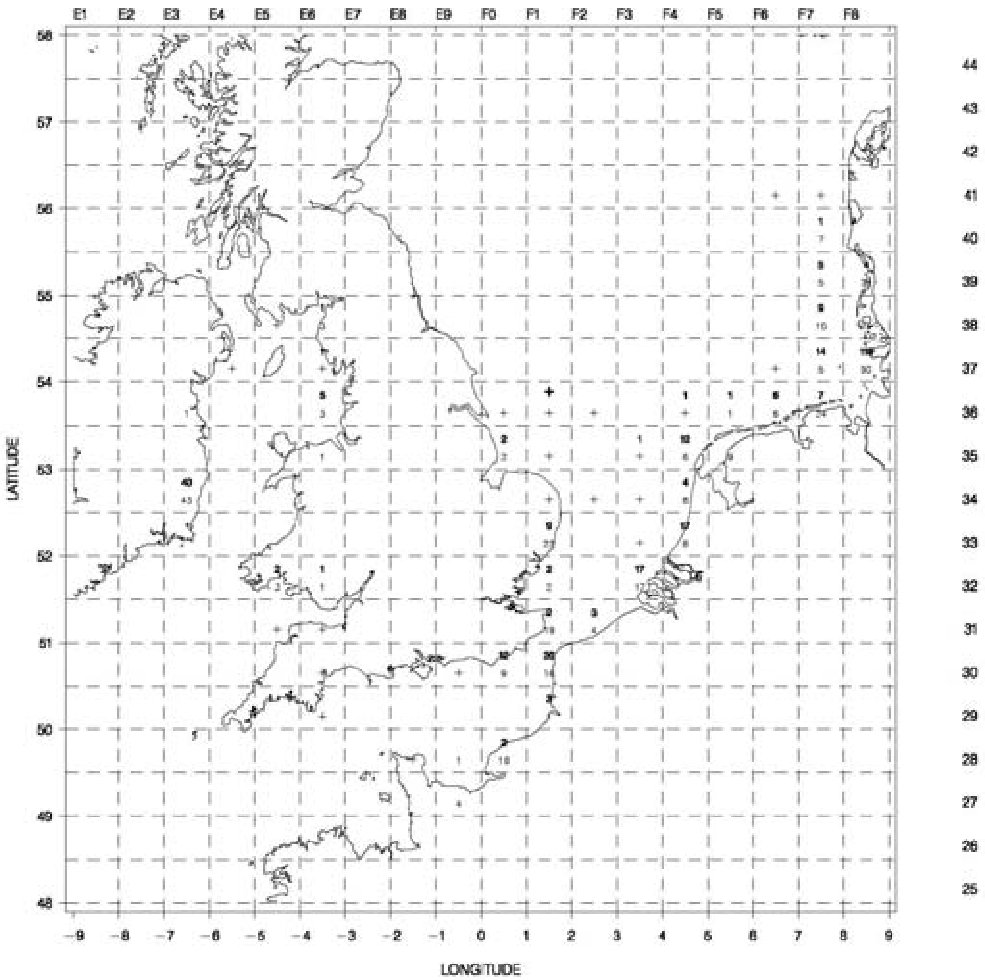


Figure 2.3.10 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Solenette

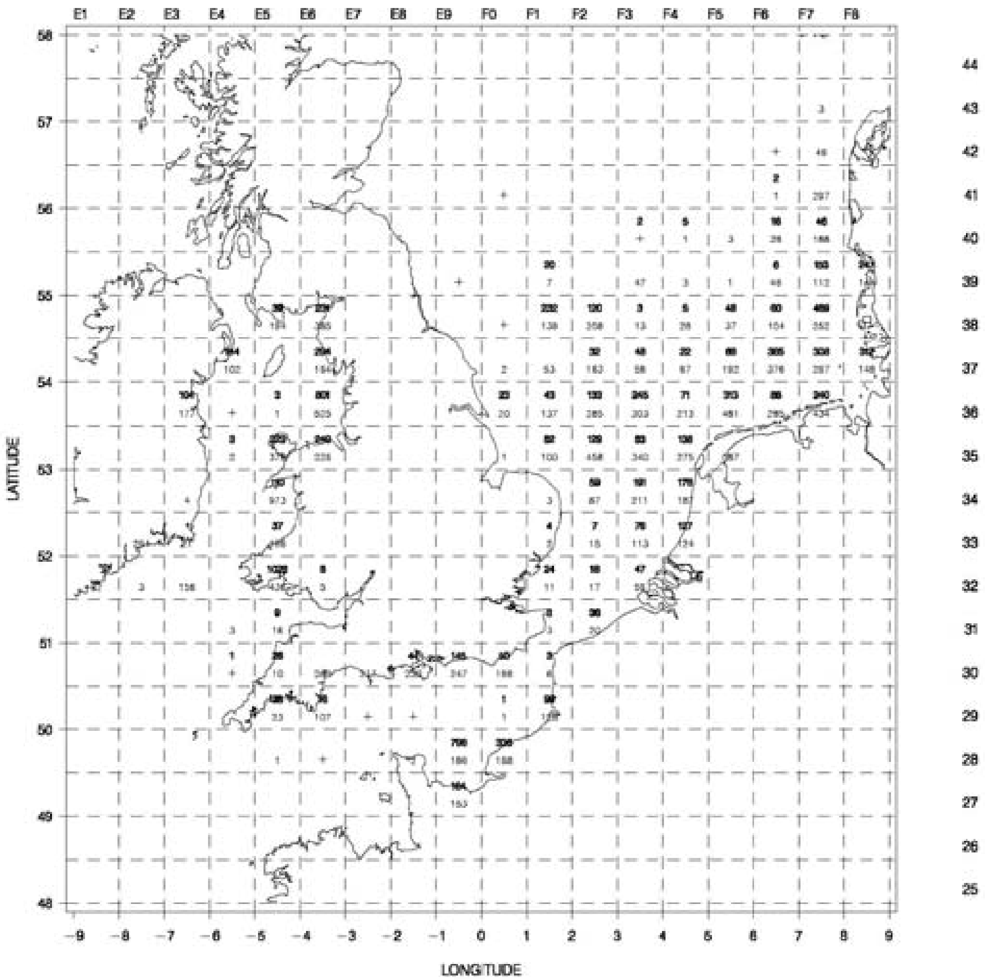


Figure 2.3.11 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Thickback sole

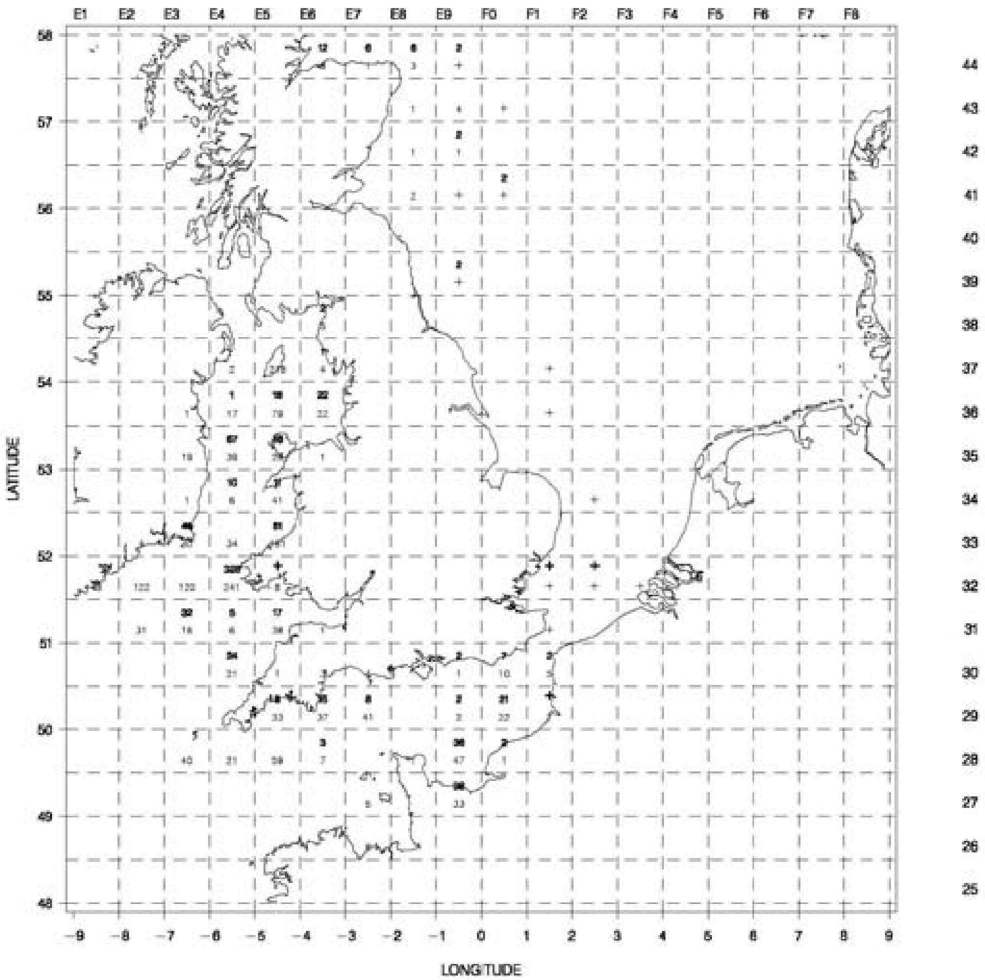


Figure 2.3.12 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Pogge (Armoured bullhead)

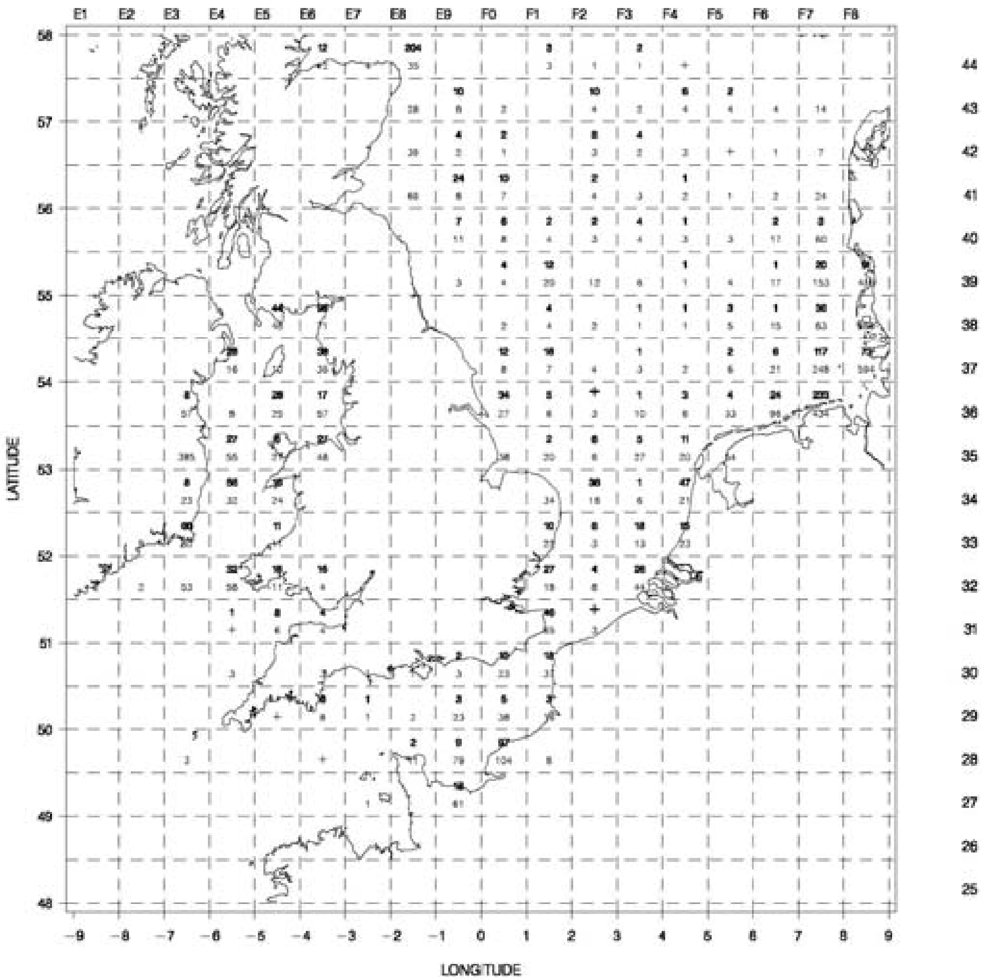


Figure 2.3.13 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Tub gurnard

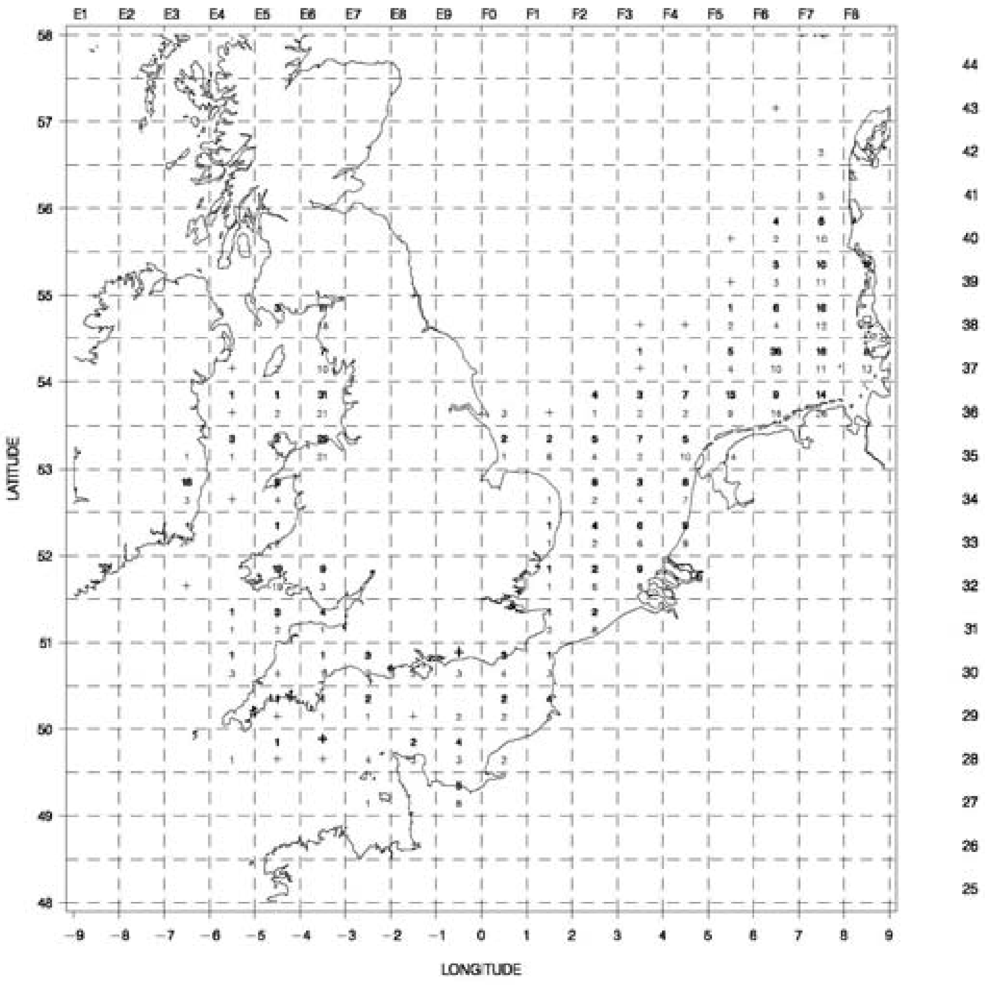


Figure 2.3.14 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Grey gurnard

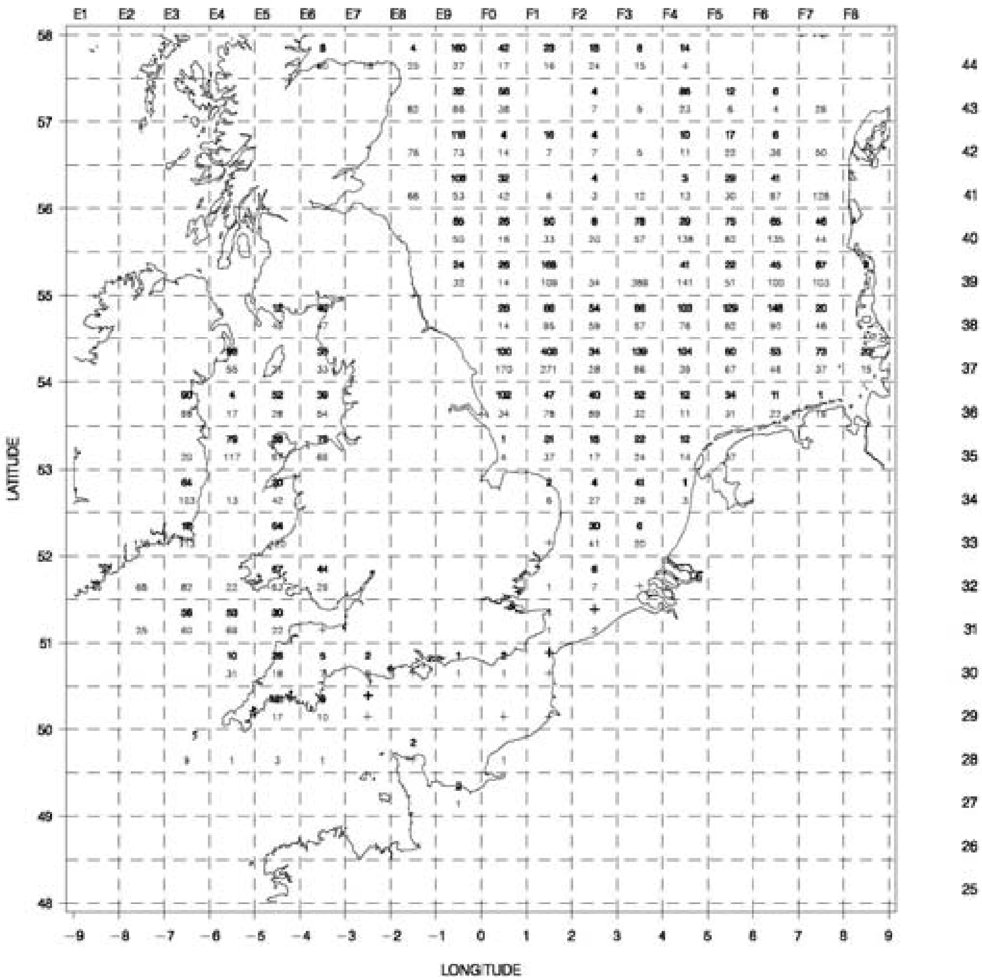


Figure 2.3.15 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Lesser weever

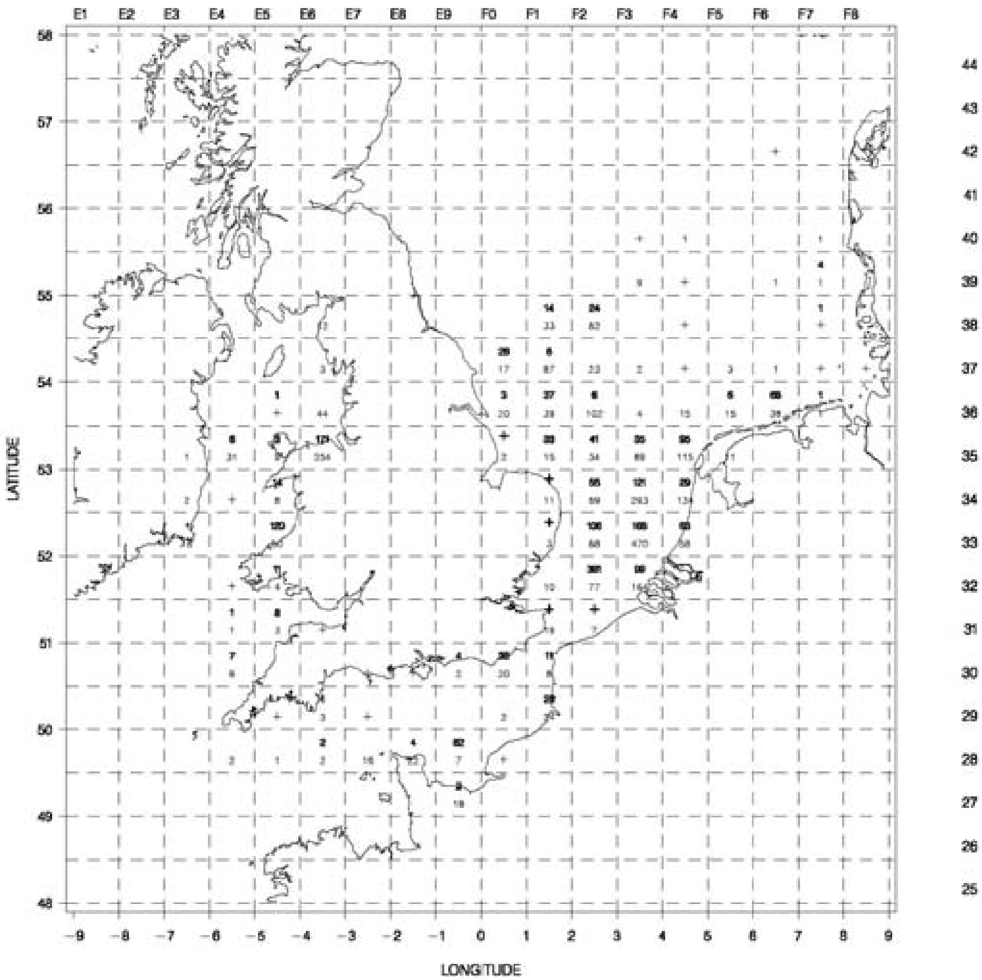


Figure 2.3.16 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Common dragonet

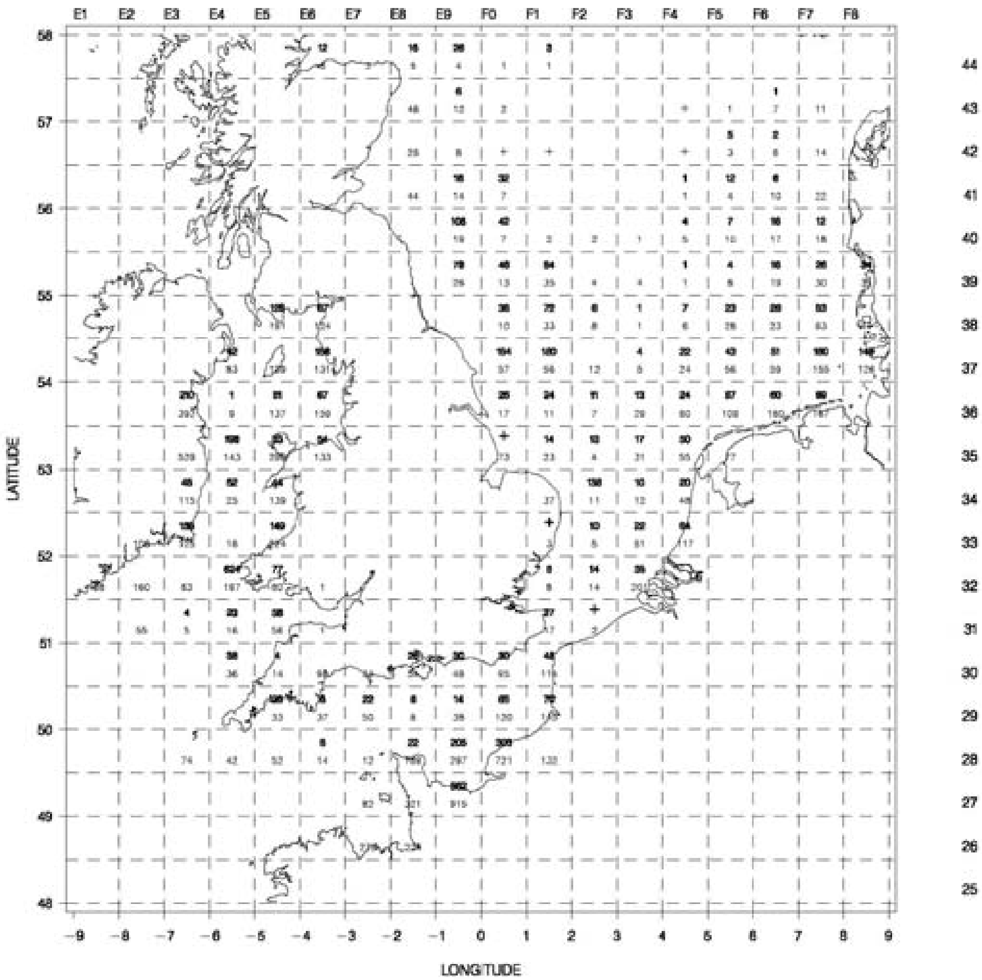


Figure 2.3.17 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Lesser spotted dogfish

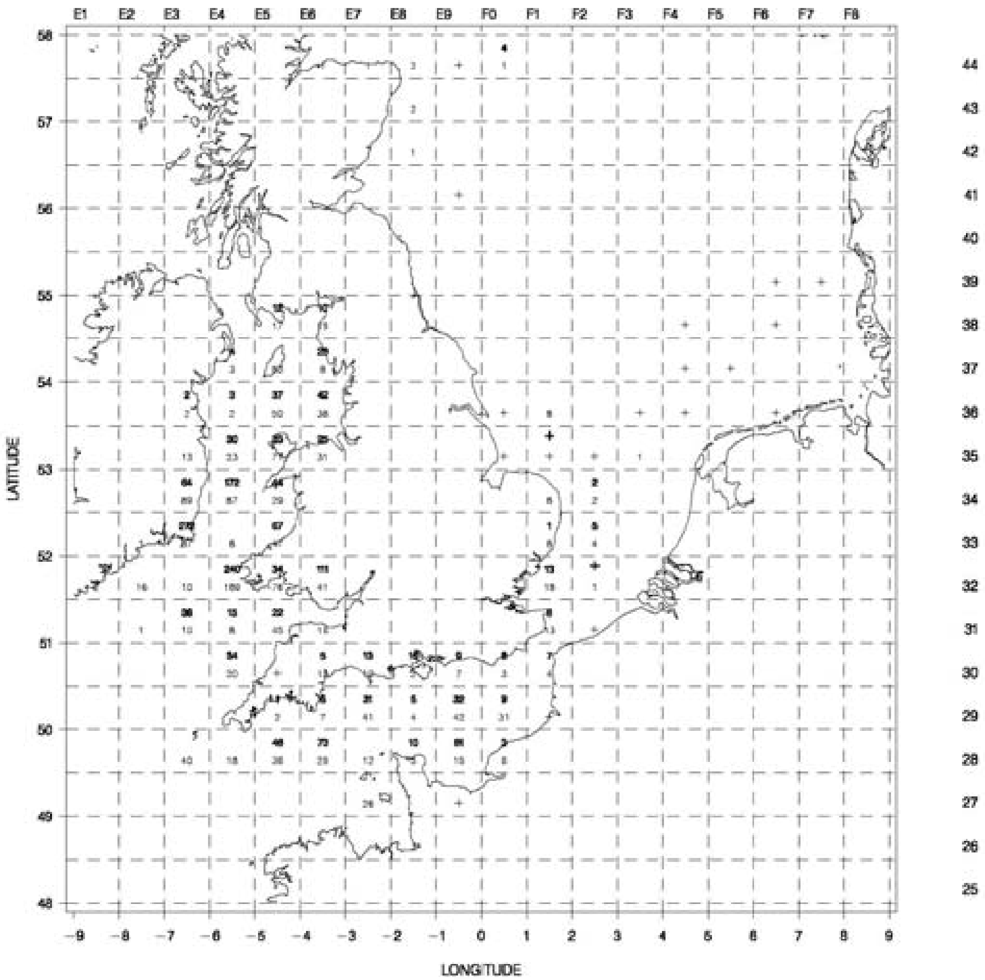


Figure 2.3.18 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Rays

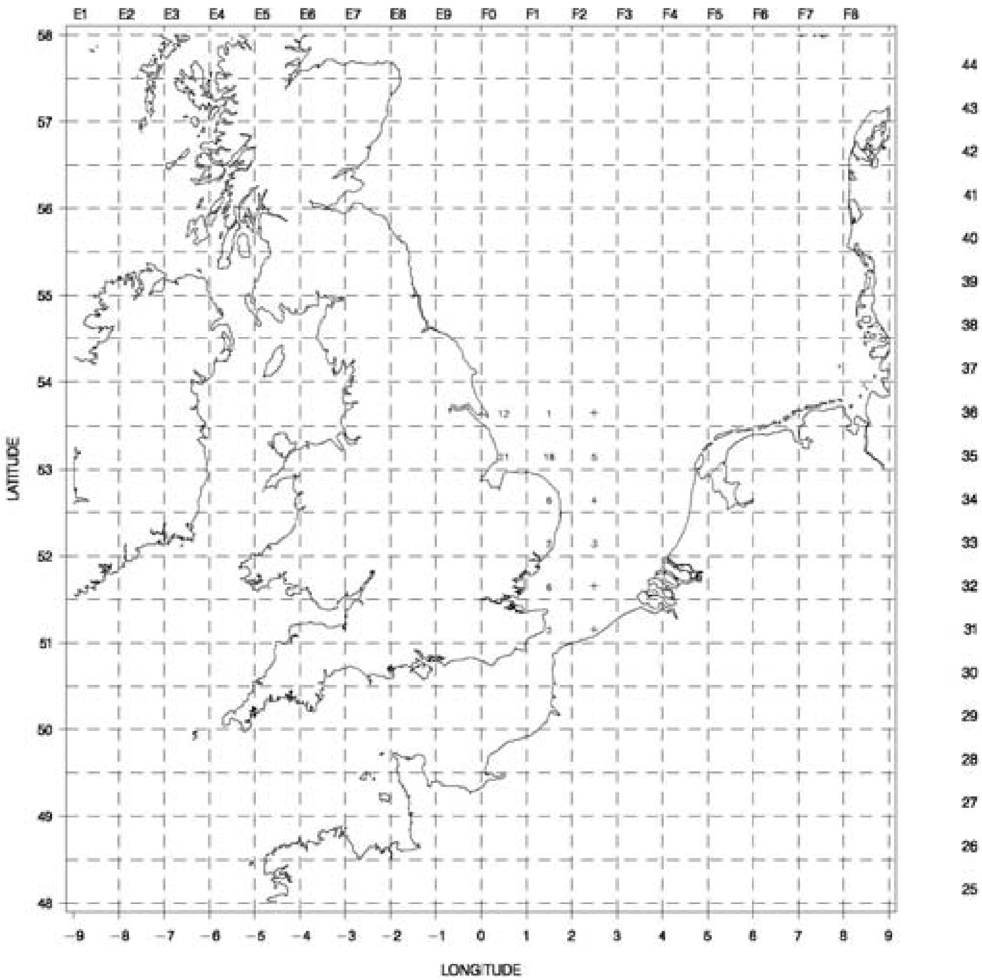


Figure 2.3.19 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Cod

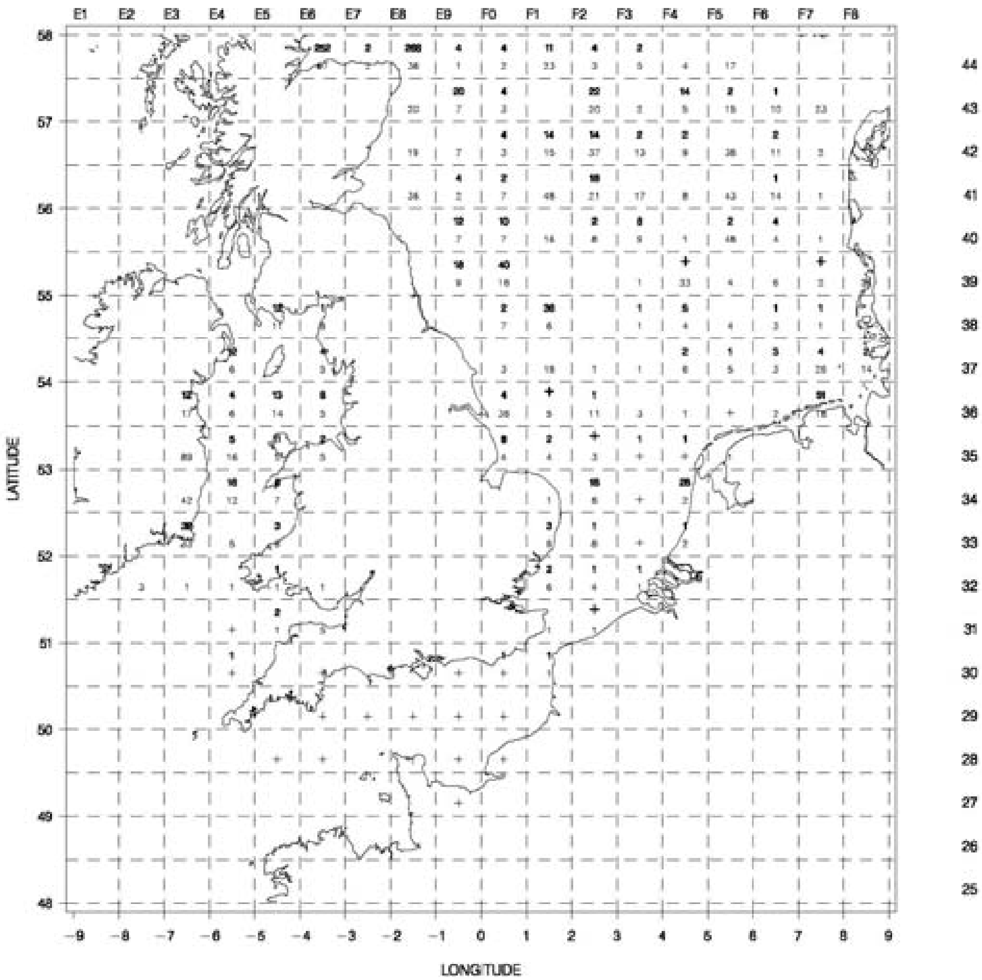


Figure 2.3.20 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Poor cod

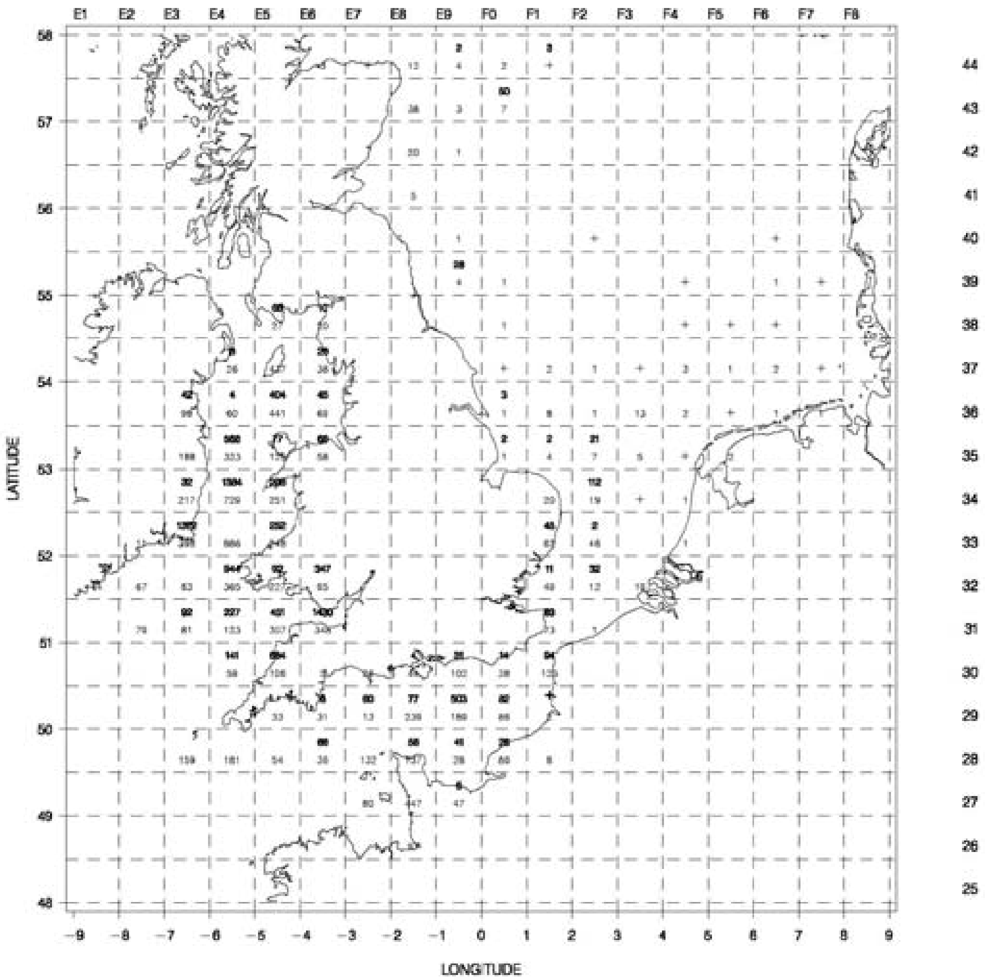


Figure 2.3.21 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Haddock

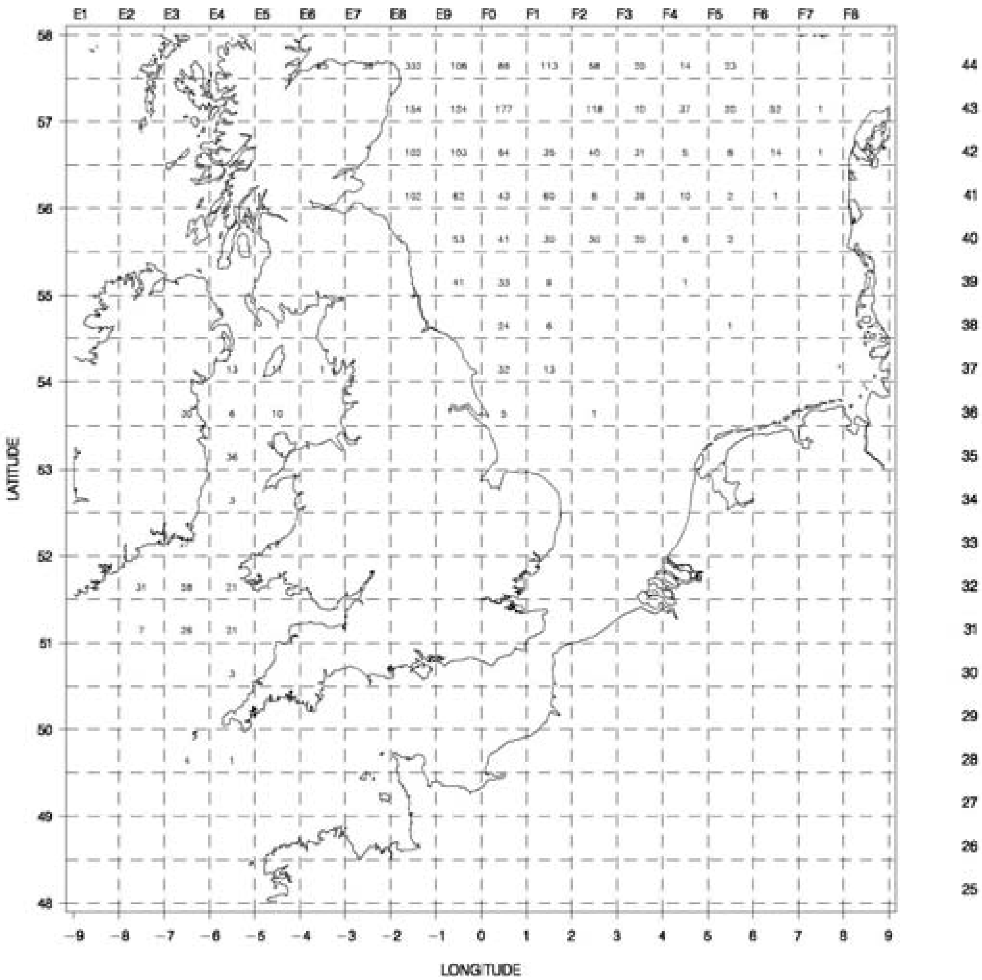


Figure 2.3.22 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+' = < 0.5)
Pout whiting (Bib)

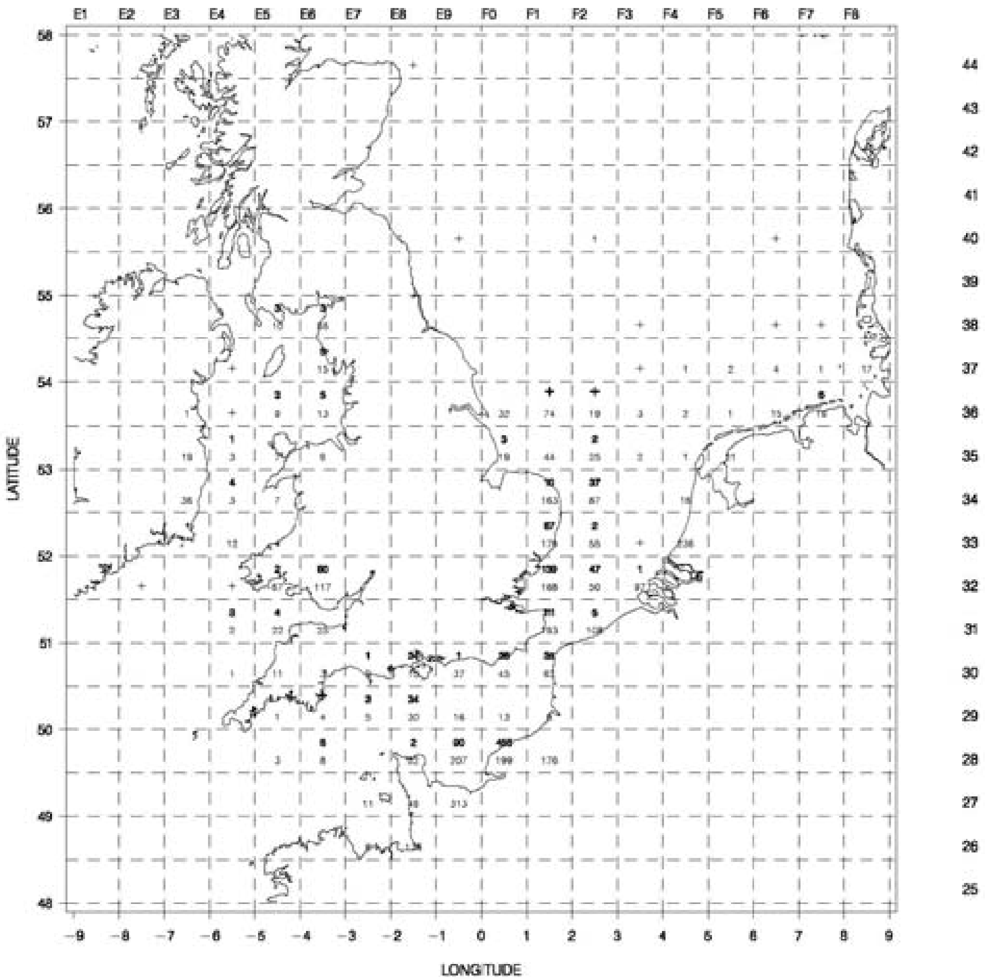


Figure 2.3.23 International Beam Trawl Surveys 1990–2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Whiting

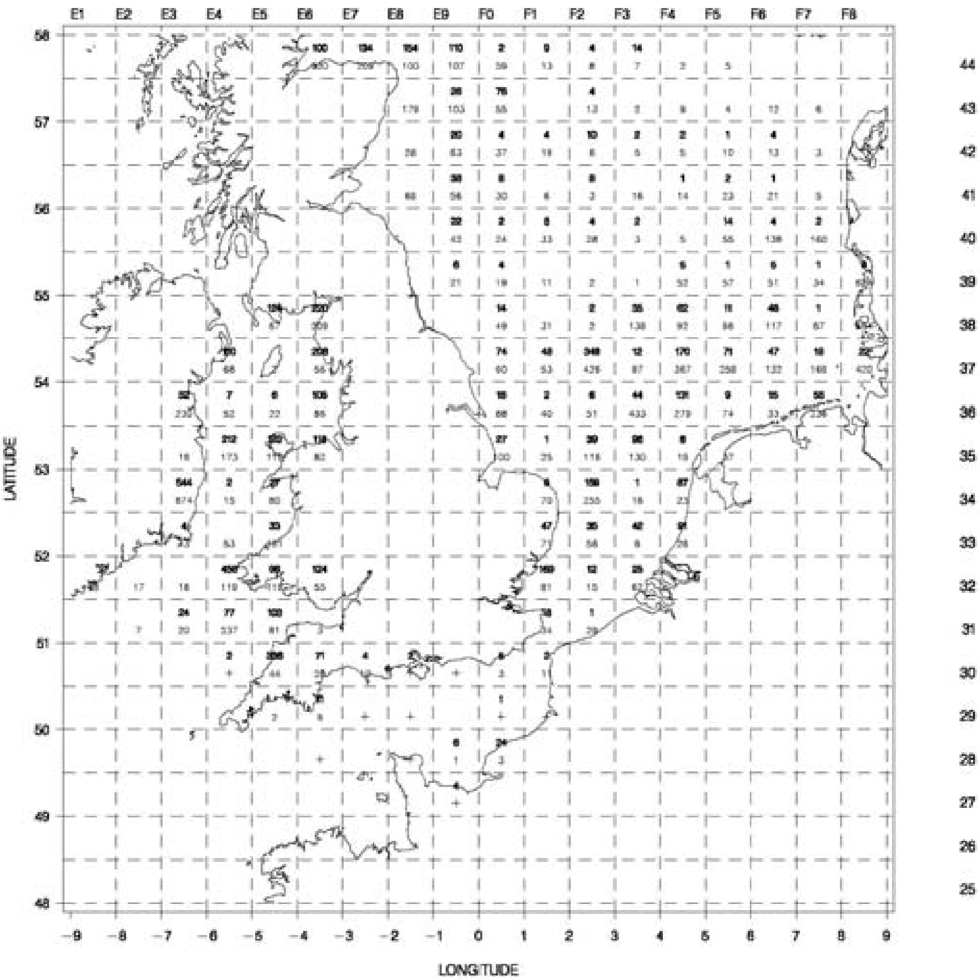


Figure 2.3.24 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Angler fish (Monk fish)

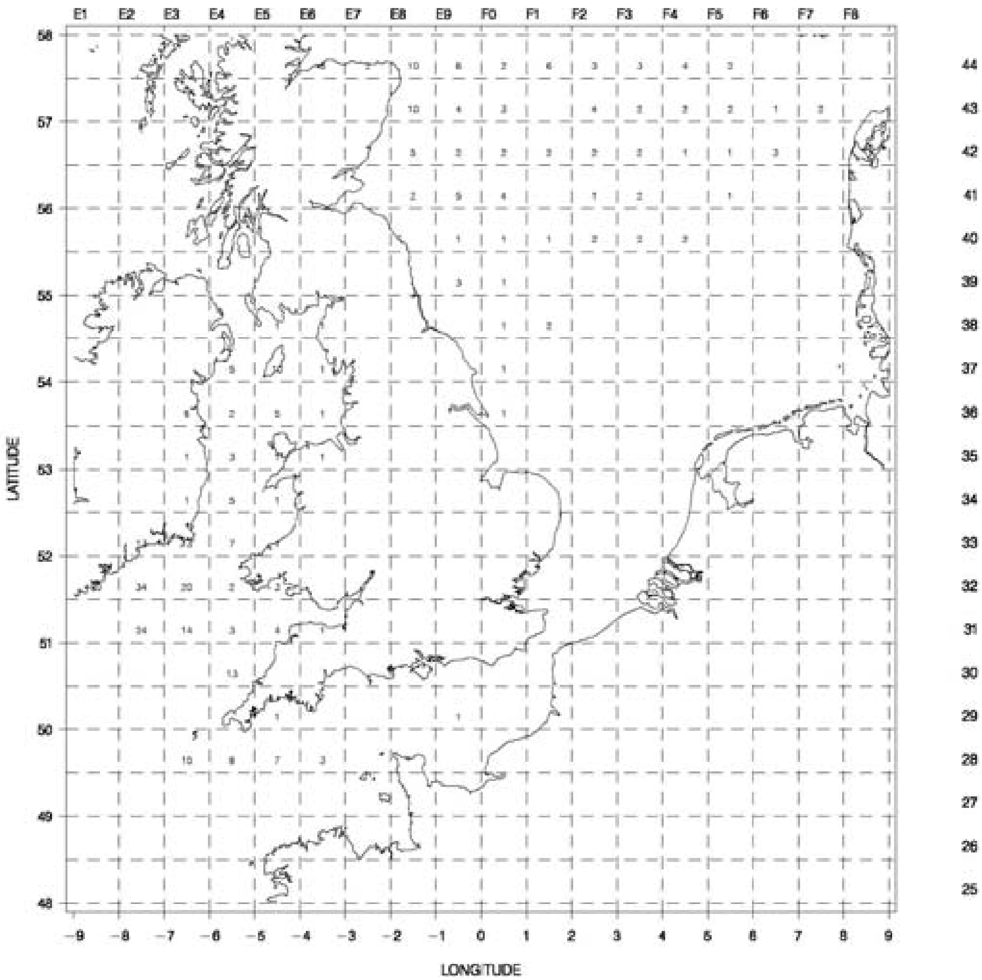


Figure 2.3.25 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
John dory

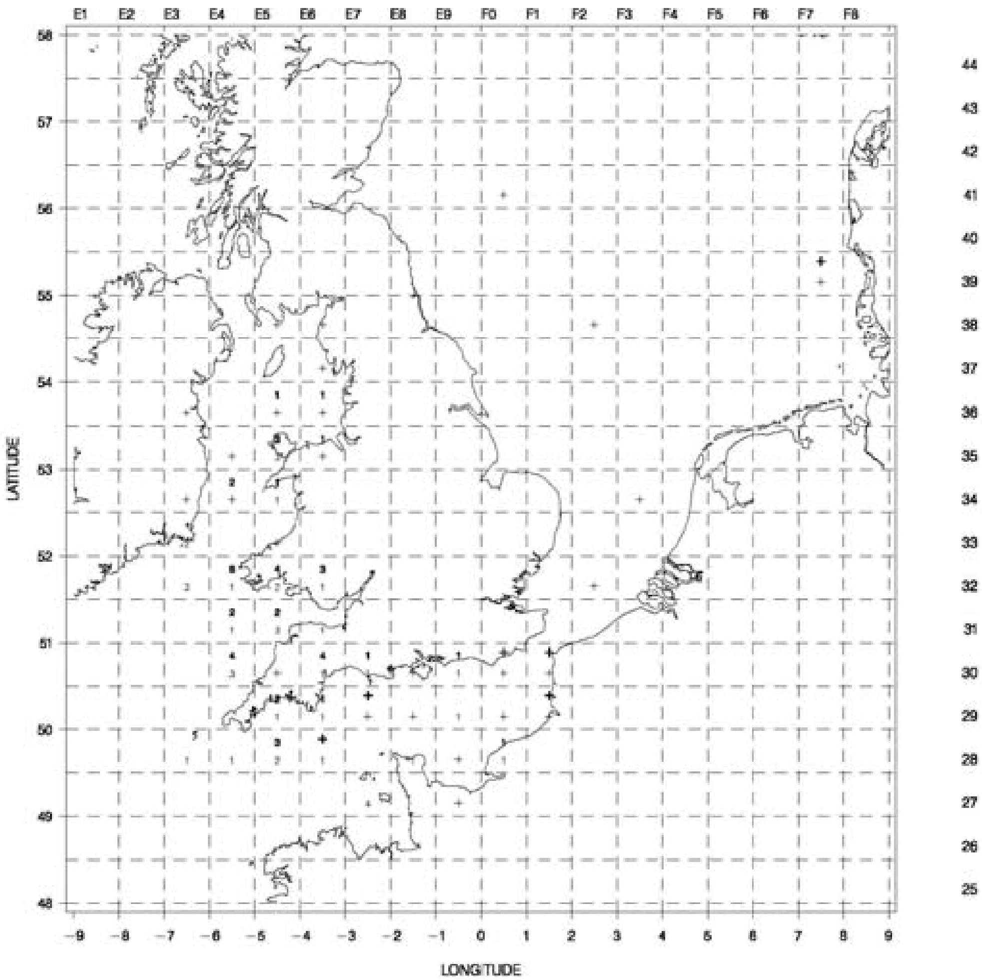
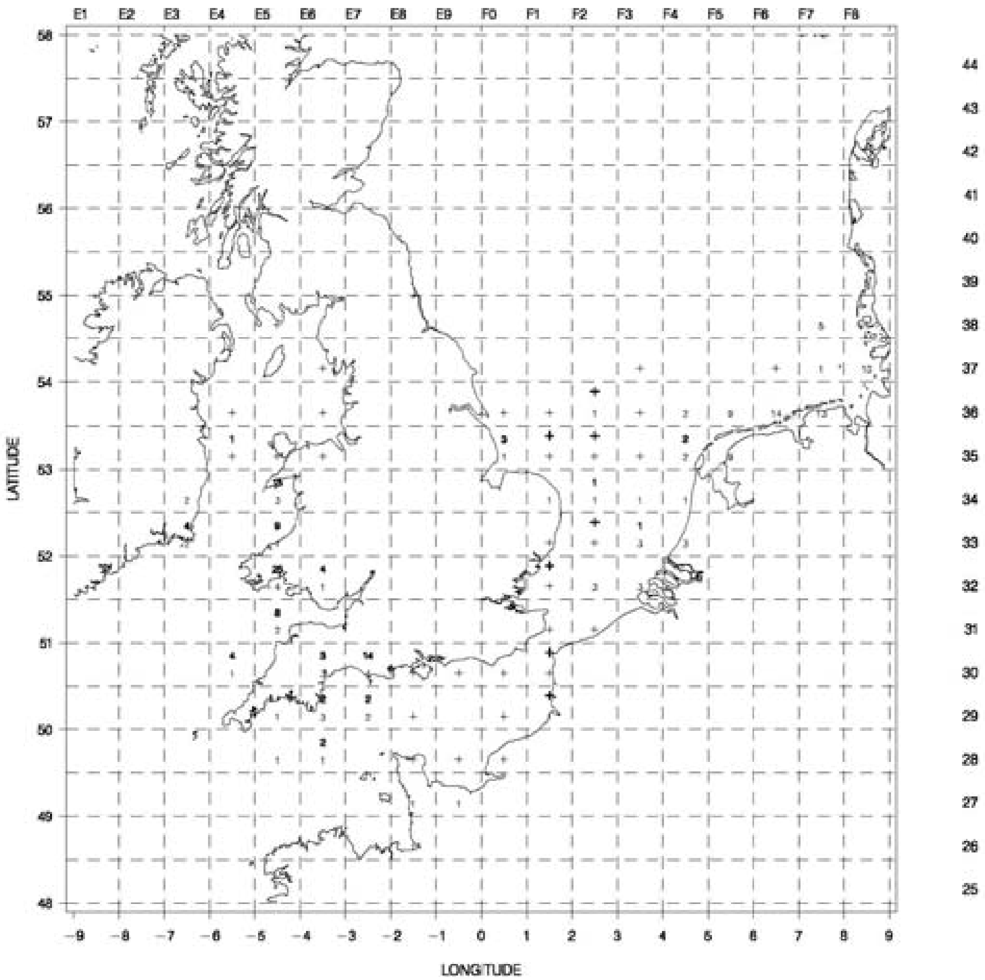
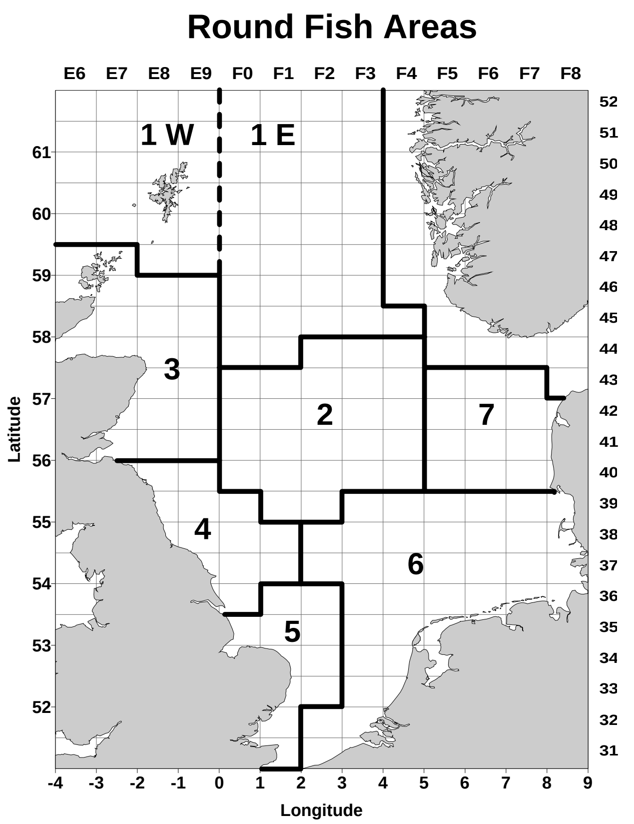


Figure 2.3.26 International Beam Trawl Surveys 1990 – 2005
Catches in number / 8m beam / hour / rectangle
2005 data in bold, above the survey mean ('+'= < 0.5)
Red mullet



Annex 6: Charts of Roundfish areas



Annex 7: Manual for the Beam Trawl Surveys – Revision 1

MANUAL FOR THE BEAM TRAWL SURVEYS
REVISION I

The Beam Trawl Survey Working Group

Table of Contents

Annex 8: Tables – Number of Hauls by area and year

Number of hauls by area and year for the Dutch DFS.

region	Belgian Coast	Dutch coast							Scheldt Est			Dutch Wadden Sea						
area_code	400	401	402	403	404	405	406	407	631	634	638	610	612	616	617	618	619	620
1970		6	19	23	42	13	7	11	13	31	26	23		24	16	10	12	20
1971		9	16	23	37	10	4	8	4	29	30	25		28	14	8	12	22
1972		8	22	22	34	9	4	8	5	29	28	18		25	11	10	10	20
1973		8	16	18	36	10	5	8	5	30	31	18	2	24	11	9	9	22
1974		8	23	21	42	12	6	8	6	32	32	19	7	24	12	10	11	21
1975		8	18	22	39	12	6	8	4	31	26	21	7	25	14	9	10	21
1976		5	8	15	21	8	4	7	6	30	26	21	7	25	13	10	10	21
1977		15	24	24	44	8	4	7	8	28	27	21	7	26	13	10	11	21
1978		6	22	25	43	17	20	25	5	30	28	21	7	26	13	10	10	21
1979		5	22	23	33	17	22	26	6	28	28	21		26	13	10	10	21
1980		14	13	24	47	18	20	30	6	27	29	21	7	26	13	10	10	21
1981		15	16	24	46	20	14	7	6	28	27	19	6	28	13	10	10	21
1982	3	23	15	24	47	25	25	13	6	28	27	21	7	26	13	10	10	21
1983		23	20	22	32	19	25	13	7	27	27	21	7	26	13	10	9	21
1984		23	20	22	52	26	26	11	6	27	27	22	7	25	12	10	10	21
1985		22	19	24	42	26	24	14	6	26	27	21	7	26	12	10	8	20
1986		17	17	19	49	26	25	12	6	26	27	21	7	26	13	10	9	21
1987		18	17	21	47	26	24	14		30	28	17	7	30	13	10	8	23
1988		18	18	18	49	26	23	11		24	27	21		26	13	9	8	22
1989		26	17	20	48	21	27	13		40	30	21		26	13	10	8	23
1990		25	13	9	28	15	21	6		39	29	21		25	13	11	8	23
1991		16	13	9	28	15	21	6		31	31	23	5	25	13	10	10	24
1992		26	16	13	28	15	21	6		36	28	23	6	26	12	6		28
1993		22	20	9	28	15	21	5		31	27	23		27	14	11	8	29
1994		21	16	13	28	15	19	6		35	33	24		26	12	10	7	25
1995		17	13	9	25	14	22	6		41	33	31		23	15	10	9	26
1996		17	12	10	29	14	21	6		43	33	28	6	28	15	10	9	27
1997		17	13	9	28	13				43	34	27		28	15	11	9	27
1998		9	10	8						43	34	27	6	29	15	10	10	27
1999		17	14	8	14	1				43	35	28		31	14	13	10	22
2000		15	7	2	17	10	19	6		45	43	42		26	15	11	10	26
2001			14	6	29	16	20	4		46	50	29		28	15	12	11	27
2002		21	13	8	26	14				44	41	27		26	13	11	9	26
2003		16	14	9	28	15	18	6		42	36	29		27	13	9	9	26
2004		17	13	4	19	15	17	6		41	31	28	6	27	14	10	8	27
2005		17	14	14	30	15	15	8		43	36	29	6	25	13	11	9	34

Number of hauls by area and year for the German DYFS.

region	German Bight		German/DK Wadden Sea							
area_code	405	406	408	409	410	411	412	413	414	
1971										48
1972										47
1973										101
1974		14	10	18	15	42				31
1975		14	9	18	14	46				11
1976		14	8	18	14	46				59
1977		14	8	18	14	46	56			56
1978		11	4	18	14	45	34			
1979		14	8	18	14	46	43			34
1980		11	9	17	14	46	33			55
1981		10	8	22	14	43	65			66
1982		10	8	22	14	46	63			79
1983		5	4	11	7	32	47			88
1984		8	8	16	13	40	55			86
1985		11			70		57			85
1986		39		12	15	44	52			100
1987		6		10	49	30	50			87
1988		11			68	25	52			96
1989		7			61	29	52			99
1990		27	3	37	44	30	62			101
1991		17	5	16	43	45	54			95
1992		20	3	25	35	41	53			104
1993		22		27	20	39	54			79
1994		28	10	29	19	32	50			61
1995		21	7	13	14	20	10			100
1996		22		45	25	48	48			63
1997	62	36		38	18	51	51		9	
1998	30	53	9	46	33	87	45		39	
1999	14	51		28	26	70	49		54	
2000	29	34	6	34	30	56	48		52	
2001	29	32		31	28	58	45		49	
2002	21	31		28	26	50	47		47	
2003	12	26		29	30	65	46		49	
2004	12	28		29	28	48	49		44	
2005	8	25	6	16	12	22	21	32	25	

Number of hauls by area and year for the Belgian DYFS.

region	Belgian Coast
area_code	400
1973	35
1974	35
1975	35
1976	35
1977	29
1978	27
1979	29
1980	36
1981	33
1982	33
1983	33
1984	32
1985	33
1986	33
1987	33
1988	29
1989	33
1990	33
1991	33
1992	24
1993	33
1994	33
1995	33
1996	33
1997	33
1998	33
1999	31
2000	27
2001	33
2002	33
2003	33
2004	33
2005	33

Annex 9: Tables Number of Hauls by depth class, year and country

Number of hauls by depth class, year and country for the continental coastal areas.

region	Belgian Coast						Dutch coast				German Bight				German Bight			
depth zon	0-5	5-10	10-20	10-20	> 20		0-5	5-10	10-20	> 20	0-5	5-10	10-20	> 20	0-5	5-10	10-20	> 20
country	BEL	BEL	BEL	NED	BEL	BEL	NED	NED	NED	NED	NED	NED	NED	NED	GFR	GFR	GFR	GFR
1970							1	20	40	29			14	17				
1971								17	36	32		1	8	13				
1972								19	39	28		3	6	12				
1973		14	14		2	5		19	30	29		1	11	11				
1974		12	13		5	5		13	53	28		1	14	11	10	4		
1975						35		13	39	35			14	12	7	7		
1976		5	15		2	13		6	24	19		2	11	6	6	8		
1977		10	9		1	9	12	16	55	24		2	8	9	6	8		
1978		8	12			7		24	47	25		16	37	9	4	7		
1979		11	11		4	3	1	24	41	17	1	22	30	12	6	8		
1980		14	15		2	5	22	14	41	21	22	20	15	11	4	7		
1981		6	19		4	4	22	12	50	17	3	5	20	13	2	8		
1982		12	11	3	4	6	19	18	52	20	14	13	27	9	2	8		
1983	4	13	15		1		26	9	42	20	13	15	20	9	1	4		
1984	2	12	17		1		19	19	51	28	5	16	32	10	2	6		
1985	3	12	16		2		20	16	46	25	11	18	24	11	3	7	1	
1986	4	12	14		3		13	23	38	28	12	11	30	10	15	22	2	
1987	5	15	10		3		27	13	46	17	12	16	27	9	2	3	1	
1988	3	15	10		1		10	27	42	24	3	18	26	13	1	9	1	
1989	9	15	8		1		4	37	42	28	1	20	28	12		5	2	
1990		9	21		3		8	40	22	5	6	14	22		8	10	9	
1991	2	16	15				13	21	26	6	5	23	14		7	3	7	
1992	4	12	7		1		19	21	27	16	9	15	18		5	9	6	
1993	3	20	8		2		14	30	29	6	6	18	17		5	10	7	
1994	8	13	10			2	18	17	30	13	5	12	23		4	13	11	
1995	7	15	10		1		11	22	25	6	3	25	14		6	7	8	
1996	5	15	12		1		1	36	27	4	1	21	19		10	6	6	
1997	3	16	12		1	1	1	31	29	6		7	6		41	39	18	
1998	5	15	4		2	7		12	15						18	39	20	6
1999	4	17	9		1			8	37	8			1		16	32	17	
2000	1	8	14		1	3		16	18	7		13	22		10	32	20	1
2001	4	16	11		2			8	28	13		2	34	4	15	27	19	
2002	2	19	9		3		5	27	29	7		5	9		14	27	10	1
2003	5	16	11		1		9	32	26		1	26	12		7	18	13	
2004	4	17	8			4	1	21	28	3		17	21		8	18	14	
2005	4	18	9		1	1	2	35	29	9	2	16	20		7	17	8	1

Number of hauls by depth class, year and country for the Wadden Sea.

region	Dutch Wadden Sea					German/DK Wadden Sea			
depth zone	0-6	6-12	12-20	> 20	(blank)	0-6	6-12	12-20	> 20
country	NED	NED	NED	NED	NED	GFR	GFR	GFR	GFR
1970	64	39	2						
1971	50	56	3						
1972	44	40	9	1					
1973	39	51	5						
1974	37	59	8			72	13		
1975	45	57	5			73	14		
1976	53	47	7			72	14		
1977	44	54	11			123	19		
1978	46	51	11			101	14		
1979	40	51	10			115	14		
1980	46	52	10			105	14		
1981	41	55	11			138	14		
1982	48	49	11			137	16		
1983	56	40	11			86	14	1	
1984	50	48	9			118	14		
1985	50	45	9			96	30		1
1986	58	42	6	1		76	39	8	
1987	54	42	12			98	41		
1988	55	33	11			112	31	2	
1989	47	40	14			119	19	4	
1990	45	46	10			133	41	2	
1991	59	45	6			118	37	7	1
1992	45	51	5			124	28	5	
1993	60	44	8			96	37	7	
1994	58	39	7			94	42	3	1
1995	55	50	9			44	19		1
1996	62	51	10			114	47	4	1
1997	62	44	10	1		130	31	4	2
1998	54	52	15	3		181	61	15	2
1999	50	54	12	2		174	43	10	
2000	42	71	15	2		181	37	8	
2001	54	56	11	1		152	48	11	
2002	54	45	12	1		159	35	4	
2003	43	59	11			166	44	8	1
2004	40	59	16	3	2	144	44	10	
2005	47	59	19	1	1	96	30	8	

Number of hauls by depth class and year for the Scheldt estuary.

region	Scheldt Est			
depth zone	0-5	5-10	10-20	> 20
country	NED	NED	NED	NED
1970	11	36	21	2
1971	11	36	15	1
1972	8	44	9	1
1973	11	42	13	
1974	4	47	18	1
1975	3	48	10	
1976	2	29	28	3
1977	1	9	42	11
1978		15	40	8
1979		10	45	7
1980	7	17	29	9
1981		16	41	4
1982		16	43	2
1983		20	37	4
1984	17	20	21	2
1985	8	24	25	2
1986	7	27	25	
1987	10	19	27	2
1988	8	21	19	3
1989	22	14	29	5
1990	1	20	32	15
1991	1	17	40	4
1992	15	19	23	7
1993	1	16	34	7
1994	13	18	27	10
1995	12	22	30	10
1996	15	19	33	9
1997	15	22	30	10
1998	14	21	34	8
1999	14	26	25	13
2000	12	20	48	8
2001	18	27	40	11
2002	22	24	31	8
2003	21	19	26	12
2004	23	20	23	6
2005	17	15	34	12