Fol. 41 Assess

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PART 2

REPORT OF THE ROUNDFISH WORKING GROUP

Aberdeen, 20-26 October 1989

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Table 17.1 Nominal catch (in tonnes) of HADDOCK in Division VIa, 1979-1988, as officially reported to ICES.

Country	1979	1980	1981	1982	1983
Belgium	2	3	1	2	1
Denmark	37	-	-	+	-
Faroe Islands	2	-	-	-	-
France	4,786	2,808	3,403	3,760	4,520
Germany, Fed. Rep.	2	3	7	71	65
Ireland	877	726	1,891	4,402	3,450
Netherlands	2	2	3	391	25
Norway	9	16	29	37	68
Spain	-	-	-	97	201
UK (England & Wales)	1,654	1,279	1,052	2,035	1,376
UK (N. Ireland)	-	+	-	1	4
UK (Scotland)	7,459	8,198	12,051	19,249	21,593
Total	14,830	13,935	18,437	30,045	31,303

Country	1984	1985	1986	1987	1988
Belgium	6	7	-	29	8[1]
Denmark	-	-	-	4[1]	+[1]
Faroe Islands	-	-	1	-[1]	-[1]
France	4,240	5,930	4,956	5,456	2,884[1,2]
Germany, Fed. Rep.	83	38	25	21	17[1,3]
Ireland	3,932	3,512	2,026	2,628	2,197[1]
Netherlands	-	-	-	-	...[1]
Norway	33	76	45	13	54[1]
Spain	129	166	-	-	...
UK (England & Wales)	1,042	348	222	425	114
UK (N. Ireland)	5	1	155	1	35
UK (Scotland)	18,472	15,036	12,955	18,503	15,151
Total	27,942	25,114	20,385	27,080	20,460

[1] Preliminary.
[2] Includes Divisions Vb and VIb.
[3] Includes Division VIb.

Table 17.2 Annual weight and numbers of haddock caught in Division VIa between 1969 and 1988.

	Weight (1000 tonnes)				Number (millions)			
Year	Total	H.Con	Disc	By-cat	Total	H.Con	Disc	By-cat
1969	51	26	25	0	181	61	119	0
1970	40	34	6	0	123	82	40	0
1971	58	46	12	0	166	86	81	0
1972	57	41	16	0	180	86	93	0
1973	40	29	11	0	138	58	81	0
1974	33	18	15	0	173	32	141	0
1975	47	14	33	0	233	27	207	0
1976	34	19	15	0	121	41	80	0
1977	24	19	4	0	65	39	26	0
1978	20	17	2	0	48	31	17	0
1979	29	15	14	0	106	26	81	0
1980	17	13	5	0	55	25	30	0
1981	33	18	15	0	109	39	69	0
1982	40	30	10	0	104	57	47	0
1983	36	29	7	0	83	49	34	0
1984	46	30	16	0	153	48	105	0
1985	42	24	17	0	125	43	82	0
1986	27	20	7	0	74	38	36	0
1987	43	27	16	0	147	50	97	0
1988	32	21	10	0	100	44	56	0

Table 17.3 Values of natural mortality rate and proportion mature at age.

Age	Nat Mor	Mat.
0	0.200	0.000
1	0.200	0.000
2	0.200	0.570
3	0.200	1.000
4	0.200	1.000
5	0.200	1.000
6	0.200	1.000
7	0.200	1.000
8	0.200	1.000
9	0.200	1.000

Table 17.4 Total international catch at age ('000) of haddock in Division VIa between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
0	2742	17189	6604	14215	19589	63698	6849	4227	4552	57	0
1	84	6317	71481	20713	47387	68837	179349	24337	13109	15942	1
2	160706	519	3915	85141	16907	11562	34957	72330	3468	2095	2
3	10260	95114	3328	2718	19477	10757	3339	15224	35948	971	3
4	1434	2770	79966	2336	258	6317	3350	1588	5705	24357	4
5	268	173	545	53823	1222	83	1882	1491	680	2938	5
6	379	89	127	504	33193	447	95	868	495	351	6
7	4576	145	7	50	150	11463	98	21	308	247	7
8	191	585	20	19	32	104	3454	7	28	338	8
9	9	16	191	67	131	70	80	1112	276	237	9

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
0	5697	13	764	136	2084	269	155	2979	1498	7683	0
1	70070	22729	251	15492	14524	98976	22820	8127	89021	10151	1
2	17282	219277	83911	5019	20233	8626	78922	11235	16824	59257	2
3	1865	5636	20697	73676	6040	12910	4667	45367	10150	7687	3
4	470	922	1768	8167	36122	6242	4184	1823	23857	4225	4
5	9863	143	194	898	3398	22790	1789	916	1452	9306	5
6	833	3082	39	108	597	2449	11189	449	1116	433	6
7	114	229	822	272	41	371	964	2611	642	237	7
8	145	22	39	288	194	43	84	344	1818	195	8
9	76	32	21	44	250	119	73	65	385	990	9

Table 17.5 Total international mean weight at age (kg.) of haddock in Division VIa between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
0	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.068	0
1	0.158	0.161	0.160	0.160	0.159	0.159	0.159	0.159	0.161	0.134	1
2	0.243	0.230	0.248	0.249	0.251	0.248	0.260	0.256	0.274	0.278	2
3	0.526	0.368	0.341	0.380	0.384	0.368	0.428	0.459	0.406	0.388	3
4	0.916	0.812	0.546	0.530	0.597	0.527	0.581	0.592	0.684	0.516	4
5	1.042	1.283	1.040	0.546	0.512	0.764	0.832	0.831	0.800	0.827	5
6	1.024	1.262	1.313	0.984	0.571	0.685	1.027	1.095	1.128	1.045	6
7	0.999	1.043	1.651	1.499	1.185	0.798	1.001	1.585	1.337	1.152	7
8	1.569	1.342	1.426	1.538	1.706	1.142	1.009	1.084	1.117	1.399	8
9	2.065	1.709	1.515	1.551	1.550	1.244	1.317	1.247	1.346	1.251	9

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
0	0.032	0.077	0.082	0.038	0.050	0.059	0.019	0.064	0.028	0.085	0
1	0.182	0.134	0.252	0.157	0.178	0.149	0.138	0.182	0.168	0.170	1
2	0.325	0.319	0.245	0.273	0.282	0.319	0.268	0.270	0.270	0.254	2
3	0.457	0.572	0.467	0.376	0.461	0.456	0.486	0.362	0.418	0.445	3
4	0.730	0.719	0.887	0.746	0.557	0.688	0.636	0.637	0.566	0.562	4
5	0.777	0.998	0.975	1.126	1.002	0.667	0.802	0.903	0.880	0.705	5
6	1.040	0.985	1.376	1.539	1.370	1.087	0.868	1.115	1.105	1.030	6
7	1.491	1.143	1.294	1.549	1.716	1.392	1.272	1.043	1.250	1.276	7
8	1.944	1.565	1.347	1.514	1.558	2.075	1.277	1.418	1.147	1.239	8
9	1.388	1.871	1.441	1.826	1.582	1.596	2.175	1.698	1.350	0.936	9

Table 17.6 Total international fishing mortality rate at age of haddock in Division VIa between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
0	0.130	0.061	0.075	0.151	0.100	0.123	0.153	0.152	0.067	0.000	0
1	0.006	0.489	0.383	0.352	1.060	0.590	0.591	1.224	0.952	0.350	1
2	0.301	0.046	0.647	1.111	0.543	0.830	0.689	0.507	0.548	0.376	2
3	1.000	0.293	0.459	1.436	0.848	0.818	0.612	0.749	0.512	0.289	3
4	1.182	0.839	0.429	0.688	0.473	0.755	0.659	0.673	0.714	0.801	4
5	0.905	0.410	0.383	0.579	0.994	0.271	0.531	0.706	0.697	1.057	5
6	0.884	0.903	0.607	0.744	0.888	1.408	0.573	0.502	0.540	1.001	6
7	1.436	1.079	0.148	0.518	0.515	0.923	1.722	0.237	0.332	0.572	7
8	1.082	0.705	0.405	0.793	0.744	0.835	0.819	0.573	0.559	0.744	8
9	1.082	0.705	0.405	0.793	0.744	0.835	0.819	0.573	0.559	0.744	9

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
0	0.012	0.000	0.009	0.003	0.005	0.003	0.002	0.010	0.026	0.018	0
1	0.557	0.058	0.007	0.239	0.429	0.328	0.408	0.167	0.463	0.249	1
2	0.800	0.337	0.314	0.191	0.558	0.491	0.474	0.361	0.611	0.649	2
3	0.681	0.671	0.615	0.502	0.368	0.866	0.542	0.554	0.648	0.635	3
4	0.221	0.884	0.459	0.528	0.495	0.816	0.790	0.422	0.643	0.623	4
5	0.931	0.096	0.457	0.448	0.437	0.678	0.586	0.391	0.709	0.563	5
6	1.051	0.884	0.035	0.500	0.614	0.654	0.867	0.281	1.215	0.473	6
7	1.147	0.982	0.625	0.351	0.360	1.018	0.588	0.504	0.827	0.958	7
8	0.806	0.704	0.438	0.466	0.455	0.807	0.675	0.430	0.808	0.650	8
9	0.806	0.704	0.438	0.466	0.455	0.807	0.675	0.430	0.808	0.650	9

Table 17.7 Stock numbers at age ('000) of haddock in Division VIa between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
0	248461	319825	100813	111704	227681	606324	53095	32982	77363	219189	0
1	15556	17871	246339	76580	78647	168743	438993	37299	23195	59232	1
2	678366	12660	8971	137523	44097	22316	76576	198980	8983	7331	2
3	17618	410953	9897	3846	37059	20967	7968	31474	98119	4250	3
4	2239	5306	250958	5120	749	12990	7579	3538	12184	48134	4
5	489	562	1876	133743	2106	382	5000	3212	1478	4883	5
6	702	162	305	1047	61343	638	238	2408	1298	603	6
7	6474	237	54	136	407	20672	128	110	1194	619	7
8	313	1261	66	38	66	199	6725	19	71	701	8
9	14	34	630	133	272	135	156	2786	704	493	9

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
0	546426	47767	98792	55888	476413	91560	71041	324453	63455	475051	0
1	179406	442230	39096	80194	45635	388172	74720	58024	262950	50600	1
2	34178	84169	341555	31782	51719	24335	228886	40700	40184	135484	2
3	4122	12575	49214	204237	21502	24234	12195	116660	23234	17855	3
4	2607	1708	5261	21786	101212	12181	8344	5806	54906	9951	4
5	17694	1712	578	2722	10524	50501	4409	3101	3118	23629	5
6	1389	5711	1273	300	1423	5568	20989	2009	1717	1257	6
7	181	397	1932	1006	149	631	2370	7219	1242	417	7
8	286	47	122	846	580	85	187	1078	3571	445	8
9	149	69	65	129	749	234	162	205	756	2262	9

Table 17.8 Mean fishing mortality, biomass and recruitment of haddock in Division VIa between 1969 and 1988.

	Mean Fishing Mortality			Biomass			Recruits
	Ages		Ages	1000 tonnes			Age 0
	2 to 6		1 to 1				
Year	H.Con	Disc	By-cat	Total	Sp St	Y.C.	Million
1969	0.781	0.074	0.000	187	114	69	25
1970	0.480	0.018	0.000	164	160	70	320
1971	0.394	0.111	0.000	185	145	71	101
1972	0.706	0.206	0.000	125	98	72	112
1973	0.645	0.105	0.000	75	58	73	228
1974	0.664	0.152	0.000	64	35	74	606
1975	0.493	0.120	0.000	109	31	75	53
1976	0.528	0.099	0.000	82	55	76	33
1977	0.514	0.088	0.000	60	55	77	77
1978	0.646	0.059	0.000	43	35	78	219
1979	0.665	0.072	0.000	64	26	79	546
1980	0.538	0.036	0.000	103	32	80	48
1981	0.299	0.077	0.000	126	80	81	99
1982	0.366	0.067	0.000	121	104	82	56
1983	0.388	0.107	0.000	104	89	83	476
1984	0.602	0.099	0.000	126	65	84	92
1985	0.569	0.082	0.000	108	71	85	71
1986	0.315	0.087	0.000	82	67	86	346
1987	0.683	0.082	0.000	110	58	87	51
1988	0.489	0.099	0.000	80	56	88	49
Arit-mean recruits at age 0 for period 1969 to 1988							180
Geom-mean recruits at age 0 for period 1969 to 1988							114

Table 17.9 Input for catch prediction of Haddock in Division VIa.

	1988 Stock and Fishing Mortality			Values used in Prediction: F at age, Mean Wt. and Propn. Retained by Consumption Fishery							
				Scaled mean F 1984 to 1988			Mean values for period 1984 to 1988				
							Mean Weight (Kg.)				Prop.
Age	Stock Number	Fishing Mortality H.Con.	Disc	Ind	H.Con.	Disc	Ind	H.Con.	Disc	Ind	Stock	Ret.
0	49000		0.013			0.013			0.051		0.051	
1	40000	0.016	0.283		0.016	0.283		0.287	0.154		0.161	0.056
2	150000	0.193	0.297		0.193	0.297		0.357	0.222		0.276	0.395
3	17855	0.574	0.061		0.516	0.098		0.464	0.281		0.433	0.837
4	9951	0.609	0.014		0.610	0.014		0.624	0.326		0.618	0.980
5	23629	0.560	0.003		0.539	0.015		0.801	0.347		0.792	0.977
6	1257	0.473			0.659	0.002		1.042	0.353		1.041	0.997
7	417	0.958			0.738			1.246			1.246	1.000
8	445	0.650			0.638			1.431			1.431	1.000
9	2262	0.650			0.638			1.551			1.551	1.000

Mean F	Age 2 to 6	Age 1 1	Age 2 to 6	Age 1 1
Unscaled	0.589	0.000	0.622	0.000
Scaled			0.589	0.000

Recruits at age 0 in 1989 = 49000
Recruits at age 0 in 1990 = 114120
Recruits at age 0 in 1991 = 114120
Recruits at age 0 in 1992 = 114120

M at age and proprtion mature at age are as shown in Table 17.3

Mean F for ages 2 to 6 in 1988 for human consumption landings + discards = 0.589 .
Human consumption + discard F-at-age values in prediction are mean values for the period 1984 to 1988
rescaled to produce a mean value of F for ages 2 to 6 equal to that for 1988

Mean F for ages 1 to 1 in 1988 for small-mesh fisheries = 0.000 .
Industrial fishery F-at-age in the prediction are averages for the period 1984 to 1988 .
rescaled to produce a mean value of F for ages 1 to 1 equal to that for 1988

Values of N in 1988 from VPA have been overwritten
for the following ages .....

Age 0
Age 1
Age 2

Values of F for these ages in 1988 from VPA have been overwritten
with scaled mean values used for predictions for 1989 onwards

Table 17.10 Predicted catches and biomasses ('000 tonnes) of haddock in Division VIa 1989 to 1990.

	Year											
	1988	1989	1990									
Biomass 1 Jan of Year												
Total	80	67	50	50	50	50	50	50	50	50	50	50
Spawning	56	57	41	41	41	41	41	41	41	41	41	41
Mean F Ages												
Human Cons. 2 to 6	0.59	0.59	0.00	0.12	0.24	0.35	0.47	0.59	0.71	0.00	0.00	
Small-mesh 1 to 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean F(Year)/Mean F(1988)											F0.1	Fmax
Human Consumption	1.00	1.00	0.00	0.20	0.40	0.60	0.80	1.00	1.20	0.00	0.00	
Catch weight												
Human Consumption	21	23	0	4	8	11	14	17	19	0	0	
Discards	10	4	0	1	1	2	2	3	3	0	0	
Small-mesh Fisheries	0	0	0	0	0	0	0	0	0	0	0	
Total landings	21	23	0	4	8	11	14	17	19	0	0	
Total catch	32	27	0	5	9	13	17	20	23	0	0	
Biomass 1 Jan of Year+1												
Total	67	50	71	65	60	55	51	47	44	0	0	
Spawning	57	41	52	46	41	37	33	29	26	0	0	

Stock at start of and catch during 1989

Age	Stock No	H.Cons	Discards	By-catch	Total
0	49000	0	555	0	555
1	39616	527	8798	0	9325
2	24286	3397	5194	0	8591
3	75266	26480	5156	0	31636
4	7747	3227	65	0	3292
5	4370	1661	39	0	1700
6	11017	4869	14	0	4883
7	641	307	0	0	307
8	131	57	0	0	57
9	190	82	0	0	82
Wt	66703	22652	4021	0	26673

Stock at start of and catch during 1990
for F(1990) = F(1989)

Age	Stock No	H.Cons	Discards	By-catch	Total
0	114120	0	1293	0	1293
1	39616	527	8798	0	9325
2	24053	3364	5144	0	8508
3	12186	4287	835	0	5122
4	33333	13887	278	0	14164
5	3399	1292	31	0	1323
6	2055	908	3	0	911
7	4657	2229	0	0	2229
8	251	108	0	0	108
9	139	60	0	0	60
Wt	50125	17013	2897	0	19910

Table 17.11 Age Composition of HADDOCK in VIa in Scottish Landings First Quarter of 1989 (Numbers in '000's)

Age	Number
0	0
1	1
2	68
3	3459
4	823
5	489
6	1128
7	51
8	36
9	40
10+	328
Tonnes	3396

Table 18.1 Nominal catch (in tonnes) of HADDOCK in Division VIb, 1979-1988, as officially reported to ICES.

Country	1979	1980	1981	1982	1983
Faroe Islands	20	5	1	21	3
France	4	1	10	32	48
Germany, Fed. Rep.	-	17	-	4	1
Norway	16	2	10	3	20
Spain	-	6	88	121	79
UK (England & Wales)	1,654	6,261	9,005	3,736	113
UK (Scotland)	548	1,051	27	5	136
UK (Northern Ireland)	-	-	-	-	-
Total	2,242	7,343	9,141	3,992	400

Country	1984	1985	1986	1987	1988
Faroe Islands	3	1	-	-[1]	-[1]
France	12	116	103	99	...[1,2]
Germany, Fed. Rep.	-	4	-	-	...[1,2]
Norway	45	31	83	33	20[1]
Spain	128	892	756	371	...
UK (England & Wales)	788	1,876	703	1,271	753
UK (Scotland)	1,654	6,397	2,961	6,221	6,542
UK (Northern Ireland)	-	-	157	-	-
Total	2,630	9,317	4,763	7,995	7,315

[1] Preliminary.
[2] Included in Division VIa.

Table 18.2 Haddock in Division VIb. Total international catch at age.

Age	1985	1986	1987	1988
1	0	0	82	256
2	65	588	791	2284
3	758	383	18358	2114
4	12971	837	295	11991
5	3699	3236	374	100
6	124	1101	1595	121
7	6	60	613	256
8	70	28	38	128
9	220	69	4	5
10+	1	87	58	8

Table 18.3 Haddock in Division VIb. Total international weight at age.

Age	1985	1986	1987	1988
1	-	-	0.154	0.233
2	0.348	0.305	0.276	0.335
3	0.479	0.477	0.339	0.377
4	0.507	0.624	0.466	0.461
5	0.543	0.646	0.601	0.724
6	0.668	0.697	0.715	0.582
7	1.208	0.868	0.688	1.017
8	0.778	0.825	0.865	0.745
9	0.879	0.841	0.852	1.797
10+	1.370	1.133	0.823	2.191

Table 18.4 HADDOCK.
Division VIb (Rockall). Scottish, English and German trawl surveys.
Numbers per 10 hours fishing (weighted average of surveys).

Year	Vessel	0	1	2	3	4	5	6	7	8+
1967	E	9	11	153	115	124	150	174	168	215
1968	E	21,302	69	11	76	66	66	60	50	58
1969	E	-	7,431	78	8	28	25	13	19	29
1970	E	[-]	11	9,746	68	25	27	22	20	34
1971	-	-	-	-	-	-	-	-	-	-
1972	-	-	-	-	-	-	-	-	-	-
1973	-	-	-	-	-	-	-	-	-	-
1974	H	42,250	5,410	400	180	20	50	-	20	-
1975	-	-	-	-	-	-	-	-	-	-
1976	-	-	-	-	-	-	-	-	-	-
1977	H	-	6,117	13,581	2,587	4,366	54	-	80	163
1978	-	-	-	-	-	-	-	-	-	-
1979	EH	-	212	819	6,110	686	843	119	-	3
1980	?	-	153	796	4,927	11,943	292	1,373	458	311
1981	RH	32,329	32,098	16,596	613	1,675	17,320	-	236	808
1982	RSH	[-]	24,940	17,677	300	249	1,172	4,363	71	534
1983	-	1	6	18,541	7,961	233	24	193	1,210	103
1984	-	-	-	-	-	-	-	-	-	-
1985	C	489	51,284	214	31	4,218	676	1	2	145
1986	R	3,577	17,309	62,196	85	139	2,568	225	-	52
1987	D	698	1,167	2,917	8,530	105	267	249	71	1
1988	S	8,640	8,170	5,799	810	2,107	5	2	91	17
1989	S	23,580	10,799	3,531	1,889	268	765	2	7	25

E = "Explorer"
H = "Walter Herwig"
R = "G.A. Reay"
C = "Charlewood"
D = "Dawn Sky"
S = "Scotia"

Table 18.5 Haddock in Division VIb. Analysis of research vessel survey data.

ANALYSIS BY RCMCM OF
ROCKALL SURVEY DATA

CPUE-AT-AGE DATA

Age	1985	1986	1987	1988	1989
0	489.0	3577.0	698.0	8640.0	23580.0
1	51284.0	17309.0	11672.0	8170.0	10799.0
2	214.0	62196.0	2917.0	5799.0	3531.0
3	31.0	85.0	8530.0	810.0	1889.0
4	4218.0	139.0	105.0	2107.0	268.0
5	676.0	2568.0	267.0	5.0	765.0
6	1.0	225.0	249.0	2.0	2.0

RESIDUAL SUM OF SQUARES= 0.942E+01

NUMBER OF OBSERVATIONS = 35

NUMBER OF PARAMETERS = 20

		PARAMETER	S.D.
Year effects			
	2	1.1484	0.4320
	3	1.0343	0.4027
	4	0.4086	0.3318
Age effects			
	1	1.8929	0.5426
	2	1.2599	0.5795
	3	-0.4642	0.6201
	4	-0.8109	0.6653
	5	-1.8262	0.7171
	6	-4.1430	0.7678
Year class effects			
	1979	4.1430	1.1033
	1980	8.3765	0.9185
	1981	8.7709	0.8330
	1982	4.8254	0.7704
	1983	3.9576	0.7093
	1984	8.4429	0.6709
	1985	6.2757	0.5838
	1986	7.0266	0.6104
	1987	6.2534	0.6131
	1988	7.8400	0.6485
	1989	9.6982	0.8162

Table 18.6 Haddock in Division VIb. Relative effort by Scottish vessels at Rockall.

year	relative effort
1985	1.00
1986	0.97
1987	1.48
1988	1.43

Table 18.7 Haddock in Division VIb. Separable analysis.

ANALYSIS BY RCSEP OF ROCKALL CATCH DATA

Source data

Age	M	Prop.mat.	wt.
2	0.20	0.00	0.3160
3	0.20	1.00	0.4180
4	0.20	1.00	0.5140
5	0.20	1.00	0.6290
6	0.20	1.00	0.6660
7	0.20	1.00	0.9450
8	0.20	1.00	0.8030
9	0.20	1.00	1.0900

Catch-at age data

Age	1985	1986	1987	1988
2	65.0	588.0	791.0	2284.0
3	758.0	383.0	18358.0	2114.0
4	12971.0	837.0	295.0	11991.0
5	3699.0	3236.0	374.0	100.0
6	124.0	1101.0	1595.0	121.0
7	6.0	60.0	613.0	256.0
8	70.0	28.0	38.0	128.0
9	220.0	69.0	4.0	5.0

Gradient for year effects = 0.1803
Number of observations = 32
Number of parameters = 20

Residual mean square = 0.3470
Coefficient of determination = 0.9716

Esimated parameter values:

	Parameter	s.d.
year effects		
	1.0000	0.0000
	1.3570	0.3884
	1.9867	0.4271
	1.3911	0.1422
age effects		
	0.0266	0.0127
	0.2853	0.1096
	0.6686	0.2099
	0.6259	0.2004
	0.6525	0.2030
	0.4029	0.1392
	0.7111	0.2091
	0.6000	0.0000
y/c effects		
	6.2779	0.5890
	5.4130	0.4272
	3.6932	0.3442
	5.6528	0.3165
	8.7093	0.3168
	9.8634	0.3203
	8.0751	0.3145
	7.4434	0.3312
	10.5912	0.3766
	9.4268	0.5004
	11.1456	0.7640

Table 18.7 cont'd.

F-at-age

Age	1985	1986	1987	1988
2	0.0266	0.0361	0.0529	0.0370
3	0.2853	0.3871	0.5668	0.3969
4	0.6686	0.9073	1.3283	0.9301
5	0.6259	0.8494	1.2436	0.8707
6	0.6525	0.8855	1.2964	0.9077
7	0.4029	0.5467	0.8005	0.5605
8	0.7111	0.9650	1.4127	0.9892
9	0.6000	0.8142	1.1920	0.8347

Fitted N-at-age

Age	1985	1986	1987	1988
2	1708.5	39781.3	12416.1	69260.0
3	3213.6	1362.1	31414.4	9641.7
4	19214.5	1978.0	757.2	14592.3
5	6058.7	8061.2	653.6	164.2
6	285.1	2652.6	2822.5	154.3
7	40.2	121.5	895.9	632.1
8	224.3	22.0	57.6	329.4
9	532.7	90.2	6.9	11.5

Log catch residuals

Age	1985	1986	1987	1988
2	0.4680	-0.7781	0.3097	0.0000
3	0.0427	-0.0405	0.3896	-0.3097
4	0.4127	-0.2597	-0.5579	0.3885
5	0.3598	-0.2703	-0.1399	0.1303
6	-0.0094	-0.2636	-0.1738	0.3569
7	-0.7060	0.2481	0.3020	0.0314
8	-0.4023	0.8042	-0.0612	-0.3981
9	0.0000	0.4023	-0.0981	-0.1775

Standardised log recruitment at age 2

Year	log R	s.d.
1978	11.6243	0.7400
1979	9.9593	0.6189
1980	7.3284	0.5247
1981	8.6851	0.4875
1982	10.8891	0.4434
1983	11.2173	0.3983
1984	8.5604	0.3331
1985	7.4434	0.3312
1986	10.5912	0.3766
1987	9.4268	0.5004
1988	11.1456	0.7640

Table 18.8 Haddock in Division VIb. Calibration regression used to predict year class strength in catch forecast.

SOURCE DATA (natural logs)

year class	survey index age 0	VPA age 2
1979	4.14	8.69
1980	8.37	10.89
1981	8.77	11.22
1982	4.83	8.56
1983	3.96	7.44
1984	8.44	10.59
1985	6.28	9.42
1986	7.02	-
1987	6.25	-
1988	7.84	-
1989	9.70	-
	MEAN	9.54
	var	1.973

Calibration regression

	Slope	se	int	Residual var	Rsq	n	D
x=VPA	1.4662	0.1701	-7.5952	0.3431	0.9368	7	1.0668

Fitted values with shrinkage (natural logs)

Year class	x=VPA	var
1979	8.2182	0.274866
1980	10.7082	0.265416
1981	10.9334	0.278899
1982	8.6121	0.254187
1983	8.1180	0.281382
1984	10.7480	0.267611
1985	9.4730	0.234577
1986	9.9172	0.237588
1987	9.4550	0.234641
1988	10.4024	0.251148
1989	11.4329	0.318572

Table 18.9 Haddock in Division VIb. Fitted and forecast yield, spawning stock biomass and total stock biomass. All weights in tonnes.

YEAR	YIELD	95% interval	SSB	95% interval	TSB	95% interval
1985	6771	3580 - 12808	16019	10386 - 24706	16558	10884 - 25191
1986	4855	2778 - 8485	8654	5576 - 13431	21224	13075 - 34453
1987	7645	3929 - 14877	16711	9009 - 30997	20635	11684 - 36443
1988	6100	3117 - 11936	12611	6254 - 25426	19018	10804 - 33477
1989	5469	3219 - 9292	12812	6575 - 24965	16848	9662 - 29376
1990	5359	3137 - 9154	11027	5819 - 20897	21411	12000 - 38203
1991	7166	4076 - 12597	16387	8066 - 33294	45557	21461 - 96709

Table 19.1 Nominal landings (in tonnes) of HADDOCK in Divisions VIId,e, 1979-1988, as officially reported to ICES.

Country	1979	1980	1981	1982	1983
Belgium	1	+	2	1	1
Denmark	21	15	-	-	-
France	333	298	421	344	232
Ireland	-	+	-	-	-
Netherlands	-	-	-	94	1
UK (England & Wales)	51	59	119	60	41
Total	406	372	542	499	275

Country	1984	1985	1986	1987	1988
Belgium	-	2	1	+	1[1]
Denmark	-	-	-	-	-[1]
France	273	138	249	268	...[1,2]
Ireland	-	-	-	-	-[1]
Netherlands	-	-	-	-	-
UK (England & Wales)	26	27	21	43	102
Total	299	167	271	311	103

[1] Preliminary.
[2] Included in Divisions VIIg-k.

Table 19.2 Nominal landings (in tonnes) of HADDOCK in Divisions VIIb,c, 1979-1988, as officially reported to ICES.

Country	1979	1980	1981	1982	1983
Denmark	1	-	-	-	-
France	735	523	658	750	1,443
Ireland	106	150	335	464	450
Netherlands	-	-	-	1	-
Norway	-	-	-	-	54
Spain	-	5	85	129	58
UK (England & Wales)	2	1	-	3	-
UK (N. Ireland)	-	-	-	-	-
UK (Scotland)	22	56	-	-	-
Total	866	735	1,078	1,347	2,005

Country	1984	1985	1986	1987	1988
Denmark	-	-	-	-	-[1]
France	1,840	1,183	1,243	1,079	...[1,2]
Ireland	277	388	202	156	52[1]
Netherlands	-	-	-	-	-
Norway	17	4	77	-	+[1]
Spain	240	291	-	-	...
UK (England & Wales)	275	35	58	30	33
UK (N. Ireland)	-	-	-	-	+
UK (Scotland)	63	7	51	79	3
Total	2,712	1,908	1,631	1,344	88

[1] Preliminary.
[2] Included in Divisions VIIg-k.

Table 19.3 Nominal landings (in tonnes) of HADDOCK in Divisions VIIg-k, 1979-1988, as officially reported to ICES.

Country	1979	1980	1981	1982	1983
Belgium	2	2	3	3	1
France	1,196	1,696	1,913	1,255	1,145
Ireland	49	124	344	440	491
Netherlands	16	-	-	6	-
Norway	-	-	-	-	3
Spain	-	-	192	119	109
UK (England & Wales)	17	49	92	179	23
UK (Scotland)	-	-	4	-	-
Total	1,280	1,871	2,548	2,002	1,772

Country	1984	1985	1986	1987	1988
Belgium	-	2	-	8	11
France	1,161	1,075	824	928	3,342[1,2]
Ireland	369	406	115	158	93[1]
Netherlands	-	-	-	-	
Norway	-	-	9	-	-[1]
Spain	292	270	-	-	-
UK (England & Wales)	34	100	100	98	184
UK (Scotland)	-	-	6	-	1
Total	1,856	1,853	1,054	1,192	3,631

[1] Preliminary.
[2] Includes all of Sub-areas VII and VIII.

Table 20.1 Nominal catch (in tonnes) of WHITING in Sub-area IV, 1979-1988, as officially reported to ICES.

Country	1979	1980	1981	1982	1983
Belgium	3,941	3,153	2,623	2,272	2,864
Denmark	41,965	17,916	16,430	27,043	18,054
Faroe Islands	581	21	12	57	18
France	27,590	23,626	24,744	23,780	21,263
German Dem. Rep.	5	-	-	-	-
Germany, Fed. Rep.	1,280	1,267	601	223	317
Ireland	-	-	-	-	-
Netherlands	13,417	14,389	14,600	12,218	10,935
Norway	49	27	27	17	39
Poland	3	1	-	-	1
Sweden	31	16	9	11	44
UK (England and Wales)	7,581	6,778	5,964	4,743	4,366
UK (N. Ireland)	-	-	-	-	-
UK (Scotland)	44,841	42,218	31,399	29,640	41,248
Total	141,284	109,412	96,409	100,004	99,149

Country	1984	1985	1986	1987	1988
Belgium	2,798	2,177	2,275	1,404	1,984
Denmark	19,771	16,152	9,076	2,047	12,112[1]
Faroe Islands	-	6	-	-[1]	-[1]
France	19,209	10,853	8,250	10,493	12,215[1,2]
German Dem. Rep.	-	-	-	-	-
Germany, Fed. Rep.	286	226	313	274	793[1]
Netherlands	8,767	6,973	13,741	8,542	...
Norway	88	103	103	74	45[1]
Poland	2	-	-	-	-
Sweden	53	22	33	17	5
UK (England & Wales)	5,017	5,024	3,805	4,485	4,007
UK (N. Ireland)	-	-	-	-	1
UK (Scotland)	42,967	30,398	29,113	37,630	31,804
Total	98,958	71,934	66,709	64,966	62,966

[1] Preliminary.
[2] Includes Division IIa.

Table 20.2 Annual weight and numbers of whiting caught in Sub-area IV between 1969 and 1988.

	Weight (1000 tonnes)				Number (millions)			
Year	Total	H.Con	Disc	By-cat	Total	H.Con	Disc	By-cat
1969	324	57	115	152	2803	204	626	1974
1970	268	79	74	115	2507	272	381	1854
1971	192	58	63	72	2118	184	458	1475
1972	188	60	67	61	1927	177	398	1352
1973	266	66	110	90	2164	232	659	1273
1974	290	75	85	130	2572	249	477	1846
1975	300	79	135	86	1965	247	699	1018
1976	361	75	136	150	2285	248	641	1396
1977	342	73	163	106	2470	259	547	1663
1978	178	88	35	55	1727	322	240	1165
1979	233	98	77	59	1869	344	640	886
1980	212	91	76	46	1411	301	466	644
1981	181	79	35	67	1396	257	210	929
1982	129	71	25	33	727	231	163	333
1983	150	79	48	24	1310	253	360	697
1984	135	77	39	19	858	245	317	296
1985	97	54	28	15	686	180	226	280
1986	154	58	78	18	1173	202	572	398
1987	132	62	53	16	916	224	408	285
1988	128	51	28	49	1371	192	228	951

Table 20.3 Values of natural mortality rate and proportion mature at age.

Age	Nat Mor	Mat.
0	2.550	0.000
1	0.950	0.110
2	0.450	0.920
3	0.350	1.000
4	0.300	1.000
5	0.250	1.000
6	0.250	1.000
7	0.200	1.000
8	0.200	1.000
9	0.200	1.000
10	0.200	1.000

Table 20.4 Total international catch at age ('000) of whiting in Sub-area IV between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
0	1206087	1187095	1232837	553711	175647	571415	238839	425081	666943	687001	0
1	374122	606631	620700	938136	1153017	755217	954764	479081	1004708	417264	1
2	1019744	82358	106187	314925	660397	975999	403599	1119600	474214	305015	2
3	154798	563090	18145	44793	131353	226168	295629	163420	268896	222078	3
4	27811	50200	123135	7445	18039	31516	53896	79425	29031	79703	4
5	12712	11023	13021	56265	5404	4660	8792	14188	20033	6935	5
6	1664	3577	2191	7933	17226	1163	7524	2733	5225	6864	6
7	5658	1162	693	3284	2375	5496	109	488	505	1707	7
8	621	1302	162	243	345	325	1303	18	228	247	8
9	34	131	408	67	118	47	132	527	17	11	9
10	1	16	26	641	50	20	2	28	159	13	10

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
0	476304	332154	516815	99925	666523	157278	186555	224978	84627	416507	0
1	611096	263896	160928	185910	197556	312901	200119	563808	260474	425447	1
2	457578	406627	334197	101294	168073	159662	143565	161474	355173	296771	2
3	202922	266932	253410	224668	107238	108546	83336	159418	120276	175303	3
4	89751	82465	92315	82234	124436	45930	37174	42548	78948	38670	4
5	26698	47603	24065	24483	35003	57092	13524	12525	10891	15532	5
6	2988	9858	10819	6282	8289	13140	17767	3376	4205	1944	6
7	1528	1003	2770	1955	1668	2831	3098	3935	822	420	7
8	250	653	238	385	760	376	830	530	818	60	8
9	33	58	43	49	96	176	94	72	101	73	9
10	5	20	37	30	33	21	9	1	7	38	10

Table 20.5 Total international mean weight at age (Kg.) of whiting in Sub-area IV between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
0	0.043	0.020	0.036	0.022	0.027	0.026	0.030	0.019	0.022	0.010	0
1	0.097	0.110	0.116	0.071	0.084	0.070	0.100	0.107	0.116	0.074	1
2	0.173	0.203	0.219	0.200	0.166	0.149	0.215	0.194	0.211	0.181	2
3	0.261	0.240	0.285	0.282	0.277	0.257	0.277	0.294	0.322	0.235	3
4	0.362	0.348	0.318	0.388	0.371	0.381	0.376	0.352	0.401	0.327	4
5	0.414	0.455	0.433	0.418	0.439	0.469	0.470	0.443	0.450	0.436	5
6	0.416	0.452	0.531	0.520	0.462	0.519	0.356	0.519	0.468	0.438	6
7	0.535	0.512	0.637	0.575	0.550	0.541	0.817	0.514	0.551	0.477	7
8	0.670	0.628	0.560	0.748	0.738	0.786	0.596	0.554	0.440	0.613	8
9	0.787	0.785	0.728	0.801	0.860	1.032	0.712	0.740	0.734	0.702	9
10	1.236	0.802	0.729	0.822	0.846	0.966	1.022	0.893	0.500	1.247	10

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
0	0.009	0.013	0.011	0.029	0.014	0.020	0.014	0.015	0.012	0.013	0
1	0.098	0.075	0.082	0.059	0.105	0.088	0.094	0.105	0.076	0.054	1
2	0.166	0.176	0.166	0.182	0.189	0.188	0.186	0.182	0.146	0.143	2
3	0.260	0.253	0.241	0.252	0.275	0.275	0.265	0.252	0.246	0.222	3
4	0.304	0.332	0.326	0.314	0.326	0.338	0.324	0.315	0.293	0.298	4
5	0.419	0.340	0.394	0.378	0.387	0.384	0.391	0.373	0.371	0.335	5
6	0.457	0.466	0.423	0.484	0.427	0.393	0.429	0.462	0.368	0.413	6
7	0.502	0.479	0.473	0.506	0.457	0.464	0.469	0.465	0.492	0.428	7
8	0.584	0.573	0.649	0.703	0.520	0.586	0.424	0.525	0.458	0.835	8
9	0.618	0.539	0.828	0.783	0.670	0.514	0.497	1.194	0.852	0.588	9
10	0.559	0.812	1.032	1.101	0.502	0.871	0.789	0.528	0.602	0.642	10

Table 20.6 Total international fishing mortality rate at age of whiting in Sub-area IV between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
0	0.140	0.085	0.051	0.017	0.011	0.017	0.012	0.021	0.033	0.033	0
1	0.792	0.749	0.396	0.326	0.289	0.398	0.229	0.180	0.435	0.161	1
2	0.564	0.837	0.544	0.719	0.822	0.873	0.783	0.956	0.517	0.429	2
3	0.822	0.974	0.577	0.611	1.064	1.059	1.005	1.257	0.872	0.644	3
4	0.722	0.855	0.702	0.588	0.636	1.007	0.984	1.041	0.985	0.853	4
5	1.074	0.806	0.626	0.947	1.407	0.365	1.025	0.879	0.949	0.761	5
6	0.634	1.188	0.384	1.122	0.968	1.866	2.136	1.238	1.087	1.183	6
7	1.095	1.459	0.820	1.966	1.497	1.062	1.063	0.972	0.852	1.619	7
8	1.246	0.824	0.839	0.788	1.570	0.881	0.799	0.489	2.524	1.575	8
9	0.954	1.026	0.675	1.082	1.216	1.036	1.201	0.924	1.279	1.198	9
10	0.954	1.026	0.675	1.082	1.216	1.036	1.201	0.924	1.279	1.198	10

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
0	0.025	0.045	0.062	0.013	0.058	0.019	0.011	0.016	0.009	0.027	0
1	0.235	0.104	0.174	0.180	0.209	0.223	0.185	0.273	0.143	0.381	1
2	0.502	0.455	0.338	0.287	0.459	0.493	0.273	0.416	0.529	0.450	2
3	0.757	0.836	0.764	0.517	0.735	0.819	0.687	0.728	0.843	0.723	3
4	0.707	1.008	0.985	0.730	0.731	1.028	0.922	1.181	1.298	0.893	4
5	0.905	1.248	1.112	0.891	0.924	1.048	1.195	1.117	1.434	1.190	5
6	0.989	1.185	1.287	1.151	0.979	1.299	1.330	1.335	2.053	1.325	6
7	1.012	1.237	1.601	0.917	1.278	1.243	1.553	1.488	1.905	1.950	7
8	1.302	2.274	1.236	1.132	1.234	1.253	2.066	1.513	1.997	0.737	8
9	0.983	1.391	1.244	0.964	1.029	1.174	1.413	1.326	1.735	1.219	9
10	0.983	1.391	1.244	0.964	1.029	1.174	1.413	1.326	1.735	1.219	10

Table 20.7 Stock numbers at age ('000) of whiting in Sub-area IV between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
0	24823870	39766450	68557060	90667260	44711080	92400620	57429150	55820790	56791900	58790630	0
1	997985	1684692	2852781	5089362	6960256	3453260	7091794	4432695	4267149	4291271	1
2	2876180	174885	308203	742604	1420224	2016316	896747	2180764	1431280	1068183	2
3	319749	1043140	48267	114111	230649	398165	537116	261266	534357	544246	3
4	61519	99041	277638	19108	43654	56087	97273	138538	52358	157493	4
5	21348	22146	31218	101904	7864	17113	15181	26942	36230	14485	5
6	3951	5678	7704	12998	30785	1500	9256	4244	8716	10920	6
7	9216	1632	1348	4086	3297	9110	181	852	959	2290	7
8	943	2524	311	486	469	604	2579	51	264	335	8
9	60	222	906	110	181	80	205	949	26	17	9
10	2	27	58	1050	77	33	2	51	237	20	10

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
0	53806380	20594760	23518510	20698150	32356870	23577280	46333480	38852450	26132620	43341530	0
1	4443026	4098911	1536958	1726066	1594621	2384121	1807107	3577592	2985225	2022233	1
2	1412735	1358793	1428393	499289	557705	500255	737791	580703	1052891	1000189	2
3	443401	545154	549811	649465	239006	224768	194840	357910	244371	395569	3
4	201449	146616	166487	180384	272810	80729	69833	69060	121820	74141	4
5	49743	73604	39620	46057	64373	97302	21394	20569	15704	24632	5
6	5271	15670	16463	10146	14708	19899	26584	5042	5241	2915	6
7	2606	1527	3732	3541	2499	4303	4229	5477	1034	524	7
8	371	776	363	616	1159	570	1016	733	1013	126	8
9	57	83	65	86	163	276	133	105	132	113	9
10	9	28	56	53	56	33	13	2	9	58	10

Table 20.8 Mean fishing mortality, biomass and recruitment of whiting in Sub-area IV between 1969 and 1988.

	Mean Fishing Mortality			Biomass		Recruits	
	Ages 2 to 6		Ages 0 to 4	1000 tonnes		Age 0	
Year	H.Con	Disc	By-cat	Total	Sp St	Y.C.	Million
1969	0.408	0.195	0.278	716	590	69	24824
1970	0.606	0.231	0.238	521	353	70	39766
1971	0.411	0.134	0.061	520	220	71	68557
1972	0.578	0.141	0.116	603	269	72	90667
1973	0.671	0.169	0.159	921	381	73	44711
1974	0.581	0.136	0.294	682	441	74	92401
1975	0.838	0.220	0.142	1102	453	75	57429
1976	0.640	0.169	0.272	1036	581	76	55821
1977	0.565	0.118	0.217	1013	547	77	56792
1978	0.604	0.078	0.103	701	404	78	58791
1979	0.595	0.073	0.105	871	465	79	53806
1980	0.651	0.219	0.093	767	474	80	20595
1981	0.650	0.084	0.171	574	443	81	23519
1982	0.492	0.100	0.100	438	340	82	20698
1983	0.561	0.145	0.068	461	303	83	32357
1984	0.744	0.129	0.068	440	246	84	23577
1985	0.739	0.082	0.055	404	242	85	46333
1986	0.745	0.148	0.055	605	263	86	37619
1987	1.015	0.158	0.070	477	270	87	39219
1988	0.702	0.109	0.167	421	265	88	70480
Arit-mean recruits at age 0 for period 1969 to 1988							47898
Geom-mean recruits at age 0 for period 1969 to 1988							43305

Table 20.9 Input for catch prediction of whiting in Sub-area IV.

	1988 Stock and Fishing Mortality				Values used in Prediction: F at age, Mean Wt. and Propn. Retained by Consumption Fishery							
					Scaled mean F 1984 to 1988			Mean values for period 1984 to 1988 Mean Weight (Kg.)				Prop.
Age	Stock Number	Fishing Mortality H.Con.	Disc	Ind	H.Con.	Disc	Ind	H.Con.	Disc	Ind	Stock	Ret.
0	70480000	0.000	0.001	0.030	0.000	0.001	0.030	0.129	0.027	0.014	0.015	0.001
1	3044000	0.004	0.109	0.230	0.004	0.109	0.230	0.194	0.097	0.051	0.083	0.037
2	963000	0.095	0.189	0.225	0.095	0.189	0.225	0.231	0.158	0.134	0.169	0.358
3	395569	0.374	0.207	0.141	0.432	0.157	0.192	0.276	0.201	0.237	0.252	0.730
4	74141	0.653	0.134	0.106	0.768	0.107	0.157	0.326	0.222	0.323	0.314	0.877
5	24632	1.088	0.064	0.038	0.949	0.060	0.118	0.375	0.243	0.420	0.371	0.939
6	2915	1.313	0.011		1.255	0.042	0.012	0.420	0.238	0.363	0.413	0.965
7	524	1.950			1.420	0.021	0.005	0.467	0.250	0.583	0.464	0.982
8	126	0.697	0.040		1.316	0.026		0.574	0.296		0.566	0.978
9	113	1.219			1.218			0.729			0.729	1.000
10	58	1.219			1.218			0.686			0.686	1.000

	Age 2 to 6	Age 0 4
Mean F Unscaled	0.811	0.167
Scaled	0.811	0.167

Recruits at age 0 in 1989 = 41290000
Recruits at age 0 in 1990 = 43304900
Recruits at age 0 in 1991 = 43304900
Recruits at age 0 in 1992 = 43304900

M at age and proprtion mature at age are as shown in Table 20.3

Mean F for ages 2 to 6 in 1988 for human consumption landings + discards = 0.811 .
Human consumption + discard F-at-age values in prediction are mean values for the period 1984 to 1988
rescaled to produce a mean value of F for ages 2 to 6 equal to that for 1988

Mean F for ages 0 to 4 in 1988 for small-mesh fisheries = 0.167 .
Industrial fishery F-at-age in the prediction are averages for the period 1984 to 1988 .
rescaled to produce a mean value of F for ages 0 to 4 equal to that for 1988

Values of N in 1988 from VPA have been overwritten
for the following ages .....

Age 0
Age 1
Age 2

Values of F for these ages in 1988 from VPA have been overwritten
with scaled mean values used for predictions for 1989 onwards

Table 20.10 Predicted catches and biomasses ('000 tonnes) of whiting in Sub-area IV 1989 to 1990.

	Year											
	1988	1989	1990									
Biomass 1 Jan of Year												
Total	421	732	642	642	642	642	642	642	642	642	642	642
Spawning	265	325	391	391	391	391	391	391	391	391	391	391
Mean F Ages												
Human Cons. 2 to 6	0.81	0.81	0.00	0.16	0.32	0.49	0.65	0.81	0.97	0.00	0.00	
Small-mesh 0 to 4	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.00	0.00	
Mean F(Year)/Mean F(1988)										F0.1	Fmax	
Human Consumption	1.00	1.00	0.00	0.20	0.40	0.60	0.80	1.00	1.20	0.00	0.00	
Small-mesh Fishery	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	
Catch weight												
Human Consumption	51	66	0	18	33	48	60	72	82	0	0	
Discards	28	56	0	12	23	34	44	54	63	0	0	
Small-mesh Fisheries	49	72	78	76	74	72	70	68	67	0	0	
Total landings	100	138	78	93	107	119	130	140	149	0	0	
Total catch	128	194	78	105	130	153	175	194	212	0	0	
Biomass 1 Jan of Year+1												
Total	732	642	723	695	670	648	627	608	590	0	0	
Spawning	325	391	467	440	415	393	372	354	336	0	0	

Stock at start of and catch during 1989

Age	Stock No	H.Cons	Discards	By-catch	Total
0	41290000	16	13191	439888	453095
1	5337143	12587	326044	688756	1027387
2	835369	54622	98013	120637	273272
3	369245	95174	35131	42355	172660
4	135345	57381	8029	11776	77187
5	22483	11575	746	1437	13759
6	5837	3702	133	35	3870
7	604	419	8	1	428
8	61	41	1	0	42
9	49	32	0	0	32
10	27	18	0	0	18
Wt	731778	66141	56452	71865	194458

Stock at start of and catch during 1990 for F(1990) = F(1989)

Age	Stock No	H.Cons	Discards	By-catch	Total
0	43304900	17	13835	461353	475206
1	3126712	7374	191010	403501	601884
2	1464679	95771	171849	211517	479137
3	320307	82560	30475	36742	149777
4	119186	50530	7071	10370	67971
5	35722	18391	1186	2284	21861
6	5672	3597	129	34	3761
7	1228	853	15	3	871
8	116	78	2	0	80
9	13	9	0	0	9
10	19	12	0	0	12
Wt	642138	71628	54065	68437	194130

Table 20.11 Estimated age composition of human consumption landings and industrial by-catch of whiting in the first half of 1989.

	Human Consumption				Small Mesh		International	
	Landings		Discards		By-catch		Catch	
Age	Number	Weight	Number	Weight	Number	Weight	Number	Weight
0								
1	445	0.165	35977	0.039			36422	0.041
2	3227	0.217	8042	0.160			11269	0.176
3	17727	0.245	19333	0.201			37060	0.222
4	14606	0.270	5787	0.215			20393	0.255
5	4082	0.309	1081	0.233			5163	0.293
6	1611	0.326	28	0.276			1639	0.325
7	135	0.435	8	0.351			143	0.430
8	41	0.384					41	0.384
9	5	0.559					5	0.559
10								
11								
12								
13								
14								
15								
No.	41879		70256		0		112135	
Wt.	10927		8082		0		19010	

Table 21.1 Nominal catch (in tonnes) of WHITING in Division VIa, 1979-1988, as officially reported to ICES.

Country	1979	1980	1981	1982	1983
Belgium	-	+	-	2	-
Denmark	92	32	-	+	-
Faroe Islands	770	-	-	-	-
France	2,779	2,609	1,637	1,798	2,029
Germany, Fed.Rep.	4	1	49	53	43
Ireland	2,791	4,407	8,148	3,406	3,578
Netherlands	17	2	6	285	811
Spain	-	-	-	99	76
UK (England & Wales)	320	227	145	166	157
UK (N. Ireland)	-	-	-		52
UK (Scotland)	10,613	7,386	8,519	8,419	10,019
Total	17,386	14,664	18,504	14,235	16,765

Country	1984	1985	1986	1987	1988
Belgium	-	3	-	4	3
Denmark	-	-	-	5	-[1]
Faroe Islands	-	-	-	-	-
France	1,887	1,502	829	1,644	1,168[1,2]
Germany, Fed. Rep.	6	9	1	+	1[1,3]
Ireland	3,454	1,917	1,683	2,868	2,305[1]
Netherlands	-	14	-	-	...
Spain	40	61	-	-	...
UK (England & Wales)	162	63	26	62	30
UK (N. Ireland)	40	17	5	13	89
UK (Scotland)	11,270	9,051	5,848	7,803	7,864
Total	16,859	12,637	8,392	12,399	11,460

[1] Preliminary.
[2] Includes Divisions Vb and VIb.
[3] Includes Division VIb.

Table 21.2 Annual weight and numbers of whiting caught in Division VIa between 1969 and 1988.

	Weight (1000 tonnes)				Number (millions)			
Year	Total	H.Con	Disc	By-cat	Total	H.Con	Disc	By-cat
1969	12	12	0	0	41	41	0	0
1970	11	11	0	0	40	40	0	0
1971	16	16	0	0	52	52	0	0
1972	15	15	0	0	50	50	0	0
1973	17	17	0	0	62	62	0	0
1974	17	17	0	0	72	72	0	0
1975	20	20	0	0	71	71	0	0
1976	25	25	0	0	90	90	0	0
1977	17	17	0	0	63	63	0	0
1978	15	15	0	0	54	54	0	0
1979	17	17	0	0	61	61	0	0
1980	13	13	0	0	45	45	0	0
1981	12	12	0	0	46	46	0	0
1982	14	14	0	0	48	48	0	0
1983	16	16	0	0	49	49	0	0
1984	16	16	0	0	50	50	0	0
1985	13	13	0	0	43	43	0	0
1986	8	8	0	0	31	31	0	0
1987	12	12	0	0	41	41	0	0
1988	11	11	0	0	41	41	0	0

Table 21.3 Values of natural mortality rate and proportion mature at age.

Age	Nat Mor	Mat.
1	0.200	0.000
2	0.200	1.000
3	0.200	1.000
4	0.200	1.000
5	0.200	1.000
6	0.200	1.000
7	0.200	1.000
8	0.200	1.000

Table 21.4 Total international catch at age ('000) of whiting in Division VIa between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
1	873	730	2387	16777	14078	9083	14917	8500	16120	17670	1
2	25174	6423	8617	12028	36142	51036	16778	46421	13376	18175	2
3	8644	28065	4122	4013	5592	10049	36318	15757	25144	6682	3
4	2566	3241	34784	1363	1461	1166	2819	17423	3127	9400	4
5	1206	670	1338	14796	357	180	281	1508	4719	941	5
6	118	214	240	793	4292	52	57	66	292	1433	6
7	2113	16	70	77	277	817	7	13	13	63	7
8	220	534	153	71	34	31	238	44	11	4	8

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
1	6334	11650	3593	2991	3418	7209	4139	2674	6470	1834	1
2	34221	11378	24395	5783	7094	12765	19520	14826	14023	20498	2
3	13282	14860	11297	29094	8040	8221	8574	9771	14076	9596	3
4	3407	4155	4611	6821	22757	4387	3351	2653	5476	6141	4
5	3488	1244	1518	2043	6070	14825	1997	532	842	1940	5
6	276	1085	452	803	1439	1953	4764	291	332	289	6
7	374	84	197	254	399	723	748	474	125	114	7
8	10	1061	5	95	141	135	74	55	135	92	8

Table 21.5 Total international mean weight at age (kg.) of whiting in Division VIa between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
1	0.178	0.205	0.209	0.211	0.196	0.193	0.209	0.201	0.200	0.199	1
2	0.223	0.203	0.247	0.258	0.235	0.215	0.245	0.242	0.244	0.235	2
3	0.335	0.274	0.276	0.345	0.362	0.317	0.305	0.309	0.296	0.286	3
4	0.500	0.382	0.316	0.368	0.479	0.444	0.471	0.361	0.392	0.389	4
5	0.570	0.519	0.426	0.426	0.485	0.591	0.651	0.497	0.431	0.516	5
6	0.649	0.619	0.551	0.494	0.532	0.641	0.615	0.687	0.629	0.549	6
7	0.618	0.664	0.696	0.603	0.654	0.574	0.841	1.050	0.848	0.602	7
8	0.744	0.683	0.720	0.675	0.763	0.843	0.713	0.800	0.784	0.750	8

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
1	0.218	0.172	0.192	0.184	0.216	0.216	0.185	0.174	0.188	0.176	1
2	0.232	0.242	0.228	0.220	0.249	0.259	0.238	0.236	0.237	0.215	2
3	0.306	0.330	0.289	0.276	0.280	0.313	0.306	0.294	0.304	0.301	3
4	0.404	0.420	0.382	0.352	0.340	0.371	0.402	0.365	0.373	0.400	4
5	0.536	0.492	0.409	0.505	0.409	0.412	0.430	0.468	0.511	0.483	5
6	0.678	0.595	0.409	0.513	0.494	0.458	0.461	0.482	0.520	0.567	6
7	0.694	0.722	0.542	0.503	0.526	0.438	0.531	0.496	0.575	0.595	7
8	0.644	0.894	0.751	0.585	0.466	0.566	0.615	0.530	0.578	0.606	8

Table 21.6 Total international fishing mortality rate at age of whiting in Division VIa between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
1	0.049	0.037	0.089	0.221	0.083	0.160	0.115	0.198	0.247	0.190	1
2	0.184	0.601	0.762	0.835	1.025	0.477	0.491	0.613	0.544	0.484	2
3	0.719	0.320	1.025	1.043	1.328	0.936	0.753	1.268	0.815	0.581	3
4	1.044	0.659	0.835	1.269	1.659	1.230	0.760	1.065	0.973	0.855	4
5	1.309	0.887	0.637	1.125	1.672	1.043	1.246	1.338	0.992	0.930	5
6	1.378	0.890	0.982	1.022	1.326	1.505	1.223	1.228	1.102	0.992	6
7	0.927	0.672	0.848	1.059	1.402	1.038	0.895	1.102	0.885	0.768	7
8	0.927	0.672	0.848	1.059	1.402	1.038	0.895	1.102	0.885	0.768	8

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
1	0.093	0.069	0.104	0.097	0.092	0.128	0.073	0.064	0.102	0.169	1
2	0.677	0.239	0.202	0.243	0.349	0.570	0.592	0.401	0.549	0.530	2
3	0.806	0.719	0.396	0.394	0.624	0.880	0.985	0.680	0.841	0.935	3
4	0.673	0.643	0.512	0.444	0.617	0.857	1.201	1.006	1.085	1.201	4
5	0.947	0.560	0.517	0.449	0.922	1.118	1.378	0.607	1.114	1.821	5
6	0.801	0.915	0.406	0.574	0.666	0.904	1.619	0.764	1.000	1.885	6
7	0.781	0.615	0.407	0.421	0.636	0.866	1.155	0.692	0.918	1.274	7
8	0.781	0.615	0.407	0.421	0.636	0.866	1.155	0.692	0.918	1.274	8

Table 21.7 Stock numbers at age ('000) of whiting in Division VIa between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
1	19940	22301	30875	93140	195340	67779	151608	51940	81001	112159	1
2	165043	15537	17599	23125	61157	147232	47309	110677	34871	51816	2
3	18372	112455	6975	6722	8216	17963	74804	23700	49103	16575	3
4	4295	7326	66852	2049	1939	1782	5767	28840	5458	17790	4
5	1785	1238	3102	23740	472	302	427	2207	8144	1688	5
6	171	395	417	1344	6312	73	87	100	474	2473	6
7	3800	35	133	128	396	1373	13	21	24	129	7
8	395	1191	291	118	48	53	437	72	19	9	8

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
1	78713	191582	39926	35589	429651	66230	64583	47283	73727	12960	1
2	75916	58733	146342	29448	26440	32094	47726	49142	36299	54527	2
3	26137	31585	37848	97852	18908	15276	14853	21614	26930	17166	3
4	7592	9559	12594	20849	54004	8292	5188	4539	8968	9507	4
5	6192	3172	4112	6182	10954	23866	2881	1279	1359	2482	5
6	545	1967	1483	2008	3229	3567	6388	595	571	365	6
7	751	200	645	809	925	1358	1182	1036	227	172	7
8	21	251	15	302	328	254	117	121	245	138	8

Table 21.8 Mean fishing mortality, biomass and recruitment of whiting in Division VIa between 1969 and 1988.

	Mean Fishing Mortality			Biomass		Recruits	
	Ages		Ages	1000 tonnes		Age 1	
	2 to 4		1 to 1				
Year	H.Con	Disc	By-cat	Total	Sp St	Y.C.	Million
1969	0.649	0.000	0.000	52	49	68	20
1970	0.527	0.000	0.000	43	38	69	22
1971	0.874	0.000	0.000	36	29	70	31
1972	1.049	0.000	0.000	40	20	71	93
1973	1.337	0.000	0.000	61	22	72	195
1974	0.881	0.000	0.000	52	39	73	68
1975	0.668	0.000	0.000	70	38	74	152
1976	0.982	0.000	0.000	56	46	75	52
1977	0.777	0.000	0.000	45	29	76	81
1978	0.640	0.000	0.000	49	26	77	112
1979	0.719	0.000	0.000	50	33	78	79
1980	0.534	0.000	0.000	65	32	79	192
1981	0.370	0.000	0.000	59	52	80	40
1982	0.360	0.000	0.000	52	46	81	36
1983	0.530	0.000	0.000	46	37	82	43
1984	0.769	0.000	0.000	43	28	83	66
1985	0.926	0.000	0.000	35	23	84	65
1986	0.696	0.000	0.000	29	21	85	47
1987	0.825	0.000	0.000	36	21	86	80
1988	0.889	0.000	0.000	31	23	87	40
Arit-mean recruits at age 1 for period 1969 to 1988							76
Geom-mean recruits at age 1 for period 1969 to 1988							62

Table 21.9 Input for catch prediction of whiting in Division VIa.

	1988 Stock and Fishing Mortality			Values used in Prediction F at age , Mean Wt. and Propn. Retained by Consumption Fishery							
				Scaled mean F 1984 to 1988			Mean values for period 1984 to 1988 Mean Weight (Kg.)				Prop.
Age	Stock Number	Fishing Mortality H.Con.	Disc	Ind	H.Con.	Disc	Ind	H.Con.	Disc	Ind	Stock	Ret.
1	40000	0.114			0.114			0.188			0.188	1.000
2	60000	0.572			0.572			0.237			0.237	1.000
3	17167	0.935			0.936			0.304			0.304	1.000
4	9506	1.201			1.158			0.382			0.382	1.000
5	2482	1.821			1.307			0.461			0.461	1.000
6	365	1.885			1.337			0.498			0.498	1.000
7	172	1.274			1.062			0.527			0.527	1.000
8	138	1.274			1.062			0.579			0.579	1.000

Mean F	Age 2 to 4	Age 1 1	Age 2 to 4	Age 1 1
Unscaled	0.889	0.000	0.821	0.000
Scaled			0.889	0.000

Recruits at age 1 in 1989 = 62091
Recruits at age 1 in 1990 = 62091
Recruits at age 1 in 1991 = 62091
Recruits at age 1 in 1992 = 62091

M at age and proprtion mature at age are as shown in Table 21.3

Mean F for ages 2 to 4 in 1988 for human consumption landings + discards = 0.889 .
Human consumption + discard F-at-age values in prediction are mean values for the period 1984 to 1988 rescaled to produce a mean value of F for ages 2 to 4 equal to that for 1988

Mean F for ages 1 to 1 in 1988 for small-mesh fisheries = 0.000 .
Industrial fishery F-at-age in the prediction are averages for the period 1984 to 1988 .
rescaled to produce a mean value of F for ages 1 to 1 equal to that for 1988

Values of N in 1988 from VPA have been overwritten
for the following ages .....

Age 1
Age 2

Values of F for these ages in 1988 from VPA have been overwritten
with scaled mean values used for predictions for 1989 onwards

Table 21.10 Predicted catches and biomasses ('000 tonnes) of whiting in Division VIa 1989 to 1990.

	Year											
	1988	1989	1990									
Biomass 1 Jan of Year												
Total	31	30	31	31	31	31	31	31	31	31	31	31
Spawning	23	19	19	19	19	19	19	19	19	19	19	19
Mean F Ages												
Human Cons. 2 to 4	0.89	0.89	0.00	0.18	0.36	0.53	0.71	0.89	1.07	0.00	0.00	
Small-mesh 1 to 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean F(Year)/Mean F(1988)										F0.1	Fmax	
Human Consumption	1.00	1.00	0.00	0.20	0.40	0.60	0.80	1.00	1.20	0.00	0.00	
Catch weight												
Human Consumption	11	11	0	3	5	7	9	11	12	0	0	
Discards	0	0	0	0	0	0	0	0	0	0	0	
Small-mesh Fisheries	0	0	0	0	0	0	0	0	0	0	0	
Total landings	11	11	0	3	5	7	9	11	12	0	0	
Total catch	11	11	0	3	5	7	9	11	12	0	0	
Biomass 1 Jan of Year+1												
Total	30	31	43	40	38	35	33	32	30	0	0	
Spawning	19	19	32	29	26	24	22	20	19	0	0	

Stock at start of and catch during 1989

Age	Stock No	H.Cons	Discards	By-catch	Total
1	62091	6081	0	0	6081
2	29217	11648	0	0	11648
3	27720	15502	0	0	15502
4	5518	3495	0	0	3495
5	2342	1581	0	0	1581
6	329	225	0	0	225
7	45	27	0	0	27
8	39	24	0	0	24
Wt	30414	10818	0	0	10818

Stock at start of and catch during 1990
for F(1990) = F(1989)

Age	Stock No	H.Cons	Discards	By-catch	Total
1	62091	6081	0	0	6081
2	45353	18081	0	0	18081
3	13498	7549	0	0	7549
4	8904	5641	0	0	5641
5	1419	958	0	0	958
6	519	354	0	0	354
7	71	43	0	0	43
8	24	14	0	0	14
Wt	30885	10526	0	0	10526

Table 21.11 Age composition of whiting in Division VIa in Scottish landings. First quarter of 1989 (numbers in '000).

Age	Number
1	0
2	231
3	1368
4	964
5	333
6	77
7	6
8	1
9	+
10+	10
Tonnes	952

Table 22.1 Nominal catch (in tonnes) of WHITING in Division VIb, 1979-1988, as officially reported to ICES.

Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Denmark	-	...[2]	-	-	-	-	-[1]	-	...[2]	-
France	-	3	-	-	-	3	2	-	-	...[1,2]
Germany, Fed.Rep.	-	-	-	-	-	-	-	-	...[2]	-
Ireland	-	-	-	-	-	-	-	-	-	-
Spain	-	-	196	112	88	16	123	-	...	...
UK(Engl. & Wales)	1	+	-	-	+	2	+	5	4	-
UK(Scotland)	2	59	+	-	5	25	6	13	108	23
Total	3	62	196	112	93	46	131	18	112	23

[1] Provisional.
[2] Included in Division VIa.

Table 23.1 Nominal catch (in tonnes) of WHITING in Division VIId, 1979-1988, as officially reported to ICES.

Country	1979	1980	1981	1982	1983
Belgium	89[1]	52[1]	88	93	84
Denmark	...	...	2	-	-
France	4,477	7,110	8,145	7,012	5,057
Netherlands	-	-	1	2	1
UK(England and Wales)	160	122	120	170	198
Total	4,726	7,284	8,356	7,277	5,340
WG Estimate	8,910	9,167	8,932	7,911	6,936

Country	1984	1985	1986	1987	1988
Belgium	79	82	65	136	69[2]
Denmark	-	-	-	-	-
France	6,914	7,563	4,551[1]	6,730	4,503[3]
Netherlands	-	-	...	-	-
UK(England and Wales)	88	186	180	287	251
Total	7,081	7,831	4,796	7,153	4,823
WG Estimate	7,373	7,339	5,678	5,518	5,203

[1] Included in Division VIIe.
[2] Preliminary.
[3] Working Group estimate.

Table 23.2 Values of natural mortality rate and proportion mature at age.

Age	Nat Mor	Mat.
1	0.200	0.000
2	0.200	1.000
3	0.200	1.000
4	0.200	1.000
5	0.200	1.000
6	0.200	1.000
7	0.200	1.000

Table 23.3 Total international catch at age ('000) of whiting in Division VIId between 1976 and 1988.

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Age
1	529	1351	1105	413	163	952	3199	3441	4105	493	1
2	9774	6717	6763	8072	5742	9204	10391	12546	12308	14184	2
3	6190	10329	18945	14018	16492	10274	14132	8486	13266	15979	3
4	8590	1099	9770	10512	7365	8548	3151	3537	2274	2494	4
5	1800	1301	579	2358	4806	3308	1553	1229	1075	578	5
6	430	336	650	98	776	1275	453	154	317	203	6
7	109	41	134	130	166	719	73	77	68	66	7

Age	1986	1987	1988	Age
1	235	2398	2161	1
2	3777	7198	12670	2
3	11819	1964	4720	3
4	6989	8893	653	4
5	1047	590	915	5
6	283	292	39	6
7	80	66	11	7

Table 23.4 Total international mean weight at age (Kg.) of whiting in Division VIId between 1976 and 1988.

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Age
1	0.220	0.191	0.280	0.189	0.157	0.150	0.146	0.174	0.172	0.137	1
2	0.225	0.179	0.215	0.205	0.211	0.229	0.197	0.211	0.194	0.167	2
3	0.284	0.242	0.223	0.247	0.243	0.278	0.257	0.258	0.239	0.242	3
4	0.312	0.352	0.275	0.272	0.286	0.272	0.318	0.296	0.310	0.301	4
5	0.414	0.357	0.328	0.325	0.312	0.264	0.346	0.307	0.261	0.318	5
6	0.381	0.378	0.319	0.398	0.347	0.305	0.410	0.376	0.305	0.290	6
7	0.480	0.473	0.340	0.368	0.332	0.333	0.446	0.375	0.382	0.428	7

Age	1986	1987	1988	Age
1	0.131	0.191	0.184	1
2	0.164	0.218	0.215	2
3	0.228	0.256	0.320	3
4	0.268	0.298	0.356	4
5	0.310	0.371	0.353	5
6	0.335	0.322	0.465	6
7	0.424	0.457	0.446	7

Table 23.5 Separable VPA of whiting in Division VIId.

Separable analysis
from 1976 to 1988 on ages 0 to 6
with Terminal F of 1.000 on age 3 and Terminal S of 1.000

Initial sum of squared residuals was ******* and
final sum of squared residuals is 297.988 after 65 iterations

Matrix of Residuals

Years	1976/77	1977/78
Ages		
0/ 1	-5.756	-4.666
1/ 2	-0.642	1.156
2/ 3	0.019	-0.104
3/ 4	0.778	0.027
4/ 5	0.571	0.288
5/ 6	0.120	0.123
	0.000	0.000
WTS	1.000	1.000

Years	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88		WTS
Ages												
0/ 1	-4.195	-2.976	-4.418	-6.019	-6.314	-6.275	-4.373	1.468	-5.501	-3.717	-52.741	0.177
1/ 2	0.272	-0.094	-1.227	0.010	0.826	1.122	0.953	0.368	-0.845	0.334	2.234	0.483
2/ 3	-0.314	-0.036	0.263	-0.076	0.357	0.298	-0.099	0.552	1.088	0.285	2.234	1.000
3/ 4	-0.012	0.319	0.430	0.322	0.297	0.463	0.600	-0.002	-0.552	-0.437	2.234	0.949
4/ 5	0.465	0.114	0.212	0.415	-0.598	-0.090	-0.150	-0.387	1.190	0.204	2.234	0.803
5/ 6	0.594	0.226	0.561	0.526	0.591	-0.100	-0.037	-0.713	-0.143	0.487	2.234	0.950
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-41.572	
WTS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		

Fishing Mortalities (F)

	1976	1977	1978
F-values	0.5725	0.3471	0.5132

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
F-values	0.4538	0.5362	0.8782	0.9770	0.8690	0.9599	0.8515	0.9474	1.3310	1.0000

Selection-at-age (S)

	0	1	2	3	4	5	6
S-values	0.0009	0.0245	0.3524	1.0000	1.3115	1.3224	1.0000

Table 23.6 Total international fishing mortality rate at age of whiting in Division VIId between 1976 and 1988.

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Age
1	0.007	0.026	0.020	0.013	0.004	0.030	0.073	0.064	0.074	0.053	1
2	0.235	0.119	0.173	0.202	0.249	0.315	0.512	0.444	0.337	0.392	2
3	1.098	0.417	0.567	0.643	0.804	0.947	1.152	1.080	1.249	0.990	3
4	1.069	0.575	0.901	0.724	0.861	1.486	0.896	1.086	1.013	0.854	4
5	0.798	0.442	0.690	0.568	0.897	1.361	1.424	1.166	1.295	0.791	5
6	0.569	0.330	0.414	0.232	0.369	0.639	0.675	0.490	1.191	0.956	6
7	0.569	0.330	0.414	0.232	0.369	0.639	0.675	0.490	1.191	0.956	7

Age	1986	1987	1988	Age
1	0.012	0.067	0.087	1
2	0.703	0.566	0.585	2
3	0.667	1.032	0.932	3
4	2.194	1.929	1.312	4
5	1.166	1.750	1.368	5
6	1.257	1.382	0.489	6
7	1.257	1.382	0.489	7

Table 23.7 Stock numbers at age ('000) of whiting in Division VIId between 1976 and 1988.

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Age
1	81037	58694	60539	35357	45895	35722	50318	61456	63054	10512	1
2	51250	65870	46835	48567	28574	37428	28387	38310	47210	47921	2
3	10067	33166	47874	32253	32496	18230	22373	13934	20116	27597	3
4	14185	2749	17888	22242	13877	11904	5787	5788	3876	4725	4
5	3564	3988	1267	5949	8827	4802	2205	1933	1599	1153	5
6	1084	1313	2099	520	2761	2948	1008	435	493	359	6
7	274	161	434	692	590	1663	162	217	105	116	7

Age	1986	1987	1988	Age
1	22492	40819	28601	1
2	8162	18202	31256	2
3	26504	3310	8461	3
4	8392	11140	965	4
5	1647	766	1325	5
6	428	420	109	6
7	122	95	32	7

Table 23.8 Mean fishing mortality, biomass and recruitment of whiting in Division VIId between 1976 and 1988.

	Mean Fishing Mortality			Biomass		Recruits	
	Ages		Ages	1000 tonnes		Age 1	
	2 to 4		1 to 1				
Year	H.Con	Disc	By-cat	Total	Sp St	Y.C.	Million
1976	0.801	0.000	0.000	39	21	75	81
1977	0.370	0.000	0.000	34	23	76	59
1978	0.547	0.000	0.000	44	27	77	61
1979	0.523	0.000	0.000	33	26	78	35
1980	0.638	0.000	0.000	29	22	79	46
1981	0.916	0.000	0.000	25	20	80	36
1982	0.853	0.000	0.000	22	14	81	50
1983	0.870	0.000	0.000	25	14	82	61
1984	0.866	0.000	0.000	27	16	83	63
1985	0.746	0.000	0.000	18	17	84	11
1986	1.188	0.000	0.000	13	10	85	22
1987	1.176	0.000	0.000	16	9	86	41
1988	0.943	0.000	0.000	23	10	87	67
Arit-mean recruits at age 1 for period 1976 to 1988							49
Geom-mean recruits at age 1 for period 1976 to 1988							44

Table 23.9 Input for catch prediction of whiting in Division VIId.

	1988				Values used in Prediction						
	Stock and Fishing Mortality				F at age , Mean Wt. and Propn. Retained by Consumption Fishery						
					Scaled mean F			Mean values for period 1984 to 1988			
Age	Stock	Fishing Mortality			1984 to 1988			Mean Weight (Kg.)			Prop.
	Number	H.Con.	Disc	Ind	H.Con.	Disc	Ind	H.Con.	Disc	Ind	Stock	Ret.
1	67379	0.036			0.046			0.163			0.163	1.000
2	31260	0.585			0.495			0.192			0.192	1.000
3	8460	0.932			0.934			0.257			0.257	1.000
4	965	1.312			1.400			0.307			0.307	1.000
5	1325	1.368			1.221			0.322			0.322	1.000
6	109	0.489			1.011			0.344			0.344	1.000
7	32	0.489			1.012			0.427			0.427	1.000

	Mean F	Age 2 to 4	Age 1 1	Age 2 to 4	Age 1 1
	Unscaled	0.943	0.000	0.984	0.000
	Scaled			0.943	0.000

Recruits at age 1 in 1989 = 43695
Recruits at age 1 in 1990 = 43695
Recruits at age 1 in 1991 = 43695
Recruits at age 1 in 1992 = 43695

M at age and proprtion mature at age are as shown in Table 23.2

Mean F for ages 2 to 4 in 1988 for human consumption landings + discards = 0.943 .
Human consumption + discard F-at-age values in prediction are mean values for the period 1984 to 1988
rescaled to produce a mean value of F for ages 2 to 4 equal to that for 1988

Mean F for ages 1 to 1 in 1988 for small-mesh fisheries = 0.000 .
Industrial fishery F-at-age in the prediction are averages for the period 1984 to 1988 .
rescaled to produce a mean value of F for ages 1 to 1 equal to that for 1988

Recruits 88 from $F_{(76-85)}$
Recruits 89-90 from $R_{(76-88)}$

Table 23.10 Predicted catches and biomasses ('000 tonnes) of whiting in Division VIId 1989 to 1990.

	Year											
	1988	1989	1990									
Biomass 1 Jan of Year												
Total	23	22	22	22	22	22	22	22	22	22	22	22
Spawning	10	15	15	15	15	15	15	15	15	15	15	15
Mean F Ages												
Human Cons. 2 to 4	0.94	0.94	0.00	0.19	0.38	0.57	0.75	0.94	1.13	0.00	0.00	
Small-mesh 1 to 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean F(Year)/Mean F(1988)										F0.1	Fmax	
Human Consumption	1.00	1.00	0.00	0.20	0.40	0.60	0.80	1.00	1.20	0.00	0.00	
Catch weight												
Human Consumption	5	7	0	2	4	5	6	8	9	0	0	
Discards	0	0	0	0	0	0	0	0	0	0	0	
Small-mesh Fisheries	0	0	0	0	0	0	0	0	0	0	0	
Total landings	5	7	0	2	4	5	6	8	9	0	0	
Total catch	5	7	0	2	4	5	6	8	9	0	0	
Biomass 1 Jan of Year+1												
Total	22	22	29	27	25	24	22	21	20	0	0	
Spawning	15	15	22	20	18	16	15	14	13	0	0	

Stock at start of and catch during 1989

Age	Stock No	H.Cons	Discards	By-catch	Total
1	43695	1797	0	0	1797
2	53214	18993	0	0	18993
3	14258	7964	0	0	7964
4	2727	1905	0	0	1905
5	213	139	0	0	139
6	276	162	0	0	162
7	55	32	0	0	32
Wt	22004	6676	0	0	6676

Stock at start of and catch during 1990
for F(1990) = F(1989)

Age	Stock No	H.Cons	Discards	By-catch	Total
1	43695	1797	0	0	1797
2	34152	12189	0	0	12189
3	26552	14831	0	0	14831
4	4588	3204	0	0	3204
5	551	359	0	0	359
6	51	30	0	0	30
7	99	58	0	0	58
Wt	22132	7572	0	0	7572

Table 23.11 Nominal catch (in tonnes) of WHITING in Division VIIe, 1979-1988, as officially reported to ICES.

Country	1979	1980	1981	1982	1983
Belgium	3	33	14	8	10
Denmark	2,585[1]	6[1]	-	-	-
France	875	580	697	1,039	651
Netherlands	1	2	1	68	398
UK(England and Wales)	770	717	1,016	1,052	1,012
Total	4,234	1,338	1,728	2,167	2,071
WG Estimate	1,220	1,222	1,437	1,403	1,723

Country	1984	1985	1986	1987	1988
Belgium	4	2	2	2	4
Denmark	-	-	-	-	-[2]
France	325	544	788	1,486	1,102[3]
Netherlands	-	-	124[1]	-	-
UK(England and Wales)	723	418	629	753	1,183
Total	1,052	964	1,543	2,241	2,289
WG Estimate	1,004	1,625	1,102	1,091	1,513

[1] Includes Division VIId.
[2] Preliminary.
[3] Working Group estimate.

Table 23.12 Nominal catch (in tonnes) of WHITING in Divisions VIIb,c,h-k, 1979-1988, based on officially reported figures (where available) and Working Group estimates.

Country	1979	1980	1981	1982	1983
France	444	656	516	204	356
Germany, Fed. Rep.	-	+	-	-	-
Ireland	2,589	3,499	3,550	4,011	2,590
Netherlands	1	1	21	78	363
Spain	-	-	-	85	91
UK (England and Wales)	-	-	67	49	18
UK (Scotland)	1	80	1	-	-
Total	3,035	4,236	4,155	4,427	3,418

Country	1984	1985	1986	1987	1988
France	398	583	614	487	...[1]
Germany, Fed. Rep.	-	-	-	-	7[1]
Ireland	1,872	2,719	2,165	2,421	1,743[1]
Netherlands	169	90	7	-	...
Spain	57	76	-	-	...
UK (England and Wales)	58	165	168	95	121
UK (Scotland)	4	-	-	7	1
Total	2,558	3,633	2,954	3,010	1,872

[1] Preliminary.

Table 24.1 Nominal catch (tonnes) of SAITHE in Sub-area IV and Division IIIa, 1979-1988, as officially reported to ICES.

Country	1979	1980	1981	1982	1983
Belgium	14	13	12	4	7
Denmark	10,461	10,370	6,454	10,114	10,530
Faroe Islands	407	1,020	614	746	806
France	40,983	37,306	42,649	47,064	38,782
German Dem. Rep.	1,504	925	-	-	-
Germany, Fed. Rep.	18,780	11,095	8,246	13,517	13,649
Netherlands	1,466	245	123	36	89
Norway	17,575	47,959	55,882	72,669	81,330
Poland	6,104	2,404	698	793	415
Sweden	211	342	156	372	548
UK (England and Wales)	6,256	4,879	4,309	5,627	6,845
UK (Scotland)	6,257	6,525	6,529	8,136	6,321
USSR	2,015	-	-	-	-
Total	114,033	123,083	125,672	159,078	159,322

Country	1984	1985	1986	1987	1988
Belgium	32	31	16	4	60[1]
Denmark	8,526	9,033	10,343	7,928[1]	6,867[1]
Faroe Islands	-	895	224	-[1]	347[1,2]
France	43,592	42,200	43,958	38,356	27,299[1,3]
German Dem. Rep.	-	-	-	-	-
Germany, Fed. Rep.	25,262	22,551	22,277	22,400	17,429[1]
Netherlands	181	233	134	334	...[1]
Norway	88,420	101,808	67,341	66,400	35,182[1]
Poland	413	-	495	832	1,016
Sweden	522	1,764	1,987	1,732	2,064
UK (England & Wales)	8,183	5,455	4,480	3,233	3,790
UK (Scotland)	6,970	9,932	15,520	11,911	10,850
USSR	-	-	-	-	-
Total	182,101	193,902	166,775	153,130	104,904

[1] Preliminary.
[2] Includes Divisions VIa,b.
[3] Includes Division IIa.

Table 24.2 Annual weight and numbers of saithe caught in Sub-area IV between 1969 and 1988.

	Weight (1000 tonnes)				Number (millions)			
Year	Total	H.Con	Disc	By-cat	Total	H.Con	Disc	By-cat
1969	115	115	0	0	66	66	0	0
1970	222	163	0	59	142	95	0	47
1971	253	218	0	35	176	143	0	33
1972	246	218	0	28	176	153	0	23
1973	226	195	0	31	169	142	0	27
1974	273	231	0	42	165	120	0	45
1975	278	240	0	38	189	142	0	47
1976	320	253	0	67	310	223	0	87
1977	196	190	0	6	121	117	0	4
1978	135	132	0	3	97	96	0	2
1979	114	113	0	2	68	67	0	1
1980	120	120	0	0	72	72	0	0
1981	123	121	0	1	70	68	0	2
1982	166	161	0	5	115	110	0	5
1983	169	167	0	1	112	111	0	1
1984	198	192	0	6	167	161	0	6
1985	200	192	0	8	206	195	0	11
1986	164	163	0	1	158	156	0	2
1987	149	145	0	4	167	159	0	8
1988	105	104	0	1	93	92	0	1

Table 24.3 Values of natural mortality rate and proportion mature at age.

Age	Nat Mor	Mat.
1	0.200	0.000
2	0.200	0.000
3	0.200	0.000
4	0.200	0.150
5	0.200	0.700
6	0.200	0.900
7	0.200	1.000
8	0.200	1.000
9	0.200	1.000
10	0.200	1.000

Table 24.4 Total international catch at age ('000) of saithe in Sub-area IV between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
1	36	234	594	379	4416	3947	312	235	2015	1215	1
2	1764	2228	10773	20189	31275	16150	71766	31335	12891	16503	2
3	28252	34392	68424	40162	47388	61201	50672	199669	22890	30972	3
4	13063	74326	53348	62290	32955	31387	23406	50339	52270	24935	4
5	9559	13194	30846	23108	24967	12123	9005	9902	13082	16771	5
6	7103	11529	3650	20779	15228	20080	6706	5137	4753	2616	6
7	5170	3654	3783	3363	7998	13734	12650	3317	3218	849	7
8	685	1596	2481	2790	1689	4308	8650	4845	3062	790	8
9	547	278	1574	1550	1165	988	3304	3003	3522	607	9
10	79	144	536	1445	1927	1094	2347	2128	3780	2165	10

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
1	907	1276	5309	1932	270	59	214	104	780	11	1
2	16787	23095	18195	28263	32798	34455	6622	6078	28876	4886	2
3	14504	14159	22267	27405	23363	75449	124122	47110	29029	27389	3
4	13022	11399	6362	38946	17980	29769	54405	85116	90577	23186	4
5	10031	8338	6151	7934	25161	12081	13039	12197	12429	32283	5
6	7991	6086	3265	5410	4903	12330	4045	4269	1942	2910	6
7	2437	5189	2994	1761	4380	1357	2524	1592	1120	1132	7
8	577	956	3173	1210	1333	1113	461	1044	813	451	8
9	349	418	504	846	929	279	267	265	689	492	9
10	1333	1486	1863	794	819	487	254	487	498	400	10

Table 24.5 Total international mean weight at age (Kg.) of saithe in Sub-area IV between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
1	0.451	0.434	0.495	0.304	0.154	0.268	0.198	0.461	0.429	0.353	1
2	0.578	0.697	0.609	0.510	0.392	0.494	0.494	0.501	0.416	0.520	2
3	0.962	0.931	0.838	0.743	0.780	0.849	0.887	0.690	0.753	0.781	3
4	1.608	1.442	1.357	1.158	1.407	1.556	1.497	1.302	1.251	1.294	4
5	2.263	2.073	2.203	1.897	1.575	2.489	2.478	2.175	1.900	2.120	5
6	2.899	2.708	3.007	2.364	2.543	2.729	3.275	3.036	3.097	3.210	6
7	3.569	3.598	3.804	3.869	3.339	3.353	3.684	4.007	4.146	4.466	7
8	4.335	4.420	4.635	4.184	4.657	4.386	4.190	4.325	4.551	4.784	8
9	5.157	5.615	5.168	4.543	4.502	5.538	5.481	4.981	4.779	5.309	9
10	6.131	6.659	5.691	6.120	6.046	7.525	7.419	6.768	6.257	6.748	10

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
1	0.434	0.253	0.274	0.249	0.418	0.181	0.142	0.481	0.360	0.417	1
2	0.389	0.411	0.585	0.498	0.455	0.482	0.481	0.481	0.387	0.545	2
3	1.080	0.905	0.937	1.087	0.982	0.772	0.649	0.648	0.641	0.698	3
4	1.590	1.812	1.859	1.566	1.701	1.600	1.244	1.000	0.838	0.902	4
5	2.219	2.370	2.694	2.497	2.118	2.270	1.889	1.674	1.770	1.324	5
6	3.071	2.975	3.529	3.144	3.058	2.645	2.603	2.294	2.921	2.641	6
7	3.966	4.047	4.470	3.958	3.533	3.715	3.141	3.559	3.782	3.684	7
8	5.128	5.044	5.424	4.908	4.432	4.524	4.521	4.245	4.902	4.649	8
9	5.947	5.812	6.907	5.606	5.336	5.897	5.094	5.779	5.491	5.672	9
10	7.170	7.322	8.349	7.748	6.948	7.720	7.218	7.900	7.040	7.194	10

Table 24.6 Total international fishing mortality rate at age of saithe in Sub-area IV between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
1	0.000	0.001	0.003	0.002	0.018	0.007	0.002	0.002	0.018	0.013	1
2	0.006	0.007	0.065	0.129	0.195	0.086	0.165	0.241	0.133	0.197	2
3	0.117	0.155	0.281	0.363	0.499	0.714	0.420	0.926	0.279	0.537	3
4	0.290	0.502	0.382	0.445	0.573	0.736	0.667	0.989	0.672	0.555	4
5	0.252	0.533	0.402	0.283	0.322	0.429	0.482	0.673	0.771	0.472	5
6	0.361	0.545	0.273	0.522	0.305	0.466	0.449	0.564	0.825	0.337	6
7	0.418	0.320	0.344	0.434	0.389	0.498	0.608	0.419	0.859	0.331	7
8	0.513	0.219	0.374	0.461	0.406	0.376	0.683	0.497	0.874	0.528	8
9	0.386	0.404	0.348	0.425	0.356	0.442	0.555	0.539	0.841	0.417	9
10	0.386	0.404	0.348	0.425	0.356	0.442	0.555	0.539	0.841	0.417	10

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
1	0.004	0.008	0.030	0.007	0.001	0.000	0.001	0.001	0.005	0.000	1
2	0.248	0.123	0.160	0.220	0.146	0.101	0.018	0.053	0.207	0.041	2
3	0.266	0.342	0.168	0.382	0.286	0.576	0.623	0.171	0.383	0.310	3
4	0.456	0.346	0.254	0.491	0.465	0.715	1.138	1.264	0.569	0.603	4
5	0.454	0.598	0.318	0.577	0.691	0.663	0.815	0.876	0.612	0.408	5
6	0.433	0.554	0.498	0.512	0.881	0.902	0.487	0.702	0.321	0.278	6
7	0.605	0.561	0.588	0.554	1.067	0.653	0.460	0.360	0.397	0.315	7
8	0.394	0.508	0.819	0.504	1.132	0.899	0.484	0.350	0.315	0.275	8
9	0.472	0.556	0.556	0.537	0.943	0.779	0.562	0.572	0.412	0.320	9
10	0.472	0.556	0.556	0.537	0.943	0.779	0.562	0.572	0.412	0.320	10

Table 24.7 Stock numbers at age ('000) of saithe in Sub-area IV between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
1	460939	230853	224863	237609	268007	636974	196531	139119	126101	103821	1
2	323016	377353	188795	183566	194195	215438	517945	160624	113689	101422	2
3	282793	262870	306937	144851	132093	130833	161818	359407	103316	81461	3
4	57013	206060	184232	189778	82532	65693	52478	87029	116600	64006	4
5	47157	34935	102122	102950	99522	38083	25773	22053	26508	48766	5
6	25680	30010	16788	55931	63512	59048	20306	13032	9209	10034	6
7	16565	14648	14249	10462	27183	38312	30345	10612	6072	3304	7
8	1867	8924	8710	8268	5549	15077	19063	13531	5713	2105	8
9	1871	915	5870	4903	4268	3028	8477	7882	6737	1951	9
10	270	476	1998	4572	7061	3354	6022	5584	7231	6954	10

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
1	268691	167119	197906	327211	482566	501813	157765	207156	166239	60731	1
2	83904	219167	135673	157238	266153	394847	410797	128974	169511	135401	2
3	68179	53593	158618	94687	103298	188352	292201	330352	100109	112789	3
4	38965	42776	31160	109808	52924	63569	86699	128258	228034	55905	4
5	30084	20226	24784	19789	55006	27213	25469	22736	29672	105643	5
6	24895	15637	9102	14764	9103	22564	11486	9230	7753	13179	6
7	5866	13215	7355	4527	7242	3088	7499	5779	3745	4603	7
8	1943	2623	6175	3343	2130	2040	1315	3877	3302	2061	8
9	1016	1073	1292	2228	1653	562	680	664	2236	1973	9
10	3880	3811	4776	2092	1458	980	646	1221	1617	1603	10

Table 24.8 Mean fishing mortality, biomass and recruitment of saithe in Sub-area IV between 1969 and 1988.

	Mean Fishing Mortality			Biomass			Recruits
	Ages		Ages	1000 tonnes			Age 1
	3 to 6		1 to 4				
Year	H.Con	Disc	By-cat	Total	Sp St	Y.C.	Million
1969	0.255	0.000	0.000	1013	229	68	461
1970	0.363	0.000	0.071	1159	269	69	231
1971	0.291	0.000	0.045	1145	377	70	225
1972	0.360	0.000	0.044	946	414	71	238
1973	0.330	0.000	0.096	833	451	72	268
1974	0.429	0.000	0.162	983	463	73	637
1975	0.404	0.000	0.111	930	399	74	197
1976	0.687	0.000	0.121	772	264	75	139
1977	0.621	0.000	0.013	533	211	76	126
1978	0.466	0.000	0.006	454	196	77	104
1979	0.394	0.000	0.007	495	192	78	269
1980	0.458	0.000	0.002	454	188	79	167
1981	0.307	0.000	0.004	554	200	80	198
1982	0.474	0.000	0.016	594	165	81	327
1983	0.575	0.000	0.003	713	174	82	483
1984	0.694	0.000	0.018	681	144	83	502
1985	0.731	0.000	0.029	633	114	84	158
1986	0.749	0.000	0.004	614	115	85	207
1987	0.456	0.000	0.014	510	140	86	166
1988	0.397	0.000	0.002	526	186	87	237
Arit-mean recruits at age 1 for period 1969 to 1988							267
Geom-mean recruits at age 1 for period 1969 to 1988							237

Table 24.9 Input for catch prediction of saithe in Sub-area IV.

	1988				Values used in Prediction						
	Stock and Fishing Mortality				F at age , Mean Wt. and Propn. Retained by Consumption Fishery						
					Scaled mean F			Mean values for period 1984 to 1988			
Age	Stock	Fishing Mortality			1984 to 1988			Mean Weight (Kg.)			Prop.
	Number	H.Con.	Disc	Ind	H.Con.	Disc	Ind	H.Con.	Disc	Ind	Stock	Ret.
1	237000	0.001		0.000	0.001		0.000	0.315		0.200	0.316	1.000
2	135401	0.040		0.000	0.054		0.000	0.476		0.402	0.475	1.000
3	112789	0.305		0.005	0.260		0.003	0.687		0.542	0.682	1.000
4	55905	0.598		0.005	0.538		0.007	1.130		0.896	1.117	1.000
5	105643	0.405		0.003	0.437		0.002	1.790		1.463	1.785	1.000
6	13179	0.278			0.352		0.000	2.621		2.760	2.621	1.000
7	4603	0.315			0.286		0.000	3.576		3.590	3.576	1.000
8	2061	0.275			0.304		0.000	4.569		4.200	4.568	1.000
9	1973	0.320			0.347			5.587			5.587	1.000
10	1603	0.320			0.347			7.414			7.414	1.000

Mean F	Age 3 to 6	Age 1 4	Age 3 to 6	Age 1 4
Unscaled	0.397	0.002	0.605	0.013
Scaled			0.397	0.002

Recruits at age 1 in 1989 = 237091
Recruits at age 1 in 1990 = 237091
Recruits at age 1 in 1991 = 237091
Recruits at age 1 in 1992 = 237091

M at age and proprtion mature at age are as shown in Table 24.3

Mean F for ages 3 to 6 in 1988 for human consumption landings + discards = 0.397 .
Human consumption + discard F-at-age values in prediction are mean values for the period 1984 to 1988
rescaled to produce a mean value of F for ages 3 to 6 equal to that for 1988

Mean F for ages 1 to 4 in 1988 for small-mesh fisheries = 0.002 .
Industrial fishery F-at-age in the prediction are averages for the period 1984 to 1988 .
rescaled to produce a mean value of F for ages 1 to 4 equal to that for 1988

Values of N in 1988 from VPA have been overwritten
for the following ages .....

Age 1

Values of F for these ages in 1988 from VPA have been overwritten
with scaled mean values used for predictions for 1989 onwards

Table 24.10 Predicted catches and biomasses ('000 tonnes) of saithe in Sub-area IV 1989 to 1990.

	Year										
	1988	1989	1990								
Biomass 1 Jan of Year											
Total	526	568	598	598	598	598	598	598	598	598	598
Spawning	186	236	244	244	244	244	244	244	244	244	244
Mean F Ages											
Human Cons. 3 to 6	0.40	0.40	0.00	0.08	0.16	0.24	0.32	0.40	0.48	0.00	0.00
Small-mesh 1 to 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mean F(Year)/Mean F(1988)										F0.1	Fmax
Human Consumption	1.00	1.00	0.00	0.20	0.40	0.60	0.80	1.00	1.20	0.00	0.00
Small-mesh Fishery	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00
Catch weight											
Human Consumption	104	118	0	28	53	77	99	120	140	0	0
Discards	0	0	0	0	0	0	0	0	0	0	0
Small-mesh Fisheries	1	1	1	1	1	1	1	1	1	0	0
Total landings	105	118	1	28	54	78	100	121	140	0	0
Total catch	105	118	1	28	54	78	100	121	140	0	0
Biomass 1 Jan of Year+1											
Total	568	598	774	739	706	676	647	621	596	0	0
Spawning	236	244	346	322	299	278	258	240	223	0	0

Stock at start of and catch during 1989

Age	Stock No	H.Cons	Discards	By-catch	Total
1	237091	213	0	0	213
2	193847	9290	0	39	9329
3	106446	22171	0	241	22411
4	67729	25700	0	321	26021
5	25035	8081	0	28	8109
6	57528	15553	0	10	15563
7	8174	1853	0	0	1853
8	2751	657	0	0	657
9	1282	342	0	0	342
10	1173	313	0	0	313
Wt	568359	117850	0	506	118355

Stock at start of and catch during 1990 for F(1990) = F(1989)

Age	Stock No	H.Cons	Discards	By-catch	Total
1	237091	213	0	0	213
2	193922	9293	0	39	9333
3	150289	31302	0	340	31642
4	66994	25421	0	317	25738
5	32157	10380	0	37	10416
6	13224	3575	0	2	3578
7	33123	7508	0	1	7509
8	5026	1201	0	0	1201
9	1662	444	0	0	444
10	1421	380	0	0	380
Wt	597637	120296	0	551	120847

Table 24.11 Estimates age composition of saithe in Sub-area IV and Division IIIa in the first quarter of 1989.

	Human Consumption				Small Mesh		International	
	Landings		Discards		By-catch		Catch	
Age	Number	Weight	Number	Weight	Number	Weight	Number	Weight
0								
1								
2	9	0.445					9	0.445
3	2436	0.759					2436	0.759
4	3745	0.942					3745	0.942
5	2047	1.258					2047	1.258
6	3329	1.794					3329	1.794
7	295	3.445					295	3.445
8	81	4.137					81	4.137
9	33	5.379					33	5.379
10	28	5.860					28	5.860
11	19	7.427					19	7.427
12	4	8.203					4	8.203
13	4	8.887					4	8.887
14	6	8.227					6	8.227
15	4	8.725					4	8.725
No.	12040		0		0		12040	
Wt.	15905		0		0		15905	

Table 25.1 Nominal catch (tonnes) of SAITHE in Sub-area VI, 1979-1988, as officially reported to ICES.

Country	1979	1980	1981	1982	1983
Belgium	1	2	2	-	-
Denmark	-	-	-	4	-
Faroe Islands	14	4	3	5	-
France	15,662	15,427	16,654	17,102	13,470
Germany, Fed. Rep.	131	49	581	441	179
Ireland	246	295	250	322	698
Netherlands	256	91	-	-	32
Norway	20	62	25	19	55
Spain	-	-	120	243	330
UK (England and Wales)	1,765	1,594	1,364	1,966	2,760
UK (N. Ireland)	11	9	10	7	12
UK (Scotland)	3,602	2,902	3,117	2,141	2,642
Total	21,708	20,435	22,126	22,250	26,178

Country	1984	1985	1986	1987	1988
Belgium	-	2	-	12	14[1]
Denmark	-	-	-	7	+[1]
Faroe Islands	-	-	-	-	-[1]
France	19,706	19,120	26,521	24,581	22,254[1,2]
Germany, Fed. Rep.	713	838	2,345	1,486	2,567[1]
Ireland	599	670	660	704	353[1]
Netherlands	-	-	-	-	-
Norway	66	51	72	38	50[1]
Spain	882	624	824	533	...
UK (England and Wales)	1,800	1,349	1,259	1,708	1,193
UK (N. Ireland)	49	15	21	26	13
UK (Scotland)	3,170	3,118	3,697	3,442	3,925
Total	26,985	25,787	35,399	32,537	30,369

[1] Preliminary.
[2] Includes Division Vb.

Table 25.2 Annual weight and numbers of saithe caught in Sub-area VI between 1969 and 1988.

	Weight (1000 tonnes)				Number (millions)			
Year	Total	H.Con	Disc	By-cat	Total	H.Con	Disc	By-cat
1969	17	17	0	0	10	10	0	0
1970	15	15	0	0	8	8	0	0
1971	20	20	0	0	11	11	0	0
1972	29	29	0	0	19	19	0	0
1973	34	34	0	0	23	23	0	0
1974	36	36	0	0	18	18	0	0
1975	31	31	0	0	16	16	0	0
1976	42	42	0	0	20	20	0	0
1977	27	27	0	0	13	13	0	0
1978	33	33	0	0	16	16	0	0
1979	22	22	0	0	7	7	0	0
1980	22	22	0	0	8	8	0	0
1981	24	24	0	0	11	11	0	0
1982	24	24	0	0	11	11	0	0
1983	29	29	0	0	14	14	0	0
1984	22	22	0	0	13	13	0	0
1985	27	27	0	0	14	14	0	0
1986	40	40	0	0	23	23	0	0
1987	31	31	0	0	16	16	0	0
1988	34	34	0	0	19	19	0	0

Table 25.3 Values of natural mortality rate and proportion mature at age.

Age	Nat Mor	Mat.
1	0.200	0.000
2	0.200	0.000
3	0.200	0.000
4	0.200	0.000
5	0.200	1.000
6	0.200	1.000
7	0.200	1.000
8	0.200	1.000
9	0.200	1.000
10	0.200	1.000

Table 25.4 Total international catch at age ('000) of saithe in Sub-area VI between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
1				51	292	806	23	35	157	38	1
2	335	33	382	3644	6557	3056	2465	2776	1234	5047	2
3	1983	2857	1385	7913	6944	5737	6315	8154	4571	4634	3
4	4618	2335	4444	3805	4743	2353	2458	2721	2697	2411	4
5	1498	1805	1891	2209	1882	2000	1314	1794	1673	1350	5
6	507	599	1085	428	833	608	860	1116	737	715	6
7	568	240	465	309	430	932	1007	659	559	309	7
8	106	196	362	154	311	891	707	517	385	263	8
9	79	41	300	91	192	489	197	583	290	161	9
10	71	122	238	162	454	861	340	1362	921	1316	10

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
1	9	45	148	38	42	147	5	233	1	22	1
2	969	1005	2449	1308	4026	2932	2224	750	1874	3603	2
3	1828	3335	3911	4491	4879	5484	4982	6918	2314	5695	3
4	1194	942	1977	1641	2624	2403	2992	8380	7156	3508	4
5	1151	677	588	1240	852	876	1454	3764	1953	2616	5
6	708	632	410	568	775	681	1222	1395	1369	1043	6
7	368	469	341	384	513	300	608	1054	780	884	7
8	156	194	223	244	161	139	186	469	454	694	8
9	191	91	153	136	107	56	104	185	261	327	9
10	756	816	673	460	508	159	223	345	217	329	10

Table 25.5 Total international mean weight at age (Kg.) of saithe in Sub-area VI between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
1				0.507	0.311	0.309	0.460	0.444	0.383	0.412	1
2	0.770	0.592	0.640	0.764	0.621	0.590	0.737	0.681	0.577	0.490	2
3	1.027	1.066	0.935	1.139	1.102	0.987	0.939	1.005	0.794	1.091	3
4	1.412	1.401	1.240	1.815	1.400	1.622	1.504	1.442	1.353	1.674	4
5	2.251	1.954	1.762	2.631	2.516	1.743	2.575	2.732	2.207	2.583	5
6	2.913	2.911	2.697	2.598	3.080	3.534	3.497	3.230	3.199	3.813	6
7	3.466	3.622	3.454	2.979	3.694	4.542	4.779	4.174	4.253	4.657	7
8	4.868	4.816	4.626	5.018	4.833	5.038	5.589	4.930	5.030	5.278	8
9	5.657	6.178	5.196	6.118	6.705	6.066	6.522	5.785	5.829	5.979	9
10	7.481	7.065	7.227	8.166	8.138	8.279	8.549	7.739	7.711	8.470	10

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
1	0.513	0.417	0.400	0.432	0.378	0.472	0.405	0.672	0.453	0.557	1
2	0.700	0.650	0.676	0.717	0.665	0.723	0.707	0.746	0.607	0.674	2
3	1.323	1.165	1.096	1.078	1.246	1.109	1.056	0.872	0.960	1.002	3
4	1.980	1.932	1.699	1.779	1.833	1.786	1.677	1.335	1.183	1.306	4
5	2.405	2.651	2.963	2.736	3.074	2.663	2.613	2.172	2.043	1.682	5
6	3.366	3.560	4.047	3.946	3.642	3.503	3.237	2.896	3.248	3.209	6
7	4.609	4.560	5.115	5.348	5.036	4.714	4.316	3.614	4.725	4.427	7
8	5.815	5.531	6.240	6.197	6.285	5.791	6.002	4.145	6.130	5.820	8
9	6.967	6.524	7.222	7.765	6.975	7.609	7.377	5.505	7.731	7.223	9
10	9.339	9.651	9.761	10.680	10.880	10.781	11.097	8.592	12.082	10.193	10

Table 25.6 Total international fishing mortality rate at age of saithe in Sub-area VI between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
1				0.002	0.010	0.027	0.001	0.002	0.009	0.002	1
2	0.012	0.002	0.014	0.154	0.308	0.140	0.108	0.163	0.096	0.428	2
3	0.152	0.137	0.089	0.431	0.488	0.485	0.474	0.614	0.436	0.616	3
4	0.404	0.268	0.325	0.373	0.501	0.302	0.396	0.385	0.421	0.434	4
5	0.315	0.272	0.362	0.265	0.319	0.409	0.276	0.565	0.434	0.386	5
6	0.227	0.200	0.261	0.129	0.151	0.161	0.308	0.399	0.480	0.335	6
7	0.260	0.160	0.235	0.110	0.185	0.252	0.433	0.412	0.356	0.380	7
8	0.314	0.133	0.382	0.114	0.154	0.711	0.308	0.414	0.452	0.282	8
9	0.279	0.191	0.310	0.154	0.202	0.383	0.331	0.449	0.434	0.346	9
10	0.279	0.191	0.310	0.154	0.202	0.383	0.331	0.449	0.434	0.346	10

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
1	0.000	0.002	0.005	0.001	0.001	0.003	0.000	0.009	0.000	0.002	1
2	0.066	0.061	0.113	0.060	0.150	0.103	0.066	0.056	0.091	0.116	2
3	0.270	0.336	0.350	0.309	0.332	0.312	0.255	0.301	0.244	0.430	3
4	0.314	0.217	0.342	0.242	0.299	0.271	0.279	0.891	0.583	0.709	4
5	0.382	0.295	0.205	0.374	0.191	0.154	0.261	0.678	0.530	0.437	5
6	0.359	0.374	0.293	0.311	0.424	0.230	0.332	0.429	0.565	0.609	6
7	0.287	0.428	0.355	0.491	0.513	0.288	0.330	0.534	0.455	0.904	7
8	0.335	0.241	0.373	0.465	0.394	0.252	0.291	0.459	0.465	0.969	8
9	0.341	0.335	0.306	0.410	0.380	0.231	0.304	0.525	0.504	0.730	9
10	0.341	0.335	0.306	0.410	0.380	0.231	0.304	0.525	0.504	0.730	10

Table 25.7 Stock numbers at age ('000) of saithe in Sub-area VI between 1969 and 1988.

Age	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Age
1	26767	37449	34276	33239	31758	33170	24890	18107	19585	20464	1
2	30459	21915	30660	28062	27167	25738	26430	20357	14793	15894	2
3	15507	24635	17913	24757	19692	16350	18318	19416	14166	10999	3
4	15221	10909	17595	13417	13173	9900	8245	9338	8605	7498	4
5	6090	8318	6832	10413	7568	6536	5991	4545	5203	4626	5
6	2745	3640	5187	3895	6539	4505	3556	3723	2116	2759	6
7	2729	1791	2441	3271	2803	4603	3141	2139	2046	1072	7
8	430	1723	1250	1580	2400	1908	2930	1668	1160	1173	8
9	358	257	1235	699	1154	1684	767	1764	902	604	9
10	318	772	979	1246	2729	2963	1324	4123	2868	4943	10

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Age
1	23046	30985	30190	38986	40305	46748	18539	29400	44433	15829	1
2	16721	18860	25328	24584	31885	32961	38142	15174	23860	36378	2
3	8486	12815	14535	18529	18947	22477	24343	29221	11746	17845	3
4	4862	5303	7497	8388	11134	11129	13474	15449	17706	7536	4
5	3977	2907	3494	4362	5391	6757	6951	8342	5188	8094	5
6	2576	2224	1772	2331	2458	3646	4743	4383	3467	2499	6
7	1617	1474	1253	1082	1398	1317	2372	2785	2337	1614	7
8	600	993	786	719	542	686	809	1396	1337	1214	8
9	724	352	639	443	370	299	436	495	722	688	9
10	2874	3149	2801	1498	1761	846	935	925	599	692	10

Table 25.8 Mean fishing mortality, biomass and recruitment of saithe in Sub-area VI between 1969 and 1988.

	Mean Fishing Mortality			Biomass		Recruits	
	Ages		Ages	1000 tonnes		Age 1	
	3 to 6		1 to 1				
Year	H.Con	Disc	By-cat	Total	Sp St	Y.C.	Million
1969	0.274	0.000	0.000	99	38	68	27
1970	0.219	0.000	0.000	103	49	69	37
1971	0.259	0.000	0.000	112	54	70	34
1972	0.299	0.000	0.000	160	70	71	33
1973	0.365	0.000	0.000	158	91	72	32
1974	0.339	0.000	0.000	150	93	73	33
1975	0.363	0.000	0.000	136	76	74	25
1976	0.490	0.000	0.000	139	84	75	18
1977	0.443	0.000	0.000	99	60	76	20
1978	0.443	0.000	0.000	120	79	77	20
1979	0.331	0.000	0.000	105	61	78	23
1980	0.306	0.000	0.000	111	61	79	31
1981	0.297	0.000	0.000	119	61	80	30
1982	0.309	0.000	0.000	120	51	81	39
1983	0.312	0.000	0.000	138	58	82	40
1984	0.242	0.000	0.000	143	52	83	47
1985	0.282	0.000	0.000	145	62	84	19
1986	0.575	0.000	0.000	135	57	85	29
1987	0.480	0.000	0.000	121	54	86	44
1988	0.546	0.000	0.000	116	48	87	29
Arit-mean recruits at age 1 for period 1969 to 1988							31
Geom-mean recruits at age 1 for period 1969 to 1988							29

Table 25.9 Input for catch prediction of saithe in Sub-area VI.

	1988 Stock and Fishing Mortality				Values used in Prediction: F at age, Mean Wt. and Propn. Retained by Consumption Fishery							
					Scaled mean F 1984 to 1988			Mean values for period 1984 to 1988 Mean Weight (Kg.)				Prop.
Age	Stock Number	Fishing Mortality H.Con.	Disc	Ind	H.Con.	Disc	Ind	H.Con.	Disc	Ind	Stock	Ret.
1	29482	0.004			0.004			0.512			0.512	1.000
2	36378	0.116			0.111			0.692			0.692	1.000
3	17845	0.430			0.396			1.000			1.000	1.000
4	7536	0.709			0.702			1.457			1.457	1.000
5	8094	0.437			0.530			2.235			2.235	1.000
6	2499	0.609			0.556			3.219			3.219	1.000
7	1614	0.904			0.646			4.359			4.359	1.000
8	1214	0.969			0.626			5.538			5.538	1.000
9	688	0.730			0.590			7.089			7.089	1.000
10	692	0.730			0.590			10.549			10.549	1.000

	Mean F	Age 3 to 6	Age 1 1	Age 3 to 6	Age 1 1
	Unscaled	0.546	0.000	0.425	0.000
	Scaled			0.546	0.000

Recruits at age 1 in 1989 = 29480
Recruits at age 1 in 1990 = 29480
Recruits at age 1 in 1991 = 29480
Recruits at age 1 in 1992 = 29480

M at age and proprtion mature at age are as shown in Table 25.3

Mean F for ages 3 to 6 in 1988 for human consumption landings + discards = 0.546 .
Human consumption + discard F-at-age values in prediction are mean values for the period 1984 to 1988
rescaled to produce a mean value of F for ages 3 to 6 equal to that for 1988

Mean F for ages 1 to 1 in 1988 for small-mesh fisheries = 0.000 .
Industrial fishery F-at-age in the prediction are averages for the period 1984 to 1988 .
rescaled to produce a mean value of F for ages 1 to 1 equal to that for 1988

Values of N in 1988 from VPA have been overwritten
for the following ages .....

Age 1

Values of F for these ages in 1988 from VPA have been overwritten
with scaled mean values used for predictions for 1989 onwards

Table 25.10 Predicted catches and biomasses ('000 tonnes) of saithe in Sub-area VI 1989 to 1990.

	Year											
	1988	1989	1990									
Biomass 1 Jan of Year												
Total	116	106	100	100	100	100	100	100	100	100	100	100
Spawning	48	34	29	29	29	29	29	29	29	29	29	29
Mean F Ages												
Human Cons. 3 to 6	0.55	0.55	0.00	0.11	0.22	0.33	0.44	0.55	0.66	0.00	0.00	
Small-mesh 1 to 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean F(Year)/Mean F(1988)										F0.1	Fmax	
Human Consumption	1.00	1.00	0.00	0.20	0.40	0.60	0.80	1.00	1.20	0.00	0.00	
Catch weight												
Human Consumption	34	30	0	7	13	19	24	29	33	0	0	
Discards	0	0	0	0	0	0	0	0	0	0	0	
Small-mesh Fisheries	0	0	0	0	0	0	0	0	0	0	0	
Total landings	34	30	0	7	13	19	24	29	33	0	0	
Total catch	34	30	0	7	13	19	24	29	33	0	0	
Biomass 1 Jan of Year+1												
Total	106	100	129	120	112	105	99	93	88	0	0	
Spawning	34	29	56	49	43	38	34	30	26	0	0	

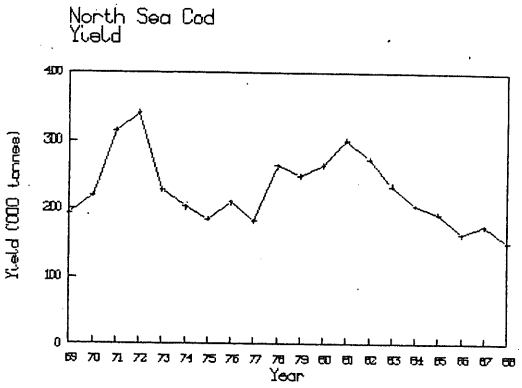
Stock at start of and catch during 1989

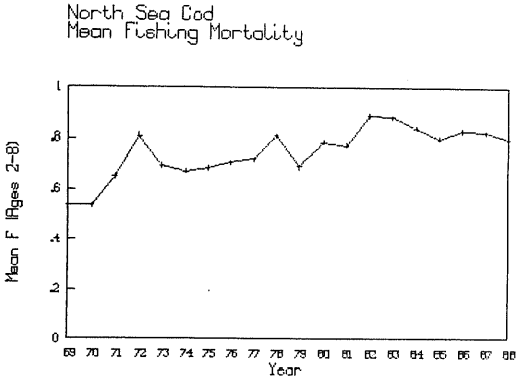
Age	Stock No	H.Cons	Discards	By-catch	Total
1	29480	97	0	0	97
2	24051	2293	0	0	2293
3	26535	7919	0	0	7919
4	9502	4396	0	0	4396
5	3038	1142	0	0	1142
6	4281	1671	0	0	1671
7	1113	485	0	0	485
8	535	228	0	0	228
9	377	154	0	0	154
10	271	111	0	0	111
Wt	106018	29522	0	0	29522

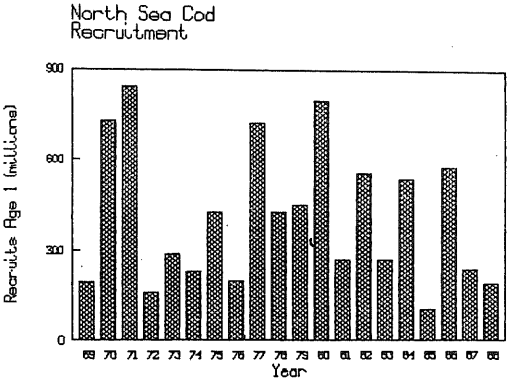
Stock at start of and catch during 1990 for F(1990) = F(1989)

Age	Stock No	H.Cons	Discards	By-catch	Total
1	29480	97	0	0	97
2	24049	2293	0	0	2293
3	17624	5260	0	0	5260
4	14618	6763	0	0	6763
5	3854	1449	0	0	1449
6	1464	572	0	0	572
7	2009	876	0	0	876
8	478	204	0	0	204
9	234	95	0	0	95
10	294	120	0	0	120
Wt	100142	28714	0	0	28714

Figure 12.1


North Sea Cod
Yield
Yield (000 tonnes)
Year


North Sea Cod
Mean Fishing Mortality
Mean F (Ages 2-8)
Year


North Sea Cod
Recruitment
Recruits Age 1 (millions)
Year

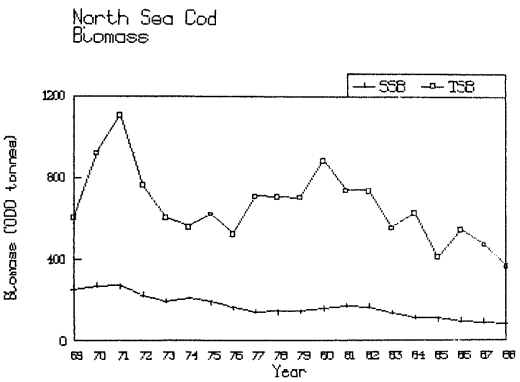

North Sea Cod
Biomass
SSB
TSB
Biomass (000 tonnes)
Year

Figure 12.2 North Sea Cod

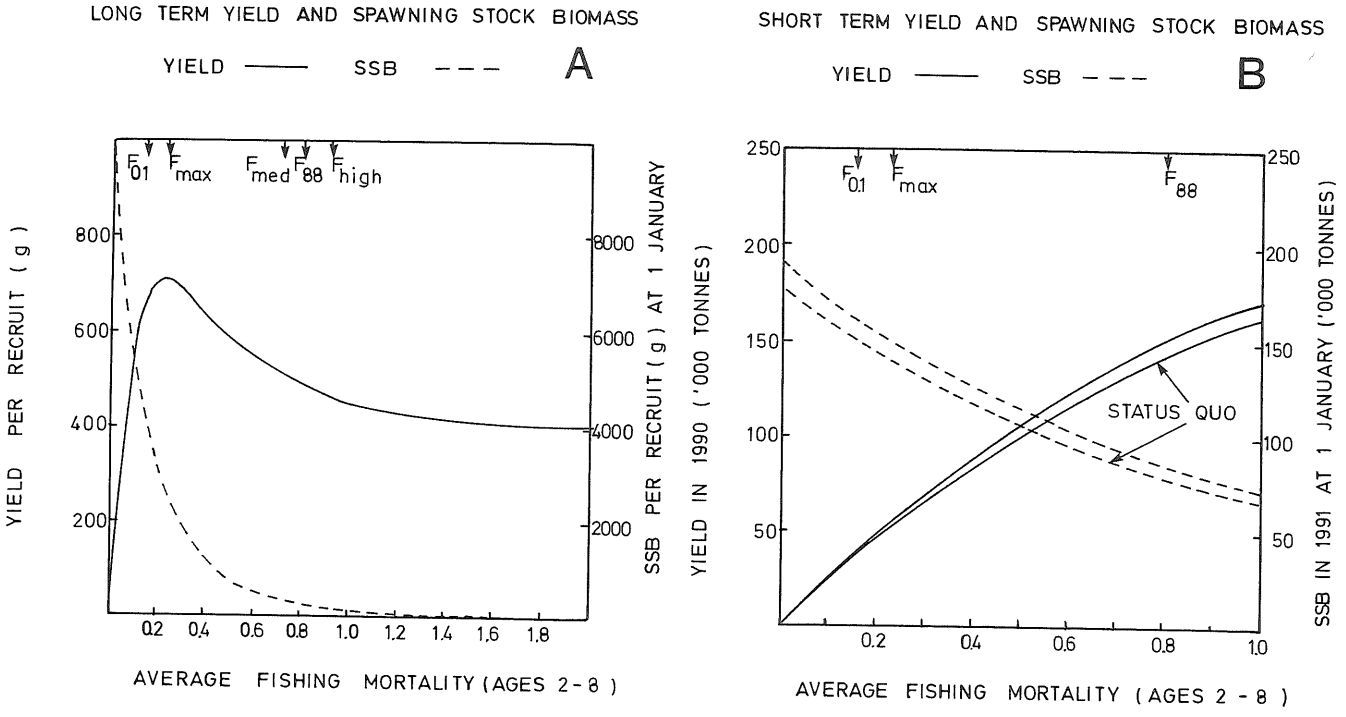


Figure 12.3 North Sea Cod. Relation between stock and recruitment.

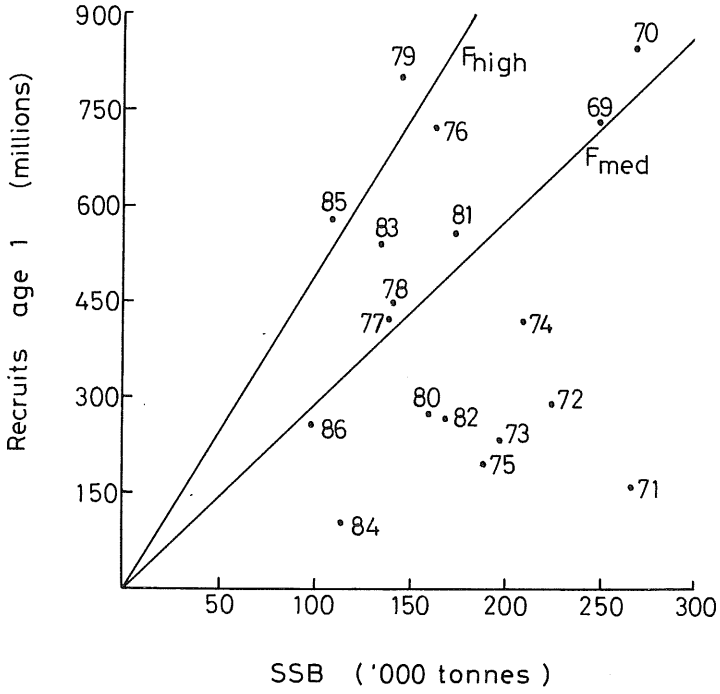
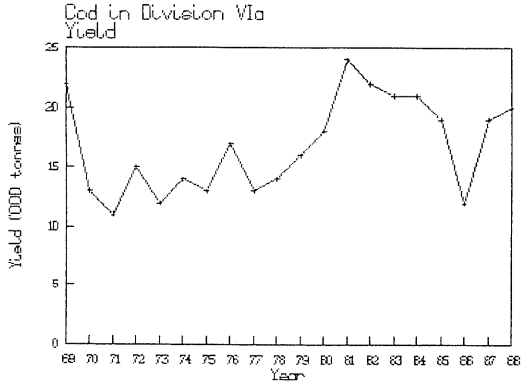
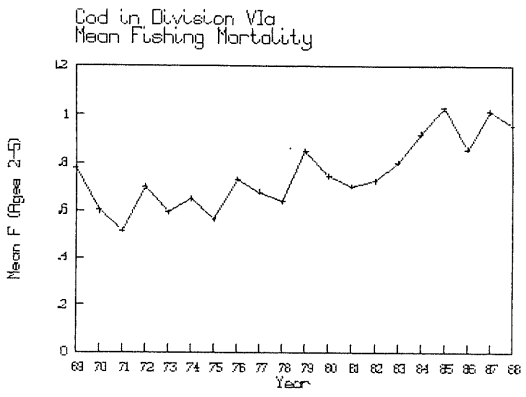
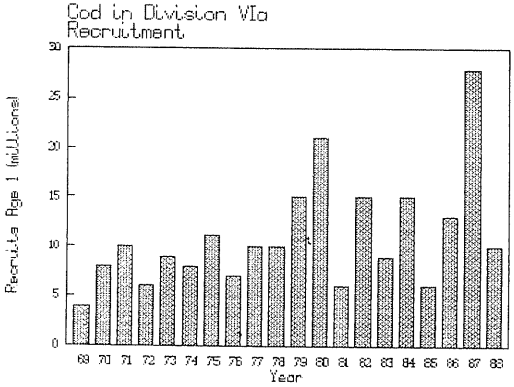


Figure 13.1


Cod in Division VIa
Yield
Yield (1000 tonnes)
Year


Cod in Division VIa
Mean Fishing Mortality
Mean F (Ages 2-5)
Year


Cod in Division VIa
Recruitment
Recruits Age 1 (millions)
Year

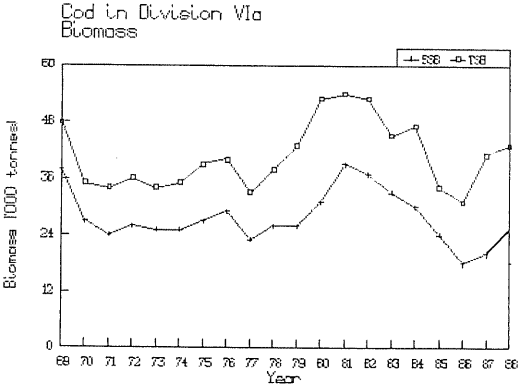

Cod in Division VIa
Biomass
SSB
TSB
Biomass (1000 tonnes)
Year

Figure 13.2 Cod in Division VIa.

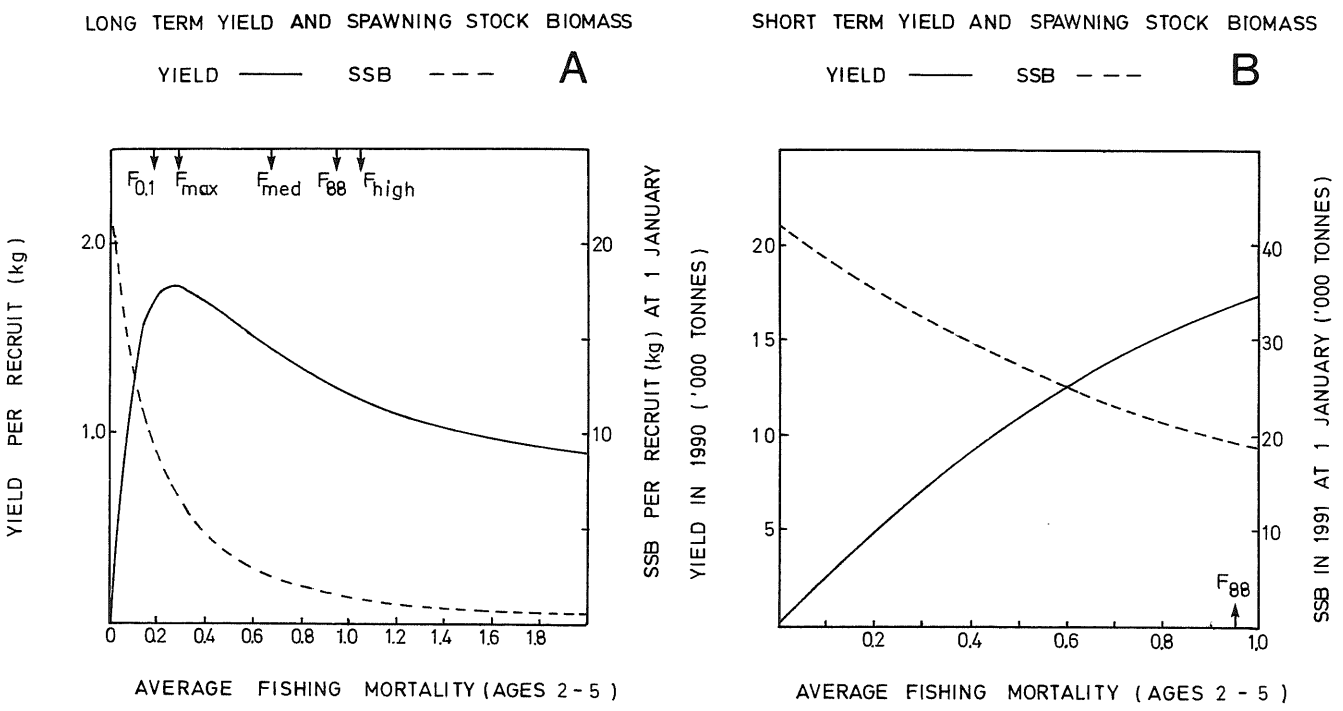


Figure 13.3 Cod in Division VIa. Relation between SSB and recruitment.

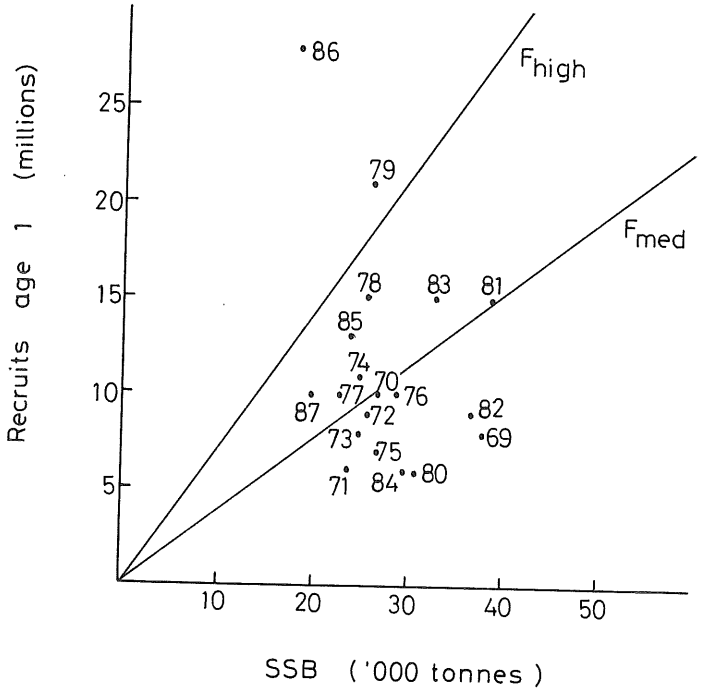
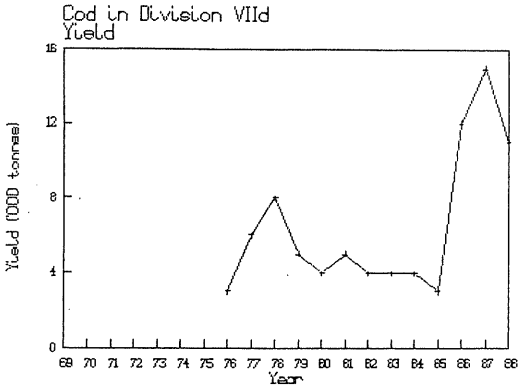
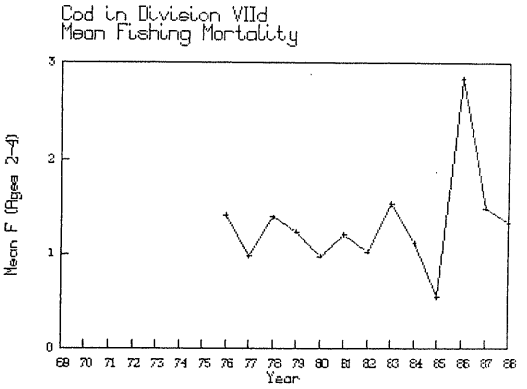
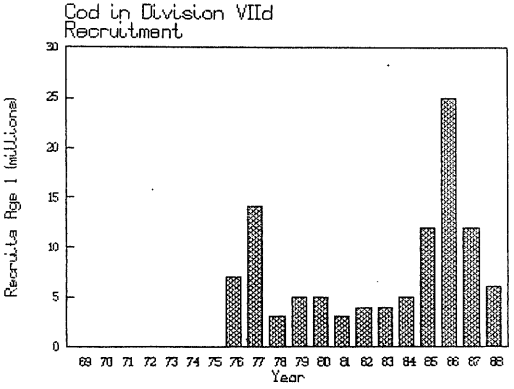


Figure 15.1


Cod in Division VIId
Yield
Yield (000 tonnes)
Year


Cod in Division VIId
Mean Fishing Mortality
Mean F (Ages 2-4)
Year


Cod in Division VIId
Recruitment
Recruits Age 1 (Millions)
Year

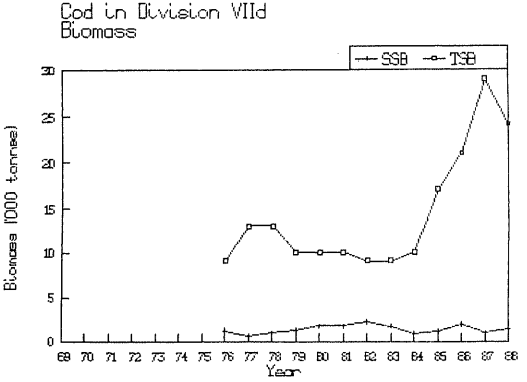

Cod in Division VIId
Biomass
SSB
TSB
Biomass (000 tonnes)
Year

Figure 15.2 Cod in Division VIId.

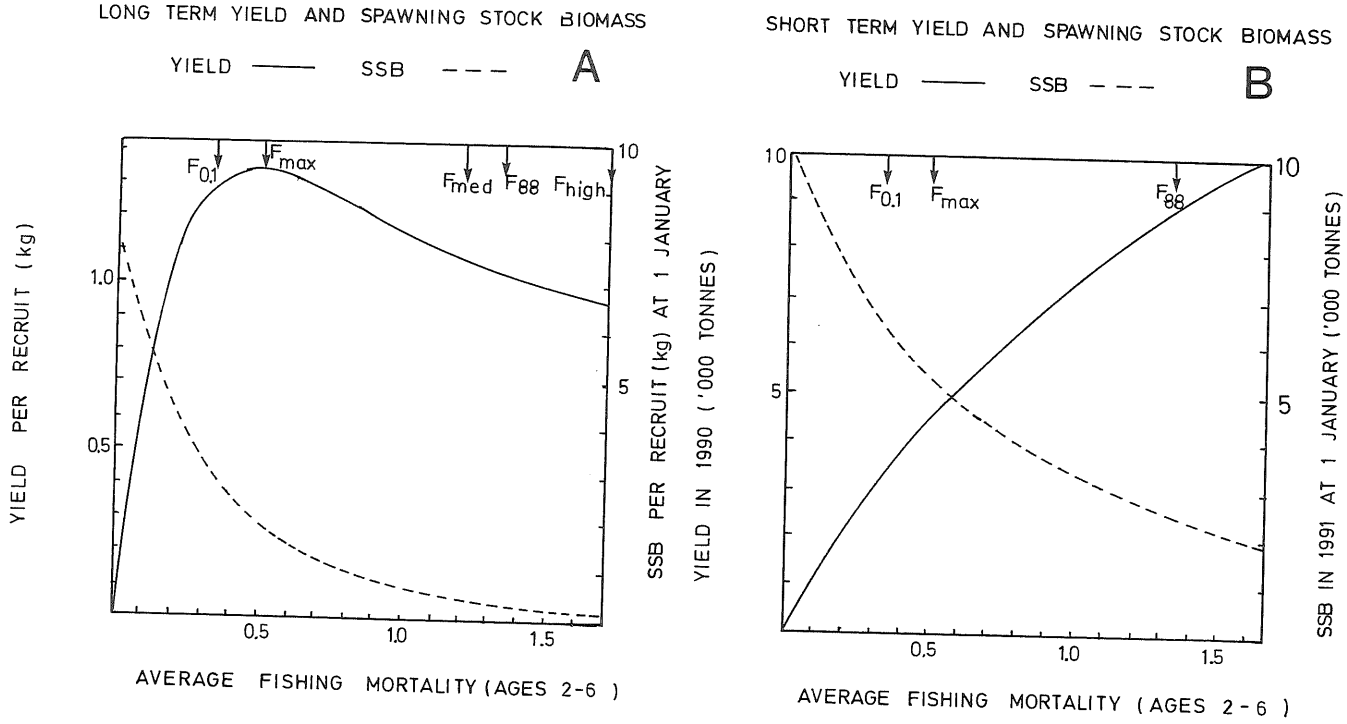


Figure 15.3 Cod in Division VIId.

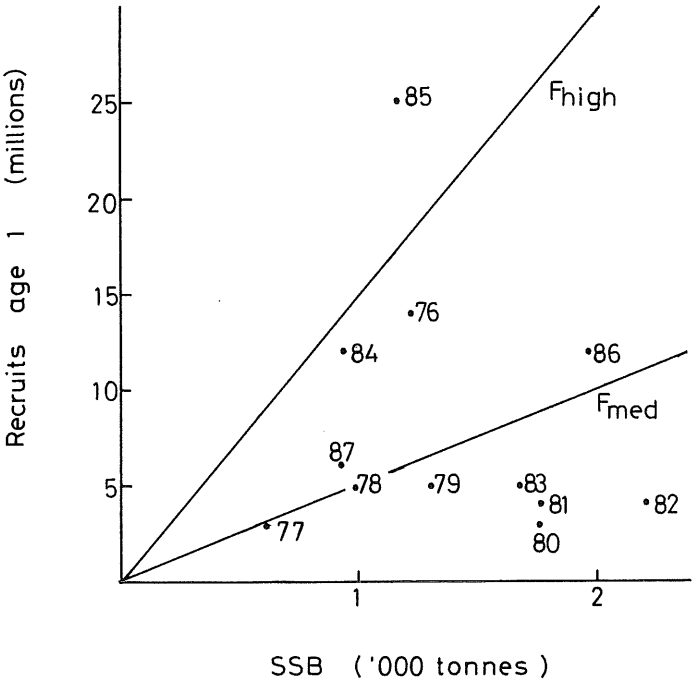
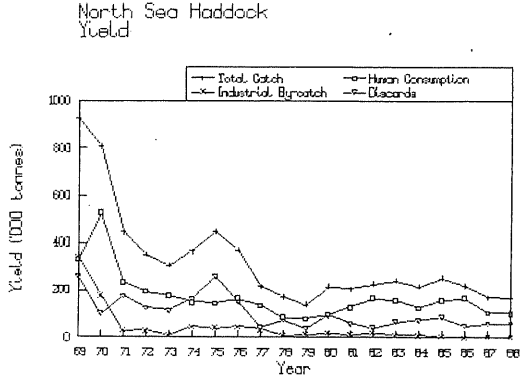
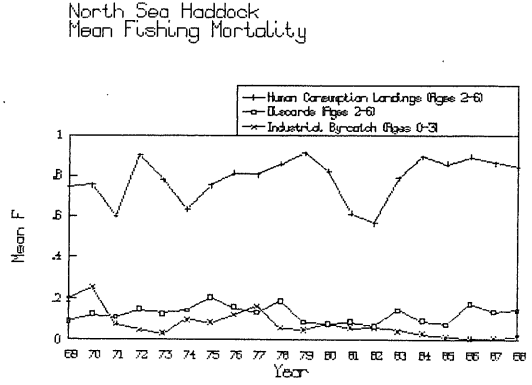
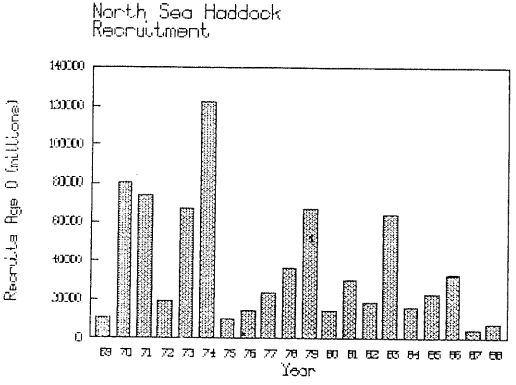


Figure 16.1


North Sea Haddock
Yield
Total Catch
Human Consumption
Industrial Bycatch
Discards
Yield (000 tonnes)
Year


North Sea Haddock
Mean Fishing Mortality
Human Consumption Landings (Ages 2-6)
Discards (Ages 2-6)
Industrial Bycatch (Ages 0-3)
Mean F
Year


North Sea Haddock
Recruitment
Recruits Age 0 (millions)
Year

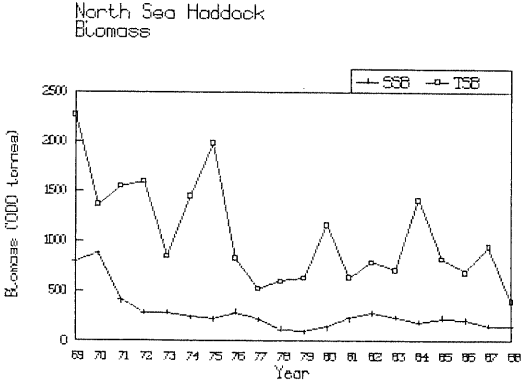

North Sea Haddock
Biomass
SSB
TSB
Biomass (000 tonnes)
Year

Figure 16.2 Haddock in Sub-area IV.

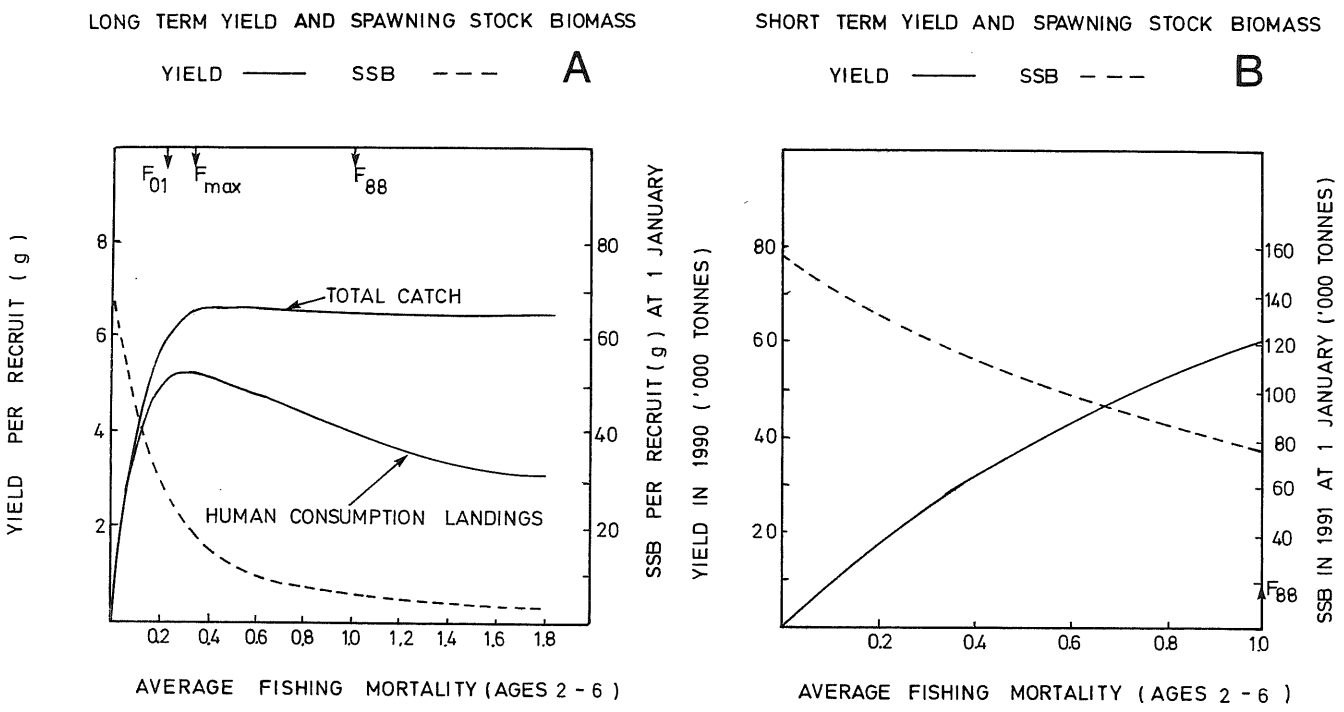


Figure 16.3 Haddock in Sub-area IV.
Relationship between stock and recruitment.

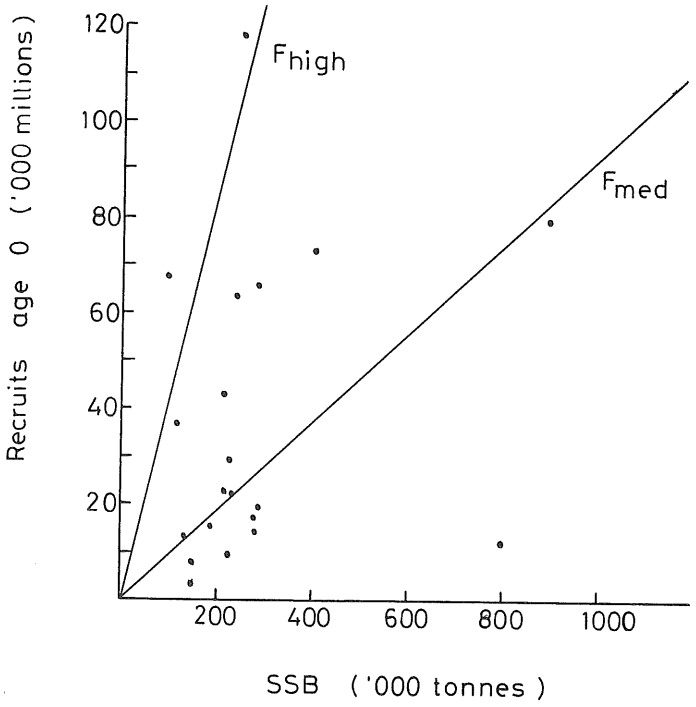
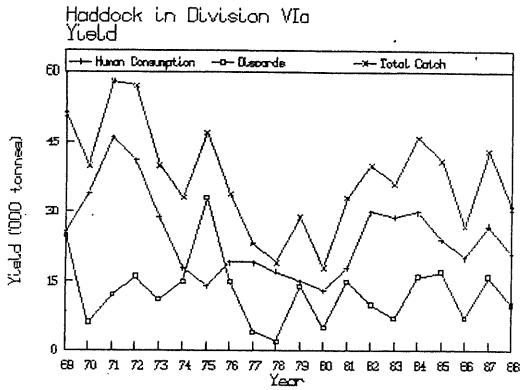
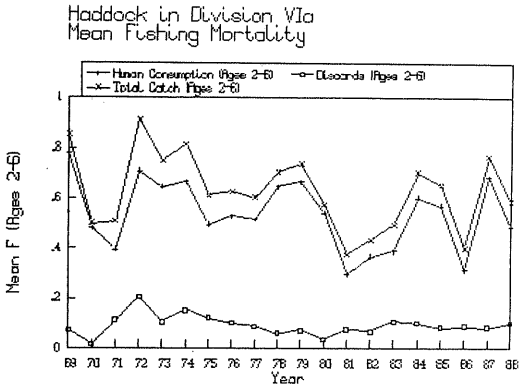
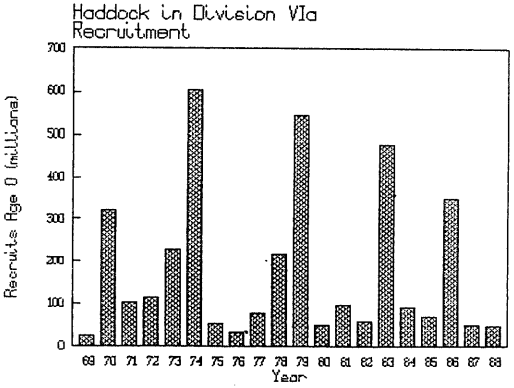


Figure 17.1


Haddock in Division VIa
Yield
Human Consumption
Discards
Total Catch
Yield (1000 tonnes)
Year


Haddock in Division VIa
Mean Fishing Mortality
Human Consumption (Ages 2-6)
Discards (Ages 2-6)
Total Catch (Ages 2-6)
Mean F (Ages 2-6)
Year


Haddock in Division VIa
Recruitment
Recruits Age 0 (millions)
Year

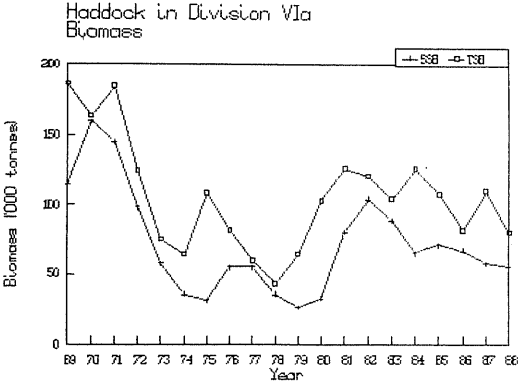

Haddock in Division VIa
Biomass
SSB
TSB
Biomass (1000 tonnes)
Year

Figure 17.2 Haddock in Division VIa.

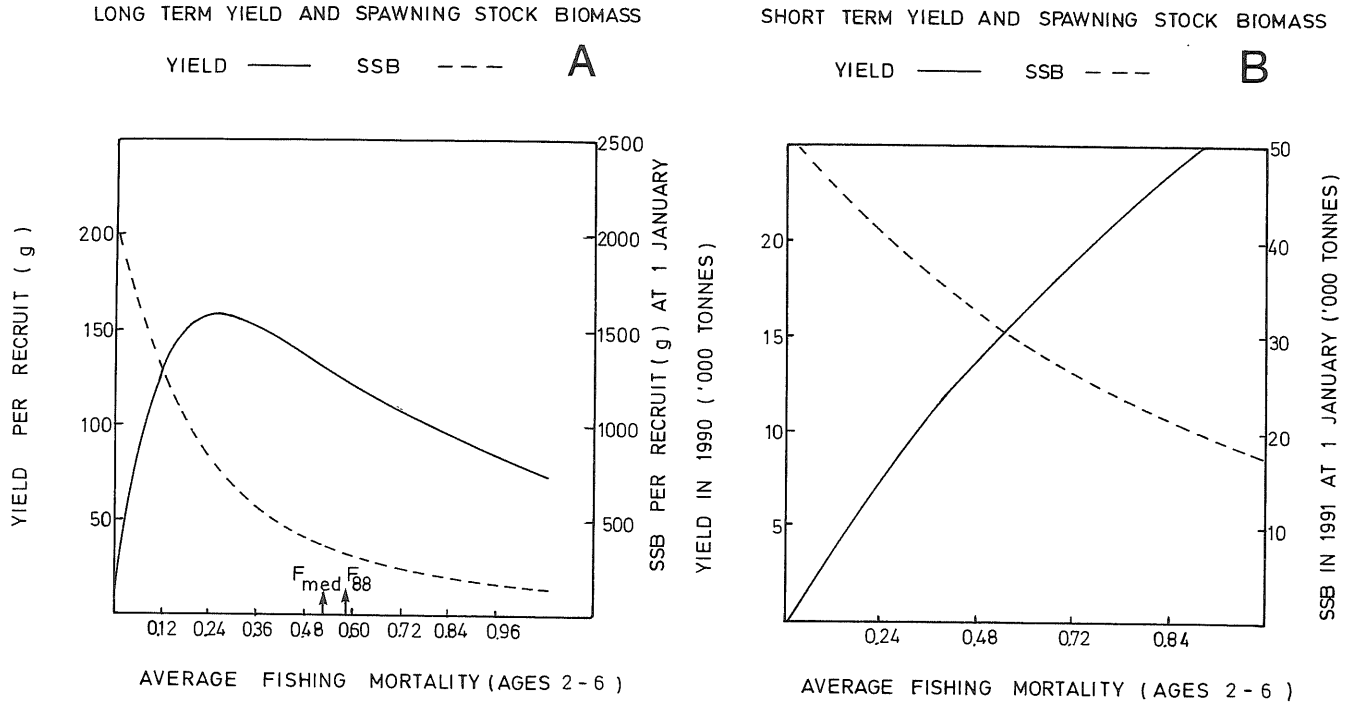


Figure 17.3 Haddock in Division VIa.

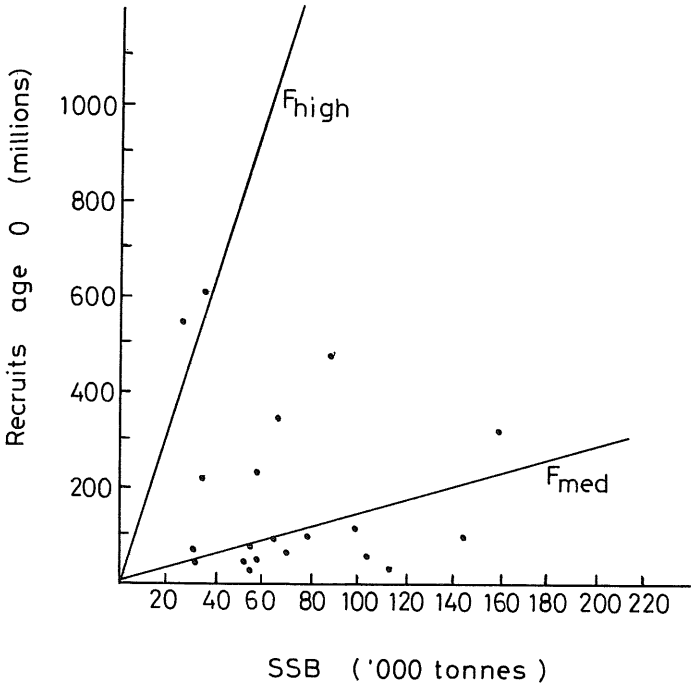


Figure 18.1 Haddock in VIb.
Calibration regression used to predict recruitment.

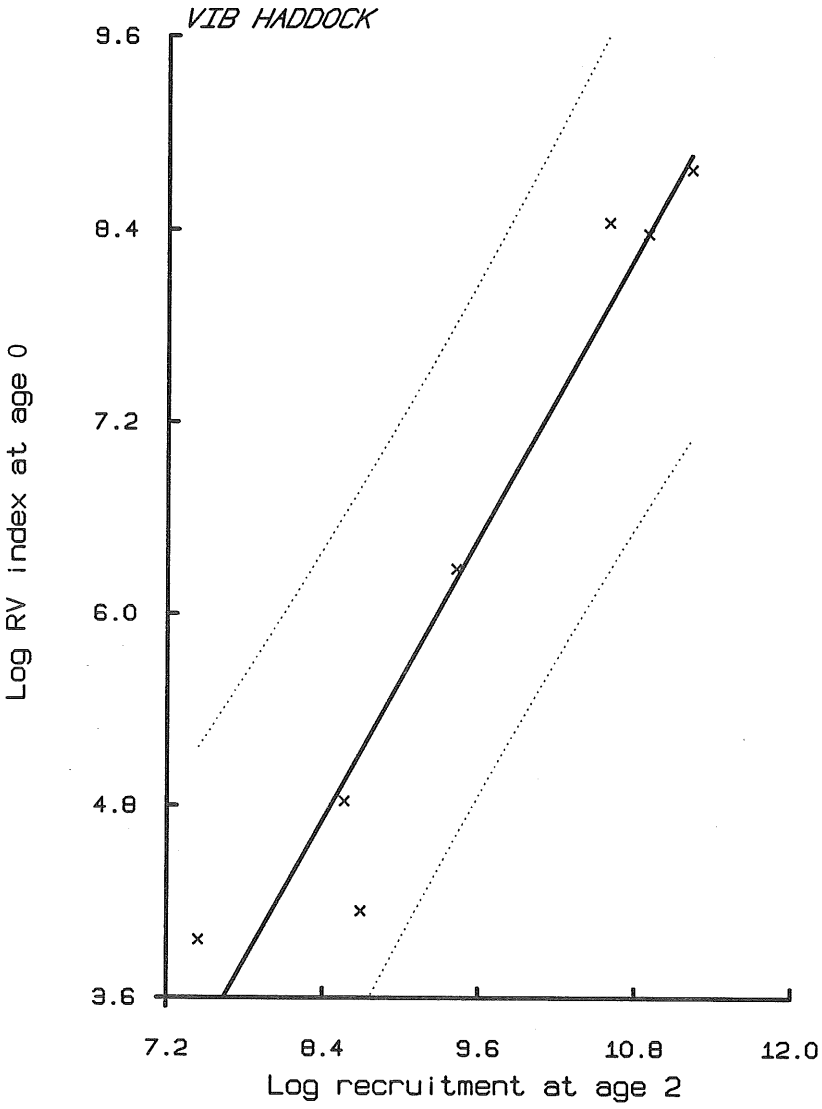
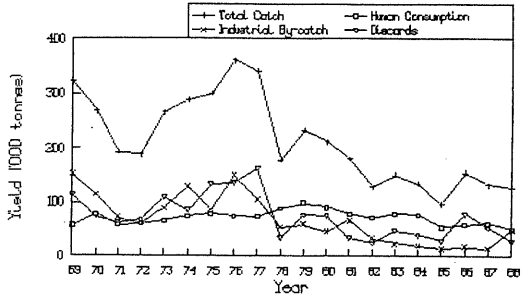
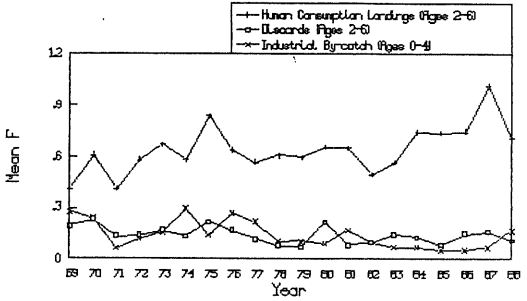


Figure 20.1

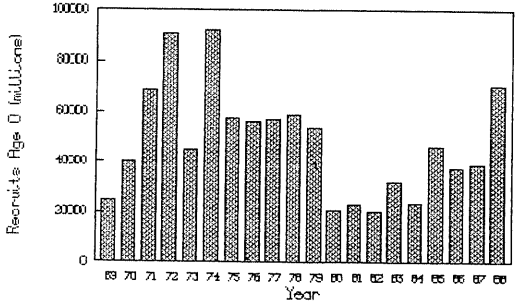
North Sea Whiting
Yield



North Sea Whiting
Mean Fishing Mortality



North Sea Whiting
Recruitment



North Sea Whiting
Biomass

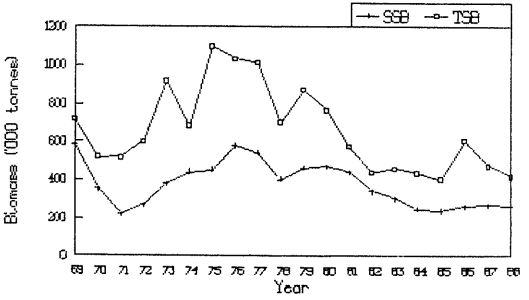


Figure 20.2 North Sea Whiting.

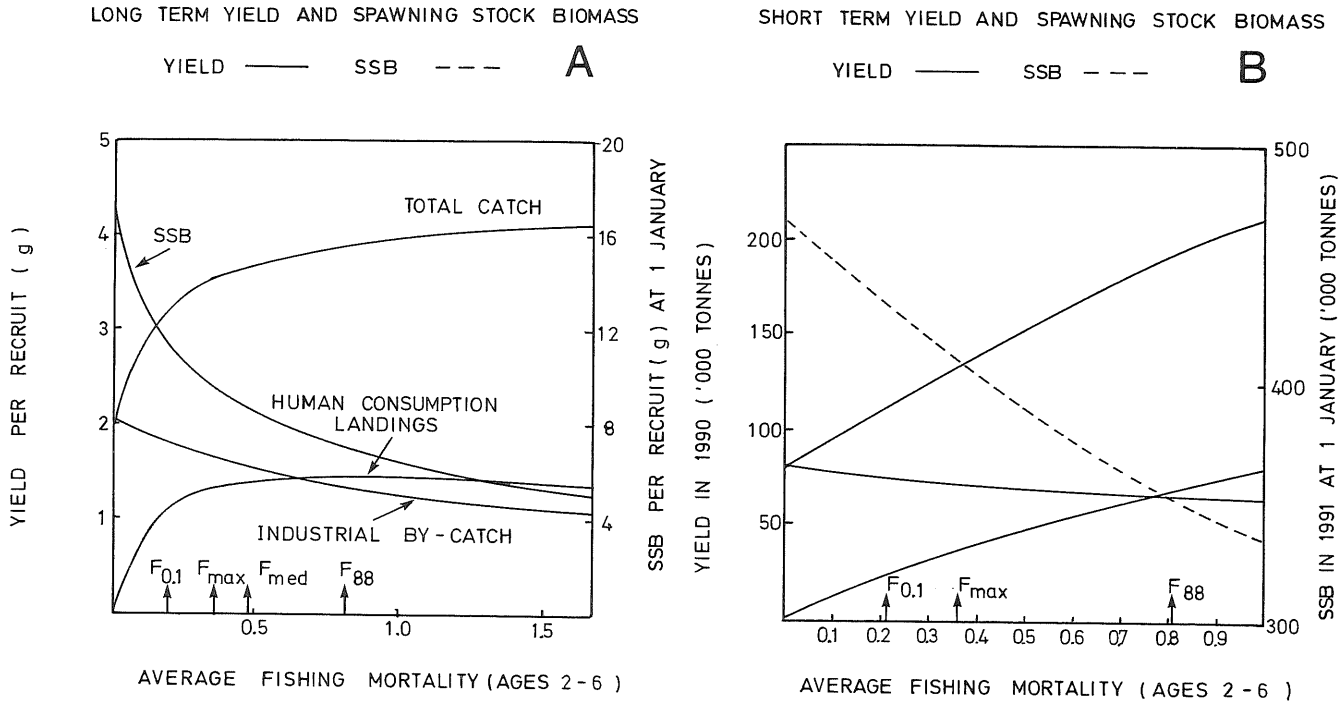


Figure 20.3 Whiting in Sub-area IV.
Relation between SSB and recruitment.

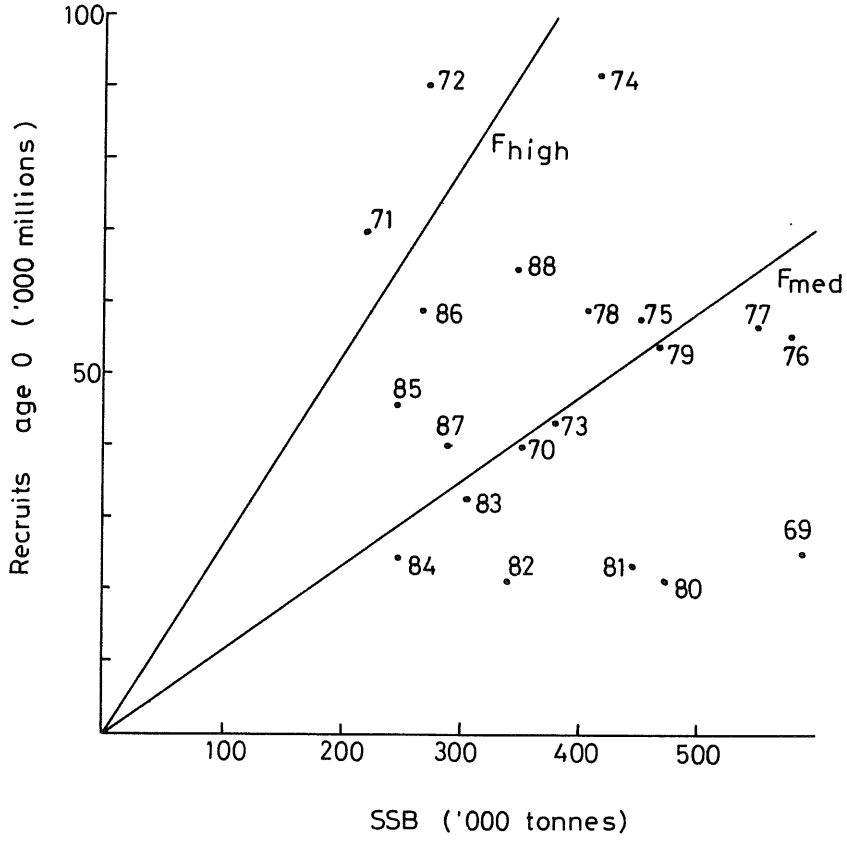
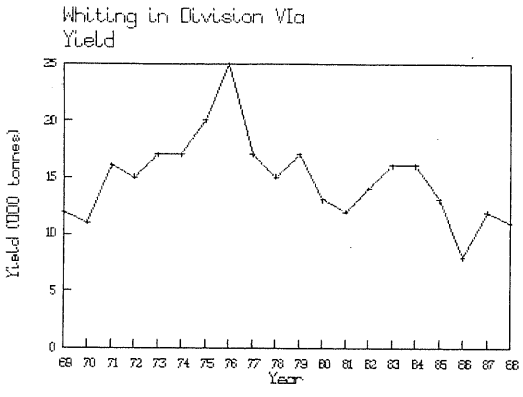
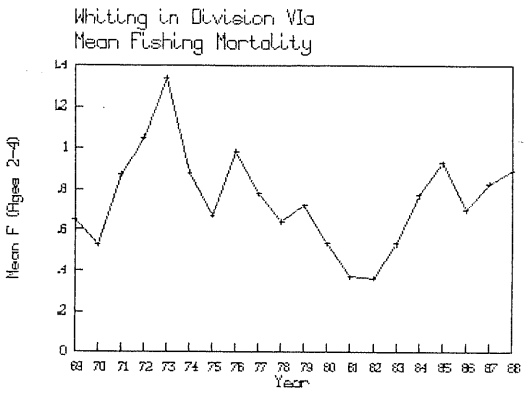
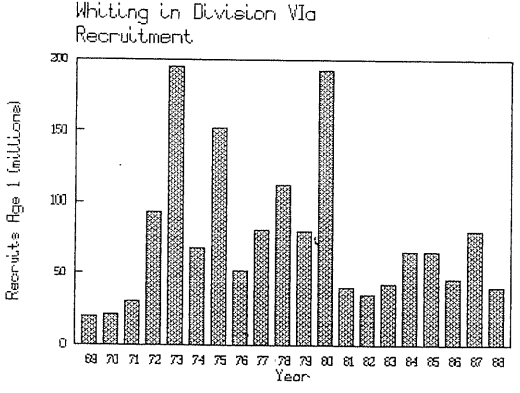


Figure 21.1


Whiting in Division VIa
Yield
Yield (000 tonnes)
0
5
10
15
20
25
69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
Year


Whiting in Division VIa
Mean Fishing Mortality
Mean F (Ages 2-4)
0
.2
.4
.6
.8
1
1.2
1.4
69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
Year


Whiting in Division VIa
Recruitment
Recruits Age 1 (millions)
0
50
100
150
200
69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
Year

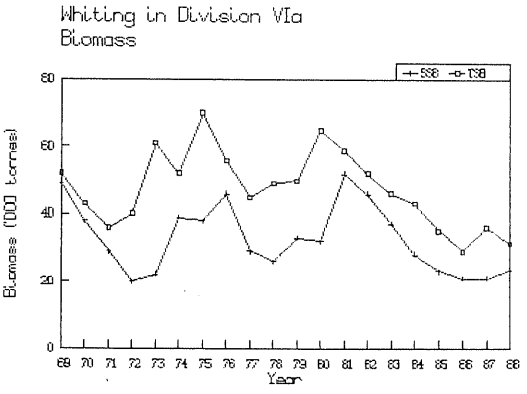

Whiting in Division VIa
Biomass
SSB
TSB
Biomass (000 tonnes)
0
20
40
60
80
69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
Year

Figure 21.2 Whiting in Division VIa.

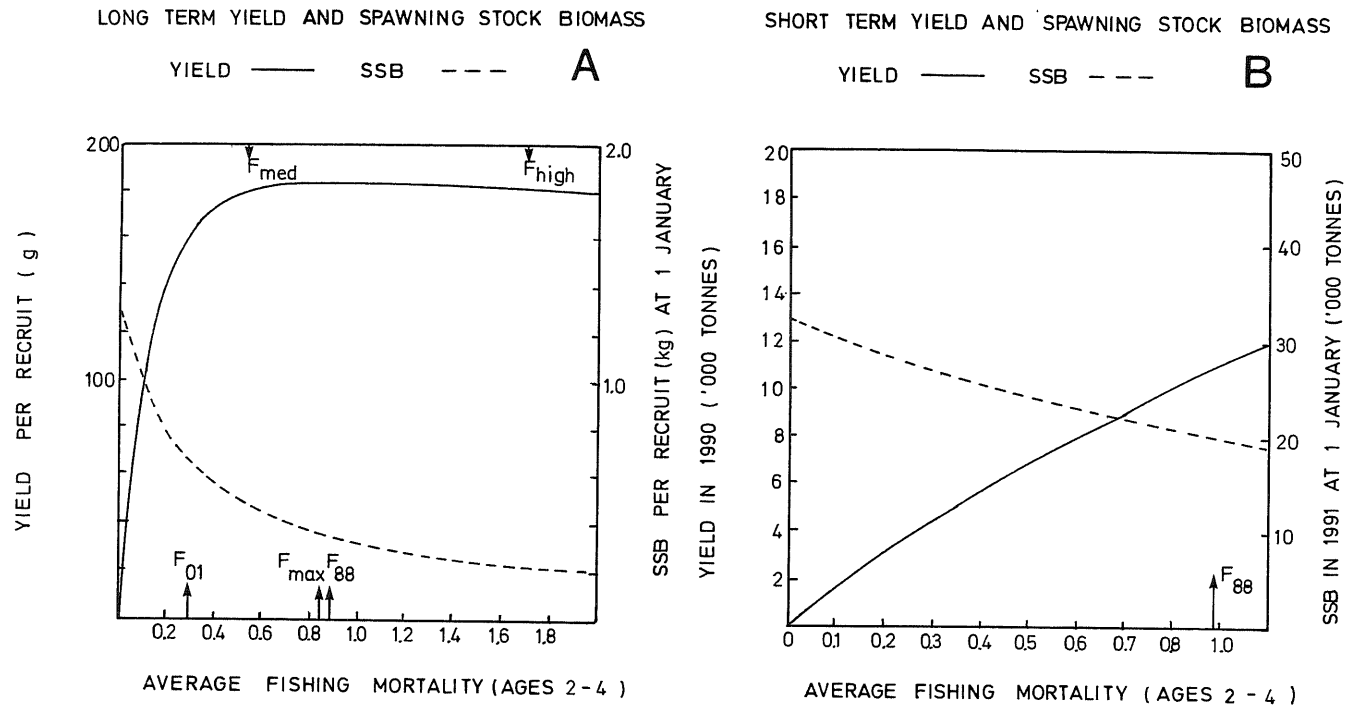


Figure 21.3 Whiting in Division VIa.
Relation between SSB and recruitment.

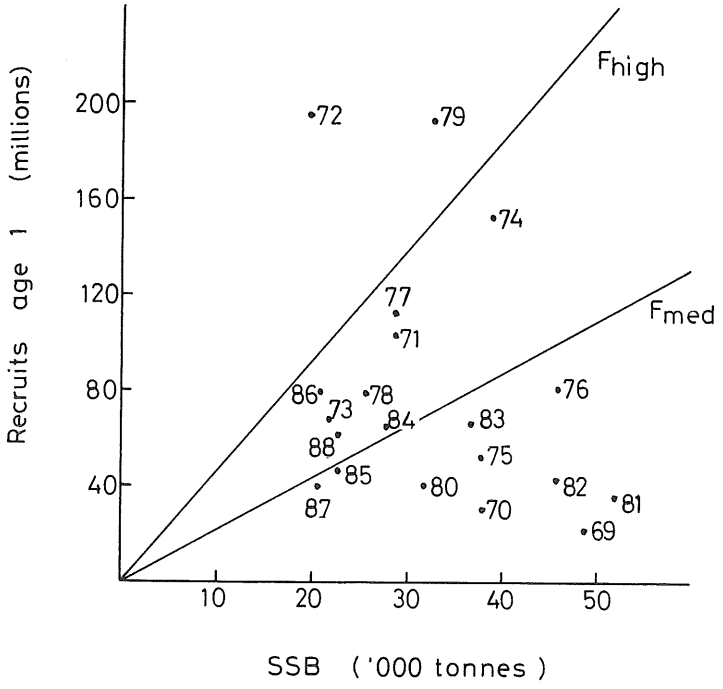
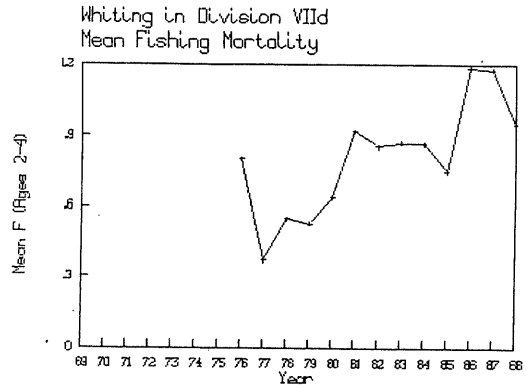
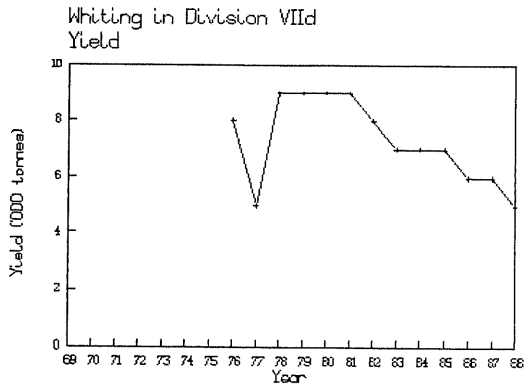
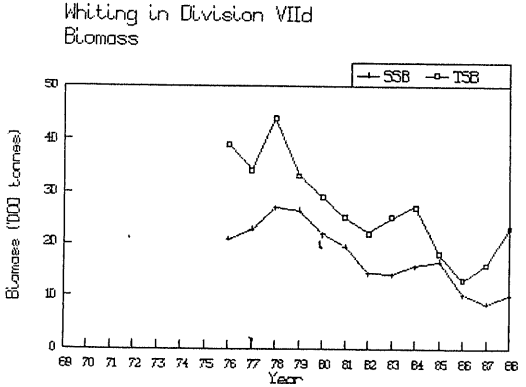


Figure 23.1


Whiting in Division VIId
Mean Fishing Mortality
Mean F (Ages 2-4)
Year


Whiting in Division VIId
Yield
Yield (000 tonnes)
Year


Whiting in Division VIId
Biomass
SSB
TSB
Biomass (000 tonnes)
Year

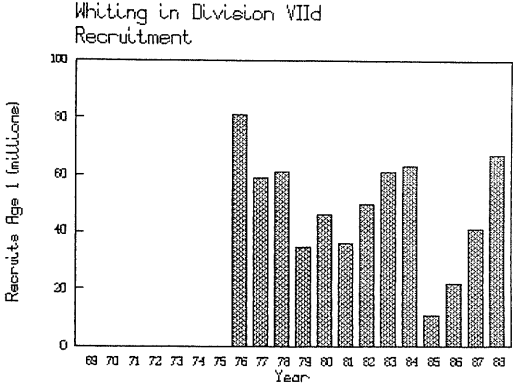

Whiting in Division VIId
Recruitment
Recruits Age 1 (millions)
Year

Figure 23.2 Whiting in Division VIId.

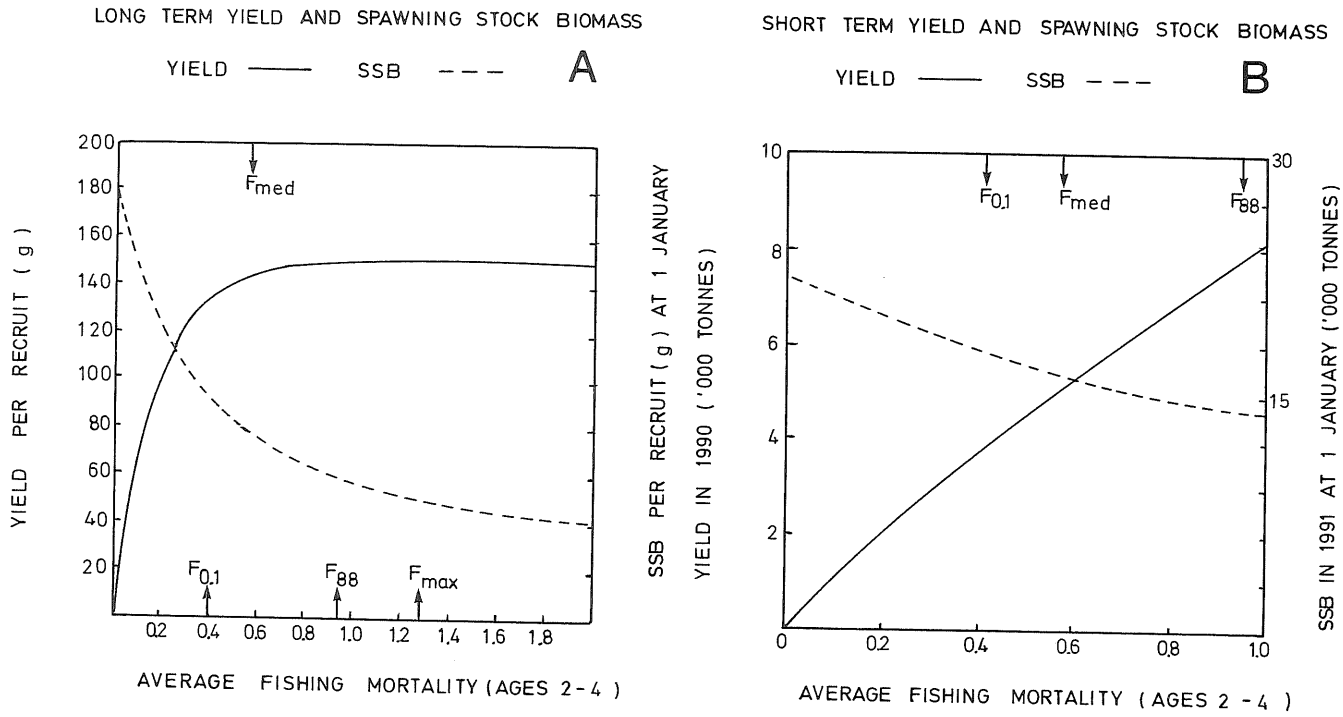


Figure 23.3 Whiting in Division VIId.
Stock-recruitment relationship.

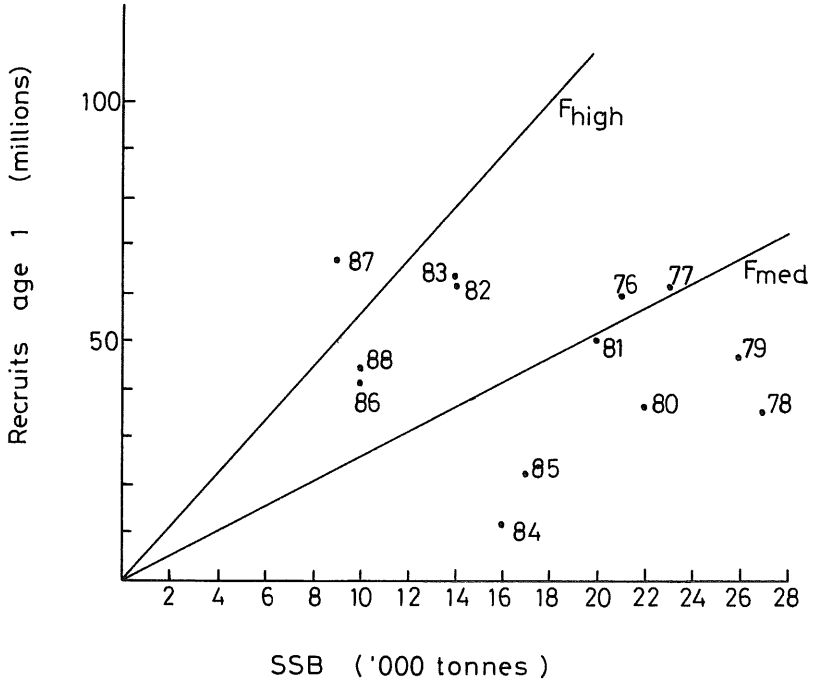
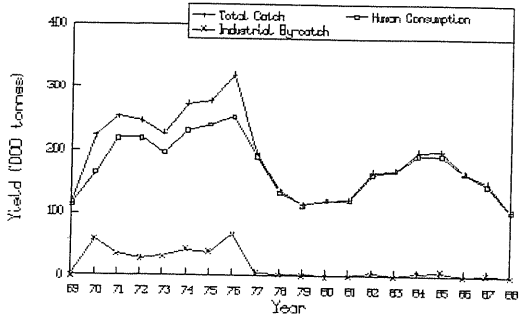
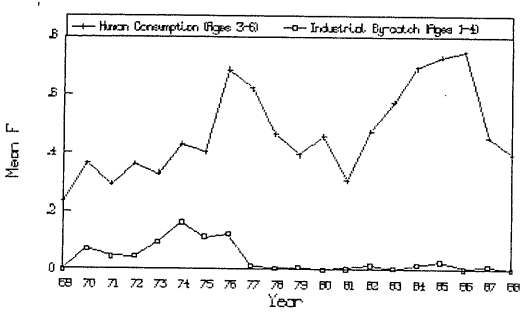


Figure 24.1

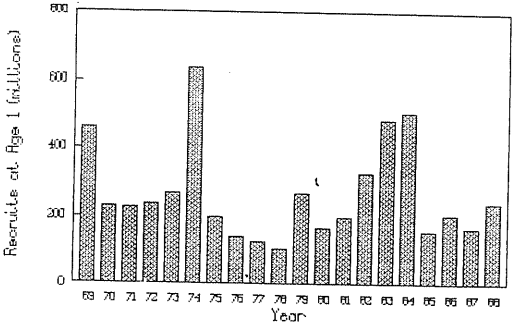
North Sea Saithe
Yield



North Sea Saithe
Mean Fishing Mortality



North Sea Saithe
Recruitment



North Sea Saithe
Biomass

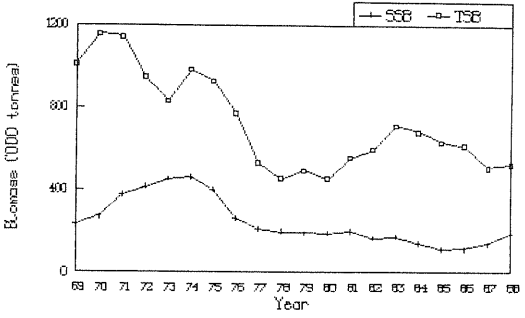


Figure 24.2 North Sea Saithe.

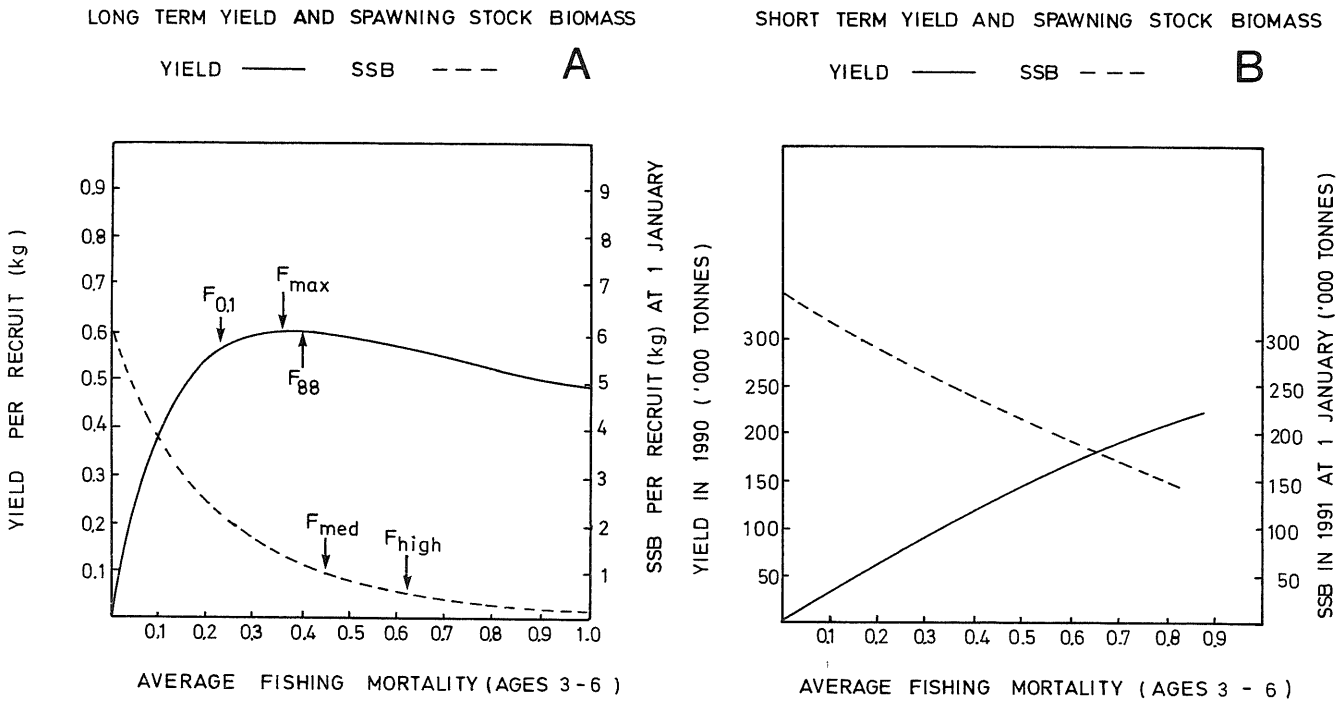


Figure 24.3 North Sea Saithe.

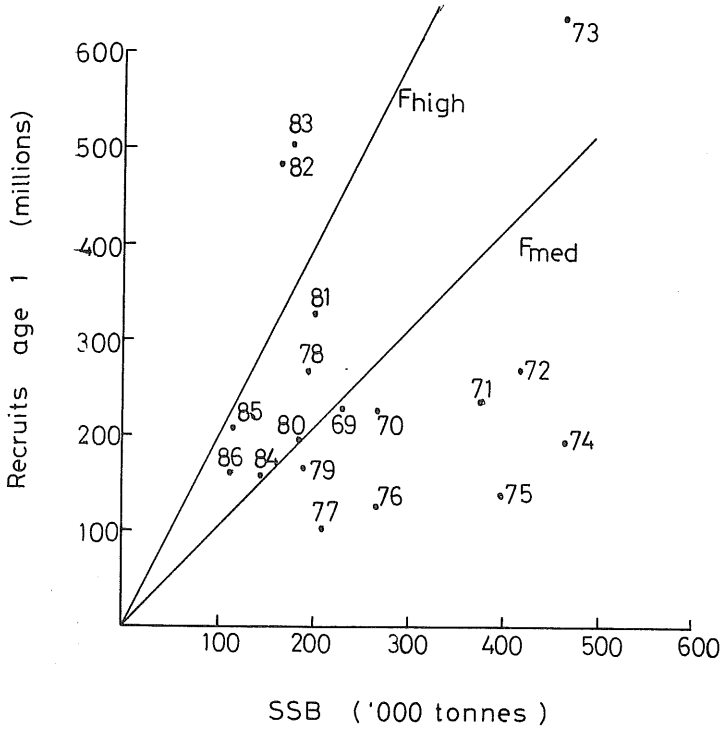
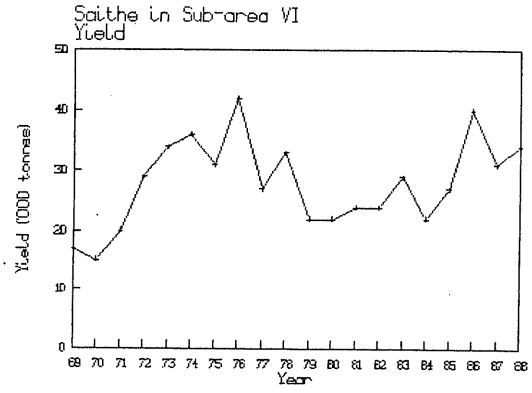
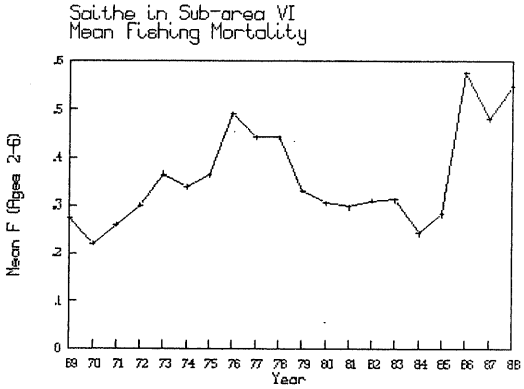
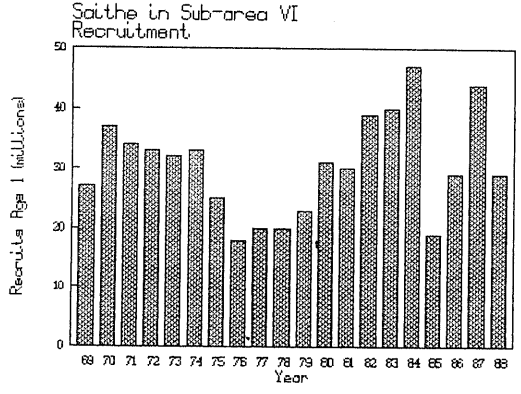


Figure 25.1


Saithe in Sub-area VI
Yield
Yield (1000 tonnes)
0
10
20
30
40
50
69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
Year


Saithe in Sub-area VI
Mean Fishing Mortality
Mean F (Ages 2-6)
0
.1
.2
.3
.4
.5
.6
69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
Year


Saithe in Sub-area VI
Recruitment
Recruits Age 1 (millions)
0
10
20
30
40
50
69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
Year

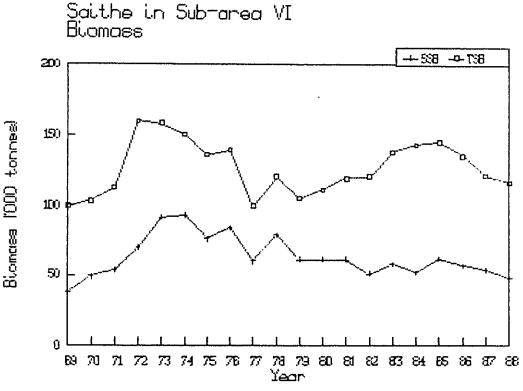

Saithe in Sub-area VI
Biomass
SSB
TSB
Biomass (1000 tonnes)
0
50
100
150
200
69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
Year

Figure 25.2 Saithe in Sub-area VI.

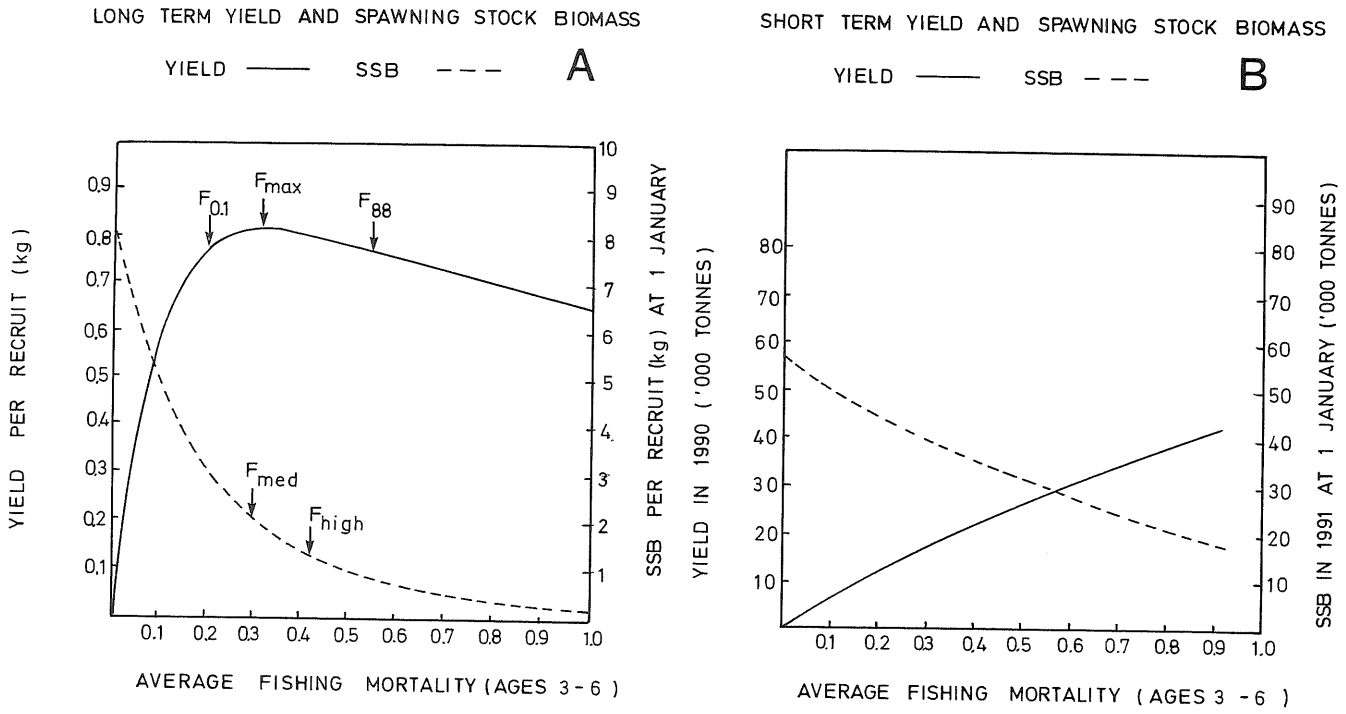


Figure 25.3 Saithe in Sub-area VI.