International Council for the
Exploration of the Sea

C.M.1986/Assess:19

Part 2.

PART II

OF

REPORT OF THE HERRING ASSESSMENT WORKING GROUP FOR THE AREA SOUTH OF 62^{0}N

Table 2.1.1 HERRING. Catch in tonnes 1974-85 North Sea, Sub-area IV and Division VIId by country. (National catches as officially reported, unless otherwise annotated.) Unallocated catches provided by Working Group members.

Country	1974	1975	1976	1977	1978	1979
Belgium	603	2,451	2,451	57	-	-
Denmark	61,728	115,616	34,841	12,769	4,359	10,546
Faroe Islands	26,161[1]	25,854	14,378	8,078	40	10
Finland	-	-	1,034	-	-	-
France	12,548	20,391	14,468	1,613	2,119	2,560
German Dem.Rep.	3,268	2,689	2,624	2	-	-
Germany,Fed.Rep.	12,470	6,953	1,654	221	24	10
Iceland	29,017	16,286	9,412	-	-	-
Netherlands	35,106	38,416	20,146	4,134	18	-
Norway	40,975	34,183	27,386	4,065	1,189	3,617
Poland	9,850	7,069	7,072	2	-	-
Sweden	3,561	6,858	4,777	3,616	-	-
UK (England)	5,699	6,475	9,662	3,224	2,843	2,253
UK(Scotland)[3]	15,034	8,904	15,015	8,159	437	-
USSR	18,096	20,653	10,935	78	4	162
Total North Sea	275,116	312,798	174,834	46,010	11,033	19,158

Country	1980	1981	1982	1983	1984	1985[5]
Belgium	-	-	9,700	5,969	5,080	3,482
Denmark	4,431	21,146	67,851	10,468	38,777	127,755[4]
Faroe Islands	-	-	-	-	-	-
Finland	-	-	-	-	-	-
France	5,527	15,099	15,310	16,353	20,320	18,566[4]
German Dem.Rep.	-	-	-	-	-	-
Germany, Fed.Rep.	147	2,300[2]	349[2]	1,837	11,609	9,724
Iceland	-	-	-	-	-	-
Netherlands	509	7,700	22,300	40,045	44,308	80,020[4]
Norway	2,165	70	680	32,512	98,714	157,919[4]
Poland	-	-	-	-	-	-
Sweden	-	-	-	284	886	2,442
UK (England)	77	303	3,730	111	1,689	4,791[4]
UK (Scotland)[3]	610	45	1,780	17,260	31,393	55,795
USSR	-	-	-	-	-	-
Total North Sea	13,466	46,663	122,056	133,794	252,776	460,494
Total including unallocated catches	60,994	140,972	235,925	317,124	317,263	529,969

[1] Supplied by Fiskirannsóknarstovan.

[2] From Federal Republic of Germany national statistics compiled by Federal Research Board for Fisheries, Hamburg.

[3] Catches of juveniles from Moray Firth not included.

[4] Unofficial as reported by W G members.

[5] Preliminary.

Table 2.1.2 HERRING, catch in tonnes in Division IVa West.

Country	1980	1981	1982	1983	1984	1985
Denmark	687	11,357	3,155	4,282	26,786	76,856
France	651	1,851	1,970	680	1,408	989
Germany, Fed.Rep	-	-	-	1,542	12,092	5,585
Netherlands	-	-	-	15,745	19,143	47,370
Norway	-	-	-	16,971	21,305	10,383
UK (Scotland)	18	2	1,706	16,136	24,634	52,100
Sweden	-	-	-	213	-[1]	-[1]
Unallocated	1,762	6,492	300	3,955	24,030	4,930
Total	3,118	19,702	7,179	61,738	129,398	198,213

[1] Included in Division IVb.

Table 2.1.3 HERRING, catch in tonnes in Divisions IVa East.

Country	1980	1981	1982	1983	1984	1985
Denmark	-	-	491	-	126	-
Norway	21	70	680	-	49,125	109,993
UK (Scotland)	-	-	-	257	74	-
Unallocated	2,476	937	-	431	-	
Total	2,497	1,007	1,171	688	49,325	109,993

Table 2.1.4 HERRING, catch in tonnes in Division IVb.

Country	1980	1981	1982	1983	1984	1985
Denmark	3,733	9,689	64,205	6,050	13,808	50,899
France	176	524	561	705	2,299	754
Germany, Fed.Rep	147	2,300	118	-	2	4,139
Netherlands	35	-	219	300	4,600	-[3]
Norway	1,607	-	-	14,156	25,820	37,543
UK (England)	76	13	3,128	40	1,956[1]	4,441[1]
UK (Scotland)	592	43	74	867	2,477	2,894[2]
Sweden	-	-	-	71	884[2]	2,442[2]
Unallocated	9,258	65,811	90,262	159,124	41,294	48,765
Total	15,624	78,380	158,567	181,313	93,140	151,879

[1] Includes catches mis-reported from Division IVc.

[2] Includes Division IVa catches.

[3] Included in Division IVa.

Table 2.1.5 HERRING, catch in tonnes in Divisions IVc and VIId.

Country	1980	1981	1982	1983	1984	1985
Belgium	-	-	9,700	5,969	5,080	3,482
Denmark	11	100	-	135	53	-
France	4,700	12,724	12,799	14,968	16,613	16,823
Germany, Fed.Rep	-	-	183	295	-	-
Netherlands	474	7,700	22,081	24,000	21,922	32,650
Norway	482	-	-	1,385	-	-
UK (England)	1	290	602	71	571[1]	350[2]
UK (Scotland)	-	-	-	-	-	799
Unallocated	37,418	21,069	23,307	17,606	1,788	15,780
Total	43,086	41,883	68,652	64,430	46,027	69,884[3]

[1] Includes 520 tonnes coastal spring-spawning herring.

[2] Includes 269 tonnes coastal spring-spawning herring.

[3] Includes 905 tonnes coastal spring-spawning herring.

Table 2.1.6 HERRING. North Sea catch in millions of fish by age.

Year/Area	Age in winter rings										Total
	0	1	2	3	4	5	6	7	8	>8	
1982											
IVaW of 2^0E	0.3	-	0.9	2.6	5.6	6.9	4.3	5.9	3.0	0.9	30.4
IVaE of 2^0E	-	4.3	7.0	-	-	-	-	-	-	-	11.3
IVb	9,552.5	815.2	59.3	6.1	1.6	0.7	0.3	0.4	0.1	0.1	10,436.3
IVc + VIId	3.9	20.9	201.2	221.4	26.5	6.8	2.2	1.5	0.5	0.1	485.0
Total NS	9,556.7	840.4	268.4	230.1	33.7	14.4	6.8	7.8	3.6	1.1	10,963.0
1983											
IVaW of 2^0E	-	51.9	126.8	74.9	27.5	13.5	18.4	12.3	10.9	12.1	348.3
IVaE of 2^0E	-	0.9	4.6	0.5	0.1	-	-	-	-	-	6.1
IVb	10,029.1	1,068.7	161.7	35.9	13.0	1.6	1.4	-	-	-	11,311.4
IVc + VIId	0.8	25.1	251.7	105.1	64.5	11.1	3.0	0.5	0.5	0.1	462.4
Total NS	10,029.9	1,146.6	544.8	216.4	105.1	26.2	22.8	12.8	11.4	12.2	12,128.2
1984											
IVaW of 2^0E	-	29.5	409.2	165.7	89.6	27.2	12.9	14.7	7.6	14.7	771.1
IVaE of 2^0E	-	60.5	138.6	71.3	37.5	18.6	2.5	6.3	0.6	1.0	336.9
IVb	2,187.3	457.4	266.1	63.5	29.8	9.4	4.3	2.7	2.4	1.7	3,024.6
IVc + VIId	2.1	13.7	172.6	116.6	33.0	22.6	2.0	0.5	-	0.4	363.5
Total NS	2,189.4	561.1	986.5	417.1	189.9	77.8	21.7	24.2	10.6	17.8	4,496.1
1985											
IVaW of 2^0E	-	37.7	509.1	468.4	161.5	57.8	15.0	11.1	8.4	10.2	1,279.2
IVaE of 2^0E	56.8	34.6	162.7	340.2	104.4	34.4	13.4	4.6	3.1	2.8	757.0
IVb	1,236.1	1,534.8	237.3	210.0	57.6	19.6	6.7	2.9	1.6	2.8	3,309.4
IVc + VIId	-	13.1	314.1	169.0	44.1	12.3	8.4	1.4	0.1	0.2	562.7
Total NS	1,292.9	1,620.2	1,223.2	1,187.6	367.6	124.1	43.5	20.0	13.2	15.9	5,908.3

Catches made in the South Buchan area of Division IVb (see Figure 1.3.1) included in Division IVa (W of 2^0E) in 1984 and 1985.

Swedish catches included in Division IVa (E of 2^0E).

Table 2.1.7 North Sea HERRING 1985
Millions caught by age groups (winter rings), Sub-divisions and quarters.

Division	Quarter	0 (1984)	1 (1983)	2 (1982)	3 (1981)	4 (1980)	5 (1979)	6 (1978)	7 (1977)	8 (1976)	>8	Total	0+1 Rings
IVa(W of 2^0E)	I	-	0.3	21.8	98.2	49.7	19.5	3.6	5.1	3.5	2.6	204.4	0.3
	II	-	2.9	58.4	64.7	28.2	12.7	3.9	1.1	1.7	4.4	178.0	2.9
	III	-	10.4	276.5	214.9	56.0	19.1	5.7	3.6	2.3	2.1	590.6	10.4
	IV	-	24.1	152.4	90.6	27.6	6.5	1.8	1.3	0.9	1.1	306.3	24.1
	Total	-	37.7	509.1	468.4	161.5	57.8	15.0	11.1	8.4	10.2	1,279.2	37.7
IVa(E of 2^0E)	I	-	-	10.1	47.6	18.7	8.8	2.0	1.4	0.9	0.7	90.2	-
	II	-	3.1	132.0	283.5	82.5	24.3	10.8	3.0	1.9	1.7	542.8	3.1
	III	34.0	18.5	17.8	5.6	0.7	0.1	0.1	-	-	-	76.8	52.5
	IV	22.8	13.0	2.8	3.5	2.5	1.2	0.5	0.2	0.3	0.4	47.2	35.8
	Total	56.8	34.6	162.7	340.2	104.4	34.4	13.4	4.6	3.1	2.8	757.0	91.4
IVb	I	-	888.4	41.2	28.0	5.8	1.7	0.4	0.2	0.1	+	965.8	888.4
	II	122.4	20.8	12.0	19.3	5.7	1.8	0.9	0.3	0.2	0.1	183.5	143.2
	III	1,113.5	529.3	171.0	153.0	39.7	13.9	4.6	2.1	1.0	2.5	2,030.6	1,471.8
	IV	0.2	96.2	13.0	9.7	6.4	2.2	0.8	0.3	0.3	0.1	129.2	96.4
	Total	1,236.1	1,534.7	237.2	210.0	57.6	19.6	6.7	2.9	1.6	2.7	3,309.1	2,770.8
IVc + VIId	I	-	0.4	10.2	69.8	19.8	4.9	3.0	0.3	+	0.2	108.6	0.4
	II	-	-	+	1.0	0.8	0.3	0.1	-	-	-	2.2	-
	III	-	-	+	0.3	0.4	0.3	0.1	-	0.1	-	1.2	-
	IV	-	12.7	303.9	97.9	23.1	6.7	5.2	1.1	-	-	450.6	12.7
	Total	-	13.1	314.1	169.0	44.1	12.3	8.4	1.4	0.1	0.2	562.6	13.1

+ = <0.1

Table 2.1.8 Millions of HERRING caught annually per age group (winter rings) in the North Sea 1970-85.

Year	Winter Rings										Total
	0	1	2	3	4	5	6	7	8	>8	
1970	898.1	1,196.2	2,002.8	883.6	125.2	50.3	61.0	7.9	12.0	12.2	5,294.3
1971	684.0	4,378.5	1,146.8	662.5	208.3	26.9	30.5	26.8	-	12.4	7,176.7
1972	750.4	3,340.6	1,440.5	343.8	130.6	32.9	5.0	0.2	1.1	0.4	6,045.5
1973	289.4	2,368.0	1,344.2	659.2	150.2	59.3	30.6	3.7	1.4	0.6	4,906.6
1974	996.1	846.1	772.6	362.0	126.0	56.1	22.3	5.0	2.0	1.1	3,189.3
1975	263.8	2,460.5	541.7	259.6	140.5	57.2	16.1	9.1	3.4	1.4	3,753.3
1976	238.2	126.6	901.5	117.3	52.0	34.5	6.1	4.4	1.0	0.4	1,482.0
1977	256.8	144.3	44.7	186.4	10.8	7.0	4.1	1.5	0.7	+	656.3
1978	130.0	168.6	4.9	5.7	5.0	0.3	0.2	0.2	0.2	0.3	315.4
1979	542.0	159.2	34.1	10.0	10.1	2.1	0.2	0.8	0.6	0.1	759.2
1980	791.7	161.2	108.1	91.8	32.1	21.8	2.3	1.4	0.4	0.2	1,211.0
1981	7,888.7	447.0	264.3	56.9	39.5	28.5	22.7	18.7	5.5	1.1	8,772.9
1982	9,556.7	840.4	268.4	230.1	33.7	14.4	6.8	7.8	3.6	1.1	10,963.0
1983	10,029.9	1,146.6	544.8	216.4	105.1	26.2	22.8	12.8	11.4	12.2	12,128.2
1984	2,189.4	561.1	986.5	417.1	189.9	77.8	21.7	24.2	10.6	17.8	4,496.1
1985	1,292.9	1,620.2	1,223.2	1,187.6	367.6	124.1	43.5	20.0	13.2	15.9	5,908.3

Table 2.1.9 Percentage age compositions of NORTH SEA HERRING (2-rings and older), 1985.

Division	Quarter	2 (1982)	3 (1981)	Older	Total No. caught (millions)
IVa(W of 2^0E)	I	10.7	48.1	41.2	204.1
	II	33.4	37.0	29.6	175.1
	III	46.8	37.0	16.2	580.2
	IV	54.0	32.1	13.9	282.2
	Total	41.0	37.7	21.3	1,241.6
IVa(E of 2^0E)	I	11.2	52.8	36.0	90.2
	II	24.5	52.5	23.0	539.7
	III	73.3	23.1	3.6	24.3
	IV	24.6	30.7	44.7	11.4
	Total	24.4	51.1	24.5	665.6
IVb	I	53.2	36.2	10.6	77.4
	II	29.8	47.9	22.3	40.3
	III	44.1	39.5	16.4	387.8
	IV	39.6	29.6	30.8	32.8
	Total	44.1	39.0	16.9	538.3
IVc + VIId	I	9.4	64.5	26.1	108.2
	II	0.1	45.5	54.4	2.2
	III	0.1	25.0	74.9	1.2
	IV	69.4	22.4	8.2	437.9
	Total	57.2	30.8	12.0	549.5
IVa + IVb	I	19.7	46.8	33.5	371.7
	II	26.8	48.7	24.5	755.1
	III	46.9	37.6	15.5	992.3
	IV	51.5	31.8	16.7	326.4
	Total	37.2	41.7	21.1	2,445.5
Total North Sea	I	17.4	50.8	31.8	479.9
	II	26.7	48.7	24.6	757.3
	III	46.8	37.6	15.6	993.5
	IV	61.8	26.4	11.8	764.3
	Total	40.8	39.7	19.5	2,995.0

Table 2.2.1 Predation Mortality on HERRING 1981 MSVPA, Key-Run 1985.

Age (winter rings)	Quarter				Total
	1	2	3	4	
0	-	0.11	0.37	0.36	0.84
1	0.95	0.15	0.02	0.02	1.14
2	0.04	0.02	0.02	+	0.08
3	0.07	0.01	0.18	0.01	0.27
4	+	+	0.01	0.01	0.02
5	+	0.01	0.01	0.02	0.04
6	+	+	+	0.02	0.03
7	-	-	-	-	-
8	-	-	-	-	-

+ = < than 0.005.

Table 2.2.2 Calculated preparation and residual natural mortality of HERRING 1981 MSVPA, Key-Run 1985.

	Age (WR)	Predation (No. in millions) Predator					Predation (tonnes)	
		Cod	Whiting	Saithe	Mackerel	Haddock	5 predators	Residual M (M1)
Quarter 1	0	-	-	-	-	-		
	1	226	3,623	65	-	2		
	2	30	5	10	-	1		
	3	19	-	1	-	-		
							36,500	9,800
Quarter 2	0	-	3,280	-	-	-		
	1	115	175	19	20	-		
	2	17	-	+	-	-		
	3	-	-	2	-	-		
	4	-	-	1	-	-		
	5	-	-	1	-	-		
							9,100	10,000
Quarter 3	0	118	6,855	28	181	-		
	1	30	-	+	1	-		
	2	24	-	+	+	-		
	3	41	-	2	-	-		
	4	-	-	1	-	-		
	5	-	-	1	-	-		
							95,500	14,421
Quarter 4	0	150	3,533	46	+	8		
	1	7	17	8	+	+		
	2	+	+	+	-	-		
	3	2	-	-	-	-		
	4	1	-	-	-	-		
	5	1	-	-	-	-		
	6	1	-	-	-	-		
							17,700	13,400

Table 2.3.1 1-group HERRING abundance in International Young Fish Survey.

Survey Year	Year class	Abundance 1-group in no./hour/ rectangle in standard area	VPA estimate 1-group x 10^9
1970	1968	822	5.92
1971	1969	2,647	11.67
1972	1970	1,629	9.23
1973	1971	827	5.90
1974	1972	1,195	2.87
1975	1973	1,592	6.11
1976	1974	452	0.69
1977	1975	342	0.66
1978	1976	575	1.05
1979	1977	139	1.11
1980	1978	535	2.43
1981	1979	551	3.53
1982	1980	1,293	6.68
1983	1981	1,797	13.02
1984	1982	2,714	-
1985	1983	3,227	-
1986	1984	3,613[1]	-

[1] Preliminary.

Table 2.3.2 English coastal 0-group indices as mean no/ hour and North Sea recruitment as 1-ringers.

Year class	0-group (no/hr)		1-group
	Total	Downs	VPA (total North Sea) x 10^9
1967	1,806	698	10.55
1968	1,165	1,917	5.92
1969	2,506	1,168	11.67
1970	1,061	2,316	9.23
1971	821	784	5.90
1972	578	53	2.87
1973	448	47	6.11
1974	158	42	0.69
1975	194	26	0.66
1976	96	36	1.05
1977	4,911	65	1.11
1978	1,506	1,650	2.43
1979	608	157	3.53
1980	516	521	6.68
1981	2,548	1,596	13.02
1982	633	863	11.51
1983	2,536	193	14.89
1984	5,149	2,152	17.07

Table 2.3.3 Abundance indices of first length component of 1-group in the IYFS and numbers of 2-ringed DOWNS HERRING from VPA.

Year class	IVc, VIId VPA 2-ringers (millions)	First component IYFS 1-group no/hr/rectangle (thousands)
1970	76	4.70
1971	75	5.80
1972	182	9.58
1973	108	4.31
1974	53	5.07
1975	66	3.39
1976	159	4.11
1977	206	1.95
1978	624	13.11
1979	409	8.83
1980	519	35.12
1981	670	46.55
1982	959	38.27
1983	-	(1.00)
1984	-	2.17

Table 2.3.4 Results of IKMT sampling compared with VPA estimates of 0-group stock size.

Year class	Mean number of larvae per rectangle: North Sea NW	North Sea NE	North Sea SE	North Sea SW	Skagerrak/ Kattegat	IKMT index weighted by area[1]	VPA estimates of 0-group stock size x 10^9
1976	19.82	1.50	1.14	11.00	0.17	1,237	3.27
1977	4.19	6.07	1.82	6.75	0.94	632	3.22
1978	42.67	5.35	0.81	15.60	8.64	2,460	7.47
1979	12.03	25.89	38.08	34.52	18.47	4,768	10.85
1980	12.43	0.33	28.69	17.78	33.67	3,423	30.12
1981	23.25	7.27	49.62	26.67	12.83	5,193	50.10
1982	2.63	9.79	37.96	14.23	47.92	3,904	46.66
1983	3.27	12.17	51.60	23.23	33.86	4,880	43.91
1984	19.18	5.83	52.24	40.85	22.31	5,829	-
1985	24.88	17.89	54.45	49.12	6.69	6,421	..

[1] Number of rectangles per area in NW North Sea 38, NE North Sea 18, SE North Sea 61, SW North Sea 35, Skagerrak/Kattegat 17. The areas are those given in Figure 2.2 of the 1985 Report (Anon., 1985).

Table 2.4.1 Numbers of herring at age (million) and biomass ('000 tonnes) on acoustic surveys in the second half of July and early August.

Age (rings)	Orkney-Shetland area	Moray Firth	Buchan area	Fladen area	Eastern area	Egersund Bank area	Total
0	-	-	48.8	-	-	-	49
1	642.5	-	17.6	66.0	0.2	0.3	727
2	1,247.9	-	68.3	382.1	93.6	87.9	1,907
3	539.4	-	31.0	174.6	90.6	58.1	894
4	169.5	-	3.5	21.3	33.3	9.1	237
5	61.8	-	0.9	5.0	13.3	2.4	83
6	21.8	-	0.3	1.6	4.8	1.8	30
7	11.7	-	0.02	0.09	1.5	-	13
8	21.2	-	0.06	0.4	1.6	0.5	24
>9	17.0	-	-	0.05	2.4	0.2	20
Total	2,760.1	-	170.6	651.0	241.5	160.3	3,984
Total biomass	375.7	-	16.0	87.4	47.7	20.5	547.3
Spawner[1] biomass	285.0	-	13.0	73.4	43.2	20.5	435.1

[1] Fish at stage 3 and over.

Table 2.4.2 Numbers of herring-at-age estimated by acoustic survey of Division IVa in 1984 and 1985 and estimates of Z.

Year class	July 1984	July 1985	Z_{84-85}
1983	-	726.3	-
1982	550.7	1,818.9	-
1981	1,717.6	835.6	0.72
1980	609.6	227.6	0.98
1979	264.1	81.0	1.18
1978	81.5	28.5	1.05
1977	36.0	13.3	1.00
1976	45.9	23.3	0.68
1975	38.1	19.4	1.35
pre-1975	36.9		
pre-1982	2,829.7	1,228.7	0.83

Covers Orkney-Shetland, Moray Firth, Buchan, Fladen and eastern area in Figure 2.4.1.

July 1984 estimates taken from Table 2.10 in Anon. (1985).

Table 2.4.3 Numbers of HERRING at age (millions) and s biomass ('000 tonnes) during the November survey.

Age (rings)	Fladen area	Egersund Bank area	Sum Div.IVa E of 1^0W
0	-	-	-
1	128	2	130
2	562	4	566
3	389	18	407
4	358	16	374
5	102	13	115
6	19	10	29
7	-	7	7
8	-	7	7
>9	6	3	9
Total	1,564	81	1,645
Total biomass	219	15	234

Table 2.4.4 Age composition (year class) of HERRING samples[1] during the northeast coast acoustic survey, August 1985 1985 (Division IVb).

Parameter	Age (rings) 2 (1982)	3 (1981)	4 (1980)	5 (1979)	6 (1978)	7 (1977)	Overall
% number	47.9	43.0	5.6	2.3	0.9	0.3	
% weight	40.8	46.9	7.2	3.3	1.2	0.6	
Mean length (cm)	25.95	27.99	29.41	30.51	30.48	32.92	27.19
(S.D.)	(1.01)	(0.95)	(1.03)	(0.65)	(0.66)	(0.71)	(1.64)
Mean weight (g)	142.2	182.1	214.7	242.2	241.2	310.8	167.1

[1] Mainly stage 5 maturity fish, excluding a small proprotion of 1-group fish.

Table 2.4.5 Percentage age compositions from Acoustic Survey samples compared with commercial catch age composition Southern Bight and Eastern Channel.

Category	2 (1982)	3 (1981)	4 (1980)	5 (1979)	6 (1978)	7> (1977)
French Surveys (VIId)						
11-14 Nov.	68.5	24.8	5.5	1.2	-	-
16-20 Nov.	61.0	29.7	8.1	0.8	0.4	-
English Survey						
(VIId) 7-15 Dec.	70.2	26.1	2.4	0.4	0.6	0.3
(IVc) 15-19 Dec.	62.0	18.4	9.9	4.1	5.1	0.5
IV Quarter (Commercial catches) [Mainly Nov.-Dec.]						
Netherlands	70.0	17.9	4.7	1.5	1.5	0.4
France	61.1	31.0	6.1	1.4	0.4	-

Table 2.4.6 Acoustic estimates of HERRING biomass ('000 tonnes) in Divisions IVc and VIId.

Year	Survey dates	Country	IVc	VIId	Biomass at end of year[1]
1981	2-15 Dec	England	73.0	23.0	96.0
1982	1-9 Feb	England	143.0	-	146.0
1983	17-28 Nov	England	178.0[2]	104.0	260.0[2]
			70.0[3]		150.0[3]
1984	11-23 Nov	France	35.6	110.5	133.0
1985	11-23 Nov	France	-	85.0	124.0[4]
	7-19 Dec	England	69.0	53.0	

[1] Biomass at end of year represents the acoustic estimates adjusted by mean weights and catches in the last quarter.

[2] This estimate assumed 75% of the biomass in IVc was herring (1984 Working Group Report).

[3] This estimate assumes 30% of the biomass in IVc was herring using the same proportion determined on the French survey in 1984.

[4] The combined estimate fromt he French and English surveys in the Channel only.

Table 2.5.1 Larvae production estimates (LPE x 10^{11} larvae) calculated using area-specific natural mortality rates (z/k) compared to larvae abundance indices (LAI) from Saville and Rankine (1985).

Year	Orkney-Shetland		Buchan		IVa (incl.Buchan)		Central N.Sea		IVc + VIId	
	LPE	LAI	LPE	LAI	LPE	LAI	LPE	LAI	LPE	LAI
1972	150	578	5	1	155	579	20	11	51	2
1973	76	239	7	1	83	240	90	73	54	1
1974	56	128	28	38	84	166	(53)	(63)	1	-
1975	40	44	9	44	49	88	39	6	-	-
1976	16	66	4	-	20	66	12	8	1	-
1977	(<133)	132	29	23	-	155	70	17	1	-
1978	90	371	21	36	111	407	86	46	3	1
1979	231	565	(<565)	20	231	585	53	19	2	4
1980	247	398	(<127)	2	247	400	121	21	47	12
1981	171	394	(<151)	2	171	396	233	36	119	49
1982	257	380	132	100	389	480	78	34	113	37
1983	207	335	365	448	572	783	87	66	(>74)	24
1984	161	354	590	430	751	783	653	105	114	23
1985	295	1,049	666	435	961	1,484	724	380	141	41
z/k	0.25	-	0.42	-	-	-	0.40	-	0.55	-

Table 2.5.2 SSB ('000 tonnes) estimated from larvae production estimates (LPE x 10^{11} larvae), and number of eggs (x 10^{5}) per kg SSB compared to SSB from VPA.

Year	IVa (incl.Buchan				IVb				IVa + IVb			IVc + VIId			North Sea	
	LPE	Eggs/ kg	LPE SSB	VPA SSB	LPE	Eggs/ kg	LPE SSB	VPA SSB	LPE SSB	VPA SSB	LPE	Eggs/ kg	LPE SSB	VPA SSB	LPE SSB	VPA SSB
1972	155	(1.56)	99	207	20	1.50	13	43	112	256	51	0.94	54	30	166	274
1973	83	(1.56)	53	147	90	1.51	60	80	113	240	54	0.93	58	8	171	225
1974	84	(1.56)	54	88	(53)	1.54	(34)	78	88	179	1	0.87	1	7	89	159
1975	49	1.59	31	65	39	1.63	24	30	55	104	-	1.01	-	6	55	85
1976	20	1.52	13	106	12	1.53	8	13	21	121	1	0.74	1	2	22	80
1977	-	1.57	-	88	70	(1.54)	45	8	-	96	1	1.02	1	6	-	54
1978	111	1.57	71	108	86	(1.54)	56	13	127	117	3	1.18	3	14	130	75
1979	231	1.64	141	112	53	(1.54)	34	19	175	133	2	1.07	2	28	177	120
1980	247	1.69	146	131	121	(1.54)	79	30	225	150	47	1.14	41	21	266	146
1981	171	1.51	113	138	233	(1.54)	151	51	264	175	119	1.06	112	55	376	214
1982	389	1.60	243	192	78	(1.54)	51	101	294	272	113	1.11	102	45	396	308
1983	572	1.53	373	307	87	(1.54)	56	202	429	476	(>74)	1.10	(>67)	49	>496	521
1984	751	1.67	450	532	653	(1.54)	424	437	874	907	114	1.04	110	81	984	968
1985	961	(1.60)	601	546	724	(1.54)	470	534	1,071	1,085	141	(1.08)	131	124	1,202	1,196

Table 2.7.1 VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN NORTH SEA (FISHING AREA IVA)

CATCH IN NUMBERS UNIT: millions

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
2	921	758	123	128	584	9	0	3	2	1	18	131
3	195	476	124	76	57	177	0	1	7	8	3	75
4	94	64	98	51	18	10	3	2	1	19	6	28
5	20	47	36	41	14	5	0	1	3	22	7	14
6	4	21	19	10	4	3	0	0	1	19	4	18
7	0	3	5	6	3	2	0	0	1	18	6	12
8	1	1	2	3	1	1	0	0	0	5	3	11
9+	0	1	1	1	0	0	0	0	0	1	1	12
TOTAL	1255	1371	406	317	680	206	4	6	15	93	47	302

	1984	1985
2	548	672
3	257	809
4	127	266
5	46	92
6	15	28
7	21	16
8	8	12
9+	16	13
TOTAL	1018	1907

Table 2.7.2 VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN NORTH SEA (FISHING AREA IVA)

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .10

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
2	.806	1.373	.627	.660	.993	.059	.001	.019	.021	.005	.038	.136
3	.894	1.218	.765	.907	.622	.842	.002	.006	.051	.089	.017	.198
4	.749	.752	.787	.747	.505	.178	.025	.018	.015	.178	.075	.218
5	.454	.938	1.176	.792	.398	.215	.004	.005	.025	.320	.083	.232
6	.488	1.117	1.151	1.145	.142	.131	.005	.000	.006	.213	.087	.292
7	.000	.654	.658	1.707	.970	.065	.010	.000	.022	.236	.085	.337
8	.791	1.125	.825	1.080	.500	.670	.010	.000	.027	.180	.050	.200
9+	.791	1.125	.825	1.080	.500	.670	.010	.000	.027	.180	.050	.200
(2- 6)U	.678	1.080	.901	.850	.532	.285	.007	.009	.024	.161	.060	.215
(2- 6)W	.804	1.258	.764	.758	.891	.496	.008	.012	.026	.135	.045	.168

	1984	1985
2	.245	.400
3	.342	.600
4	.524	.700
5	.591	.800
6	.399	.800
7	.557	.800
8	.355	.600
9+	.355	.600
(2- 6)U	.420	.660
(2- 6)W	.300	.532

Table 2.7.3 VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN NORTH SEA (FISHING AREA IVA)

STOCK SIZE IN NUMBERS UNIT: millions

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY; THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .670
PROPORTION OF ANNUAL M BEFORE SPAWNING: .670

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
2	1738	1055	275	277	966	172	114	158	111	184	505	1086
3	545	705	242	133	130	324	147	105	140	98	166	440
4	157	127	188	102	49	63	126	132	93	121	81	148
5	57	80	54	77	44	27	48	112	118	83	91	68
6	11	33	28	15	32	27	19	43	101	104	54	76
7	2	6	10	8	4	25	21	17	59	90	76	45
8	1	2	3	5	1	1	21	0	16	34	65	63
9+	1	1	2	2	1	0	32	0	4	7	19	70
TOTAL NO	2541	2007	802	619	1226	638	528	566	621	722	1057	1996
SPS NO	1110	744	422	317	555	419	472	499	552	581	875	1496
TOT.BIOM	451428	386675	168692	127229	226120	132361	119678	125521	146237	171080	228050	405521
SPS BIOM	207405	147189	87537	65244	106149	87974	107960	111860	131395	137872	191755	307070

	1984	1985	1986
2	2645	2134	0
3	858	1874	1294
4	326	552	951
5	107	175	248
6	49	54	71
7	31	30	22
8	29	27	12
9+	35	30	28
TOTAL NO	4122	4875	
SPS NO	2773	2741	
TOT.BIOM	739010	963253	
SPS BIOM	532813	546128	

Table 2.7.4 VIRTUAL POPULATION ANALYSIS

HERRING IN THE CENTRAL NORTH SEA (FISHING AREA IVB)

CATCH IN NUMBERS UNIT: millions

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
2	378.7	443.3	427.7	218.2	176.2	22.5	1.8	9.2	6.6	40.9	58.3	161.7
3	108.0	47.0	152.2	127.6	14.1	5.1	1.0	.3	1.3	8.5	6.1	35.9
4	24.4	15.3	13.5	74.1	23.6	.2	.8	1.7	.7	1.4	1.6	13.0
5	7.2	2.7	13.0	13.0	15.6	1.4	.1	.8	.4	.2	.7	1.6
6	.7	3.5	2.8	4.5	1.4	.7	.1	.1	.0	.4	.3	1.4
7	.2	.3	.2	1.9	1.5	.0	.0	.7	.1	.0	.4	.0
8	.5	.0	.3	.4	.4	.0	.0	.5	.0	.1	.1	.0
9+	.0	.0	.1	.3	.1	.0	.0	.0	.0	.0	.1	.0
TOTAL	519.7	512.1	609.8	440.0	232.9	29.9	3.8	13.3	9.1	51.5	67.6	213.6

	1984	1985
2	240.7	174.3
3	55.8	195.8
4	28.0	55.7
5	8.8	19.1
6	4.3	6.5
7	2.6	2.9
8	2.4	1.4
9+	1.7	2.8
TOTAL	344.3	458.5

Table 2.7.5 VIRTUAL POPULATION ANALYSIS

HERRING IN THE CENTRAL NORTH SEA (FISHING AREA IVB)

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .10

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
2	1.647	.935	1.239	2.247	2.421	1.453	.043	.215	.091	.276	.175	.229
3	1.257	.383	.880	1.642	.941	.405	.177	.098	.038	.146	.054	.139
4	1.235	.505	.575	1.442	1.899	.025	.091	.453	.021	.047	.033	.140
5	.910	.357	.952	1.694	1.391	.472	.014	.111	.162	.007	.027	.038
6	.553	1.578	.674	.939	.760	.164	.049	.016	.000	.215	.012	.063
7	.166	.431	.282	1.265	.853	.000	.000	.489	.018	.000	.308	.000
8	.900	.000	.900	1.250	.900	.000	.000	.169	.000	.020	.020	.000
9+	.900	.000	.900	1.250	.900	.000	.000	.169	.000	.020	.020	.000
(2- 6)U	1.120	.848	.865	1.593	1.482	.504	.075	.160	.062	.138	.060	.122
(2- 6)W	1.521	.906	1.107	1.878	2.141	.841	.059	.132	.062	.198	.125	.192

	1984	1985
2	.152	.205
3	.103	.160
4	.158	.128
5	.119	.118
6	.121	.109
7	.145	.102
8	.120	.096
9+	.120	.096
(2- 6)U	.127	.144
(2- 6)W	.139	.165

Table 2.7.6 VIRTUAL POPULATION ANALYSIS

HERRING IN THE CENTRAL NORTH SEA (FISHING AREA IVB)

STOCK SIZE IN NUMBERS UNIT: millions

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY; THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .667
PROPORTION OF ANNUAL M BEFORE SPAWNING: .667

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
2	487	761	626	252	200	31	44	50	80	178	382	829
3	157	85	270	164	24	16	6	39	36	66	122	290
4	36	40	32	101	29	9	10	5	35	32	51	105
5	13	9	22	17	22	4	8	8	3	31	27	45
6	2	5	6	8	3	5	2	7	6	2	28	24
7	1	1	1	3	3	1	4	2	6	6	2	25
8	1	1	1	1	1	1	1	3	1	5	5	1
9+	0	1	0	0	0	1	1	0	1	0	5	1
TOTAL NO	696	903	958	545	280	67	76	113	168	319	622	1519
SPS NO	239	464	435	150	68	40	69	97	151	263	537	1090
TOT.BIOM	125068	155186	170803	103947	51526	13397	15015	22327	32976	60976	116520	242652
SPS BIOM	43094	80410	78272	29713	13200	8521	13563	19154	29767	50998	101239	201760

	1984	1985	1986
2	1788	995	0
3	596	1390	735
4	228	487	1072
5	82	180	387
6	39	66	145
7	21	31	54
8	22	16	26
9+	16	32	40
TOTAL NO	2793	3197	
SPS NO	2382	2683	
TOT.BIOM	511471	634430	
SPS BIOM	436786	534014	

Table 2.7.7 Estimation of F in 1985 Division IVc + VIId HERRING (No in millions).

Category	Age (winter ring)						Total
	2	3	4	5	6	7	
French Acoustic Estimate[1] (November)	415.8	211.0	41.5	9.5	2.7	-	680.5
English Acoustic Estimate[2] (December)	310.4	80.1	18.6	6.3	5.1	1.3	421.8
Total	726.2	291.1	60.1	15.8	7.8	1.3	1,102.3
Total at year end (Adjusted by subtracting half Q4 catches)	574.2	242.1	48.5	12.5	5.2	0.8	888.3
Catch in 1985	314.1	169.0	44.1	12.3	8.4	1.4	549.3
F	0.42	0.51	0.62	0.66	0.93	0.97	

[1] Raised by age distribution from French catches in November.
[2] Raised by age distribution from Dutch catches in December.

Table 2.7.8 VIRTUAL POPULATION ANALYSIS

HERRING IN THE SOUTHERN NORTH SEA (FISHING AREAS IVC AND VIID)

CATCH IN NUMBERS UNIT: millions

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	22.30	25.50	54.80	42.40	22.90	161.80	81.60	130.80	135.10	43.30	24.10	127.20
3	78.50	60.50	9.90	15.40	19.90	8.80	85.80	41.70	29.30	115.10	20.30	39.60
4	.70	32.60	1.20	4.90	9.70	5.30	5.40	31.10	9.30	55.00	8.40	5.30
5	5.90	2.10	3.10	2.20	1.50	1.90	1.60	.70	5.00	7.40	1.20	1.80
6	.00	2.40	.00	.10	3.00	.40	1.00	.30	.00	1.90	.10	.00
7	.00	.50	.00	.00	.60	.40	.10	.60	.00	.50	.20	.00
8	.00	.00	.00	.00	.00	.01	.40	.00	.00	.10	.00	.00
9+	.00	.03	.00	.00	.00	.02	.10	.30	.00	.00	.00	.00
TOTAL	107.40	123.63	69.00	65.00	57.60	178.63	174.00	205.50	178.70	223.30	54.30	173.90

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	94.40	6.40	2.80	21.60	99.10	222.60	201.20	251.70	172.60	314.10
3	41.30	3.00	4.00	9.00	85.80	40.40	221.40	105.10	116.60	169.00
4	3.50	.70	1.20	5.60	30.20	19.30	26.50	64.50	33.00	44.10
5	.50	.20	.00	.60	18.40	6.70	6.80	11.10	22.60	12.30
6	.30	.00	.00	.10	1.70	3.30	2.20	3.00	2.00	8.40
7	.00	.00	.00	.00	.50	.60	1.50	.50	.50	1.40
8	.00	.00	.00	.00	.00	.00	.50	.50	.03	.10
9+	.00	.00	.00	.00	.00	.00	.10	.10	.40	.20
TOTAL	140.50	10.30	8.00	36.90	235.70	292.90	460.20	436.50	347.73	549.60

Table 2.7.9 VIRTUAL POPULATION ANALYSIS

HERRING IN THE SOUTHERN NORTH SEA (FISHING AREAS IVC AND VIID)

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .10

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	.14	.85	.96	.62	.82	.77	.79	.84	.68	.91	.41	1.30
3	1.05	.59	.81	.70	.59	.78	1.08	1.15	.39	2.36	1.43	2.37
4	.27	1.87	.02	1.15	1.21	.27	1.56	1.57	.76	3.76	1.52	2.37
5	1.19	7.29	.88	.04	1.30	.72	.11	.78	1.15	4.21	6.73	1.87
6	.00	7.55	.01	.05	.06	1.55	.93	.02	.00	2.27	4.38	.01
7	.01	6.08	.01	.01	.43	.01	4.48	6.26	.00	6.08	5.17	.01
8	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
9+	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
(2- 6)U	.53	3.62	.55	.51	.79	.81	.89	.87	.60	2.70	2.89	1.58
(6- 7)U	.00	6.81	.01	.05	.24	.77	2.71	3.14	.00	4.17	4.77	.01

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1980-83
2	2.50	.14	.05	.15	.70	.47	.72	.71	.31	.42	.65
3	3.26	.39	.11	.18	1.23	.60	1.06	.94	.74	.51	.96
4	2.83	.64	.24	.19	1.33	.95	.91	.93	.78	.62	1.03
5	5.86	4.95	.00	.16	1.37	1.15	.97	1.17	.91	.66	1.17
6	3.46	.01	.01	.17	.77	.88	1.53	1.61	.59	.93	1.19
7	.01	.01	.01	.01	6.08	.60	1.21	2.32	1.34	.97	2.55
8	.01	.01	.01	.01	.01	.01	1.37	1.97	.96	.97	.84
9+	.01	.01	.01	.01	.01	.01	1.37	1.97	.96	.97	.84
(2- 6)U	3.94	1.22	.08	.17	1.08	.81	1.04	1.07	.67	.63	
(6- 7)U	2.74	.01	.01	.09	3.42	.74	1.37	1.97	.96	.95	

Table 2.7.10 VIRTUAL POPULATION ANALYSIS

HERRING IN THE SOUTHERN NORTH SEA (FISHING AREAS IVC AND VIID)

STOCK SIZE IN NUMBERS UNIT: millions

BIOMASS TOTALS UNIT: thousand tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY; THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: 1.000
PROPORTION OF ANNUAL M BEFORE SPAWNING: 1.000

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	180.3	47.2	92.5	96.1	42.7	315.1	155.4	240.9	286.1	75.8	75.1	181.6
3	125.9	142.0	18.6	52.0	46.8	17.0	132.3	63.5	94.5	131.1	27.8	45.1
4	3.1	39.9	71.2	7.5	14.4	23.6	7.1	40.7	16.2	57.7	11.2	6.0
5	8.8	2.1	5.5	65.5	2.1	3.9	16.3	1.4	7.6	7.7	1.2	2.2
6	.6	2.4	.0	2.1	55.2	.5	1.7	13.2	.6	2.2	.1	.0
7	.0	.5	.0	.0	1.8	47.1	.1	.6	11.7	.5	.2	.0
8	.0	.0	.0	.0	.0	1.1	42.2	.0	.0	10.6	.0	.0
9+	.0	3.2	.0	.0	.0	2.1	10.6	31.7	.0	.0	.0	.0
TOTAL NO	318.7	237.5	187.9	201.0	163.1	410.4	365.7	392.0	418.6	285.6	115.5	234.9
SPS NO	187.0	98.2	104.9	120.4	95.2	202.5	106.7	160.9	209.7	49.9	53.3	49.3
TOT.BIOM	45.6	38.5	29.4	32.8	29.3	59.6	58.4	59.2	59.2	46.4	16.4	31.8
SPS BIOM	25.4	15.5	17.8	20.9	17.9	31.8	28.8	25.7	30.3	7.8	7.1	6.4

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
2	108.3	53.2	65.5	159.0	206.6	623.5	409.3	519.4	670.1	959.1	********
3	44.6	9.8	42.0	56.6	123.3	93.2	353.3	180.2	232.1	442.7	570.2
4	3.8	1.5	6.0	34.2	42.7	32.7	46.1	111.0	65.9	99.8	240.5
5	.5	.2	.7	4.3	25.6	10.2	11.4	16.7	39.6	26.6	48.6
6	.3	.0	.0	.7	3.3	5.9	2.9	3.9	4.7	14.5	12.4
7	.0	.0	.0	.0	.5	1.4	2.2	.6	.7	2.4	5.2
8	.0	.0	.0	.0	.0	.0	.7	.6	.1	.2	.8
9+	.0	.0	.0	.0	.0	.0	.1	.1	.7	.3	.2
TOTAL NO	157.6	64.7	114.3	254.8	402.1	766.9	826.1	832.5	1011.7	1545.4	
SPS NO	11.5	48.8	95.3	195.5	145.4	416.7	315.2	341.0	586.3	877.9	
TOT.BIOM	21.7	8.6	16.3	36.8	60.4	103.7	121.1	120.5	145.9	220.9	
SPS BIOM	1.5	6.4	13.6	28.1	20.6	55.4	44.9	48.3	80.7	123.9	

Table 2.7.11 VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN NORTH SEA (FISHING AREAS IVA + IVB)

CATCH IN NUMBERS UNIT: millions

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
2	1305	1301	749	415	807	38	2	13	9	42	67	293
3	315	544	342	220	76	183	2	1	8	16	9	111
4	121	95	118	135	49	10	4	5	2	20	7	41
5	28	52	55	55	34	7	0	2	3	22	8	15
6	5	29	22	16	6	4	0	0	1	19	5	20
7	0	5	5	9	4	2	0	1	1	18	6	12
8	1	1	2	3	1	1	0	1	0	5	3	11
9+	0	1	1	1	0	0	0	0	0	1	1	12
TOTAL	1776	2026	1293	855	977	245	9	21	24	144	106	515

	1984	1985
2	776	909
3	291	1019
4	152	324
5	54	112
6	19	35
7	23	19
8	10	13
9+	17	16
TOTAL	1342	2446

Table 2.17.12 VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN NORTH SEA (FISHING AREAS IVA + IVB)

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .10

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
2	.919	1.091	1.162	1.285	1.180	.214	.016	.066	.052	.134	.084	.177
3	.956	1.179	.855	1.248	.752	.839	.012	.009	.049	.114	.034	.175
4	.792	.735	.775	.894	.933	.182	.031	.035	.019	.152	.060	.194
5	.488	.846	1.159	.938	.516	.275	.007	.014	.050	.265	.071	.156
6	.492	1.244	.989	1.235	.200	.095	.010	.002	.006	.216	.073	.237
7	.090	.596	.613	1.439	1.325	.065	.005	.047	.025	.229	.091	.254
8	.791	1.123	.825	1.080	.500	.670	.010	.018	.027	.180	.050	.200
9+	.791	1.123	.825	1.080	.500	.670	.010	.018	.027	.180	.050	.200
(2- 6)U	.725	1.018	.988	1.120	.716	.321	.015	.025	.031	.176	.064	.188
(2- 6)W	.900	1.087	1.026	1.176	1.068	.512	.017	.034	.035	.158	.071	.179

	1984	1985
2	.205	.300
3	.258	.400
4	.341	.400
5	.377	.400
6	.266	.400
7	.423	.400
8	.304	.400
9+	.304	.400
(2- 6)U	.285	.380
(2- 6)W	.229	.356

Table 2.7.13 VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN NORTH SEA (FISHING AREAS IVA + IVB)

STOCK SIZE IN NUMBERS UNIT: millions

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY; THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .670
PROPORTION OF ANNUAL M BEFORE SPAWNING: .670

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
2	2265	2040	1134	596	1212	209	139	206	186	348	874	1900
3	540	818	620	321	149	357	153	124	174	160	276	727
4	251	191	228	239	83	64	152	136	111	150	129	241
5	76	95	83	95	58	30	48	116	119	99	117	110
6	13	42	37	24	34	48	20	43	103	105	68	98
7	2	7	11	12	6	25	39	18	39	93	76	58
8	2	2	4	5	3	1	21	35	16	34	67	63
9+	1	1	2	2	1	0	32	6	4	7	22	70
TOTAL NO	3151	3197	2119	1294	1577	713	584	684	752	996	1628	3267
SPS NO	1399	1234	916	511	659	459	517	593	657	780	1313	2423
TOT.BIOM	563586	587150	402943	256279	285836	146350	130951	150927	169567	220707	350257	632798
SPS BIOM	256469	259989	178822	104124	120891	95217	117348	132863	150358	174833	271788	476291

	1984	1985	1986
2	4390	5677	0
3	1441	3236	2465
4	552	1028	1965
5	180	355	623
6	85	112	215
7	70	59	68
8	40	42	56
9+	68	50	56
TOTAL NO	6827	8558	
SPS NO	4823	5460	
TOT.BIOM	1272598	1669825	
SPS BIOM	907114	1084688	

Table 2.7.14 VIRTUAL POPULATION ANALYSIS

NORTH SEA HERRING (FISHING AREA IV)

CATCH IN NUMBERS UNIT: millions

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
0	0	0	0	0	0	0	150	219	164	96	279	97
1	0	3	0	0	462	722	1023	1451	2072	1697	1483	4279
2	494	247	478	535	660	1346	1322	1493	1931	1860	1644	1029
3	416	672	644	1039	959	576	1003	1111	1032	1221	736	999
4	658	328	596	617	1255	610	474	591	479	516	644	322
5	526	601	287	490	630	652	386	361	337	249	344	461
6	756	487	652	254	262	464	473	330	252	194	207	147
7	431	400	462	331	142	236	278	379	120	104	147	73
8	627	252	414	195	206	166	118	194	109	104	100	46
9+	684	665	623	402	239	388	275	317	106	188	153	72
TOTAL	4571	3655	3956	3661	4815	5160	5502	6445	6581	6228	5737	7526

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
0	0	195	1269	142	443	497	157	375	645	839	112	898
1	1609	2393	336	2147	1262	2972	3209	1383	1674	2425	2503	1196
2	4934	1142	1889	270	2961	1548	2218	2570	1172	1795	1883	2005
3	488	1967	480	797	177	2243	1325	741	1365	1494	296	884
4	497	166	1456	535	158	148	2039	450	572	621	133	125
5	233	168	124	1082	81	149	145	890	298	157	191	50
6	249	113	153	127	230	95	152	45	593	145	50	61
7	120	126	61	145	22	256	118	65	68	163	43	8
8	82	129	56	86	42	26	413	96	82	14	27	12
9+	219	142	88	87	51	58	78	236	173	92	25	12
TOTAL	8431	6539	5917	5218	5427	7992	9854	6850	6241	7746	5264	5249

ctd.

ctd. Table 2.7.14 VIRTUAL POPULATION ANALYSIS

NORTH SEA HERRING (FISHING AREA IV)

CATCH IN NUMBERS UNIT: millions

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
0	684	750	289	996	264	238	257	130	542	792	7889	9557
1	4379	3341	2568	846	2461	127	144	169	159	161	447	840
2	1147	1441	1344	773	542	902	45	5	34	108	264	268
3	663	344	659	562	260	117	186	6	10	92	57	230
4	208	131	150	126	141	52	11	5	10	32	40	34
5	27	33	59	56	57	35	7	0	2	22	29	14
6	31	5	31	22	16	6	4	0	0	2	23	7
7	27	0	4	5	9	4	2	0	1	1	19	8
8	0	1	1	2	3	1	1	0	1	0	6	4
9+	12	0	1	1	1	0	0	0	0	0	1	1
TOTAL	7177	6046	4907	3189	3753	1482	656	315	759	1211	8773	10963

	1983	1984	1985
0	10050	2190	1493
1	1147	560	1620
2	545	970	1225
3	216	422	1188
4	105	195	368
5	26	78	124
6	23	22	44
7	13	24	20
8	11	11	15
9+	12	18	16
TOTAL	12128	4492	5908

MEAN WEIGHT AT AGE OF THE STOCK

1947-85

0	15.000
1	50.000
2	155.000
3	187.000
4	223.000
5	239.000
6	276.000
7	299.000
8	306.000
9+	312.000

Table 2.7.15 VIRTUAL POPULATION ANALYSIS

NORTH SEA HERRING (FISHING AREA IV)

FISHING MORTALITY COEFFICIENT UNIT: Year-1 VARIABLE NATURAL MORTALITY COEFFICIENT

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
0	.000	.000	.000	.000	.000	.000	.000	.010	.008	.007	.005	.006
1	.000	.000	.000	.000	.063	.095	.118	.147	.268	.215	.331	.189
2	.143	.050	.081	.134	.204	.364	.350	.351	.417	.598	.474	.590
3	.165	.262	.159	.227	.332	.246	.448	.492	.387	.449	.444	.524
4	.188	.170	.217	.202	.415	.325	.292	.459	.361	.302	.401	.515
5	.222	.242	.197	.218	.291	.351	.312	.337	.457	.287	.301	.494
6	.274	.293	.398	.240	.279	.322	.410	.424	.334	.461	.366	.181
7	.358	.205	.441	.320	.184	.385	.289	.595	.259	.220	.672	.190
8	.300	.300	.300	.300	.300	.300	.300	.300	.300	.300	.300	.400
9+	.300	.300	.300	.300	.300	.300	.300	.300	.300	.300	.300	.400
(2- 6)U	.198	.203	.210	.204	.304	.321	.363	.413	.391	.419	.397	.421
(2- 9)U	.241	.228	.262	.245	.283	.324	.338	.407	.349	.365	.407	.387

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
0	.000	.037	.027	.007	.020	.017	.010	.028	.034	.045	.011	.044
1	.294	.329	.178	.124	.167	.390	.319	.243	.365	.378	.409	.338
2	.494	.506	.701	.295	.349	.449	.877	.677	.478	1.467	.880	1.085
3	.546	.331	.366	.642	.284	.430	.765	.732	.857	1.925	.945	1.306
4	.476	.320	.587	.416	.221	.362	.772	.567	.909	1.071	.870	1.319
5	.352	.258	.372	.491	.148	.297	.634	.824	.813	1.174	1.054	.865
6	.481	.256	.365	.711	.161	.233	.492	.366	.979	1.118	1.526	1.079
7	.197	.423	.193	.592	.227	.243	.442	.356	1.296	1.432	1.110	1.000
8	.300	.300	.300	.400	.300	.400	.670	.690	.900	.900	.900	1.000
9+	.300	.300	.300	.400	.300	.400	.670	.690	.900	.900	.900	1.000
(2- 6)U	.470	.354	.458	.510	.253	.354	.708	.633	.803	1.351	1.055	1.131
(2- 9)U	.393	.337	.373	.493	.249	.352	.665	.613	.889	1.249	1.023	1.082

ctd.

ctd. Table 2.7.15 VIRTUAL POPULATION ANALYSIS

NORTH SEA HERRING (FISHING AREA IV)

FISHING MORTALITY COEFFICIENT UNIT: Year-1 VARIABLE NATURAL MORTALITY COEFFICIENT

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
0	.042	.071	.057	.090	.199	.188	.151	.066	.121	.121	.507	.547
1	.754	.699	.807	.554	.810	.565	.571	.259	.230	.100	.200	.199
2	.995	.909	1.155	1.140	1.562	1.455	.251	.025	.105	.557	.528	.244
3	1.256	.835	1.574	.992	1.549	1.207	1.585	.037	.060	.389	.266	.468
4	1.202	.797	.936	.936	1.295	1.715	.275	.094	.077	.247	.257	.222
5	1.056	.551	.943	1.120	1.787	1.274	1.138	.010	.047	.212	.521	.126
6	2.426	.489	1.259	1.054	1.256	.891	.416	.070	.007	.060	.519	.105
7	2.693	.079	.725	.612	1.820	1.415	.497	.028	.584	.058	.794	.154
8	.000	1.000	1.000	1.000	1.000	1.000	.800	.100	.100	.300	.300	.300
9+	.000	1.000	1.000	1.000	1.000	1.000	.800	.100	.100	.300	.300	.300
(2- 6)U	1.538	.712	1.140	1.070	1.451	1.308	.638	.047	.059	.249	.298	.233
(2- 9)U	1.204	.705	1.055	.995	1.384	1.244	.692	.058	.110	.258	.361	.240

	1983	1984	1985
0	.599	.082	.045
1	.156	.073	.170
2	.265	.224	.510
3	.283	.300	.410
4	.359	.387	.410
5	.240	.433	.410
6	.267	.284	.410
7	.262	.442	.410
8	.300	.320	.410
9+	.300	.320	.410
(2- 6)U	.285	.326	.390
(2- 9)U	.284	.339	.397

Table 2.7.16 VIRTUAL POPULATION ANALYSIS

NORTH SEA HERRING (FISHING AREA IV)

STOCK SIZE IN NUMBERS UNIT: millions

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY; THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .667
PROPORTION OF ANNUAL M BEFORE SPAWNING: .667

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
0	33899	27148	22706	29786	31222	36013	41780	34528	34428	20500	97261	24599
1	11853	14310	9987	8353	10958	11486	13248	15283	12575	12570	7486	35618
2	3901	5326	6428	4488	3753	4624	4693	5290	5929	4321	4556	2417
3	2869	3061	4585	5361	3552	2769	2908	2992	3371	3535	2150	2565
4	3908	2201	2132	3537	3866	2305	1959	1681	1655	2072	2042	1248
5	2771	2930	1680	1553	2615	2309	1508	1323	961	1044	1386	1237
6	3302	2008	2081	1248	1150	1769	1471	998	855	551	709	928
7	1576	2270	1355	1265	889	774	1160	883	591	554	314	445
8	2534	1018	1674	789	852	669	476	736	441	421	402	145
9+	2767	2689	2521	1625	968	1570	1111	1282	427	758	620	230
TOTAL NO	74379	62962	55149	58805	59785	64288	70314	65046	61252	46526	116926	69431
SPS NO	17998	16187	16600	14948	12557	11632	10262	9749	9053	9286	8616	6402
TOT.BIOM	6872120	6095228	5843968	5193658	4883516	4829220	4602562	4532572	3973971	3661400	4334222	4083526
SPS BIOM	4380390	3801903	3743060	3301870	2812020	2643462	2298153	2147613	1864262	1945506	1782986	1368181

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
0	32958	8356	74128	32245	36108	46240	25150	21705	30671	30009	16287	32887
1	3993	12124	2961	26535	11780	13026	16722	9161	7767	10938	10553	5927
2	13246	3010	3919	1114	10532	4478	5962	5462	3228	2423	3357	3151
3	1213	7315	1642	1760	752	6722	2586	1492	2512	1811	505	1260
4	1375	636	4752	1031	858	512	3957	1088	649	985	239	178
5	824	775	418	2920	615	608	323	1654	559	237	505	91
6	683	524	541	261	1618	480	409	155	656	224	66	96
7	700	582	367	339	116	1246	544	226	97	223	66	15
8	333	520	226	274	170	84	884	200	143	24	48	20
9+	884	574	554	276	206	183	168	495	304	161	44	20
TOTAL NO	61208	34215	89308	66752	62755	73580	54505	41638	46586	47005	31472	43642
SPS NO	13220	10108	8386	5591	11529	10258	7073	6394	4764	2149	2565	2110
TOT.BIOM	4502950	3489541	3772907	3585225	3355170	4143469	3809402	2873557	2445631	2172170	1579671	1617755
SPS BIOM	2472822	2044210	1757742	1195014	2086796	2021763	1475471	1242469	909367	425777	409271	360637

ctd.

ctd. Table 2.7.16 VIRTUAL POPULATION ANALYSIS

NORTH SEA HERRING (FISHING AREA IV)

STOCK SIZE IN NUMBERS UNIT: millions

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY; THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .667
PROPORTION OF ANNUAL M BEFORE SPAWNING: .667

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
0	20164	17212	8253	18181	2275	2108	5266	5218	7466	10347	30124	50102
1	11667	9229	5398	2868	6113	686	661	1054	1109	2434	3534	6675
2	1897	2516	2062	1182	755	1222	227	205	365	396	989	1500
3	963	635	917	600	342	174	259	163	181	298	256	644
4	509	248	250	210	201	66	47	59	142	154	185	177
5	43	84	101	84	71	50	11	32	48	119	109	128
6	35	14	44	36	25	11	15	5	29	42	87	72
7	30	5	8	11	11	6	4	8	3	26	36	57
8	0	2	2	5	6	2	1	2	7	2	22	15
9+	0	1	1	2	2	1	0	3	1	0	4	4
TOTAL NO	41108	29942	17536	25173	9301	4385	4468	4747	9350	14518	35344	59175
SPS NO	1485	1598	1281	878	453	477	299	400	630	739	1142	1067
TOT.BIOM	1547573	1304975	1005265	795368	594966	320867	163703	188897	312291	484286	959409	1520154
SPS BIOM	251401	274117	225604	153685	84662	80463	55959	74858	119700	146064	214097	308286

	1983	1984	1985	1986
0	46662	45913	48425	0
1	13824	11514	14889	17065
2	2458	5110	4610	5644
3	922	1707	3698	3192
4	365	629	1145	2220
5	129	231	386	687
6	102	91	135	232
7	58	71	62	81
8	44	41	41	37
9+	49	68	50	54
TOTAL NO	64613	65375	73641	
SPS NO	2363	3504	6439	
TOT.BIOM	2091055	2621123	3339425	
SPS BIOM	528866	987778	1196475	

Table 2.8.1 1985 North Sea HERRING - mean weight at age (year class) weighted by numbers caught.

Division	Quarter	0	1	2	3	4	5	6	7	8	9+
		(1984)	(1983)	(1982)	(1981)	(1980)	(1979)	(1978)	(1977)	(1976)	
IVa W	I	-	70	103	132	165	191	214	247	248	263
	II	-	75	125	168	207	228	224	273	274	322
	III	-	83	146	196	238	264	283	323	338	339
	IV	-	75	138	179	206	215	243	263	257	276
	Total	-	77	139	175	205	226	246	276	279	305
IVa E	I	-	-	87	124	148	163	169	185	221	216
	II	-	70	135	170	199	213	234	254	261	257
	III	11	87	117	163	191	222	233	284	290	-
	IV	17	82	128	156	175	196	199	224	235	261
	Total	14	84	130	163	189	199	223	232	247	248
IVb	I	-	12	75	117	141	159	165	184	198	238
	II	5	31	135	169	201	215	241	259	260	259
	III	9	63	134	190	215	227	228	260	285	297
	IV	14	80	124	155	174	191	201	222	236	242
	Total	9	34	123	177	202	216	223	250	267	291
IVc + VIId	I	-	32	78	103	120	145	147	159	270	193
	II	-	-	69	118	148	177	188	-	-	-
	III	-	-	85	154	177	187	196	-	191	-
	IV	-	84	114	139	171	188	179	223	198	-
	Total	-	82	113	124	148	170	168	212	207	193
IVa	Total	14	80	137	170	199	216	235	263	270	293
IVa + IVb	Total	9	36	133	171	200	216	233	261	270	293
North Sea	Total	9	36	128	164	194	211	220	252	270	292

Table 2.8.2 Comparison between mean weights at age in catch of North Sea HERRING from earlier years[1] and 1985.

Age	IVa/IVb	IVa	IVb	IVa/IVb	Differences (g)		
	Pre-1985	1985	1985	1985	IVa	IVb	IVa/IVb
2	126	137	123	133	+11	- 3	+ 7
3	176	170	177	171	- 6	+ 1	- 5
4	211	199	202	200	-12	- 9	-11
5	243	216	216	216	-27	-27	-27
6	256	235	223	233	-21	-33	-23
7	267	263	250	261	- 4	-17	- 6
8	271	270	267	270	- 1	- 4	- 1
9+	271	293	291	293	+22	+20	+22

Age	IVc + VIId			Total North Sea		
	Pre-1985	1985	Difference (g)	Pre-1985	1985	Difference (g)
2	117	113	- 4	125	128	+ 3
3	141	124	-17	166	164	- 2
4	170	148	-22	204	194	-10
5	192	170	-22	228	211	-17
6	221	168	-53	253	220	-33
7	224	212	-12	266	258	- 8
8	216	207	- 9	271	270	- 1
9+	208	193	-15	270	292	+22

[1] Pre-1985 values taken from Table 2.16, Anon., (1985).

Table 2.9.1
List of input variables for the ICES prediction program.

HERRING - DIVISIONS IVA AND IVB
The reference F is the mean F for the age group range from 2 to 6

The number of recruits per year is as follows:

Year	Recruitment
1986	5430.0
1987	5700.0
1988	2700.0

Proportion of F (fishing mortality) effective before spawning: .6700
Proportion of M (natural mortality) effective before spawning: .6700

Data are printed in the following units:

Number of fish:	millions
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	thousand tonnes
Catch weight:	thousand tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
2	5430.0	.30	.10	.70	.133	.133
3	2465.0	.40	.10	1.00	.171	.171
4	1965.0	.40	.10	1.00	.200	.200
5	625.0	.40	.10	1.00	.216	.216
6	215.0	.40	.10	1.00	.233	.233
7	68.0	.40	.10	1.00	.261	.261
8	36.0	.40	.10	1.00	.270	.270
9+	56.0	.40	.10	1.00	.293	.293

Table 2.9.2
List of input variables for the ICES prediction program.

HERRING IN DIVISIONS IVC AND VIID
The reference F is the mean F for the age group range from 2 to 6

The number of recruits per year is as follows:

Year	Recruitment
1986	600.0
1987	800.0
1988	700.0

Proportion of F (fishing mortality) effective before spawning: 1.0000
Proportion of M (natural mortality) effective before spawning: 1.0000

Data are printed in the following units:

Number of fish:	millions
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	thousand tonnes
Catch weight:	thousand tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
2	600.0	.65	.10	1.00	.113	.126
3	570.2	1.00	.10	1.00	.124	.161
4	240.5	1.00	.10	1.00	.148	.191
5	46.6	1.20	.10	1.00	.170	.215
6	12.4	1.20	.10	1.00	.168	.231
7	5.2	1.20	.10	1.00	.212	.232
8	.8	1.20	.10	1.00	.207	.232
9+	.2	1.20	.10	1.00	.193	.232

Table 2.9.3 Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass. HERRING in Divisions IVc and VIId.

Year 1986					Year 1987					Year 1988	
Management option	$\bar{F}_{(2-6)}$	SB 1 Jan	SSB 31 Dec	Catch	Management option	$\bar{F}_{(2-6)}$	SB 1 Jan	SSB 31 Dec	Catch	SB 1 Jan	SSB 31 Dec
No further	0.04	228	199	6	$F_{0.1}$	0.14	339	270	31	406	321
catch in					$0.5F_{86}$	0.29		235	61	365	249
1986 after					F_{86}	0.58		182	106	303	160
1 Apr 1986					F_{85}	0.63		174	113	294	149
Catch in	0.58	228	124	70	$F_{0.1}$	0.14	250	201	22	328	261
1986 = TAC					$0.5F_{86}$	0.29		176	44	298	206
					F_{86}	0.58		138	76	254	137
					F_{85}	0.63		132	82	247	128

The data unit of the biomass and the catch is 1,000 tonnes.

The spawning stock biomass (SSB) is given for the time of spawning (31 December).

The spawning stock biomass (SSB) for 1988 has been calculated with the same fishing mortality as for 1987.

The reference F is the mean F for the age group range from 2 to 6.

Both sets of $0.5F_{86}$ and F_{86} options in 1987 assume the TAC option in 1986.

Table 2.9.4 Input variables for catch prediction for the total North Sea.

Year	Recruitment (millions)		
	2-ring		1-ring
	Assumption 1	Assumption 2	Assumption 3
1986	6,030	6,030	17,832
1987	7,360	6,760	10,000
1988	4,127	3,791	10,000

Age	Stock size (millions) at 1 January 1986		
	Assumption 1	Assumption 2	Assumption 3
1	-	-	17,832
2	6,030	6,030	6,030
3	3,192	3,192	3,192
4	2,220	2,220	2,220
5	687	687	687
6	232	232	232
7	81	81	81
8	37	37	37
9+	54	54	41

Table 2.9.5 Catch and stock projections for total North Sea based on alteration assumptions listed in Section 2.9.3. ('000 tonnes.)

1986					1987					1988
		Catch			Management option			Catch		
$\bar{F}_{2-9(u)}$	SSB	1-ri	≥2-ri	Σ		$\bar{F}_{2-9(u)}$	SSB	1-ri	≥2-ri	Σ	SSB
Assumption 1 $F_{(1-ri)} = 0.5 \times F_{(1-ri)}$ in 1985, for both 1986 and 1987 = 0.085											
0.36	1,292	36	534	570	$F_{0.1}$	0.13	1,873	20	269	289	2,320
					F^{max}	0.33	1,646	20	625	645	1,732
					$F_{87} = F_{85}$	0.40	1,579	20	727	747	1,578
Assumption 2 $F_{(1-ri)} = F_{(1-ri)}$ in 1985 for both 1986 and 1987 = 0.17											
0.33	1,314	70	500	570	$F_{0.1}$	0.13	1,864	39	256	295	2,270
					F^{max}	0.29	1,679	39	547	568	1,788
					$F_{87} = F_{85}$	0.40	1,565	39	719	758	1,527
Assumption 3 $F_{(1-ri)} = F_{(2-ri)}$ in both 1986 and 1987											
0.31	1,331	97	473	570	$F_{0.1}$	0.12	1,862	22	240	262	2,288
					F^{max}	0.25	1,713	44	472	516	1,867
					$F_{87} = F_{85}$	0.40	1,554	67	714	781	1,471

Table 3.2.1 HERRING in Division IIIa. Landings in tonnes 1976-85. (Data mainly provided by Working Group members.)

Country	1976	1977	1978	1979	1980
Skagerrak					
Denmark	7,326	19,889	6,425	5,153	5,180
Faroe Islands	1,553	10,064	1,041	817	526
Germany, Fed.Rep.	6	32	28	181	-
Iceland	123	-	-	-	-
Norway (Open sea)	-	-	1,860	2,460	1,350
Norway (Fjords)	2,304	1,837	2,271	2,259	2,795
Sweden	6,505	8,109	11,551	8,140	10,701
Total	17,817	39,931	23,176	18,974	20,552
Kattegat					
Denmark	41,749	38,205	29,241	21,337	25,380
Sweden	30,263	37,160	35,193	25,272	18,260
Total	72,012	75,365	64,434	46,609	43,640
Division IIIa Total	89,829	115,296	87,610	65,583	64,192
Unallocated	-	-	-	8,117	20,053
Grand total	89,829	115,296	87,610	73,700	84,245

Country	1981	1982	1983	1984	1985[1]
Denmark	18,001	22,881	54,102	36,776	88,192
Faroe Islands	990	715	1,980	891	455
Germany, Fed.Rep.	199	43	40	-	-
Iceland	-	-	-	-	-
Norway (Open sea)	6,330	10,140	500	-	2,752
Norway (Fjords)	950	1,560	2,834	1,494	1,673
Sweden	30,274	24,859	35,176	59,195	40,349
Total	56,744	60,198	94,632	98,356	133,421
Kattegat					
Denmark	18,721	12,366	62,901	71,359	69,235
Sweden	38,871	38,892	40,463	35,027	39,829
Total	57,592	51,258	103,364	106,386	109,064
Division IIIa Total	114,336	111,456	197,996	204,742	242,485
Unallocated	57,000	35,344	-	-	-
Grand Total	171,336	146,800	197,996	204,742	242,485

[1] Preliminary.

Table 3.2.2 Catch in numbers (millions) at age, for that part of Division IIIa, catch that was sampled in 1985.

Winter rings	Quarter				
	I	II	III	IV	Total
0	-	630	296	319	1,245
1	760	170	153	125	1,208
2	228.0	144.7	159.6	98.4	630.7
3	108.2	48.4	133.6	57.7	347.9
4	22.9	18.5	49.5	16.8	107.7
5	2.6	3.3	11.0	3.6	20.5
6	1.3	1.5	3.5	0.7	7.0
7	0.1	0.5	0.1	0.1	0.8
8+	-	0.2	-	-	
Total (≥2)	363.1	217.1	357.3	177.3	1,114.8
Tonnes covered by sampling	37,879	23,526	56,094	33,394	150,893

Industrial landings in the Skagerrak and the northern Kattegat in the second half of 1985 are not included.

Table 3.3.1 Estimated abundance of herring in Division IIIa from acoustic surveys during August/September 1979-85.

Winter rings	Numbers at age (millions)						
	1979	1980	1981	1982	1983	1984	1985
0	577	482	1,840	6,171	1,424	1,004	6,515
1	611	477	698	2,349	3,526	1,992	1,111
2	1,067	434	1,260	989	1,160	2,069	1,132
3	93	473	44	221	413	756	73
4	13	84	22	31	122	126	11
5	4	28	2	8	13	34	1
6	-	3	0.6	1	-	2	-
Total	2,365	1,981	3,867	9,770	6,658	5,983	8,843
Biomass ('000 tonnes)				340	325	551	222
Biomass adult				123	185	403	9

Table 3.3.2 Estimated abundance (numbers at age in millions) of herring in Sub-divisions 22-24 from acoustic surveys during August-September 1984-85.

Winter rings	1984	1985
0	231	843
1	3,602	4,368
2	1,221	1,132
3	826	188
4	406	58
5	99	23
6	62	4
7	49	2
8	11	2
9	1	3
10+	10	1
Total	6,518	6,624
Biomass ('000 tonnes)	377,300	228,700
Biomass adult	262,000	23,609

Table 3.3.3 Estimated abundance (numbers at age in millions) of herring in Division IIIa from acoustic surveys during November/December 1982, 1983 and 1985. No survey was carried out in 1984.

Winter rings	November 1982	December 1983	November 1985
0	2,530	5,089	9,303
1	1,060	1,393	918
2	380	22	12
3	40	-	-
4	5	-	-
Total	4,015	6,504	10,233
Biomass ('000 tonnes)	168	153	215

Table 3.4.1. Length components of 1-group HERRING in Division IIIa from 1980-86. Mean lengths (cm) and proportions of spring- and autumn-spawned components are shown.

Year	Strata	Length components							
		Spring spawners				Autumn spawners			
		l (cm)	Proportion	l (cm)	Proportion	l (cm)	Proportion	l (cm)	Proportion
1980	1	14.0	0.73			17.0	0.27		
	2	14.6	0.14			16.2	0.86		
	3	15.1	0.09					18.01	0.91
	4					16.2	0.45	18.2	0.55
1981	1	12.9	0.34			16.9	0.66		
	2					15.6	0.47	18.0	0.53
	3					16.3	0.24	19.1	0.76
	4					17.4	0.81	19.6	0.19
1982	1	13.9	0.15	15.5	0.85				
	2			15.5	0.60			18.0	0.40
	3					17.2	1.0		
	4					17.4	0.80	19.6	0.20
1983	1	14.3	0.27			17.0	0.73		
	2	14.4	0.11			17.5	0.89		
	3	13.8	0.58			17.3	0.42		
	4	14.0	0.65			17.5	0.35		
1984	1	13.5	0.55			16.3	0.45		
	2	13.3	0.50			16.4	0.50		
	3	13.9	0.26			15.4	0.74		
	4	14.2	0.57			16.4	0.43		
1985	1	14.1	0.82			16.9	0.18		
	2	14.7	0.32			16.2	0.66		
	3	14.8	0.91			17.8	0.09		
	4	14.8	0.06			15.3	0.94		
1986	1	13.3	0.30			14.0	0.70	14.9	0.25
	2	13.1	0.25			14.0	0.50		
	3	11.5	0.04			14.4	0.96		
	4	11.8	0.08			14.4	0.92		

Table 4.2.1 Celtic Sea and Division VIIj HERRING landings (tonnes), 1975-84 (Data provided by Working Group members).

Year	France	German Dem.Rep.	Germany Fed.Rep.	Ireland	Nether-lands	Poland	USSR	Un-allocated	Total
1976	1,919	147	28	5,986	1,627	324	826	-	10,857
1977	106	-	96	5,533	1,455	-	-	-	7,190
1978	8	-	220	6,249	1,002	-	-	850	15,519
1979	584	-	20	7,019	850	-	-	3,705	12,178
1980	9	-	2	8,849	393	-	-	-	9,253
1981	123	-	-	15,562	1,150	-	-	-	16,835
1982	+	-	-	9,501	-	-	-	-	9,501
1983	495	-	-	10,000	1,500	-	-	10,187	22,187
1984	680	-	-	7,000	890	-	-	11,148	19,718
1985[1]	622	-	-	11,000	-	-	-	4,601	16,223

[1] Provisional.

Table 4.2.2 Celtic Sea and Division VIIj HERRING landings (tonnes) by season (1 April to 31 March). (Data provided by Working Group members).

Year	France	German Dem.Rep.	Germany Fed.Rep.	Ireland	Nether-lands	Poland	USSR	Un-allocated	Total
1976/77	1,317	147	36	5,864	1,324	257	826	-	9,771
1977/78	95	-	96	6,264	1,378	-	-	-	7,833
1978/79	8	-	220	8,239	1,002	-	-	-	7,559
1979/80	584	-	20	7,932	850	-	-	935	10,321
1980/81	9	-	2	9,024	292	-	-	3,803	13,130
1981/82	123	-	-	15,830	1,150	-	-	-	17,103
1982/83	+	-	-	13,042	-	-	-	-	13,042
1983/84	495	-	-	10,000	1,500	-	-	9,186	21,181
1984/85	680	-	-	7,000	890	-	-	14,009	22,579
1985/86[1]	622	-	-	11,000	-	-	-	4,509	16,131

[1] Provisional.

Table 4.2.3 VIRTUAL POPULATION ANALYSIS

HERRING SOUTH AND SOUTH WEST OF IRELAND (FISH AREAS VIIG-J) (Seasonal catches.)

CATCH IN NUMBERS UNIT: thousands

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	12768	13317	8159	2800	11335	7162	39361	15339	11484	16456	14168
2	15429	11113	12516	15585	13913	30093	21285	42725	87253	78524	45117
3	17785	7286	8610	11948	12599	11726	21861	8728	22895	34672	28672
4	7333	7011	5280	5583	8056	6585	5505	4817	2755	13527	12677
5	3006	2872	1585	1580	2889	2812	4438	1497	1579	2066	1824
6	1520	4785	1898	1470	1316	2204	3436	1891	277	915	180
7	1644	1980	1043	540	1283	1184	795	1670	315	317	67
8	1156	1245	585	858	551	1262	515	335	190	195	137
9+	1194	1769	470	482	635	565	866	596	261	152	105
TOTAL	69813	51570	39944	38052	52957	63593	97860	77598	127589	146624	102947
Tonnes	15588	9771	7833	7559	10321	13130	17103	13042	21181	22579	16131
SOP	114	99	104	98	103	109	103	95	93	99	102

Table 4.4.1 VIRTUAL POPULATION ANALYSIS

M = 0.1 - adults

HERRING SOUTH AND SOUTH WEST OF IRELAND (FISH AREAS VIIG-J) M = 0.8 - 1-winter-ringers

Seasonal.

FISHING MORTALITY COEFFICIENT UNIT: Year-1 VARIABLE NATURAL MORTALITY COEFFICIENT

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	.19	.15	.10	.04	.10	.11	.22	.04	.03	.03	.07
2	.54	.35	.27	.35	.45	.63	.80	.55	.49	.33	.17
3	.68	.47	.44	.40	.55	.76	1.22	.80	.58	.33	.17
4	.63	.55	.65	.51	.51	.56	.90	.87	.55	.72	.17
5	.65	.48	.21	.36	.47	.27	.82	.59	.71	.96	.17
6	.67	.73	.59	.27	.51	.71	.54	.91	.18	1.07	.17
7	.52	.91	.50	.50	.35	1.07	.55	.49	.52	.28	.17
8	.48	.37	.38	.38	.49	.60	.82	.40	.40	.30	.17
9+	.48	.37	.38	.38	.49	.60	.82	.40	.40	.30	.17
(2- 7)U	.58	.58	.41	.36	.47	.67	.80	.70	.47	.31	.17
(2- 7)W	.60	.48	.36	.38	.49	.62	.92	.61	.51	.36	.17

Table 4.4.2 VIRTUAL POPULATION ANALYSIS

HERRING SOUTH AND SOUTH WEST OF IRELAND (FISH AREAS VIIG-J)

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR **1 April.** THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .200
PROPORTION OF ANNUAL M BEFORE SPAWNING: .500

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1	130384	141090	118485	92213	165740	100454	289923	546121	572657	697819	503052	0
2	33697	39569	54786	47949	39881	67125	40495	104939	255403	294774	302833	126964
3	37635	20409	25268	37699	30695	22907	32272	16535	54515	130375	192451	231176
4	16597	17239	11566	14707	22789	16058	9648	8620	6717	27652	85090	146913
5	20111	7900	8963	5472	8021	12443	6280	3534	3252	3489	12243	64956
6	7511	9679	4429	6606	3453	4522	3591	3300	1781	1450	1208	9346
7	6376	3468	4235	2211	4577	1879	2008	4521	1202	1349	450	922
8	3119	4211	1269	2843	1489	2925	584	1064	2510	739	920	343
9+	3278	5992	1557	1597	1716	1369	1615	1893	829	615	705	1240
TOTAL NO	259509	249558	250557	211897	278361	229600	393416	690529	978896	1158521	898951	
SPS NO	146698	139946	138105	135612	151536	141505	175130	303248	487546	640240	648047	
TOT.BIOM	40851	39583	35315	35119	42577	37542	54740	90196	133804	138565	127438	
SPS BIOM	23101	25296	24517	25088	26535	25600	27679	43928	74300	86735	98609	

Table 4.6.1
List of input variables for the ICES prediction program.

CELTIC SEA AND DIVISION VIIJ HERRING
The reference F is the mean F for the age group range from 2 to 7

The number of recruits per year is as follows:

Year	Recruitment
1986	214000.0
1987	214000.0
1988	214000.0

Proportion of F (fishing mortality) effective before spawning: .2000
Proportion of M (natural mortality) effective before spawning: .5000

Data are printed in the following units:

Number of fish:	thousands
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	tonnes
Catch weight:	tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	214000.0	.40	.80	.50	.104	.104
2	125964.0	1.00	.10	1.00	.152	.152
3	231176.0	1.00	.10	1.00	.189	.189
4	146213.0	1.00	.10	1.00	.214	.214
5	64956.0	1.00	.10	1.00	.230	.230
6	9546.0	1.00	.10	1.00	.250	.250
7	922.0	1.00	.10	1.00	.254	.254
8	343.0	1.00	.10	1.00	.262	.262
9+	1240.0	1.00	.10	1.00	.264	.264

Table 4.7.1

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

CELTIC SEA AND DIVISION VIIJ HERRING

Year 1986					Year 1987					Year 1988	
factor	ref. F	stock biomass	sp.stock biomass	catch	factor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
.2	.15	135	111	16	.2	.16	134	111	16	131	108
					.2	.17		110	16	130	106
					.1	.14		111	15	133	110

The data unit of the biomass and the catch is 1000 tonnes.
The spawning stock biomass is given for the time of spawning.
The spawning stock biomass for 1988 has been calculated with the same fishing mortality as for 1987.
The reference F is the mean F for the age group range from 2 to 7

Table 5.1.1 Catch in weight, Division VIa (North) HERRING 1976-85.

Country	1976	1977	1978	1979	1980
Denmark	249	626	128	-	-
Faroes	4,017	3,564	-	-	-
France	1,481	1,548	1,435	3	-
German Dem. Rep.	279	-	-	-	2
Germany, Fed. Rep.	4,084	-	26	-	-
Iceland	3,273	-	-	-	256
Netherlands	16,573	8,705	5,874	-	-
Norway	5,183	1,098	4,462	-	-
Poland	390	-	-	-	-
Sweden	2,206	261	-	-	-
UK (England)	20	301	134	54	-
UK (Scotland)	53,351	25,238	10,097	3	33
USSR	2,536	-	-	-	15
Unallocated	-	-	-	-	-
Total 01	93,642	41,341	22,176	60	306

Country	1981	1982	1983	1984	1985[1]
Denmark	1,580	-	-	96	-
Faroes	-	74	834	954	169
France	1,243	2,069	1,313	-	510
German Dem. Rep.	-	-	-	-	-
Germany, Fed. Rep.	3,029	8,453	6,283	5,564	6,065
Iceland	-	-	-	-	-
Netherlands	5,602	11,317	20,200	7,729	5,500
Norway	3,850	13,018	7,336	6,669	5,126
Poland	-	-	-	-	-
Sweden	-	-	-	-	-
UK (England)	1,094	90	-	-	-
UK (Scotland)	30,389	38,381	31,616	37,554	28,065
USSR	-	-	-	-	-
Unallocated	4,633	18,958	-4,059	16,588	502
Total	51,420	92,360	63,523	75,154	44,933

[1] Preliminary.

Table 5.1.2 VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN PART OF VIA

CATCH IN NUMBERS UNIT: thousands

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	238758	169947	801663	51170	309016	172879	69055	34836	22525	592	12867	36740
2	205454	372615	804097	235627	124944	202087	319604	47739	46284	225	1335	77961
3	359711	560348	219502	808267	151025	89066	101548	95834	20587	122	452	105600
4	139718	357745	63069	131484	519178	63701	35502	22117	40692	31	246	61341
5	55320	113391	85920	63071	82466	188202	25195	10083	6879	21	62	21473
6	205462	54571	37341	54642	49683	30601	76289	12211	3833	12	43	12623
7	29141	181592	13377	18242	34629	12297	10918	20992	2100	7	40	11583
8	32860	18042	100938	6506	22470	13121	3914	2758	6278	2	3	1309
9+	30651	36395	20465	32223	21042	13698	12014	1486	1544	0	1	1326
TOTAL	1293055	1864646	2146572	1401232	1314453	785652	654037	248056	150722	812	15049	329956

	1982	1983	1984	1985
1	13304	81925	2961	46523
2	250010	77810	253291	79428
3	72179	92743	66857	169681
4	93544	29262	46963	19866
5	58452	42535	20057	17397
6	23580	27318	15250	7578
7	11516	14709	12478	7861
8	13814	8437	5940	3787
9+	4027	8484	2629	2494
TOTAL	540426	583221	426426	354615

Table 5.1.3 HERRING in Division VIa (North).
Scottish bottom trawl survey indices of 2-ringed herring catch rates and acoustic survey indices of the same year class.

Trawl survey year	Year class	Number of GOV hauls	2-ringer index	Acoustic estimate no of 1-ringers (millions)
1981	1978	9	1,237	-
1982	1979	10	2,361	-
1983	1980	12	11	-
1984	1981	12	12,456	28.1
1985	1982	17	98	-
1986	1983	12	359	1,016.4

Table 5.1.4 HERRING in Division VIa.
Mean weights at age (kg)

Age (Rings)	Weight in the stock	Weight in the catch 1970-81	1982-84	1985(obs.)	1985(fit.)
1	0.097	0.090	0.090	0.075	0.069
2	0.164	0.141	0.140	0.111	0.105
3	0.208	0.158	0.175	0.129	0.134
4	0.235	0.175	0.205	0.172	0.161
5	0.246	0.186	0.231	0.190	0.182
6	0.252	0.206	0.255	0.195	0.199
7	0.258	0.218	0.270	0.202	0.213
8	0.269	0.224	0.234	0.220	0.225
9	0.292	0.224	0.295	0.258	0.251

Table 5.1.5 HERRING in Division VIa (North).
Larval indices (numbers x 10^{10}) and spawning stock biomass ('000 tonnes) age 2 and older.

Year	Larval index	Spawning stock biomass from LPE	from VPA
1973	244	264	413
1974	119	205	220
1975	38	126	125
1976	19	58	101
1977	79	183	75
1978	35	117	74
1979	107	94	104
1980	144	168	169
1981	215	254	178
1982	189	162	172
1983	67	71	146
1984	215	167	264
1985	271	206	283[1]

[1]Predicted from (1973-85) regression
Y = 18.9018 + 0.9725 x (r = 0.704).

Table 5.1.6 VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN PART OF VIA

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .10

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
2	.210	.491	.344	.575	.561	.817	.809	.335	.298	.001	.004	.326
3	.434	1.195	.552	.606	.797	.893	1.201	.534	.210	.001	.002	.368
4	.441	.905	.540	.624	.892	.858	1.009	.823	.403	.000	.002	.354
5	.442	.684	.498	.592	.915	.861	.852	.793	.580	.000	.001	.247
6	.328	.984	.445	.605	1.205	.950	.944	1.265	.712	.002	.001	.216
7	.625	.483	.608	.359	.864	1.023	.980	.652	.665	.002	.006	.212
8	.408	.899	.480	.597	.879	.855	.985	.628	.363	.001	.001	.228
9+	.408	.899	.480	.597	.879	.855	.985	.628	.363	.001	.001	.228
(2- 7)U	.413	.790	.461	.560	.872	.897	.966	.734	.478	.001	.002	.287
(2- 7)W	.345	.775	.383	.596	.854	.855	.902	.534	.327	.001	.003	.324

	1982	1983	1984	1985
2	.651	.326	.228	.210
3	.501	.447	.455	.210
4	.570	.345	.380	.210
5	.591	.498	.374	.210
6	.414	.559	.287	.210
7	.278	.436	.447	.210
8	.373	.300	.280	.210
9+	.373	.300	.280	.210
(2- 7)U	.497	.430	.362	.210
(2- 7)W	.568	.407	.277	.210

Table 5.1.7 VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN PART OF VIA

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY: THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .670
PROPORTION OF ANNUAL M BEFORE SPAWNING: .670

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
2	1139845	1005375	2397348	503754	504506	377992	601505	175853	188004	264157	598884	293602
3	1069158	636365	556849	1859247	267150	157276	151157	242210	113853	126268	238805	359656
4	410581	626619	229134	296063	917651	117146	58240	41154	128441	85478	114136	215650
5	156204	239145	229348	147531	143519	340255	45846	19218	16550	77656	75505	103040
6	76170	90827	109179	120164	73815	52057	130138	17095	7305	8284	70246	68260
7	63558	49534	30711	63414	62461	20011	13214	45819	4519	5493	7484	63520
8	10272	31736	27733	15155	40086	25325	6512	6185	21606	2103	5154	6734
9+	9581	54016	56188	74955	57539	24871	19988	5331	5514	0	1051	6822
TOTAL NO	3301624	3339425	4385892	3146765	1866086	1113412	1051449	551463	486010	565439	909266	1117286
SPS NO	2821514	1917830	3162305	1974066	1001862	587480	528459	366120	365552	528519	848904	842059
TOT.BIOM	807874	721851	827190	658567	415255	237649	199997	112452	98984	111694	181045	235947
SPS BIOM	594746	404968	592115	413227	220202	125024	101432	72802	74014	104403	169044	178517

	1982	1983	1984	1985	1986
2	558801	293274	1504198	439678	1028000
3	191735	269142	191581	959706	322627
4	225328	105142	155673	110619	689224
5	136975	115359	67393	96546	80693
6	72860	68633	64100	41968	70665
7	49734	43586	36242	43535	30731
8	46482	34122	25500	20975	31930
9+	13550	34312	11286	13812	25513
TOTAL NO	1295514	963567	1855974	1706236	
SPS NO	834324	690370	1444214	1386232	
TOT.BIOM	265386	204693	342247	348417	
SPS BIOM	172545	146091	264586	283072	

Table 5.1.8
List of input variables for the ICES prediction program.

HERRING - DIVISION VIA NORTH
The reference F is the mean F for the age group range from 2 to 7

The number of recruits per year is as follows:

Year	Recruitment
1986	1023000.0
1987	320000.0
1988	320000.0

Proportion of F (fishing mortality) effective before spawning: .6700
Proportion of M (natural mortality) effective before spawning: .6700

Data are printed in the following units:

Number of fish:	thousands
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	tonnes
Catch weight:	tonnes

Age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
2	1023000.0	1.00	.10	1.00	.163	.164
3	322527.0	1.00	.10	1.00	.184	.208
4	839224.0	1.00	.10	1.00	.161	.233
5	83593.0	1.00	.10	1.00	.182	.246
6	70065.0	1.00	.10	1.00	.199	.252
7	39781.0	1.00	.10	1.00	.213	.258
8	31950.0	1.00	.10	1.00	.225	.269
9+	25516.0	1.00	.10	1.00	.231	.292

Table 5.2.1 Monthly landings (tonnes) of HERRING from the Firth of Clyde (all fishing methods combined). (Data provided by the Working Group).

Month	1975	1976	1977	1978	1979	1980	1981
January	-[1]	-[1]	-[1]	4[1]	4[1]	6[1]	15[1]
February	68[1]	7[1]	-[1]	6[1]	8[1]	3[1]	15[1]
March	85	69[1]	-[1]	7[1]	13[1]	8[1]	14[1]
April	369	521	530	246	12[1]	4[1]	32[1]
May	283	436	44	245	4[1]	2[1]	25[1]
June	203	281	640	238	336	114	429
July	354	332	494	376	466	656	982
August	240	473	601	587	450	645	511
September	515	541	559	581	374	559	106[1]
October	811	598	556	653	263	79[1]	-[1]
November	571	595	560	647	1[1]	3[1]	2[1]
December	120	236	328	272	-[1]	2[1]	4[1]
Not known	44	50	35	-	-	-	-
Total	3,663	4,139	4,847	3,862	1,951	2,081	2,135

Month	1982	1983	1984	1985
January	2[1]	+[1]	-[1]	-[1]
February	16[1]	1[1]	-[1]	-[1]
March	1[1]	1[1]	-[1]	-[1]
April	2[1]	-[1]	-[1]	-[1]
May	615	1[1]	554	527
June	850	265	847	831
July	757	519	944	815
August	262[1]	681	276	661
September	-[1]	604	246	187[1]
October	-[1]	457[1]	124[1]	1[1]
November	-[1]	1[1]	-[1]	-[1]
December	1[1]	-[1]	-[1]	-[1]
Not known	-	273[2]	247[2]	-
Total	2,506	2,803	3,238	3,022

[1] Subject to closure of directed fishery for whole or part of the month.

[2] Landed in Northern Ireland and Isle of Man.

Table 5.2.2 Monthly catches of Clyde herring in number at age ('000) in landings and discards, 1985.

Age (winter rings)	May		June		July	
	Landings	Discards	Landings	Discards	Landings	Discards
0	-	-	-	-	-	-
1	2	979	6	44	-	-
2	326	419	246	665	122	189
3	676	236	576	723	527	308
4	1,025	73	1,206	300	1,016	90
5	281	14	688	86	719	44
6	297	6	682	18	785	21
7	121	+	189	-	303	6
8	104	+	163	2	161	3
9	58	-	181	+	144	2
>10	70	-	56	+	55	1

Age (winter rings)	August		September		Total		
	Landings	Discards	Landings	Discards	Landings	Discards	Combined
0	-	-	-	-	-	-	
1	-	23	-	21	8	1,067	1,075
2	45	728	86	127	825	2,128	2,953
3	411	507	337	117	2,527	1,891	4,418
4	479	74	319	9	4,045	546	4,591
5	835	32	101	6	2,624	182	2,806
6	754	6	85	-	2,603	51	2,654
7	246	+	52	-	911	6	917
8	205	+	42	+	675	5	680
9	61	-	9	+	453	2	455
>10	43	-	13	-	237	1	238

Table 5.2.3 Number of days absent from port by pair-trawlers in the Firth of Clyde, 1974-85.

Year	Days absent
1974	2,982
1975	3,200
1976	3,026
1977	4,186
1978	4,377
1979	2,926
1980	2,170
1981	1,825
1982	1,881
1983	1,737
1984	1,401
1985	1,712

Table 5.2.4 VIRTUAL POPULATION ANALYSIS

CLYDE HERRING

CATCH IN NUMBERS UNIT: thousands

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
2	7551	6505	8983	5258	8841	1876	10480	7524	1796	4659	5633	2572
3	10333	1976	3181	4548	2817	2483	913	6976	2259	807	1592	2785
4	8745	4355	1684	1811	2559	1024	1049	1062	2724	930	567	1622
5	2306	3432	3007	918	1140	1072	526	1112	654	888	341	1158
6	741	1090	1114	1525	494	451	638	574	606	341	204	433
7	760	501	656	659	700	175	261	489	550	289	125	486
8	755	352	282	507	253	356	138	251	298	156	48	407
9	227	225	177	132	87	130	178	146	174	119	56	74
10+	117	181	152	114	59	67	100	192	236	154	68	18
TOTAL	31538	18615	19216	15272	16950	7634	14283	18326	9057	8543	8634	9555

	1982	1983	1984	1985
2	11311	10109	11829	2951
3	4079	5232	5774	4420
4	2440	1747	3406	4592
5	1028	963	1509	2206
6	603	555	587	1054
7	145	415	489	917
8	222	189	375	681
9	65	85	74	457
10+	53	38	80	240
TOTAL	20004	19333	24122	19718

Table 5.2.5 VIRTUAL POPULATION ANALYSIS

CLYDE HERRING

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .10

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
2	.695	.512	.551	.548	.772	.274	.515	.736	.138	.270	.258	.062
3	.585	.344	.449	.497	.566	.450	.186	.684	.449	.077	.119	.176
4	.813	.463	.489	.441	.512	.366	.309	.304	.552	.299	.064	.154
5	.609	.780	.595	.477	.487	.371	.289	.551	.267	.309	.152	.161
6	.438	.577	.560	.609	.453	.321	.350	.517	.584	.201	.097	.262
7	.593	.527	.750	.675	.554	.254	.277	.438	.563	.541	.095	.310
8	.783	.535	.565	.812	.526	.538	.291	.415	.462	.502	.142	.441
9	.500	.500	.500	.500	.500	.500	.500	.500	.500	.300	.300	.300
10+	.500	.500	.500	.500	.500	.500	.500	.500	.500	.300	.300	.300
(2- 9)W	.666	.516	.528	.527	.658	.362	.424	.633	.351	.229	.174	.125

	1982	1983	1984	1985	1982-84
2	.266	.196	.290	.300	.251
3	.150	.169	.147	.150	.149
4	.206	.068	.142	.150	.139
5	.124	.105	.069	.150	.099
6	.117	.082	.078	.150	.092
7	.118	.090	.087	.150	.098
8	.203	.198	.099	.150	.167
9	.100	.100	.100	.150	.100
10+	.100	.100	.100	.150	.100
(2- 9)W	.196	.149	.171	.163	

Table 5.2.6 VIRTUAL POPULATION ANALYSIS

CLYDE HERRING

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
2	15747	16979	22824	13030	17156	8209	27231	15082	14598	21543	25939	41435
3	24411	7110	9206	12148	6813	7170	5648	14717	6536	11503	14883	18126
4	16406	12306	4560	5517	6685	3499	4136	4244	6721	3774	9042	11954
5	5286	6585	7010	2531	3095	3626	2195	2747	2833	3503	2533	8185
6	2189	2601	2716	3498	1421	1721	2265	1437	1453	1962	2528	1968
7	1777	1279	1322	1404	1722	818	1129	1445	802	724	1451	1912
8	1448	889	685	570	647	896	574	774	844	414	581	1194
9	604	598	471	551	231	346	475	388	463	481	226	299
10+	511	481	351	505	157	178	266	511	628	623	275	73
TOTAL NO	68178	48828	49143	39157	37927	26462	43917	41395	34858	44526	57658	85148
SPS NO	68178	48828	49143	39157	37927	26462	43917	41395	34858	44526	57658	85148
TOT.BIOM	18672	13322	12980	10590	10008	7257	11115	11010	9292	11552	15000	22059
SPS BIOM	18672	13322	12980	10590	10008	7257	11115	11010	9292	11552	15000	22059

	1982	1983	1984	1985	1986
2	50853	59562	49206	11935	0
3	35258	35265	44298	33303	8000
4	15757	28010	26941	34599	25937
5	9276	10132	23685	21142	26946
6	6307	7417	8253	19997	16466
7	1370	5077	6184	6909	15574
8	1269	1102	4199	5131	5381
9	695	938	818	3443	3996
10+	585	419	880	1808	4090
TOTAL NO	119551	147922	164463	138269	
SPS NO	119551	147922	164463	138269	
TOT.BIOM	22557	28725	33625	31673	
SPS BIOM	22557	28725	33625	31673	

Table 5.2.7 Weights at age (g) of Clyde HERRING by month in landings and discards, 1985.

Age (rings)	May		June		July	
	Landings	Discards	Landings	Discards	Landings	Discards
1	66	61	100	90	-	-
2	130	122	146	146	182	163
3	166	151	197	167	213	189
4	200	166	234	187	254	215
5	208	171	254	199	262	227
6	219	183	270	222	282	263
7	245	-	315	-	311	307
8	238	-	277	245	321	308
9	253	-	288	293	318	310
⩾10	262	-	310	293	283	280

Age (Rings)	August		September	
	Landings	Discards	Landings	Discards
1	-	128	-	119
2	177	159	199	160
3	220	185	216	181
4	248	208	255	215
5	270	206	263	204
6	285	226	306	-
7	325	245	313	-
8	306	258	300	272
9	340	-	272	272
⩾10	363	-	330	-

Age (Rings)	Whole Year (weighted means)			Values used for years prior to 1982
	Landings	Discards	Catch	
1	91	65	65	-
2	152	148	149	225
3	198	174	187	270
4	234	192	228	290
5	257	205	253	310
6	273	235	272	328
7	307	307	307	340
8	292	283	291	345
9	300	310	300	350
⩾10	300	280	300	350

Table 5.2.8 Estimates of F allocated to landings and discards in Clyde HERRING, 1984-85.

Age (rings)	1984 F			1985 F			Mean proportion of F in landings and discards	
	Total	Landings	Discards	Total	Landings	Discards	Landings	Discards
2	0.290	0.112	0.178	0.300	0.084	0.216	0.33	0.67
3	0.147	0.117	0.030	0.150	0.086	0.064	0.58	0.32
4	0.142	0.132	0.010	0.150	0.132	0.018	0.90	0.10
5	0.069	0.067	0.002	0.150	0.140	0.010	0.95	0.05
6	0.078	0.078	-	0.150	0.147	0.003	0.99	0.01
7	0.087	0.087	-	0.150	0.149	0.001	0.997	0.003
8	0.099	0.098	0.001	0.150	0.149	0.001	0.99	0.01
9	0.100	0.100	-	0.150	0.149	0.001	0.997	0.003
⩾10	0.100	0.100	-	0.150	0.149	0.001	0.997	0.003

Table 5.2.9 Input parameters for Clyde HERRING projections.

Age	Stock in no. ('000) at 1 Jan 1986	F in 1986	Catch in no. ('000) in 1986			Weight at age (g)			Stock in no. ('000) at 1 Jan 1987
			Total	Landings	Discards	Landings	Discards	Spawn.stock at 1 Sep	
2	19,350	0.25	4,082	1,347	2,735	152	148	176	19,350
3	8,000	0.125	895	609	286	198	174	207	13,636
4	25,937	0.125	2,903	2,613	290	234	192	254	6,388
5	26,946	0.125	3,016	2,865	151	257	205	260	20,711
6	16,466	0.125	1,843	1,825	18	273	235	306	21,517
7	15,574	0.125	1,743	1,726	17	307	307	313	13,148
8	5,381	0.125	602	596	6	292	283	300	12,436
9	3,996	0.125	447	447	-	300	310	272	4,297
⩾10	4,090	0.125	458	458	-	300	280	330	6,457
Tonnes				3,147	552				

Table 6.1.1 HERRING estimated catches in weight in Divisions VIa (south) and VIIb,c, 1975-84.

Country	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985[1]
Belgium	12	-	-	-	-	-	-	-	-	-
France	47	-	-	-	-	-	353	19	-	-
German Dem.Rep.	890	-	-	-	-	-	-	-	-	-
Germany Fed.Rep.	924	221	100	5	-	2,687	265	-	-	-
Ireland	10,895	15,916	19,128	18,910	27,499	19,443	16,856	15,000	10,000	10,000
Netherlands	16,546	4,423	481	1,939	1,514	2,790	1,735	5,000	6,400	1,270
Poland	2,778	6	-	-	-	-	-	-	-	-
United Kingdom (N Ireland)	1	1	6	2	1	2	-	-	-	-
USSR	674	1	-	-	-	-	-	-	-	-
Unallocated	-	-	-	1,752	1,110	-	-	13,000	11,000	12,104
Total	32,767	20,567	19,715	22,608	30,124	24,922	19,209	33,019	27,400	23,374

[1] Provisional.

Table 6.1.2 VIRTUAL POPULATION ANALYSIS

HERRING IN FISHING AREAS VIIB,C AND LOWER VIA (W. COAST OF IRELAND, PORCUPINE BANK)

CATCH IN NUMBERS UNIT: thousands

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	155	985	1001	6423	3574	7360	16613	4485	10170	5919	2856	1620
2	35114	6177	28786	40390	29406	41308	29011	44512	40520	50071	40058	22265
3	26007	7058	20554	47389	41116	25117	57512	13596	27079	19161	64946	41794
4	13243	10856	5191	16863	44579	29192	26544	17176	13508	19969	25140	31460
5	5895	8826	11145	7452	17857	23718	25517	12209	10685	9549	22126	12812
6	4013	3956	10057	12583	8882	10703	15000	9924	5556	8422	7748	12746
7	2932	4055	4245	9191	10901	5909	5208	5534	4270	5443	6946	5461
8	1657	2286	4782	1569	10272	9378	3596	1360	3658	4423	4544	2735
9+	1911	2160	4535	5980	30549	32029	15703	4150	5524	4090	5554	5220
TOTAL	125155	62717	133444	195020	176936	184714	174504	112746	118150	126847	179498	134115
Tonnes	20306	15044	23474	36719	36589	38704	32767	20567	19715	22608	30124	24922
SOP	90	87	90	102	98	112	105	108	102	107	96	103

	1982	1983	1984	1985
1	748	1517	2794	9606
2	16155	43648	81481	15145
3	17004	43554	23860	67355
4	23220	25516	17654	12756
5	13280	31782	7790	11241
6	8121	18320	12656	7658
7	4089	6695	5974	9185
8	3249	3529	2008	7587
9+	2375	4251	4020	2168
TOTAL	100722	182452	162817	142679
Tonnes	19209	32988	27450	23343
SOP	103	100	97	98

Table 6.2.3 Larval production estimates (LPE) from the HERRING Larval Survey Working Group (Anon., 1986b) and larval abundance indices (LAI) from Saville and Rankine (1985) for Divisions VIa and VIIb,c.

Year	VIa(S)		VIa (S) + VIIb,c	
	LPE	LAI	LPE	LAI
1972	8	-	-	-
1973	128	391	-	-
1974	125	355	-	-
1975	23	175	-	-
1976	27	32	-	-
1977	31	69	-	-
1978	16	136	-	-
1979	115	448	-	-
1980	45	151	-	-
1981	54	100	114	58
1982	64	86	101	76
1983	50	112	94	68
1984	23	72	40	36
1985	32	40	70	26

Table 6.3.1 VIRTUAL POPULATION ANALYSIS

HERRING IN FISHING AREAS VIIB,C AND LOWER VIA (W. COAST OF IRELAND, PORCUPINE BANK)

FISHING MORTALITY COEFFICIENT UNIT: Year-1 VARIABLE NATURAL MORTALITY COEFFICIENT

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	.001	.002	.005	.026	.013	.038	.058	.019	.024	.016	.015	.007
2	.411	.059	.136	.206	.216	.296	.280	.298	.319	.210	.193	.213
3	.204	.120	.251	.307	.301	.259	.423	.180	.206	.220	.408	.281
4	.137	.110	.132	.299	.467	.322	.422	.310	.244	.285	.441	.315
5	.185	.114	.142	.207	.524	.430	.453	.311	.288	.242	.516	.374
6	.146	.257	.165	.207	.361	.602	.471	.285	.195	.343	.289	.563
7	.230	.193	.428	.200	.253	.385	.598	.282	.171	.277	.467	.181
8	.320	.320	.320	.320	.320	.320	.380	.270	.270	.240	.330	.300
9+	.320	.320	.320	.320	.320	.320	.380	.270	.270	.240	.330	.300
(2- 7)U	.227	.142	.209	.238	.354	.383	.441	.278	.247	.253	.386	.321
(2- 7)W	.201	.138	.167	.246	.330	.330	.397	.277	.272	.236	.335	.293

	1982	1983	1984	1985
1	.004	.005	.037	.040
2	.138	.441	.308	.400
3	.223	.591	.513	.400
4	.277	.529	.388	.400
5	.272	.506	.248	.400
6	.382	.424	.349	.400
7	.312	.551	.211	.400
8	.230	.400	.280	.400
9+	.230	.400	.280	.400
(2- 7)U	.268	.507	.336	.400
(2- 7)W	.231	.504	.337	.400

Table 6.3.2 VIRTUAL POPULATION ANALYSIS

HERRING IN FISHING AREAS VIIB,C AND LOWER VIA (W. COAST OF IRELAND, PORCUPINE BANK)

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY; THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .670
PROPORTION OF ANNUAL M BEFORE SPAWNING: .670

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	253352	530945	503678	362012	381504	287868	427051	350753	630575	541950	275203	330238
2	109198	113750	237995	225664	158477	169150	124555	181043	154080	276737	239654	121794
3	147927	65533	97055	188005	105851	115486	113855	85181	121632	101724	202849	178820
4	103692	109165	52611	68555	125169	111072	80005	67477	84566	75858	122002	43013
5	24249	85771	38462	41724	45858	71054	72620	47859	44706	45604	57396	30985
6	309759	13245	69225	69460	30699	24570	41802	41908	51708	30571	32593	21961
7	12795	242104	12771	53082	51096	19358	12106	23617	28506	23606	19495	11061
8	6530	3749	180568	7555	39311	35890	11915	6026	16120	21739	16196	11111
9+	7313	8266	16475	175103	116913	122577	52032	18389	14729	20103	19887	21111
TOTAL NO	979645	1182526	1258838	1210925	1114658	956984	936801	822274	1107073	1146170	936931	880986
SPS NO	595883	554081	615841	665299	551575	502921	366544	366582	371485	484437	495993	423659
TOT.BIOM	204072	223242	236214	241957	217673	190938	167870	144259	179938	192154	173421	161870
SPS BIOM	145077	134335	142204	155219	123656	117067	83251	79429	81647	101158	104119	95533

	1982	1983	1984	1985	1986
1	286803	718574	111114	354970	0
2	147328	123381	321886	48107	155244
3	89071	116084	74775	215978	29179
4	122157	64457	58168	40524	129784
5	80557	83762	34557	35711	24579
6	26775	55549	45098	24265	21660
7	15974	16530	32905	29180	14717
8	16585	10576	8620	24103	17098
9+	14676	15505	17257	6287	18797
TOTAL NO	799926	1207417	704780	777726	
SPS NO	411526	327564	444218	302413	
TOT.BIOM	143777	196200	155491	124254	
SPS BIOM	91059	73694	91465	63477	

Table 6.6.1
List of input variables for the ICES prediction program.

HERRING IN DIVISIONS VIA (SOUTH) AND VIIB
The reference F is the mean F for the age group range from 2 to 7

The number of recruits per year is as follows:

Year	Recruitment
1986	366000.0
1987	366000.0
1988	366000.0

Proportion of F (fishing mortality) effective before spawning: .670
Proportion of M (natural mortality) effective before spawning: .670

Data are printed in the following units:

Number of fish:	thousands
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	tonnes
Catch weight:	tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	366000.0	.10	.30	.00	.108	.120
2	155244.0	1.00	.10	1.00	.150	.169
3	29179.0	1.00	.10	1.00	.166	.210
4	12784.0	1.00	.10	1.00	.195	.236
5	2457.0	1.00	.10	1.00	.210	.260
6	2156.0	1.00	.10	1.00	.222	.275
7	1477.0	1.00	.10	1.00	.232	.285
8	1098.0	1.00	.10	1.00	.238	.290
9+	1397.0	1.00	.10	1.00	.242	.296

Table 6.6.2a

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

HERRING IN DIVISIONS VIA (SOUTH) AND VIIB

Year 1986					Year 1987					Year 1988	
fac-tor	ref. F	stock biomass	sp.stock biomass	catch	fac-tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
.5	.27	134	70	17	.2	.15	140	82	11	155	94
					.4	.40		69	25	136	66

The data unit of the biomass and the catch is 1000 tonnes.
The spawning stock biomass is given for the time of spawning.
The spawning stock biomass for 1988 has been calculated with the same fishing mortality as for 1987.
The reference F is the mean F for the age group range from 2 to 7

Table 6.6.2b

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

HERRING IN DIVISIONS VIA (SOUTH) AND VIIB

Year 1986					Year 1987					Year 1988	
fac-tor	ref. F	stock biomass	sp.stock biomass	catch	fac-tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
.4	.27	134	65	23	.2	.15	133	75	10	149	89
					.4	.40		63	25	131	62

The data unit of the biomass and the catch is 1000 tonnes.
The spawning stock biomass is given for the time of spawning.
The spawning stock biomass for 1988 has been calculated with the same fishing mortality as for 1987.
The reference F is the mean F for the age group range from 2 to 7

Table 7.1.1 HERRING. Total catches (tonnes) in North Irish Sea (Division VIIa), 1976-85.

Country	1976	1977	1978	1979	1980	1981
France	651	85	174	455[2]	1	-
Ireland	3,205	3,331	2,371	1,805	1,340	283
Netherlands	989	500	98	-	-	-
UK	16,401	11,498	8,432[1]	10,078[3]	9,272	4,094
Other	-	-	-	-	-	-
Total	21,246	15,414	11,075	12,338	10,613	4,377

Country	1982	1983	1984	1985[5]
France	-	48[2]	-	-
Ireland	300	860	1,084	1,000
Netherlands	-	-	-	-
UK	3,375	3,025	2,982	4,077
Other	1,180[4]	-	-	4,110[4]
Total	4,855	3,933	4,066	9,187

[1] Includes 68.5 tonnes of spring-spawned herring.
[2] No data basis for allocation to stock.
[3] Additional unrecorded catch of 106 tonnes estimated.
[4] Unallocated.
[5] Preliminary.

Table 7.1.2 VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN IRISH SEA (MANX PLUS MOURNE HERRING)

CATCH IN NUMBERS UNIT: thousands

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	[illegible]	34740	[illegible]	15540	[illegible]	5340	5050	5100	1505	1168	2429
2	43240	55150	39240	36950	30270	25760	15790	16030	12102	8424	10050
3	39410	20780	22090	15410	25490	19510	3200	5670	5598	7257	17336
4	10840	15220	6750	6780	4250	520	2790	2150	2820	3841	13287
5	7870	4580	4520	1740	2200	1980	2500	330	445	2221	7206
6	4210	2810	1460	1340	1050	910	330	1110	484	380	2651
7	2090	2420	910	670	430	360	290	140	255	229	667
8+	1640	1270	1120	550	290	250	240	380	59	479	724
TOTAL	147030	[illegible]	108770	[illegible]	81720	65110	29990	30910	23125	23979	54350

Table 7.1.3 North Irish Sea HERRING Division VIIa. Basic data on discards by Northern Irish and Manx vessels. No discards by Republic of Ireland.

Percentage of total catch by number discarded					
Month	%	Percentage age distribution of discards			
		1	2	3	4+
June	64.5	67	26	7	-
July	34.8	67	26	7	-
August	50.0	67	26	7	-

Month	Landed catch (no x 10^3)	% of total catch	Total catch
June	2,220	35.5	6,254
July	5,948	65.2	9,123
August	9,955	50.0	19,910

Month	No. of discards (10^3) at age			Total
	1	2	3	
June	2,702	1,049	282	4,034
July	2,127	826	222	3,175
August	6,670	2,588	697	9,955
Total	11,499	4,463	1,101	17,164
Mean wt (kg)	0.087	0.125	0.157	
Total wt (tonnes)	1,000	558	173	1,731

Table 7.5.1 Trial VPA's on HERRING in North Irish Sea (Division VIIa).

Year		1978	1979	1980	1981	1982	1983	1984	1985
Declared catch (tonnes)		11,075	12,338	10,613	4,377	4,855	3,933	4,066	9,187
Input F_{1985}		Estimated fishing mortality from VPA at various input F_{1985}							
Age 1	Age 2+								
0.05	0.6	0.71	0.86	1.17	0.46	0.29	0.15	0.12	0.3
0.08	0.5	0.71	0.86	1.21	0.52	0.36	0.21	0.18	0.5
0.10	0.67	0.71	0.86	1.23	0.55	0.41	0.25	0.21	0.67
F_1	F_{2+}	Estimated SSB ('000 tonnes) at spawning time							
0.05	0.3	10.1	9.1	5.3	7.5	13.2	22.1	30.2	24.9
0.08	0.5	10.1	9.1	5.1	6.5	10.2	15.8	20.4	13.7
0.10	0.67	10.1	9.1	5.0	6.1	9.1	13.4	16.7	9.5
F_1	F_{2+}	Total biomass ('000 tonnes) at 1 January							
0.05	0.3	35.2	30.0	24.2	24.2	33.9	43.0	44.9	41.8
0.08	0.5	35.2	29.8	23.1	20.9	26.9	31.5	31.4	27.4
0.10	0.67	35.2	29.7	22.6	19.6	24.3	27.2	26.4	22.0
F_1	F_{2+}	Recruit 1-ring-fish (No. in millions)							
0.05	0.3	178	104	110	158	201	194	92	72
0.08	0.5	178	100	98	128	151	135	61	46
0.10	0.67	178	99	94	116	132	113	50	37

$M_1 = 0.8$

$M_{2+} = 0.1$

Table 7.5.2 VIRTUAL POPULATION ANALYSIS

HERRING IN THE CELTIC SEA (MAY PLUS JOUNE HERRING)

FISHING MORTALITY COEFFICIENT UNIT: Year-1 VARIABLE NATURAL MORTALITY COEFFICIENT

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	.176	.226	.206	.154	.178	.079	.047	.036	.010	.019	.050
2	.351	.394	.967	.614	.346	1.167	.447	.236	.159	.108	.300
3	.943	1.017	1.034	.965	.901	1.370	.365	.254	.137	.120	.300
4	.315	1.102	1.003	.915	.842	.385	.029	.595	.173	.118	.300
5	.961	.786	1.078	.622	.757	1.137	.552	.122	.118	.180	.300
6	.677	1.014	.699	1.010	1.052	.749	.497	.499	.256	.126	.300
7	.967	.750	.990	.720	.660	1.220	.500	.560	.180	.150	.300
8+	.880	.750	.990	.720	.660	1.220	.500	.560	.180	.150	.300
(2- 7)U	.855	.977	.962	.817	.679	1.088	.498	.319	.167	.134	.300
(2- 7)W	.878	.951	.990	.715	.864	1.171	.460	.287	.155	.119	.300

Table 7.5.3 VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN IRISH SEA (MANX PLUS MOURNE HERRING)

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY; THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .900
PROPORTION OF ANNUAL M BEFORE SPAWNING: .750

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1	268446	195659	230840	178117	105568	110495	157678	200554	194027	92153	72117	0
2	87427	97142	65667	84225	69973	58942	45356	67563	86794	86550	40645	30824
3	67322	33921	36698	22590	41255	27182	10975	26535	45928	60986	70112	27245
4	23290	25737	11693	11812	7790	15159	6249	6897	18630	36241	53737	46998
5	13235	8129	7155	5076	4290	3056	5574	3015	4203	14179	29143	36021
6	3947	4597	3032	2190	1031	1303	882	2957	2415	3330	10722	19535
7	3726	4115	1509	1364	724	531	771	485	1624	1725	2698	7187
8+	2924	2159	1333	712	525	540	638	1317	376	3609	2928	3771
TOTAL NO	472762	371458	357858	304693	229811	197488	228123	309323	353996	304694	282102	
SPS NO	90332	69951	52977	62449	53133	31101	40002	79242	127118	170065	147425	
TOT.BIOM	58155	46360	40170	35182	30011	24221	24198	33931	42352	44863	41840	
SPS BIOM	15998	12029	8618	10110	9398	5345	7487	13167	22085	30230	24912	

Table 7.5.4
List of input variables for the ICES prediction program.

HERRING - NORTH IRISH SEA
The reference F is the mean F for the age group range from 2 to 7

The number of recruits per year is as follows:

Year	Recruitment
1986	67739.0
1987	67739.0
1988	67739.0

Proportion of F (fishing mortality) effective before spawning: .9000
Proportion of M (natural mortality) effective before spawning: .7500

Data are printed in the following units:

Number of fish:	thousands
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	tonnes
Catch weight:	tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	67739.0	.15	.80	.08	.077	.077
2	50324.0	1.00	.10	.85	.146	.146
3	27245.0	1.00	.10	1.00	.186	.186
4	46998.0	1.00	.10	1.00	.211	.211
5	36021.0	1.00	.10	1.00	.224	.224
6	19535.0	1.00	.10	1.00	.241	.241
7	7187.0	1.00	.10	1.00	.247	.247
8+	3771.0	1.00	.10	1.00	.273	.273

Table 7.5.5

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

HERRING - NORTH IRISH SEA (Assuming the 1986 catch equals the TAC.)

Year 1986					Year 1987					Year 1988	
fac-tor	ref. F	stock biomass	sp.stock biomass	catch	fac-tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
.2	.20	40282	26757	8300	.2	.15	37915	26205	4420	37466	25838
					.3	.30		22920	8244	33485	19788
					.2	.20		25061	5756	36073	23635

The data unit of the biomass and the catch is tonnes.
The spawning stock biomass is given for the time of spawning.
The spawning stock biomass for 1988 has been calculated with the same fishing mortality as for 1987.
The reference F is the mean F for the age group range from 2 to 7
The F options in 1987 are $F_{0.1}$, F_{85}, and F_{86}, respectively.

Table 7.5.6

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

HERRING - NORTH IRISH SEA (Assuming the 1986 catch equals the 1985 catch.)

Year 1986					Year 1987					Year 1988	
fac-tor	ref. F	stock biomass	sp.stock biomass	catch	fac-tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
.3	.31	40282	24428	9000	.2	.15	35098	23950	4046	35111	23929
					.3	.30		20932	7547	31456	18352
					.3	.31		20746	7765	31251	18052

The data unit of the biomass and the catch is tonnes.
The spawning stock biomass is given for the time of spawning.
The spawning stock biomass for 1988 has been calculated with the same fishing mortality as for 1987.
The reference F is the mean F for the age group range from 2 to 7

The F options in 1987 are $F_{0.1}$, F_{85}, and F_{86}, respectively.

Table 8.1.1 Catch in numbers, millions and catch in weights, tonnes. Icelandic summer-spawning herring.

AGE	1969	1970	1971	1972	1973	1974	1975
1	4.520	2.003	8.774	0.147	0.001	0.001	1.518
2	78.410	22.344	13.071	0.322	0.159	3.760	2.049
3	8.274	33.965	5.439	0.131	0.678	0.832	31.975
4	5.178	4.500	13.688	0.163	0.104	0.993	6.493
5	10.015	2.734	3.040	0.264	0.017	0.092	7.905
6	2.841	4.419	1.563	0.047	0.013	0.046	0.863
7	1.389	1.145	3.276	0.028	0.006	0.002	0.442
8	1.179	0.531	0.748	0.024	0.006	0.001	0.345
9	0.609	0.604	0.250	0.013	0.003	0.001	0.114
10	0.424	0.195	0.103	0.009	0.003	0.001	0.004
11	0.286	0.103	0.120	0.003	0.001	0.001	0.001
12	0.139	0.076	0.001	0.001	0.001	0.001	0.001
13	0.109	0.061	0.001	0.003	0.001	0.001	0.001
14	0.074	0.051	0.001	0.001	0.001	0.001	0.001
JUVENILE	78.943	23.167	16.899	0.376	0.065	3.285	3.973
ADULT	34.504	49.564	33.176	0.780	0.929	2.448	47.739
TOTAL CATCH	20.913	15.779	10.975	0.310	0.255	1.274	13.280

AGE	1976	1977	1978	1979	1980	1981	1982
1	0.614	0.705	2.634	0.929	3.147	2.283	0.454
2	9.848	18.853	22.551	15.098	14.347	4.629	19.187
3	3.908	24.152	50.995	47.561	20.761	16.771	28.109
4	34.144	10.404	13.846	69.735	60.728	12.126	38.280
5	7.009	46.357	8.738	16.451	65.329	36.871	16.623
6	5.481	6.735	39.492	8.003	11.541	41.917	38.308
7	1.045	5.421	7.253	26.040	9.285	7.299	43.770
8	0.438	1.395	6.354	3.050	19.442	4.863	6.813
9	0.296	0.524	1.616	1.869	1.796	13.416	6.633
10	0.134	0.362	0.926	0.494	1.464	1.032	10.457
11	0.092	0.027	0.400	0.439	0.698	0.884	2.354
12	0.001	0.128	0.017	0.032	0.001	0.760	0.594
13	0.001	0.001	0.025	0.054	0.110	0.101	0.075
14	0.001	0.001	0.051	0.006	0.079	0.062	0.211
JUVENILE	9.573	22.321	35.502	33.011	18.438	12.764	22.889
ADULT	53.439	92.744	119.396	156.750	190.290	130.250	188.979
TOTAL CATCH	17.168	28.924	37.333	45.072	53.269	39.544	56.528

AGE	1983	1984	1985
1	1.470	0.421	0.111
2	22.422	18.011	12.800
3	151.198	32.237	24.521
4	30.181	141.324	21.535
5	21.525	17.039	84.733
6	8.637	7.111	11.836
7	14.017	3.915	5.708
8	13.666	4.112	2.323
9	3.715	4.516	4.339
10	2.373	1.828	4.030
11	3.424	0.202	2.758
12	0.552	0.255	0.970
13	0.100	0.260	0.477
14	0.003	0.003	0.578
JUVENILE	78.323	24.055	15.363
ADULT	194.960	207.179	161.356
TOTAL CATCH	58.665	50.293	49,092

Table 8.1.2 Weight at age, in grammes, Icelandic summer spawners.

AGE	1969	1970	1971	1972	1973	1974	1975
1	82.0	85.0	88.0	96.0	90.0	80.0	110.0
2	157.0	169.0	165.0	177.0	199.0	189.0	179.0
3	195.0	216.0	237.0	278.0	257.0	262.0	241.0
4	264.0	263.0	273.0	332.0	278.0	297.0	291.0
5	284.0	312.0	301.0	358.0	337.0	340.0	319.0
6	304.0	329.0	324.0	379.0	381.0	332.0	339.0
7	339.0	338.0	346.0	410.0	380.0	379.0	365.0
8	372.0	357.0	368.0	419.0	397.0	356.0	364.0
9	379.0	378.0	390.0	470.0	385.0	407.0	407.0
10	390.0	396.0	409.0	500.0	450.0	410.0	389.0
11	376.0	408.0	412.0	500.0	450.0	410.0	430.0
12	401.0	425.0	420.0	500.0	450.0	423.0	416.0
13	409.0	430.0	442.0	500.0	450.0	423.0	416.0
14	414.0	450.0	450.0	500.0	450.0	423.0	416.0

AGE	1976	1977	1978	1979	1980	1981	1982
1	103.0	84.0	73.0	75.3	68.9	60.8	65.0
2	189.0	157.0	128.0	145.3	115.3	140.9	141.0
3	243.0	217.0	196.0	182.4	202.0	190.5	186.1
4	281.0	261.0	247.0	230.9	232.5	245.5	217.3
5	305.0	285.0	295.0	284.7	268.9	268.6	273.7
6	335.0	313.0	314.0	315.7	316.7	297.6	293.3
7	351.0	326.0	339.0	333.7	351.6	329.8	323.0
8	355.0	347.0	359.0	350.4	360.4	355.7	353.8
9	395.0	364.0	360.0	366.7	379.9	368.3	384.6
10	363.0	362.0	376.0	368.3	382.9	405.4	388.7
11	396.0	358.0	380.0	370.6	392.7	381.5	400.4
12	396.0	355.0	425.0	350.0	390.0	400.0	393.5
13	396.0	400.0	425.0	350.0	390.0	400.0	390.3
14	396.0	420.0	425.0	450.0	390.0	400.0	419.5

AGE	1983	1984	1985
1	59.3	49.3	53.2
2	131.7	131.4	146.0
3	179.7	188.6	219.0
4	218.1	216.8	265.8
5	259.9	244.9	285.3
6	308.6	276.9	314.6
7	328.7	314.6	334.6
8	356.5	321.7	365.0
9	370.2	350.7	388.2
10	406.9	333.8	400.5
11	436.6	361.9	453.0
12	458.6	446.3	468.9
13	429.9	417.4	432.8
14	471.5	392.3	446.7

Table 8.1.3 Proportion of mature herring in each group. Based on samples taken in Sept.-Dec. by purse seine and pelagic trawls.

AGE	1969	1970	1971	1972	1973	1974	1975
1	0.00	0.00	0.01	0.00	0.00	0.00	0.00
2	0.08	0.22	0.38	0.29	0.64	0.14	0.27
3	0.73	0.89	0.98	1.00	0.99	0.94	0.97
4	0.99	1.00	1.00	1.00	1.00	1.00	1.00

AGE	1976	1977	1978	1979	1980	1981	1982
1	0.00	0.00	0.00	0.00	0.00	0.00	0.02
2	0.13	0.02	0.04	0.07	0.05	0.03	0.05
3	0.90	0.87	0.78	0.65	0.92	0.65	0.85
4	1.00	1.00	1.00	0.98	1.00	0.99	1.00

AGE	1983	1984	1985
1	0.00	0.00	0.00
2	0.00	0.01	0.00
3	0.64	0.82	0.90
4	1.00	1.00	1.00

Table 8.2.1 Stock abundance and catches by age groups (millions) and fishing mortality rates for the Icelandic summer spawners. F' is the F in 1985 calculated from the January 1986 survey. F_p is the fishing pattern in 1985 calculated from the January 1986 survey. F_{85} is the fishing mortality in 1985 according to the new method. Rings are referred to the year 1985.

Rings in 1985	Acoustic survey estimate Jan 1986	Catches in 1985	F'	F_p	F_{85}
0	311.5	-	-	-	-
1	910.5	0.111	-	-	0.00013
2	274.2	12.800	0.04	-	0.038
3	141.8	24.521	0.15	1.0	0.16
4	109.5	21.535	0.17	1.0	0.16
5	538.5	84.733	0.14	1.0	0.16
6	84.6	11.836	0.13	1.0	0.13
7	50.9	5.708	0.10	0.8	0.13
8	20.5	2.323	0.10	0.8	0.13
9	33.5	4.339	0.12	0.8	0.13
10	33.2	4.030	0.11	0.8	0.13
11	19.6	2.758	0.13	0.8	0.13
12	7.5	0.970	0.12	0.8	0.13
13	7.0	0.477	0.06	0.8	0.13
14	1.4	0.578	0.33	0.8	0.13

Table 8.3.1 Comparison of acoustic estimates obtained in December 1983, January 1985 and January 1986. The comparison is given in terms of fishing mortality rates in 1985 obtained from the three different surveys. $\overline{F}$ is the mean fishing mortality rate in 1985 derived from the three different surveys. F_{85} is the fishing mortality rate in 1985 calculated by the new method.

Year class	Dec 1983	Jan 1985	Jan 1986	$\overline{F}$	F_{85}
1980	0.07	0.36	0.17	0.20	0.16
1979	0.12	0.21	0.14	0.16	0.16
1978	0.17	0.16	0.13	0.15	0.16
1977	0.17	0.16	0.10	0.14	0.13
1976	0.20	0.14	0.10	0.15	0.13
1975	0.17	0.25	0.12	0.18	0.13
1974	0.18	0.21	0.11	0.10	0.13
1973	0.35	0.30	0.13	0.26	0.13
>1973	0.12	0.12	0.12	0.12	0.13
F weighted	0.12	0.22	0.14	0.15	0.155

Table 8.3.2 Icelandic summer spawners. Fishing mortalities.

AGE	1969	1970	1971	1972	1973	1974	1975
1	0.107	0.064	0.140	0.002	0.000	0.000	0.007
2	0.849	0.947	0.647	0.006	0.002	0.011	0.019
3	0.591	1.020	0.554	0.010	0.014	0.012	0.107
4	0.657	0.661	1.542	0.025	0.009	0.024	0.112
5	0.722	0.779	1.193	0.083	0.003	0.009	0.238
6	0.829	0.726	1.354	0.040	0.005	0.009	0.097
7	0.920	0.855	2.009	0.059	0.006	0.001	0.098
8	0.899	1.014	3.213	0.055	0.015	0.001	0.165
9	0.857	1.717	2.353	0.628	0.008	0.003	0.146
10	0.943	0.655	1.963	0.485	0.253	0.003	0.012
11	1.219	0.548	0.989	0.223	0.080	0.112	0.003
12	1.110	1.204	0.008	0.016	0.097	0.097	0.141
13	0.799	3.564	0.035	0.027	0.018	0.119	0.119
14	0.700	1.000	1.000	0.040	0.010	0.020	0.150
AVERAGE WEIGHTED BY STOCK IN NUMBERS							
AVE 4-14	0.751	0.765	1.578	0.047	0.007	0.019	0.151

AGE	1976	1977	1978	1979	1980	1981	1982
1	0.001	0.002	0.018	0.004	0.013	0.002	0.002
2	0.055	0.039	0.065	0.124	0.076	0.022	0.017
3	0.042	0.166	0.127	0.170	0.224	0.107	0.160
4	0.143	0.134	0.121	0.229	0.303	0.177	0.336
5	0.153	0.263	0.143	0.186	0.310	0.272	0.347
6	0.230	0.193	0.332	0.169	0.172	0.299	0.443
7	0.147	0.332	0.292	0.339	0.269	0.141	0.512
8	0.120	0.266	0.710	0.171	0.404	0.197	0.169
9	0.187	0.184	0.492	0.411	0.130	0.478	0.396
10	0.228	0.325	0.501	0.242	0.579	0.092	0.747
11	0.367	0.059	0.632	0.417	0.557	0.740	0.278
12	0.004	1.130	0.043	0.081	0.001	2.175	1.651
13	0.183	0.004	0.605	0.168	0.388	0.158	1.915
14	0.150	0.250	0.250	0.250	0.350	0.350	0.500
AVERAGE WEIGHTED BY STOCK IN NUMBERS							
AVE 4-14	0.152	0.228	0.244	0.234	0.296	0.263	0.404

AGE	1983	1984	1985
1	0.007	0.001	0.000
2	0.100	0.094	0.038
3	0.163	0.183	0.160
4	0.230	0.201	0.160
5	0.286	0.176	0.160
6	0.272	0.129	0.160
7	0.256	0.170	0.130
8	0.263	0.099	0.130
9	0.118	0.117	0.130
10	0.214	0.071	0.130
11	0.515	0.023	0.130
12	0.087	0.057	0.130
13	1.534	0.048	0.130
14	0.300	0.130	0.130
AVERAGE WEIGHTED BY STOCK IN NUMBERS			
AVE 4-14	0.247	0.181	0.155

Table 8.3.3 Icelandic summer spawners. VPA stock size in number (millions) and spawning stock biomass at 1 July.

AGE	1969	1970	1971	1972	1973	1974	1975
1	46.823	33.785	70.348	88.011	407.632	124.926	215.633
2	143.018	38.074	28.666	55.320	79.496	368.727	113.040
3	19.396	55.372	13.369	13.576	49.750	71.780	330.063
4	11.242	9.721	18.075	6.949	12.160	44.371	64.158
5	20.344	5.275	4.541	3.499	6.133	10.904	39.204
6	5.263	8.942	2.190	1.246	2.916	5.533	9.779
7	2.409	2.079	3.914	0.512	1.083	2.626	4.963
8	2.073	0.869	0.800	0.475	0.436	0.974	2.374
9	1.104	0.763	0.285	0.029	0.407	0.389	0.880
10	0.724	0.424	0.124	0.025	0.014	0.366	0.351
11	0.422	0.255	0.199	0.016	0.014	0.010	0.330
12	0.216	0.113	0.134	0.067	0.011	0.011	0.008
13	0.207	0.064	0.031	0.120	0.060	0.009	0.009
14	0.154	0.084	0.002	0.027	0.106	0.053	0.008
JUVENILE	183.749	69.573	87.685	127.288	436.748	446.337	308.054
SP.STOCK BIOMASS	16.699	19.873	13.259	10.650	28.702	45.509	114.562

AGE	1976	1977	1978	1979	1980	1981	1982
1	569.448	416.223	152.736	228.810	252.618	1315.802	274.132
2	193.669	514.674	375.944	135.697	206.153	225.586	1188.417
3	100.335	165.880	447.776	318.737	108.443	172.902	199.718
4	268.278	87.072	127.161	356.728	243.247	78.420	140.516
5	51.885	210.322	68.905	101.908	256.601	162.502	59.444
6	27.972	40.291	146.325	54.049	76.592	170.226	112.059
7	8.028	20.109	30.063	94.954	41.307	58.346	114.269
8	4.070	6.272	13.055	20.323	61.228	28.567	45.861
9	1.820	3.267	4.351	5.806	15.493	36.977	21.232
10	0.688	1.366	2.459	2.407	3.483	12.313	20.752
11	0.314	0.496	0.893	1.348	1.709	1.766	10.160
12	0.298	0.197	0.423	0.430	0.804	0.886	0.762
13	0.006	0.268	0.058	0.366	0.358	0.726	0.091
14	0.008	0.005	0.242	0.028	0.280	0.220	0.561
JUVENILE	747.973	942.168	612.153	473.701	457.139	1595.920	1427.604
SP.STOCK BIOMASS	126.288	132.205	177.003	198.408	205.652	176.120	184.542

AGE	1983	1984	1985
1	235.021	398.987	972.078
2	247.613	211.258	360.619
3	1057.082	202.748	174.042
4	154.021	812.917	152.848
5	90.848	110.722	601.407
6	38.027	61.784	84.008
7	65.104	26.215	49.150
8	61.953	45.609	20.003
9	35.028	43.092	37.362
10	12.925	28.166	34.702
11	8.895	9.443	23.749
12	6.960	4.807	8.352
13	0.132	5.774	4.107
14	0.012	0.026	4.977
JUVENILE	863.183	644.627	1350.101
SP.STOCK BIOMASS	246.714	292.516	326.999

Table 8.4.1 Input parameters used in catch prediction for the Icelandic summer-spawning (Division Va) HERRING.

Rings	Stock in number ('000) at 1 January 1986	Proportional F	Mean weight in catch and spawning stock
1	400,000	0.005	60
2	879,467	0.15	124
3	314,135	0.50	199
4	134,195	1.00	259
5	117,854	1.00	297
6	463,715	1.00	313
7	64,774	1.00	337
8	39,052	1.00	352
9	15,893	1.00	370
10	29,686	1.00	380
11	27,572	1.00	417
12	18,869	1.00	458
13	6,636	1.00	427
14	3,263	1.00	437

Figure 1.3.1

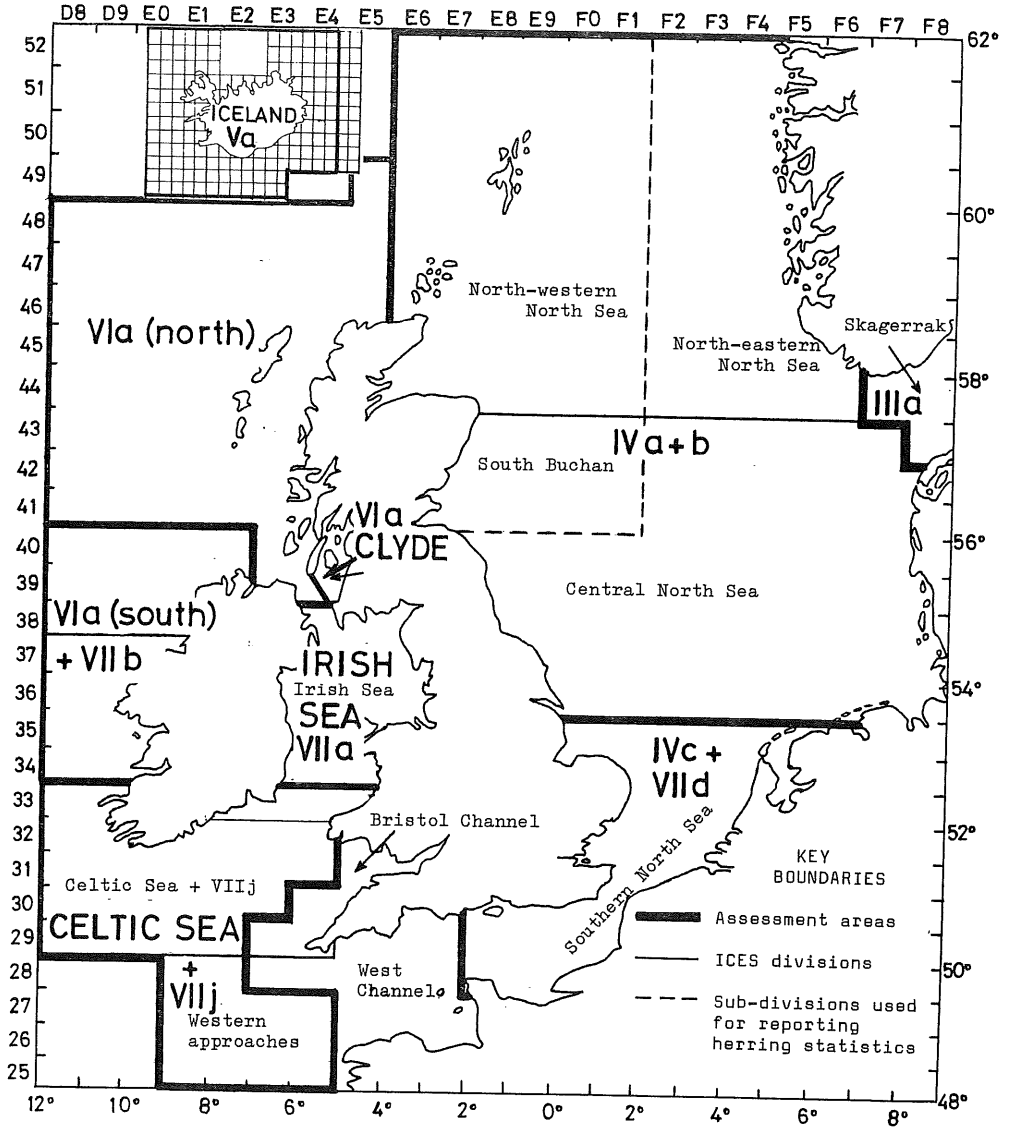

D8 D9 E0 E1 E2 E3 E4 E5 E6 E7 E8 E9 F0 F1 F2 F3 F4 F5 F6 F7 F8
52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
62° 60° 58° 56° 54° 52° 50° 48°
12° 10° 8° 6° 4° 2° 0° 2° 4° 6° 8°
ICELAND
Va
North-western
North Sea
North-eastern
North Sea
Skagerrak
IIIa
VIa (north)
IVa+b
South Buchan
VIa
CLYDE
Central North Sea
VIa (south)
+ VII b
IRISH
Irish Sea
SEA
VIIa
IVc +
VIId
Bristol Channel
Southern North Sea
Celtic Sea + VIIj
CELTIC SEA
+
VIIj
Western
approaches
West
Channel
KEY
BOUNDARIES
Assessment areas
ICES divisions
Sub-divisions used
for reporting
herring statistics

Figure 2.3.1 Regression VPA estimates of year class strength as 1-group on IKMT indices.

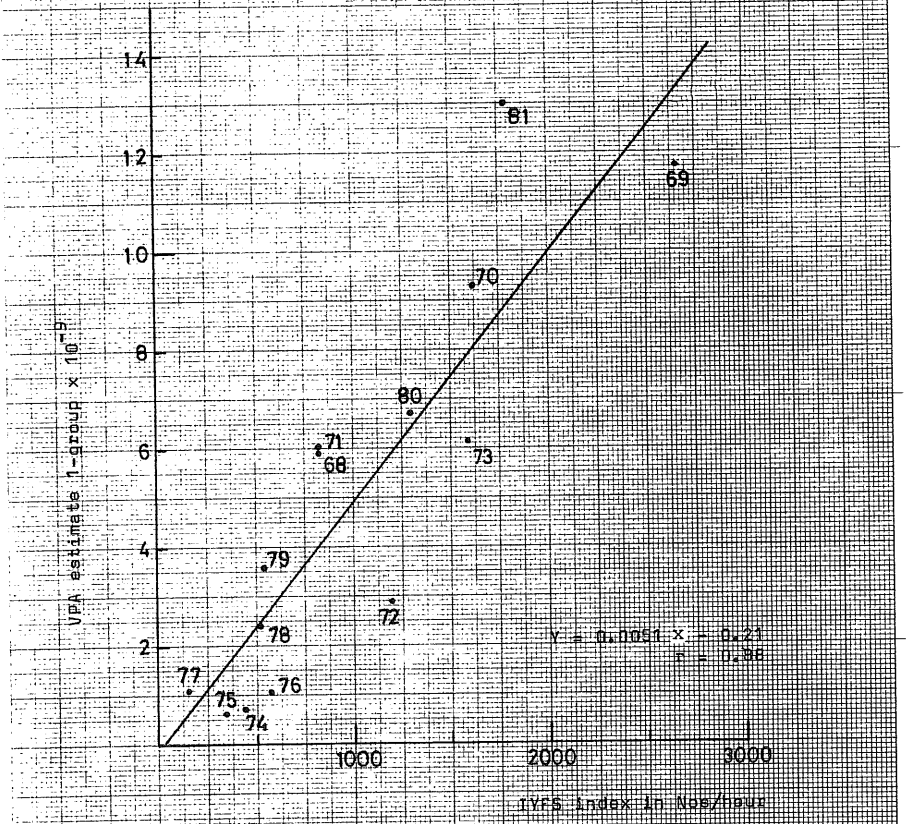


Figure 2.3.2 Comparison between old IKMT index, and new index corrected for haul duration and water depth.

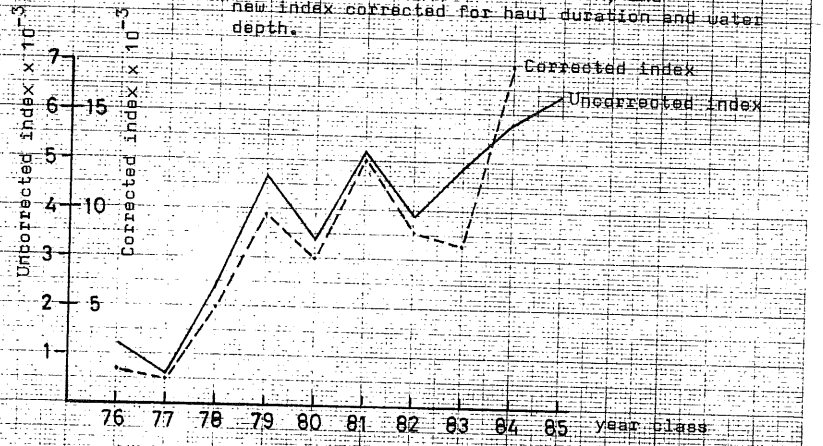


Figure 2.3.3 Regression of VPA estimates of year class strength on IKMT indices.

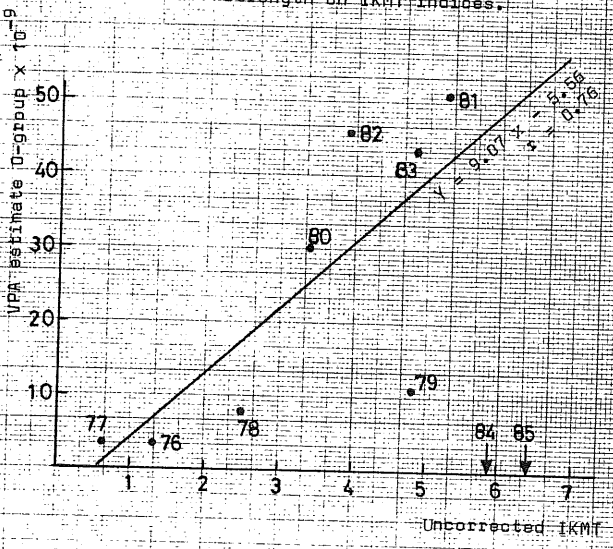


Figure 2.3.4 Regression of Downs recruitment (Nos. at age as 2-ringers in Divisions IVc and VIId VPA) on ln of Downs 0-group on English 0-group survey.

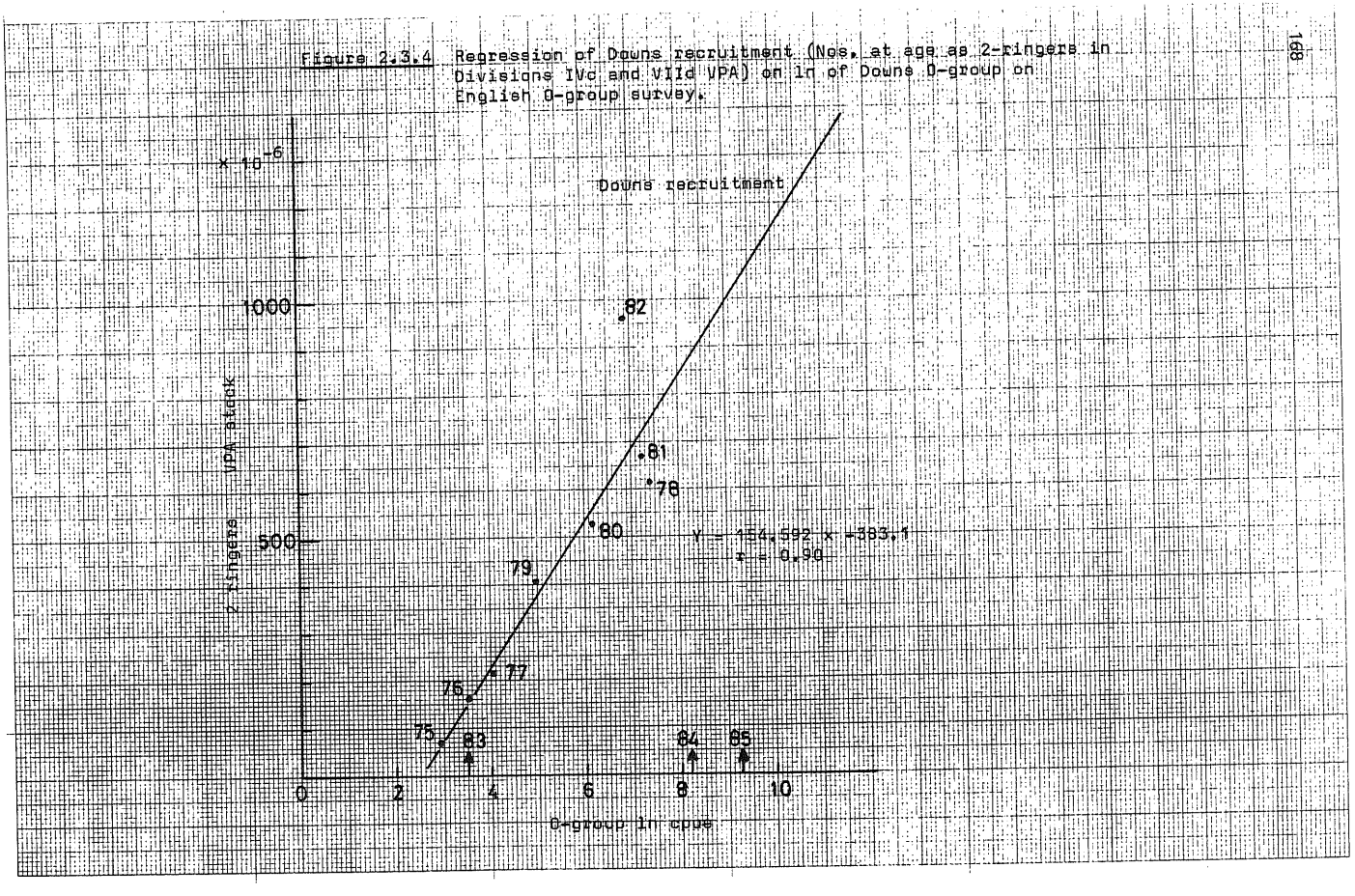
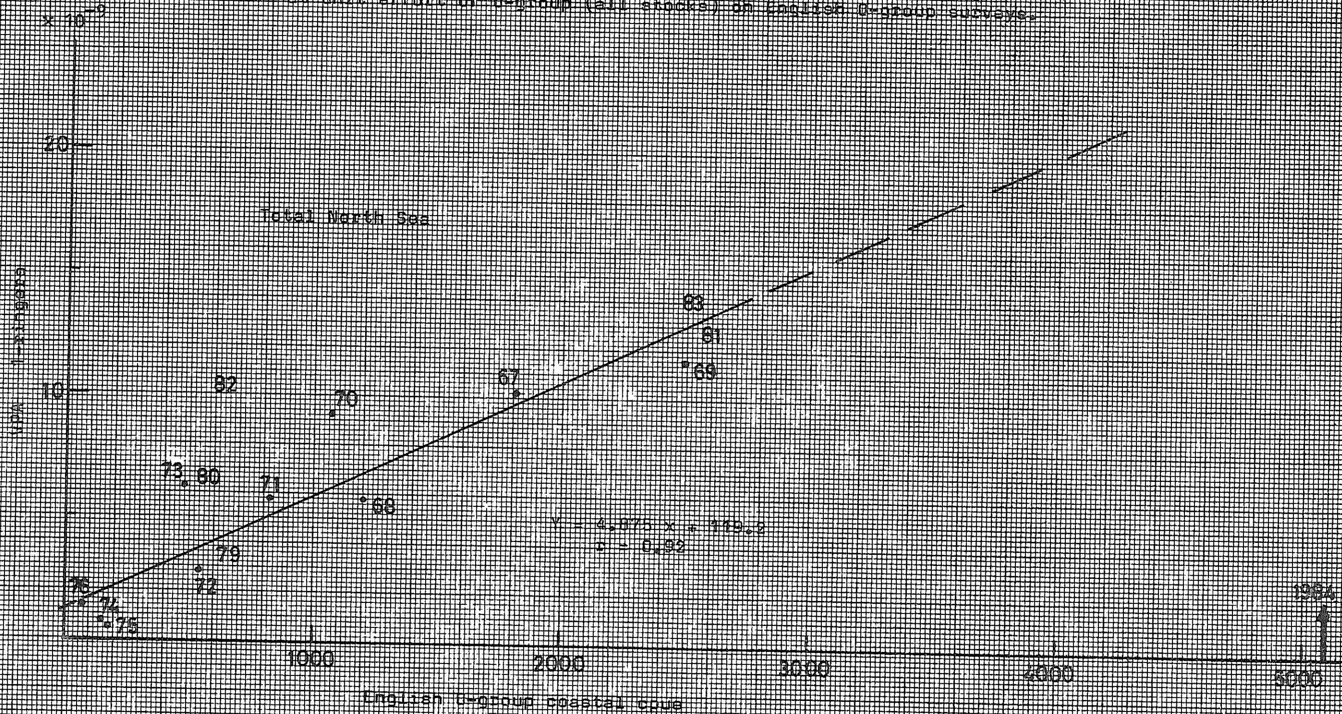


Figure 2.3.5 Regression of VPA abundance of 1-ringers (total North Sea) against catch at unit effort of 0-group (all stocks) on English 0-group surveys.



170 Figure 2.3.6 Modal length groups of 1-group herring in each area, 1986 IYFS.

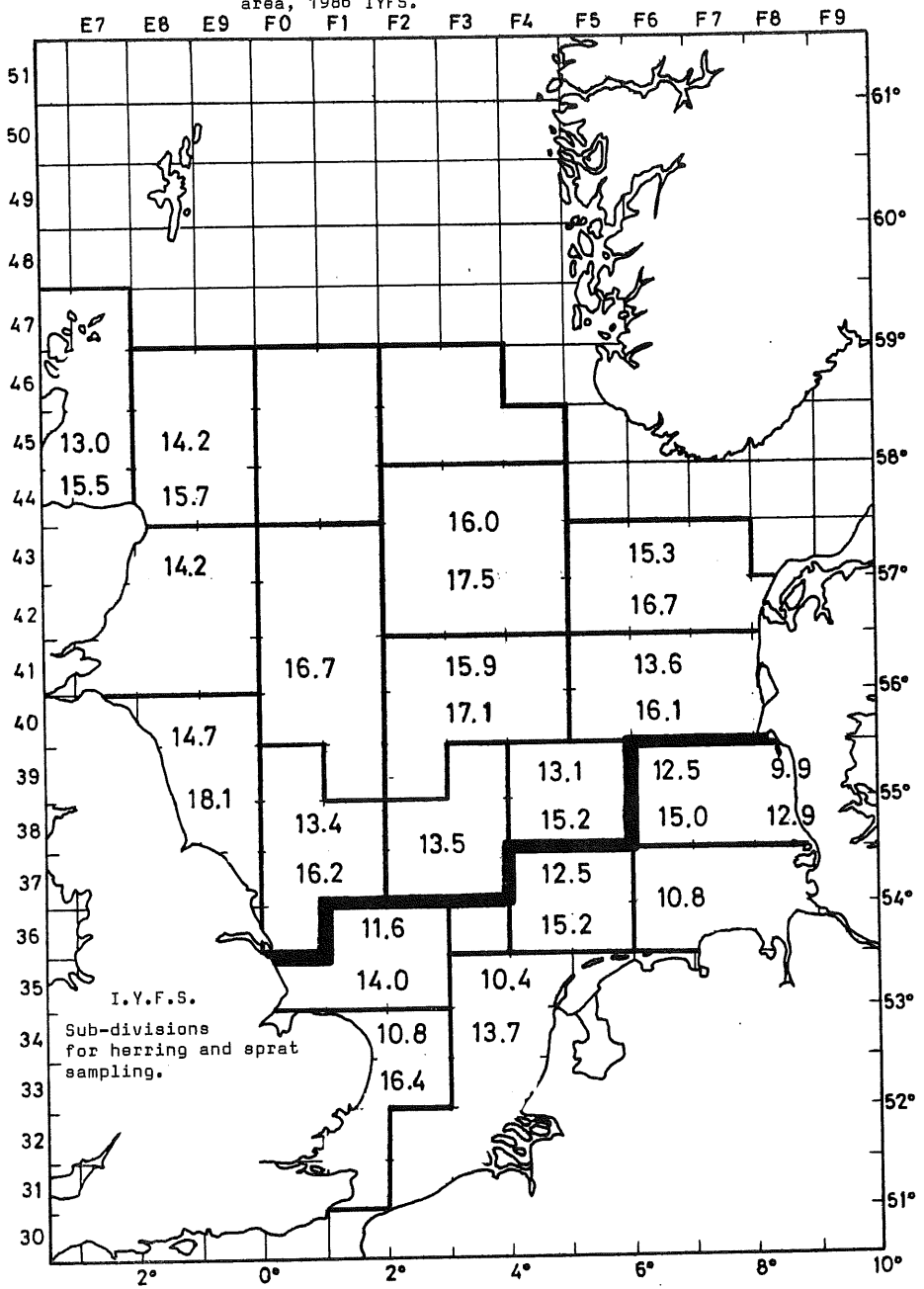


Figure 2.3.7 Cumulative percentage length distributions and extracted modes 1986 IYFS. Combined length distributions for area south of heavy line in Figure 2.3.6.

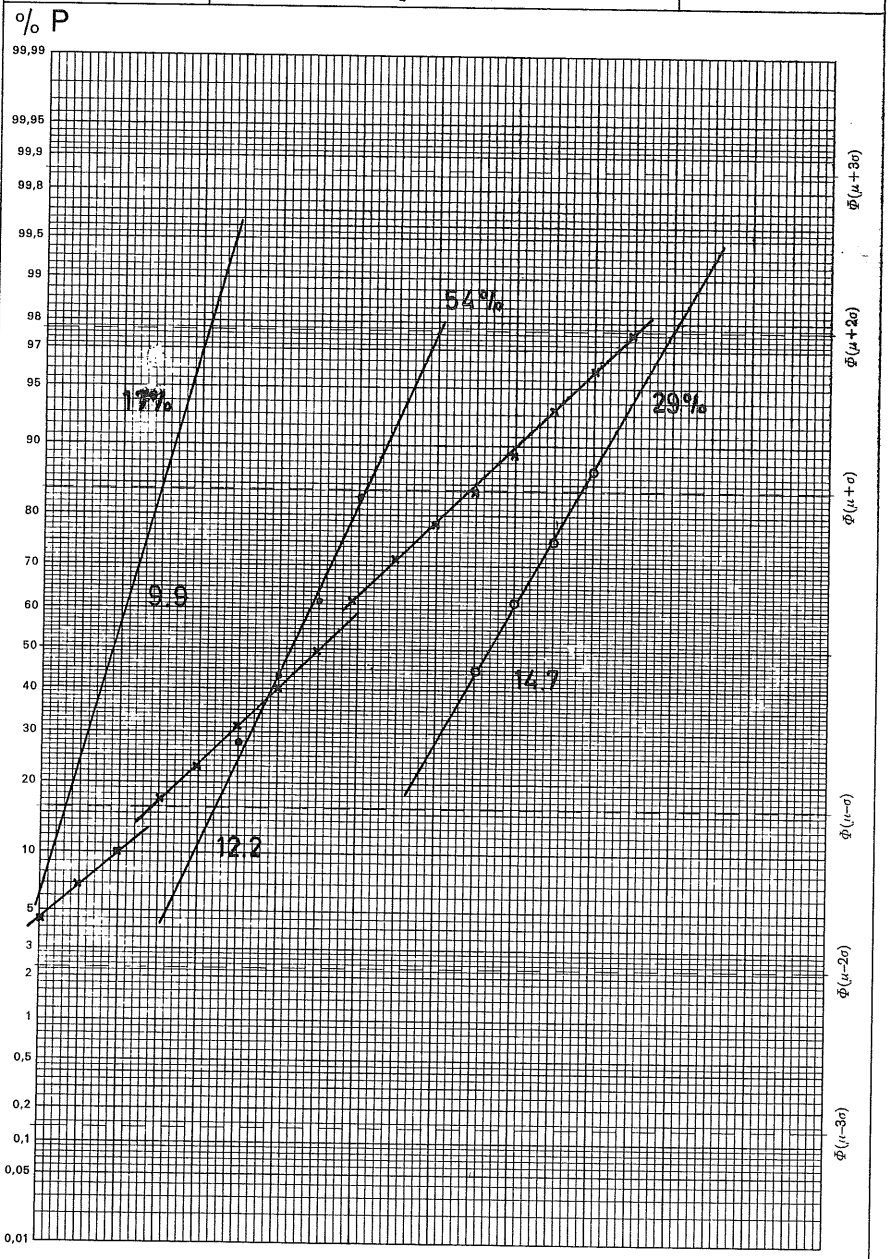
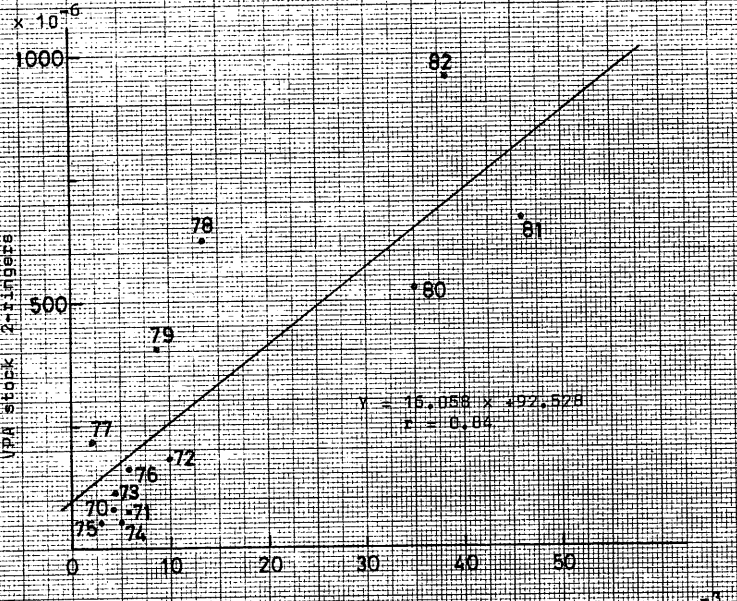


Figure 2.3.8 Regression of VPA estimate of 2-ringers in the Downs stock (Div.IVc and VIId) against first length components in IYFS.



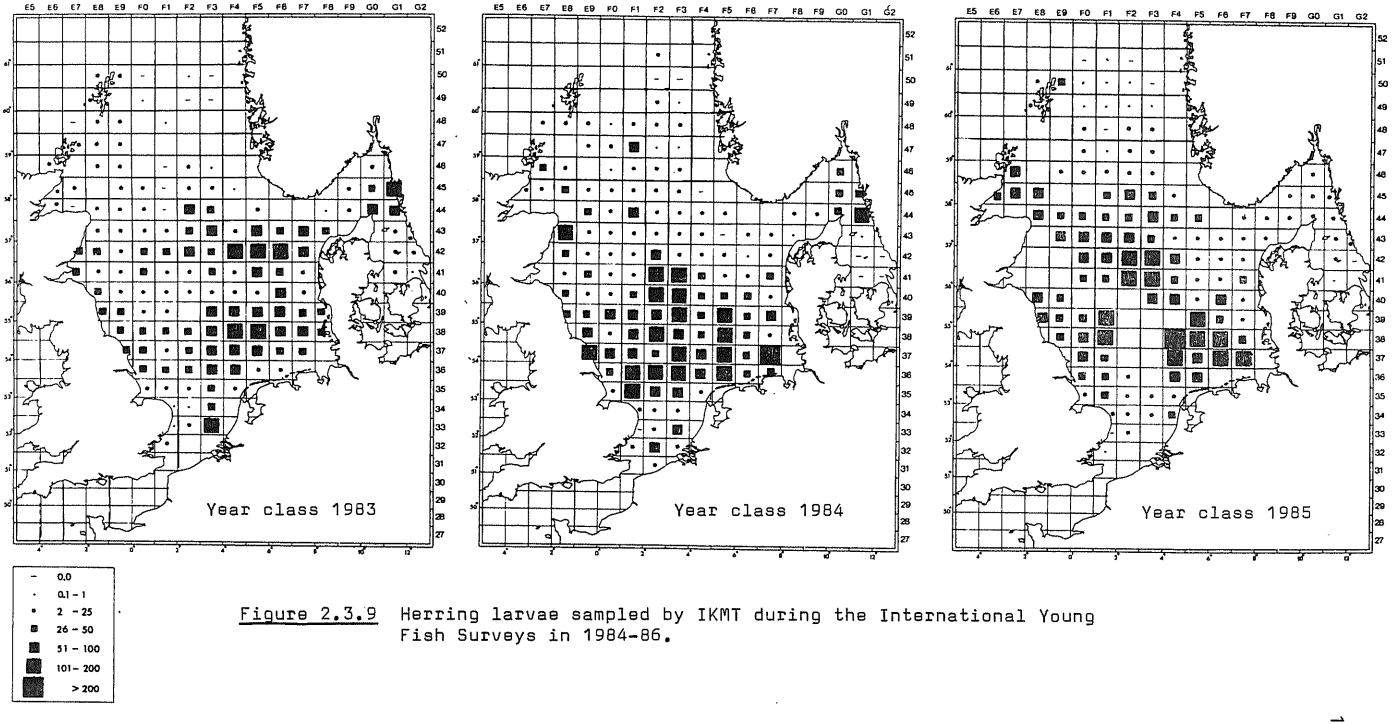
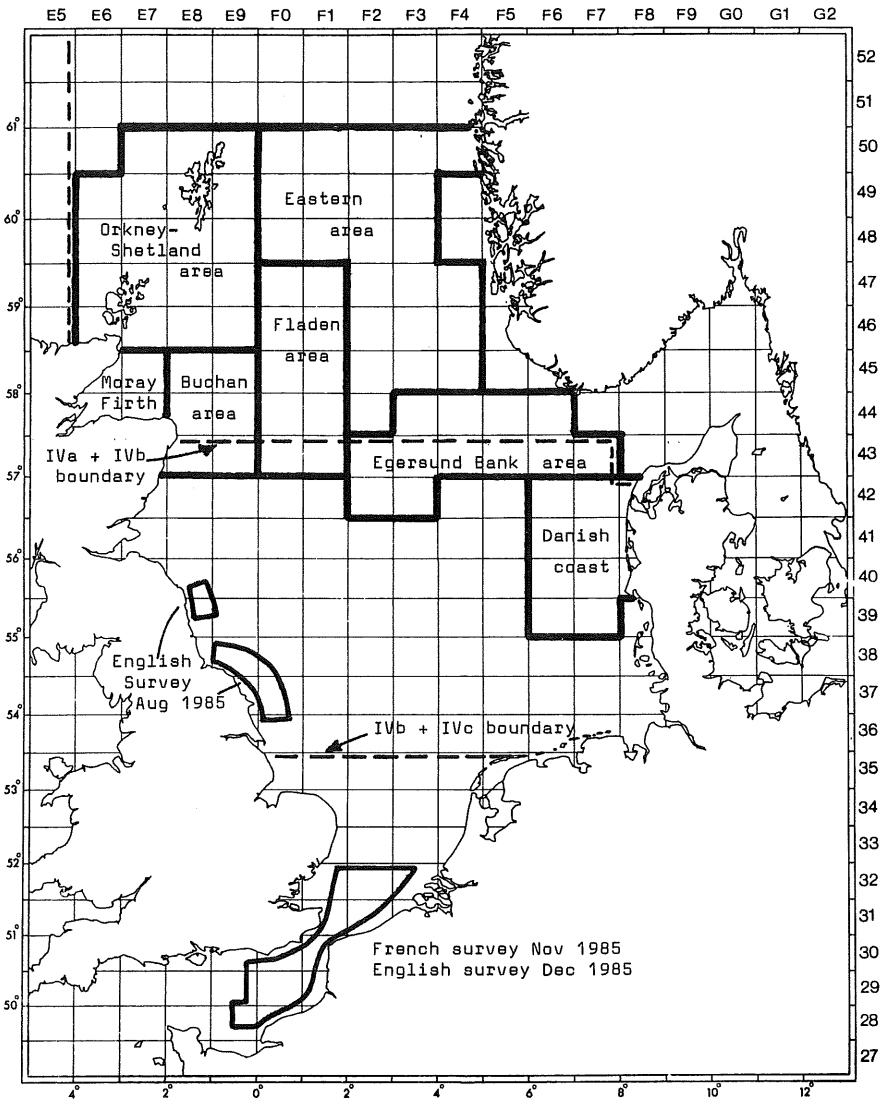


Figure 2.3.9 Herring larvae sampled by IKMT during the International Young Fish Surveys in 1984-86.

Figure 2.4.1 Area Sub-divisions used for presenting results of acoustic surveys (see Tables 2.4.1-2.4.6).



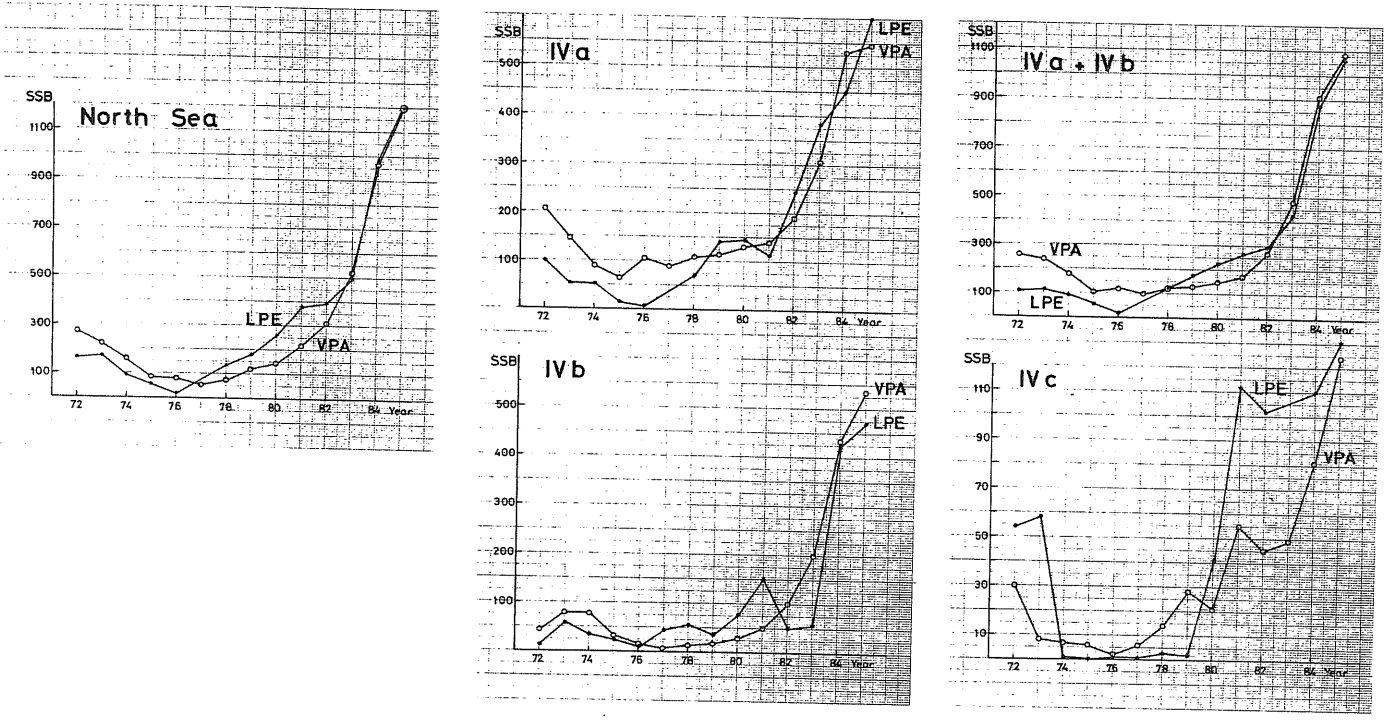


Figure 2.5.1 SSB (10^3 tonnes) estimated from larvae production (LPE) and from VPA.

Figure 2.7.1 Regression of SSB from VPA on spawning stock biomass estimates from larval production (LPE) Division IVb.

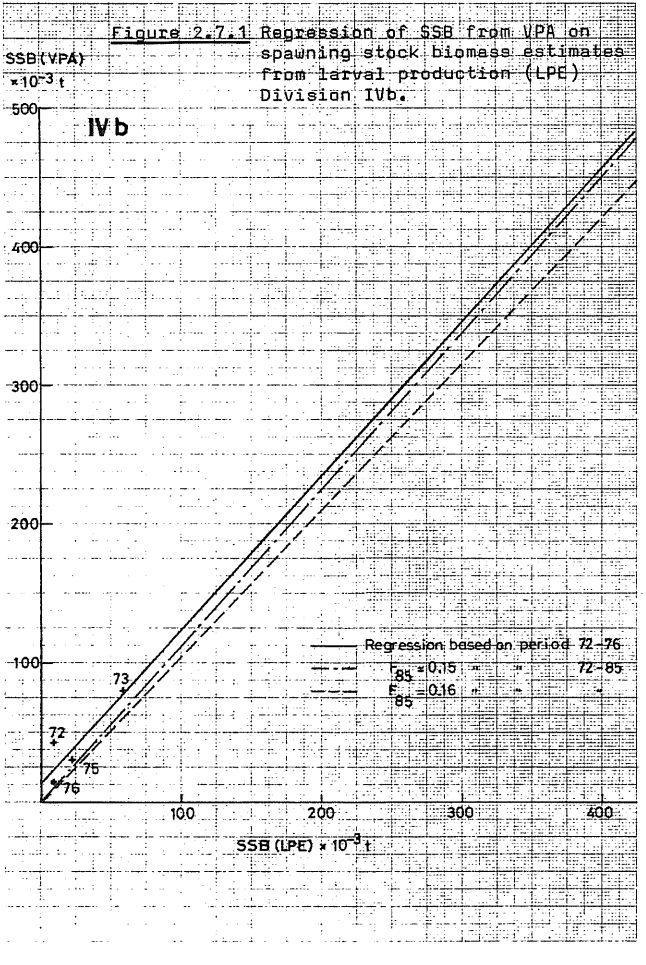


Figure 2.7.2 Plot of residuals of SSB_{85} from VPA runs assuming different values of F against predicted SSB (LPE) in 1985.

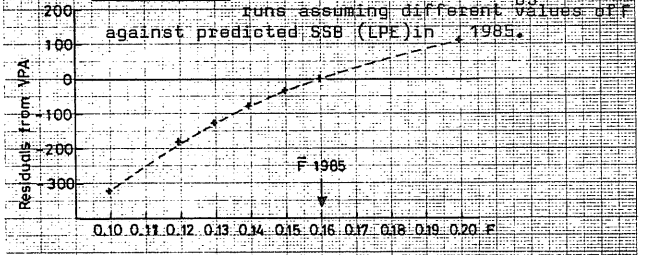


Figure 2.7.3 Spawning stock biomass from VPA.

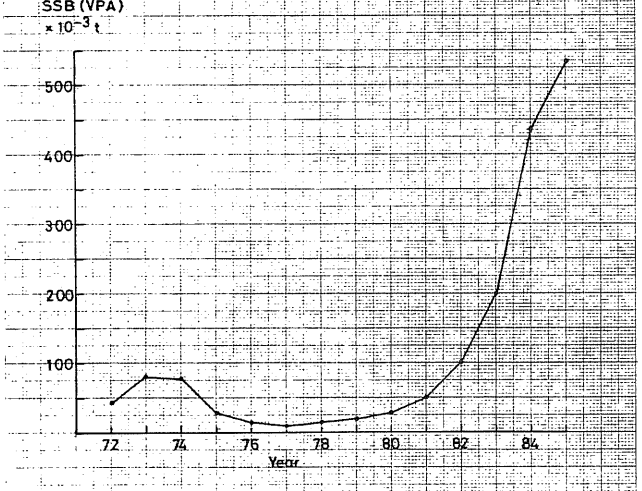
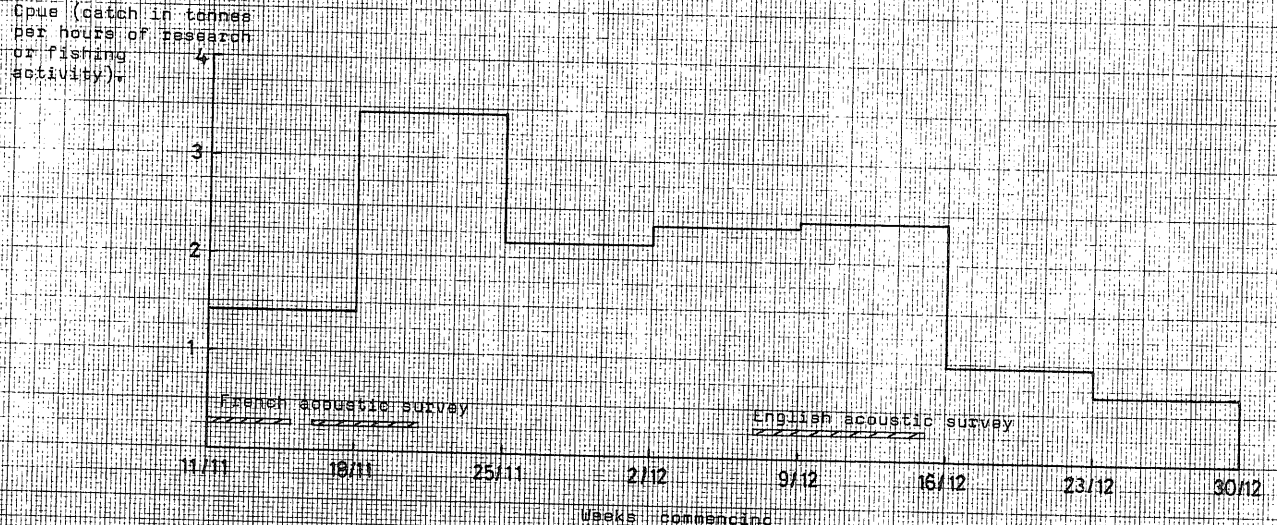


Figure 2.7.4 Trend in cpue of French trawlers in the Channel in Nov-Dec 1985.



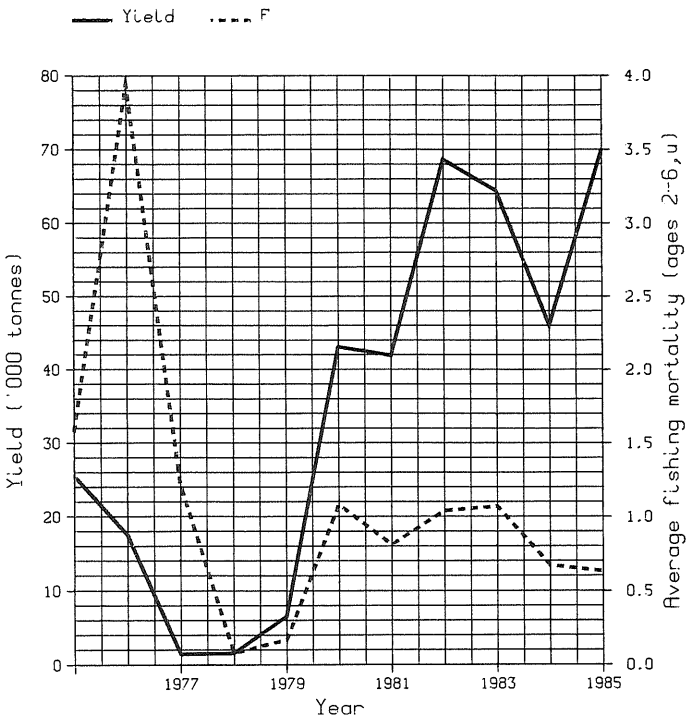
FISH STOCK SUMMARY

STOCK: Herring - IVc and VIId

22-4-1986

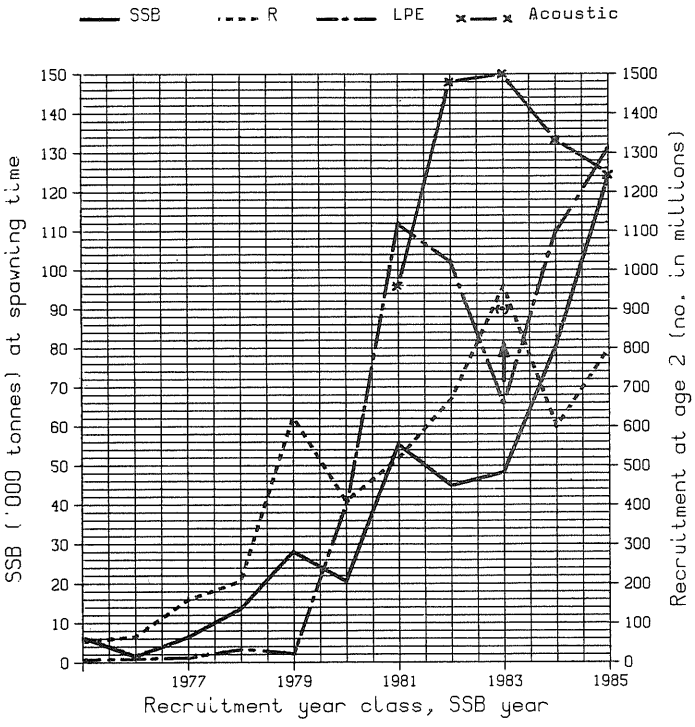
Figure 2.7.5

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

(.) Likely to have been underestimated

cont'd.

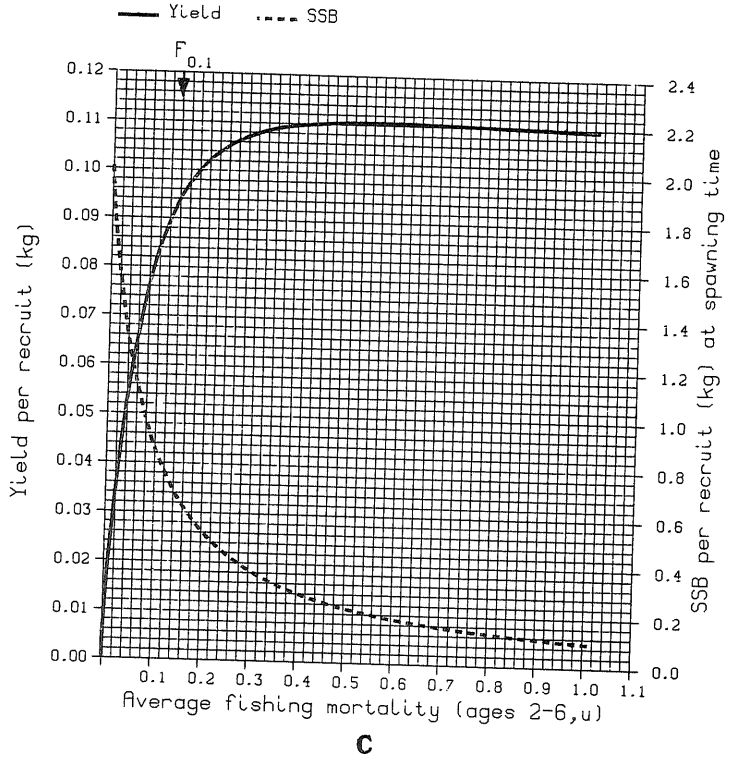
FISH STOCK SUMMARY

STOCK: Herring - IVc and VIId

22-4-1986

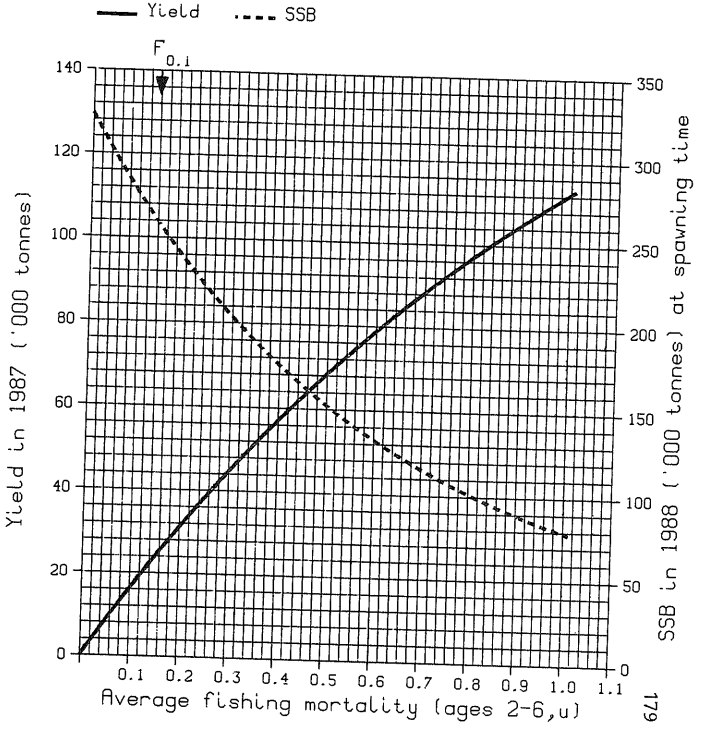
Figure 2.7.5 cont'd.

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass
assuming a catch of 70,000 tonnes in 1986



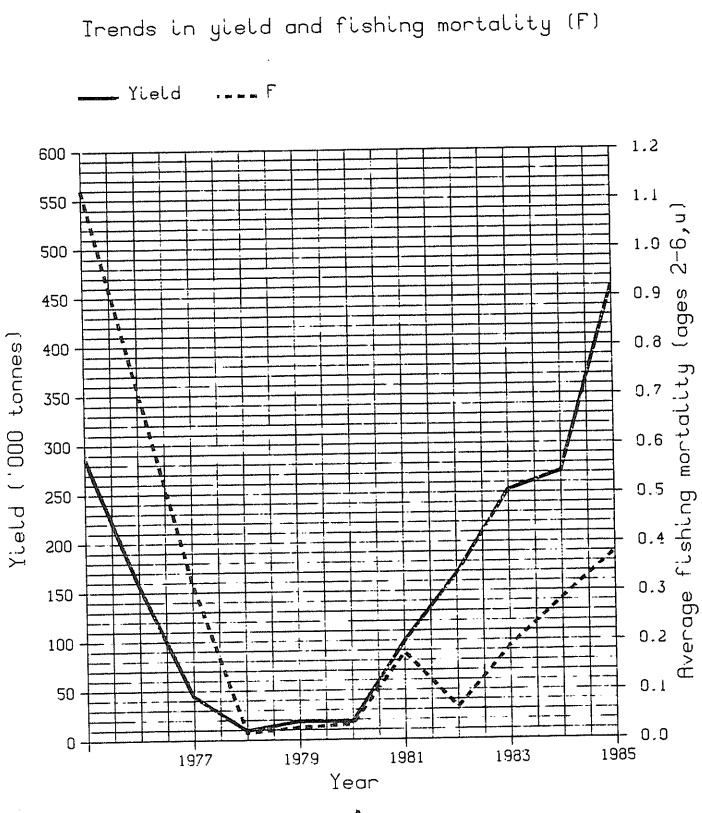
D

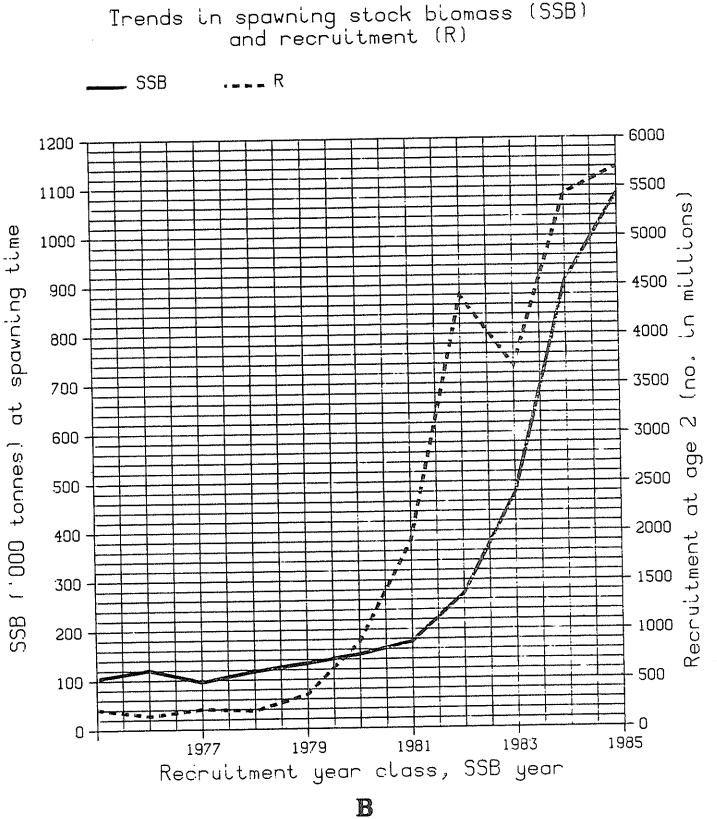
FISH STOCK SUMMARY

STOCK: Herring - IVa and IVb

23-4-1986

Figure 2.9.1





cont'd.

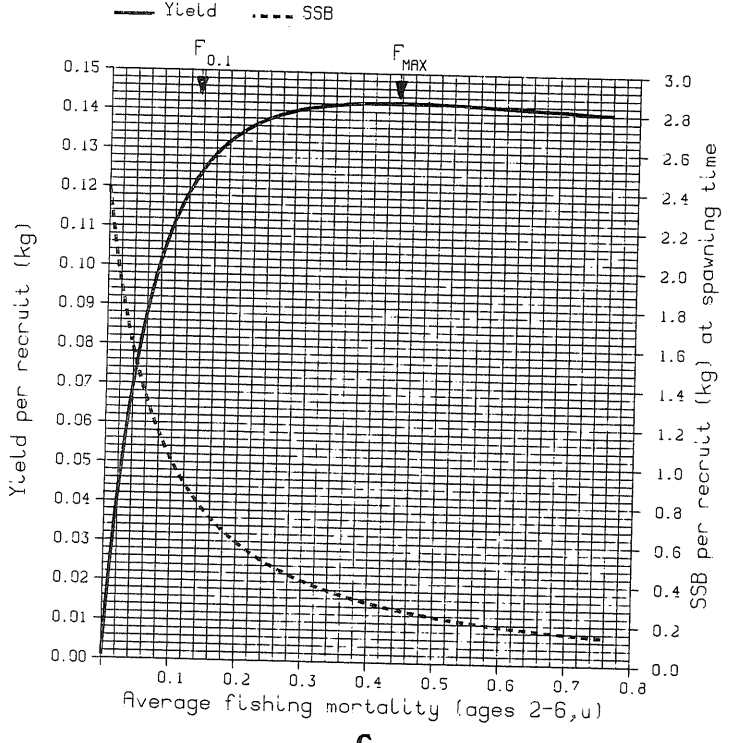
FISH STOCK SUMMARY

STOCK: Herring – IVa and IVb

23-4-1986

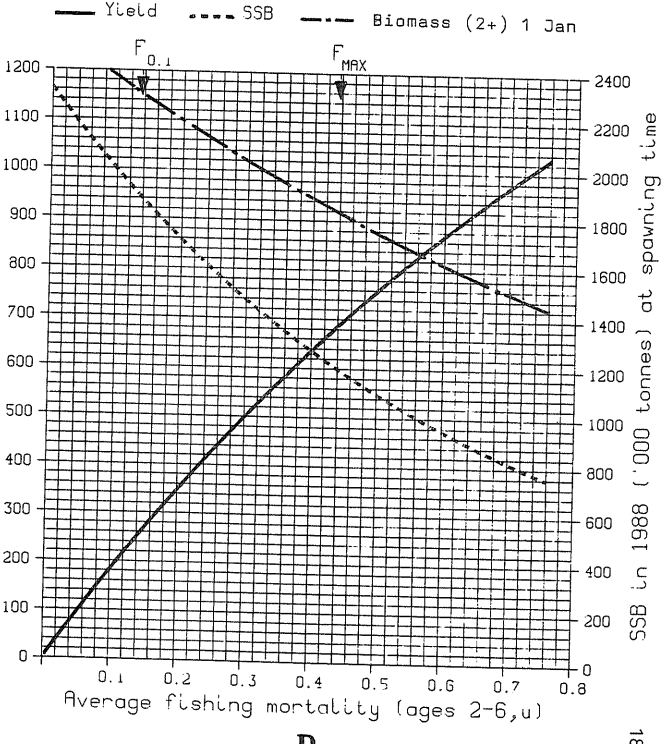
Figure 2.9.1 cont'd.

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

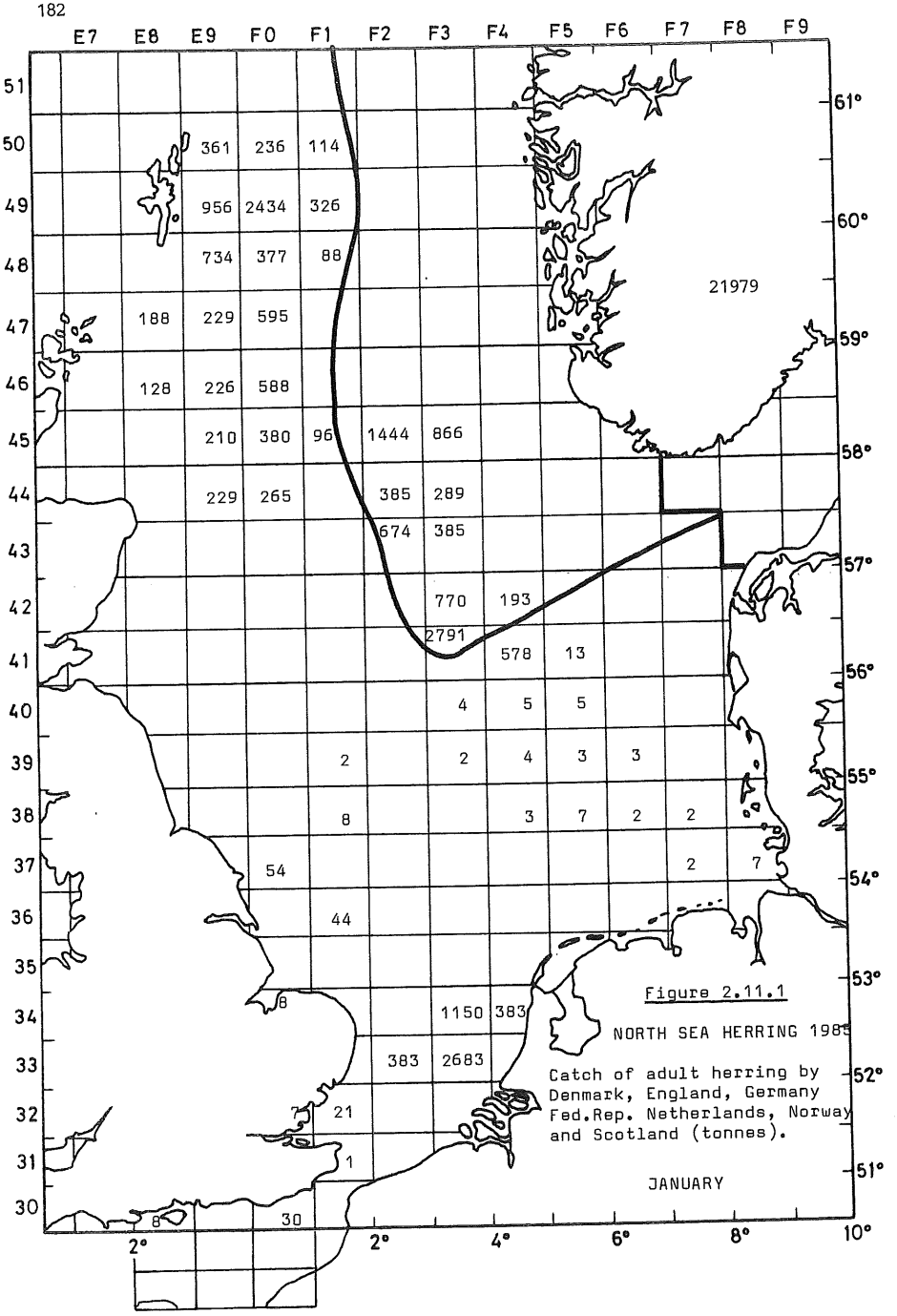


Figure 2.11.1

NORTH SEA HERRING 1985

Catch of adult herring by Denmark, England, Germany Fed.Rep. Netherlands, Norway and Scotland (tonnes).

JANUARY

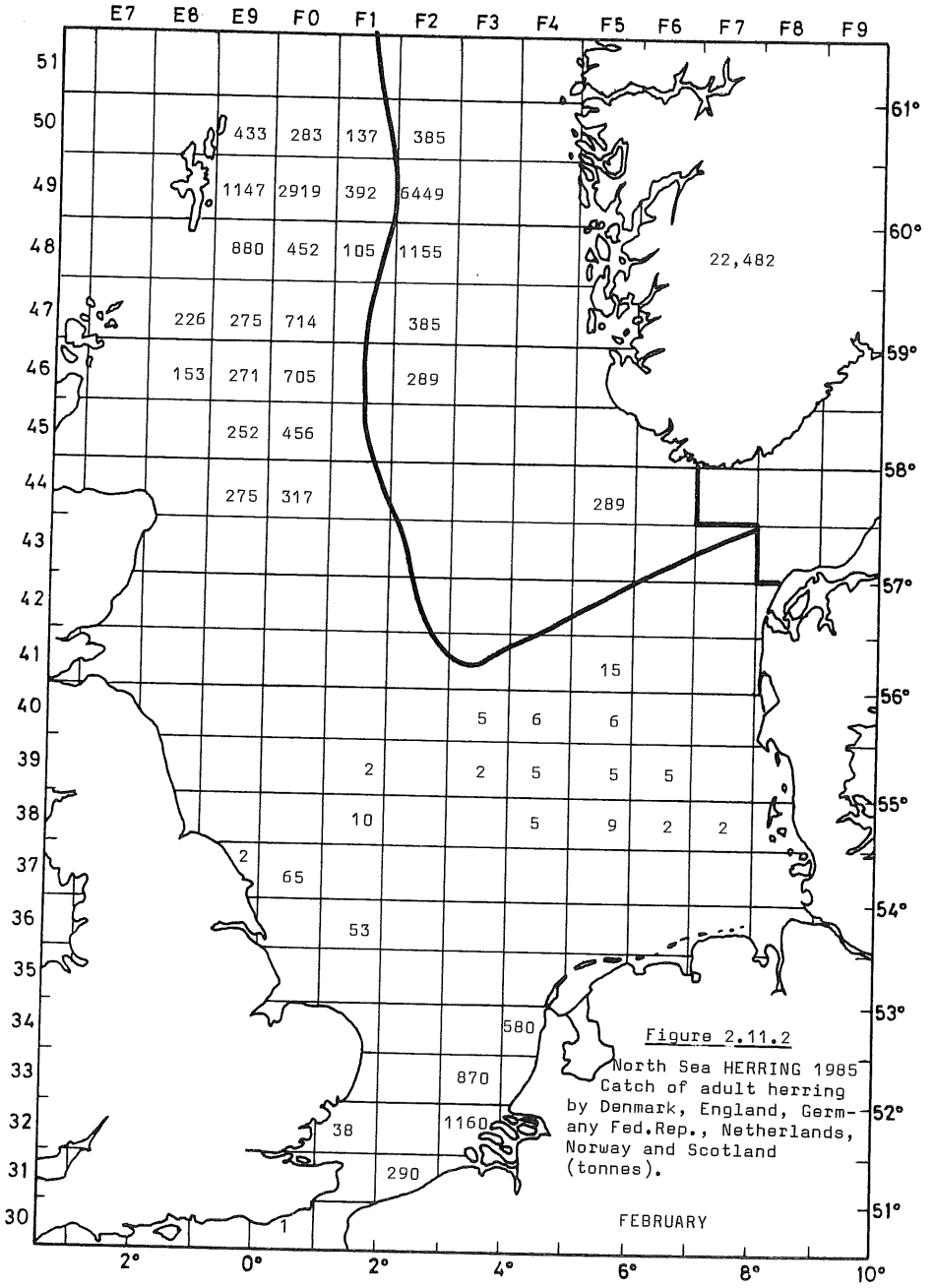


Figure 2.11.2

North Sea HERRING 1985
Catch of adult herring by Denmark, England, Germany Fed.Rep., Netherlands, Norway and Scotland (tonnes).

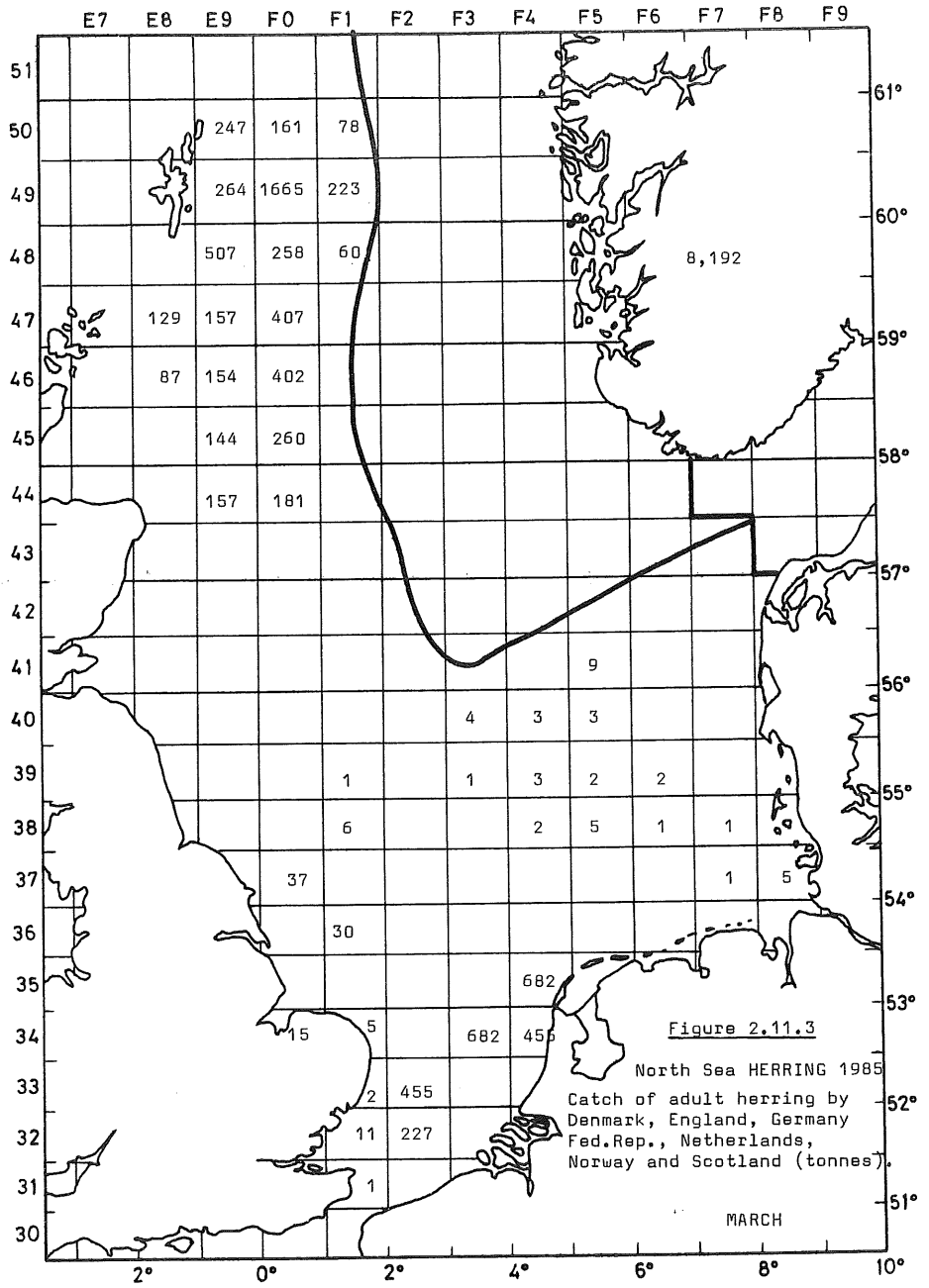


Figure 2.11.3

North Sea HERRING 1985

Catch of adult herring by Denmark, England, Germany Fed.Rep., Netherlands, Norway and Scotland (tonnes).

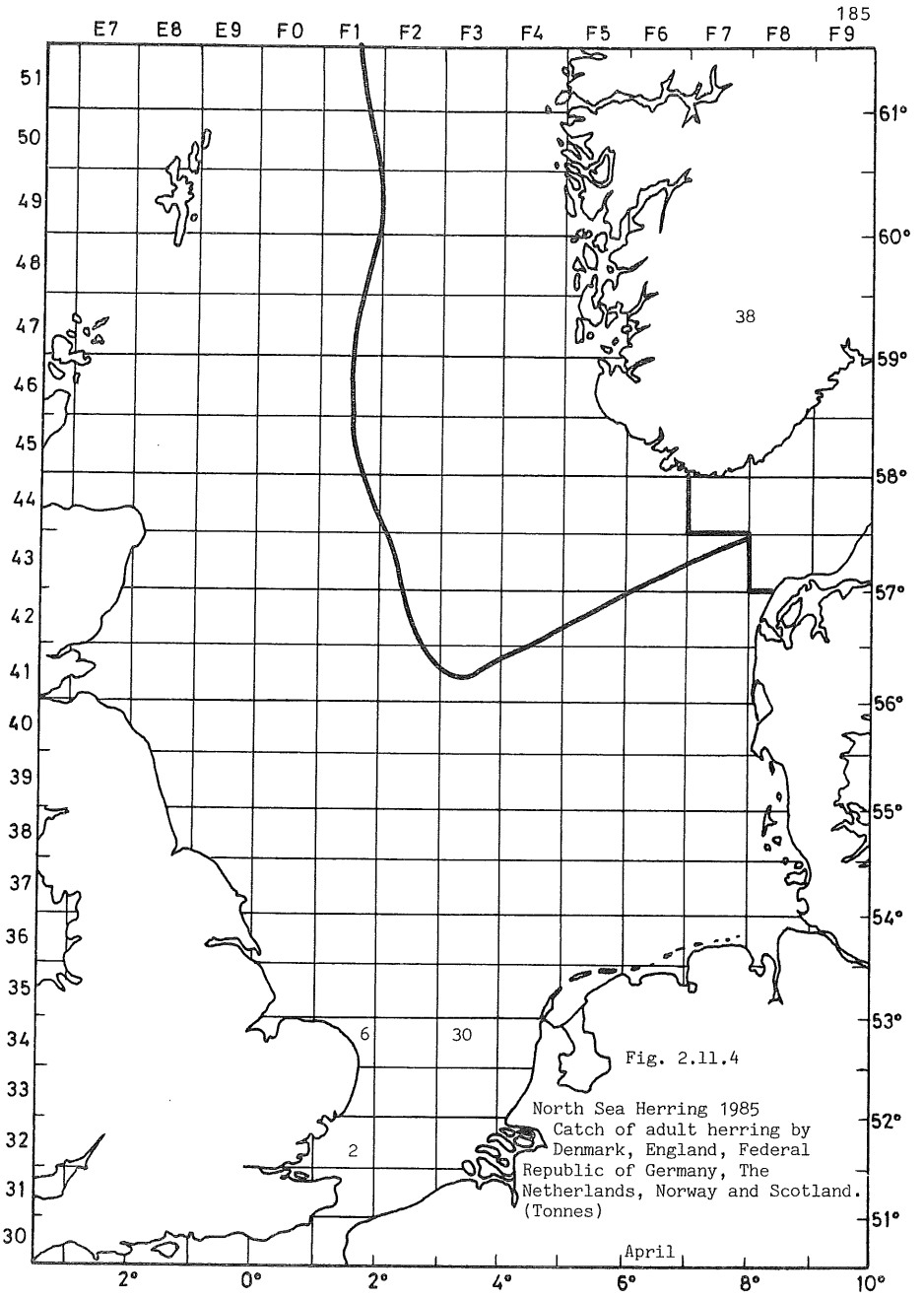


Fig. 2.11.4

North Sea Herring 1985
Catch of adult herring by Denmark, England, Federal Republic of Germany, The Netherlands, Norway and Scotland.
(Tonnes)

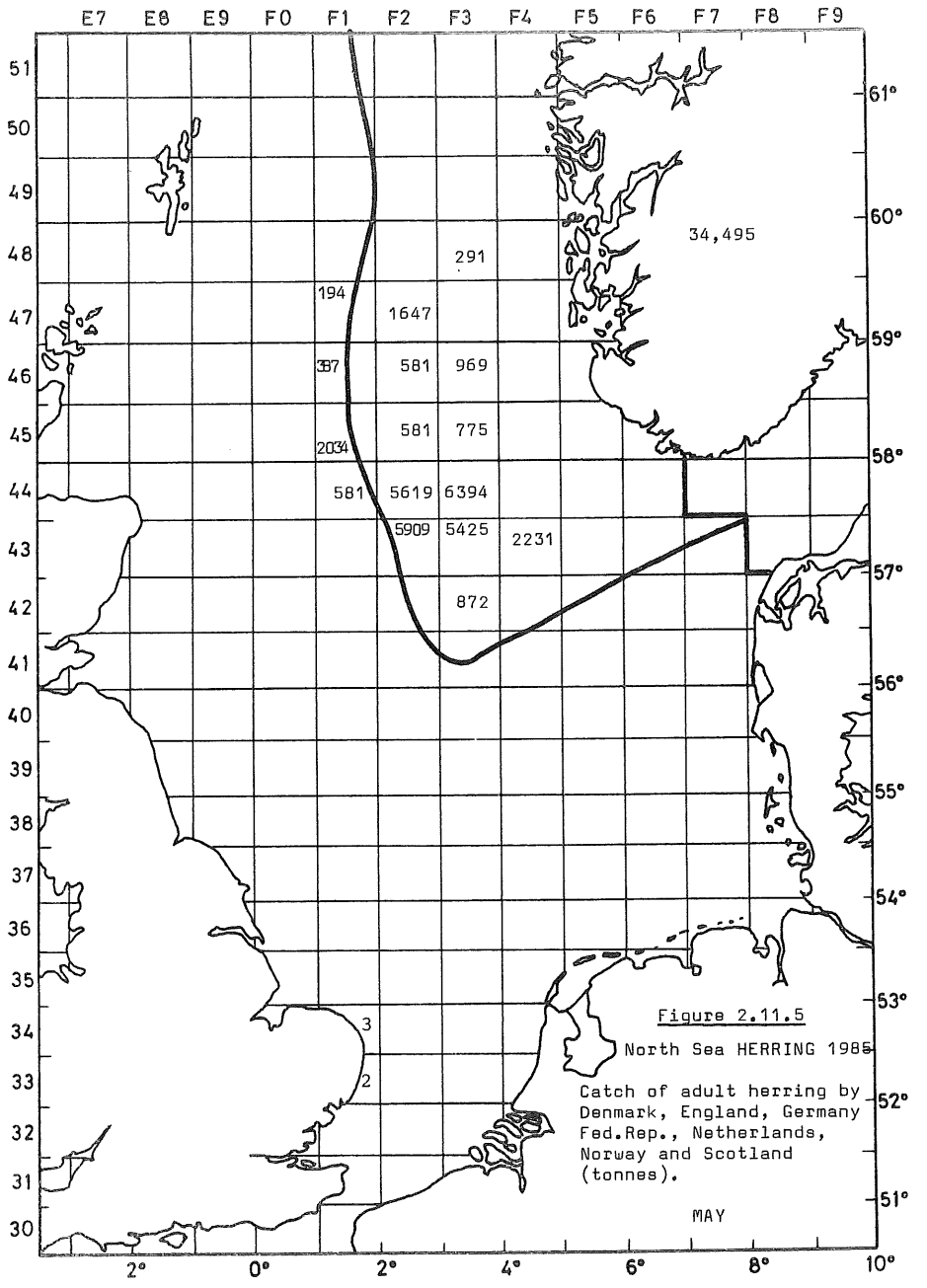


Figure 2.11.5

North Sea HERRING 1985

Catch of adult herring by Denmark, England, Germany Fed.Rep., Netherlands, Norway and Scotland (tonnes).

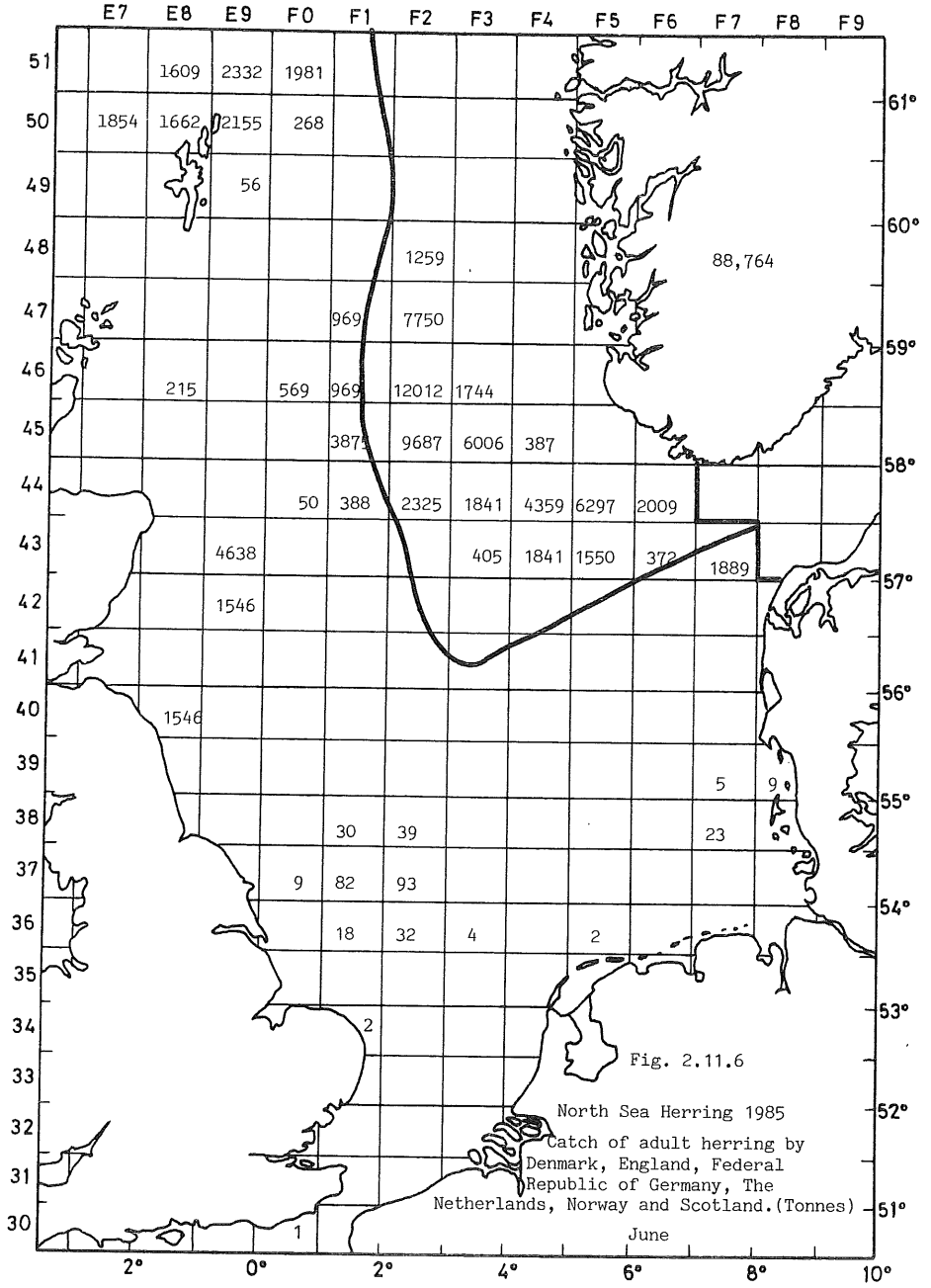


Fig. 2.11.6

North Sea Herring 1985

Catch of adult herring by Denmark, England, Federal Republic of Germany, The Netherlands, Norway and Scotland.(Tonnes)

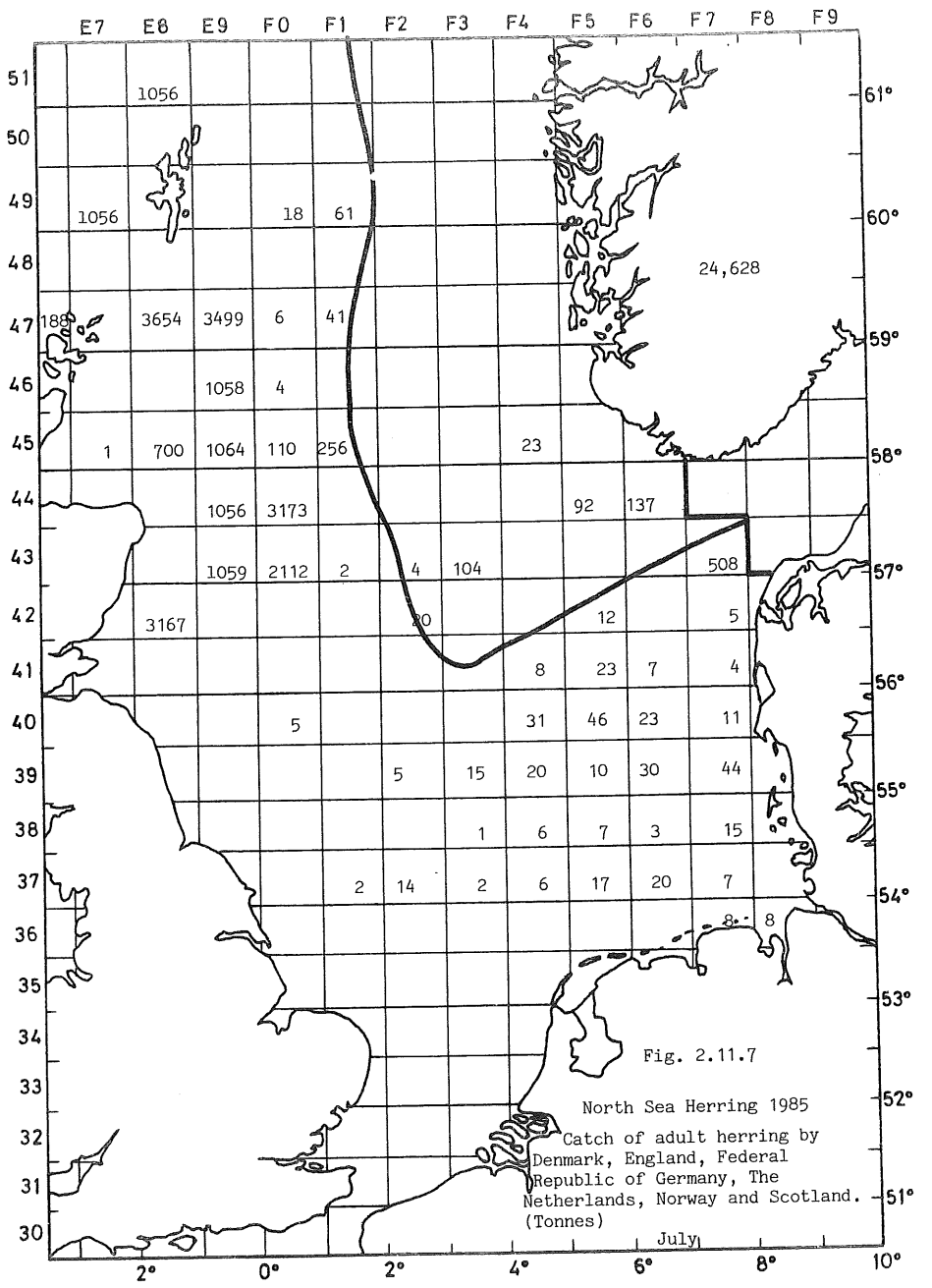
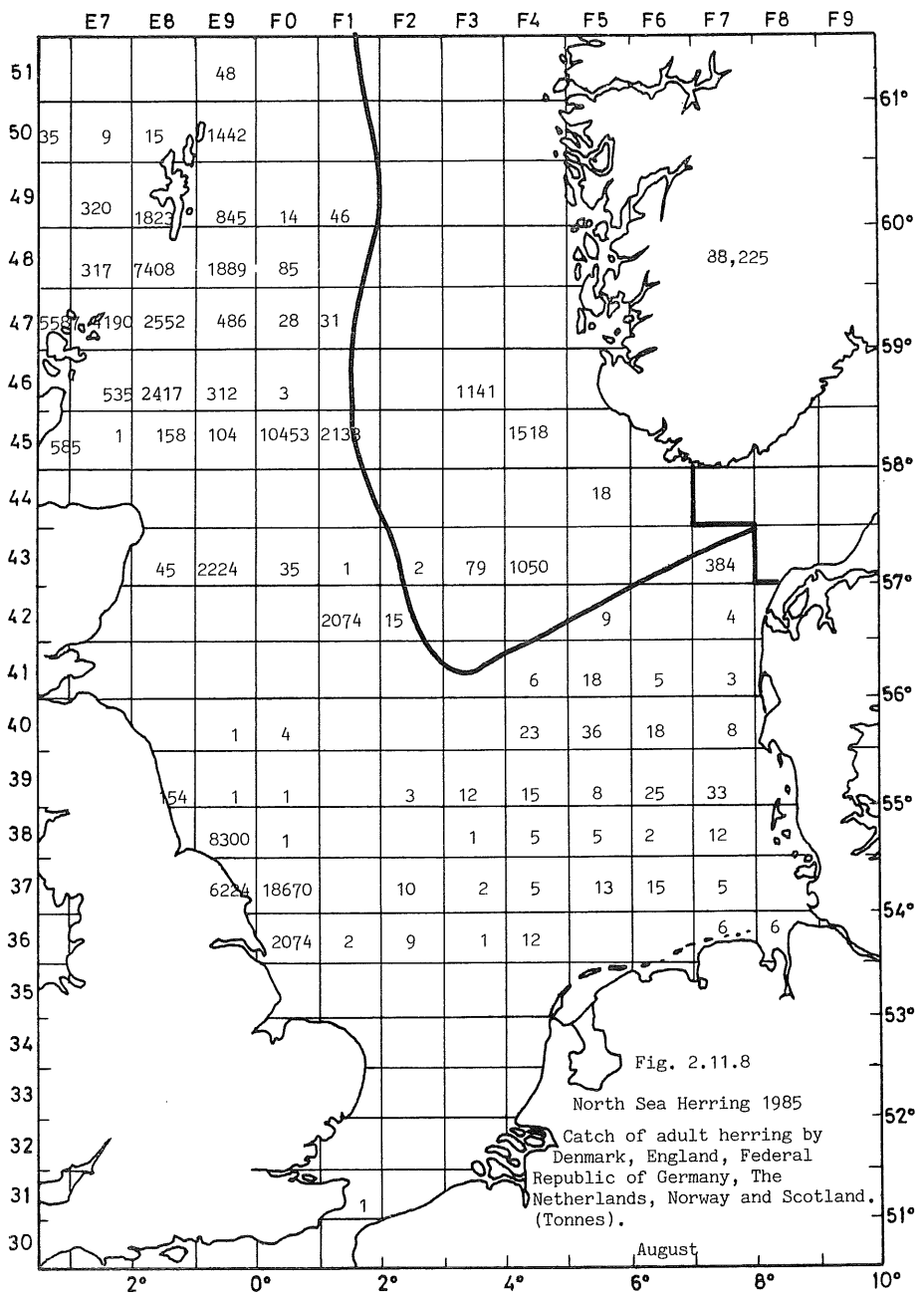


Fig. 2.11.7

North Sea Herring 1985

Catch of adult herring by Denmark, England, Federal Republic of Germany, The Netherlands, Norway and Scotland. (Tonnes)


E7 E8 E9 F0 F1 F2 F3 F4 F5 F6 F7 F8 F9
51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30
61° 60° 59° 58° 57° 56° 55° 54° 53° 52° 51°
2° 0° 2° 4° 6° 8° 10°
48
35 9 15 1442
320 1823 845 14 46
317 7408 1889 85
88,225
558 190 2552 486 28 31
535 2417 312 3 1141
585 1 158 104 10453 2138 1518
18
45 2224 35 1 2 79 1050 384
2074 15 9 4
6 18 5 3
1 4 23 36 18 8
154 1 1 3 12 15 8 25 33
8300 1 1 5 5 2 12
6224 18670 10 2 5 13 15 5
2074 2 9 1 12 6 6
1
Fig. 2.11.8
North Sea Herring 1985
Catch of adult herring by Denmark, England, Federal Republic of Germany, The Netherlands, Norway and Scotland. (Tonnes).
August

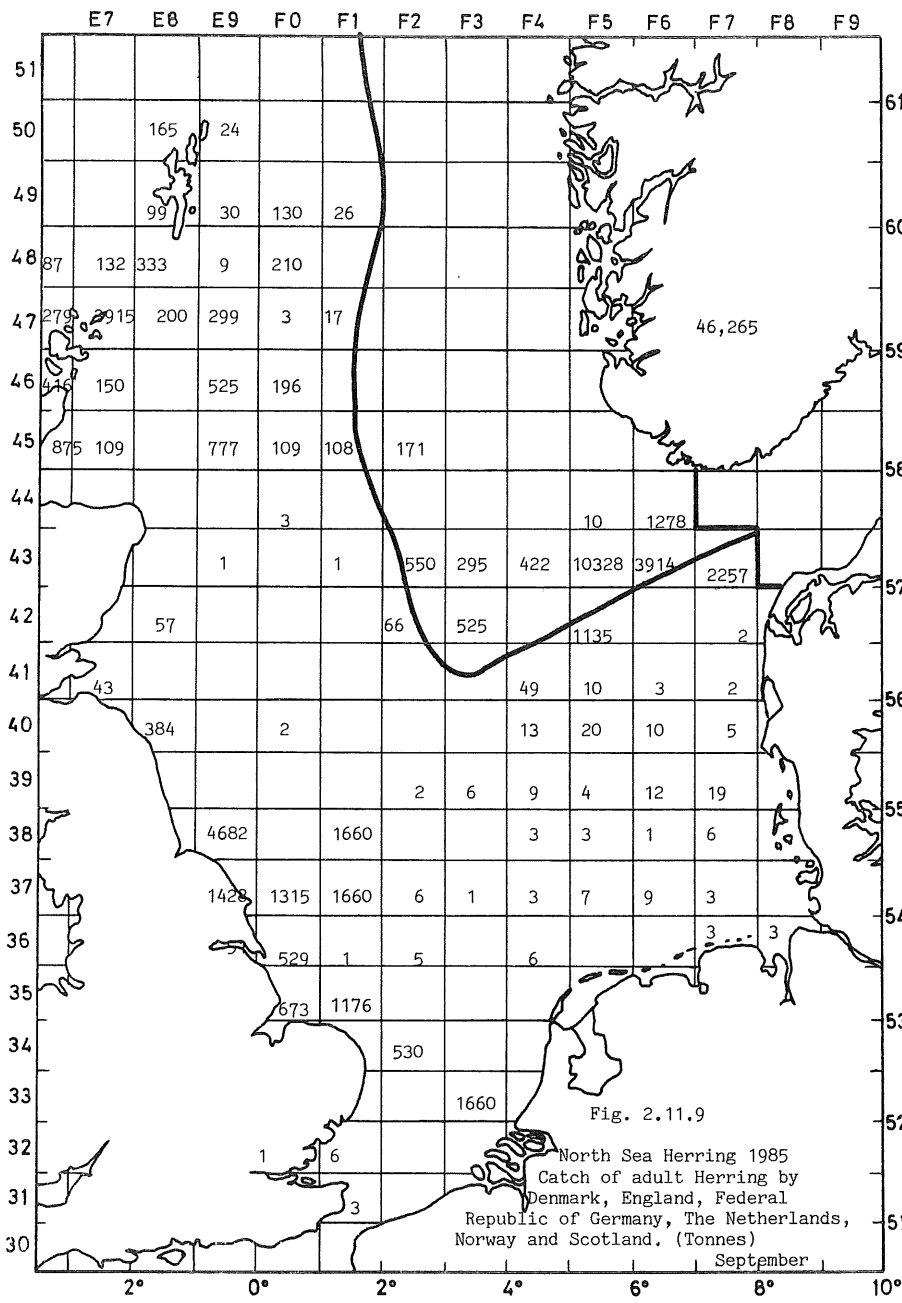


Fig. 2.11.9

North Sea Herring 1985
Catch of adult Herring by Denmark, England, Federal Republic of Germany, The Netherlands, Norway and Scotland. (Tonnes)
September

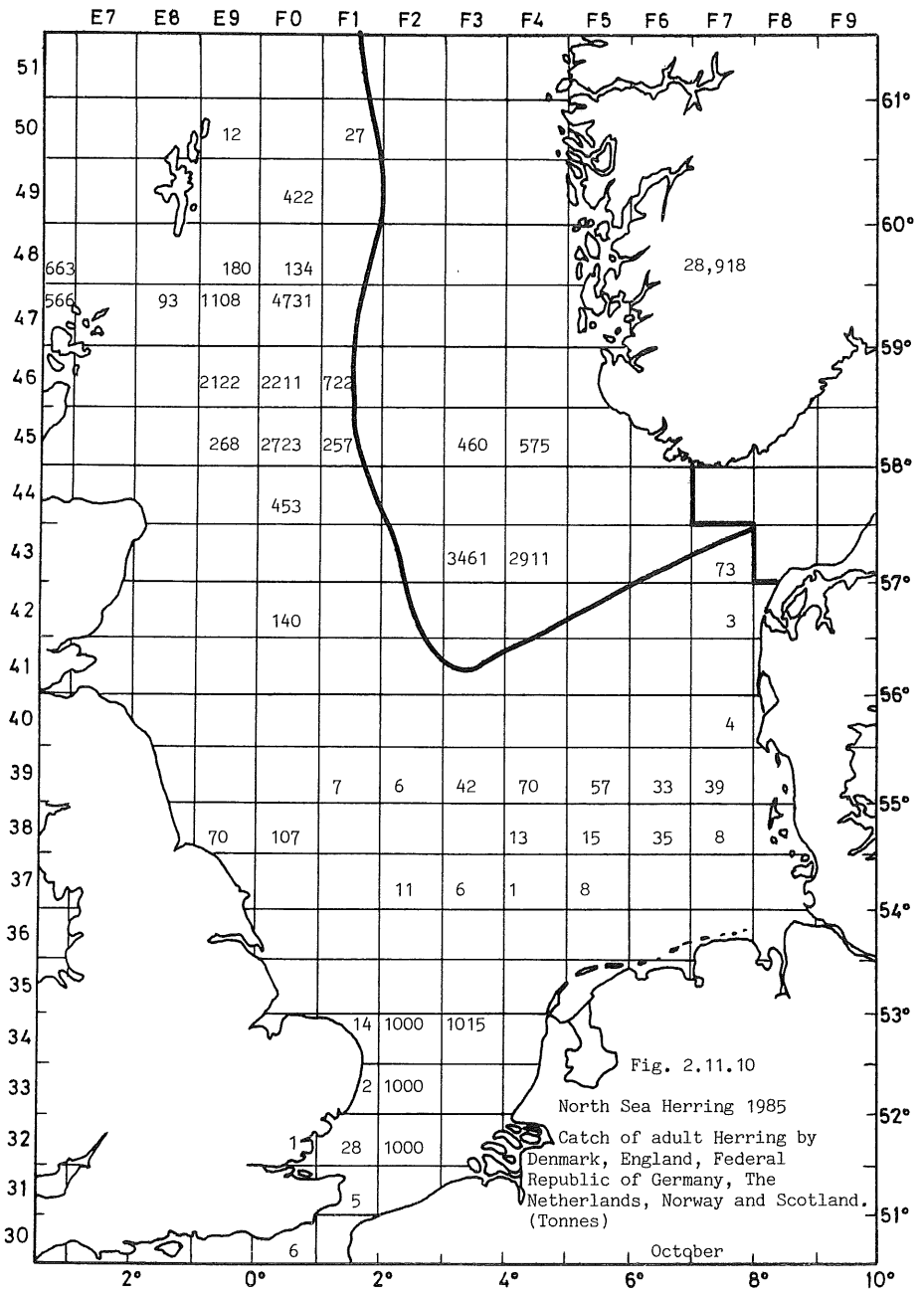


Fig. 2.11.10

North Sea Herring 1985

Catch of adult Herring by Denmark, England, Federal Republic of Germany, The Netherlands, Norway and Scotland. (Tonnes)

October

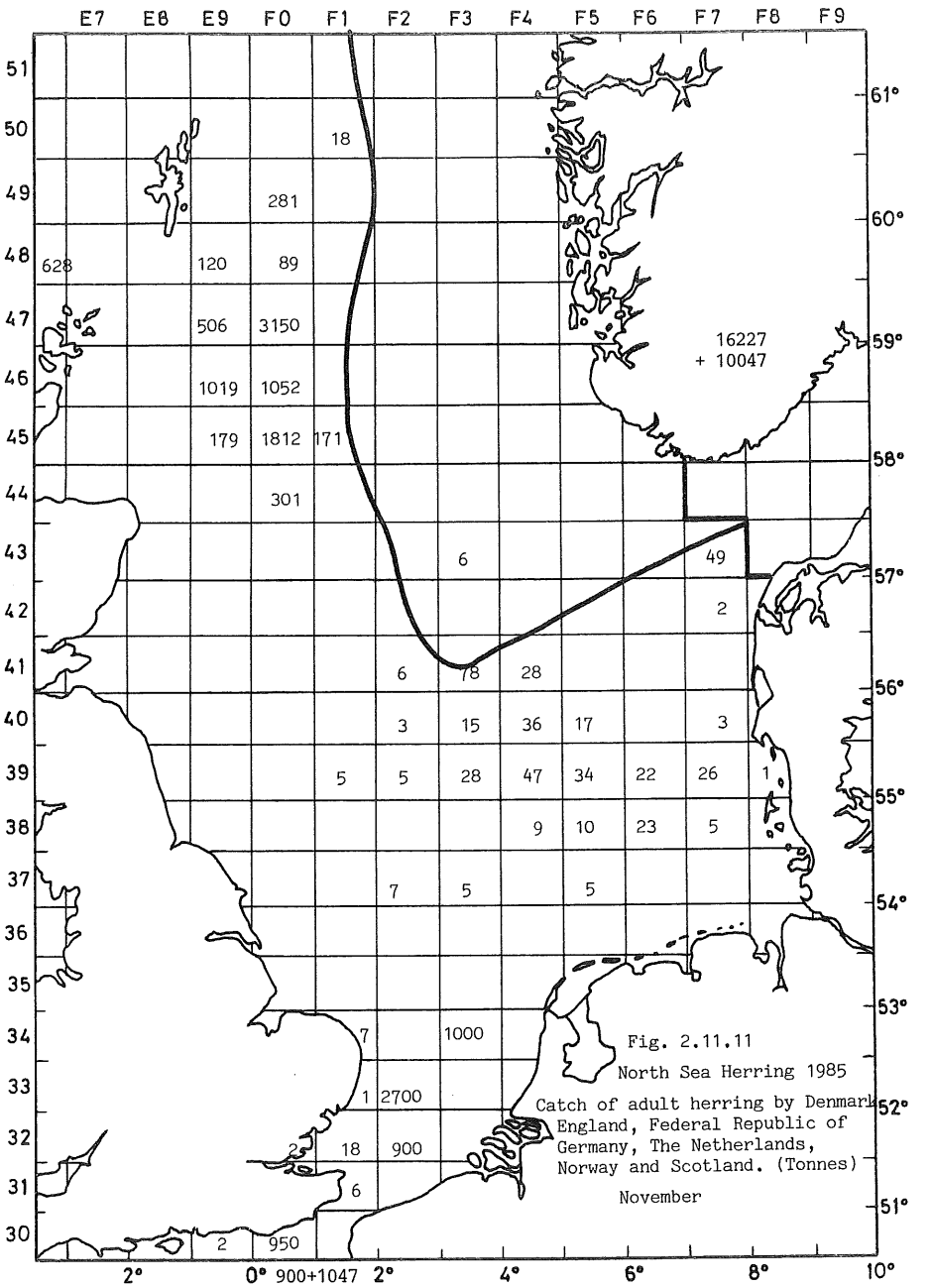


Fig. 2.11.11

North Sea Herring 1985

Catch of adult herring by Denmark, England, Federal Republic of Germany, The Netherlands, Norway and Scotland. (Tonnes)

November

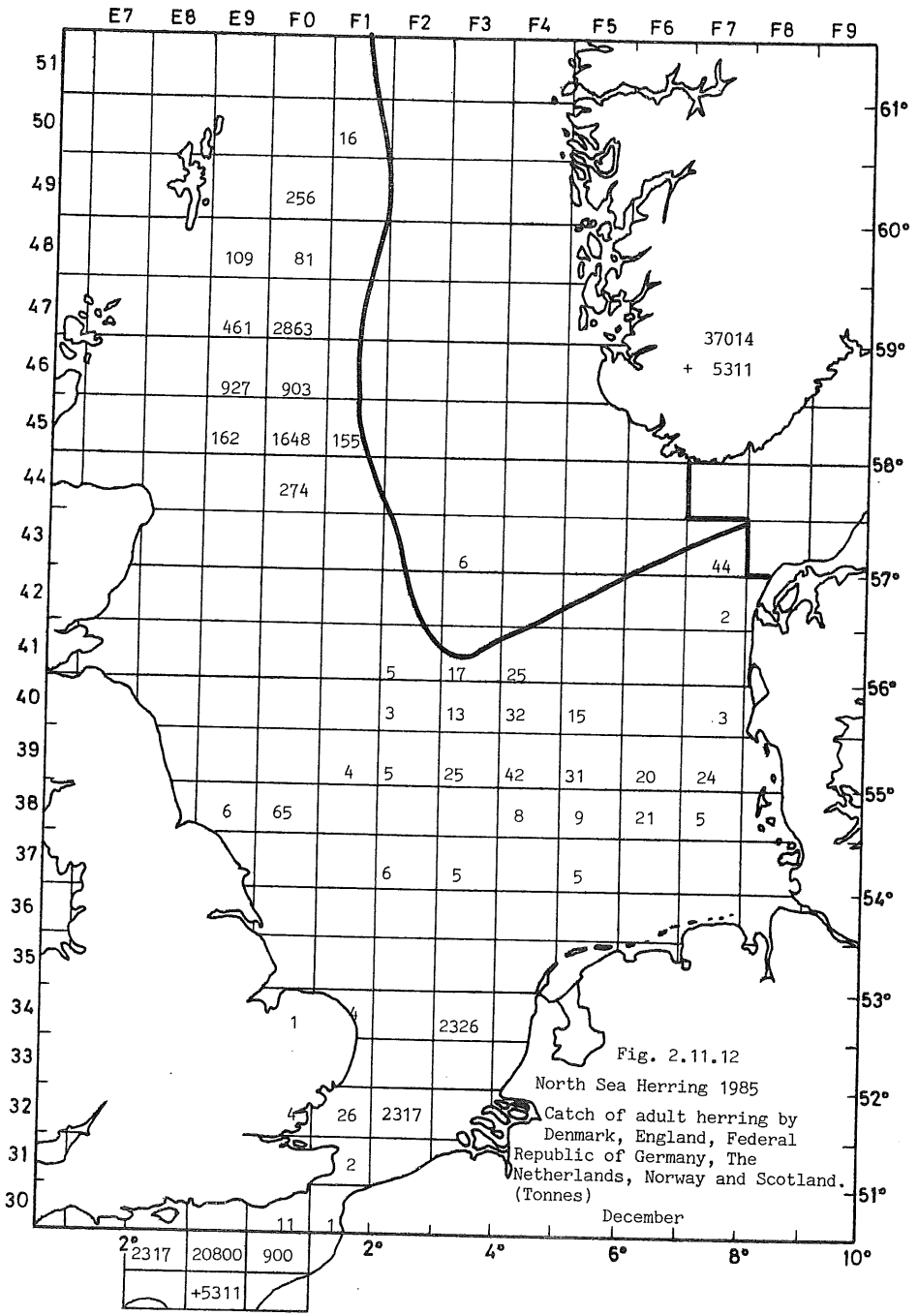


Fig. 2.11.12

North Sea Herring 1985

Catch of adult herring by Denmark, England, Federal Republic of Germany, The Netherlands, Norway and Scotland. (Tonnes)

Figure 3.4.1 Regression of 1-group indices on 2-group indices of spring- and autumn spawners herring. Year classes indicated.

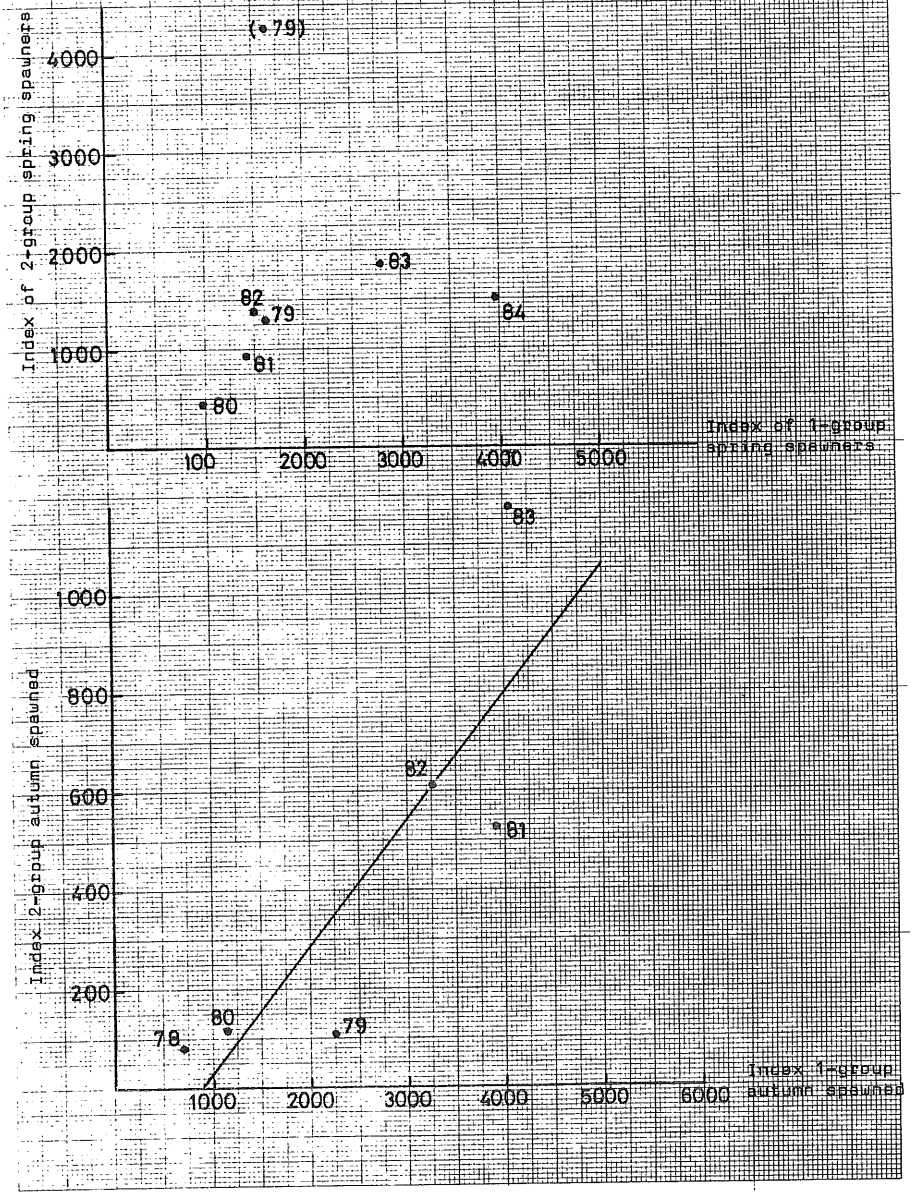
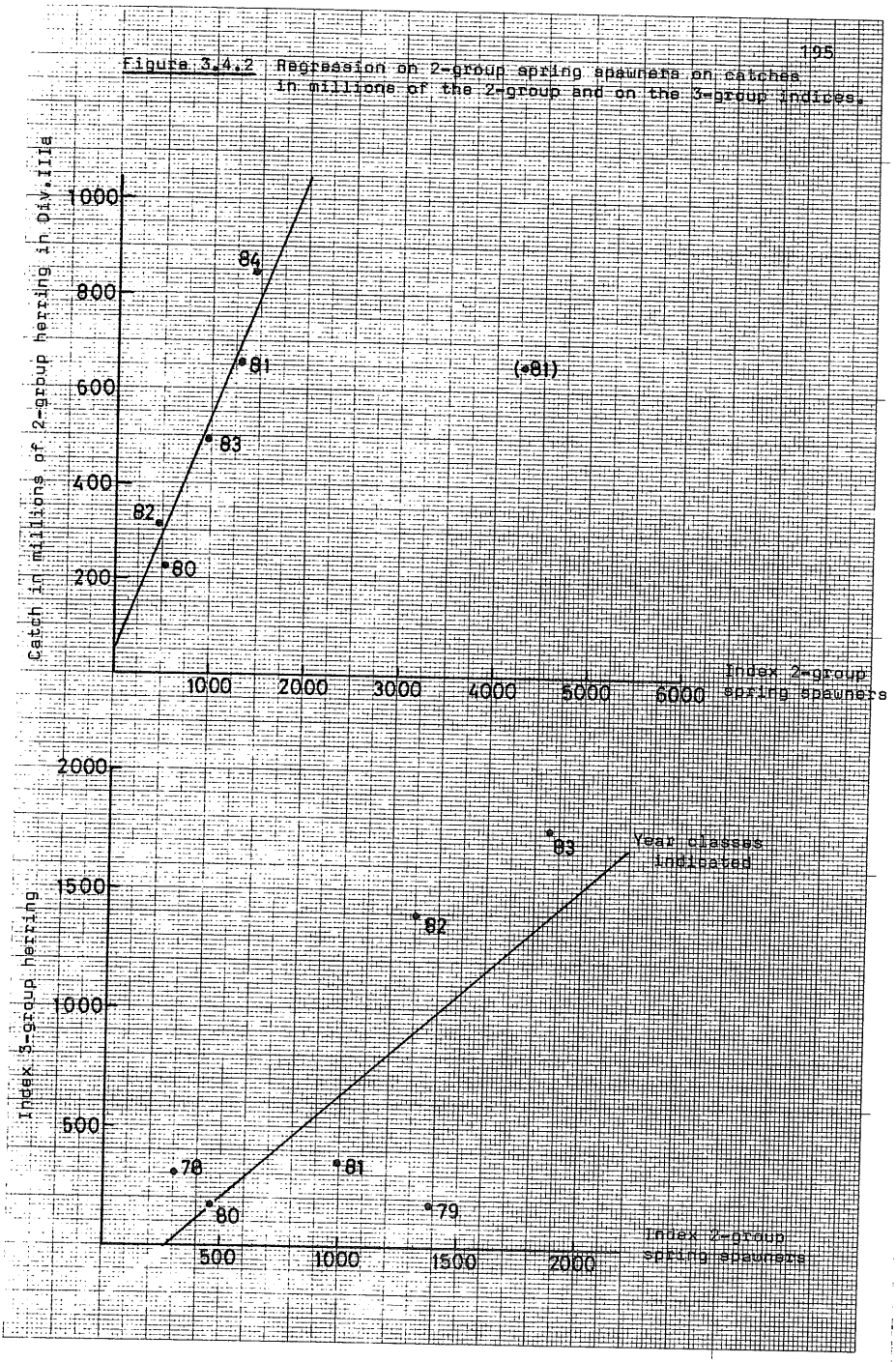


Figure 3.4.2 Regression on 2-group spring spawners on catches in millions of the 2-group and on the 3-group indices.



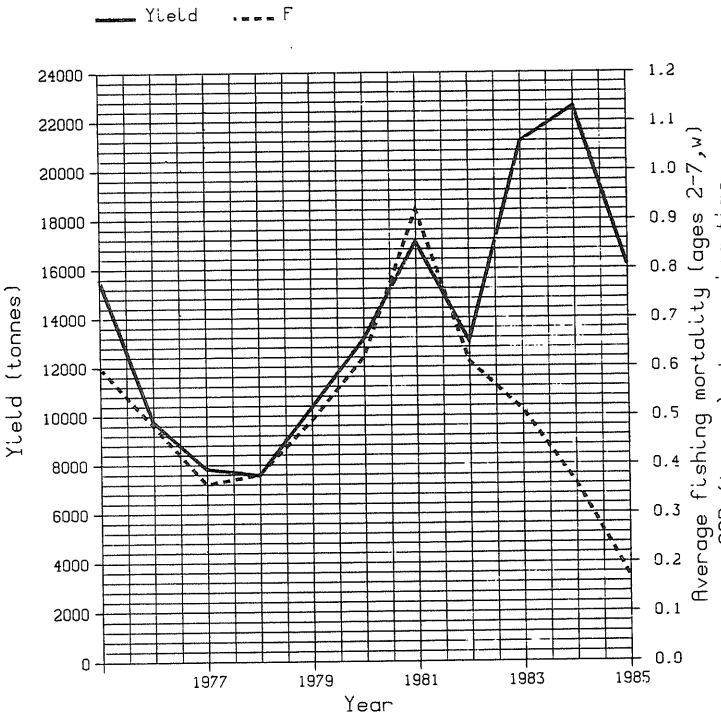
FISH STOCK SUMMARY

STOCK: Herring - Celtic Sea and VIIj

10-4-1986

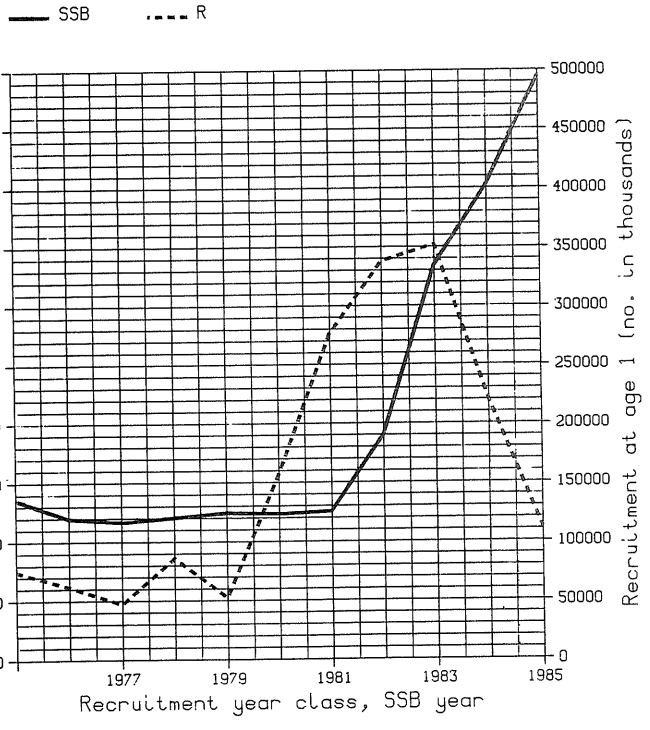
Figure 4.7.1

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

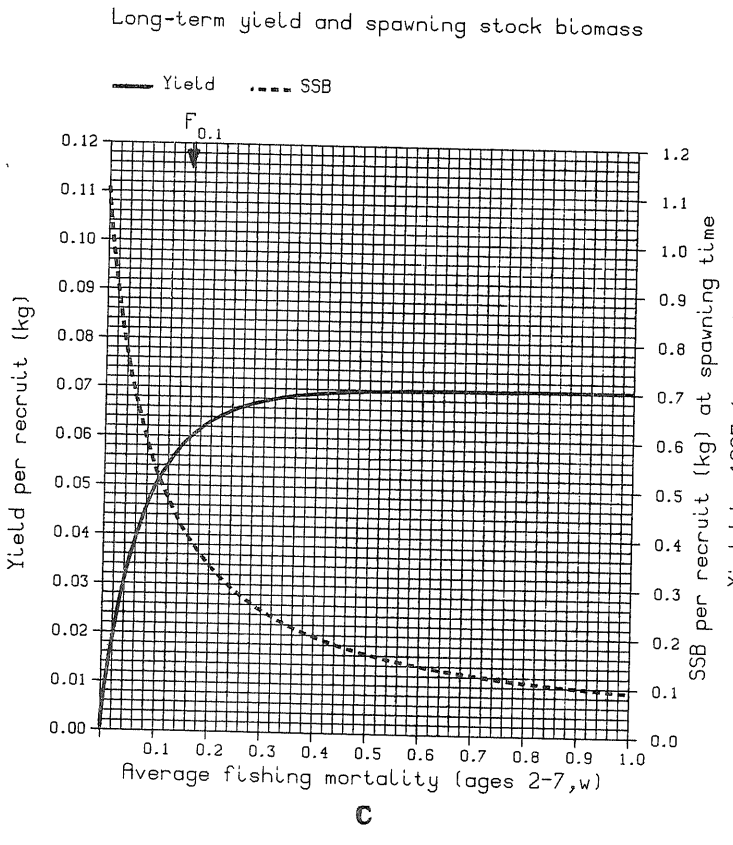
cont'd.

FISH STOCK SUMMARY

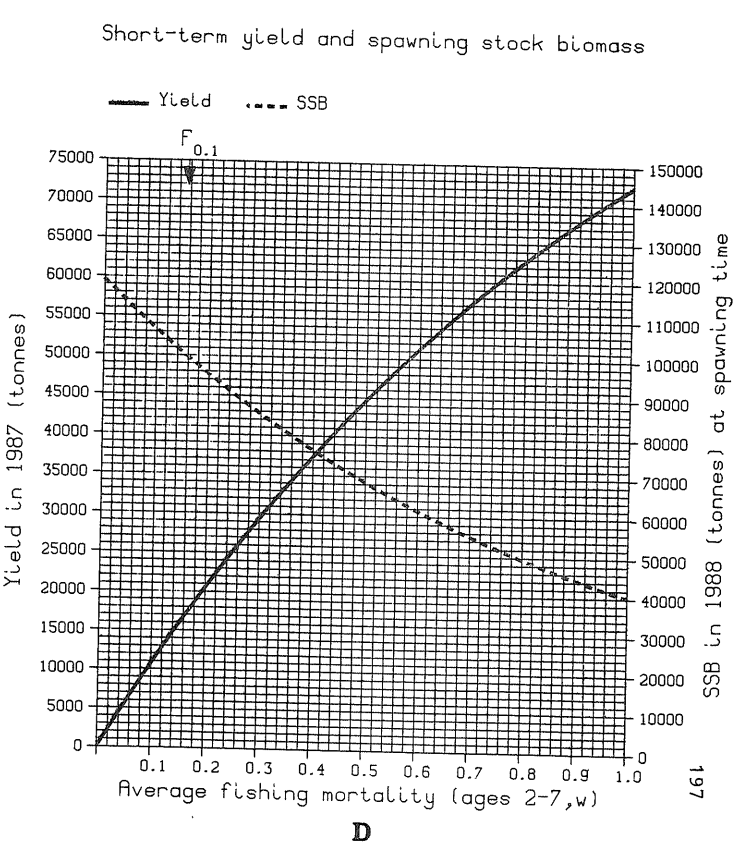
STOCK: Herring - Celtic Sea and VIIj

10-4-1986

Figure 4.7.1 cont'd.



C



D

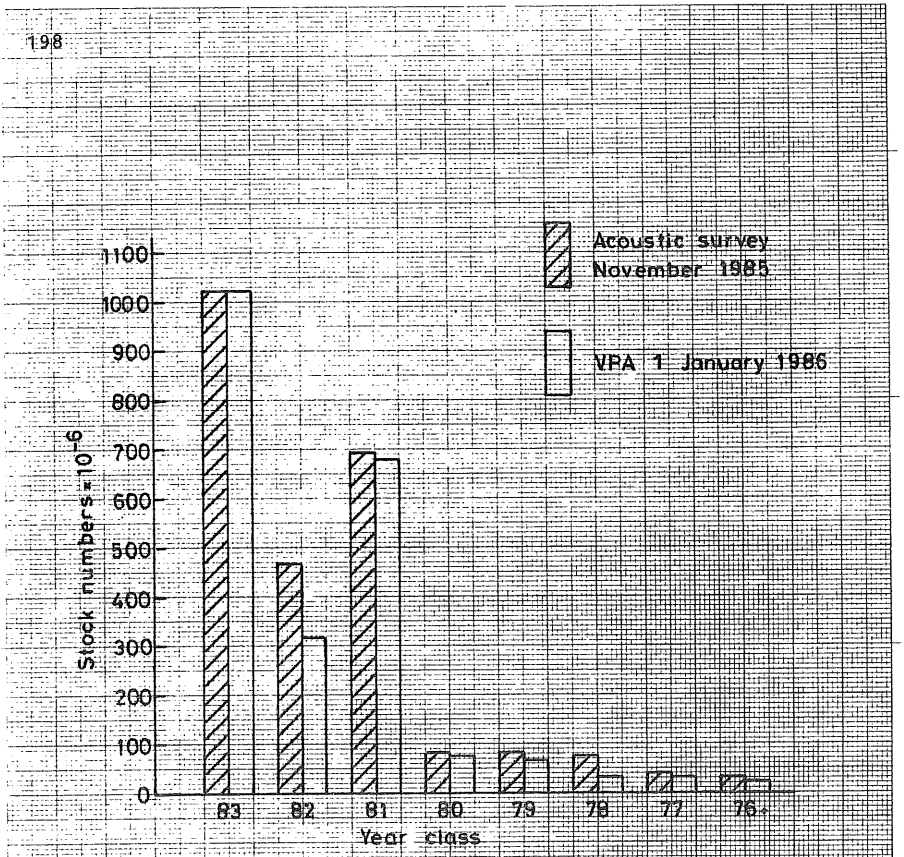


Figure 5.1.1 Comparison of year class numbers in Division VIa (North) calculated from an acoustic survey carried out in November 1985 and from a VPA relating to the situation on 1 Jan 1986. The VPA estimate of the 1983 year class was calculated from the 1-ringer catch in 1985 by applying the same exploitation pattern as in previous years, ie. 20% of F on ages 2-7.

Figure 5.1.2 HERRING, VIA NORTH. Spawning biomass from larval production and from VPA. Points are labelled by years.

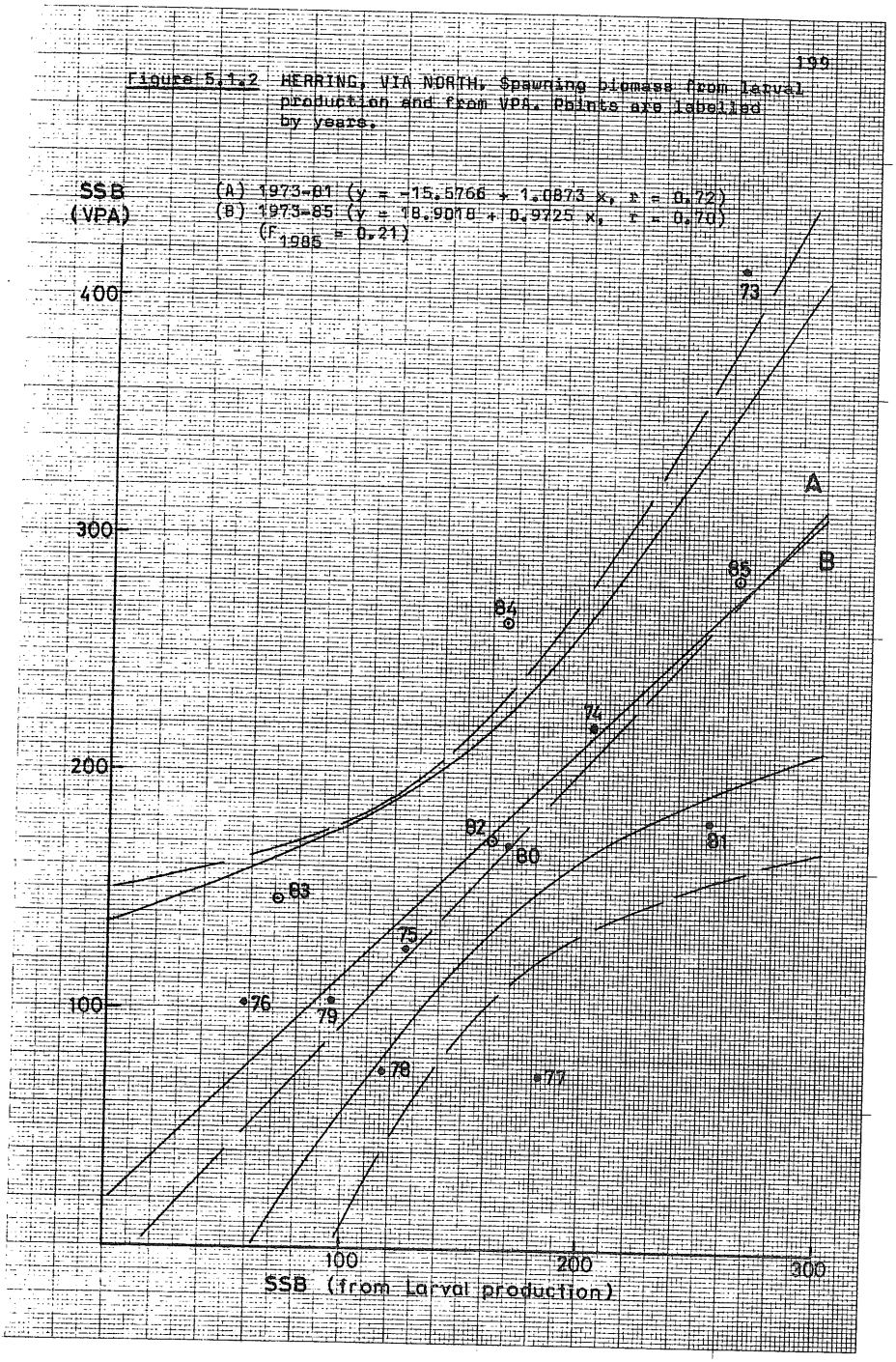
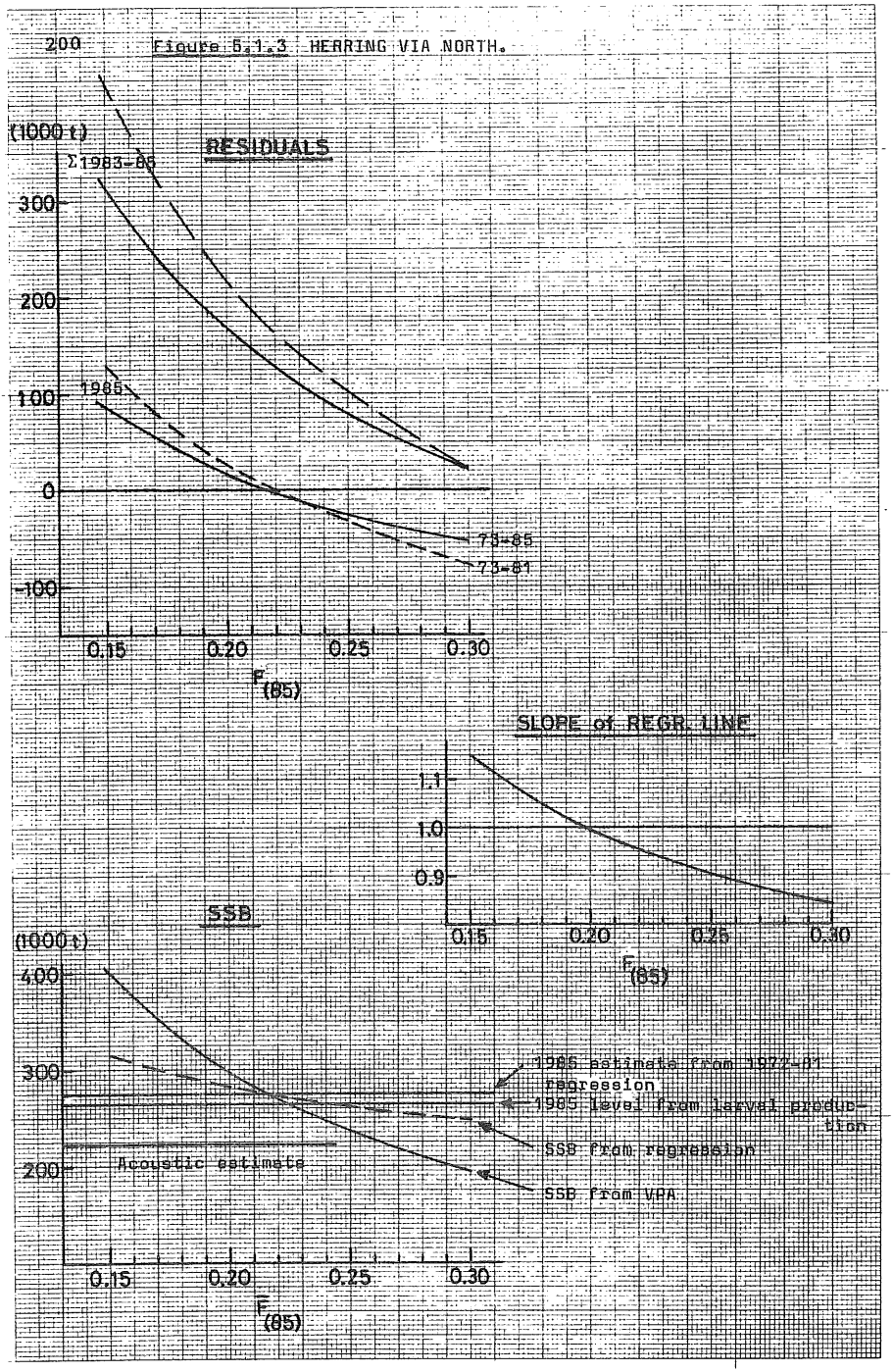


Figure 5.1.3 HERRING VIA NORTH.



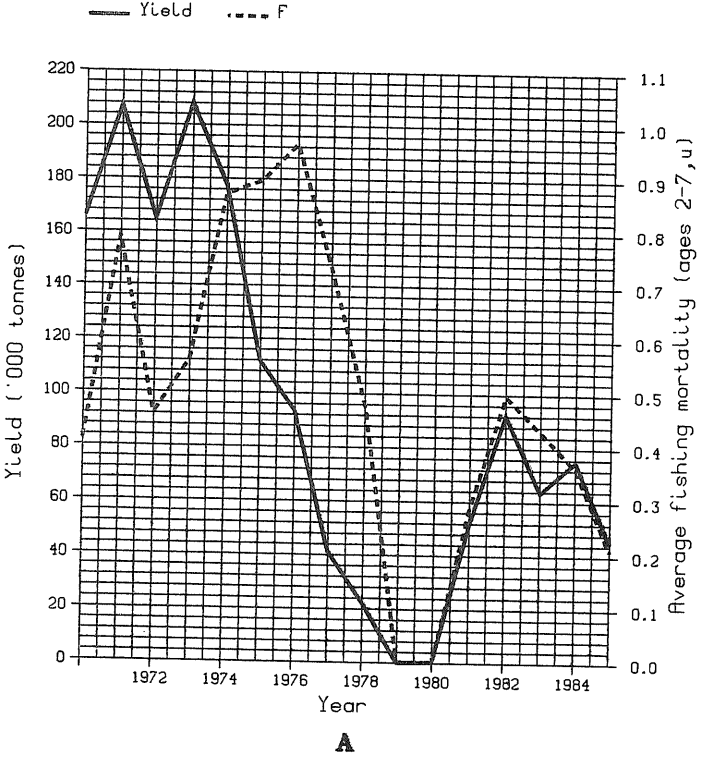
FISH STOCK SUMMARY

STOCK: Herring - Vla North

28-4-1986

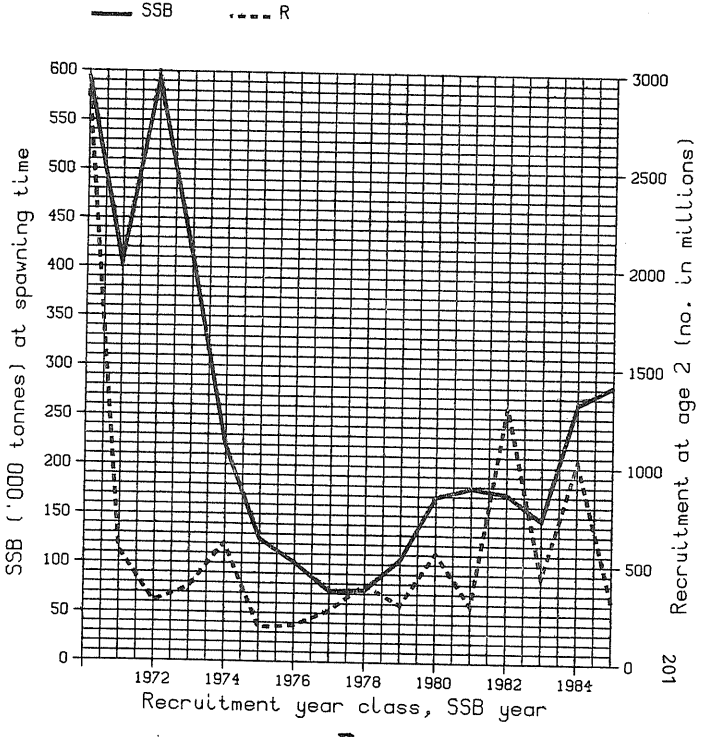
Figure 5.1.4

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

cont'd.

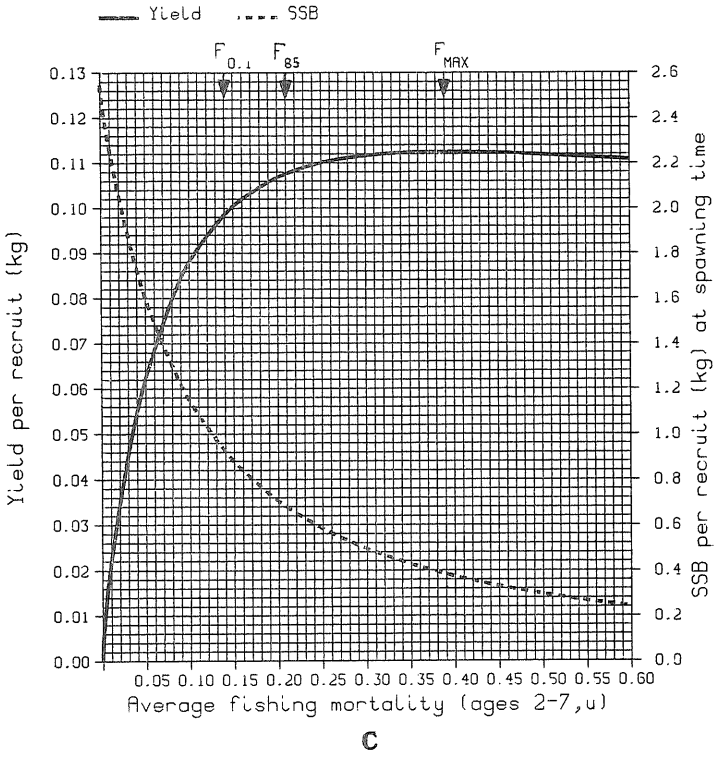
Figure 5.1.4 contd.

FISH STOCK SUMMARY

STOCK: Herring - VIa North

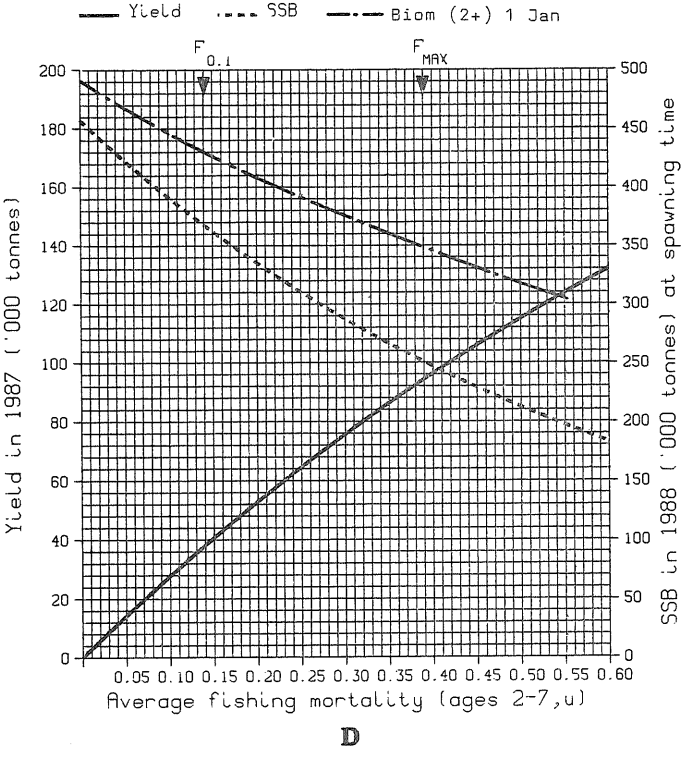
28-4-1986

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

Figure 6.3.1 Trends in spawning stock biomasses produced with different input F values and trends in larval indices.

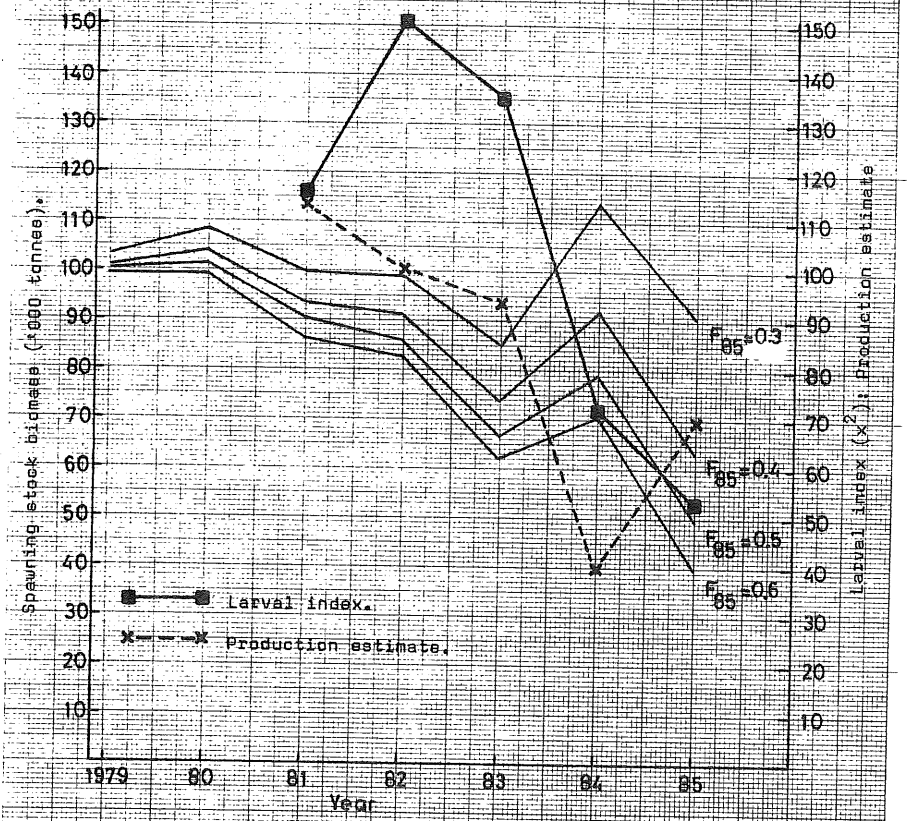


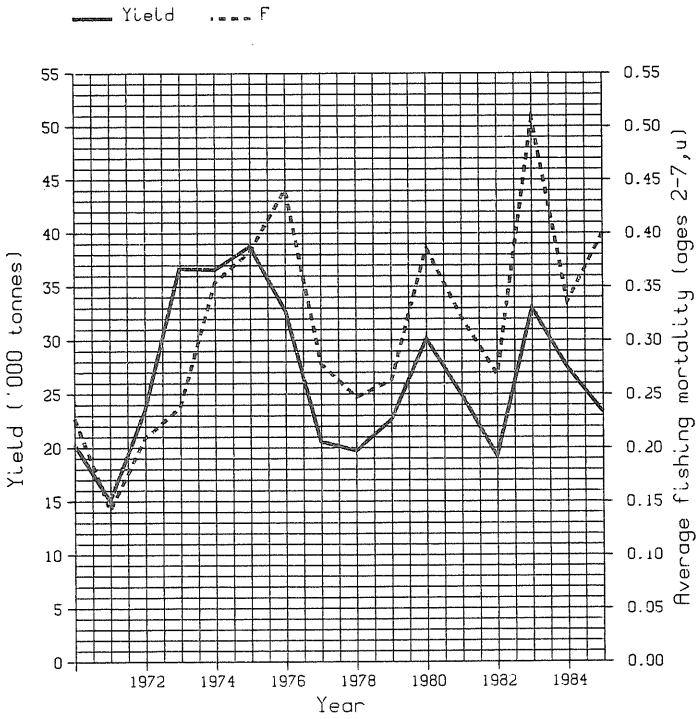
Figure 6.3.2

FISH STOCK SUMMARY

STOCK: Herring – VIa S and VIIb

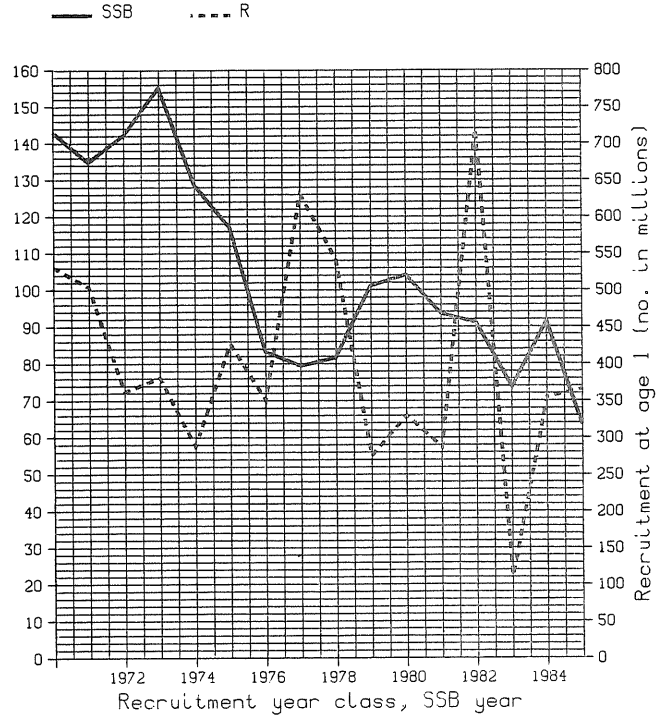
25-4-1986

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

cont'd.

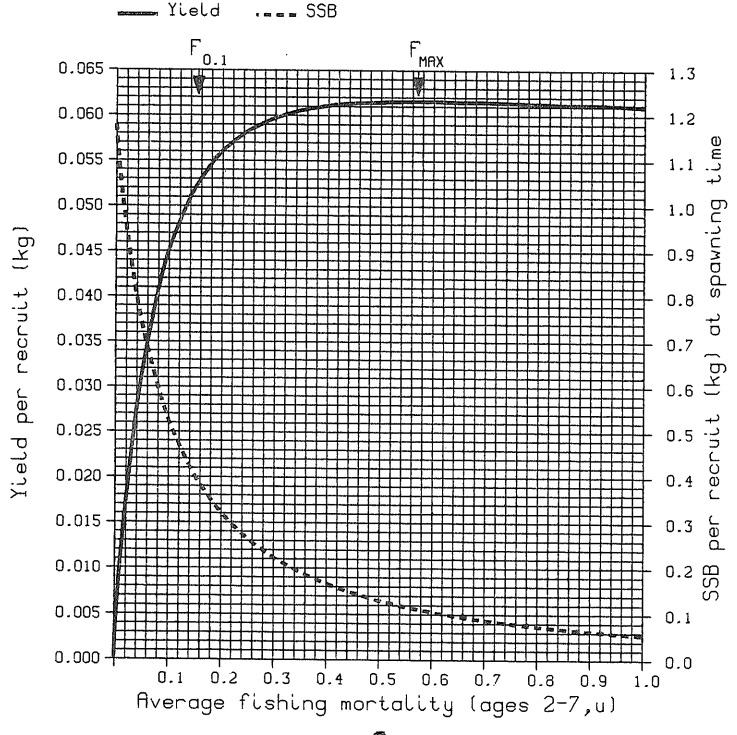
Figure 6.3.2 cont'd.

FISH STOCK SUMMARY

STOCK: Herring - VIa S and VIIb

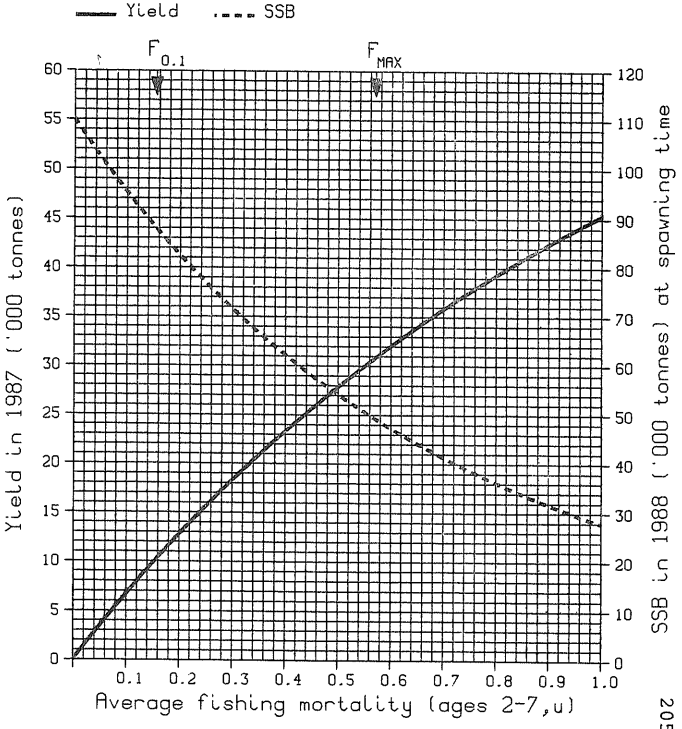
25-4-1986

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

Figure 7.5.1 HERRING in the North Irish Sea (VIIa). Spawning stock and recruits. Data from VPA with $F_{1985} = 0.3$.

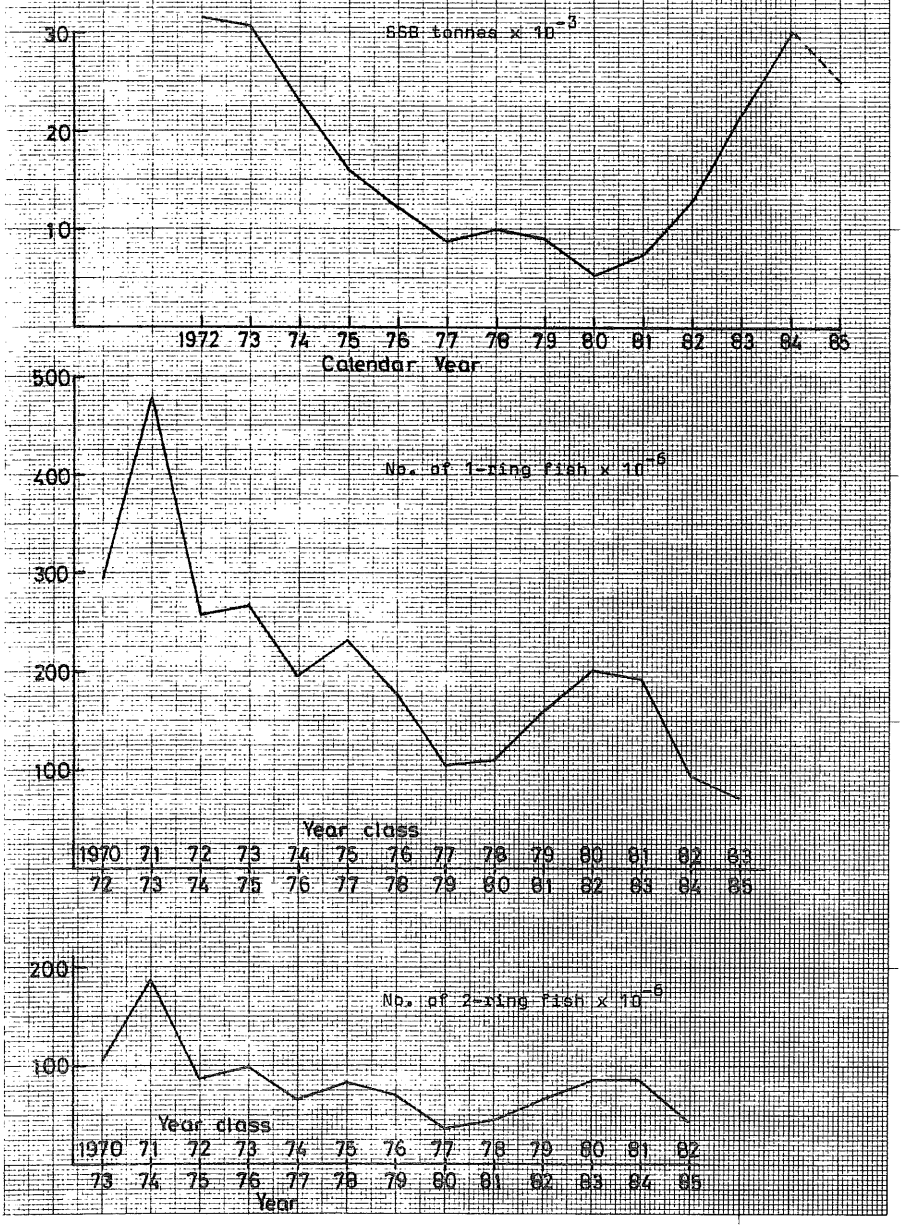
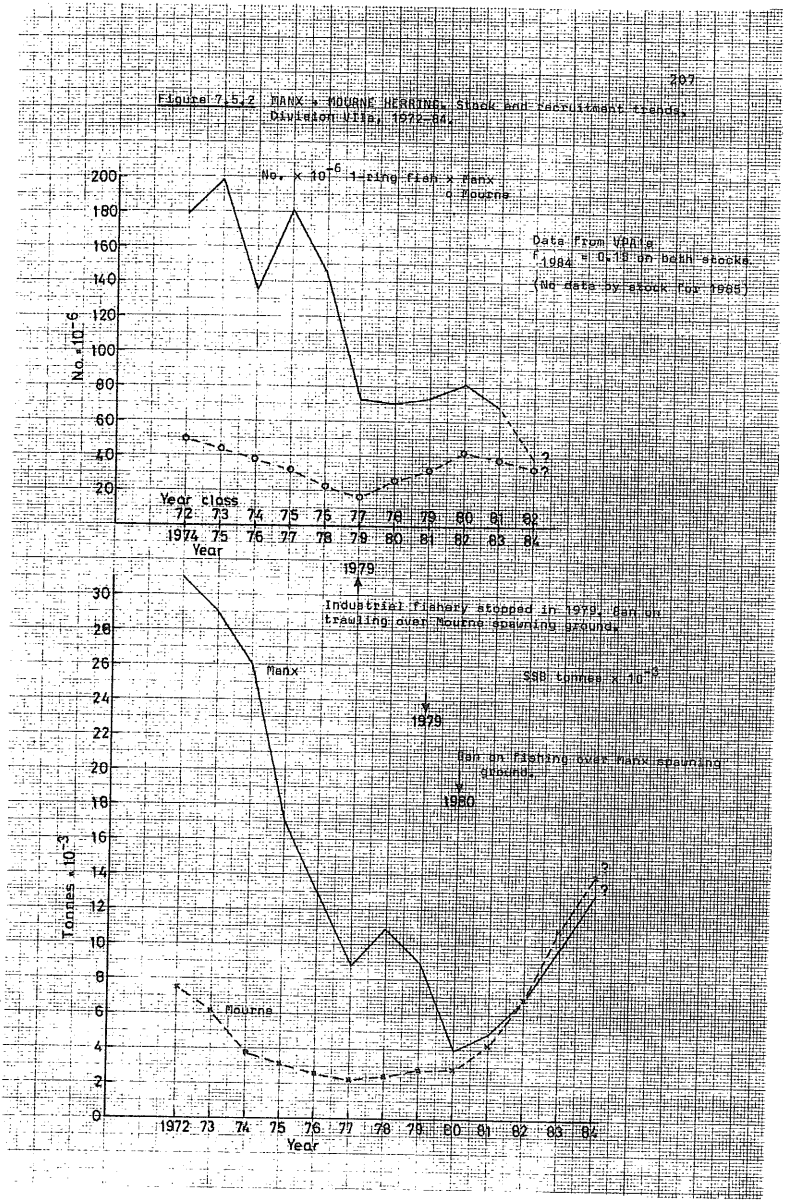


Figure 7.5.2 MANX + MOURNE HERRING. Stock and recruitment trends, Division VIIa, 1972-84.



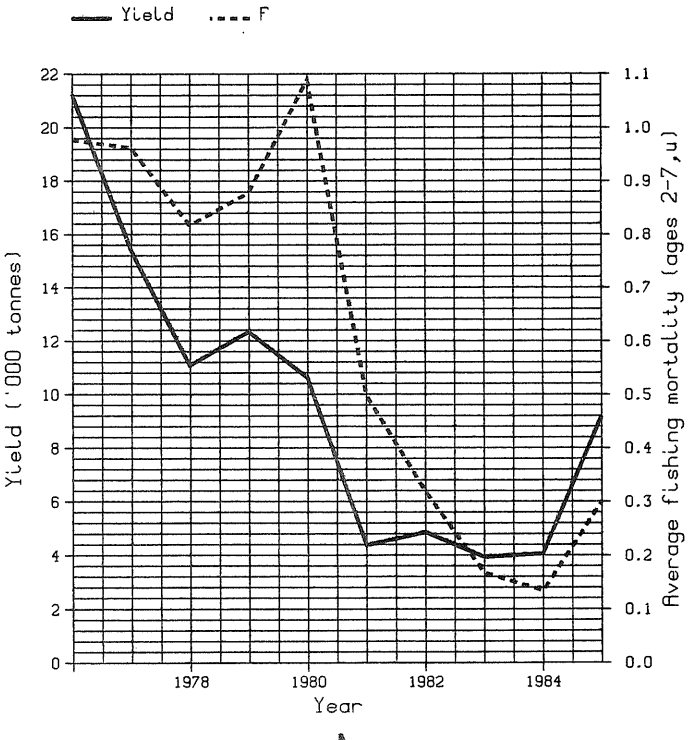
FISH STOCK SUMMARY

STOCK: Herring - Northern Irish Sea

25-4-1986

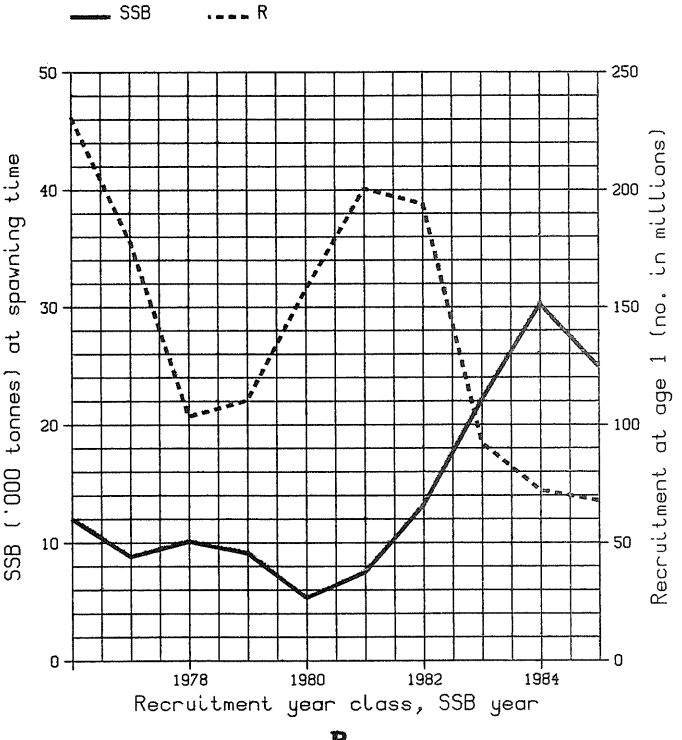
Table 7.5.3

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

cont'd.

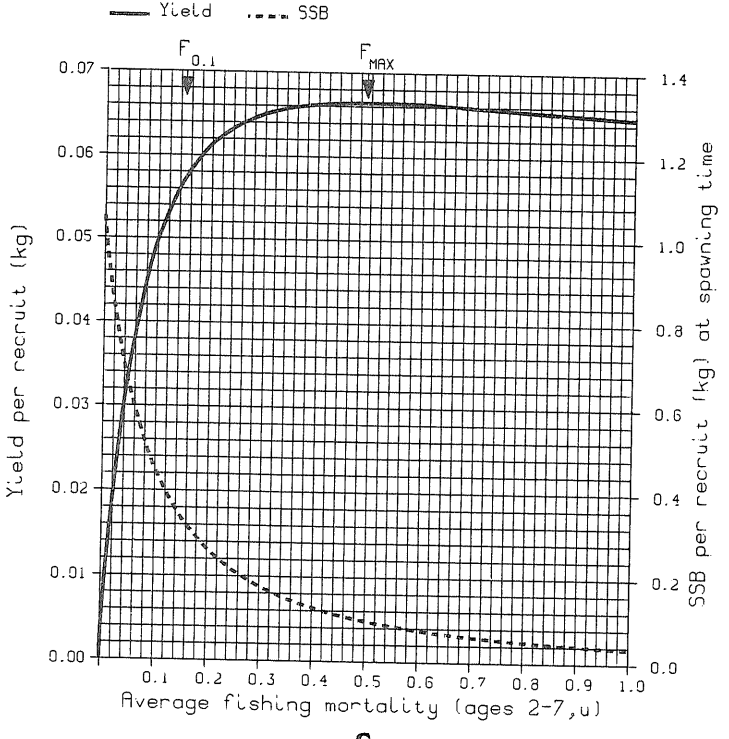
Table 7.5.3 cont'd.

FISH STOCK SUMMARY

STOCK: Herring - Northern Irish Sea

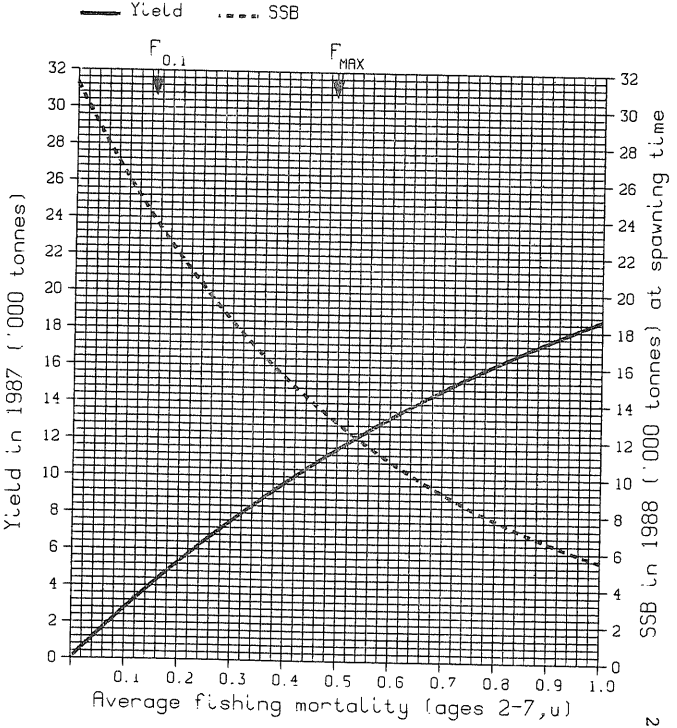
25-4-1986

Long-term yield and spawning stock biomass



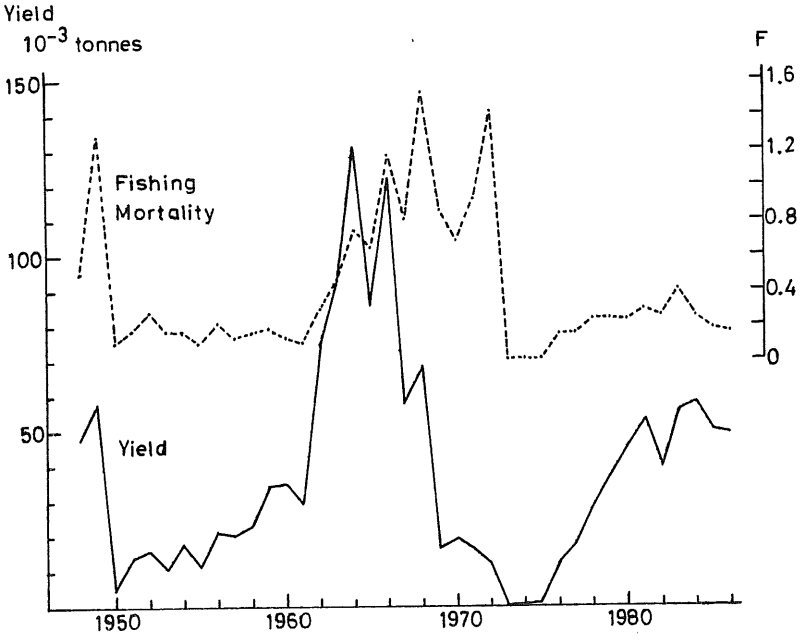
C

Short-term yield and spawning stock biomass



D

Figure 8.4.1 Trends in yield and fishing mortality (F). Icelandic (Division Va) summer-spawning herring.



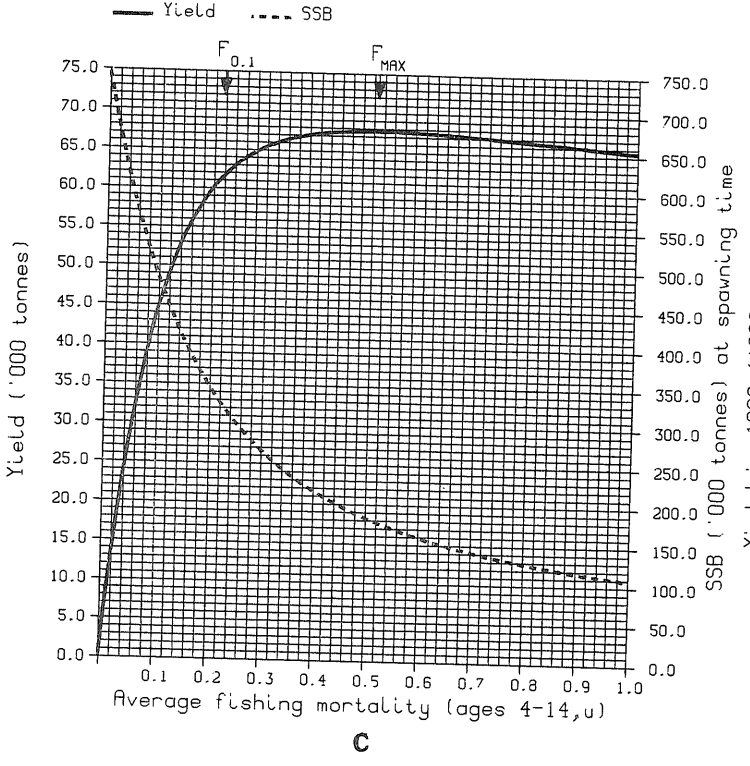
FISH STOCK SUMMARY

STOCK: Herring - Va (summer)

07-4-1986

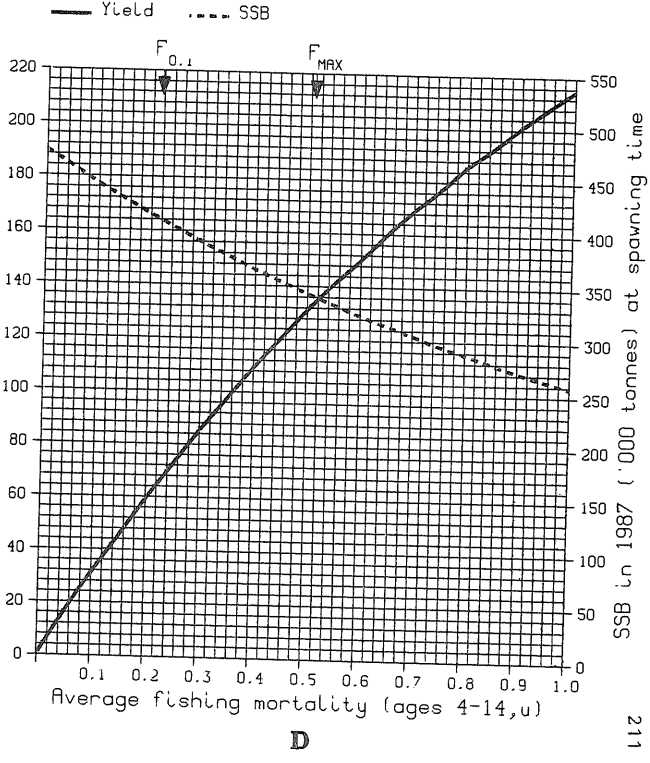
Figure 8.4.2

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

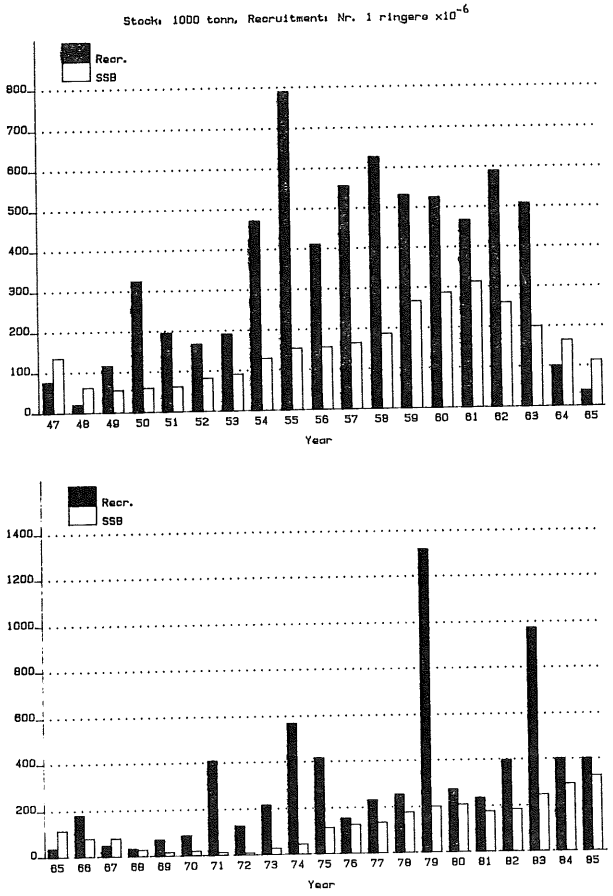


Figure 8.4.3 Trends in spawning stock biomass (SSB) and recruitment (Recr.). Recruitment year class, SSB year. (Note different scale in different sections of graph).