

PART 2

of

REPORT OF THE HERRING ASSESSMENT WORKING GROUP  
FOR THE AREA SOUTH OF 62°N

**Table 2.1 HERRING.** Catch in tonnes 1974-84 North Sea. Sub-area IV and Division VIId by country. (National catches as officially reported. Unallocated catches provided by Working Group members).

Country	1974	1975	1976	1977	1978
Belgium	603	2,451	2,451	57	-
Denmark	61,728	115,616	34,841	12,769	4,359
Faroe Islands	26,161 <sup>1)</sup>	25,854	14,378	8,078	40
Finland	-	-	1,034	-	-
France	12,548	20,391	14,468	1,613	2,119
German Dem. Rep.	3,268	2,689	2,624	2	-
Germany, Fed. Rep.	12,470	6,953	1,654	221	24
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
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
UK (Scotland) <sup>3)</sup>	15,034	8,904	15,015	8,159	437
USSR	18,096	20,653	10,935	78	4
<b>Total</b>					
North Sea	275,116	312,798	174,834	46,010	11,033

Country	1979	1980	1981	1982	1983	1984*
Belgium	-	-	-	9,700	5,969	5,080
Denmark	10,546	4,431	21,146	67,851	10,468	38,777
Faroe Islands	10	-	-	-	-	-
Finland	-	-	-	-	-	-
France	2,560	5,527	15,099	15,310	16,353	20,320
German Dem. Rep.	-	-	-	-	-	-
Germany, Fed. Rep.	10	147	2,300 <sup>2)</sup>	349 <sup>2)</sup>	1,837	12,092
Iceland	-	-	-	-	-	-
Netherlands	-	509	7,700	22,300	40,045	45,665
Norway	3,617	2,165	70	680	32,512	96,250
Poland	-	-	-	-	-	-
Sweden	-	-	-	-	284	884
UK (England)	2,253	77	303	3,730	111	1,622
UK (Scotland) <sup>3)</sup>	-	610	45	1,780	17,260	27,234
USSR	162	-	-	-	-	-
<b>Total</b>						
North Sea	19,158	13,466	46,663	122,056	133,794	247,924
<b>Total including un-</b>						
<b>allocated catches</b>	25,148	60,994	140,972	235,925	317,124	317,263

\* ) Preliminary

<sup>1)</sup> Supplied by Fiskirannsóknarstofvan

<sup>2)</sup> From Federal Republic of Germany national statistics compiled by Federal Research Board for Fisheries, Hamburg

<sup>3)</sup> Catches of juveniles from Moray Firth not included

Table 2.2.1 HERRING, catch in tonnes in Division IVa west.

Country	1980	1981	1982	1983	1984
Belgium	-	-	-	-	-
Denmark	687	11,357	3,155	4,282	26,786
France	651	1,851	1,970	680	1,408
Germany, Fed.Rep	-	-	-	1,542	12,092
Netherlands	-	-	-	15,745	19,143
Norway	-	-	-	16,971	21,305
UK (England)	-	-	-	-	-
UK (Scotland)	18	2	1,706	16,136	24,743
Sweden	-	-	-	213	(*)
Unallocated	1,762	6,492	300	3,955	24,030
Total	3,118	19,702	7,179	61,738	129,507

(\*) Included in IVb.

Table 2.2.2 HERRING, catch in tonnes in Division IVa East

Country	1980	1981	1982	1983	1984
Belgium	-	-	-	-	-
Denmark	-	-	491	-	126
France	-	-	-	-	-
Germany, Fed.Rep	-	-	-	-	-
Netherlands	-	-	-	-	-
Norway	21	70	680	-	49,125
UK (England)	-	-	-	-	-
UK (Scotland)	-	-	-	257	74
Unallocated	2,476	937	0	431	-
Total	2,497	1,007	1,171	688	49,325

Table 2.2.3 HERRING, catch in tonnes in Division IVb

Country	1980	1981	1982	1983	1984
Belgium	-	-	-	-	-
Denmark	3,733	9,689	64,205	6,050	13,808
France	176	524	561	705	2,299
Germany, Fed.Rep	147	2,300	118	-	2
Netherlands	35	-	219	300	4,600
Norway	1,607	-	-	14,156	25,820
UK (England)	76	13	3,128	40	1,956 <sup>1)</sup>
UK (Scotland)	592	43	74	867	2,417
Sweden	-	-	-	71	884 <sup>2)</sup>
Unallocated	9,258	65,811	90,262	159,124	41,294
Total	15,624	78,380	158,567	181,313	93,080

<sup>1)</sup> Includes catches mis-reported from IVc

<sup>2)</sup> Includes IVa catches

Table 2.2.4 HERRING, catch in tonnes in Divisions IVc and VIId

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

<sup>1)</sup> Includes 520 tonnes spring spawning herring.



Table 2.3 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 <sup>0</sup> E	0.3	-	0.9	2.6	5.6	6.9	4.3	5.9	3.0	0.9	30.4
	IVaE of 2 <sup>0</sup> E	-	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 <sup>0</sup> E	-	51.9	126.8	74.9	27.5	13.5	18.4	12.3	10.9	12.1	348.3
	IVaE of 2 <sup>0</sup> E	-	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	-	0	-	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 <sup>0</sup> E	-	29.5	409.2	165.7	89.6	27.2	12.9	14.7	7.6	14.7	771.1
	IVaE of 2 <sup>0</sup> E	-	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	13.5	162.3	120.7	34.3	23.0	2.0	0.4	-	0.4	358.7
TOTAL NS		2,189.4	560.9	976.2	421.2	191.2	78.2	21.7	24.1	10.6	17.8	4,491.3

**Table 2.4** Millions of HERRING caught annually per age group  
(winter rings) in the North Sea 1970-84.

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	560.9	976.2	421.2	191.2	78.2	21.7	24.1	10.6	17.8	4,491.3

**Table 2.5** North Sea HERRING 1984  
Millions caught by age groups (winter rings), divisions and quarters.

Division	Quarter	(Age) Winter Rings									Total	0+1 Rings	
		0	1	2	3	4	5	6	7	8			>8
		(1983)	(1982)	(1981)	(1980)	(1979)	(1978)	(1977)	(1976)	(1975)			
IVa(w of 2 <sup>0</sup> E)	I	-	-	14.5	11.7	10.5	2.1	1.4	1.2	1.0	1.1	43.5	-
	II	-	5.4	169.6	50.3	27.5	8.4	2.8	3.1	0.5	3.0	270.6	5.4
	III	-	17.5	152.1	57.9	37.7	10.3	5.7	8.7	4.1	6.7	300.7	17.5
	IV	-	6.6	73.0	45.8	13.9	6.4	3.0	1.7	2.0	3.9	156.3	6.6
	Total	-	29.5	409.2	165.7	89.6	27.2	12.9	14.7	7.6	14.7	771.1	29.5
IVa(w of 2 <sup>0</sup> E)	I	-	-	-	-	-	-	-	-	-	-	-	-
	II	-	11.0	101.9	50.8	28.3	15.4	0.9	4.0	-	0.4	212.7	11.0
	III	-	37.9	31.2	19.2	8.1	3.0	1.4	2.3	0.6	0.6	104.3	37.9
	IV	-	11.6	5.5	1.3	1.0	0.2	0.2	-	+	+	19.8	11.6
	Total	-	60.5	138.6	71.3	37.5	18.6	2.5	6.3	0.6	1.0	336.9	60.5
IVb	I	-	111.9	94.9	20.7	10.8	2.1	1.6	1.0	1.4	1.4	245.8	111.9
	II	-	60.8	31.5	10.1	5.3	2.3	0.7	1.0	0.3	-	112.0	60.8
	III	1,859.5	100.0	94.7	26.2	10.1	4.6	1.4	0.7	0.7	0.3	2,098.2	1,959.5
	IV	327.8	184.7	45.0	6.5	3.6	0.4	0.6	-	-	-	568.6	512.5
	Total	2,187.3	457.4	266.1	63.5	29.8	9.4	4.3	2.7	2.4	1.7	3,024.6	2,644.7
IVc + VIId	I	-	0.9	22.0	49.2	12.5	9.2	0.7	0.2	-	-	94.7	0.9
	II	-	+	0.3	1.9	2.1	0.9	0.1	+	+	-	5.3	+
	III	2.1	+	+	+	+	+	+	-	-	-	2.2	2.1
	IV	-	12.5	140.0	69.5	19.7	12.8	1.1	0.2	-	0.4	256.2	12.4
	Total	2.1	13.5	162.3	120.7	34.3	23.0	2.0	0.4	+	0.4	358.7	15.4

+ = <0.1

Table 2.6 Results of IKMT sampling compared with VPA-estimates of 0-group stock size.

Year Class	Mean number of larvae per rectangle					IKMT index weighted by area	VPA estimates of 0-group stock size x 10 <sup>-9</sup>
	North Sea NW	North Sea NE	North Sea SE	North Sea SW	Skagerrak Kattegat		
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	3.00
1978	42.67	5.35	0.81	15.60	8.64	2,460	7.68
1979	12.03	25.89	38.08	34.52	18.47	4,768	10.92
1980	12.43	0.33	28.69	17.78	33.67	3,423	29.90
1981	23.25	7.27	49.62	26.67	12.83	5,193	42.98
1982	2.63	9.79	37.96	14.23	47.92	3,904	
1983	3.27	12.17	51.60	23.23	33.86	4,880	
1984	19.18	5.83	52.24	40.85	22.31	5,829	

Table 2.7 Abundance indices (A) in thousands per hour, mean weight ( $\bar{l}$ ) in cm for length components in each area shown in Figure 2.4.

1983 year class in 1985 IYFS.

<u>Area</u>	<u>Mean <math>\bar{l}</math> (cm)</u>	<u><math>\hat{A}</math></u>	
65	8.3	459	
66	8.8	378	
63	10.3	2,518	Component 1
65	10.3	6,578	
66	10.3	5,291	$\bar{A}$ 30,802
72	11.7	5,694	$\bar{l}$ 11.28
51	12.3	137	
71	12.7	8,135	
31	12.7	1,612	
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66	13.2	1,890	
63	13.3	20,143	Component 2
41	13.4	179	
64	13.4	6,295	$\bar{A}$ 43,305
65	13.4	8,260	$\bar{l}$ 13.38
72	13.6	6,538	
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71	13.8	30,914	
33	14.3	3,740	
51	14.5	548	
42	14.5	6,228	
62	14.7	14,805	Component 3
63	14.7	13,308	
61	14.8	5,644	$\bar{A}$ 95,437
64	14.9	6,581	$\bar{l}$ 14.45
31	14.9	9,137	
13	14.9	243	
41	15.1	339	
32	15.3	342	
33	15.4	1,760	
23	15.4	1,848	
-----			
61	16.1	2,907	
62	16.3	18,095	
72	16.4	8,857	Component 4
51	16.4	12,272	
64	16.5	1,431	$\bar{A}$ 73,698
42	16.5	24,133	$\bar{l}$ 16.44
21	16.5	11,852	
22	16.6	321	
32	16.6	147	
23	16.7	3,926	
41	17.0	757	
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71	17.2	15,186	Component 5
42	17.8	8,563	$\bar{A}$ 24,968
41	18.4	717	$\bar{l}$ 17.47
22	18.5	502	
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Table 2.8 Estimated abundance  $\bar{a}$  (thousands per hour), mean VS and mean  $K_2$  of O-group HERRING components on the English O-group survey.

<u>Year Class</u>	<u>NORTH</u>			<u>BANK</u>		
	<u>Average a</u>	<u>Average VS</u>	<u>Average <math>K_2</math></u>	<u>Average a</u>	<u>Average VS</u>	<u>Average <math>K_2</math></u>
1983	1.746	56.612	13.566	4.766	56.250	13.403
1982	0.160	56.560	13.880	1.136	56.399	14.227
1981	4.827	56.464	13.964	1.392	56.532	14.083
1980	0.180	56.598	13.950	0.882	56.455	13.074
1979	1.448	56.471	13.882	0.259	56.574	14.777
1978	0.909	56.480	13.825	1.847	56.545	14.187
1977	3.388	56.587	13.972	0.202	56.393	14.963
1976	0.146	56.398	14.091	0.113	56.485	14.326
1975	-	-	-	0.694	56.280	14.220
1974	0.015	56.400	-	0.484	56.445	14.027
1973	0.032	56.461	14.108	1.389	56.512	14.264
1972	1.554	56.446	14.181	0.354	56.484	14.000
1971	0.018	56.467	13.944	1.771	56.410	14.152
1970	0.158	56.514	13.814	0.296	56.427	14.401
1969	1.480	56.501	14.036	3.474	56.320	14.099
1968	post larvae	post larvae	post larvae	post larvae	post larvae	post larvae
1967	4.713	56.507	14.023	0.463	56.423	14.207

DOWNNS

<u>Year Class</u>	<u>Average a</u>	<u>Average VS</u>	<u>Average <math>K_2</math></u>
1983	0.033	56.545	13.000
1982	0.858	56.636	14.382
1981	1.434	56.489	14.474
1980	0.512	56.681	14.088
1979	0.156	56.698	14.325
1978	1.649	56.660	14.486
1977	0.057	56.675	14.075
1976	0.033	56.350	14.299
1975	0.019	56.380	14.440
1974	0.037	56.356	14.304
1973	0.047	56.450	14.296
1972	0.061	56.357	14.261
1971	0.784	56.362	14.370
1970	2.500	56.522	14.270
1969	1.061	56.524	14.379
1968	1.770	56.447	14.582
1967	0.683	56.671	14.449

Table 2.9 Abundance indices of 0-group and 1-group and numbers of 2-ringed DOWNS HERRING

<u>Year Class</u>	<u>IVc, VIId VPA</u> <u>2-ringers x 10<sup>-6</sup></u>	<u>1-group x 10<sup>-3</sup></u> <u>IYFS</u>	<u>0-group x 10<sup>-3</sup></u> <u>English 0-group survey</u>
1970	280	4.70	
1971	270	5.80	
1972	200	9.58	
1973	170	4.31	
1974	49	5.07	
1975	67	3.39	19
1976	179	4.11	33
1977	220	1.95	57
1978	683	13.11	1,649
1979	480	8.83	156
1980	923	35.12	512
1981	(1,072)	46.55	1,434
1982		38.27	858
1983		1.00	33

Table 2.10 Estimated numbers at age and biomass of HERRING in Subareas shown in Figure 2.6 from Norwegian and Scottish acoustic survey. (No. x 10<sup>-6</sup>; biomass t x 10<sup>-3</sup>)

<u>AGE</u> <u>(rings)</u>	<u>ORKNEY-SHETLAND</u> <u>AREA</u>		<u>MORAY</u> <u>FIRTH</u>		<u>BUCHAN AREA</u>		<u>FLADEN</u> <u>AREA</u>		<u>ABER-</u> <u>DEEN</u> <u>AREA</u>	<u>EASTERN</u> <u>AREA</u>	<u>Σ</u>
	<u>Norweg.</u>	<u>Scottish</u>	<u>Mean</u>	<u>Scottish</u>	<u>Norweg.</u>	<u>Scottish</u>	<u>Mean</u>	<u>Norweg.</u>	<u>Scottish</u>	<u>Norweg.</u>	
1	179.1	283.1	231.1	14.7	171.3	253.8	212.6	45.9	40.3	6.1	550.7
2	809.5	1,162.4	986.0	19.1	291.3	329.0	310.2	331.5	52.2	18.6	1,717.6
3	495.5	396.8	446.2	1.8	73.7	31.5	52.6	93.1	5.0	10.9	609.6
4	246.8	181.3	214.0	0.7	16.5	12.5	14.5	24.2	2.0	8.7	264.1
5	82.9	51.2	67.0	0.1	5.5	2.5	4.0	7.0	0.4	3.0	81.5
6	34.5	28.3	31.4	-	1.4	0.7	1.0	1.6	0.1	1.9	36.0
7	39.9	36.6	38.2	-	1.3	-	0.6	2.7	-	4.4	45.9
8	27.3	19.3	23.3	-	0.4	0.4	0.4	9.8	0.1	4.5	38.1
≤9	24.4	17.9	21.2	-	0.2	-	0.1	11.4	-	4.2	36.9
<u>Σ</u>	1,939.9	2,176.7	2,058.3	36.4	561.6	630.4	596.0	527.2	100.1	62.0	3,380.2
Biom. Total	356	353	354	3	69	66	68	84	11	14	534
" spaw. stock	332	309	<u>320</u>	<u>2</u>	53	43	<u>48</u>	<u>76</u>	<u>7</u>	<u>13</u>	<u>466</u>



Table 2.11 Results of Acoustic Survey off Robin Hood's Bay  
(Division IVb), August-September 1984.

Dates	Total Miles integr.	Average spawning between transects (km)	Total Survey Area (km <sup>2</sup> )	Area with pelagic trage (km <sup>2</sup> )	Average* density (tonnes/km <sup>2</sup> )	Raised tonnes (1,000)
24-25.8.	198	2.9	910	477	101.2	48.3
26-28.8.	328	2.9	896	307	214.6	65.9
28-30.8.	266	1.5	711	596	95.7	57.0
30.8.	55	1.5	161	110	1,072.6	118.0
30-31.8.	101	1.5	258	125	878.1	104.8
1-2.9.	151	1.5	381	152	848.0	128.9
2-3.9.	134	1.5	354	190	1,202.6	228.5
3.9**	48	0.8	69	43	3,064.5	131.8

\*Using a target strength of -34.96 dB/kg.

\*\*This survey covered the central part of the main patch only.

Table 2.12 Age composition of HERRING samples taken during the Yorkshire Coast Acoustic Survey (Division IVb)

	<u>AGE (RINGS)</u>								
Stage 5 maturity and above	2 (1981)	3 (1980)	4 (1979)	5 (1978)	6 (1977)	7 (1976)	8 (1975)	9 (1974)	
% Number	78.8	11.3	4.7	2.4	0.6	0.4	0.1	0.2	
% Weight	74.7	12.8	6.4	3.3	0.9	0.6	0.2	0.4	
Average length (S.D.)	26.40 (1.06)	27.78 (1.27)	24.62 (0.80)	29.8 (0.73)	31.43 (1.27)	32.30 (0.42)	32.13 (0.75)	32.18 (0.67)	
Average weight (g)	164	195	238	242	282	299	292	292	
<u>Stock numbers and weight</u>									<u>Total</u>
No. x. 10 <sup>-6</sup>	956.2	137.1	57.0	29.1	7.3	4.9	1.2	2.4	1,195.2
Weight (1,000 tonnes)	157.1	26.9	13.5	6.9	1.9	1.3	0.4	0.8	208.8

Table 2.13. VIRTUAL POPULATION ANALYSIS  
 HERRING IN THE NORTHERN NORTH SEA (FISHING AREA IVA)

CATCH IN NUMBERS	UNIT: millions									
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
2	128	584	9	0	3	2	1	18	131	548
3	76	57	177	0	1	7	8	3	75	237
4	51	18	10	3	2	1	19	6	28	127
5	41	14	5	0	1	3	22	7	14	46
6	10	4	3	0	0	1	19	4	18	15
7	6	3	2	0	0	1	18	6	12	21
8	3	1	1	0	0	0	5	3	11	8
9+	1	0	0	0	0	0	1	1	12	16
TOTAL	317	680	206	4	6	15	93	47	302	1018

Table 2.14. VIRTUAL POPULATION ANALYSIS  
 HERRING IN THE NORTHERN NORTH SEA (FISHING AREA IVA)

FISHING MORTALITY COEFFICIENT	UNIT: Year <sup>-1</sup>					NATURAL MORTALITY COEFFICIENT = .10				
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
2	.660	.993	.059	.001	.018	.023	.004	.036	.157	.245
3	.907	.622	.842	.002	.006	.048	.099	.016	.188	.411
4	.747	.505	.178	.023	.018	.015	.169	.084	.209	.485
5	.792	.398	.215	.004	.005	.025	.320	.078	.265	.555
6	1.143	.142	.131	.005	.000	.006	.213	.087	.272	.480
7	1.707	.970	.065	.010	.000	.022	.236	.085	.337	.499
8	.791	.500	.670	.010	.000	.027	.180	.050	.200	.355
9+	.791	.500	.670	.010	.000	.027	.180	.050	.200	.355
(2-6)M	.758	.891	.496	.008	.012	.026	.134	.044	.179	.309
(2-6)U	.850	.532	.285	.007	.009	.024	.161	.060	.218	.435

Table 2.15. 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

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	277	966	172	114	165	101	191	529	952	2644	0
3	133	130	324	147	103	147	89	172	402	736	1872
4	102	49	63	126	132	93	127	73	153	346	442
5	77	44	27	48	112	118	85	97	61	112	193
6	15	32	27	19	43	101	104	54	81	42	58
7	8	4	25	21	17	39	90	76	45	56	24
8	6	1	1	21	0	16	34	65	63	29	31
9+	2	1	0	32	0	4	7	19	70	55	53
TOTAL NO	621	1226	638	528	573	618	725	1085	1887	4021	
SPS NO	348	639	446	491	532	568	615	984	1560	3056	
TOT. BIOM	127650	226119	132361	119679	126604	145877	171829	233037	387644	769407	
SPS BIOM	70825	120528	92757	111260	117578	134227	143892	210661	319046	579312	

**Table 2.16** Mean weights at age (g) in catch and stock in  
North Sea HERRING.

<u>Age</u> <u>(rings)</u>	<u>IVa</u>		<u>IVb</u>		<u>IVa + IVb</u>		<u>IVc + VIId</u>		<u>Total North</u>
	<u>Catch</u>	<u>Stock</u>	<u>Catch</u>	<u>Stock</u>	<u>Catch</u>	<u>Stock</u>	<u>Catch</u>	<u>Stock</u>	<u>Sea Stock</u>
2	126	172	126	164	126	166	117	126	155
3	176	203	176	195	176	201	141	161	187
4	211	232	211	238	211	234	170	191	223
5	243	260	243	242	243	255	192	215	239
6	256	284	256	282	256	283	221	231	276
7	267	303	267	299	267	302	224	232	299
8	271	315	271	292	271	309	216	232	306
9	271	318	271	292	271	315	208	232	312

Table 2.17 Calculations of F in 1984 in Division IVb.

	<u>Age Group</u>		<u>Spawn. Stock</u>	<u>SSB</u>
	<u>2</u>	<u>≥3</u>	<u>no. x 10<sup>-6</sup></u>	<u>t x 10<sup>-3</sup></u>
Stock size estimate at 1 September 1984	1,373.8	343.4	1,717.2	300.0
Catches in Div. VIB (Buchan incl.) in first three quarters of 1984	181.1	85.2		
Fishing mortality rate 1 January- 1 September	0.121	0.215		
Stock at 1 January 1984	1,657	455		
Catches in Div. IVb in whole year	228.1	96.8		
Fishing mortality rate 1984	0.156	0.252		

Table 2.18 VIRTUAL POPULATION ANALYSIS  
 HERRING IN THE CENTRAL NORTH SEA (FISHING AREA IVB)

CATCH IN NUMBERS	UNIT: millions				
	1980	1981	1982	1983	1984
2	6.6	40.9	58.3	101.7	260.1
3	1.3	8.5	6.1	35.9	63.5
4	.7	1.4	1.6	13.0	29.8
5	.4	.2	.7	1.6	9.4
6	.0	.4	.3	1.4	4.3
7	.1	.0	.4	.0	2.7
8	.0	.1	.1	.0	2.4
9+	.0	.0	.1	.0	1.7
TOTAL	9.1	51.5	67.6	213.6	579.9

Table 2.19 VIRTUAL POPULATION ANALYSIS  
 Natural Mortality Coefficient = .10  
 HERRING IN THE CENTRAL NORTH SEA (FISHING AREA IVB)

FISHING MORTALITY COEFFICIENT	UNIT: Year <sup>-1</sup>				
	1980	1981	1982	1983	1984
2	.14	.41	.25	.41	.16
3	.06	.25	.09	.22	.25
4	.04	.07	.06	.24	.25
5	.36	.01	.04	.07	.25
6	.00	.66	.02	.10	.25
7	.15	.00	6.62	.00	.25
8	.07	.19	.08	.24	.25
9+	.07	.19	.08	.24	.25
( 3- 6)W	.06	.16	.07	.20	.25
( 3- 6)U	.11	.25	.05	.16	.25

Table 2.20 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

	1980	1981	1982	1983	1984	1985
2	52	127	275	502	1889	0
3	25	40	76	194	301	1456
4	18	21	28	63	141	212
5	1	16	18	24	45	100
6	2	1	14	16	20	31
7	1	2	0	13	13	14
8	0	1	1	0	11	9
9+	0	0	1	0	8	14
TOTAL NO	99	207	415	811	2428	
SPS NO	86	158	342	611	2015	
TOT. BIOM	16563	38481	75983	148854	427532	
SPS BIOM	16275	29841	63208	113448	353692	



Table 2.21. VIRTUAL POPULATION ANALYSIS

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

CATCH IN NUMBERS	UNIT: millions				
	1980	1981	1982	1983	1984
2	118.9	245.6	157.9	285.0	200.1
3	91.0	34.9	186.2	98.5	130.4
4	28.9	13.3	24.1	50.5	40.4
5	13.0	3.3	5.7	8.5	23.6
6	1.1	2.9	2.3	2.6	2.6
7	.1	.6	1.9	.3	1.0
8	.0	.0	.6	.3	.5
9+	.0	.0	.0	.1	.8
TOTAL	253.1	300.6	378.8	451.8	399.4

Table 2.22. VIRTUAL POPULATION ANALYSIS

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

Natural mortality coefficient = .10

FISHING MORTALITY COEFFICIENT UNIT: Year<sup>-1</sup>

	1980	1981	1982	1983	1984	1980-82
2	.83	.47	.42	.39	.22	.57
3	1.41	.54	.70	.45	.28	.88
4	1.43	.69	.80	.42	.30	.97
5	1.08	.52	.65	.66	.27	.75
6	.40	.65	.75	.59	.38	.60
7	0.44	.38	1.07	.17	.43	3.30
8	1.36	.58	.71	.45	.43	.88
9+	1.36	.58	.71	.45	.43	.88
(3-6)W	1.36	.58	.71	.45	.28	
(3-6)U	1.08	.60	.73	.53	.31	

Table\_2.23. 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

	1980	1981	1982	1983	1984	1985
2	220	683	480	923	1072	0
3	125	87	386	285	505	780
4	40	28	46	173	164	388
5	21	9	13	18	103	110
6	3	6	5	6	9	71
7	0	2	3	2	3	5
8	0	0	1	1	1	2
9+	0	0	0	0	2	2
TOTAL NO	409	815	933	1408	1919	
SPS NO	132	453	486	846	1358	
TOT. BIOM	61	109	136	201	283	
SPS BIOM	19	60	69	120	199	

Table 2.24. VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN NORTH SEA (FISHING AREA IVA and IVb)

CATCH IN NUMBERS	UNIT: millions									
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
2	414.5	807.1	38.3	2.1	12.5	8.9	41.6	67.2	293.1	775.9
3	220.0	75.5	183.4	1.7	1.0	8.0	16.4	8.7	111.3	291.3
4	135.2	48.5	10.1	3.8	4.5	2.0	20.1	7.2	40.6	152.1
5	55.4	34.0	6.8	.3	1.5	3.3	21.9	7.6	15.1	53.9
6	16.1	5.8	4.1	.2	.1	.6	19.4	4.6	19.8	19.0
7	9.1	4.4	1.5	.2	.8	.9	18.1	6.3	12.3	23.1
8	3.4	1.0	.7	.2	.6	.4	5.4	3.1	10.9	10.1
9+	1.4	.4	.0	.3	.1	.1	1.1	1.0	12.1	17.0
TOTAL	855.1	976.7	244.9	8.8	21.1	24.2	144.0	105.7	515.2	1342.4

Table 2.25. VIRTUAL POPULATION ANALYSIS  
 HERRING IN THE NORTHERN NORTH SEA (FISHING AREA IVA and IVb)

FISHING MORTALITY COEFFICIENT		UNIT: Year-1					NATURAL MORTALITY COEFFICIENT = .10				
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	
2	1.285	1.180	.214	.016	.067	.065	.150	.095	.244	.333	
3	1.248	.752	.839	.012	.009	.050	.147	.038	.201	.361	
4	.894	.933	.182	.031	.035	.019	.155	.080	.224	.408	
5	.938	.516	.275	.007	.014	.030	.265	.073	.214	.458	
6	1.233	.200	.095	.010	.002	.006	.216	.073	.244	.402	
7	1.439	1.325	.065	.005	.047	.025	.229	.091	.254	.440	
8	1.080	.500	.670	.010	.018	.027	.180	.050	.200	.304	
9+	1.080	.500	.670	.010	.018	.027	.180	.050	.200	.304	
( 3- 6)W	1.080	.683	.642	.018	.018	.030	.189	.058	.211	.384	
( 3- 6)U	1.078	.600	.348	.015	.015	.026	.196	.066	.221	.407	

Table 2.26. VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN NORTH SEA (FISHING AREA IVA) and 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

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	596	1212	209	139	202	149	313	780	1420	2871	0
3	321	149	337	153	124	171	126	244	642	1007	1862
4	239	83	64	132	136	111	147	98	212	475	635
5	95	88	30	48	116	119	99	114	82	154	286
6	24	34	48	20	43	103	105	68	96	60	88
7	12	6	25	39	18	39	93	76	58	68	36
8	5	3	1	21	35	16	34	67	63	40	40
9+	2	1	0	32	6	4	7	22	70	68	72
TOTAL NO	1294	1577	713	584	660	712	924	1470	2644	4743	
SPS NO	511	639	459	517	590	625	718	1181	1918	3118	
TOT. BIOM	256279	285839	146350	130951	150314	162474	207323	300456	521595	900828	
SPS BIOM	104124	120892	96217	117348	132393	144658	163281	246514	385326	599417	

Table 2.26a. List of input variables for the ICES prediction program.

## HERRING NORTHERN AND CENTRAL NORTH SEA (IVA + IVB)

The reference F is the mean F for the age group range from 2 to 9

The number of recruits per year is as follows:

Year	Recruitment
1985	4300.0
1986	7369.0
1987	4094.0

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: gram  
 Weight by age group in the stock: gram  
 Stock biomass: tonnes  
 Catch weight: tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
2	4300.0	.32	.10	1.00	126.000	166.000
3	1862.0	.32	.10	1.00	176.000	201.000
4	635.0	.32	.10	1.00	211.000	234.000
5	286.0	.32	.10	1.00	243.000	255.000
6	88.0	.32	.10	1.00	251.000	283.000
7	36.0	.32	.10	1.00	267.000	302.000
8	40.0	.32	.10	1.00	271.000	309.000
9+	72.0	.32	.10	1.00	271.000	315.000

Table 2.27. Virtual Population Analysis.

NORTH SEA HERRING (FISHING AREA IV)

CATCH IN NUMBERS

UNIT: millions

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
0	898.1	684.0	750.4	289.4	996.1	263.8	238.2	256.8	130.0	542.0	791.7	7888.7
1	1196.2	4378.5	3340.6	2368.0	846.1	2460.5	126.6	144.3	168.6	159.2	161.1	447.0
2	2002.8	1146.8	1440.5	1344.2	772.6	541.7	901.5	44.7	4.9	34.1	108.0	264.3
3	883.6	662.5	343.8	659.2	362.0	259.6	117.3	186.4	5.7	10.0	91.8	56.9
4	125.2	208.3	130.6	150.2	126.0	140.5	52.0	10.8	5.0	10.1	32.2	39.5
5	50.3	26.9	32.9	59.3	56.1	57.2	34.5	7.0	.3	2.1	21.7	28.5
6	61.0	30.5	5.0	30.6	22.3	16.1	6.1	4.1	.2	.2	2.3	22.7
7	7.9	26.8	.2	3.7	5.0	9.1	4.4	1.5	.2	.8	1.4	18.7
8	12.0	.0	1.1	1.4	2.0	3.4	1.0	.7	.2	.6	.4	5.5
9+	12.2	12.4	.4	.6	1.1	1.4	.4	.0	.3	.1	.1	1.1
TOTAL	5249.3	7176.7	6045.5	4906.6	3189.3	3753.3	1482.0	656.3	315.4	759.2	1210.7	8772.9

	1982	1983	1984
0	9556.7	10029.9	2189.9
1	840.4	1146.6	560.2
2	268.4	544.8	976.0
3	230.1	216.4	421.7
4	33.7	105.1	192.5
5	14.4	26.2	77.5
6	6.8	22.8	21.6
7	7.8	12.8	24.1
8	3.6	11.0	10.6
9+	1.1	12.1	17.8
TOTAL	10963.0	12127.7	4491.9

Table 2.28. Virtual Population Analysis.

NORTH SEA HERRING (FISHING AREA IV)

	FISHING MORTALITY COEFFICIENT			UNIT: Year-1		VARIABLE NATURAL MORTALITY COEFFICIENT						
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
0	.044	.042	.071	.057	.090	.199	.188	.131	.071	.117	.121	.527
1	.338	.734	.699	.807	.534	.810	.305	.371	.259	.250	.097	.199
2	1.085	.995	.909	1.135	1.140	1.368	1.453	.231	.025	.103	.378	.315
3	1.306	1.256	.833	1.374	.992	1.549	1.207	1.383	.037	.060	.389	.311
4	1.319	1.208	.797	.986	.982	1.296	1.713	.275	.094	.077	.247	.257
5	.865	1.056	.531	.943	1.180	1.786	1.274	1.138	.010	.047	.212	.321
6	1.079	2.426	.489	1.259	1.054	1.256	.891	.416	.070	.007	.060	.319
7	1.000	2.693	.079	.723	.612	1.820	1.415	.497	.028	.384	.058	.794
8	1.000	.000	1.000	1.000	1.000	1.000	1.000	.800	.100	.100	.300	.300
9+	1.000	.000	1.000	1.000	1.000	1.000	1.000	.800	.100	.100	.300	.300
( 2- 9)W	1.146	1.123	.876	1.184	1.080	1.422	1.426	.790	.038	.082	.320	.319
	1982	1983	1984									
0	.416	.387	.070									
1	.211	.172	.070									
2	.242	.284	.300									
3	.440	.279	.330									
4	.273	.328	.380									
5	.126	.314	.380									
6	.105	.266	.410									
7	.154	.262	.440									
8	.300	.300	.320									
9+	.300	.300	.320									
( 2- 9)W	.287	.288	.321									



Table 2.29. 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												
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
0	33129	26164	17212	8253	18181	2275	2168	3268	2998	7679	10915	29201
1	5921	11667	9229	5898	2868	6113	686	661	1054	1028	2512	3559
2	3151	1897	2516	2062	1182	755	1222	227	205	366	360	1024
3	1260	963	635	917	600	342	174	259	163	181	298	223
4	178	309	248	250	210	201	66	47	59	142	154	183
5	91	43	84	101	84	71	50	11	32	48	119	109
6	96	35	14	44	36	23	11	13	3	29	42	87
7	13	30	3	8	11	11	6	4	8	3	26	36
8	20	0	2	2	3	6	2	1	2	7	2	22
9+	20	0	1	1	2	2	1	0	3	1	0	4
TOTAL NO	43879	41107	29942	17536	23178	9801	4385	4491	4528	9483	14429	34450
SPS NO	2110	1465	1829	1444	971	514	555	332	434	688	759	1279
TOT. BIOM	1621143	1547556	1308964	1005260	793367	594985	320866	183798	185638	311501	483673	926220
SPS BIOM	360704	251403	309938	250317	173117	92586	92572	59043	80098	128654	149058	234283
	1982	1983	1984	1985								
0	42975	47950	50951	0								
1	6342	10432	11983	17477								
2	1311	2309	3947	5020								
3	676	932	1572	2646								
4	148	394	638	1023								
5	128	102	257	395								
6	72	102	67	159								
7	57	58	71	40								
8	15	44	41	41								
9+	4	49	68	71								
TOTAL NO	51729	62372	69594									
SPS NO	1867	3082	4733									
TOT. BIOM	1397775	1959640	2546268									
SPS. BIOM	338286	554761	837015									

Table 2.30.

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 3 to 6

The number of recruits per year is as follows:

Year	Recruitment
1985	1000.0
1986	200.0
1987	200.0

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: gram  
 Weight by age group in the stock: gram  
 Stock biomass: tonnes  
 Catch weight: tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
2	1000.0	1.00	.10	1.00	116.000	126.000
3	779.7	1.00	.10	1.00	140.000	161.000
4	587.6	1.00	.10	1.00	170.000	191.000
5	110.6	1.00	.10	1.00	191.000	215.000
6	70.7	1.00	.10	1.00	221.000	231.000
7	5.4	1.00	.10	1.00	223.000	252.000
8	1.8	1.00	.10	1.00	216.000	232.000
9+	2.3	1.00	.10	1.00	208.000	232.000

Table 2.31 North Sea Herring landings by quarter

Catch in numbers at age/mean weight at age  
available to the Working Group

Country	Catch in number and weight supplied for the period	Proportion of total international catch in the period 1974-84	Total catch in the period 1974-83
Belgium			21 231
Denmark	1974-1984	30%	343 755
Faroe Islands			74 513
Finland			1 034
France	1974-1984 <sup>2</sup>	7%	105 988
German Dem.Rep.			8 583
Germany, Fed.Rep.	1983-1984 <sup>1</sup>	+	25 965
Iceland			54 715
Netherlands	1974-1984	15%	177 685
Norway	1974-1984	13%	146 842
Poland			23 993
Sweden			19 096
UK (England)			34 377
UK (Scotland)	1976-1984	4%	67 244
USSR			49 928
<b>Total</b>		<b>69%</b>	<b>1 154 949</b>

<sup>1</sup> Catch in weight 1974-82 available

<sup>2</sup> Divisions IVC + VIIId only

Table 3.1 HERRING in Division IIIa.  
Landings in tonnes 1974-84.  
(Data mainly provided by Working Group members).

<u>Skagerrak</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	
Denmark	35,732	29,997	7,326	19,889	6,425	
Faroe Islands	7,132	8,053	1,553	10,064	1,041	
Germany, Fed.Rep.	36	108	6	32	28	
Iceland	231	1,209	123	-	-	
Norway (Open sea)	698	196	-	-	1,860	
Norway (Fjords)	1,720	1,459	2,304	1,837	2,271	
Sweden	11,683	12,348	6,505	8,109	11,551	
<b>Total</b>	<b>57,232</b>	<b>53,370</b>	<b>17,817</b>	<b>39,931</b>	<b>23,176</b>	
<hr/>						
<u>Kattegat</u>						
Denmark	54,540	48,974	41,749	38,205	29,241	
Sweden	39,779	23,769	30,263	37,160	35,193	
<b>Total</b>	<b>94,319</b>	<b>72,743</b>	<b>72,012</b>	<b>75,365</b>	<b>64,434</b>	
<hr/>						
Division IIIa						
<b>Total</b>	<b>151,551</b>	<b>126,113</b>	<b>89,829</b>	<b>115,296</b>	<b>87,610</b>	
<hr/>						
<u>Skagerrak</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984*</u>
Denmark	5,153	5,180	18,001	22,881	54,102	36,776
Faroe Islands	817	526	990	715	1,980	891
Germany, Fed.Rep.	181	-	199	43	40	-
Iceland	-	-	-	-	-	-
Norway (Open sea)	2,460	1,350	6,330	10,140	500	-
Norway (Fjords)	2,259	2,795	950	1,560	2,834	1,494
Sweden	8,140	10,701	30,274	24,859	35,176	59,195
<b>Total</b>	<b>18,974</b>	<b>20,552</b>	<b>56,744</b>	<b>60,198</b>	<b>94,632</b>	<b>98,356</b>
<hr/>						
<u>Kattegat</u>						
Denmark	21,337	25,380	18,721	12,366	62,901	71,359
Sweden	25,272	18,260	38,871	38,892	40,463	35,027
<b>Total</b>	<b>46,609</b>	<b>43,640</b>	<b>57,592</b>	<b>51,258</b>	<b>103,364</b>	<b>106,386</b>
<hr/>						
Division IIIa						
<b>Total</b>	<b>65,583</b>	<b>64,192</b>	<b>114,336</b>	<b>111,456</b>	<b>197,996</b>	<b>204,742</b>
<hr/>						
Unallocated	8,117	20,053	57,000	35,344	-	-
<hr/>						
<b>Grand Total</b>	<b>73,700</b>	<b>84,245</b>	<b>171,336</b>	<b>146,800</b>	<b>197,996</b>	<b>204,742</b>

\*Preliminary

Table 3.2. VIRTUAL POPULATION ANALYSIS  
 HERRING IN FISHING AREA IIIA (KATTEGAT AND SKAGERRAK)

CATCH IN NUMBERS	UNIT: millions									
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
0	2006	433	934	147	457	682	3624	3334	4876	4969
1	1471	1474	1437	876	168	467	966	985	2603	2942
2	149	325	329	455	583	233	656	314	490	847
3	60	28	61	65	70	185	178	241	122	187
4	57	4	12	10	13	30	08	26	56	39
5	15	3	6	1	4	4	8	16	5	14
6	6	1	4	1	0	1	2	3	2	1
7	1	1	2	0	0	0	0	1	0	0
8+	1	1	0	0	0	0	0	0	0	0
TOTAL	3766	2270	2784	1555	1296	1603	5502	4920	8154	8999

Table 3.3 Estimates of stock size of HERRING in Division IIIa and Sub-divisions 22-24 of the western Baltic, 1981 - 1984.

Winter Rings	Nos. at age (millions)					Total
	1981	1982	1983	1984		
	Div.IIIa	Div.IIIa	Div.IIIa	Div.IIIa	Sub.d. 22-24	
0	1,840	6,171	1,424	926	231	1,156
1	698	2,349	3,526	1,989	3,602	5,590
2	1,260	989	1,160	1,999	1,221	3,219
3	44	221	413	741	826	1,566
4	22	31	122	124	406	830
5	2	8	13	11	99	110
6	.6	.8	-	2	62	64
7	-	.1	-	-	49	49
8	-	-	-	-	11	11
9	-	-	-	-	1	1
10+	-	-	-	-	10	10
<b>Total</b>	<b>3,867</b>	<b>9,770</b>	<b>6,658</b>	<b>5,792</b>	<b>6,518</b>	<b>12,306</b>
<b>Biomass</b>						
(total)		340,000	325,000	533,300	377,300	910,600
(adult stock)		123,000	185,000	390,000	262,000	652,000

Table 3.4 Weighted mean weights by age group for HERRING in Div. IIIa during August-September acoustic surveys in 1982-1984.

Age	Skagerrak		Kattegat		Baltic	
	No. $\times 10^{-6}$	$\bar{w}(g)$	No. $\times 10^{-6}$	$\bar{w}(g)$	Sub-div. 22-24 No. $\times 10^{-6}$	$\bar{w}(g)$
0	355	22.64	571	16.18	231	11.72
1	1,072	80.37	917	44.43	3,602	31.29
2	1,386	136.76	613	70.21	1,221	63.96
3	715	171.95	26	111.58	826	106.97
4	122	226.09	2	170.50	406	150.79
5	10	211.90	75	171.25	99	148.93
6	2	220.00			62	144.58
7					49	158.63
8					11	111.64
9					1	150.70
10+					10	148.33

Age	Skagerrak 1983		Kattegat		Skagerrak 1982		Kattegat	
	No. $\times 10^{-6}$	$\bar{w}(g)$	No. $\times 10^{-6}$	$\bar{w}(g)$	No. $\times 10^{-6}$	$\bar{w}(g)$	No. $\times 10^{-6}$	$\bar{w}(g)$
0	344	14.69	1,080	17.35	765	14.20	5,406	16.5
1	1,307	82.32	2,194	42.97	269	105.9	2,080	53.6
2	663	109.61	491	70.09	170	129.3	819	82.7
3	203	155.00	209	94.10	118	143.7	103	99.3
4	71	226.35	51	162.51	12	177.7	19	85.7
5	10	228.98	3	167.63	8	216.5		
6					0.8	260.0		
7					0.1			

Table 3.5 Length components of 1-group HERRING in Division IIIa from 1980-85.  
Mean lengths

Year	Strata	Length components							
		1(cm)	p	1(cm)	p	1(cm)	p	1(cm)	p
1980	1	14.0	.73			17.0	.27		
	2	14.6	.14			16.2	.86		
	3	15.1	.09					18.01	.91
	4					16.2	.45	18.2	.55
1981	1	12.9	.34			16.9	.66		
	2					15.6	.47	18.0	.53
	3					16.3	.24	19.1	.76
	4					17.4	.81	19.6	.19
1982	1	13.9	.15	15.5	.85				
	2			15.5	.60			18.0	.40
	3					17.2	1.0		
	4					17.4	.80	19.6	.20
1983	1	14.3	.27			17.0	.73		
	2	14.4	.11			17.5	.89		
	3	13.8	.58			17.3	.42		
	4	14.0	.65			17.5	.35		
1984	1	13.5	.55			16.3	.45		
	2	13.3	.50			16.4	.50		
	3	13.9	.26			15.4	.74		
	4	14.2	.57			16.4	.43		
1985	1	14.1	.82			16.9	.18		
	2	14.7	.32			16.2	.66		
	3	14.8	.91			17.8	.09		
	4	14.8	.06			15.3	.94		



**Table 4.1** Annual Celtic Sea and Division VIIj HERRING, 1975-84  
(Data provided by Working Group members)

Year	France	German Dem.Rep.	Germany Fed.Rep.	Ireland	Nether- lands	Poland	UK	USSR	Un- allocated	Total
1975	1,924	-	361	10,587	2,825	512	24	1,054	-	17,287
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

\*provisional

**Table 4.2** Celtic Sea and Division VIIj HERRING 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	UK	USSR	Un- allocated	Total
1974/75	2,150	-	435	13,939	2,462	954	-	-	-	19,940
1975/76	2,451	-	399	8,640	2,441	579	24	1,054	-	15,588
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

\* Provisional

Table 4.3. VIRTUAL POPULATION ANALYSIS

HERRING SOUTH AND SOUTH WEST OF IRELAND (FISH AREAS VIIG-J)  
 Category: Total. Autumn Spawning Component. Seasonal catch in numbers by age groups  
 CATCH IN NUMBERS UNIT: thousands

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	12768	13317	8159	2800	11335	7162	39361	5952	8646	14728
2	15429	11113	12516	13585	13913	30093	21285	19310	51096	34885
3	17783	7286	8610	11948	12399	11726	21861	5396	16505	19180
4	7333	7011	5280	5583	8636	6585	5505	3558	2120	12539
5	9006	2872	1585	1580	2889	2812	4438	1099	1291	2022
6	3520	4785	1898	1476	1316	2204	3436	1230	225	871
7	1644	1980	1043	540	1283	1184	795	1588	269	317
8	1136	1243	383	858	551	1262	313	282	759	195
9+	1194	1769	470	482	635	565	866	559	252	130
TOTAL	69813	51376	39944	38652	52957	63593	97860	38974	81163	84667
9)NOMIN.	15588	9771	7833	7559	10321	13130	17103	7250	14123	13640
(B/A) %	114	99	104	96	103	109	103	100	97	103

**Table 4.4** Celtic Sea HERRING. Winter spawners. Seasonal catch in numbers by age group.

Age Group	1982/83	1983/84	1984/85	- W
1	7,387	2,838	1,728	96
2	23,415	36,157	43,439	141
3	3,332	6,390	15,492	184
4	1,259	615	1,188	211
5	398	288	44	233
6	661	52	44	245
7	82	46	-	259
8	53	31	-	243
9+	37	9	35	261
-----				
<b>Total</b>	<b>38,624</b>	<b>46,429</b>	<b>61,977</b>	
-----				
<b>Tonnes</b>	<b>5,792</b>	<b>7,057</b>	<b>8,939</b>	
<b>SOP</b>	<b>5,380</b>	<b>6,777</b>	<b>9,422</b>	
	93	96	103	

Table 4.5 Celtic Sea HERRING. Biomass and larval indices.

## a) Autumn spawners

Year	Biomass		Larval index	Biom./Larv.Ind.	
	F=0.3	F=0.35		F=0.3	F=0.35
1978	21.7	23.7	10.8	2.19	2.19
1979	24.5	24.4	14.3	1.71	1.71
1980	24.4	24.2	11.5	2.12	2.10
1981	24.9	24.0	24.6	1.01	0.98
1982	31.6	29.9	21.9	1.44	1.37
1983	46.5	41.9	58.5	0.79	0.72
1984	47.3	41.0	56.3	0.84	0.73

## b) Winter spawners

Year	Biomass			Larval Index	Larval Index (adjust.)	Biomass/Larval Index		
	F=0.1	F=0.2	F=0.3			F=0.1	F=0.2	F=0.3
1982	18.9	13.9	8.3	5.2	7.62	2.48	1.82	1.09
1983	55.1	31.7	9.9	15.6	22.85	2.41	1.37	0.43
1984	92.7	48.0	33.1	53.4	78.23	1.19	0.61	0.42

Table\_4.6. VIRTUAL POPULATION ANALYSIS

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

FISHING MORTALITY COEFFICIENT	UNIT: Year-1										NATURAL MORTALITY COEFFICIENT =	.10
-----	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984		
1	.27	.21	.15	.07	.15	.15	.32	.04	.06	.12		
2	.54	.35	.28	.36	.47	.62	.75	.23	.48	.30		
3	.68	.47	.45	.41	.57	.80	1.15	.37	.27	.30		
4	.63	.55	.65	.52	.51	.61	1.01	.50	.22	.30		
5	.63	.48	.21	.36	.49	.28	.97	.49	.30	.30		
6	.67	.73	.59	.27	.51	.76	.56	.70	.15	.30		
7	.58	.89	.30	.30	.55	1.07	.61	.48	.28	.30		
8	.61	.48	.37	.38	.49	.60	.82	.40	.40	.30		
9+	.61	.48	.37	.38	.49	.60	.82	.40	.40	.30		
( 1- 9)W	.51	.37	.29	.30	.35	.48	.55	.16	.26	.24		
( 2- 7)W	.61	.48	.36	.39	.50	.63	.90	.29	.40	.30		

Table 4.7. VIRTUAL POPULATION ANALYSIS

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

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: .200  
PROPORTION OF ANNUAL M BEFORE SPAWNING: .500

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	56775	74161	60317	46174	87316	54190	152135	160099	165006	136729	0
2	38698	39259	54463	46829	39119	68243	42232	100330	139206	141086	61793
3	37641	20411	24987	37407	29683	22218	33261	18098	72456	77570	94573
4	16401	17245	11567	14453	22525	15125	9028	9522	11261	49903	51997
5	20111	7904	8968	5473	7792	12205	7456	2977	5246	8178	33451
6	7557	9679	4431	6610	3454	4314	8376	2560	1653	3523	5482
7	5494	3509	4235	2214	4581	1830	1821	4327	1154	1282	2361
8	2601	3413	1306	2843	1491	2928	585	896	2411	789	859
9+	2734	4857	1603	1597	1718	1311	1618	1776	801	526	881
TOTAL NO	188011	180436	171878	163599	197680	182414	256531	300585	399194	419585	
SPS NO	136126	125736	126546	125056	135261	132661	150956	201713	283373	316880	
TOT. BIOM	34649	31133	29532	29443	33099	31952	38963	45085	63917	60995	
SPS BIOM	26615	23372	23157	23734	24668	24481	24870	31567	46464	47303	

Table 4.8.

List of input variables for the ICES prediction program.

CELTIC SEA AUTUMN SPAWNERS CATCH PREDICTION

The reference  $F$  is the maximum value in the  $F$  at age array (age 9).

The number of recruits per year is as follows:

Year	recruitment
1985	77000.0
1986	77000.0
1987	77000.0

Proportion of  $F$  (fishing mortality) effective before spawning: .3300  
 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	77000.0	.12	.10	.50	.108	.108
2	61793.0	.30	.10	1.00	.163	.163
3	94573.0	.30	.10	1.00	.202	.202
4	51997.0	.30	.10	1.00	.224	.224
5	33451.0	.30	.10	1.00	.234	.234
6	5482.0	.30	.10	1.00	.253	.253
7	2361.0	.30	.10	1.00	.255	.255
8	859.0	.30	.10	1.00	.263	.263
9+	681.0	.30	.10	1.00	.265	.265



Table 4.9.

List of input variables for the ICES prediction program.

CFLTIC SEA WINTER SPAWNERS CATCH PREDICTION

The reference F is the maximum value in the F at age array (age 9).

The number of recruits per year is as follows:

Year	Recruitment
1985	100000.0
1986	100000.0
1987	100000.0

Proportion of F (fishing mortality) effective before spawning: .1000  
 Proportion of M (natural mortality) effective before spawning: .8300

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	100000.0	.08	.10	.50	.096	.096
2	83527.0	.20	.10	1.00	.141	.141
3	186242.0	.20	.10	1.00	.184	.184
4	66421.0	.20	.10	1.00	.211	.211
5	5093.0	.20	.10	1.00	.233	.233
6	188.0	.20	.10	1.00	.245	.245
7	33.0	.20	.10	1.00	.259	.259
8	.0	.20	.10	1.00	.260	.260
9+	1.0	.20	.10	1.00	.261	.261

**Table 4.10** Catch and stock prediction for Celtic Sea autumn spawning HERRING (Celtic Sea and Division VIIj).

1 9 8 5				Manage-	1 9 8 6				1 9 8 7	
Stock	Spawn-			ment	Stock	Spawn-			Stock	Spawn-
biom-	ing	F	Catch	option	bio-	ing	F	Catch	bio-	ing
mass	stock	(2-7)	***	for	mass	stock	(2-7)		mass	stock
*	biom **			1986	*	biom **			*	biom **
59,400	50,900	.10	5,100	F <sub>0-1</sub> F=.16	65,500	55,600	.16	8,300	67,500	57,400
				.30						
				=F <sub>84</sub>	65,500	53,100	.30	15,000	60,300	48,600
				F <sub>max</sub> =0.46	65,500	50,500	.46	21,600	53,400	40,600

Weights in '000 tonnes

\* Stock biomass calculated at 1 January

\*\* SSB calculated at spawning time, i.e., 1 October

\*\*\* The assumed catch in 1984 corresponds to the agreed TAC

**Table 4.11** Catch and stock prediction for Celtic Sea winter spawning herring

1 9 8 5				1 9 8 6				1 9 8 7		
Stock biom. *	Spawn- ing stock biom.**	F <sub>(2-7)</sub>	Management option		Stock biom. *	Spawn- ing stock biom.**	F <sub>(2-7)</sub>	Stock biom. *	Spawn- ing stock biom.**	
			Catch ***	for 1986						Catch
71,000	60,100	.14	7,900	F <sub>0-1</sub> =.15	78,200	66,600	.15	9,600	82,300	70,300
				F <sub>86</sub> =F <sub>84</sub>	78,200	66,209	.20	12,600	79,200	67,100
				F <sub>max</sub>	78,200	65,600	.39	22,300	68,500	56,500

Weights in '000 tonnes

\* Stock biomass calculated at 1 January

\*\* SSB calculated at spawning time, i.e., 1 January

\*\*\* The assumed catch in 1984 corresponds to the agreed TAC

Table 5.1 Catch in weight, Division VIa (North) 1975-1984.

<u>Country</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>
Denmark	374	249	626	128	-
Faroës	3,895	4,017	3,564	-	-
France	1,244	1,481	1,548	1,435	3
German Dem. Rep.	600	279	-	-	-
Germany, Fed. Rep.	5,582	4,084	-	26	-
Iceland	2,633	3,273	-	-	-
Netherlands	12,024	16,573	8,705	5,874	-
Norway	509	5,183	1,098	4,462	-
Poland	376	390	-	-	-
Sweden	-	2,206	261	-	-
UK (England)	125	20	301	134	54
UK (Scotland)	85,395	53,351	25,238	10,097	3
USSR	1,244	2,536	-	-	-
Unallocated	-	-	-	-	-
<b>TOTAL</b>	<b>114,001</b>	<b>93,642</b>	<b>41,341</b>	<b>22,176</b>	<b>60</b>

<u>Country</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984*</u>
Denmark	-	1,580	-	-	96
Faroës	-	-	74	834	954
France	2	1,243	2,069	1,313	-
German Dem. Rep.	-	-	-	-	-
Germany, Fed. Rep.	256	3,029	8,453	6,283	5,507
Iceland	-	-	-	-	-
Netherlands	-	5,602	11,317	20,200	7,729
Norway	-	3,850	13,018	7,336	5,980
Poland	-	-	-	-	-
Sweden	-	-	-	-	-
UK (England)	33	1,094	90	-	-
UK (Scotland)	15	30,389	38,381	31,616	37,431
USSR	-	-	-	-	-
Unallocated	-	4,633	18,958	-4,059	16,588
<b>TOTAL</b>	<b>306</b>	<b>51,420</b>	<b>92,360</b>	<b>63,523</b>	<b>74,285</b>

\*preliminary

Table 5.2. VIRTUAL POPULATION ANALYSIS  
 HERRING IN THE NORTHERN PART OF VIA

CATCH IN NUMBERS	UNIT: thousands									
-----	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	172879	69053	34836	22525	392	12867	36740	13304	31923	2927
2	202037	319604	47739	46284	225	1335	77961	250010	77810	250362
3	89066	101548	95834	20587	122	452	105600	72179	92743	66084
4	63701	35502	22117	40692	31	246	61341	93544	29262	46420
5	188202	25195	10083	6879	21	62	21473	58452	42535	19825
6	30601	76289	12211	3833	12	43	12625	23580	27318	15074
7	12297	10918	20992	2100	7	40	11583	11516	14709	12334
8	13121	3914	2758	6278	2	3	1309	13814	8437	5871
9+	13698	12014	1486	1544	0	1	1526	4027	8484	2599
TOTAL	785652	654037	248056	150722	812	15049	329956	540426	383221	421496

Table 5.3. HERRING in Division VIa.  
Mean weights at age (kg).

Age (Rings)	Weight in the stock	Weight in the catch 1970-81	Weight in the catch 1982-84
1	0.090	0.090	0.090
2	0.164	0.121	0.140
3	0.208	0.158	0.175
4	0.233	0.175	0.205
5	0.246	0.186	0.231
6	0.252	0.206	0.253
7	0.258	0.218	0.270
8	0.269	0.224	0.284
9	0.292	0.224	0.295

Table 5.4. HERRING in Division VIa (North).  
Predictive regression between revised larval  
indices (numbers  $\times 10^{-9}$ ) and spawning stock  
biomass (tonnes  $\times 10^{-3}$  age 2 and older).  
Regression based on data from 1973-80.

Year	Larval index	Spawning stock biomass
1972	1582.5	592
1973	2789.9	413
1974	1668.0	220
1975	1023.2	125
1976	183.2	101
1977	851.3	71
1978	355.7	64
1979	1071.1	106
1980	1437.6	171
1981	2053.2	185
1982	1821.3	188
1983	748.6	176
1984	1959.3	262*

\* Predicted from regression equation

$$Y = 5.577 + 0.131 X \quad (r = 0.94)$$

Table 5.5. VIRTUAL POPULATION ANALYSIS

## HERRING IN THE NORTHERN PART OF VIA

	FISHING MORTALITY COEFFICIENT					UNIT: Year-1	NATURAL MORTALITY COEFFICIENT = .10				
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	
1	.241	.317	.162	.071	.001	.038	.055	.032	.070	.050	
2	.817	.809	.355	.299	.001	.004	.297	.557	.231	.280	
3	.893	1.201	.534	.210	.001	.002	.367	.437	.365	.280	
4	.838	1.009	.623	.403	.000	.002	.314	.567	.262	.280	
5	.861	.852	.793	.580	.000	.001	.248	.492	.434	.280	
6	.950	.944	1.265	.712	.002	.001	.216	.416	.393	.280	
7	1.023	.980	.652	.665	.002	.006	.212	.278	.440	.280	
8	.855	.985	.628	.363	.001	.001	.223	.373	.300	.280	
9+	.855	.985	.628	.363	.001	.001	.223	.373	.300	.280	
(2-7)0	.897	.960	.734	.478	.001	.002	.276	.458	.367	.280	

Table 5.6. 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

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	845848	266720	243803	346192	442259	364514	715271	450668	1273843	65040	0
2	377992	601305	175854	187523	291843	399800	317595	612286	395134	1074772	54259
3	157276	151157	242210	113853	125778	263856	360485	213426	317395	285690	734995
4	117146	58240	41154	128441	83478	113693	238317	226077	124734	199275	194005
5	340255	45846	19218	16350	77656	75505	102640	157466	116035	85106	136277
6	52057	130188	17695	7865	8284	70246	68261	72497	87129	64711	58201
7	20011	18214	45819	4519	3493	7484	65520	49784	43254	52948	44253
8	25823	6512	6183	21606	2103	3154	6734	46482	34122	25203	36209
9+	24871	19988	3531	5314	0	1051	6322	15550	34312	11157	24866
TOTAL NO	1959260	1298169	795266	831662	1034895	1299303	1879645	1842235	2425959	1859904	
SPS NO	587480	528439	363120	365041	553953	872774	886559	927364	868716	1392977	
TOT. BIOM	315775	224002	134395	130055	155936	219109	309611	324354	355388	348317	
SPS BIOM	125024	101432	72302	73931	108554	173967	187098	190269	180212	265626	



Table 5.7 Herring in Division VIa (North)  
 Mean number of 2-ringers per hour  
 fishing in the Scottish Young  
 Fish Survey and VPA estimates of  
 2-ringers in the stock.

Year	Survey estimate	VPA (millions)
1980	6 766	399.8
1981	1 157	317.6
1982	2 175	612.3
1983	14	395.1
1984	15 578	1 074.8
1985	173	[349.0]*

\* estimated from the regression

$$y = 340.63 + 0.0463 x ; r = 0.84$$

Table 5.8. List of input variables for the ICES prediction program.

HERRING IN DIVISION VIA (NORTH)

The reference F is the maximum value in the F at age array (age 2).

The number of recruits per year is as follows:

Year	recruitment
1985	349000.0
1986	349000.0
1987	349000.0

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	349000.0	1.00	.10	1.00	.140	.164
3	734995.0	1.00	.10	1.00	.175	.208
4	194005.0	1.00	.10	1.00	.205	.233
5	136277.0	1.00	.10	1.00	.231	.246
6	58201.0	1.00	.10	1.00	.253	.252
7	44253.0	1.00	.10	1.00	.270	.258
8	36209.0	1.00	.10	1.00	.284	.269
9+	24866.0	1.00	.10	1.00	.295	.292

Table 5.9 Mean vertebral counts of HERRING (2 rings and older) from the Firth of Clyde, 1968-1982 (number of fish sampled in parenthesis)

Year	Ring-net and pair trawl fisheries (April-December)	Trammel net fishery on spawning grounds (February-April)
1968	56.86 (1,457)	57.10 (95)
1969	56.90 (1,649)	56.97 (150)
1970	56.76 (1,602)	57.12 (141)
1971	56.74 (1,483)	57.08 (184)
1972	56.71 (1,349)	57.05 (501)
1973	56.63 (1,134)	56.66 (93)
1974	56.77 (1,015)	57.27 (99)
1975	56.53 (462)	56.93 (60)
1976	56.78 (539)	57.03 (169)
1977		
1978		
1979	56.66 (3,641)	
1980		
1981	56.62 (1,277)	
1982	56.76 (1,331)	

---

1968-1976 values from CM 1978/H:67 revised

Table 5.10 Recoveries of HERRING tagged in the Firth of Clyde, 1976-82, by year and area of recapture.

Month + Year of Tagging	Year of Recapture	Firth of Clyde	Irish Sea	NW Ireland	Minch	SW Ireland	Unknown	% Outside Clyde
<u>October 1976</u>								
	1976	128	0	0	0	0	1	0
	1977	206	1	2	0	0	4	1.4
	1978	9	0	0	0	0	1	0
	∑	343	1	2	0	0	6	0.9
	%	99.1	0.3	0.6	0	0		
<u>July 1977</u>								
	1977	258	5	0	2	0	6	2.6
	1978	31	0	0	0	0	3	0
	∑	289	5	0	2	0	9	2.4
	%	97.6	1.7	0	0.7	0		
<u>May 1979</u>								
	1979	504	25	3	1	0	0	5.4
	1980	73	0	0	0	0	0	0
	∑	577	25	3	1	0	0	4.8
	%	95.2	4.1	0.5	0.2	0		
<u>May-June 1980</u>								
	1980	588	9	4	0	0	0	2.2
	1981	199	5	9	2	2	2	8.3
	1982	28	0	1	1	1	1	9.7
	1983	11	0	1	0	0	3	8.3
	∑	826	14	15	3	3	6	4.1
	%	95.9	1.6	1.7	0.3	0.3		
<u>November 1982</u>								
	1983	11	0	2	0	0	1	15.4
	%	84.6	0	15.4	0	0		

Table 5.11 Mean lengths at age (cm) of HERRING in catches from the Firth of Clyde (based on data from landings and discards)

<u>Age</u> <u>(rings)</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>October</u>
1	20.2	18.4	22.6	22.6	22.3	22.2
2	25.2	25.1	26.2	26.4	26.9	26.9
3	28.4	28.2	28.6	29.1	29.0	29.3
4	29.6	29.7	29.5	29.6	30.4	30.6
5	30.6	30.6	30.0	30.7	30.5	31.6
6	30.6	31.8	29.6	32.9	-	32.9
7	32.9	31.4	31.0	31.1	-	34.4
8	31.3	31.9	32.1	32.3	-	35.3
9	-	32.8	32.3	31.8	-	-
>10	31.6	33.0	33.4	33.0	-	-

Table 5.12 Monthly landings (tonnes) of HERRING from the Firth of Clyde (all fishing methods combined). (Data provided by the Working Group).

<u>Month</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
January	*	*	*	4*	4*	6*	15*
February	68*	7*	*	6*	8*	3*	15*
March	85	69*	*	7*	13*	8*	14*
April	369	521	530	246	12*	4*	32*
May	283	436	544	245	4*	2*	25*
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
October	811	598	556	653	263	79	*
November	571	595	560	647	1*	3*	2*
December	120	236	328	272	-*	2*	4*
Not known	44	50	35				
TOTAL	3,663	4,139	4,847	3,862	1,951	2,081	2,135

<u>Month</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>
January	2*	+ *	- *
February	16*	1*	- *
March	1*	1*	- *
April	2*	- *	- *
May	615	1*	554
June	850	265	847
July	757	519	944
August	262	681	276
September	- *	604	246
October	- *	457	124
November	- *	1*	*
December	1*	- *	- *
Not known		273**	247**
TOTAL	2,506	2,803	3,238

\*Subject to closure of directed fishery

\*\* Landed in Northern Ireland and Isle of Man.

**Table 5.13** Monthly catches of Clyde HERRING in number-at-age ( $10^{-3}$ ) in landings and discards, 1984.

Age (W-ring)	MAY		JUNE		JULY		AUGUST	
	Landings	Discards/	Landings	Discards/	Landings	Discards/	Landings	Discards
0	-	-	-	-	14	34	-	11
1	5	91	31	1,585	43	1,393	16	427
2	607	2,379	882	1,395	1,571	1,472	396	451
3	1,212	623	1,157	266	1,383	118	411	36
4	536	137	1,164	48	1,073	36	248	11
5	255	28	666	16	339	2	113	+
6	185	23	288	+	53	+	22	+
7	75	+	209	+	154	+	41	+
8	85	5	193	-	68	-	22	-
9	-	-	22	-	45	-	8	-
>10	17	+	41	-	16	-	5	-

Age (W-ring)	SEP		OCT		Sprat Fishery			Tot Yea
	Landings	Discards/	Landings	Discards	Age (W-ring)	By-catch Jan-Mar	Oct-Dec	
0	-	-	-	-	0	-	467	5
1	10	230	+	107	1	185	31	4,1
2	838	1,078	261	499	2	-	-	11,8
3	293	83	154	39	3	-	-	5,7
4	73	12	63	6	4	-	-	3,4
5	30	3	55	1	5	-	-	1,5
6	-	-	16	-	6	-	-	5
7	-	-	8	-	7	-	-	4
8	-	-	1	-	8	-	-	3
9	-	-	-	-	9	-	-	
>10	-	-	-	-	>10	-	-	

Table 5.14 Number of days absent from port by pair-trawlers in the Firth of Clyde, 1974-84.

Year	Days Absence
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

Table 5.15 VIRTUAL POPULATION ANALYSIS

## CLYDE HERRING

CATCH IN NUMBERS

UNIT: thousands

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
0	.0	.0	.0	.0	.0	380.0	.0	427.0	479.0	525.7
1	12694.0	6194.0	1041.0	14123.0	507.0	333.0	312.0	220.0	314.0	4156.0
2	1876.0	10480.0	7524.0	1796.0	4859.0	5633.0	2372.0	11311.0	10109.0	11828.5
3	2483.0	913.0	6976.0	2259.0	807.0	1592.0	2785.0	4079.0	5232.0	5773.6
4	1024.0	1049.0	1062.0	2724.0	930.0	567.0	1622.0	2440.0	1747.0	3406.4
5	1072.0	526.0	1112.0	634.0	888.0	341.0	1158.0	1028.0	963.0	1508.8
6	451.0	638.0	574.0	606.0	341.0	204.0	433.0	663.0	555.0	587.3
7	175.0	261.0	489.0	330.0	289.0	125.0	486.0	145.0	415.0	488.6
8	356.0	138.0	251.0	298.0	156.0	48.0	407.0	222.0	189.0	375.2
9	130.0	178.0	146.0	174.0	119.0	56.0	74.0	63.0	85.0	74.1
10+	67.0	100.0	192.0	236.0	154.0	68.0	18.0	53.0	38.0	79.8
TOTAL	20328.0	20477.0	19367.0	23180.0	9050.0	9347.0	9667.0	20651.0	20126.0	28804.0



Table\_5.16. VIRTUAL POPULATION ANALYSIS

CLYDE HERRING

	FISHING MORTALITY COEFFICIENT					UNIT: Year <sup>-1</sup>	NATURAL MORTALITY COEFFICIENT = .10				
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	
2	.313	.547	.798	.190	.383	.380	.125	.332	.252	.200	
3	.450	.220	.765	.521	.110	.185	.291	.290	.225	.200	
4	.306	.309	.381	.086	.373	.094	.260	.396	.174	.200	
5	.371	.289	.551	.365	.440	.202	.252	.234	.238	.200	
6	.321	.350	.517	.584	.304	.151	.378	.200	.171	.200	
7	.254	.277	.438	.563	.541	.155	.560	.186	.167	.200	
8	.538	.291	.415	.462	.502	.142	.919	.477	.349	.200	
9	.500	.500	.500	.500	.300	.300	.300	.300	.300	.200	
10+	.500	.500	.500	.500	.300	.300	.300	.300	.300	.200	
( 2- 9)W	.376	.450	.695	.417	.319	.260	.223	.315	.230	.200	
( 3- 9)W	.402	.288	.634	.560	.259	.156	.307	.296	.210	.200	

Table 5.17. VIRTUAL POPULATION ANALYSIS

CLYDE 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: .750  
 PROPORTION OF ANNUAL H BEFORE SPAWNING: .750

		1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	7316	26019	14292	10899	16000	18683	21242	41997	47529	68457		0
3	7170	4841	13623	5824	8157	9872	11500	16967	27275	33414		50714
4	3499	4136	3514	5735	3131	6614	7421	7823	11484	19714		24754
5	3626	2195	2747	2173	2614	1952	3446	5176	4766	8732		14605
6	1721	2265	1487	1433	1365	1524	1442	3829	3708	3399		6469
7	818	1129	1445	802	724	912	1185	895	2835	2828		2518
8	896	574	774	844	414	381	706	612	672	2171		2095
9	346	473	388	463	481	226	299	255	344	429		1009
10+	178	266	511	628	623	275	73	214	154	462		660
<hr/>												
SPS	NO	17898	27871	21547	19737	24586	30985	38754	56992	77118	111478	
<hr/>												
SPS	BIOM	4927	7154	5813	5240	6426	8135	10092	14575	19918	28735	

Table 5.18 Input data for Clyde HERRING catch and stock prediction

Age	W (g)	No. x 10 <sup>-3</sup>		F	No. x 10 <sup>-3</sup>	
		at	1 Jan 1984			
2	225	68,457	0.20	17,000		
3	270	33,414	0.20	50,714		
4	290	19,714	0.20	24,754		Proportion of M before spawning 0.75
5	310	8,732	0.20	14,605		" F before spawning 0.80
6	328	3,399	0.20	6,469		
7	340	2,828	0.20	2,518		
8	345	2,171	0.20	2,095		TAC constraint in 1985 = 4,540 tonnes
9	350	429	0.20	1,609		
>10	350	462	0.20	660		
<b>Biomass (t)</b>						
1 Jan		35,986		40,224		
SSB		28,735				

**Table 6.1** Estimated catches in weight in Divisions VIa  
(south) and VIIb,c, 1975-84

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	-	12	-	-	-	-	-	-	-	-
France	68	47	-	-	-	-	-	353	19	-
German Dem.Rep.	1,394	890	-	-	-	-	-	-	-	-
Germany Fed.Rep.	4,431	924	221	100	5	-	2,687	265	-	-
Ireland	12,465	10,895	15,916	19,128	18,910	27,499	19,443	16,856	15,000	10,000
Netherlands	15,208	16,546	4,423	481	1,939	1,514	2,790	1,735	5,000	6,400
Poland	2,558	2,778	6	-	-	-	-	-	-	-
United Kingdom (N Ireland)	6	1	1	6	2	1	2	-	-	-
USSR	2,634	674	-	-	-	-	-	-	-	-
Unallocated	-	-	-	-	1,752	1,110	-	-	13,000	11,000
<b>Total</b>	<b>38,764</b>	<b>32,767</b>	<b>20,567</b>	<b>19,715</b>	<b>22,608</b>	<b>30,124</b>	<b>24,922</b>	<b>19,209</b>	<b>33,019</b>	<b>27,400</b>

\* Provisonal

Table 6.2. VIRTUAL POPULATION ANALYSIS

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

CATCH IN NUMBERS	UNIT: thousands									
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	7360	16613	4485	10170	5919	2856	1620	748	1517	2794
2	41308	29011	44512	40320	50071	40058	22265	18136	43688	81481
3	25117	37512	13396	27079	19161	64946	41794	17004	49534	28660
4	29192	26544	17176	13308	19969	25140	31460	28220	25316	17854
5	23718	25317	12209	10685	9349	22126	12812	18280	31782	7190
6	10703	15000	9924	5356	8422	7748	12746	8121	18520	12836
7	5909	5208	5534	4270	5443	6946	3461	4089	6695	5974
8	9378	3596	1360	3636	4423	4344	2735	3249	3329	2008
9+	32029	15703	4150	3524	4090	5334	5220	2875	4251	4020
TOTAL	184714	174504	112746	118150	126847	179498	134113	100722	184432	162817
TONNES	38764	32767	20567	19715	22608	30124	24922	19209	32988	27450
SOP	112	105	108	102	107	96	103	103	100	97

Table 6.3 Divisions VIa (south) and VIIb,c.  
(Old indices, new SSB)

Year	Larval Index	Spawning Stock Biomass
1973	716.6	166.1
1974	767.3	127.8
1975	386.4	116.6
1976	56.3	83.2
1977	162.1	79.6
1978	338.8	81.2
1979	349.8	96.8
1980	327.5	98.0
1981	197.5	93.1
1982	251.0	94.2
1983	197.	86.0
1984	368.	103.0

Up to 1980  $y = 0.103.658 x + 65.9377$

Table 6.4. VIRTUAL POPULATION ANALYSIS

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

	FISHING MORTALITY COEFFICIENT					NATURAL MORTALITY COEFFICIENT = .10				
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	.055	.034	.027	.030	.022	.023	.009	.004	.004	.280
2	.296	.280	.298	.319	.221	.181	.223	.119	.290	.280
3	.259	.423	.130	.266	.220	.437	.200	.230	.478	.280
4	.322	.422	.310	.244	.285	.441	.348	.250	.574	.280
5	.430	.453	.311	.283	.242	.516	.374	.311	.436	.280
6	.608	.471	.285	.195	.343	.289	.563	.382	.517	.280
7	.385	.598	.282	.171	.277	.467	.181	.312	.551	.280
8	.320	.380	.270	.270	.240	.330	.300	.230	.400	.280
9+	.320	.380	.270	.270	.240	.330	.300	.230	.400	.280
( 1- 9)W	.279	.302	.209	.180	.170	.283	.222	.162	.251	.280
( 2- 7)W	.330	.397	.277	.272	.242	.335	.295	.221	.424	.280

Table 6.5. VIRTUAL POPULATION ANALYSIS

HERKING 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

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	145385	217573	175059	303196	286636	132378	189529	201675	388169	-	-
2	169130	124555	181083	154680	264676	253732	117066	169952	181771	349788	-
3	115486	113854	85181	121632	101724	191967	191555	84794	136552	123034	239206
4	111072	80665	67477	64357	84366	73858	112170	133673	60589	76645	84138
5	71034	72820	47839	44766	45604	57396	43013	71668	94176	30866	52415
6	24570	41802	41908	31708	30371	32393	30985	26775	47512	55103	21108
7	19358	12106	23617	28506	23606	19495	21961	15974	16550	25646	37683
8	35890	11915	6026	16120	21739	16196	11061	16585	10576	8620	17538
9+	122577	52032	18589	14729	20103	19867	21111	14676	13505	17257	17697
TOTAL NO	814501	727322	647179	779693	878825	797302	738451	735772	949379	698953	-
SPS NO	502920	366344	366582	371485	471182	498849	421917	431161	396352	532549	-
TOT. BIOM	173840	142733	123248	140652	159483	156376	144540	141894	169473	142413	-
SPS BIOM	117067	83251	79429	81647	99227	104176	95107	94176	85983	103000	-



Table 6.6.

List of input variables for the ICES prediction program.

HERRING VI SOUTH AND VIIB CATCH PREDICTION

The reference F is the mean F for the age group range from 2 to 9

The number of recruits per year is as follows:

Year	Recruitment
1984	202000.0
1985	202000.0
1986	202000.0
1987	202000.0

Proportion of F (fishing mortality) effective before spawning: .8700  
 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
1	202000.0	.07	.10	.00	.108	.120
2	349788.0	.28	.10	1.00	.130	.169
3	123034.0	.28	.10	1.00	.166	.210
4	76645.0	.28	.10	1.00	.193	.236
5	30866.0	.28	.10	1.00	.210	.260
6	55103.0	.28	.10	1.00	.223	.273
7	25648.0	.28	.10	1.00	.232	.283
8	8620.0	.28	.10	1.00	.238	.290
9+	17257.0	.28	.10	1.00	.242	.296

Table 7.1 HERRING. Total catches (tonnes) in North Irish Sea (Division VIIa), 1975-84.

<u>Country</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
France	813	651	85	174	455+	1	-
Ireland	4,790	3,205	3,331	2,371	1,805	1,340	283
Netherlands	630	989	500	98	-	-	-
U.K.	18,244	16,401	11,498	8,432**	10,078++	9,272	4,094
Other	26*	-	-	-	-	-	-
TOTAL	24,503	21,246	15,414	11,075	12,338	10,613	4,377

<u>Country</u>	<u>1982</u>	<u>1983</u>	<u>1984***</u>
France	-	48+	-
Ireland	300	860	1,084
Netherlands	-	-	-
U.K.	3,375	3,025	2,982
Other	1,180+++	-	-
TOTAL	4,855	3,933	4,066

\*USSR

\*\* Includes 68.5 tonnes of spring-spawned herring

+ No data basis for allocation to stock

++ Additional unrecorded catch of 106 tonnes estimated

+++ Unallocated

\*\*\* Preliminary

Table 7.2 HERRING. Total catch by stock in Northern Irish Sea, 1975-1984.

Country	1975		1976		1977		1978	
	1	2	1	2	1	2	1	2
France	813	-	651	-	85	-	87	87
Ireland	2,406	2,384	1,816	1,389	2,009	1,322	610	1,761
Netherlands	630	-	989	-	500	-	98	-
U.K.	15,408	2,836	12,831	3,570	9,837	1,661	7,663	700
Unallocated	-	-	-	-	-	-	-	-
Total Manx	19,283	-	16,287	-	12,431	-	8,458	-
Total Mourne	5,220	-	4,959	-	2,983	-	2,548	-

Country	1979		1980		1981		1982	
	1	2	1	2	1	2	1	2
France	-	-	1	-	-	-	-	-
Ireland	748	1,054	762	578	100	183	198	102
Netherlands	-	-	-	-	-	-	-	-
U.K.	9,382	696	7,897	1,375	2,837	1,257	2,120	1,255
Unallocated	-	-	-	-	-	-	779	401
Total Manx	10,130	-	8,660	-	2,937	-	3,097	-
Total Mourne	1,753	-	1,953	-	1,440	-	1,758	-

Country	1983		1984*	
	1	2	1	2
France	-	-	-	-
Ireland	346	514	385	699
Netherlands	-	-	-	-
U.K.	1,759	1,266	1,587	1,395
Unallocated	-	-	-	-
Total Manx	2,105	-	1,972	-
Total Mourne	1,780	-	2,094	-

1) Manx stock, 2) Mourne stock  
\* preliminary

Table 7.3. 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
1	33330	34740	30280	15540	11770	5840	5050	5100	1305	1168
2	48240	56160	39040	36950	38270	25760	15790	16030	12162	8424
3	39410	20780	22690	13410	23490	19510	3200	5670	5598	7237
4	10840	15220	6750	6780	4250	8520	2790	2150	2820	3841
5	7870	4580	4520	1740	2200	1980	2300	330	445	2221
6	4210	2810	1460	1340	1050	910	350	1110	484	380
7	2090	2420	910	670	400	360	290	140	255	229
3+	1640	1270	1120	350	290	230	240	380	59	479
TOTAL	147630	137980	106770	76780	81720	63110	29990	30910	23128	23979

Table 7.4 North Irish Sea HERRING: Effort and Fishing Mortality.

Year	U.K. catch	Total Catch	U.K. Proportion of Total Catch	F from VPA with			F generated by U.K.			U.K. Effort Trawler Arrivals
				F <sub>1984</sub> = 0.1	0.15	0.2	F <sub>1984</sub> = 0.1	0.15	0.2	
1979	10,078	12,338	0.82	0.852	0.866	0.874	0.696	0.707	0.714	2,652
1980	1,272	10,613	0.87	1.111	1.196	1.244	0.971	1.045	1.087	1,904
1981	4,094	4,377	0.94	0.359	0.440	0.497	0.336	0.412	0.465	918
1982	3,375	4,855	0.70	0.232	0.310	0.371	0.161	0.215	0.258	389
1983	3,025	3,933	0.77	0.126	0.178	0.226	0.097	0.137	0.174	513
1984	2,982	4,066	0.73	0.100	0.150	0.200	0.073	0.110	0.147	486

Correlation with U.K. effort r = 0.871 0.840 0.818

Comparison of effort and F in two periods

		<u>1979-80(A)</u>	<u>1981-84(B)</u>	<u>A/B</u>
Mean Effort		2,278	577	3.95
Mean F	} Assuming 1984 F	0.10	0.834	4.99
		0.15	0.876	4.00
		0.20	0.901	3.45

Table 7.5. VIRTUAL POPULATION ANALYSIS

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

	FISHING MORTALITY COEFFICIENT					UNIT: Year <sup>-1</sup>	NATURAL MORTALITY COEFFICIENT = .10				
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	
1	.277	.400	.294	.191	.257	.107	.079	.064	.019	.022	
2	.851	.894	.967	.616	.846	1.212	.408	.338	.192	.150	
3	.943	1.017	1.034	.965	.909	1.370	.395	.224	.169	.150	
4	.815	1.102	1.005	.913	.842	.902	.629	.445	.148	.150	
5	.961	.886	1.078	.682	.767	1.137	.576	.122	.138	.150	
6	.677	1.014	.699	1.010	1.052	.749	.497	.538	.236	.150	
7	.860	.950	.990	.720	.860	1.220	.500	.360	.200	.150	
8+	.880	.950	.990	.720	.860	1.220	.500	.360	.200	.150	
(2-7)W	.878	.951	.990	.717	.866	1.196	.440	.310	.178	.150	

Table 7.6. VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN IRISH SEA (MANX PLUS HOURNE 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
1	144513	108957	124549	93640	54515	60631	70109	86059	71519	80000*	0
2	87827	99142	65667	63976	69977	38160	49314	58638	73023	63472	49918
3	67328	33921	36698	22590	41030	27182	10275	29658	37859	54529	49432
4	20299	23737	11098	11812	7790	14956	6249	6264	21454	28941	42467
5	13285	8129	7135	3676	4290	3036	5491	3015	3631	16735	22539
6	8947	4597	3032	2196	1631	1803	382	2792	2415	2863	13033
7	3726	4115	1509	1364	724	531	771	485	1476	1725	2230
∑	2924	2159	1858	712	525	340	638	1317	341	3609	4155
TOTAL NO	348849	284755	251547	219967	180531	146639	143728	188229	211718	251874	
SPS NO	38833	68934	51668	61171	52307	29841	46135	71856	107449	135704	
TOT. BIOM	48984	39944	32504	28892	26337	20366	18075	24504	30016	37205	
SPS BIOM	15886	11955	8721	9999	9007	5172	7613	12287	19107	24480	

\* Input from stock/recruit relationship: see text.

Table 7.7 Age distribution (%) of HERRING in survey  
within 12 mile limit of Northern Ireland.  
Jun-Dec 1984.

Age (W-rings)	Northern area (54 <sup>0</sup> 15'N-54 <sup>0</sup> 40'N)	Southern area (53 <sup>0</sup> 50'N-54 <sup>0</sup> 15'N)	Commercial trawl fishery
1	15	36	3
2	33	35	34
3	24	15	31
4	15	8	18
5	9	4	10
6+	4	2	4



**Table 8.1** 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					
1	1.470	0.418					
2	22.422	17.904					
3	151.198	32.045					
4	30.181	140.481					
5	21.525	16.937					
6	8.637	7.069					
7	14.017	3.892					
8	13.666	4.087					
9	3.715	4.489					
10	2.373	1.817					
11	3.424	0.201					
12	0.552	0.253					
13	0.100	0.258					
14	0.003	0.003					
JUVENILE	78.323	23.911					
ADULT	194.960	205.943					
TOTAL CATCH	58.665	49.993					

Table 8.2 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					
1	59.3	49.3					
2	131.7	131.4					
3	179.7	188.6					
4	218.1	216.8					
5	259.9	244.9					
6	308.6	276.9					
7	328.7	314.6					
8	356.5	321.7					
9	370.2	350.7					
10	406.9	333.8					
11	436.6	361.9					
12	458.6	446.3					
13	429.9	417.4					
14	471.5	392.3					

Table 8.3.

Proportion of mature herring in each group. Based on samples taken in Sept.-Dec. by purse seine and pelagic trawls. The number of herring analysed are given in the brackets.

Rings	1960	1961	1962	1963	1964	1965
2	0.28 (254)	0.13 (128)	0.04 (78)	0.54 (13)	0 (90)	0.05 (141)
3	0.79 (179)	0.79 (229)	0.46 (82)	0.96 (45)	0.85 (114)	0.75 (177)
4	0.99 (81)	0.97 (179)	0.83 (117)	0.97 (69)	0.99 (78)	1.0 (122)
5			0.96 (85)		0.98 (58)	
Rings	1966	1967	1968	1969	1970	1971
2	0.05 (279)	0.02 (121)	0.02 (139)	0.08 (1595)	0.22 (970)	0.38 (436)
3	0.52 (195)	0.41 (472)	0.67 (141)	0.73 (165)	0.89 (1271)	0.98 (318)
4	0.95 (170)	0.85 (136)	0.97 (328)	0.99 (104)	1	1
Rings	1972	1973	1974	1975	1976	1977
2	0.20 (157)	0.64 (74)	0.14 (662)	0.27 (163)	0.13 (611)	0.02 (948)
3	1.0 (5)	0.99 (132)	0.94 (86)	0.97 (2053)	0.90 (143)	0.87 (263)
4	1	1	1	1	1 (1018)	1 (121)
Rings	1978	1979	1980	1981	1982	1983
2	0.04 (714)	0.07 (366)	0.05 (417)	0.03 (185)	0.05 (718)	0.0 (302)
3	0.78 (1012)	0.65 (835)	0.92 (290)	0.65 (390)	0.85 (342)	0.64 (1471)
4	1.0 (174)	0.90 (907)	1.0 (808)	0.99 (178)	1.00 (466)	1.0 (218)
Rings	1984					
2	0.01 (157)					
3	0.82 (259)					
4	1.00 (1134)					

Table 8.4 Stock abundance and catches by age groups ( $\times 10^{-6}$ ) of Icelandic summer spawners. Rings are referred to the year 1984

Year class	Rings in 1984	Acoustic survey estimate Jan. 1985	Catches in 1984	F in 1984	Stock in number at 1 Jan. 1984 *	Acoustic Survey estimate Dec. 1983
1982	1	38.9	0.4	0	439.5	-
1981	2	87.8	17.9	0.18	114.0	235
1980	3	73.2	32.0	0.29	133.3	410
1979	4	461.0	140.5	0.25	666.1	940
1978	5	83.1	16.9	0.18	107.6	102
1977	6	40.4	7.1	0.15	53.5	49
1976	7	19.5	3.9	0.17	26.2	19
1975	8	20.9	4.1	0.17	27.5	34
1974	9	23.0	4.5	0.17	30.2	33
1973	10	10.9	1.8	0.14	14.5	12
1972	>11	18.2	0.7	0.04	18.8	21
and earlier						
14+		677.0	179.5	0.22	944.4	1,210

\*Estimated from acoustic survey estimate in Jan. 1985 and catches in 1984.

Table 8.5 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	0.009
2	0.849	0.947	0.647	0.006	0.002	0.011	0.021
3	0.591	1.020	0.554	0.010	0.014	0.012	0.106
4	0.657	0.661	1.542	0.025	0.009	0.024	0.107
5	0.722	0.779	1.193	0.083	0.003	0.009	0.237
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	0.148
AGE	1976	1977	1978	1979	1980	1981	1982
1	0.001	0.002	0.018	0.005	0.013	0.002	0.001
2	0.068	0.041	0.072	0.124	0.085	0.021	0.020
3	0.046	0.210	0.135	0.190	0.224	0.122	0.157
4	0.141	0.149	0.160	0.246	0.349	0.177	0.395
5	0.145	0.257	0.162	0.259	0.341	0.329	0.348
6	0.229	0.181	0.323	0.195	0.261	0.339	0.591
7	0.147	0.330	0.270	0.325	0.323	0.233	0.626
8	0.120	0.266	0.702	0.156	0.382	0.250	0.316
9	0.187	0.184	0.492	0.403	0.116	0.437	0.556
10	0.228	0.325	0.501	0.242	0.561	0.081	0.638
11	0.367	0.059	0.632	0.417	0.557	0.696	0.240
12	0.004	1.130	0.043	0.081	0.001	2.175	1.359
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	0.149	0.229	0.264	0.255	0.335	0.303	0.490
AGE	1983	1984					
1	0.004	0.001					
2	0.085	0.050					
3	0.195	0.150					
4	0.225	0.250					
5	0.358	0.170					
6	0.273	0.170					
7	0.395	0.170					
8	0.358	0.170					
9	0.254	0.170					
10	0.349	0.170					
11	0.391	0.040					
12	0.073	0.040					
13	0.777	0.040					
14	0.300	0.040					
AVERAGE WEIGHTED BY STOCK IN NUMBERS							
AVE 4-14	0.293	0.224					

Table 8.6 Icelandic summer spawners. VPA stock size in number ( $\times 10^{-6}$ ) and spawning stock biomass at 1 July.

AGE	1969	1970	1971	1972	1973	1974	1975
1	46.823	33.785	70.557	91.799	413.609	113.835	176.265
2	143.018	38.074	28.666	55.510	82.924	374.146	103.016
3	19.396	55.372	13.369	13.576	49.921	74.881	334.966
4	11.242	9.721	18.075	6.949	12.160	44.526	66.964
5	20.344	5.275	4.541	3.499	6.133	10.904	39.345
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	87.892	131.211	443.961	440.093	261.515
Sp. stock biomass	16.699	19.873	13.259	10.659	29.159	46.416	116.011
AGE	1976	1977	1978	1979	1980	1981	1982
1	540.436	379.437	152.570	205.124	257.040	1117.413	321.405
2	158.048	488.423	342.659	135.547	184.721	229.587	1008.906
3	91.265	133.649	424.023	288.621	108.307	153.510	203.339
4	272.714	78.865	98.006	335.238	216.004	78.297	122.972
5	54.424	214.335	61.480	75.532	237.165	137.874	59.333
6	28.099	42.588	149.954	47.332	52.736	152.655	89.791
7	8.028	20.223	32.141	98.235	35.231	36.768	98.384
8	4.070	6.272	13.158	22.202	64.194	23.073	26.342
9	1.820	3.267	4.351	5.900	17.193	39.657	16.263
10	0.688	1.366	2.459	2.407	3.567	13.850	23.173
11	0.314	0.496	0.893	1.348	1.709	1.842	11.552
12	0.298	0.197	0.423	0.430	0.804	0.886	0.831
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	687.064	875.466	574.808	438.905	441.189	1394.625	1303.938
Sp. stock biomass	125.531	126.108	166.243	182.925	186.957	155.489	162.257
AGE	1983	1984					
1	427.707	439.464					
2	290.388	385.607					
3	894.654	241.449					
4	157.296	665.985					
5	74.991	113.684					
6	37.927	47.448					
7	44.999	26.124					
8	47.618	27.433					
9	17.374	30.131					
10	8.438	12.196					
11	11.077	5.385					
12	8.219	6.778					
13	0.193	6.912					
14	0.012	0.080					
JUVENILE	1040.171	864.676					
Sp. stock biomass	208.052	249.969					

Table 8.7 Input parameters used in catch prediction for the Icelandic summer-spawning (Div. Va) HERRING.

Rings	Stock in number (in '000) at 1/1 1985	Proportional F	Mean weight in catch and in spawning stock
1	400 000	0.005	60
2	397 246	0.15	135
3	331 895	0.5	175
4	188 041	1.0	225
5	469 312	-	250
6	86 784	-	280
7	36 221	-	315
8	19 942	-	325
9	20 941	-	350
10	23 001	-	350
11	9 310	-	360
12	4 681	-	400
13	5 893	-	400
14	6 009	-	400

Fig. 2.1. HERRING larvae sampled by IKMT during the International Young Fish Surveys 1983-1985.

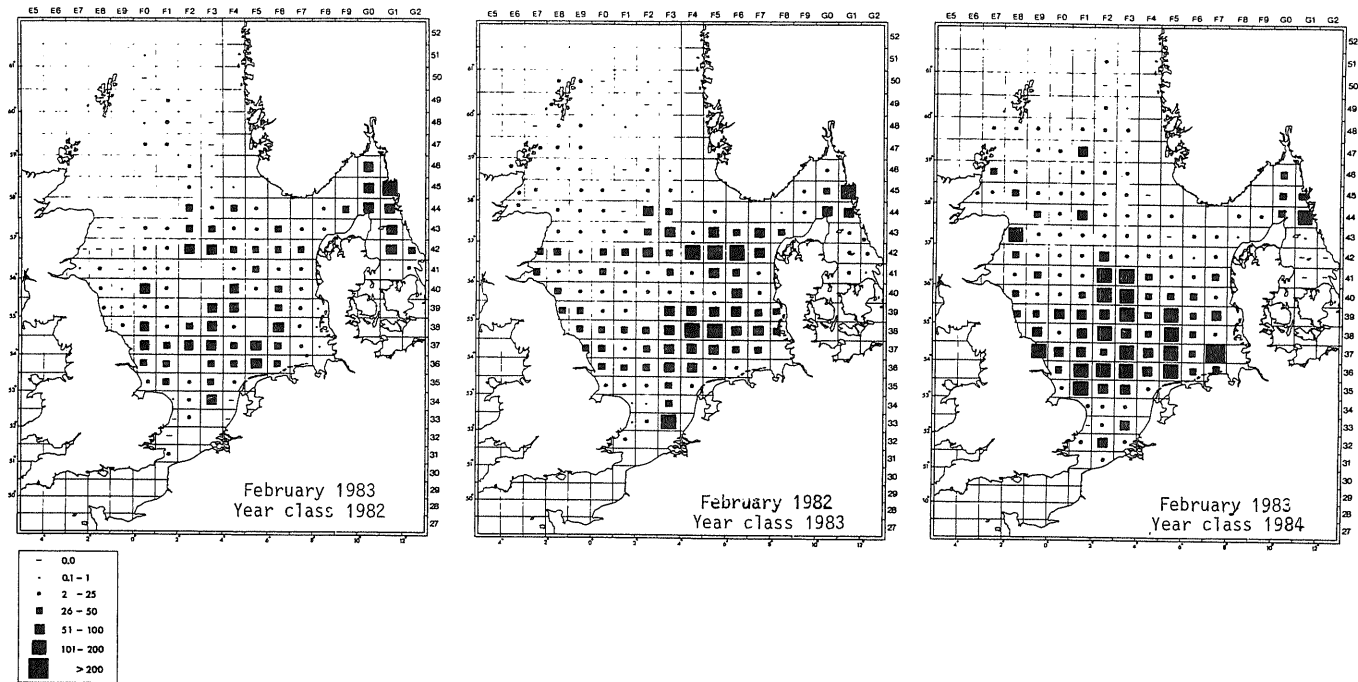




Figure 2.2. Sub-areas used for calculation of IKMT-indices with raising factor used to raise mean No./rectangle for each sub-area (based on maximum number of rectangles sampled in any year).

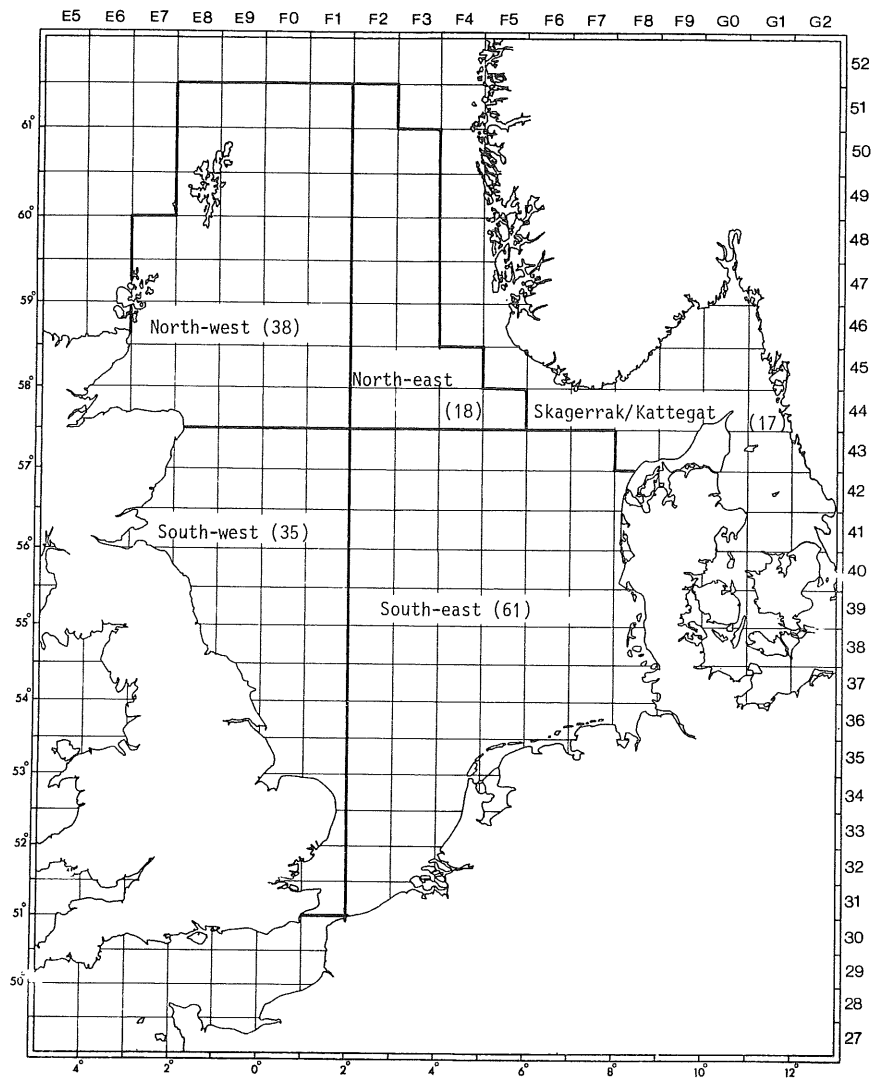


Figure 2.3. Results of KMO sampling compared with VFA estimates of 0-group stock size. (Based on data in Table 2.6). Figures denote year classes.

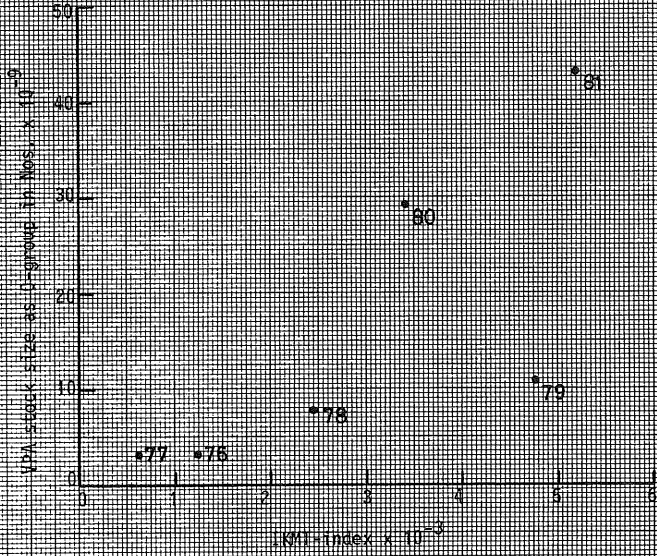
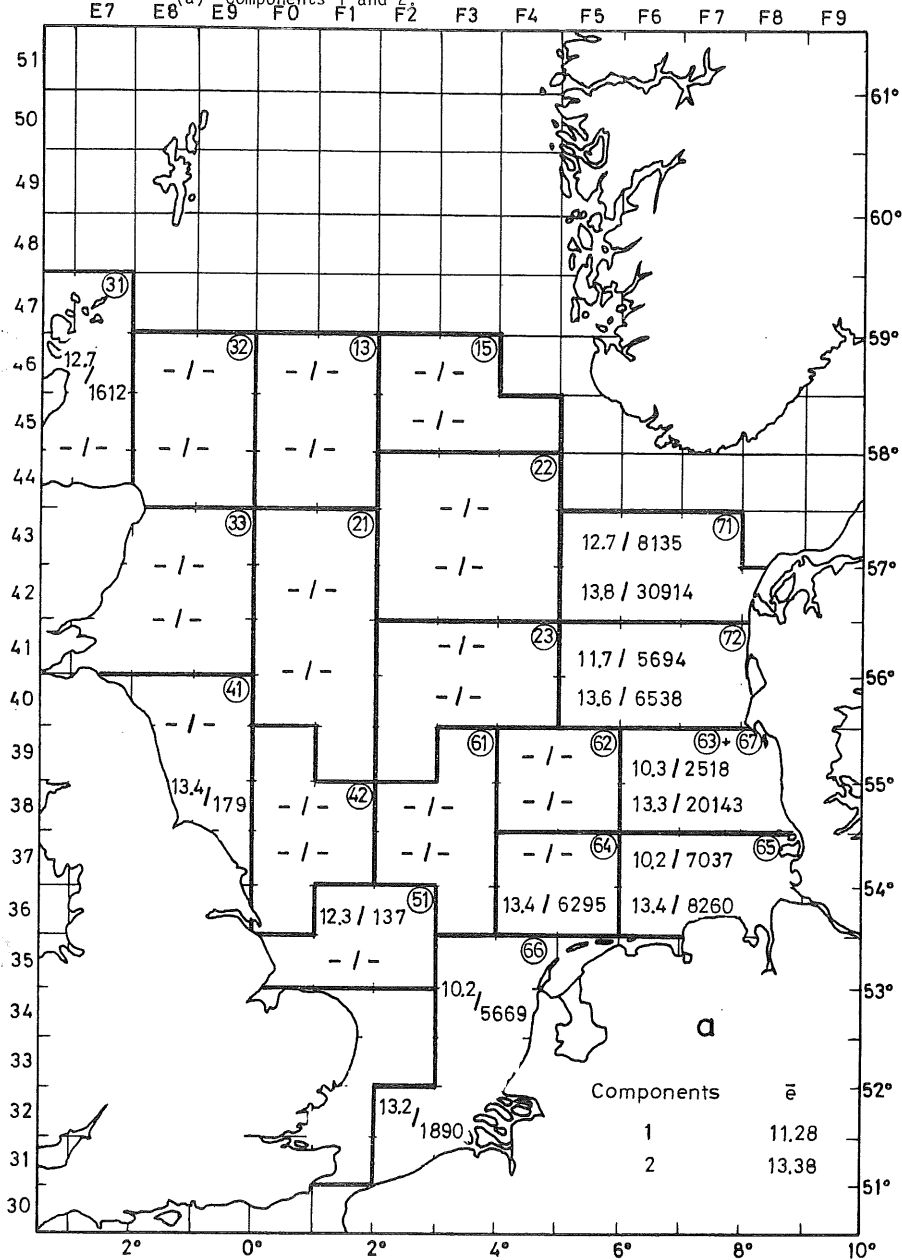


Figure 2.4. Mean length (cm) and abundance (No./hour) of component length groups of 1-group herring (1983 year class) in 1985 IYFS. 193

(a) Components 1 and 2.



(cont'd)

Figure 2.4 (cont'd).  
 (b) Components 3-5.

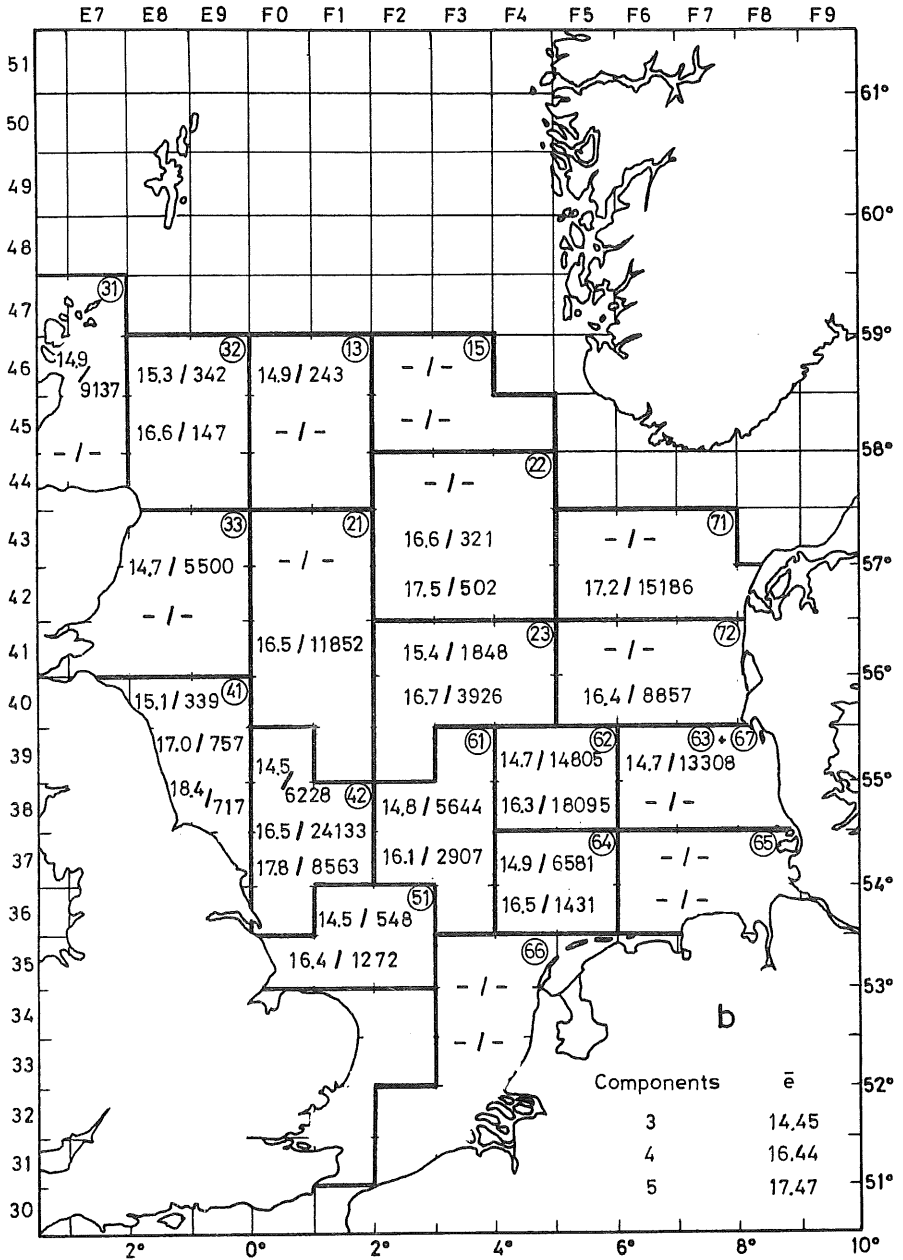


Figure 2.5. Relationship between VPA estimate of 2-ringers in the Downs stock and survey indices.  
 (a) 0-group Downs component in English surveys;  
 (b) 1-group Downs component in IYFS

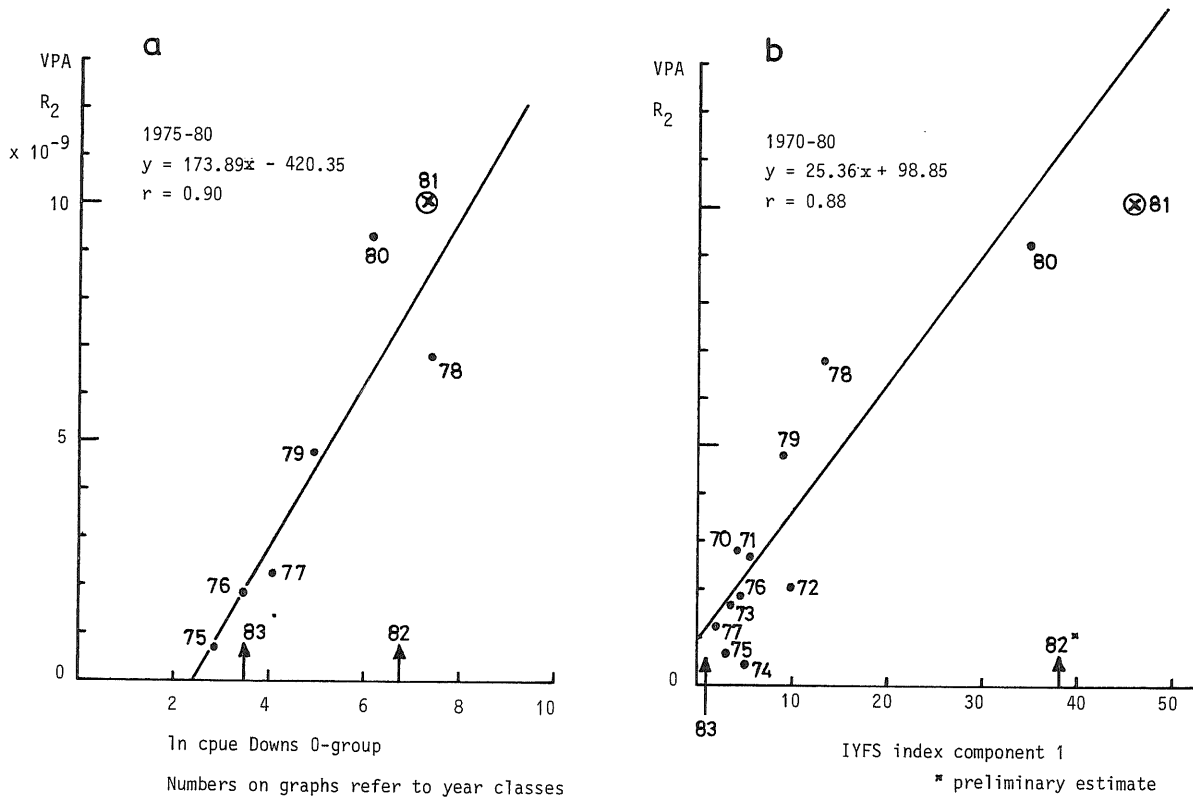


Figure 2.6. Area sub-divisions on acoustic survey of Division IVa used in Table 2.10.

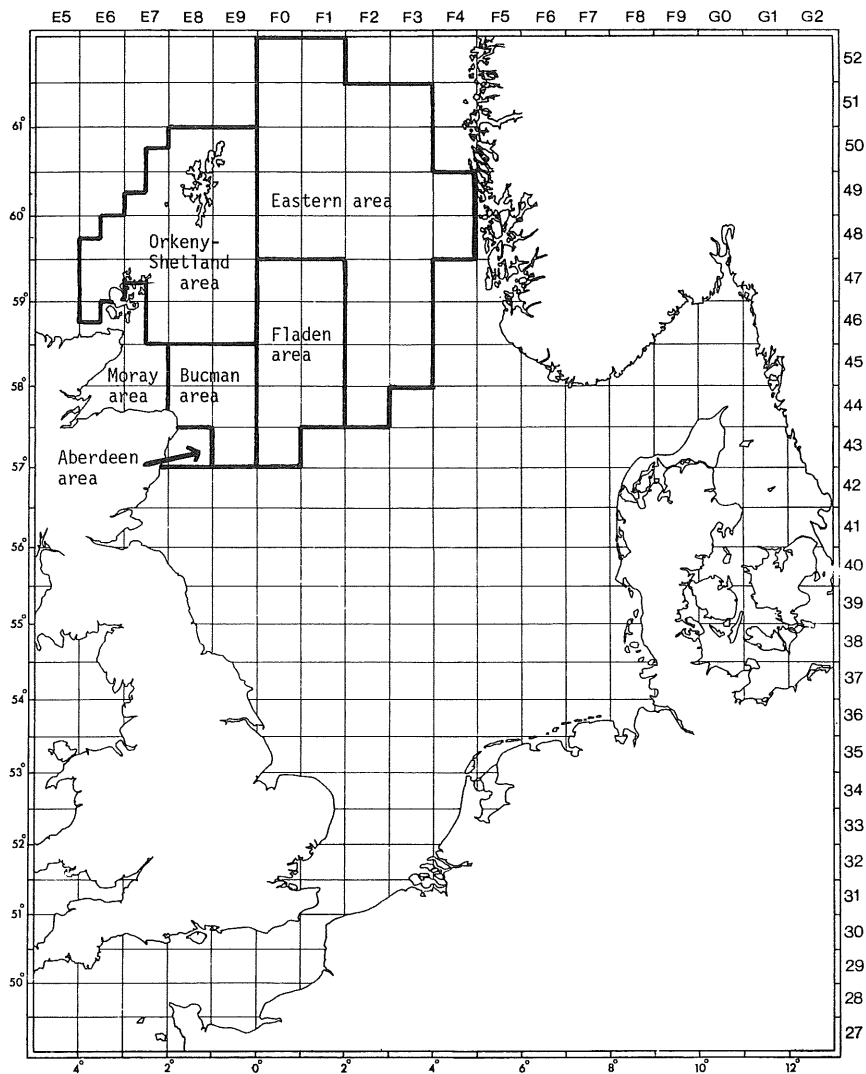


Figure 2.7. Scatter diagram and regression line of VPA estimate of spawning stock biomass in Division IVa against larval index in Division IVa (Buchan included)

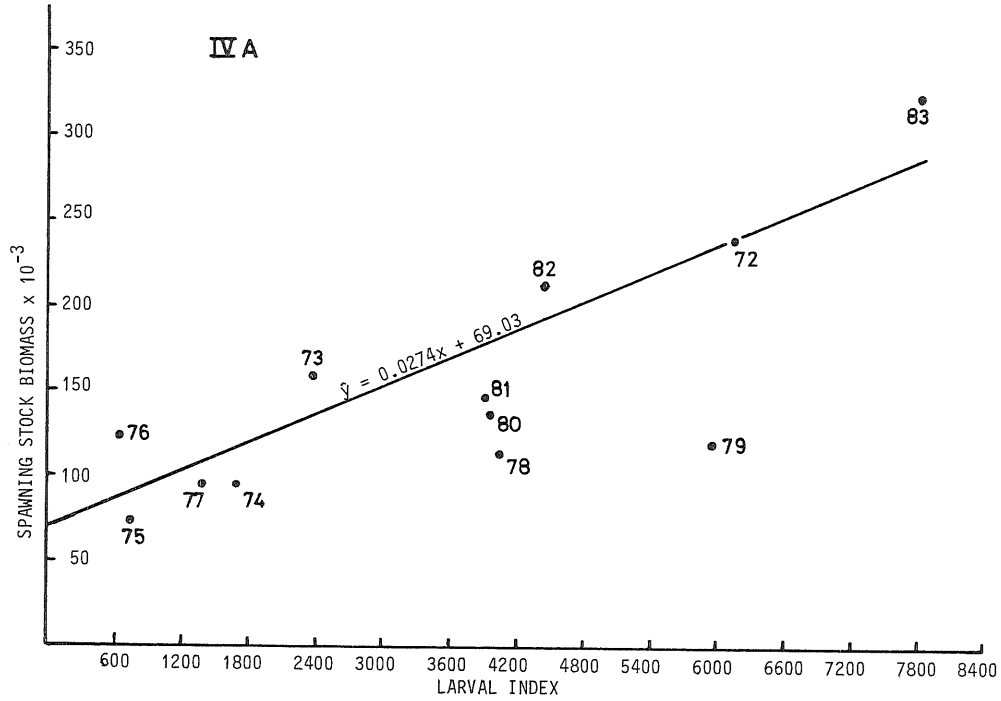


Figure 2.8. HEARING IN Divisions I/a and I/b combined. Yield in 1986, biomass (2x) as 1 January 1987 and spawning stock biomass at spawning time (1 September) 1987 for different levels of fishing mortality in 1986.

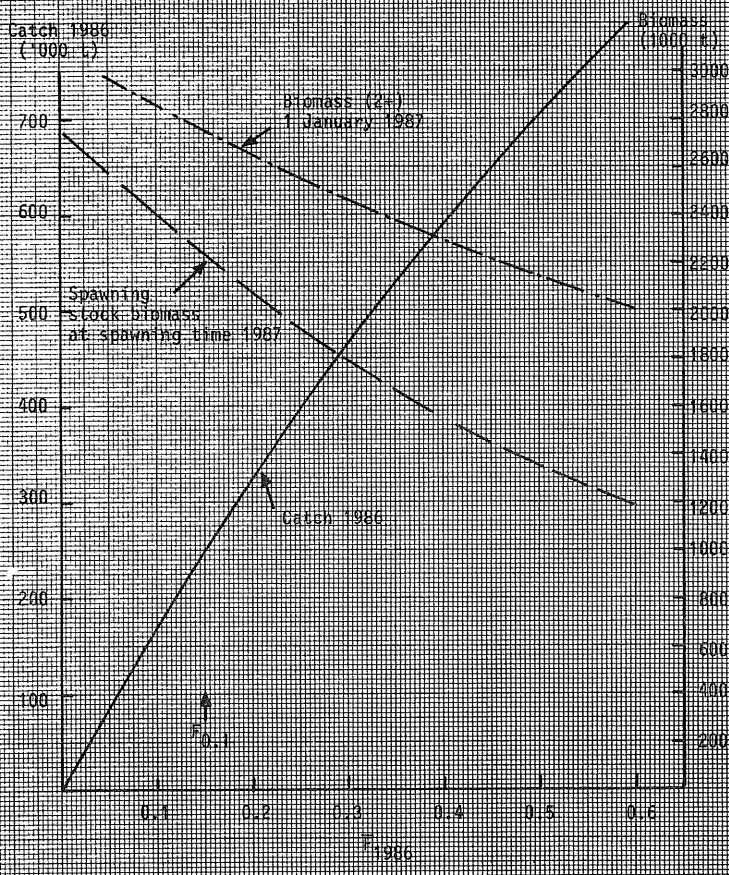


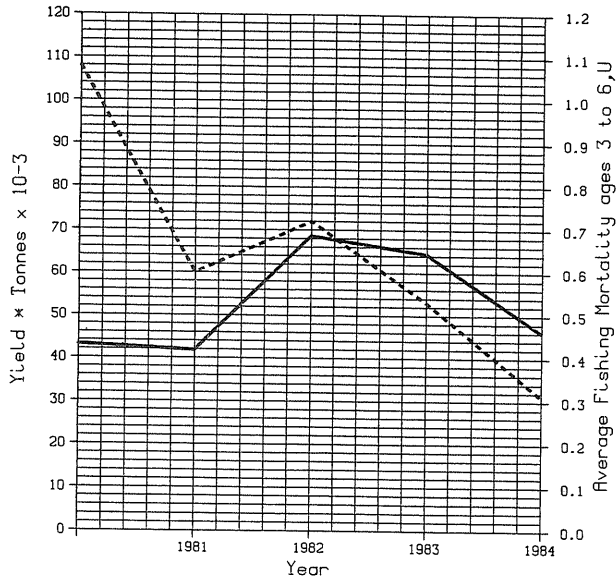


Figure 2.9

**FISH STOCK SUMMARY**  
**STOCK: Herring - IVc and VIId**  
**10-04-1985**

Trends in yield and fishing mortality (F)

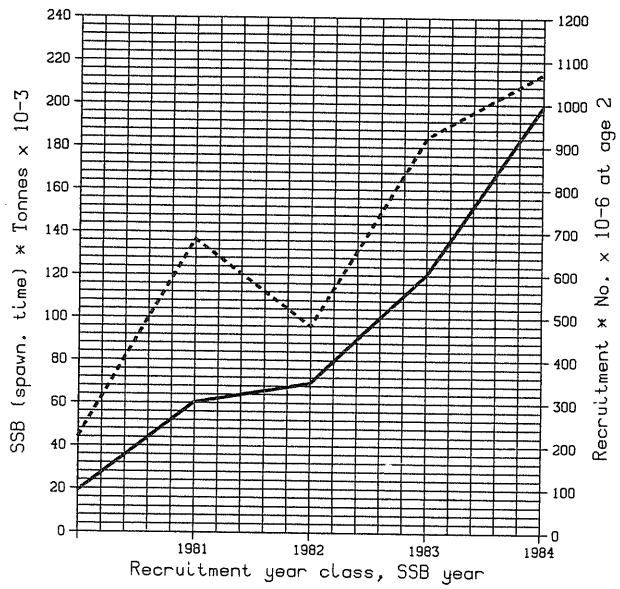
— Yield    - - - F



**A**

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

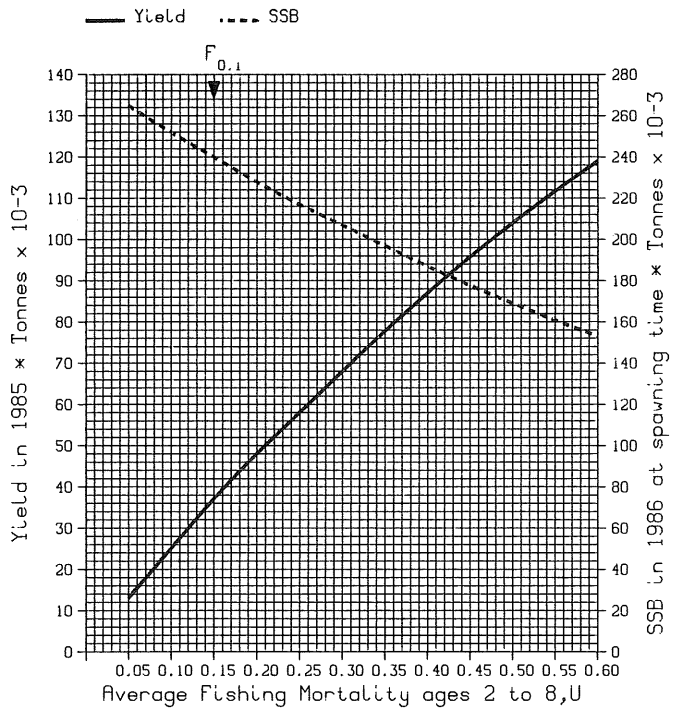
— SSB    - - - R



**B**

Figure 2.9 (ctd) **FISH STOCK SUMMARY**  
**STOCK: Herring - IVc and VIId**  
**10-04-1985**

Short-term yield and spawning stock biomass



**D**

Figure 2.10. Closed areas for sprat fishing in 1985 (shaded) according to EC regulation of 19 December 1984. Also indicated is possible extension of box in eastern North Sea, to allow exemptions for small boat fisheries in present box (see text).

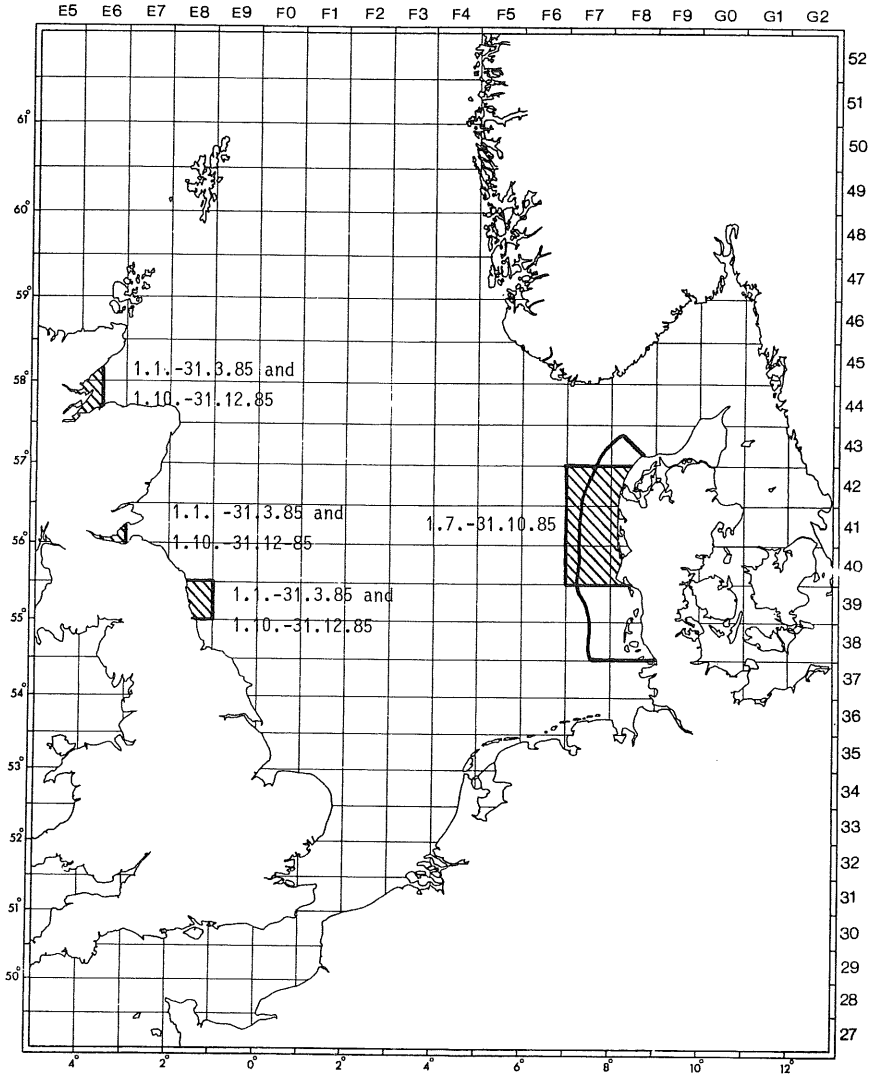


Figure 2-11. Long-term Yield - Month Sea Trout  
Corresponding yield of 1-group and adult bearing (>2-group) for 3 levels of 0-group fish.

A = 0-group Yield = 0 tonnes  
B = 0-group Yield = 37 000 tonnes  
C = 0-group Yield = 82 000 tonnes

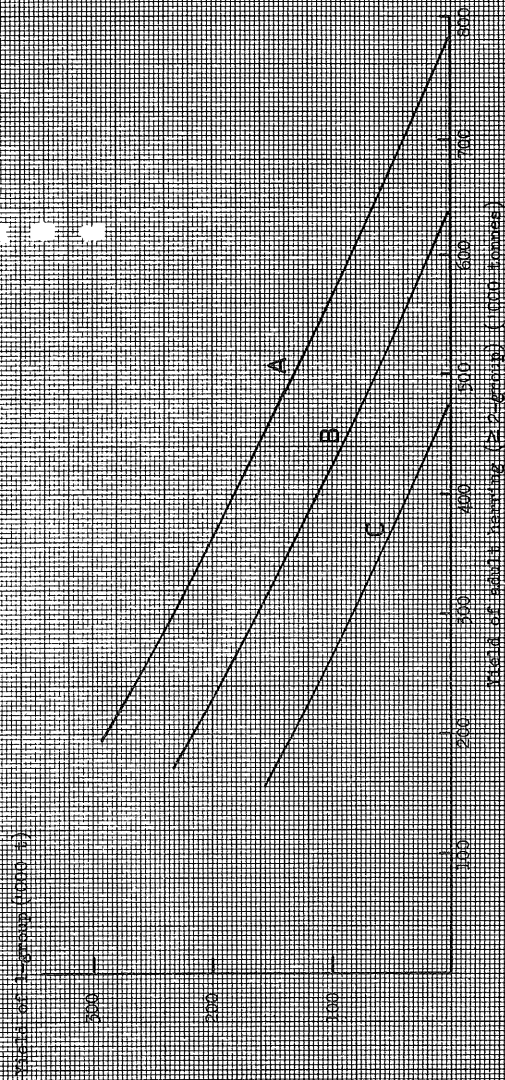


Figure 3.1. Mean vertebral counts (VS) per length group of 1-group HERRING from IVFS 1985 in Division IIIa. Each point includes more than 10 herring.

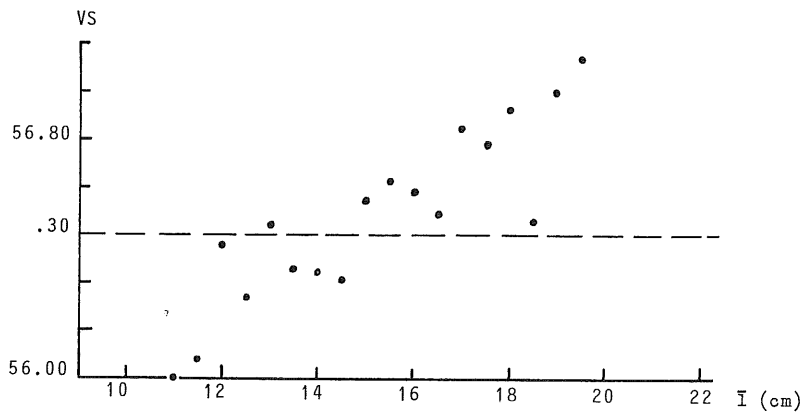


Figure 4.1. CELTIC SEA HERRING. Comparison of SSB/Larval abundance index for autumn and winter spawners.

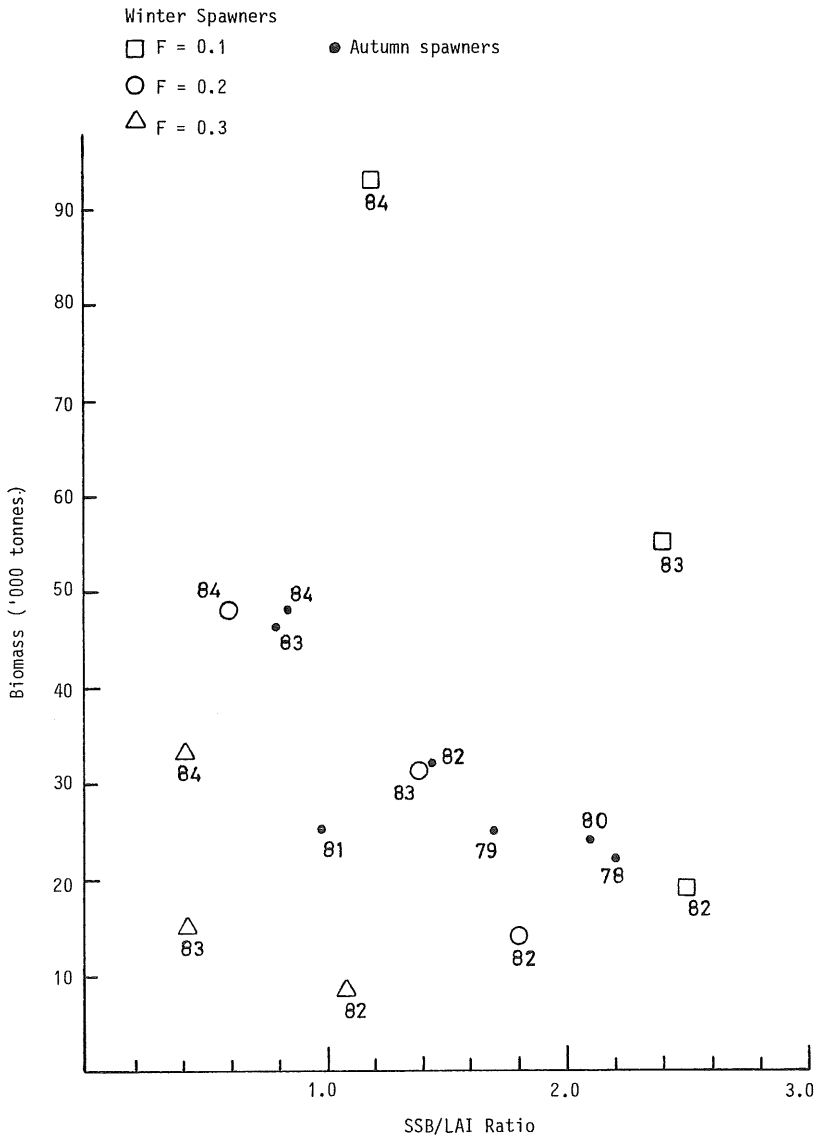


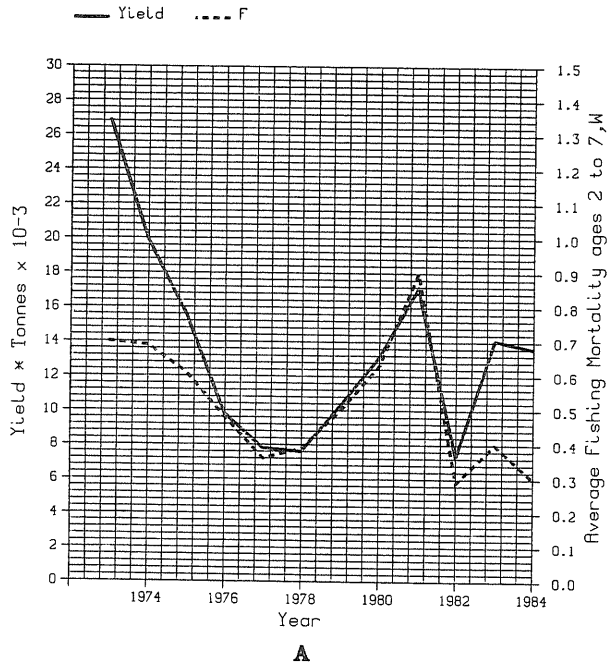
Figure 4.2

## FISH STOCK SUMMARY

### STOCK: Autumn Spawners - Celtic Sea VIIJ

10-04-1985

Trends in yield and fishing mortality (F)



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

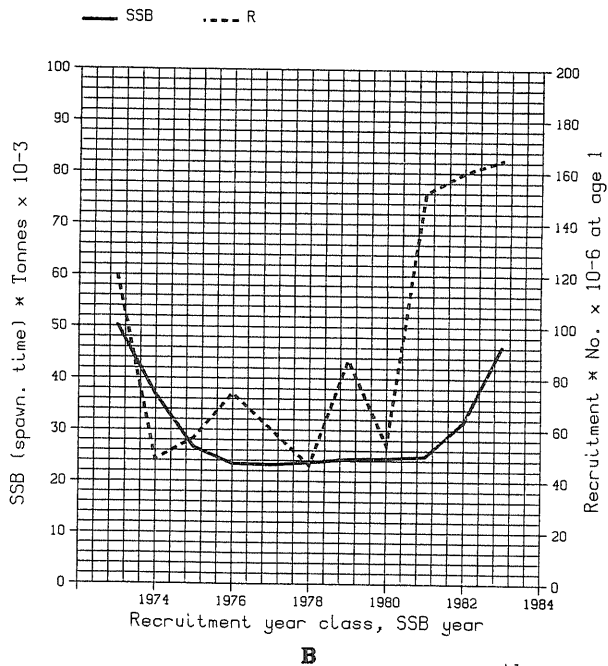


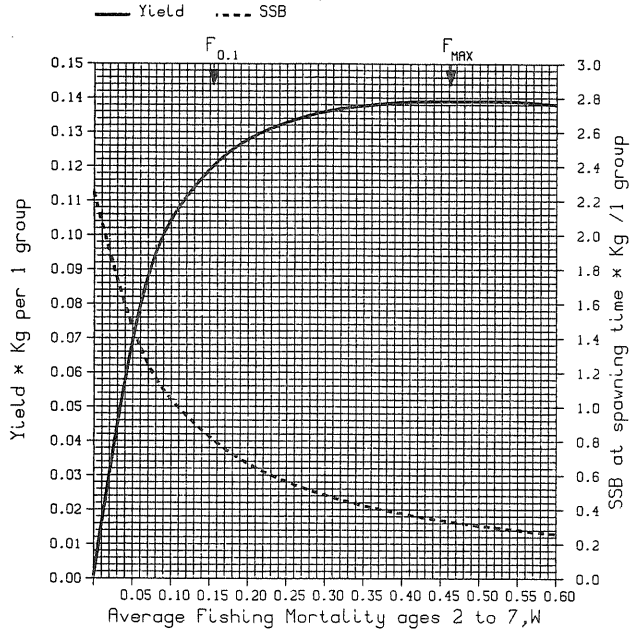
Figure 4.2\_(ctd)

## FISH STOCK SUMMARY

### STOCK: Autumn Spawners - Celtic Sea VIIJ

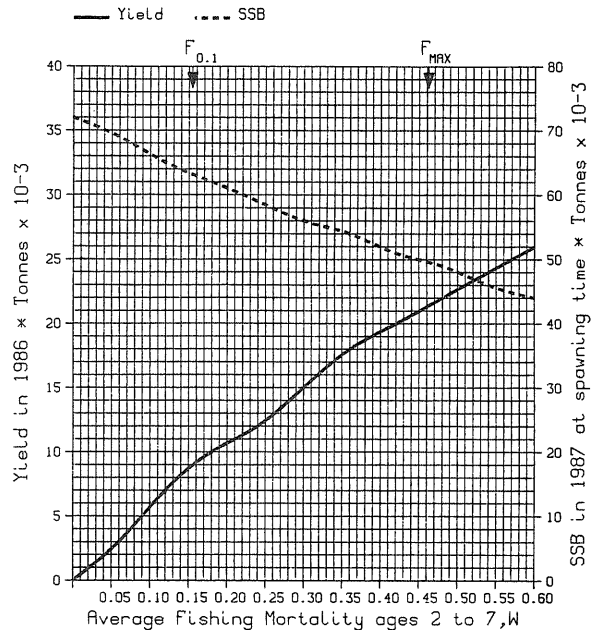
10-04-1985

Long term yield and spawning stock biomass (kg)



C

Short-term yield and spawning stock biomass



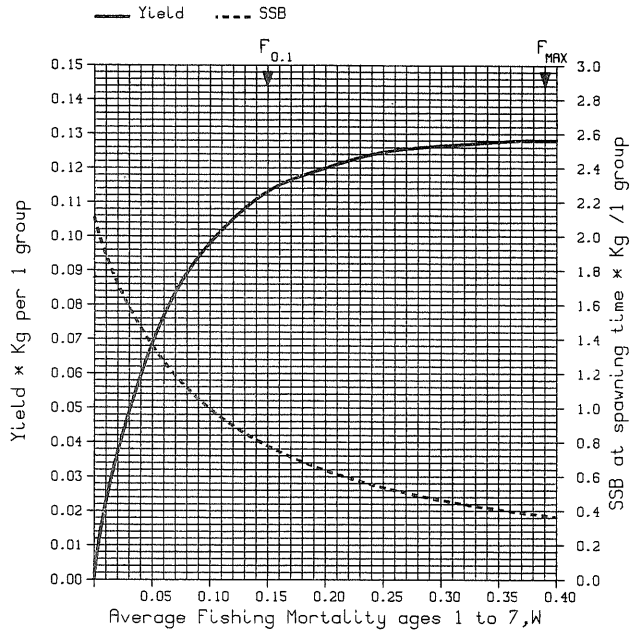
D



**FISH STOCK SUMMARY**  
**STOCK: Winter Spawners - Celtic Sea VIIJ**  
**10-04-1985**

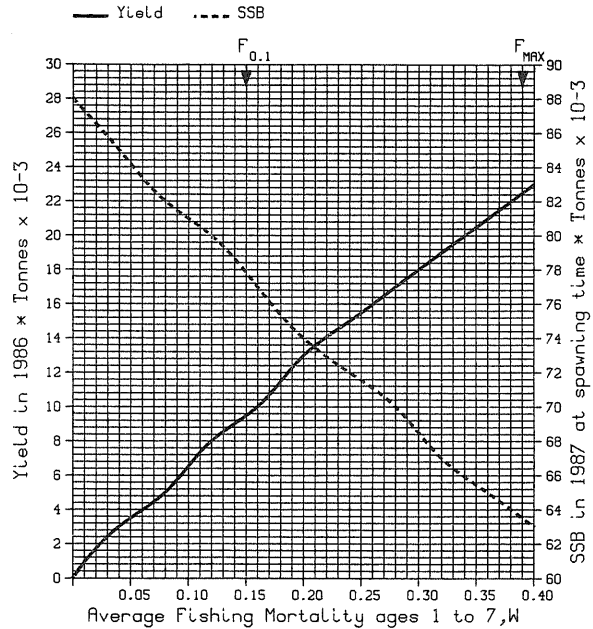
Figure 4.3

Long term yield and spawning stock biomass (kg)



**C**

Short-term yield and spawning stock biomass



**D**

Figure 5.1. Boundaries of new HERRING unit stocks west of Scotland and Ireland.

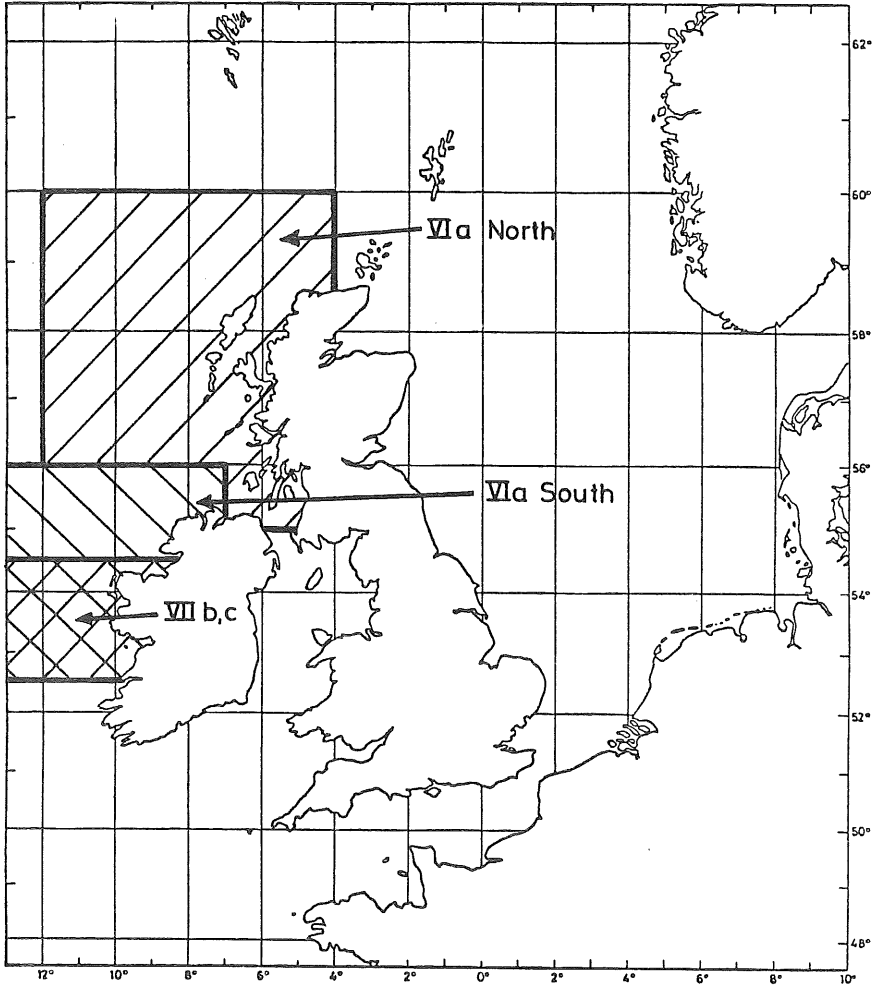
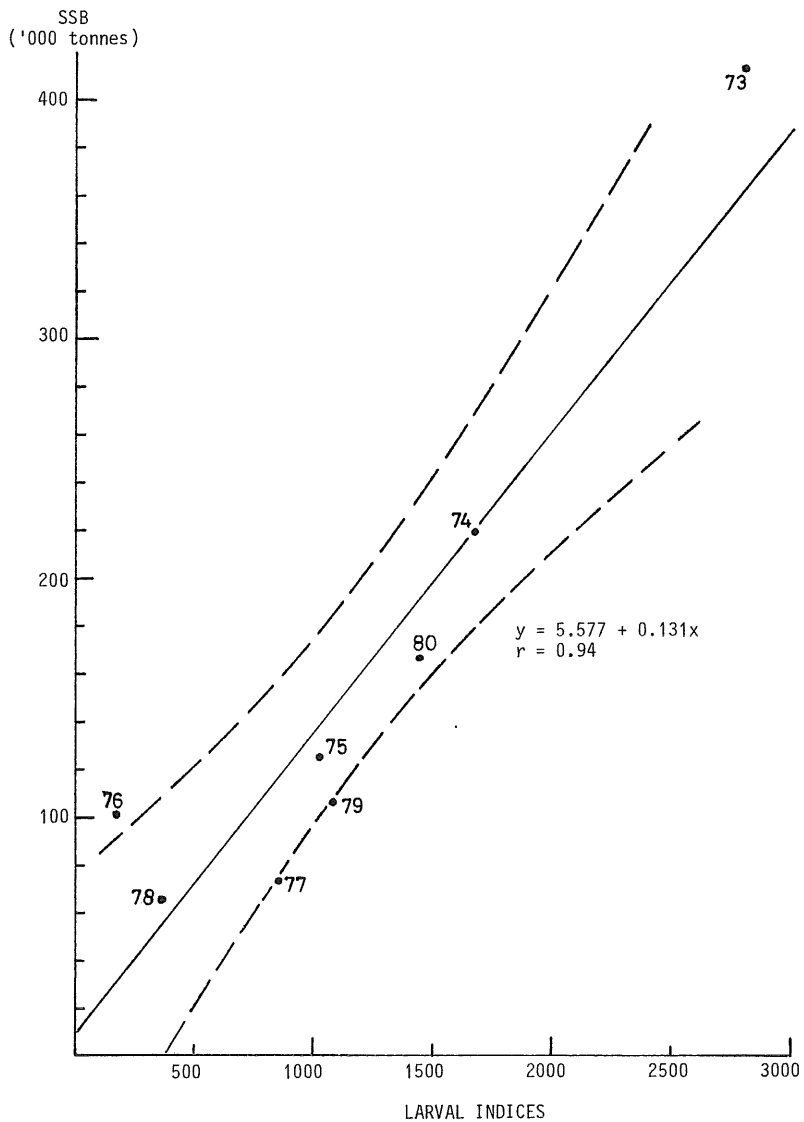


Figure 5.2. HERRING in Division VIa North.  
Larval abundance indices and spawning stock biomass.  
Points are labelled by years.



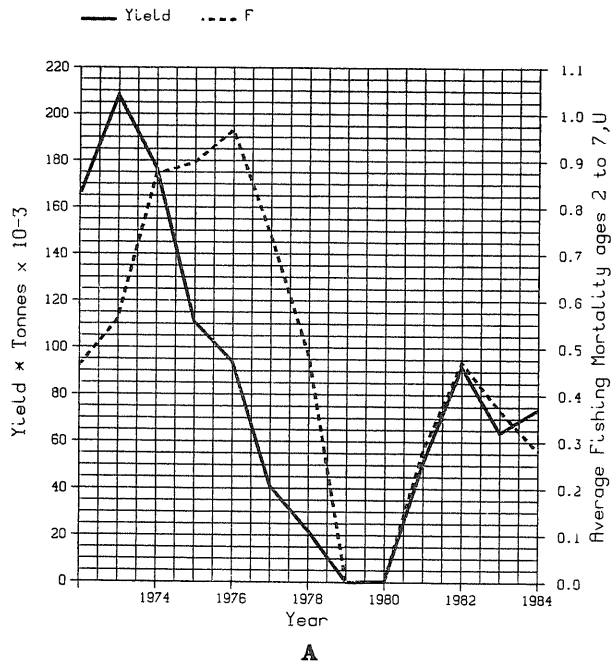
# FISH STOCK SUMMARY

STOCK: Herring - VIa North

22-03-1985

Figure 5.3

Trends in yield and fishing mortality (F)



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

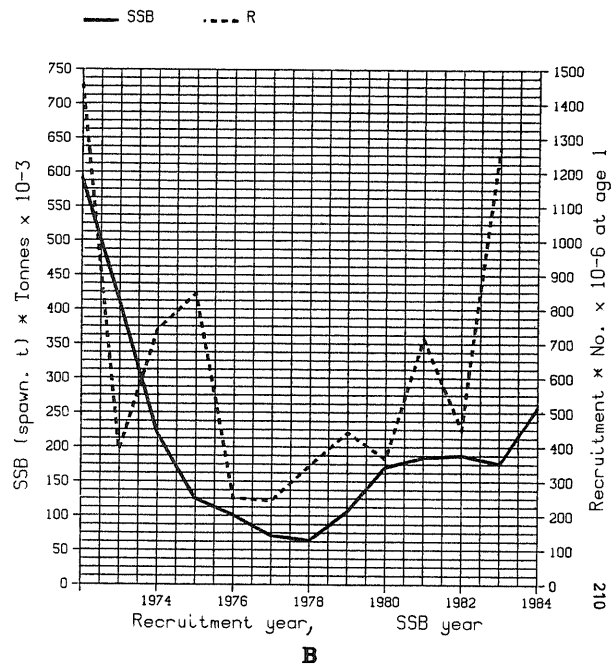


Figure 5.4. HERRING in Division VIa (North).  
 Mean number of 2-ringers per hour fishing in the  
 Scottish Young Fish Survey/VPA estimates of 2-  
 ringers.

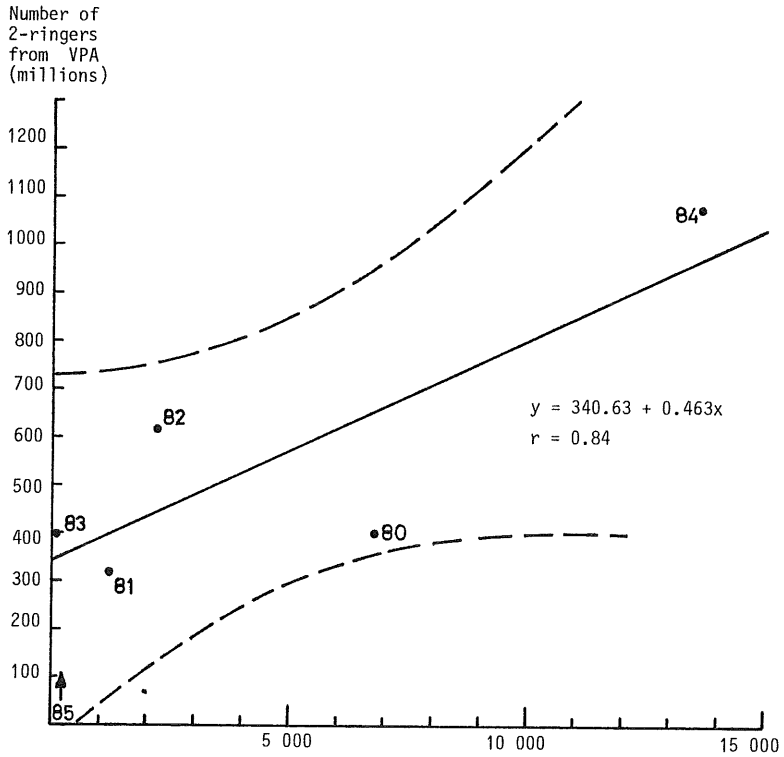


Figure 5.5. HERRING in Division VIa North

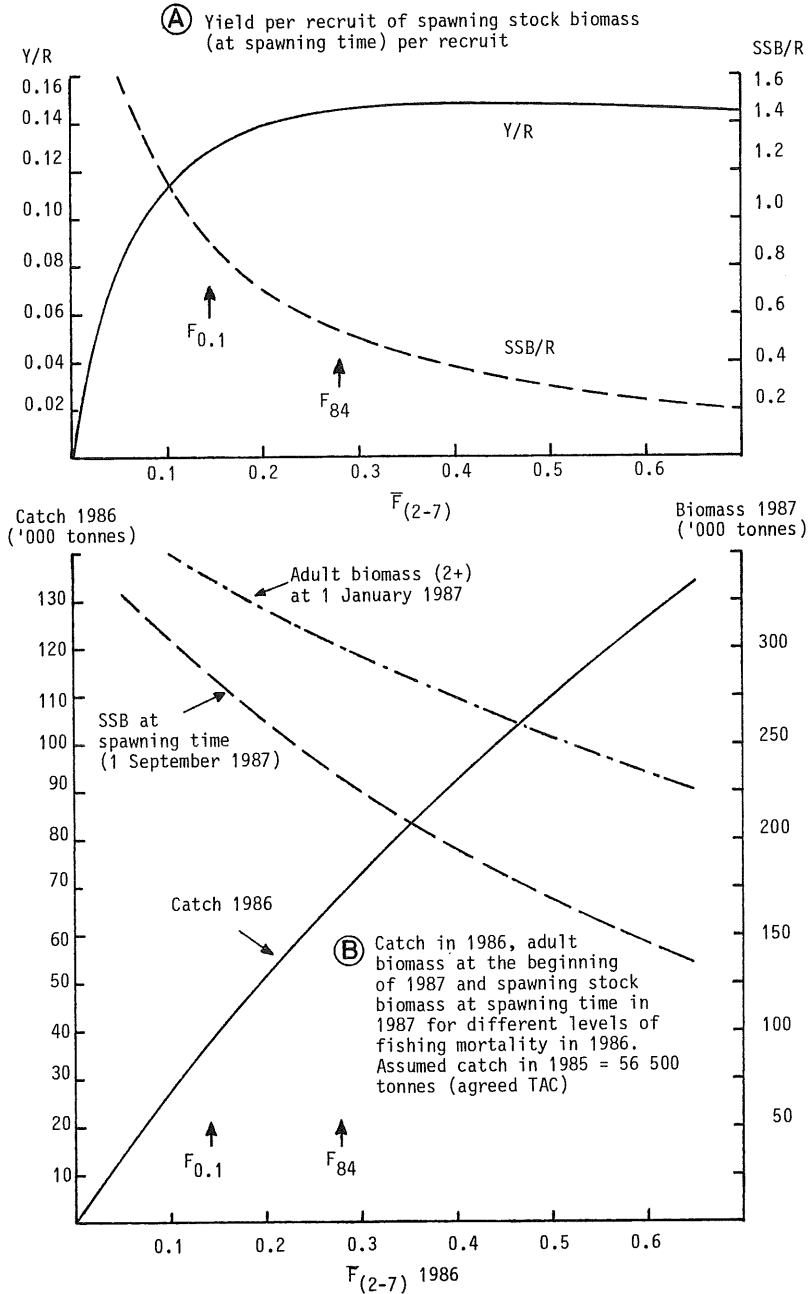


Figure 5.6. Scatter diagram of weighted mean F on 2-9 ringers in Clyde HERRING (based on input F of 0.2) plotted against number of days absence from port.

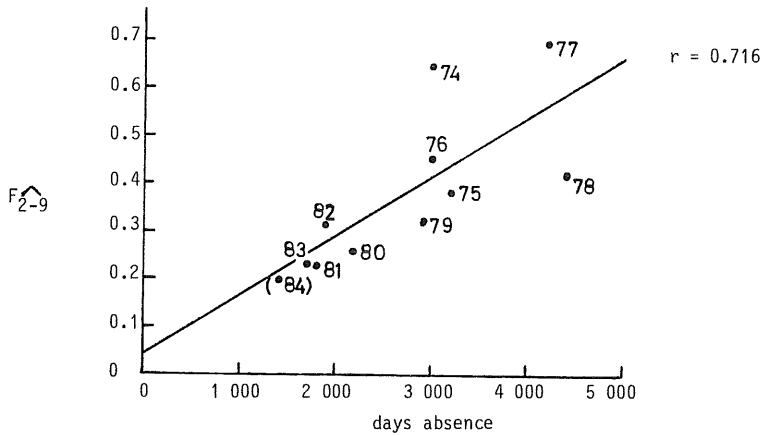
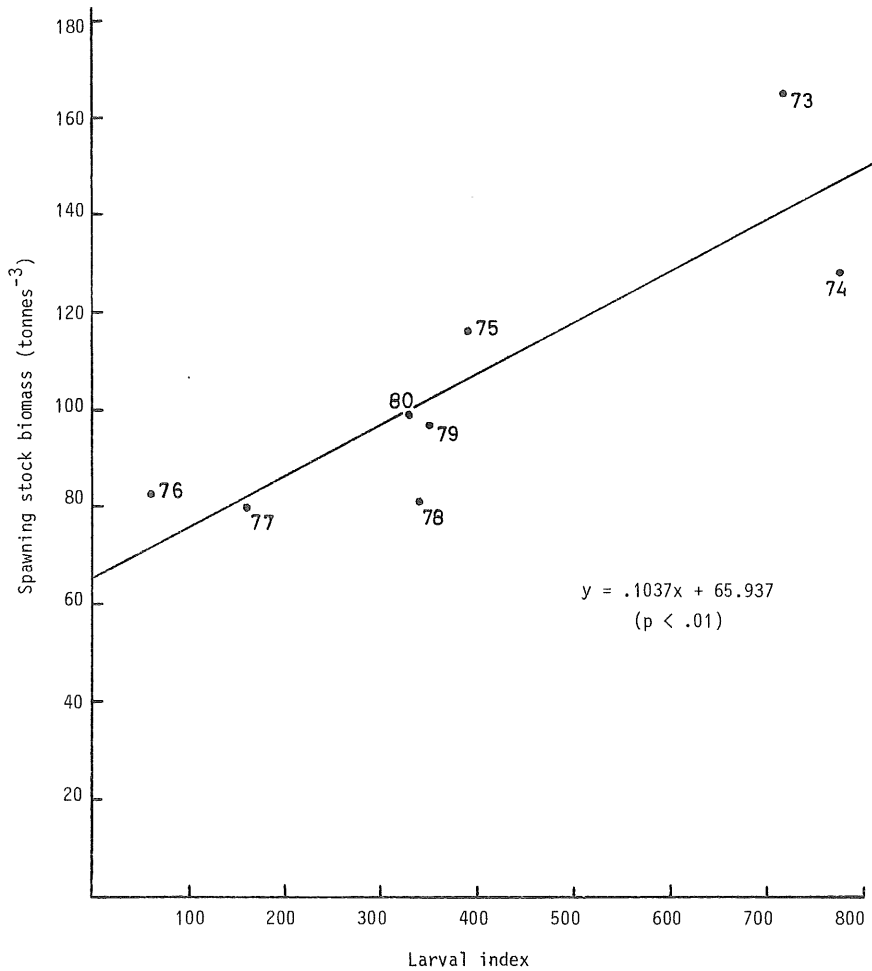


Figure 6.1. Larval abundance indices and spawning stock biomass in Divisions VIa South and VIIb.

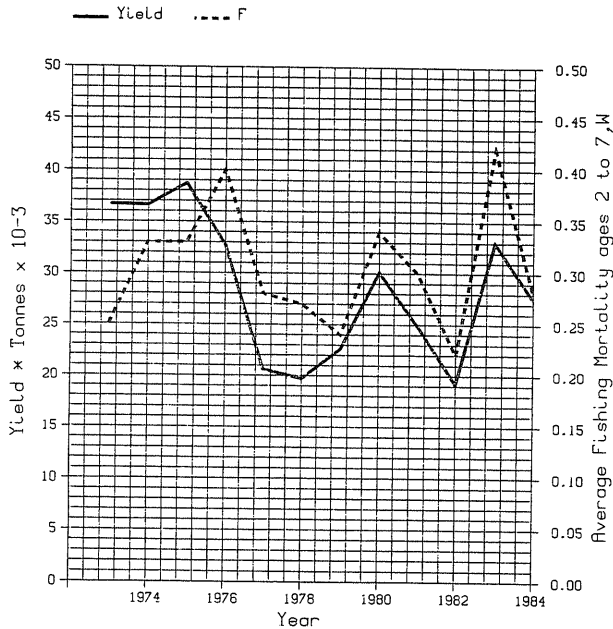




**FISH STOCK SUMMARY**  
**STOCK: Herring - VIa S and VIIb**  
**10-04-1985**

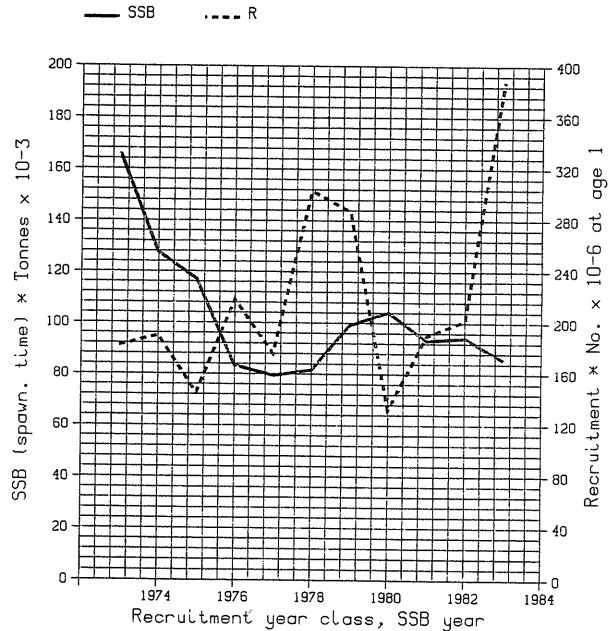
Figure 6.2

Trends in yield and fishing mortality (F)



**A**

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



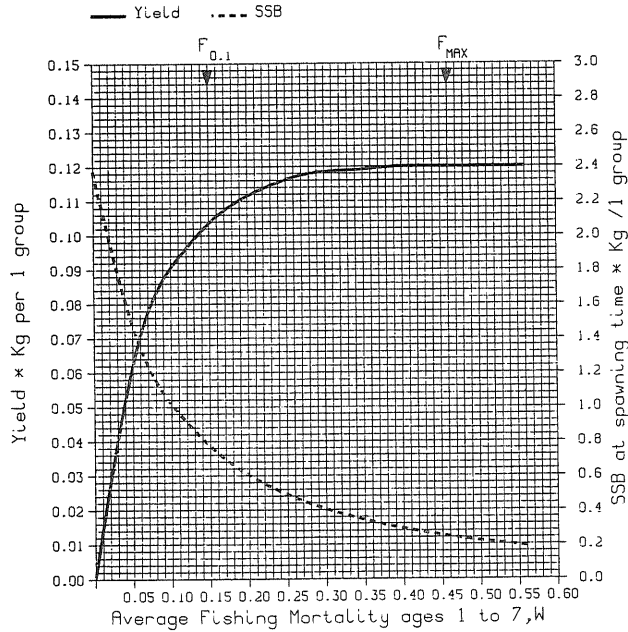
**B**

ctd.

Figure 6.2 (ctd)

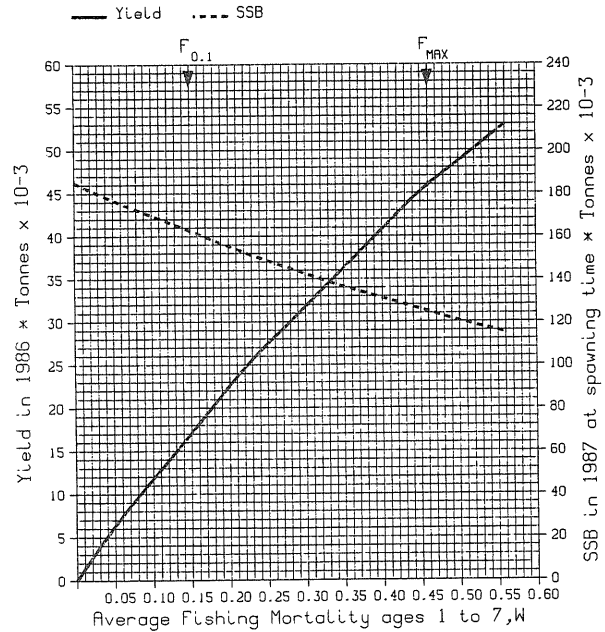
**FISH STOCK SUMMARY**  
**STOCK: Herring - VIa S and VIIb**  
**10-04-1985**

Long term yield and spawning stock biomass (kg)



C

Short-term yield and spawning stock biomass



D

Figure 7.1. North Irish Sea HERRING: 'Shepherd' Stock/Recruit Curve.

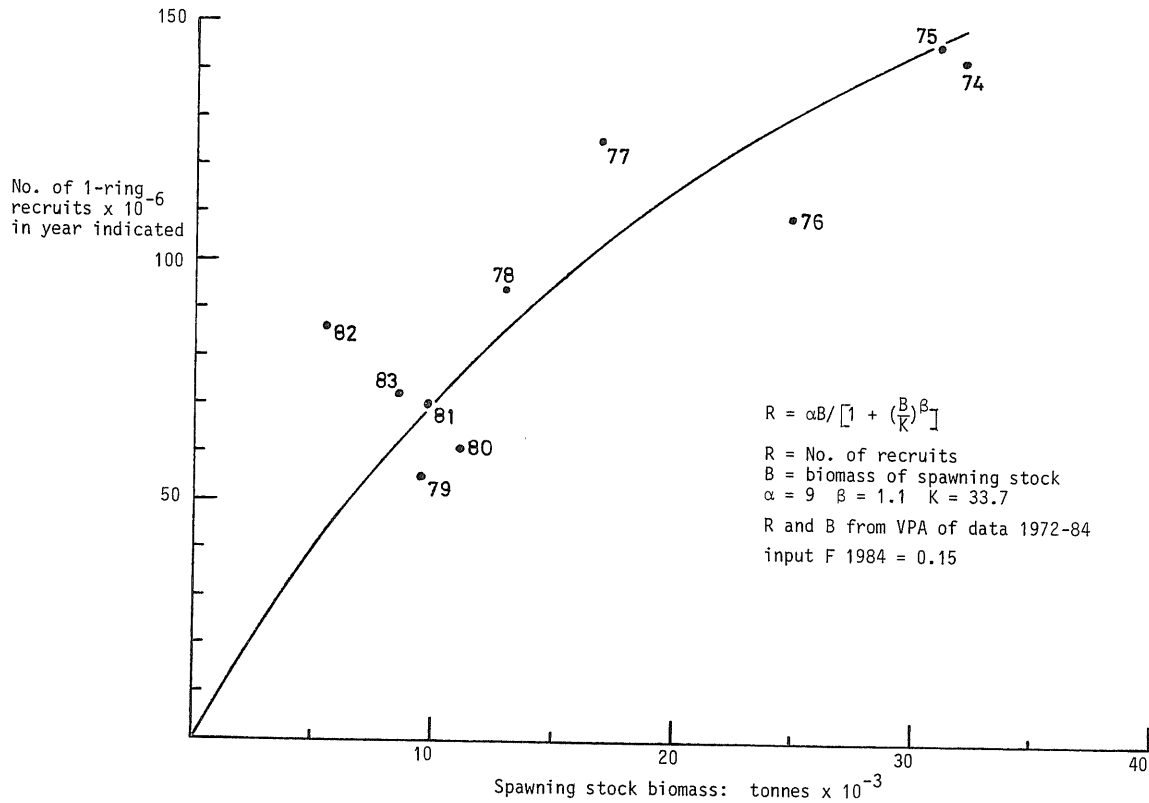
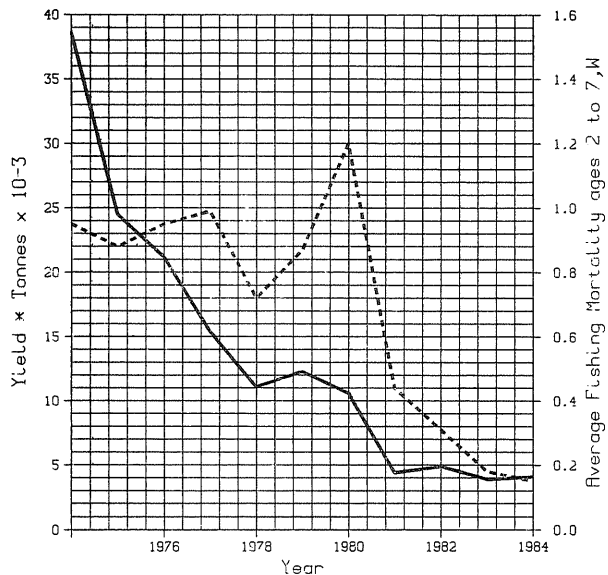


Figure 7.2.

**FISH STOCK SUMMARY**  
**STOCK: Herring - North Irish Sea**  
**28-03-1985**

Trends in yield and fishing mortality (F)

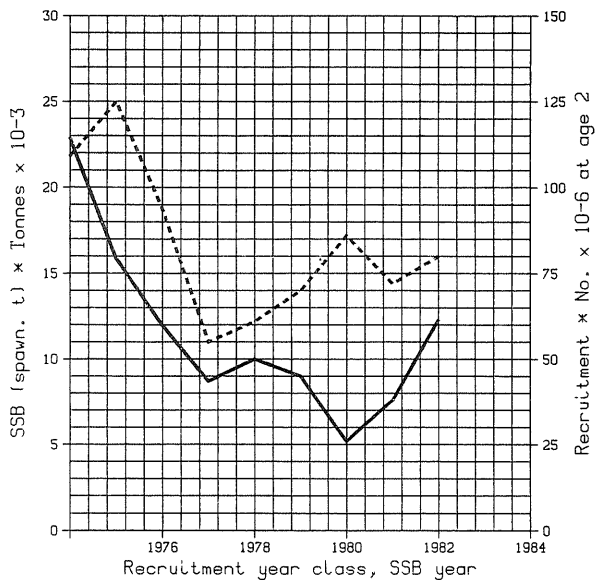
— Yield    - - - F



**A**

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

— SSB    - - - R



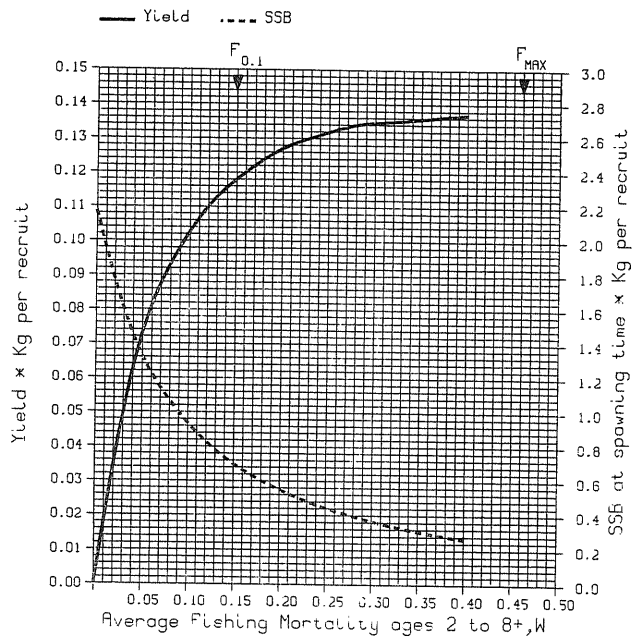
**B**

(cont'd)

Figure 7.2. (cont'd)

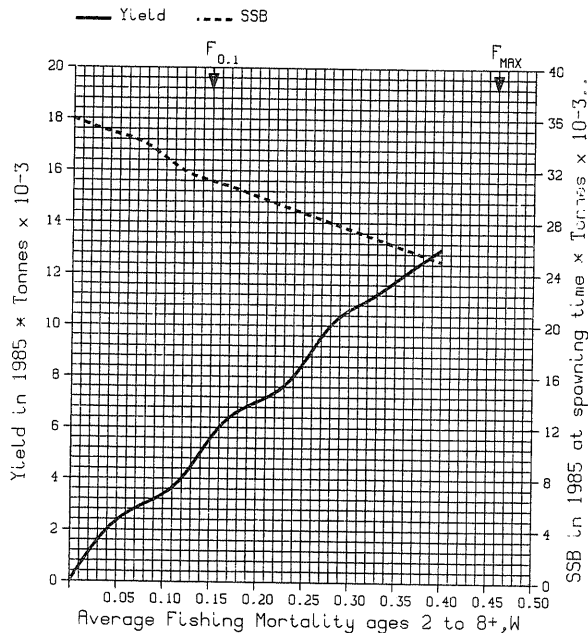
**FISH STOCK SUMMARY**  
**STOCK: Herring - North Irish Sea**  
**28-03-1985**

Long term yield and spawning stock biomass (kg)



C

Short-term yield and spawning stock biomass



D

Figure 7.3. North Irish Sea. Location of herring spawning grounds and boundaries of possible closures mentioned in text

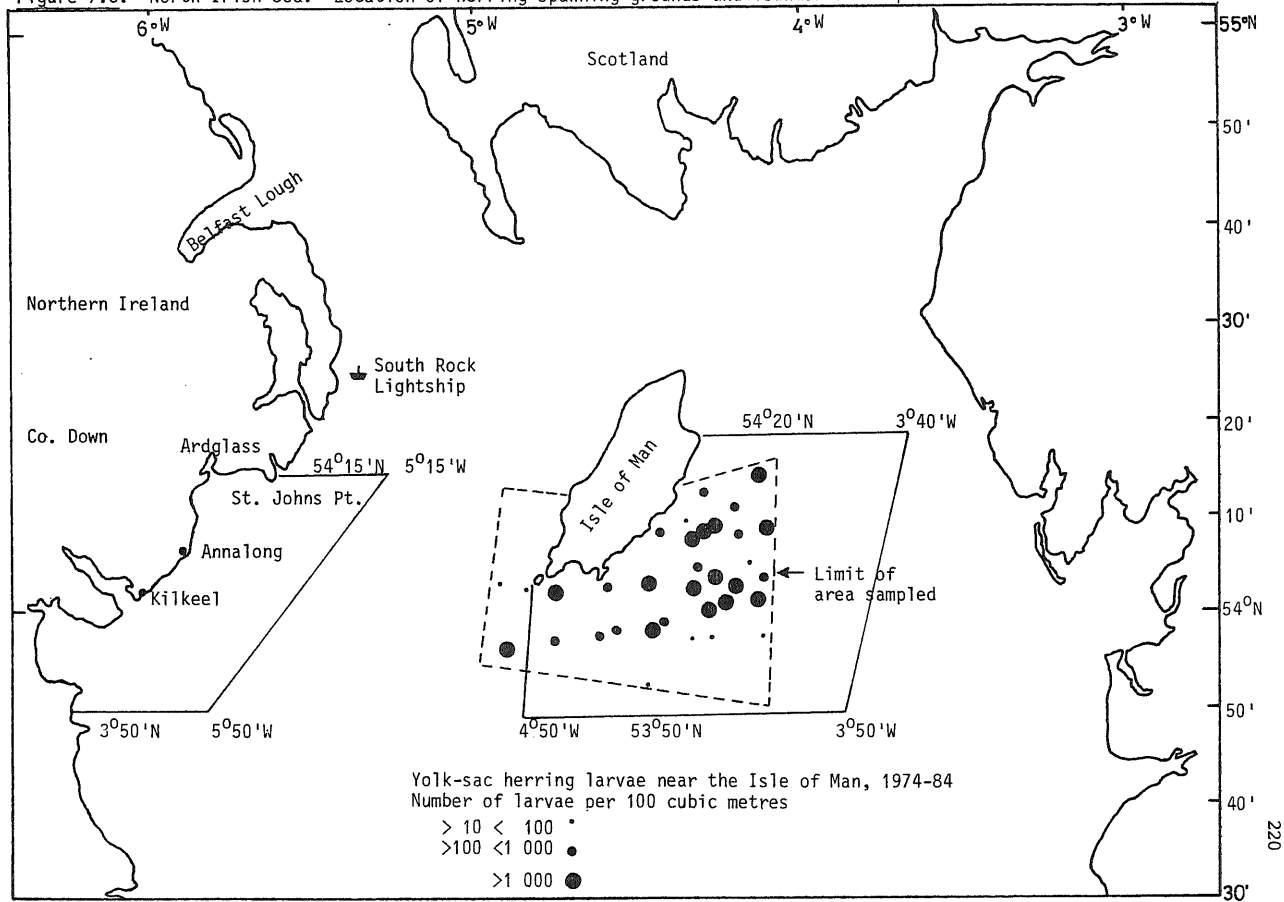
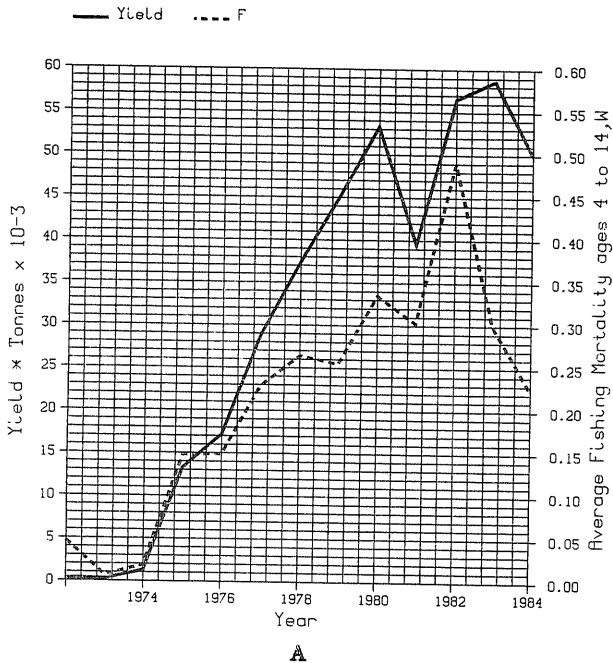


Figure 8.1.

**FISH STOCK SUMMARY**  
**STOCK: Herring - Va (Summer)**  
**26-03-1985**

Trends in yield and fishing mortality (F)



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

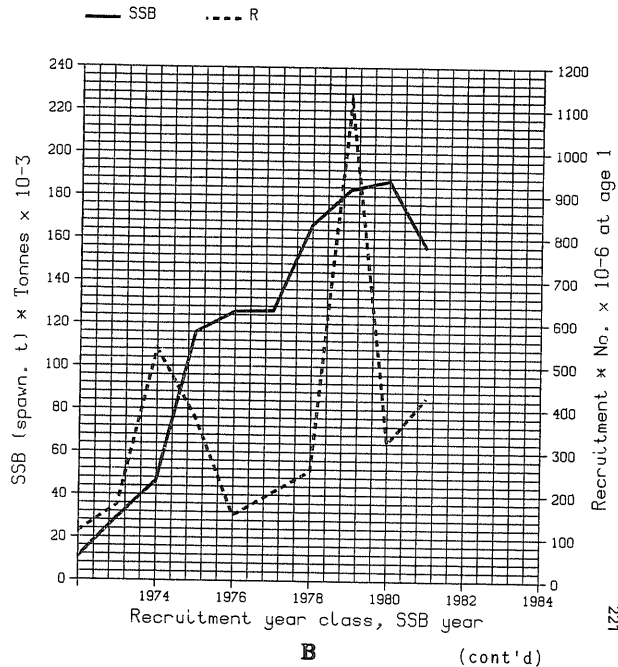
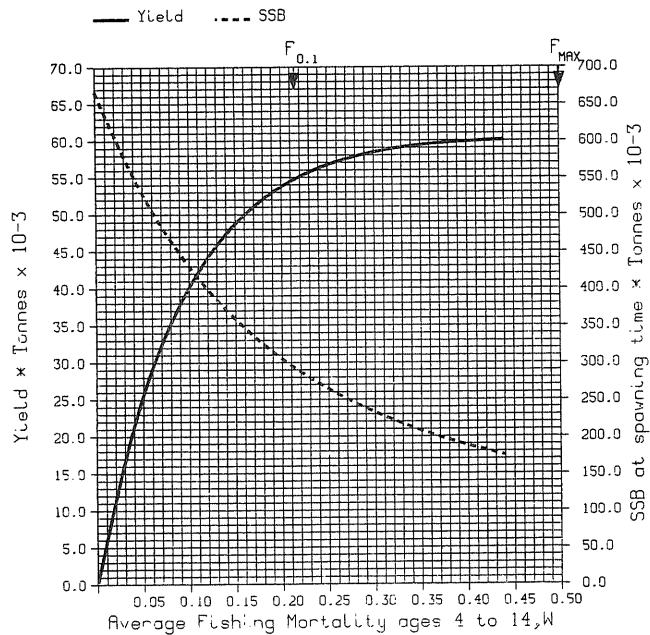


Figure 8.1. (cont'd)

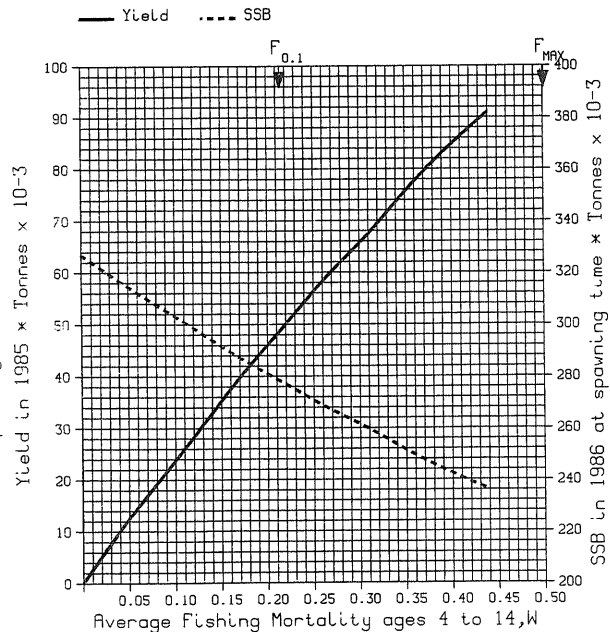
**FISH STOCK SUMMARY**  
**STOCK: Herring - Va (Summer)**  
**26-03-1985**

Long term yield and spawning stock biomass (kg)



C

Short-term yield and spawning stock biomass



D





