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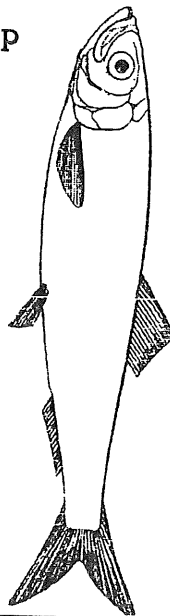
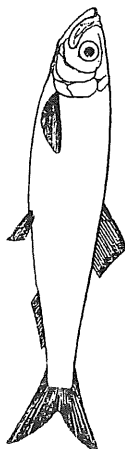


C.M. 1990/Assess: 14

PART 2

REPORT OF  
THE **H E R R I N G**  
ASSESSMENT WORKING GROUP  
FOR THE AREA SOUTH OF 62° N.

COPENHAGEN,  
27 MARCH -  
6 APRIL



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**Table 3.1.1** Catch in numbers (,000) and mean weight (g) at age and year class of herring in Divisions IVa,b which were transferred to the Division IIIa herring stock. SOP in tonnes.

		Year: 1989									
Quarter		2 1986	3 1985	4 1984	5 1983	6 1982	7 1981	8 1980	9 1979	Total number	Total weight
II	No	13,889	21,268	15,820	3,149	1,751	716	266	39	56,898	7,375
	w	82	116	166	181	208	200	194	227		
	SOP	1,133	2,476	2,630	569	364	144	52	9		
III	No	13,424	31,419	22,505	8,466	6,900	3,095	1,434	185	87,428	12,498
	w	101	123	163	180	170	189	204	206		
	SOP	1,355	3,861	3,668	1,522	1,173	585	292	38		
Total Year	No	27,313	52,687	38,325	11,615	8,651	3,811	1,700	224	144,326	19,869
	w	91	120	164	180	178	191	202	209		
	SOP	2,488	6,337	6,298	2,090	1,537	729	344	47		

**Table 3.1.2** Mean length, mean VS and proportion of 1- and 2-group spring spawners and autumn spawners (North Sea) components in commercial catches by quarters in Division IIIa 1989. Data IIIa 1989. Data from Swedish catches.

NS = North Sea autumn spawners.  
SP = Spring spawners.

Area	Quarter and age group	Mean length (cm)	Mean VS	Proportion	Comments
Skagerrak	1.1	-----	No data	-----	{ Assumed to be autumn spawners (AS)
	2.1	-----	No data	-----	
	4.1	20.7	56.26	1.0	AS
	1.2	18.7	56.31	0.81	AS
	-	20.4	56.38	0.11	AS
	-	22.4	56.41	0.08	AS
	2.2	19.2	56.30	1.0	AS
	3.2	21.1	55.61	0.86	SP
	-	23.9	56.27	0.14	AS
	4.2	21.4	55.56	0.39	SP
	-	22.8	56.03	0.44	Assigned to SP
	-	24.8	56.39	0.16	AS
	Kattegat	1.1	15.4	56.38	1.0
2.1		15.6	56.35	1.0	AS
3.1		16.9	55.86	1.0	SP
4.1		18.5	55.96	1.0	SP
1.2		17.9	56.20	0.05	Assigned to AS
-		19.6	56.37	0.95	AS
2.2		18.6	55.92	0.90	SP
-		20.6	56.41	0.10	AS
3.2		19.5	55.81	0.84	SP
-		21.9	55.80	0.16	SP
4.2		19.8	55.72	0.26	SP
-		22.2	55.91	0.65	SP
-		24.6	56.08	0.09	Assigned to SP

Table 3.1.3 Catch in number (millions) of 0-, 1- and 2-ringers in Division IIIa, 1974-1988, including both spring and autumn spawners. From Working Group reports 1982, 1985 and 1989. Figures in brackets are gross estimates not given in the reports.

Year	0-ringers	1-ringers	2-ringers
1974	2,499	910	375
1975	2,006	1,471	149
1976	433	1,474	325
1977	934	1,437	329
1978	147	876	455
1979	457	168	583
1980	682	467	233
1981	3,624	966	656
1982	3,334	985	314
1983	4,876	2,603	490
1984	4,969	2,942	847
1985	(3,900)	(2,400)	631
1986	(3,700)	(3,700)	415
1987	6,238	3,503	767
1988	1,830	5,792	2,321



Table 3.1.4 Statements in working group reports regarding the proportion of autumn spawners in the catches in Division IIIa.

Year of catch	0-Ringers					1-Ringers					2-Ringers					Remarks
	quarterly					quarterly					quarterly					
	1	2	3	4	yr	1	2	3	4	yr	1	2	3	4	yr	
1980										20						Survey data not rep. for total area.
1981	-	-	dom	dom		maj	hal	min	min							sma Swedish catches Kattegat.
1982	-	-	maj	maj		maj	maj	sma	sma							sma General statements.
1983	-	100	83	26	<u>67</u>	25	34	18	13	<u>25</u>						Dan. ind. c.; underest. prop of NS 1-r.
1984					<u>dom</u>					<u>&gt;26</u> <sup>1</sup>						<sup>1</sup> Sampl. cov. 60% of 1-r-catch.
1985											25	min	sma	sma	<u>15</u>	<sup>1</sup> Too few samples of 0- and 1-r.
1986					<u>dom</u> <sup>1</sup>					<u>dom</u> <sup>1</sup>	43	min	0	0		<sup>1</sup> IYFS (and acoustic survey).
1987	-	100	100	100	<u>100</u>	100	100	>96	>88	<u>90</u>	>24	>54	0	0	<u>15</u>	
1988					<u>100</u>					<u>100</u>					<u>13</u>	

Brief interpretation of statements:

sma (=small): 1-20%  
 min (=minor): 10-40%  
 hal (=half): 40-60%  
 maj (=major): 60-80%  
 dom (=dominating): 70-99%

Table 3.1.5 Proportion (%) of North Sea autumn spawners in Division IIIa; estimates from IYFS and annual means estimated from the IYFS. "Best estimates" of the proportion in catch are equal to annual mean in cases where no better estimates are available from the Working Group reports. IYFS-data are from Table 3.4.1 in the 1989 Working Group report and text table p. 38 in the 1986 Working Group report.

An = Proportion of 1-r in year n (IYFS).

Bn = Proportion of 2-r in year n (IYFS).

Proportion (%) of Autumn Spawners in Division IIIa								
Year	From IYFS		Estimate of annual mean			"Best estimate" of proportion in catch		
	1-r An	2-r Bn	0-r= An+1	1-r= (An+Bn+1)	2-r= Bn/2	0-r	1-r	2-r
1980	30	21	69	18	11	69	18	11
1981	69	5	45	44	3	45	44	3
1982	45	19	72	28	10	72	28	10
1983	72	11	54 *	50	6	67	50	6
1984	54	27	(>51)*	40	14	90	40	14
1985	(>51)	25	(74)	(>47)	13*	74	67 <sup>1</sup>	15
1986	(74)	43	(100)*	(50)*	22	80	80	22
1987	(100)	26	(100)*	(61)*	13*	100	90	15
1988	(100)	21	(100)*	(100)*	11*	100	100	13
1989	(100)	(100)	-	-	-	-	-	-

In brackets: "tentative split".

\*better information available in Working Group reports (See Table 2).

<sup>1</sup> assuming 90% in the beginning of the year (prop. of 0-r late 1984) and 43% at the end of the year (prop. of 2-r early 1986). 1986).

Table 3.1.6 Catches (millions) of North Sea autumn spawners in Division IIIa (estimates based on Tables 3.1.3 and 3.1.5).

Year	0-ringers	1-ringers	2-ringers
1980	471	84	26
1981	1,631	425	20
1982	2,400	276	31
1983	3,267	1,302	29
1984	4,472	1,177	119
1985	(2,866)	(1,608)	93
1986	(2,960)	(2,960)	91
1987	6,238	3,153	117
1988	1,830	5,792	292

Table 3.2.1 HERRING in Division IIIa.  
Landings in tonnes, 1980-1989. (Data provided by Working Group  
members 1989.)

Country	1983	1984	1985	1986	1987	1988	1989 <sup>1</sup>
<u>Skagerrak</u>							
Denmark	54,102	64,621	88,192	94,014	105,017	144,421	47,393
Faroe Islands	1,980	891	455	520	-	-	-
Germany, Fed.Rep.	40	-	-	11	-	-	-
Norway (Open sea)	500	-	2,752	677	-	2,982	-
Norway (Fjords)	2,834	1,494	1,673	860	1,209	2,692	1,605
Sweden	35,176	59,195	40,349	42,996	51,184	57,159	39,756
Total	94,632	126,201	133,421	139,078	157,410	207,254	88,754
<u>Kattegat</u>							
Denmark	62,901	71,359	69,235	37,419	46,603	76,175	57,130
Sweden	40,463	35,027	39,829	35,852	29,844	49,653	26,159
Total	103,364	106,386	109,064	73,271	76,447	125,828	83,289
Div. IIIa total	197,996	232,587	242,485	212,349	233,931	333,082	172,043

<sup>1</sup> Preliminary.

Table 3.2.2 HERRING Division IIIa 1989.

Numbers (millions) and weight (g) at age (winter rings) and year class of herring caught in each quarter. Landings in tonnes.

Area: Division IIIa. Country: All. Stock: All.

Quarter		0 1989	1 1988	2 1987	3 1986	4 1985	5 1984	6 1983	7 1982	8 1981	9+	Landings
I	No		513.32	397.36	172.52	18.75	3.82	1.23	0.35			
	w		18.4	51.7	67.8	70.8	104.6	122.3	186.1			44.139
II	No		130.75	338.45	123.57	17.55	4.52	0.93	0.29			
	w		23.8	43.9	71.2	78.7	102.6	110.7	194.1			29.910
III	No	871.44	425.82	212.28	88.54	26.44	6.96	2.06	0.76	0.38		
	w	14.8	42.2	65.5	86.2	147.9	167.1	187.5	188.5	214.3		58.507
IV	No	131.43	417.98	85.69	66.35	14.16	3.04	0.81	0.13	0.03		
	w	24.3	47.1	73.9	87.4	109.7	138.8	138.4	147.5	217.0		39.487
Total year	No	1,002.87	1,487.87	1,033.78	450.98	76.90	18.34	5.03	1.53	0.41		
	w	16.0	33.7	53.8	75.2	106.3	133.5	149.5	185.5	214.5		172.043

Spring spawners transferred from Division IV to Division IIIa are not included.

**Table 3.2.3** HERRING Division IIIa, 1989 estimated catch in numbers (millions) and weights (g) at age (winter rings) and year class of spring-spawning herring caught by quarter in Division IIIa and adjacent parts of the North Sea. SOP in tonnes.

Quarter	Catches in: 1989									Total	
			2	3	4	5	6	7	8		9+
			1987	1986	1985	1984	1983	1982	1981		
I	No	-	172.5	18.75	3.82	1.23	0.35	-	-	-	196.65
	w	-	67.8	70.8	104.2	122.3	186.1	-	-	-	-
	SOP	-	11,697	1,328	399.6	150.4	65.1	-	-	-	13,639.5
II	No	230.3	144.8	33.37	7.69	2.68	1.01	0.27	0.04	-	420.2
	w	41.4	77.8	120.1	134.8	174.2	198.3	194.0	227	-	-
	SOP	9,530.9	11,265	4,007	1,033.7	467.2	199.5	51.60	8.9	-	26,564
III	No	195.70	120.00	48.95	15.43	8.96	3.86	1.81	0.19	-	394.85
	w	67.9	95.84	154.8	174.2	174.0	188.9	206.2	206.0	-	-
	SOP	13,280.2	11,497	7,579	2,686.9	1,559	728.2	374.0	38.1	-	37,742
IV	No	71.69	66.35	14.16	3.04	0.81	0.13	0.03	-	-	156.21
	w	73.9	87.4	109.7	138.8	138.4	147.5	217	-	-	-
	SOP	5,296.5	5,799	1553	422.0	112.1	19.18	6.5	-	-	13,209
Total year	No	497.69	503.66	115.23	29.96	13.68	5.35	2.11	0.23	-	1,167.91
	w	56.5	79.9	125.5	151.6	167.3	189.2	204.8	204.3	-	-
	SOP	28,107.6	40,258	14,467	4,542.2	2,288.7	1,012	432.1	47	-	91,154.5

**Table 3.2.4** HERRING Division IIIa, 1987-1989. Estimated numbers (millions) at age by quarter of North Sea autumn spawners caught in Division IIIa. SOP in tonnes.

Quarter	1987									1988			1989			Total
			0	1	2			0	1	2			0	1	2	
I	No	-	1,107	35	-	1,240	281	-	-	513	397	-	-	-	910	
	w	-	13	61	-	16	56	-	-	18	52	-	-	-	33	
	SOP	0	14,834	2,103	0	19,223	15,865	0	9,466	20,544	30,010	-	-	-	-	
II	No	9	617	82	111	2,087	11	-	131	122	253	-	-	-	-	
	w	5	18	63	2	20	79	0	24	53	38	-	-	-	-	
	SOP	45	11,110	5,205	200	41,327	848	0	3,112	6,474	9,586	-	-	-	-	
III	No	4,077	898	-	1,194	1,814	0	871	178	30	1,079	-	-	-	-	
	w	7	51	-	10	36	0	15	54	66	23	-	-	-	-	
	SOP	27,965	45,613	0	11,367	65,175	0	13,065	9,680	1,947	24,692	-	-	-	-	
IV	No	2,153	515	-	525	651	0	131	218	14	363	-	-	-	-	
	w	10	60	-	19	54	0	24	54	74	44	-	-	-	-	
	SOP	21,957	31,042	0	10,098	35,418	0	3,144	11,658	1,014	15,816	-	-	-	-	
Total year	No	6,238	3,127	117	1,830	5,792	292	1,002	1,039	563	2,604	-	-	-	-	
	w	8	33	63	12	28	57	16	33	53	31	-	-	-	-	
	SOP	49,966	102,599	7,308	21,665	161,144	16,713	16,209	33,879	29,978	80,066	-	-	-	-	

Table 3.2.5 HERRING Division IIIa.

Samples of commercial catches by quarter and area available to the Working Group. Discards estimated to be nil.

Country and quarter	Catch in tonnes	No. of samples	No. of age readings	No. of fish measured	No. of fish examined racially
<u>Skaqerrak</u>					
Denmark					
1	7,843	-	-	-	-
2	5,744	1	189	195	-
3	20,176	9	825	829	510
4	15,235	2	13	13	-
Sweden					
1	11,163	12	678	2,457	678
2	7,514	1	69	187	69
3	12,901	11	833	2,457	833
4	8,178	22	1,205	4,283	935
Total	88,754	58	3,812	10,421	3,025
<u>Kattegat</u>					
Denmark					
1	15,168	11	4,583	4,584	402
2	10,781	2	851	851	-
3	20,678	16	3,438	3,438	-
4	10,503	9	1,307	1,307	-
Sweden					
1	9,965	76	1,795	15,580	1,795
2	5,871	84	1,344	13,594	1,344
3	4,752	30	816	6,516	816
4	5,571	76	1,613	14,566	1,613
Total	83,289	304	15,747	60,436	5,970
Grand total	172,043	362	19,559	70,857	8,995

Table 3.3.1 Total estimate of Division IIIa spring-spawning herring in Division IIIa and the eastern part of the Sub-area IV in 1987 - 1989 and mean weight at age in 1988 and 1989.

Age group	1987	1988	$\bar{w}(g)$	1989	$\bar{w}(g)$
0	-	-	-	-	-
1	-	-	-	-	-
2	958	1,511.6	65	1,105	78
3	665	761.4	118	714	117
4	310	86.7	160	317	171
5	114	74.2	166	81	198
6	43	18.0	181	54	211
7	3	1.0	241	16	215
8	-	1.2	175	4.2	226
Total (millions)	2,093	2,454	-	2,289	-
Biomass (t)	252,459	217,997	-	255,500	-

Table 3.4.1 Recruitment indices for 1- and 2-group herring from International Young Fish Survey in Division IIIa. Indices are given for North Sea autumn and spring spawners based on modal length analysis and vertebral counts.

Year	Index					
	Total		Spring Spawners		Autumn-spawners	
	1-gr	2-gr	1-gr	2-gr	1-gr	2-gr
1980	2,311	387	1,607	307	704	80
1981	3,246	1,393	9,660	1,318	2,250	75
1982	2,560	549	1,408	445	1,152	104
1983	5,419	1,063	1,522	946	3,897	117
1984	6,035	1,947	2,793	1,419	3,242	528
1985	7,994	2,473	- <sup>1</sup>	1,867	- <sup>1</sup>	606
1986	21,489	2,738	- <sup>1</sup>	1,562	- <sup>1</sup>	1,175
1987	11,733	3,671	- <sup>1</sup>	2,921	- <sup>1</sup>	949
1988	67,753	10,095	- <sup>1</sup>	7,834	- <sup>1</sup>	2,161
1989	17,451	4,976	- <sup>1</sup>	0	- <sup>1</sup>	4,976
1990	3,544	3,876	0	3,192	3,544	684

<sup>1</sup>Separation not valid.

Table 3.4.2 Result of model length analysis of IYFS 2-group herring in 1990 giving mean length,  $\bar{v}_s$  and proportion of separated component.

Stratum (m)	Mean length (cm)		$\bar{v}_s$	Proportion
	Autumn sp.	Spring sp.		
1 10-34		18.8	55.94	0.85
	21.5		56.40	0.15
2 35-44		19.3	55.99	0.66
	21.5		56.41	0.34
3 45-65		19.6	56.05	0.61
	22.3		56.40	0.39
4 66-150		19.6	56.06	0.42
	22.3		56.31	0.58



Table 4.2.1 Celtic Sea and Division VIIj HERRING landings by calendar year (t), 1977-1989. (Data provided by by Working Group members.)

Year	Germany,				Unallocated	Discards	Total
	France	Fed.Rep.	Ireland	Netherlands			
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	4,000	26,187
1984	680	-	7,000	890	11,148	3,600	23,318
1985	622	-	11,000	-	4,601	3,100	19,323
1986	-	-	13,338	+	6,098	3,900	23,236
1987	820	-	15,500	1,453	5,310	4,200	27,283
1988	-	-	16,766	-	-	2,400	19,166
1989 <sup>1</sup>	10	-	15,880	1,942	1,258	3,500	22,590

<sup>1</sup> Provisional.

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

Year	Germany,				Unallocated	Discards	Total
	France	Fed.Rep.	Ireland	Netherlands			
1977/1978	95	96	6,264	1,378	-	-	7,833
1978/1979	8	220	8,239	1,002	-	-	7,559
1979/1980	584	20	7,932	850	935	-	-
1980/1981	9	2	9,024	292	3,803	-	13,130
1981/1982	123	-	15,830	1,150	-	-	17,103
1982/1983	+	-	13,042	-	-	-	13,042
1983/1984	495	-	10,000	1,500	9,186	3,800	24,981
1984/1985	680	-	7,000	890	14,009	4,200	26,779
1985/1986	622	-	11,995	-	4,509	3,300	20,426
1986/1987	-	-	14,725	1	6,098	4,200	25,024
1987/1988	820	-	15,500	1,453	4,444	4,000	26,217
1988/1989	-	-	17,047	-	-	3,400	20,447
1989/1990 <sup>1</sup>	10	-	15,000	1,942	2,602	3,600	23,254

<sup>1</sup> Provisional.

Table 4.2.3 Celtic Sea/Division VIIJ.  
Length Distribution of Irish catches per quarter  
(pelagic trawlers).

Length	VIIJ	VIIG	VIIAS	VIIJ	VIIG	VIIAS
	4th Q.89	4th Q.89	4th Q.89	1st Q.90	1st Q.90	1st Q.90
17.5			4			
20		2 3	5			
21	6 52	13 25	13 112	4 17	11 0	17 59
22	136 350	134 147	196 451	21 17	21 74	84 176
23	551 667	354 352	683 919	38 63	180 562	786 1,304
24	713 959	529 592	1,352 1,754	135 321	1,282 1,727	2,290 3,693
25	1,794 3,142	894 1,068	2,062 2,490	330 566	2,437 2,628	4,120 4,061
26	4,709 4,560	1,344 1,063	2,160 2,115	888 816	3,253 2,490	3,961 2,950
27	3,666 2,442	1,030 582	2,071 1,937	575 334	1,420 996	2,482 1,663
28	1,989 1,535	529 309	1,615 1,142	144 68	678 572	1,329 1,103
29	1,367 1,315	342 198	683 344	47 17	328 127	535 518
30	1,049 544	119 76	161 80	9 4	53 21	201 67
31	363 175	15 5	5 4		0 11	8
32	13 7	5 3				
33	12					
Total	32,117	9,733	22,358	4,414	18,871	31,407
Tonnes	6,028	1,467	3,372	624	2,642	4,311
No./kg	5.32	6.6	6.6	7.1	7.1	7.3

Table 4.2.4 Celtic Sea, Division VIIj.  
Samples of commercial catches available to the Working  
Group.

Country	Catch (t)	No. of samples	No. of age readings	No. of fish measured	Estimates of discards
France	10	-	-	-	-
Ireland	15,880	55	1,917	7,047	yes
Netherlands	1,342	3	75	300	yes

Table 4.2.5 SUM OF PRODUCTS CHECK

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

	CATCH IN NUMBERS											
	UNIT: thousands											
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	1319	12658	8422	23547	5507	12768	13317	8159	2800	11335	7162	39361
2	37260	23313	137690	38133	42808	15429	11113	12516	13385	13913	30093	21285
3	50087	37563	17855	55805	17184	17783	7286	8610	11948	12399	11726	21861
4	26481	41904	15842	7012	22530	7333	7011	5280	5583	8636	6585	5505
5	18763	18759	14531	9651	4225	9006	2872	1585	1580	2889	2812	4438
6	7853	10443	4645	5323	3737	3520	4785	1898	1476	1316	2204	3436
7	6351	4276	3012	3352	2978	1644	1980	1043	540	1283	1184	795
8	2175	4942	2374	2332	903	1136	1243	383	858	551	1262	313
9+	3367	2239	1020	1209	827	1194	1769	470	482	635	565	866
TOTAL	153656	156097	205391	146364	100699	69813	51376	39944	38652	52957	63593	97860
	1982	1983	1984	1985	1986	1987	1988	1989				
1	15339	13540	19517	17916	4159	5976	2307	8260				
2	42725	102871	92892	57054	56747	67000	82027	42413				
3	8728	26993	41121	36258	42881	43075	30962	68399				
4	4617	3225	16043	16032	32930	23014	9398	19601				
5	1497	1862	2450	2306	8790	14323	5963	8205				
6	1821	327	1085	228	1127	2716	3047	3837				
7	1670	372	376	85	98	1175	869	2569				
8	335	932	231	173	29	296	297	767				
9+	586	308	180	132	12	464	86	682				
TOTAL	77598	150430	173835	130184	146773	158039	134956	154753				

Table 4.2.6 Celtic Sea, Division VIIj.  
 Percentage age distribution 1977/1978 -  
 1989/1989.

Winter rings	Season						
	1977- 1978	1978- 1979	1979- 1980	1980- 1981	1981- 1982	1982- 1983	1983- 1984
1	20.4	7.3	21.4	11.3	40.2	19.8	9.0
2	31.3	34.6	26.3	47.3	21.8	55.1	68.4
3	21.5	30.9	23.4	18.4	22.3	11.2	17.9
4	13.2	14.5	16.3	10.4	5.6	6.2	2.1
5	4.0	4.1	5.5	4.4	4.5	1.9	1.2
6	4.8	3.8	2.5	3.5	3.5	2.4	0.2
7	2.6	1.4	2.4	1.9	0.8	2.2	0.2
8	1.0	2.2	1.0	2.0	0.3	0.4	0.6
9+	1.2	1.2	1.2	0.9	0.9	0.8	0.2
Catch ( '000 t)	7.8	7.6	10.3	13.1	17.1	13.0	25.0

Winter rings	Season					
	1984- 1985	1985- 1986	1986- 1987	1987- 1988	1988- 1989	1989- 1990
1	11.2	13.8	2.8	3.8	1.7	5.3
2	53.4	43.8	38.7	42.4	60.8	27.4
3	23.6	27.9	29.2	27.3	22.9	44.2
4	9.2	12.3	22.4	14.6	7.0	12.7
5	1.4	1.8	6.0	9.1	4.4	5.3
6	0.6	0.2	0.8	1.7	2.3	2.5
7	0.2	+	+	0.7	0.6	1.7
8	0.1	0.1	+	0.2	0.2	0.5
9+	0.1	0.1	+	0.3	0.1	0.4
Catch ( '000 t)	26.8	20.4	25.0	26.2	20.4	23.2

Table 4.4.1 HERRING SOUTH AND SOUTH WEST OF IRELAND (FISH AREAS VIIG-J) from 1970-1989 on ages 1-8 with Terminal F of .400 on age 2 and Terminal S of 1.000. Initial sum of squared residuals was 173.779 and final sum of squared residuals is 45.943 after 105 iterations.

Matrix of Residuals

Years	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79			
Ages												
1/ 2	-.365	-.325	.653	1.425	1.016	2.149	1.905	1.593	.821			
2/ 3	-.041	-.309	.426	.153	.276	.129	-.486	-.373	-.010			
3/ 4	-.044	.057	.224	.018	.013	.082	-.619	-.151	.066			
4/ 5	-.078	.020	-.445	-.622	-.157	-.144	.320	.419	.203			
5/ 6	-.086	.109	-.173	-.421	-1.137	-.703	-1.037	-1.011	-.543			
6/ 7	.234	.315	-.491	-.412	-.132	-.406	.396	.451	-.307			
7/ 8	.330	.143	-.084	.807	.495	-.217	1.002	-.143	-.011			
	.000	.000	.000	.000	.000	.000	.000	.000	.000			
WTS	.001	.001	.001	.001	.001	.001	.001	.001	.001			
Years	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	WTS	
Ages												
1/ 2	1.319	1.184	1.756	.040	.470	.405	1.010	-.266	-.809	-.354	.000	.323
2/ 3	-.121	-.078	-.014	-.250	.670	-.301	-.077	.193	-.061	.246	.000	.984
3/ 4	.131	.105	.327	.051	.031	-.560	-.441	.303	.389	.309	.000	1.000
4/ 5	.405	-.488	-.147	-.233	-.436	.169	-.142	.308	-.074	-.260	.000	.913
5/ 6	-.692	-1.294	-.831	.084	-.380	.328	-.310	.400	-.175	-.235	.000	.575
6/ 7	-.530	.307	-.536	.556	-.697	.910	.105	-.511	-.254	-.249	.000	.618
7/ 8	-.153	1.090	.116	.004	.382	-.336	.804	-1.117	.479	.167	.000	.539
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	6.912	
WTS	.001	.001	.001	.001	.001	1.000	1.000	1.000	1.000	1.000		
Fishing Mortalities (F)												
F-values	70	71	72	73	74	75	76	77	78	79		
	.3562	.5433	.5309	.5883	.5609	.5429	.4964	.3615	.3304	.4440		
F-values	80	81	82	83	84	85	86	87	88	89		
	.5514	.7227	.5796	.4959	.7379	.3783	.3813	.5348	.2982	.4000		
Selection-at-age (S)												
S-values	1	2	3	4	5	6	7	8				
	.0484	1.0000	1.3931	1.6816	1.6525	1.1087	.8447	1.0000				

Table 4.4.2 VIRTUAL POPULATION ANALYSIS.

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

	FISHING MORTALITY COEFFICIENT			UNIT: Year-1		VARIABLE NATURAL MORTALITY COEFFICIENT						
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	.009	.023	.050	.125	.064	.140	.108	.076	.033	.078	.081	.162
2	.309	.364	.692	.609	.654	.460	.301	.241	.299	.400	.552	.677
3	.465	.632	.568	.741	.670	.685	.441	.432	.407	.537	.759	1.155
4	.565	.860	.570	.432	.731	.646	.605	.631	.526	.551	.581	.976
5	.604	.900	.740	.728	.447	.647	.500	.234	.345	.504	.308	.881
6	.485	.712	.512	.588	.613	.728	.764	.641	.316	.475	.800	.665
7	.364	.471	.403	.759	.682	.530	1.090	.325	.333	.441	.924	.671
8	.356	.474	.460	.552	.414	.533	.875	.551	.429	.589	.918	.588
9+	.356	.474	.460	.552	.414	.533	.875	.551	.429	.589	.918	.588
( 1- 7)U	.400	.566	.505	.569	.552	.548	.544	.369	.323	.427	.572	.741
( 2- 7)U	.465	.656	.581	.643	.633	.616	.617	.417	.371	.485	.654	.837
	1982	1983	1984	1985	1986	1987	1988	1989				
1	.037	.029	.055	.059	.015	.014	.011	.019				
2	.478	.685	.507	.394	.474	.569	.368	.437				
3	.719	.691	.712	.406	.630	.838	.496	.558				
4	.830	.608	1.168	.641	.753	.799	.382	.597				
5	.689	.805	1.201	.437	.785	.776	.432	.593				
6	1.090	.275	1.571	.275	.351	.525	.324	.486				
7	.708	.564	.513	.405	.163	.662	.280	.445				
8	.590	1.005	.733	.418	.209	.890	.305	.379				
9+	.590	1.005	.733	.418	.209	.890	.305	.379				
( 1- 7)U	.650	.523	.818	.374	.453	.597	.328	.448				
( 2- 7)U	.753	.605	.945	.427	.526	.695	.381	.519				

Table 4.4.3 VIRTUAL POPULATION ANALYSIS.

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

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 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

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	240124	872364	272444	312928	138812	153311	203610	174417	135917	238016	145213	410954
2	161016	87569	313572	95345	101555	47878	49054	67222	59446	48376	81006	49280
3	147406	87578	45063	116229	38423	39114	22389	26882	39131	32646	24025	34557
4	64145	75788	38123	20916	45360	16105	16140	11796	14287	21318	15627	9209
5	43292	32980	29013	19503	12282	19750	7637	7971	5680	7642	11115	7909
6	21396	21420	12136	12519	8525	7111	9353	4191	5708	3641	4179	7390
7	21789	11923	9510	6583	6291	4178	3107	3941	1997	3765	2048	1699
8	7612	13695	6738	5751	2789	2877	2225	945	2577	1295	2192	736
9+	11784	6205	2895	2982	2554	3024	3166	1160	1448	1492	981	2036
TOTAL NO	718564	1209522	729493	592755	356592	293348	316680	298527	266191	358191	286386	523770
SPS NO	470422	535359	436467	313582	213691	158095	153218	155478	149442	169557	155141	205947
TOT. BIOM	128287	173298	119344	93884	60365	47196	46873	44732	41937	52076	44598	70241
SPS BIOM	92364	89275	78245	56596	40121	29128	26218	26612	26713	28507	27199	31318
	1982	1983	1984	1985	1986	1987	1988	1989	1990			
1	665632	747130	576064	495458	445833	629853	308659	680961	0			
2	128575	235973	266993	200614	171892	161595	279114	137184	245712			
3	18558	59046	88080	119133	100172	79249	82810	174797	65652			
4	8912	7402	24235	35400	65004	43678	31032	45611	81892			
5	3140	3514	3647	6818	16868	27701	17782	19171	22725			
6	2967	1426	1421	993	3985	6959	11533	10441	9583			
7	3438	902	980	267	682	2537	3726	7546	5813			
8	786	1532	464	531	161	524	1184	2547	4375			
9+	1398	506	362	405	67	821	343	2264	2980			
TOTAL NO	833405	1057432	962244	859619	804664	952918	736182	1080522				
SPS NO	332224	461603	473050	444977	420545	478587	479075	529886				
TOT. BIOM	107877	143129	114526	109136	110833	114171	94475	132469				
SPS BIOM	47700	69607	63439	62521	63705	64616	66713	70920				

Table 4.6.1

List of input variables for the ICES prediction program.

CELTIC SEA HERRING

The reference F is the mean F for the age group range from 1 to 7

The number of recruits per year is as follows:

Year	Recruitment
1990	390000.0
1991	390000.0
1992	390000.0

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

Data are printed in the following units:

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

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	390000.0	.02	1.00	.50	.105	.105
2	245712.0	.44	.30	1.00	.139	.139
3	65652.0	.56	.20	1.00	.169	.169
4	81892.0	.60	.10	1.00	.188	.188
5	22725.0	.60	.10	1.00	.206	.206
6	9583.0	.49	.10	1.00	.223	.223
7	5813.0	.44	.10	1.00	.235	.235
8	4375.0	.38	.10	1.00	.257	.257
9+	2980.0	.38	.10	1.00	.270	.270



Table 5.1.1 Nominal catch (t), Division VIa (North) HERRING,  
1980-1989, as reported to the Working Group.

Country	1980	1981	1982	1983	1984
Denmark	-	1,580	-	-	96
Faroes	-	-	74	834	954
France	-	1,243	2,069	1,313	-
German Dem. Rep.	2	-	-	-	-
Germany, Fed. Rep.	-	3,029	8,453	6,283	5,564
Iceland	256	-	-	-	-
Ireland	-	-	-	-	-
Netherlands	-	5,602	11,317	20,200	7,729
Norway	-	3,850	13,018	7,336	6,669
UK (England)	-	1,094	90	-	-
UK (Scotland)	33	30,389	38,381	31,616	37,554
USSR	15	-	-	-	-
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>75,154</b>

Country	1985	1986	1987	1988	1989 <sup>1</sup>
Denmark	-	-	-	-	-
Faroes	104	400	-	-	-
France	20	18	136	44	1,342
German Dem. Rep.	-	-	-	-	-
Germany, Fed. Rep.	5,937	2,188	1,711	1,860	4,290
Iceland	-	-	-	-	-
Ireland	-	6,000	6,800	6,740	8,000
Netherlands	5,500	5,160 <sup>2</sup>	5,212 <sup>2</sup>	6,131	5,860
Norway	4,690	4,799	4,300	456	- <sup>3</sup>
UK (England)	-	-	-	1,892	1,977
UK (Scotland)	28,065	25,294	26,810	25,002	27,897
USSR	-	-	-	-	-
Unallocated	502	37,840 <sup>2</sup>	18,038 <sup>2</sup>	5,229 <sup>2</sup>	2,123
Discards	-	-	-	-	1,550
<b>Total</b>	<b>43,814</b>	<b>81,699</b>	<b>63,007</b>	<b>47,354</b>	<b>53,039</b>

<sup>1</sup> Preliminary.

<sup>2</sup> Including discards.

<sup>3</sup> Working Group estimate.

Table 5.1.2 HERRING in Division VIa (North).  
Samples of commercial catches available.

Country	Catch in tonnes	No. of samples	No. of age readings	No. of fish measured	Estimate of discards
France	1,342	0	0	0	No
Germany, Fed. Rep.	4,290	0	0	0	No
Ireland	8,000	0	0	0	No
Netherlands	5,860	17	425	1,700	Yes
UK (England)	1,977	0	0	0	No
UK (Scotland)	27,897	52	3,012 <sup>1</sup>	8,422	No

<sup>1</sup> Includes research vessel samples.

Table 5.1.3 VIRTUAL POPULATION ANALYSIS

HERRING IN THE NORTHERN PART OF VJA

CATCH IN NUMBERS	UNIT: millions											
-----	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	239	170	802	51	309	173	69	35	23	0	13	37
2	205	373	804	236	125	202	320	48	46	0	1	78
3	360	560	220	808	151	89	102	96	21	0	0	106
4	140	358	63	131	519	64	36	22	41	0	0	61
5	53	113	86	63	82	188	25	10	7	0	0	21
6	203	55	37	55	50	31	76	12	4	0	0	13
7	29	182	13	18	35	12	11	21	2	0	0	12
8	33	18	101	7	22	13	4	3	6	0	0	1
9+	31	36	20	32	21	14	12	1	2	0	0	1
TOTAL	1293	1865	2146	1401	1314	786	654	248	151	1	15	330
	1982	1983	1984	1985	1986	1987	1988	1989				
1	13	82	3	46	39	28	2	10				
2	250	78	253	77	179	94	159	57				
3	72	93	67	166	99	65	56	171				
4	94	29	47	19	137	45	38	29				
5	58	43	20	17	22	71	26	28				
6	24	27	15	7	21	12	38	12				
7	12	15	12	8	3	10	4	23				
8	14	8	6	4	16	5	3	3				
9+	4	8	3	2	2	8	3	5				
TOTAL	540	383	426	346	518	338	329	339				

**Table 5.1.4** HERRING in Division VIa (North).  
 Larvae abundance indices (numbers in billions), larvae mortality rates (Z/K), fecundity estimate ( $10^3$  eggs/g), spawning stock biomass ('000 t, age 2+ at spawning time).

Year	LAI	Z/K	LPE			Spawning stock biomass from		
			Larvae	Fecundity	SSB	LPE <sup>1</sup>	LAI <sup>2</sup>	VPA
1973	2,442	0.74	318	(1.39)	229	223	219	417
1974	1,186	0.42	238	(1.39)	171	166	106	213
1975	878	0.46	157	1.46	108	105	79	121
1976	189	-	60	1.23	49	48	17	98
1977	787	-	223	1.49	150	146	71	63
1978	332	-	132	1.37	109	106	30	62
1979	1,071	-	118	1.49	79	77	96	100
1980	1,436	0.39	287	2.04	141	137	129	168
1981	2,154	0.34	448	2.12	211	205	193	170
1982	1,890	0.39	267	1.95	137	133	169	163
1983	668	-	112	1.88	60	58	60	133
1984	2,133	0.57	253	1.75	145	141	191	238
1985	2,710	0.37	418	(1.86)	225	219	243	246
1986	3,037	0.24	907	(1.86)	488	475	272	248
1987	4,119	0.53	423	(1.86)	227	221	369	252
1988	5,947	0.47	781	(1.86)	420	409	533	444
1989	4,320	0.40	752	(1.86)	404	393	387	449

<sup>1</sup>Predicted from (1973-1989) regression:  $SSB = 0.974 \times LPE$  ( $r = 0.70$ ).

<sup>2</sup>Predicted from (1973-1989) regression:  $SSB = 0.0897 \times LAI$  ( $r = 0.78$ ).

Table 5.1.5 HERRING in Division VIa (North).  
 Scottish bottom trawl survey indices of 2-ringed herring catch rates in January-March and acoustic survey indices of the same year class in the preceding November.

Trawl survey year	Year class	Number of GOV hauls	2-ringer index (millions)	Acoustic estimate no. of 1-ringers (millions)
1981	1978	9	1,237	-
1982	1979	10	2,361	-
1983	1980	12	11	-
1984	1981	12	12,456	28.1
1985	1982	17	98	-
1986	1983	12	359	1,039.0
1987	1984	15	40	85.6
1988	1985	19	15,770	249.1
1989	1986	15	2,174 <sup>1</sup>	-
1990	1987	16	68 <sup>1</sup>	-

<sup>1</sup> Preliminary estimate

Table 5.1.6 HERRING in Division VIa (North).  
 Mean weights at age (g).

Age (rings)	Weight in the stock	Weight in the catch					
		1982-1984	1985	1986	1987	1988	1989
1	90	90	69	113	73	80	82
2	164	140	103	145	143	112	142
3	208	175	134	173	183	157	145
4	233	205	161	196	211	177	191
5	246	231	182	215	220	203	190
6	252	253	199	230	238	194	213
7	258	270	213	242	241	240	216
8	269	284	223	251	253	213	204
9	292	295	231	258	256	228	243

Table 5.1.7 HERRING IN THE NORTHERN PART OF VIA from 1970-1989 on ages 1-8 with Terminal F of .145 on age 3 and Terminal S of 1.000.

Initial sum of squared residuals was 545.922 and  
final sum of squared residuals is 95.377 after 96 iterations.

Matrix of Residuals

Years	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79			
Ages												
1/ 2	2.563	.365	3.766	1.839	2.735	1.770	2.488	1.830	1.002			
2/ 3	-.727	-.396	-.192	.375	-.277	.124	.348	.078	-.359			
3/ 4	-.127	.763	-.099	-.069	-.263	-.159	.124	-.409	-.259			
4/ 5	.239	.195	-.434	.117	.057	.012	.033	.083	1.032			
5/ 6	-.214	-.393	-.218	-.344	-.231	-.275	-.782	-.386	-.462			
6/ 7	.064	.077	.197	.022	.342	.019	-.038	.579	-.328			
7/ 8	.295	-.908	.053	-.782	-.237	-.017	-.114	-.135	.140			
	.000	.000	.000	.000	.000	.000	.000	.000	.000			
WTS	.001	.001	.001	.001	.001	.001	.001	.001	.001			
Years	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	WTS	
Ages												
1/ 2	2.001	4.307	.972	.514	1.170	-1.222	1.443	1.338	.385	-.876	.000	.184
2/ 3	.084	.492	.311	.552	-.229	-.169	-.035	.625	.094	-.248	.000	.698
3/ 4	-.247	-.375	-.035	.032	-.115	.252	.039	-.003	-.267	.099	.000	.964
4/ 5	-.032	.249	.069	.103	-.229	.220	-.085	.068	-.055	-.041	.000	.902
5/ 6	-.273	-.801	-.296	-.169	.179	-.040	-.387	-.226	-.205	.240	.000	1.000
6/ 7	-.618	-.949	.033	-.300	.092	-.200	.871	.024	.334	.073	.000	.634
7/ 8	1.277	1.020	-.378	-.616	.060	.172	-.931	-1.342	.416	-.030	.000	.395
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	22.279	
WTS	.001	.001	.001	1.000	1.000	1.000	.001	.001	1.000	1.000		
Fishing Mortalities (F)												
F-values	70	71	72	73	74	75	76	77	78	79		
	.4544	.9007	.5462	.6288	.9657	.9825	1.1179	.9268	.7186	.0015		
F-values	80	81	82	83	84	85	86	87	88	89		
	.0028	.3608	.5783	.4927	.4175	.2595	.3580	.2662	.1772	.1450		

Table 5.1.8

Analysis by RCRTINX? of data from file airtinx.dat  
Herring in VIa(N)

Data for 2 surveys over 17 years  
REGRESSION TYPE = C  
TAPERED TIME WEIGHTING NOT APPLIED  
PRIOR WEIGHTING NOT APPLIED  
FINAL ESTIMATES SHRUNK TOWARDS MEAN  
ESTIMATES WITH S.E.'S GREATER THAN THAT OF MEAN INCLUDED  
MINIMUM S.E. FOR ANY SURVEY TAKEN AS .20  
MINIMUM OF 5 POINTS USED FOR REGRESSION

Yearclass = 1986

Survey/ Series	Index Value	Slope	Inter- cept	Rsquare No. Pts	Predicted Value	Sigma	Standard Error	Weight
	8.0190	.919	-1.347	.5852 13	6.0200	.49284	.54312	.45535
	6.1924	1.999	-4.615	.3403 13	7.7633	.81512	1.07132	.11703
MEAN					5.0789	.56045	.56045	.42763

Yearclass = 1987

Survey/ Series	Index Value	Slope	Inter- cept	Rsquare No. Pts	Predicted Value	Sigma	Standard Error	Weight
	8.3236	.888	-1.146	.6268 14	6.2459	.45950	.51470	.44005
	5.4293	1.527	-2.419	.4106 14	5.8692	.71336	.75633	.20379
MEAN					5.1305	.57211	.57211	.35616

Yearclass = 1985

Survey/ Series	Index Value	Slope	Inter- cept	Rsquare No. Pts	Predicted Value	Sigma	Standard Error	Weight
	8.6908	.844	-.853	.6682 15	6.4803	.42797	.48830	.48053
	6.0426	1.532	-2.442	.4382 15	6.8123	.68768	.78702	.18498
MEAN					5.1813	.58527	.58527	.33449

Yearclass = 1989

Survey/ Series	Index Value	Slope	Inter- cept	Rsquare No. Pts	Predicted Value	Sigma	Standard Error	Weight
	8.3712	.806	-.600	.7212 16	6.1511	.39916	.43086	.53112
	6.0039	1.391	-1.770	.5208 16	6.5795	.61580	.68109	.21255
MEAN					5.2450	.62019	.62019	.25634

Yearclass	Weighted Average Prediction	Internal Standard Error	External Standard Error	Virtual Population Analysis	Ext.SE/ Int.SE	
1986	5.82	337.49	.37	.59	5.80 331.00 1.61	
1987	5.77	321.15	.34	.35	5.89 362.00 1.03	
1988	6.11	449.07	.34	.47	6.20 493.00 1.39	
1989	6.01	407.44	.31	.34		1.08

Table 5.1.9 VIRTUAL POPULATION ANALYSIS.

## HERRING IN THE NORTHERN PART OF VIA

	FISHING MORTALITY COEFFICIENT					VARIABLE NATURAL MORTALITY COEFFICIENT						
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	.106	.027	.504	.077	.333	.136	.192	.087	.036	.000	.021	.032
2	.181	.424	.296	.501	.493	.730	.760	.346	.274	.001	.003	.301
3	.419	1.155	.513	.589	.768	.874	1.185	.586	.262	.001	.002	.352
4	.460	.919	.342	.632	.918	.844	1.053	.873	.503	.001	.003	.358
5	.444	.740	.513	.596	.939	.923	.866	.883	.654	.000	.001	.279
6	.402	.993	.510	.636	1.224	1.018	1.134	1.330	.907	.002	.001	.303
7	.591	.669	.619	.445	.969	1.070	1.191	1.027	.758	.003	.007	.290
8	.454	.801	.876	.617	1.416	1.150	1.120	1.023	.900	.001	.001	.275
9+	.454	.801	.876	.617	1.416	1.150	1.120	1.023	.900	.001	.001	.275
( 3- 6)U	.431	.952	.469	.613	.962	.915	1.060	.918	.582	.001	.002	.323
	1982	1983	1984	1985	1986	1987	1988	1989				
1	.022	.034	.003	.036	.037	.008	.002	.004				
2	.566	.293	.239	.175	.333	.199	.099	.123				
3	.542	.455	.472	.259	.380	.204	.184	.155				
4	.571	.417	.416	.228	.335	.285	.168	.134				
5	.602	.490	.498	.232	.383	.259	.236	.163				
6	.495	.557	.289	.307	.433	.334	.192	.142				
7	.441	.582	.472	.208	.173	.356	.173	.155				
8	.586	.595	.435	.222	.762	.431	.145	.130				
9+	.586	.595	.435	.222	.762	.431	.145	.130				
( 3- 6)U	.553	.480	.419	.256	.383	.270	.195	.149				



Table 5.1.10 VIRTUAL POPULATION ANALYSIS.  
HERRING IN THE NORTHERN PART OF VIA

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: .670

PROPORTION OF ANNUAL M BEFORE SPAWNING: .670

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	3731	10060	3076	1079	1681	2124	617	659	995	1437	956	1854
2	1432	1235	3602	684	367	443	682	187	222	353	528	344
3	1152	886	599	1984	307	166	158	236	98	125	261	390
4	397	621	228	293	901	117	57	40	108	62	102	214
5	156	227	224	147	141	326	45	18	15	59	56	92
6	643	90	98	121	73	50	117	17	7	7	53	51
7	68	389	30	53	58	19	16	34	4	2	6	48
8	94	34	180	15	31	20	6	4	11	2	2	6
9+	88	69	37	73	29	21	19	2	3	0	1	6
TOTAL NO	7762	13611	8075	4450	3589	3287	1717	1198	1463	2047	1966	3004
SPS NO	2808	1893	3302	2007	983	580	517	317	317	521	866	813
TOT. BIOM	1172	1645	1192	796	570	435	265	168	182	245	281	405
SPS BIOM	581	391	602	417	213	121	98	63	62	100	168	170
	1982	1983	1984	1985	1986	1987	1988	1989	1990			
1	978	3855	1508	2043	1685	5350	1558	4265	0			
2	661	352	1371	553	725	597	1952	572	1563			
3	189	278	194	800	344	385	363	1310	375			
4	225	90	144	99	505	193	257	247	919			
5	135	115	54	86	72	327	131	197	195			
6	63	67	64	29	62	44	228	94	151			
7	34	35	35	43	20	36	29	171	73			
8	33	20	18	20	32	15	23	22	132			
9+	10	20	8	13	4	25	24	47	55			
TOTAL NO	2326	4831	3395	3686	3449	6973	4565	6924				
SPS NO	805	647	1308	1223	1217	1215	2346	2122				
TOT. BIOM	357	549	480	513	508	817	706	943				
SPS BIOM	163	133	238	246	248	252	444	449				

Table 5.1.11

List of input variables for the ICES prediction program.

HERRING - VIA NORTH

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
1990	586.0
1991	586.0
1992	586.0

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

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

Data are printed in the following units:

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

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
2	586.0	.12	.30	1.00	.142	.164
3	375.0	.16	.20	1.00	.145	.208
4	919.0	.13	.10	1.00	.191	.233
5	195.0	.16	.10	1.00	.190	.246
6	151.0	.14	.10	1.00	.213	.252
7	73.0	.16	.10	1.00	.216	.258
8	132.0	.13	.10	1.00	.204	.269
9+	55.0	.13	.10	1.00	.243	.292

(cont'd)

Table 5.1:11 (cont'd)

For data that can be entered by file or manually by screen the following table gives the method of input by age group. The identifiers in the table are to be interpreted as:

space: not defined or set by the program  
 M : manual input by screen  
 F : data read from a file

age	F at age	M at age	maturity ogive	weight in the catch	weight in the stock
2	M	F	F	F	F
3	M	F	F	F	F
4	M	F	F	F	F
5	M	F	F	F	F
6	M	F	F	F	F
7	M	F	F	F	F
8	M	F	F	F	F
9+	M	F	F	F	F
proportion of F before spawning: F					
proportion of M before spawning: F					

The data from the files were selected as follows:

M at age: year 1989 from file NATMOR  
 Maturity ogive: year 1989 from file MORPROP  
 Catch weight: year 1989 from file WECA  
 Stock weight: year 1989 from file WEST  
 Proportions of F and M: from file MORPROP

Table 5.1.12 HERRING - VIA NORTH.

\*\*\*\*\*  
 \* Year 1990, F-factor 1.490 and reference F .2198 \*  
 -----\*  
 Run depending on a TAC value \*  
 -----\*

age	absolute F	catch in numbers	catch in weight	stock size	stock biomass	at 1 January		at spawning time	
						sp.stock size	sp.stock biomass	sp.stock size	sp.stock biomass
2	.1788	83.261	11.8231	586.00	96.104	586.00	96.104	425.18	69.730
3	.2384	72.380	10.4951	375.00	78.000	375.00	78.000	279.55	58.147
4	.1937	154.254	29.4624	919.00	214.127	919.00	214.127	754.84	175.878
5	.2384	39.440	7.4936	195.00	47.970	195.00	47.970	155.44	38.239
6	.2086	27.102	5.7728	151.00	38.052	151.00	38.052	122.79	30.944
7	.2384	14.765	3.1892	73.00	18.834	73.00	18.834	58.19	15.013
8	.1937	22.156	4.5198	132.00	35.508	132.00	35.508	108.42	29.165
9+	.1937	9.232	2.2433	55.00	16.060	55.00	16.060	45.18	13.191
Total		422.589	74.9993	2486.00	544.655	2486.00	544.655	1949.60	430.308

\*\*\*\*\*  
 \* Year 1991, F-factor 1.000 and reference F .1475 \*  
 -----\*

age	absolute F	catch in numbers	catch in weight	stock size	stock biomass	at 1 January		at spawning time	
						sp.stock size	sp.stock biomass	sp.stock size	sp.stock biomass
2	.1200	57.420	8.1537	586.00	96.104	586.00	96.104	442.27	72.532
3	.1600	48.780	7.0732	363.04	75.513	363.04	75.513	285.24	59.329
4	.1300	28.093	5.3657	241.90	56.363	241.90	56.363	207.35	48.313
5	.1600	96.526	18.3400	685.11	168.538	685.11	168.538	575.58	141.593
6	.1400	17.303	3.6855	139.02	35.032	139.02	35.032	118.37	29.829
7	.1600	15.626	3.3751	110.91	28.614	110.91	28.614	93.17	24.039
8	.1300	6.044	1.2329	52.04	13.999	52.04	13.999	44.61	12.000
9+	.1300	16.190	3.9341	139.41	40.707	139.41	40.707	119.50	34.894
Total		285.982	51.1603	2317.43	514.869	2317.43	514.869	1886.09	422.529

(cont'd)

Table 5.1.12 (cont'd)

\*\*\*\*\*  
 \* Year 1992, F-factor 1.000 and reference F .1475 \*  
 \*\*\*\*\*

age	absolute F	catch in numbers	catch in weight	stock size	stock biomass	at 1 January		at spawning time	
						sp.stock size	sp.stock biomass	sp.stock size	sp.stock biomass
2	.1200	57.420	8.1537	586.00	96.104	586.00	96.104	442.27	72.532
3	.1600	51.735	7.5016	385.03	80.086	385.03	80.086	302.51	62.922
4	.1300	29.415	5.6182	253.29	59.015	253.29	59.015	217.11	50.587
5	.1600	27.079	5.1450	192.20	47.281	192.20	47.281	161.47	39.722
6	.1400	65.751	14.0049	528.26	133.121	528.26	133.121	449.79	113.347
7	.1600	15.407	3.3279	109.35	28.213	109.35	28.213	91.87	23.703
8	.1300	9.931	2.0259	85.51	23.003	85.51	23.003	73.30	19.718
9+	.1300	17.665	4.2927	152.11	44.417	152.11	44.417	130.39	38.074
Total		274.403	50.0699	2291.75	511.241	2291.75	511.241	1868.72	420.606

Table 5.2.1 Catches (t) of HERRING from the Firth of Clyde.

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Reported landings:										
UK (Scotland)	2,081	2,135	2,506	2,530	2,991	3,001	3,395	2,895	1,568	2,135
UK (N.Ireland and Isle of Man)	-	-	-	273	247	22	-	-	-	-
Additional landings <sup>1</sup>	-	274	262	293	224	433	576	278	110	208
Discards	- <sup>5</sup>	- <sup>5</sup>	1,253	1,265	2,308 <sup>3</sup>	1,344 <sup>3</sup>	679 <sup>3</sup>	439 <sup>4</sup>	245 <sup>4</sup>	- <sup>2</sup>
Catch used by Working Group	2,081	2,409	4,021	4,361	5,770	4,800	4,650	3,612	1,923	2,343

<sup>1</sup> Calculated from estimates of weight per box and, in some years, estimated by-catch in sprat fishery.

<sup>2</sup> Reported to be at a low level; assumed to be zero.

<sup>3</sup> Based on sampling.

<sup>4</sup> Estimated assuming same discarding rate as in 1986.

<sup>5</sup> No estimates available.

Table 5.2.2 Sampling levels of Clyde HERRING 1988-1989.

Year	Reported landings (t)	No. of samples	No. of fish measured	No. of fish aged	Estimates of discards
1988	1,568	41	5,955	2,574	Based on
1989	2,135	45	8,368	4,152	local reports

Table 5.2.3 Clyde HERRING.  
Numbers ('000) landed in  
half cm length groups.

Length (cm)	1988	1989
13		3 3
14		3
15		3
16		
17		7
18		
19		2
20	+	5
21	+	12 13
22	+	61 78
23	3 10	169 186
24	31 59	235 304
25	99 185	422 883
26	172 171	1,494 2,128
27	229 376	2,196 1,529
28	620 348	815 484
29	977 923	421 315
30	889 697	158 112
31	514 305	80 72
32	146 102	20 22
33	43 6	2 1
34	7 +	+ +
35	+	2

+ Less than 500.

Table 5.2.4 Number of days absent from port by pair trawlers in the Firth of Clyde, 1974-1989, and estimated total effort in pair trawl units.

Year	Days absent (pair trawl)	Raised to total landings
1974	3,376	3,376
1975	3,209	3,209
1976	3,016	3,016
1977	4,186	4,186
1978	4,379	4,379
1979	2,933	2,933
1980	1,982	1,982
1981	1,529	1,529
1982	1,755	1,755
1983	1,644	1,644
1984	1,401	1,401
1985	1,688	1,688
1986	1,375	1,375
1987	850	998
1988	540	626
1989	582	639

Table 5.2.5 CLYDE HERRING. Mean weight at age in the catch and stock.

Age (rings)	Mean weight in catch						Mean weight in stock				
	1970- 1981	1982- 1985	1986	1987	1988	1989	1970- 1981	1982- 1986	1987	1988	1989
2	.225	.149	.166	.149	.156	.149	.225	.176	.149	.156	.149
3	.270	.187	.199	.194	.194	.174	.270	.207	.194	.194	.174
4	.290	.228	.224	.203	.207	.203	.290	.254	.203	.207	.203
5	.310	.253	.253	.217	.211	.221	.310	.260	.217	.211	.221
6	.328	.272	.265	.225	.222	.227	.328	.306	.225	.222	.227
7	.340	.307	.297	.236	.230	.235	.340	.313	.236	.230	.235
8	.345	.291	.298	.247	.225	.237	.345	.300	.247	.225	.237
9	.350	.300	.298	.255	.244	.219	.350	.272	.255	.244	.219
10+	.350	.300	.321	.258	.230	.254	.350	.330	.258	.230	.254



**Table 5.2.6** Estimated numbers (millions) and mean weight (g) at age of herring (> 1-ringers) from Clyde acoustic surveys, 1985-1989.

Year	Dates	Rings										Biomass (tx10 <sup>-3</sup> )
		1	2	3	4	5	6	7	8	>9	Total	
1985	17/5-1/6	1.1	3.2	9.9	10.6	3.0	3.2	0.8	0.7	0.3	33.1	6.6
1986	4-14/6	1.6	20.5	12.5	9.3	3.4	3.2	1.2	-	0.2	52.0	9.0
1987	8-14/7	148.2	11.5	9.2	11.5	5.7	3.0	1.2	0.7	0.4	191.4	16.1
1988	7-18/7	1.6	67.4	6.2	4.8	5.5	3.6	2.8	1.5	0.4	93.8	12.4
1989	3-18/7	1.2	9.5	80.3	6.7	2.4	1.8	1.1	0.3	0.1	103.4	18.4
Mean weight at age (g) in 1989		97	158	176	199	235	234	252	267	200	173	

**Table 5.2.7** CLYDE HERRING.  
Inputs for tuning VPA.  
Fleet 1. Effort (days absence),  
catch in numbers at ages 2-9.  
Fleet 2. Acoustic survey estimates of  
numbers at ages 2-8.

```

clyde-tuning
102
cpue
1974 1989
1 1
2 9
3376 8841 2817 2559 1140 494 700 253 87
3209 1876 2483 1024 1072 451 175 356 130
3016 10480 913 1049 526 638 261 138 178
4186 7524 6976 1062 1112 574 489 251 146
4379 1796 2259 2724 634 606 330 298 174
2933 4859 807 930 888 341 289 156 119
1982 5633 1592 567 341 204 125 48 56
1529 2372 2785 1622 1158 433 486 407 74
1755 11311 4079 2440 1028 663 145 222 63
1644 10109 5232 1747 963 555 415 189 85
1401 11829 5774 3406 1509 587 489 375 74
1688 2951 4420 4592 2806 2654 917 631 457
1375 4574 4431 4622 2679 1847 644 287 251
998 1376 3669 4379 3408 1983 1427 630 308
626 1062 1724 2506 2014 1319 510 234 66
639 1523 9293 876 452 252 146 29 16
acoustic survey
1985 1989
1 1
2 8
1 3200 9900 10600 3000 3200 800 700
1 20500 12500 9300 3400 3200 1200 0
1 11500 9200 11500 5700 3000 1200 700
1 67400 6200 4800 5500 3600 2800 1500
1 9500 30300 6700 2400 1800 1100 300

```

Table 5.2.8 CLYDE HERRING. Outputs from tuning module.

DISAGGREGATED Qs  
 LOG TRANSFORMATION  
 NO explanatory variate (Mean used)  
 Fleet 1 ,cpue , has terminal q estimated as the mean  
 Fleet 2 ,acoustic survey , has terminal q estimated as the mean  
 FLEETS COMBINED BY \*\* VARIANCE \*\*

Regression weights  
 , .005, .036, .100, .193, .308, .432, .555, .670, .769, .850, .911, .954, .980, .994, .999, 1.000,  
 Olcest age F = 1.000\*average of 5 younger ages. Fleets combined by variance of predictions  
 Fishing mortalities

Age,	74,	75,	76,	77,	78,	79,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89,
2,	.687,	.266,	.475,	.718,	.183,	.361,	.349,	.122,	.392,	.354,	.426,	.153,	.310,	.127,	.010,	.084,
3,	.516,	.447,	.213,	.734,	.527,	.124,	.204,	.310,	.339,	.338,	.376,	.297,	.384,	.471,	.245,	.114,
4,	.535,	.339,	.326,	.387,	.684,	.407,	.114,	.312,	.463,	.225,	.365,	.550,	.547,	.772,	.653,	.180,
5,	.498,	.397,	.260,	.598,	.374,	.437,	.228,	.317,	.297,	.298,	.275,	.511,	.640,	.896,	.893,	.204,
6,	.444,	.332,	.387,	.443,	.679,	.314,	.150,	.444,	.270,	.231,	.266,	.949,	.663,	1.306,	.966,	.224,
7,	.456,	.248,	.290,	.510,	.437,	.718,	.162,	.555,	.232,	.241,	.291,	.743,	.555,	1.596,	1.445,	.223,
8,	.412,	.392,	.281,	.442,	.593,	.338,	.215,	.994,	.470,	.471,	.318,	.730,	.481,	1.945,	1.255,	.230,
9,	.469,	.342,	.309,	.476,	.554,	.443,	.174,	.525,	.346,	.293,	.303,	.697,	.577,	1.303,	1.042,	.212,

Log catchability estimates

Age 2 Fleet,	74,	75,	76,	77,	78,	79,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1,	-8.50,	-9.40,	-8.76,	-8.67,	-10.08,	-9.00,	-8.64,	-9.43,	-8.41,	-8.44,	-8.10,	-9.31,	-8.40,	-8.97,	-11.09,	-8.94
2,	,	,	,	,	,	,	,	,	,	,	,	-1.80,	.33,	.06,	-1.50,	-1.65

SUMMARY STATISTICS

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
	q		F	F		Slope	Intrcpt	
1	-9.03	.700	.0765	.0765	.000E+00	.000E+00	-9.030	.213
2	-.50	.886	.6046	.0969	.000E+00	.000E+00	-.503	.364
Fbar		SIGMA(int.)		SIGMA(ext.)		SIGMA(overall)		Variance ratio
.084		.549		.115		.549		.044

(cont'd)

Table 5.2.8 (cont'd)

Age 3

Fleet,	74,	75,	76,	77,	78,	79,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1,	-8.79,	-8.88,	-9.56,	-8.65,	-9.02,	-10.07,	-9.18,	-8.50,	-8.55,	-8.49,	-8.22,	-8.64,	-8.18,	-7.66,	-7.84,	-8.63
2,	,	,	,	,	,	,	,	,	,	,	,	-.41,	.08,	.17,	-.13,	-.01

SUMMARY STATISTICS

Fleet,	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
,	q	,	F	F	,	Slope	,	Intrcpt
1,	-8.46	.458	.1352	.1352	.000E+00	.000E+00	-8.461	.140
2,	-.06	.240	.9446	.1093	.000E+00	.000E+00	-.057	.099
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
.114	.213	.874E-01	.213	.169				

Age 4

Fleet,	74,	75,	76,	77,	78,	79,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1,	-8.75,	-9.16,	-9.13,	-9.29,	-8.76,	-8.88,	-9.76,	-8.50,	-8.24,	-8.90,	-8.25,	-8.03,	-7.83,	-7.17,	-6.87,	-8.17
2,	,	,	,	,	,	,	,	,	,	,	,	.24,	.10,	.71,	.22,	.32

SUMMARY STATISTICS

Fleet,	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
,	q	,	F	F	,	Slope	,	Intrcpt
1,	-8.16	.634	.1822	.1822	.000E+00	.000E+00	-8.163	.193
2,	.32	.253	1.3744	.1797	.000E+00	.000E+00	.318	.104
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
.180	.235	.477E-02	.235	.000				

Age 5

Fleet,	74,	75,	76,	77,	78,	79,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1,	-8.82,	-9.00,	-9.36,	-8.85,	-9.37,	-8.81,	-9.07,	-8.48,	-8.69,	-8.62,	-8.53,	-8.10,	-7.67,	-7.02,	-6.55,	-8.05
2,	,	,	,	,	,	,	,	,	,	,	,	-.60,	-.21,	.40,	.89,	.08

SUMMARY STATISTICS

Fleet,	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
,	q	,	F	F	,	Slope	,	Intrcpt
1,	-8.10	.666	.1941	.1941	.000E+00	.000E+00	-8.099	.203
2,	.12	.621	1.1272	.2123	.000E+00	.000E+00	.120	.255
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
.204	.454	.447E-01	.454	.010				

(cont'd)

Table 5.2.8 (cont'd)

Age 6

Fleet,	74,	75,	76,	77,	78,	79,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1,	-8.94,	-9.18,	-8.96,	-9.15,	-8.77,	-9.14,	-9.49,	-8.14,	-8.78,	-8.87,	-8.57,	-7.48,	-7.64,	-6.64,	-6.47,	-7.96
2,	,	,	,	,	,	,	,	,	,	,	,	.13,	.14,	.68,	.97,	.47

SUMMARY STATISTICS

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	q	F	F	Slope	Slope	Intrcpt	Intrcpt	
1	-8.01	.784	.2120	.2120	.000E+00	.000E+00	-8.011	.239
2	.48	.391	1.6208	.2269	.000E+00	.000E+00	.483	.160
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
.224	.350	.271E-01	.350	.006				

Age 7

Fleet,	74,	75,	76,	77,	78,	79,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1,	-8.91,	-9.47,	-9.25,	-9.01,	-9.21,	-8.31,	-9.41,	-7.92,	-8.93,	-8.83,	-8.48,	-7.73,	-7.81,	-6.44,	-6.07,	-7.96
2,	,	,	,	,	,	,	,	,	,	,	,	-.43,	.03,	.29,	2.07,	.52

SUMMARY STATISTICS

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	q	F	F	Slope	Slope	Intrcpt	Intrcpt	
1	-7.95	.845	.2254	.2254	.000E+00	.000E+00	-7.950	.258
2	.51	1.034	1.6618	.2206	.000E+00	.000E+00	.508	.425
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
.223	.654	.106E-01	.654	.000				

Age 8

Fleet,	74,	75,	76,	77,	78,	79,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1,	-9.01,	-9.01,	-9.28,	-9.16,	-8.91,	-9.07,	-9.13,	-7.34,	-8.23,	-8.16,	-8.39,	-7.75,	-7.96,	-6.24,	-6.21,	-7.93
2,	,	,	,	,	,	,	,	,	,	,	,	-.29,	-2.30,	.69,	2.09,	.87

SUMMARY STATISTICS

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	q	F	F	Slope	Slope	Intrcpt	Intrcpt	
1	-7.80	.785	.2607	.2607	.000E+00	.000E+00	-7.804	.239
2	.23	1.783	1.2544	.1213	.000E+00	.000E+00	.227	.732
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
.230	.718	.282	.718	.154				

Table 5.2.9 VIRTUAL POPULATION ANALYSIS.

CLYDE HERRING

CATCH IN NUMBERS

UNIT: thousands

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
2	7551	6503	8983	5258	8841	1876	10480	7524	1796	4859	5633	2372
3	10338	1976	3181	4548	2817	2483	913	6976	2259	807	1592	2785
4	8745	4355	1684	1811	2559	1024	1049	1062	2724	930	567	1622
5	2306	3432	3007	918	1140	1072	526	1112	634	888	341	1158
6	741	1090	1114	1525	494	451	638	574	606	341	204	433
7	760	501	656	659	700	175	261	489	330	289	125	486
8	753	352	282	307	253	356	138	251	298	156	48	407
9	227	225	177	132	87	130	178	146	174	119	56	74
10+	117	181	132	114	59	67	100	192	236	154	68	18
TOTAL	31538	18615	19216	15272	16950	7634	14283	18326	9057	8543	8634	9355
	1982	1983	1984	1985	1986	1987	1988	1989				
2	11311	10109	11829	2951	4574	1376	1062	1523				
3	4079	5232	5774	4420	4431	3669	1724	9293				
4	2440	1747	3406	4592	4622	4379	2506	876				
5	1028	963	1509	2806	2679	3408	2014	452				
6	663	555	587	2654	1847	1983	1319	252				
7	145	415	489	917	644	1427	510	146				
8	222	189	375	681	287	680	234	29				
9	63	85	74	457	251	308	66	16				
10+	53	38	80	240	79	175	16	5				
TOTAL	20004	19333	24122	19718	19414	17405	9451	12592				

Table 5.2.10 VIRTUAL POPULATION ANALYSIS.

## CLYDE HERRING

	FISHING MORTALITY COEFFICIENT					VARIABLE NATURAL MORTALITY COEFFICIENT						
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
2	.600	.443	.465	.460	.687	.266	.475	.718	.183	.361	.349	.122
3	.548	.327	.433	.489	.516	.447	.213	.734	.527	.124	.204	.310
4	.797	.445	.485	.447	.535	.339	.326	.387	.684	.407	.114	.312
5	.606	.753	.558	.472	.498	.397	.260	.598	.374	.437	.228	.317
6	.449	.572	.517	.543	.444	.332	.387	.443	.679	.314	.150	.444
7	.622	.550	.719	.585	.456	.248	.290	.510	.437	.718	.162	.555
8	.847	.582	.608	.785	.412	.393	.281	.442	.593	.338	.215	.994
9	.664	.581	.578	.568	.469	.342	.309	.476	.554	.443	.174	.525
10+	.664	.581	.578	.568	.469	.342	.309	.476	.554	.443	.174	.525
( 2- 6)U	.600	.508	.492	.482	.536	.356	.332	.576	.489	.329	.209	.301
	1982	1983	1984	1985	1986	1987	1988	1989				
2	.392	.354	.426	.153	.311	.127	.010	.084				
3	.339	.338	.376	.297	.384	.472	.245	.114				
4	.463	.225	.365	.550	.547	.772	.654	.180				
5	.296	.298	.275	.511	.640	.895	.893	.204				
6	.270	.231	.266	.949	.663	1.306	.965	.224				
7	.232	.241	.291	.743	.555	1.596	1.444	.223				
8	.470	.472	.318	.730	.481	1.945	1.255	.230				
9	.346	.293	.303	.697	.577	1.303	1.042	.212				
10+	.346	.293	.303	.697	.577	1.303	1.042	.212				
( 2- 6)U	.352	.289	.342	.492	.509	.714	.553	.161				

Table 5.2.11 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: .000  
PROPORTION OF ANNUAL M BEFORE SPAWNING: .250

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
2	19098	20819	27655	16332	20250	9225	31729	16695	12383	18393	21947	23773
3	26799	7768	9907	12872	7642	7548	5236	14624	6029	7641	9496	11470
4	16615	12687	4585	5259	6464	3734	3953	3465	5747	2913	5528	6342
5	5304	6773	7354	2554	3043	3426	2407	2582	2129	2624	1755	4463
6	2145	2617	2886	3808	1441	1674	2084	1679	1284	1325	1533	1264
7	1716	1239	1337	1556	2002	836	1087	1281	976	589	876	1194
8	1376	834	647	589	785	1149	591	736	696	570	260	674
9	489	534	422	319	243	470	702	403	428	348	368	190
10+	252	430	314	275	165	242	394	531	580	451	447	46
TOTAL NO	73795	53701	55106	43565	42035	28303	48183	41996	30252	34854	42209	49415
SPS NO	52701	31884	26535	26250	21063	18426	15922	24324	17283	15871	19534	24733
TOT. BIOM	20017	14465	14388	11656	11004	7737	12086	11077	8087	8971	10825	12804
SPS BIOM	15157	9489	7900	7701	6239	5473	4791	7045	5130	4664	5680	7196
	1982	1983	1984	1985	1986	1987	1988	1989	1990			
2	39967	38862	39021	23979	19676	13344	129445	21834	0			
3	15584	20004	20197	18872	15243	10684	8710	94984	14872			
4	6888	9095	11678	11353	11478	8503	5459	5580	69388			
5	4200	3921	6572	7337	5926	6011	3557	2570	4217			
6	2941	2825	2635	4515	3982	2828	2222	1317	1896			
7	734	2032	2030	1827	1581	1857	693	766	953			
8	620	526	1445	1373	786	821	341	148	555			
9	226	351	297	951	599	440	106	88	106			
10+	190	157	320	500	188	250	26	27	84			
TOTAL NO	71349	77772	84194	70707	59460	44738	150557	127315				
SPS NO	30232	37468	43571	45119	38435	30361	20382	100589				
TOT. BIOM	14541	16116	17785	15707	13249	8545	24529	22021				
SPS BIOM	7244	8947	10597	11100	9660	6345	4138	17907				

Table 5.2.12 Clyde HERRING: historic series of catch population and mortality estimates.

Year	Catch (t)	Year	Catch (t)	F(2-6,u)	Total biomass (2+) at 1 Jan (t x 10 <sup>-3</sup> )	SSB at spawning time (31 Mar) (t x 10 <sup>-3</sup> )	Recruitment (2) at 1 Jan (No. x 10 <sup>-6</sup> )
1955	4,050	1970	7,763	0.60	20.0	15.2	19.1
1956	4,843	1971	4,088	0.51	14.5	9.5	20.8
1967	5,915	1972	4,226	0.49	14.4	7.9	27.7
1958	4,926	1973	4,715	0.48	11.7	7.7	16.3
1959	10,530	1974	4,063	0.54	11.0	6.2	20.2
1960	15,680	1975	3,663	0.36	7.7	5.5	9.2
1961	10,848	1976	4,139	0.33	12.1	4.8	31.7
1962	3,989	1977	4,847	0.58	11.1	7.0	16.7
1963	7,073	1978	3,862	0.49	8.1	5.1	12.4
1964	14,509	1979	1,951	0.33	9.0	4.7	18.4
1965	15,096	1980	2,081	0.21	10.8	5.7	21.9
1966	9,807	1981	2,409	0.30	12.8	7.2	23.8
1967	7,929	1982	4,021	0.35	14.5	7.2	40.0
1968	9,433	1983	4,361	0.29	16.1	8.9	38.9
1969	10,594	1984	5,770	0.34	17.8	10.5	39.0
		1985	4,800	0.49	15.7	11.1	24.0
		1986	4,650	0.51	13.2	9.5	19.7
		1987	3,612	0.71	8.5	6.3	13.4
		1988	1,923	0.55	24.5	4.2	129.4
		1989	2,343	0.16	22.0	17.9	21.8



Table 5.2.13

List of input variables for the ICES prediction program.

CLYDE HERRING PREDICTION

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

The number of recruits per year is as follows:

Year	Recruitment
1990	23000.0
1991	23000.0
1992	23000.0

Proportion of F (fishing mortality) effective before spawning: .0000  
 Proportion of M (natural mortality) effective before spawning: .2500

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	23000.0	.04	.30	.00	.151	.151
3	14872.0	.10	.20	1.00	.187	.187
4	69388.0	.18	.10	1.00	.204	.204
5	4217.0	.22	.10	1.00	.216	.216
6	1896.0	.27	.10	1.00	.225	.225
7	953.0	.33	.10	1.00	.234	.234
8	555.0	.35	.10	1.00	.236	.236
9	106.0	.27	.10	1.00	.239	.239
10+	84.0	.27	.10	1.00	.247	.247

Table 5.2.14

## Results - CLYDE HERRING PREDICTION.

Year 1990. F-factor .868

Run depending on a TAC value

and reference F .1398

age	absolute F	catch in numbers	catch in weight	stock size	stock biomass	at 1 January		at spawning time	
						sp.stock size	sp.stock biomass	sp.stock size	sp.stock biomass
2	.0339	662.0	100.19	23000	3480.7	.0	.0	.0	.0
3	.0842	1090.1	204.20	14872	2786.0	14872.0	2786.0	14146.7	2650.1
4	.1571	9613.6	1964.39	69388	14178.3	69388.0	14178.3	67674.8	13828.2
5	.1927	704.5	152.42	4217	912.3	4217.0	912.3	4112.9	899.8
6	.2309	372.7	83.74	1896	426.0	1896.0	426.0	1849.2	415.5
7	.2899	228.8	53.47	953	222.7	953.0	222.7	929.5	217.2
8	.2995	137.0	32.38	555	131.2	555.0	131.2	541.3	127.9
9	.2344	21.1	5.05	106	25.4	106.0	25.4	103.4	24.7
10+	.2344	16.7	4.14	84	20.8	84.0	20.8	81.9	20.3
Total		12846.7	2599.98	115071	22183.2	92071.0	18702.5	89439.6	18173.7

\*\*\*\*\*  
 \* Year 1991. F-factor 1.000 and reference F .1610 \*  
 \*\*\*\*\*

age	absolute F	catch in numbers	catch in weight	stock size	stock biomass	at 1 January		at spawning time	
						sp.stock size	sp.stock biomass	sp.stock size	sp.stock biomass
2	.0390	760.8	115.13	23000	3480.7	.0	.0	.0	.0
3	.0970	1382.3	258.96	16471	3085.7	16471.6	3085.7	15668.3	2935.2
4	.1810	1766.2	360.88	11192	2287.1	11192.9	2287.1	10916.5	2230.6
5	.2220	10184.1	2203.16	53655	11607.5	53655.9	11607.5	52331.1	11321.0
6	.2660	701.0	157.49	3146	707.0	3146.9	707.0	3069.2	689.5
7	.3340	369.0	86.22	1361	318.2	1361.8	318.2	1328.2	310.4
8	.3450	179.7	42.47	645	152.5	645.3	152.5	629.3	148.7
9	.2700	84.0	20.10	372	89.1	372.2	89.1	363.0	86.9
10+	.2700	30.7	7.59	135	33.6	136.0	33.6	132.6	32.8
Total		15457.7	3252.01	109982	21761.4	86982.5	18280.7	84438.3	17755.1

(cont'd)

Table 5.2.14 (cont'd)

\*\*\*\*\*  
 \* Year 1992, F-factor 1.000 and reference F .1610 \*  
 \*\*\*\*\*

age	absolute F	catch in numbers	catch in weight	stock size	stock biomass	at 1 January		at spawning time	
						sp.stock size	sp.stock biomass	sp.stock size	sp.stock biomass
2	.0390	760.8	115.13	23000	3480.7	.0	.0	.0	.0
3	.0970	1375.2	257.63	16387	3069.8	16387.1	3069.8	15587.9	2920.1
4	.1810	1931.3	394.62	12239	2500.9	12239.1	2500.9	11937.0	2439.1
5	.2220	1604.0	347.00	8450	1828.2	8450.9	1828.2	8242.3	1783.1
6	.2660	8661.7	1945.99	38884	8736.0	38884.3	8736.0	37924.2	8520.3
7	.3340	591.3	138.18	2182	509.9	2182.4	509.9	2128.5	497.4
8	.3450	245.7	58.07	882	208.5	882.4	208.5	860.6	203.4
9	.2700	93.3	22.33	413	99.0	413.5	99.0	403.3	96.5
10+	.2700	79.2	19.59	351	86.8	351.0	86.8	342.4	84.7
Total		15342.5	3298.54	102790	20519.9	79790.7	17039.2	77426.1	16544.6

Table 6.1.1 Estimated HERRING catches in tonnes in Divisions VIa (South) and VIb,c, 1980-1989.

Country	1980	1981	1982	1983	1984
France	-	-	353	19	-
Germany, Fed. Rep.	-	2,687	265	-	-
Ireland	27,499	19,443	16,856	15,000	10,000
Netherlands	1,514	2,790	1,735	5,000	6,400
UK (N. Ireland)	1	2	-	-	-
UK (England + Wales)	-	-	-	-	-
Unallocated	1,110	-	-	13,000	11,000
<b>Total landings</b>	<b>30,124</b>	<b>24,922</b>	<b>19,209</b>	<b>33,019</b>	<b>27,400</b>
Discards	-	-	-	-	-
<b>Total catch</b>	<b>30,124</b>	<b>24,922</b>	<b>19,209</b>	<b>33,019</b>	<b>27,400</b>

Country	1985	1986	1987	1988	1989 <sup>1</sup>
France	-	-	-	-	-
Germany, Fed. Rep.	-	-	-	-	-
Ireland	13,900	15,450	15,000	15,000	18,200
Netherlands	1,270	1,550	1,550	300	2,900
UK (N. Ireland)	-	-	5	-	-
UK (England + Wales)	-	-	51	-	-
UK (Scotland)	-	-	-	-	+
Unallocated	8,204	11,785	31,994	13,800	7,100
<b>Total landings</b>	<b>23,374</b>	<b>28,785</b>	<b>48,600</b>	<b>29,100</b>	<b>28,200</b>
Discards	-	-	-	-	1,000
<b>Total catch</b>	<b>23,374</b>	<b>28,785</b>	<b>48,600</b>	<b>29,100</b>	<b>29,200</b>

<sup>1</sup> Provisional.

Table 6.1.2 SUM OF PRODUCTS CHECK.

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

CATCH IN NUMBERS	UNIT: thousands											
-----	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	135	883	1001	6423	3374	7360	16613	4485	10170	5919	2856	1620
2	35114	6177	28786	40390	29406	41308	29011	44512	40320	50071	40058	22265
3	26007	7038	20534	47389	41116	25117	37512	13396	27079	19161	64946	41794
4	13243	10856	6191	16863	44579	29192	26544	17176	13308	19969	25140	31460
5	3895	8826	11145	7432	17857	23718	25317	12209	10685	9349	22126	12812
6	40181	3938	10057	12383	8882	10703	15000	9924	5356	8422	7748	12746
7	2982	40553	4243	9191	10901	5909	5208	5534	4270	5443	6946	3461
8	1667	2286	47182	1969	10272	9378	3596	1360	3638	4423	4344	2735
9+	1911	2160	4305	50980	30549	32029	15703	4150	3324	4090	5334	5220
TOTAL	125135	82717	133444	193020	196936	184714	174504	112746	118150	126847	179498	134113
	1982	1983	1984	1985	1986	1987	1988	1989				
1	748	1517	2794	9606	918	12149	0	2241				
2	18136	43688	81481	15143	27110	44160	29135	6919				
3	17004	49534	28660	67355	24818	80213	46300	78842				
4	28220	25316	17854	12756	66383	41504	41008	26149				
5	18280	31782	7190	11241	14644	99222	23381	21481				
6	8121	18320	12836	7638	7988	15226	45692	15008				
7	4089	6695	5974	9185	5696	12639	6946	24917				
8	3249	3329	2008	7587	5422	6082	2482	4213				
9+	2875	4251	4020	2168	2127	10187	1964	3036				
TOTAL	100722	184432	162817	142679	155106	321382	196908	182806				

**Table 6.1.3** HERRING Division VIaS and Divisions VIIb,c. Samples of commercial catch available to the Working Group.

Country	Catch (t)	No. of samples	No. of age readings	No. of fish measured	Estimate of discards
Ireland	18,200	59	2,284	5,697	No
Netherlands	2,900	5	125	500	Yes

**Table 6.1.4** Division VIa and VIIb.  
Length distribution of Irish catches  
(Pelagic trawlers) per quarter (10<sup>3</sup>).

Length	1.Q	2.Q	3.Q	4.Q	Total
19.0	16	-	-	-	16
19.5	-	-	-	-	-
20.0	16	-	-	-	16
20.5	-	-	-	-	-
21.0	-	19	-	-	19
21.5	17	10	-	-	36
22.0	66	38	-	-	104
22.5	214	75	-	69	358
23.0	839	169	13	103	1,124
23.5	1,415	588	13	344	2,260
24.0	2,649	1,014	147	309	4,119
24.5	2,682	2,422	268	1,477	6,849
25.0	2,632	3,774	977	3,539	10,922
25.5	1,530	4,600	1,526	8,589	16,245
26.0	773	3,737	2,691	10,135	17,336
26.5	592	3,981	2,838	9,208	16,245
27.0	609	2,817	1,727	4,982	10,135
27.5	642	4,187	1,473	2,886	9,188
28.0	905	4,863	1,192	1,821	8,781
28.5	773	6,666	1,982	2,130	11,551
29.0	1,102	6,159	2,008	2,130	11,399
29.5	1,053	5,614	1,915	2,130	10,712
30.0	526	2,666	1,111	1,580	5,883
30.5	362	1,070	415	447	2,294
31.0	181	376	308	275	1,140
31.5	33	131	147	137	448
32.0	49	-	40	34	123
32.5	17	-	-	-	17
33.0	16	-	13	-	16
<b>Total</b>	<b>19,708</b>	<b>54,886</b>	<b>20,806</b>	<b>52,326</b>	<b>147,726</b>
<b>Tonnes</b>	<b>(2,318)</b>	<b>(6,752)</b>	<b>(5,258)</b>	<b>(5,918)</b>	<b>20,246</b>

Table 6.4.1 HERRING IN FISHING AREAS VIIB, C AND LOWER VIA (W. COAST OF IRELAND, PORCUPINE BANK) from 1970-1989 on ages 2-8 with Terminal F of .300 on age 4 and Terminal S of 1.000.

Initial sum of squared residuals was 35.147 and  
final sum of squared residuals is 14.938 after 115 iterations

Matrix of Residuals

Years	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79			
Ages												
2/ 3	1.920	-.388	.189	.751	.499	.562	.665	.697	1.229			
3/ 4	.425	.187	.110	.035	-.152	-.430	-.189	-.600	.001			
4/ 5	.045	.119	-.186	-.006	.212	-.160	-.115	-.049	.132			
5/ 6	-.427	-.041	-.168	-.192	.021	.082	-.030	.235	-.045			
6/ 7	-.441	-.001	.009	.093	-.108	.318	.005	.234	-.319			
7/ 8	-.333	-.239	.529	-.296	-.517	-.052	.191	-.350	-.496			
	.000	.000	.000	.000	.000	.000	.000	.000	.000			
WTS	.001	.001	.001	.001	.001	.001	.001	.001	.001			
Years	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	WTS	
Ages												
2/ 3	.465	.071	-.467	-.171	.128	.604	.092	-.001	.001	-.703	.000	.245
3/ 4	-.344	.006	-.213	-.354	-.104	.454	-.166	-.211	-.128	.052	.000	.534
4/ 5	-.097	.034	.019	.003	.218	.194	-.233	-.022	-.147	.208	.000	1.000
5/ 6	.128	-.158	-.132	.055	-.202	-.387	.189	.278	-.017	-.061	.000	.757
6/ 7	.111	.073	.529	.229	-.009	-.009	.123	-.163	-.033	.080	.000	.661
7/ 8	-.006	.041	-.706	.092	-.092	-.746	.196	.084	.652	-.184	.000	.382
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	3.245	
WTS	.001	.001	.001	.001	.001	1.000	1.000	1.000	1.000	1.000		
Fishing Mortalities (F)												
F-values	70	71	72	73	74	75	76	77	78	79		
	.1736	.1454	.2054	.2661	.4027	.4113	.4938	.3149	.2555	.2747		
F-values	80	81	82	83	84	85	86	87	88	89		
	.3977	.3088	.2491	.4001	.1968	.1869	.2129	.4439	.3293	.3000		
Selection-at-age (S)												
S-values	2	3	4	5	6	7	8					
	.4133	.9634	1.0000	1.0000	1.1271	1.1534	1.0000					

Table 6.4.2 VIRTUAL POPULATION ANALYSIS.

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

	FISHING MORTALITY COEFFICIENT			UNIT: Year-1		VARIABLE NATURAL MORTALITY COEFFICIENT						
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
2	.371	.048	.115	.186	.192	.249	.262	.241	.257	.162	.143	.151
3	.232	.124	.234	.297	.311	.264	.402	.197	.240	.198	.347	.230
4	.166	.136	.146	.290	.476	.359	.465	.307	.290	.266	.408	.267
5	.151	.143	.181	.233	.499	.443	.533	.358	.284	.303	.466	.334
6	.136	.201	.214	.279	.424	.560	.494	.365	.234	.336	.391	.474
7	.172	.177	.308	.276	.374	.492	.517	.302	.235	.352	.453	.269
8	.174	.174	.286	.204	.497	.564	.556	.218	.296	.361	.464	.287
9+	.174	.174	.286	.204	.497	.564	.556	.218	.296	.361	.464	.287
( 2- 7)U	.205	.138	.199	.260	.379	.394	.445	.295	.257	.269	.368	.288
( 3- 7)U	.171	.156	.216	.275	.417	.423	.482	.306	.257	.291	.413	.315
	1982	1983	1984	1985	1986	1987	1988	1989				
2	.096	.246	.125	.067	.086	.188	.084	.124				
3	.175	.436	.269	.153	.158	.418	.327	.363				
4	.228	.401	.262	.174	.210	.404	.370	.294				
5	.219	.383	.169	.234	.276	.488	.371	.301				
6	.325	.316	.234	.243	.232	.455	.386	.384				
7	.243	.430	.144	.234	.257	.607	.343	.334				
8	.386	.284	.197	.245	.189	.424	.201	.321				
9+	.386	.284	.197	.245	.189	.424	.201	.321				
( 2- 7)U	.214	.369	.200	.184	.203	.427	.314	.300				
( 3- 7)U	.238	.393	.216	.208	.227	.474	.359	.335				



Table 6.4.3 VIRTUAL POPULATION ANALYSIS.

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

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

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

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
2	129819	153407	306749	274678	194372	215308	144652	239284	204470	385736	347623	183143
3	137936	66338	108357	202632	169012	118899	124302	82446	139326	117122	242998	223298
4	90976	89530	47969	70238	123303	101425	74756	68109	55439	89706	78639	140619
5	29171	69744	70699	37524	47559	69348	64099	42500	45337	37540	62224	47333
6	331736	22696	54725	53390	26900	26124	40279	34033	26882	30887	25101	35346
7	19766	262005	16798	39972	36562	15925	13508	22242	21387	19241	19963	15369
8	10981	15053	198570	11175	27449	22750	8814	7292	14877	15299	12249	11483
9+	12589	14224	18118	289343	81633	77699	38488	22252	13593	14147	15041	21917
TOTAL NO	762973	692997	821984	978952	706790	647478	508898	518158	521310	709679	803839	678507
SPS NO	606154	571147	637029	745350	494225	450782	341929	378666	382657	530487	575971	509915
TOT. BIOM	183029	168038	186940	230080	159621	144558	113625	109163	110414	143218	165022	147153
SPS BIOM	147788	138983	145427	177198	111139	100192	76107	80432	81860	107340	117646	110715
	1982	1983	1984	1985	1986	1987	1988	1989	1990			
2	228025	230678	799075	269996	378739	297071	417129	68513	0			
3	116655	153411	133657	522318	187055	257380	182386	284086	44841			
4	145211	80194	81179	83655	366949	130787	138766	107727	161797			
5	97391	104611	48571	56515	63583	269020	79010	86689	72672			
6	30680	70773	64532	37122	40469	43640	149457	49328	58065			
7	19910	20060	46665	46210	26342	29037	25064	91927	30409			
8	10623	14136	11807	36551	33096	18430	14317	16093	59553			
9+	9400	18051	23638	10444	12983	30870	11329	11597	18181			
TOTAL NO	657896	691912	1209125	1062811	1109215	1076236	1017457	715961				
SPS NO	514164	485677	923166	841955	878118	742026	757033	520718				
TOT. BIOM	142499	151766	236143	209075	238807	235205	213573	133670				
SPS BIOM	111575	107180	181492	165904	189670	161599	158264	97519				

Table 6.6.1

List of input variables for the ICES prediction program.

-----

HERRING - VIA (SOUTH) AND VIIIB

The reference F is the mean F for the age group range from 2 to 7

The number of recruits per year is as follows:

Year	Recruitment
1990	319000.0
1991	319000.0
1992	319000.0

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	319000.0	.12	.30	1.00	.113	.166
3	44841.0	.36	.20	1.00	.149	.207
4	161797.0	.29	.10	1.00	.172	.235
5	72672.0	.30	.10	1.00	.185	.253
6	58065.0	.38	.10	1.00	.196	.273
7	30409.0	.33	.10	1.00	.209	.280
8	59553.0	.32	.10	1.00	.205	.293
9+	18181.0	.32	.10	1.00	.236	.315

(cont'd)

Table 6.6.1 (cont'd)

For data that can be entered by file or manually by screen the following table gives the method of input by age group. The identifiers in the table are to be interpreted as:

space: not defined or set by the program  
 M : manual input by screen  
 F : data read from a file

age	F at age	M at age	maturity ogive	weight in the catch	weight in the stock
2	M	F	F	F	F
3	M	F	F	F	F
4	M	F	F	F	F
5	M	F	F	F	F
6	M	F	F	F	F
7	M	F	F	F	F
8	M	F	F	F	F
9+	M	F	F	F	F
proportion of F before spawning: F					
proportion of M before spawning: F					

The data from the files were selected as follows:

M at age: year 1989 from file NATMOR  
 Maturity ogive: year 1989 from file MORPROP  
 Catch weight: mean values for years 1986 - 1988 from file WECA  
 Stock weight: mean values for years 1986 - 1988 from file WEST  
 Proportions of F and M: from file MORPROP

Table 6.6.2 . HERRING - VIA (SOUTH) AND VIIB.  
Results.

\*\*\*\*\*  
\* Year 1990, F-factor 1.008 and reference F .2991 \*  
\*  
\* Run depending on a TAC value \*  
\*\*\*\*\*

age	absolute F	catch in numbers	catch in weight	stock size	stock biomass	at 1 January		at spawning time	
						sp.stock size	sp.stock biomass	sp.stock size	sp.stock biomass
2	.1210	31501	3549.1	319000	52847	319000	52847	240598	39859
3	.3630	12445	1854.4	44841	9282	44841	9282	30751	6365
4	.2924	39130	6730.4	161797	37968	161797	37968	124392	29190
5	.3025	18096	3347.8	72672	18410	72672	18410	55495	14058
6	.3831	17642	3463.9	58065	15832	58065	15832	42008	11454
7	.3327	8213	1716.5	30409	8514	30409	8514	22755	6371
8	.3226	15670	3207.2	59553	17449	59553	17449	44866	13145
9+	.3226	4783	1130.6	18181	5733	18181	5733	13697	4319
Total		147483	25000.0	764518	166037	764518	166037	574564	124765

\*\*\*\*\*  
\* Year 1991, F-factor .876 and reference F .2599 \*  
\*\*\*\*\*

age	absolute F	catch in numbers	catch in weight	stock size	stock biomass	at 1 January		at spawning time	
						sp.stock size	sp.stock biomass	sp.stock size	sp.stock biomass
2	.1051	27572	3106.5	319000	52847	319000	52847	243169	40285
3	.3154	51600	7688.4	209390	43343	209390	43343	148251	30688
4	.2540	5463	939.7	25537	5992	25537	5992	20144	4727
5	.2628	24086	4456.1	109283	27685	109283	27685	85701	21711
6	.3329	13129	2577.8	48593	13249	48593	13249	36359	9913
7	.2891	8577	1792.7	35817	10028	35817	10028	27597	7727
8	.2803	4599	941.5	19727	5780	19727	5780	15290	4479
9+	.2803	11877	2807.2	50940	16063	50940	16063	39481	12449
Total		146907	24309.7	818289	174991	818289	174991	615997	131982

\*\*\*\*\*  
\* Year 1992, F-factor .876 and reference F .2599 \*  
\*\*\*\*\*

age	absolute F	catch in numbers	catch in weight	stock size	stock biomass	at 1 January		at spawning time	
						sp.stock size	sp.stock biomass	sp.stock size	sp.stock biomass
2	.1051	27572	3106.5	319000	52847	319000	52847	243169	40285
3	.3154	52425	7811.4	212740	44037	212740	44037	150623	31178
4	.2540	26756	4602.1	125065	29348	125065	29348	98655	23151
5	.2628	3950	730.8	17923	4540	17923	4540	14055	3560
6	.3329	20543	4033.3	76031	20731	76031	20731	56889	15512
7	.2891	7548	1577.6	31519	8825	31519	8825	24286	6800
8	.2803	5659	1158.4	24272	7111	24272	7111	18812	5512
9+	.2803	11265	2662.3	48311	15234	48311	15234	37444	11807
Total		155720	25682.4	854864	182677	854864	182677	643937	137807

Table 7.1.1 HERRING.  
Total catches (t) in North Irish Sea  
(Division VIIa), 1979-1989 as reported to  
the Working Group.

Country	1979	1980	1981	1982	1983	1984
France	455	1	-	-	48	-
Ireland	1,805	1,340	283	300	860	1,084
Netherlands	-	-	-	-	-	-
UK	10,078	9,272	4,094	3,375	3,025	2,982
Unallocated	-	-	-	1,180	-	-
<b>Total</b>	<b>12,338</b>	<b>10,613</b>	<b>4,377</b>	<b>4,855</b>	<b>3,933</b>	<b>4,066</b>

Country	1985	1986	1987	1988	1989
France	-	-	-	-	-
Ireland	1,000	1,640	1,200	2,579	1,430
Netherlands	-	-	-	-	-
UK	4,077	4,376	3,290	7,593	3,532
Unallocated	4,110	1,424	1,333	-	-
<b>Total</b>	<b>9,187</b>	<b>7,440</b>	<b>5,823</b>	<b>10,172</b>	<b>4,962</b>

Table 7.1.2 HERRING in Division VIIa (North).  
Quality of catch and biological data.

Country	Catch (t)	No. samples	No. age readings	No. fish measured	Estimation of discards
Ireland	1,430	21	555	1,843	No
UK (N. Ireland)	3,532	45	2,249	11,464	No
UK (Isle of Man)		21	1,057	5,173	No
UK (Scotland)		1	0	96	No

Table 7.1.3 SUM OF PRODUCTS CHECK.

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

CATEGORY: TOTAL

CATCH IN NUMBERS -----	UNIT: thousands											
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	40640	42150	43250	33330	34740	30280	15540	11770	5840	5050	5100	1305
2	46660	32740	109550	48240	56160	39040	36950	38270	25760	15790	16030	12162
3	26950	38240	39750	39410	20780	22690	13410	23490	19510	3200	5670	5598
4	13180	11490	24510	10840	15220	6750	6780	4250	8520	2790	2150	2820
5	13750	6920	10650	7870	4580	4520	1740	2200	1980	2300	330	445
6	6760	5070	4990	4210	2810	1460	1340	1050	910	330	1110	484
7	2660	2590	5150	2090	2420	910	670	400	360	290	140	255
8+	1670	2600	1630	1640	1270	1120	350	290	230	240	380	59
TOTAL	152270	141800	239480	147630	137980	106770	76780	81720	63110	29990	30910	23128
	1984	1985	1986	1987	1988	1989						
1	1168	2429	4491	2225	2607	1156						
2	8424	10050	15266	12981	21250	6385						
3	7237	17336	7462	6146	13343	12039						
4	3841	13287	8550	2998	7159	4708						
5	2221	7206	4528	4180	4610	1876						
6	380	2651	3198	2777	5084	1255						
7	229	667	1464	2328	3232	1559						
8+	479	724	877	1671	4213	1956						
TOTAL	23979	50350	45836	35306	61498	30934						

Table 7.1.4 HERRING in Division VIIa (North). Catch at length for 1988-1989. Numbers of fish in thousands.

Length	1988	1989
13		
14	1 1	
15	1 10	
16	13 16	
17	29 44	24
18	46 85	44 43
19	247 306	116 214
20	385 265	226 244
21	482 530	320 401
22	763 1,205	453 497
23	2,101 3,573	612 814
24	5,046 5,447	1,183 1,656
25	5,276 4,634	2,206 2,720
26	4,082 4,570	3,555 3,293
27	4,689 4,124	2,847 2,018
28	3,406 2,916	1,947 1,586
29	2,659 1,740	1,268 997
30	1,335 685	801 557
31	563 144	238 128
32	80 7	57 7
33	2 1	5 6
34		0 5

Table 7.2.1 HERRING in Division VIIa (North).

Lengths at age (cm)								
Year	Age							
	1	2	3	4	5	6	7	8
1985	22.1	24.3	26.1	27.6	28.3	28.6	29.5	30.1
1986	19.7	24.3	25.8	26.9	28.0	28.8	28.8	29.8
1987	20.0	24.1	26.3	27.3	28.0	29.2	29.4	30.1
1988	20.2	23.5	25.7	26.3	27.2	27.7	28.7	29.6
1989	20.9	23.8	25.8	26.8	27.8	28.2	28.0	29.5

Table 7.2.2 HERRING in Division VIIa (North).

Mean weights at age (g)								
Year	Age							
	1	2	3	4	5	6	7	8
1976-1983	74	155	195	219	232	251	258	278
1984	76	142	187	213	221	243	240	273
1985	87	125	157	186	202	209	222	258
1986	68	143	167	188	215	229	239	254
1987	58	130	160	175	194	210	218	229
1988	70	124	160	170	180	198	212	232
1989	81	128	155	174	184	195	205	218



Table 7.3.3 HERRING IN THE NORTHERN IRISH SEA (MANX PLUS MOURNE HERRING) from 1972-1989 on ages 1-7 with Terminal F of .200 on age 3 and Terminal S of 1.000.  
 Initial sum of squared residuals was 112.069 and  
 final sum of squared residuals is 18.506 after 111 iterations.

<u>Matrix of Residuals</u>												
Years	72/73	73/74	74/75	75/76	76/77	77/78	78/79					
Ages												
1/ 2	1.538	.978	1.131	.925	1.146	1.013	.488					
2/ 3	-.619	-.385	-.065	.000	-.186	-.045	-.422					
3/ 4	.012	.210	.131	.029	-.060	.016	.207					
4/ 5	-.528	-.438	-.365	-.371	-.299	-.172	-.136					
5/ 6	.272	.218	-.087	.258	.118	.175	-.294					
6/ 7	-.005	-.345	-.410	-.471	-.165	-.528	.158					
	.000	.000	.000	.000	.000	.000	.000					
WTS	.001	.001	.001	.001	.001	.001	.001					
Years	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89		WTS
Ages												
1/ 2	.640	-.283	.031	.237	-.328	.313	-.433	.206	-.105	.071	.000	.284
2/ 3	-.190	.497	.175	.199	.153	-.168	-.297	.212	.187	-.460	.000	.567
3/ 4	.073	.305	-.438	-.117	.060	-.020	.132	.248	.090	.043	.000	1.000
4/ 5	-.490	-.706	.960	.419	-.411	-.348	.171	-.285	-.498	-.005	.000	.415
5/ 6	.091	.288	-.015	-1.122	-.091	.487	.325	-.096	.128	.384	.000	.462
6/ 7	.026	-.636	-.114	.514	.292	-.099	-.114	-.485	-.034	.041	.000	.545
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	2.240	
WTS	.001	.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		
Fishing Mortalities (F)												
F-values	72	73	74	75	76	77	78	79				
	.6690	.5648	1.0333	.9309	1.0808	1.0342	.8950	.9306				
F-values	80	81	82	83	84	85	86	87	88	89		
	1.0420	.4691	.3119	.1808	.1589	.3852	.3186	.2204	.3926	.2000		
Selection-at-age (S)												
S-values	1	2	3	4	5	6	7					
	.0746	.8424	1.0000	1.1593	.9104	1.0536	1.0000					

Table 7.3.4 VIRTUAL POPULATION ANALYSIS.

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

	FISHING MORTALITY COEFFICIENT					VARIABLE NATURAL MORTALITY COEFFICIENT						
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	.167	.104	.214	.152	.230	.156	.104	.143	.061	.038	.034	.009
2	.363	.346	.825	.753	.792	.857	.529	.759	1.081	.411	.281	.178
3	.536	.617	1.024	.907	.979	.993	.924	.845	1.359	.382	.270	.158
4	.553	.436	1.014	.847	1.100	1.003	.907	.831	.830	.672	.454	.198
5	.652	.560	.818	.978	.972	1.074	.679	.755	1.097	.489	.134	.141
6	.702	.470	.908	.805	1.063	.866	.998	1.040	.725	.461	.411	.265
7	.666	.564	1.111	1.151	1.521	1.131	1.194	.834	1.179	.471	.321	.138
8+	.666	.564	1.111	1.151	1.521	1.131	1.194	.834	1.179	.471	.321	.138
( 2- 7)U	.579	.499	.950	.907	1.071	.987	.872	.844	1.045	.481	.312	.180
	1984	1985	1986	1987	1988	1989						
1	.013	.023	.033	.012	.031	.015						
2	.117	.256	.335	.213	.262	.164						
3	.161	.396	.327	.232	.377	.247						
4	.147	.468	.328	.200	.436	.209						
5	.212	.399	.255	.236	.472	.173						
6	.155	.372	.275	.219	.441	.201						
7	.173	.391	.321	.294	.378	.209						
8+	.173	.391	.321	.294	.378	.209						
( 2- 7)U	.161	.380	.307	.232	.394	.200						

Table 7.3.5 VIRTUAL POPULATION ANALYSIS.

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

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

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

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	412553	667557	348824	368929	262911	326504	246546	137865	154993	212438	242209	241758
2	175970	128439	221259	103590	116563	76876	102716	81732	43947	53637	75222	86144
3	71028	90710	67316	71857	36135	39123	24171	44821	28340	11041	26333	42076
4	32439	34023	40074	19800	23756	11111	11863	7857	15769	5960	6167	16461
5	30002	16877	19900	13148	7680	7153	3688	4336	3096	6222	2754	3544
6	14006	14143	8722	7948	4473	2629	2212	1692	1844	936	3452	2179
7	5716	6282	7995	3182	3215	1399	1000	738	541	808	534	2072
8+	3588	6307	2530	2497	1687	1721	523	535	346	669	1449	479
TOTAL NO	745301	964338	716619	590951	456420	466516	392720	279576	248876	291711	358120	394712
SPS NO	182746	178014	136354	94269	73671	57489	68883	57293	33170	47840	75963	109660
TOT. BIOM	91707	105286	91583	68266	53975	49298	43291	35101	28678	29565	38115	45089
SPS BIOM	32299	31236	23543	16211	12313	9282	10940	9730	5623	7692	12558	18936
	1984	1985	1986	1987	1988	1989	1990					
1	140926	171321	218807	291626	136424	123434	0					
2	88179	51165	61614	77888	105990	48674	44737					
3	53434	58122	29341	32663	46629	60416	30606					
4	29405	37228	32029	17318	21212	26198	38634					
5	12217	22959	21101	20873	12824	12411	19236					
6	2784	8947	13945	14796	14920	7238	9448					
7	1512	2158	5582	9585	10753	8684	5358					
8+	3163	2342	3344	6880	14016	10895	14380					
TOTAL NO	331621	354242	385763	471629	362768	297950						
SPS NO	138132	115381	111764	129436	137164	125393						
TOT. BIOM	44090	44941	44525	46118	44553	38986						
SPS BIOM	24167	18670	19446	20320	21127	20358						

Table 7.5.1

List of input variables for the ICES prediction program.

-----

NORTH IRISH SEA F=0.2 (RUN 3)

The reference F is the mean F for the age group range from 2 to 7

The number of recruits per year is as follows:

Year	Recruitment
1990	184000.0
1991	184000.0
1992	184000.0

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

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

Data are printed in the following units:

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

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	184000.0	.08	1.00	.08	.081	.086
2	44737.0	.84	.30	.85	.128	.130
3	30606.0	1.00	.20	1.00	.155	.157
4	38634.0	1.00	.10	1.00	.174	.175
5	19236.0	1.00	.10	1.00	.184	.186
6	9448.0	1.00	.10	1.00	.195	.198
7	5358.0	1.00	.10	1.00	.205	.210
8+	14380.0	1.00	.10	1.00	.218	.221

(cont'd)

Table 7.5.1 (cont'd)

For data that can be entered by file or manually by screen the following table gives the method of input by age group. The identifiers in the table are to be interpreted as:

space: not defined or set by the program  
 M : manual input by screen  
 F : data read from a file

age	F at age	M at age	maturity ogive	weight in the catch	weight in the stock
1	M	F	F	F	F
2	M	F	F	F	F
3	M	F	F	F	F
4	M	F	F	F	F
5	M	F	F	F	F
6	M	F	F	F	F
7	M	F	F	F	F
8+	M	F	F	F	F
proportion of F before spawning: F					
proportion of M before spawning: F					

The data from the files were selected as follows:

M at age: year 1989 from file NATMOR  
 Maturity ogive: year 1989 from file MORPROP  
 Catch weight: year 1989 from file WECA  
 Stock weight: year 1989 from file WEST  
 Proportions of F and M: from file MORPROP

Table 7.5.2 Detailed prediction for HERRING in Division VIIa (North) assuming  $F_{91} = F_{low}$ .

Results  
NORTH IRISH SEA F = 0.2 (RUN 3)

\*\*\*\*\*  
\* Year 1990. F-factor .328 and reference F .3194 \*  
\*\*\*\*\*

\* Run depending on a TAC value \*  
\*\*\*\*\*

age	absolute F	catch in numbers	catch in weight	stock size	stock biomass	at 1 January		at spawning time	
						sp.stock size	sp.stock biomass	sp.stock size	sp.stock biomass
1	.0246	2832.1	229.40	184000	15824.0	14720	1265.9	6800	584.9
2	.2762	9391.6	1202.12	44737	5815.8	38026	4943.4	23682	3078.7
3	.3280	7799.6	1208.93	30606	4805.1	30606	4805.1	19608	3078.6
4	.3280	10309.2	1793.80	38634	6761.0	38634	6761.0	26680	4669.0
5	.3280	5133.0	944.47	19236	3577.9	19236	3577.9	13284	2470.9
6	.3280	2521.1	491.62	9448	1870.7	9448	1870.7	6524	1291.9
7	.3280	1429.7	293.10	5358	1125.2	5358	1125.2	3700	777.0
8+	.3280	3837.2	836.51	14380	3178.0	14380	3178.0	9930	2194.7
Total		43253.4	6999.94	346399	42957.7	170408	27527.2	110212	18145.7

\*\*\*\*\*  
\* Year 1991. F-factor .205 and reference F .2001 \*  
\*\*\*\*\*

age	absolute F	catch in numbers	catch in weight	stock size	stock biomass	at 1 January		at spawning time	
						sp.stock size	sp.stock biomass	sp.stock size	sp.stock biomass
1	.0154	1781.0	144.26	184000	15824.0	14720	1265.9	6857	589.7
2	.1730	9104.3	1165.35	66044	8585.8	56138	7298.0	38363	4987.2
3	.2055	4247.4	658.35	25143	3947.6	25143	3947.6	17987	2824.1
4	.2055	3196.1	556.12	18050	3158.9	18050	3158.9	13919	2435.8
5	.2055	4458.7	820.40	25181	4683.8	25181	4683.8	19417	3611.7
6	.2055	2220.0	432.90	12538	2482.6	12538	2482.6	9668	1914.3
7	.2055	1090.4	223.53	6158	1293.2	6158	1293.2	4748	997.2
8+	.2055	2277.9	496.59	12865	2843.2	12865	2843.2	9920	2192.4
Total		28375.8	4497.49	349983	42819.2	170796	26973.2	120882	19552.6

\*\*\*\*\*  
\* Year 1992. F-factor .205 and reference F .2001 \*  
\*\*\*\*\*

age	absolute F	catch in numbers	catch in weight	stock size	stock biomass	at 1 January		at spawning time	
						sp.stock size	sp.stock biomass	sp.stock size	sp.stock biomass
1	.0154	1781.0	144.26	184000	15824.0	14720	1265.9	6857	589.7
2	.1730	9188.4	1176.11	66654	8665.1	56656	7365.3	38717	5033.3
3	.2055	6951.9	1077.54	41154	6461.2	41154	6461.2	29441	4622.2
4	.2055	2968.0	516.42	16762	2933.4	16762	2933.4	12925	2262.0
5	.2055	2354.8	433.28	13299	2473.7	13299	2473.7	10255	1907.5
6	.2055	3285.0	640.58	18553	3673.5	18553	3673.5	14306	2832.7
7	.2055	1635.6	335.30	9237	1939.9	9237	1939.9	7123	1495.9
8+	.2055	2481.7	541.01	14016	3097.5	14016	3097.5	10807	2388.5
Total		30646.3	4864.50	363677	45068.4	184399	29210.5	130434	21131.8

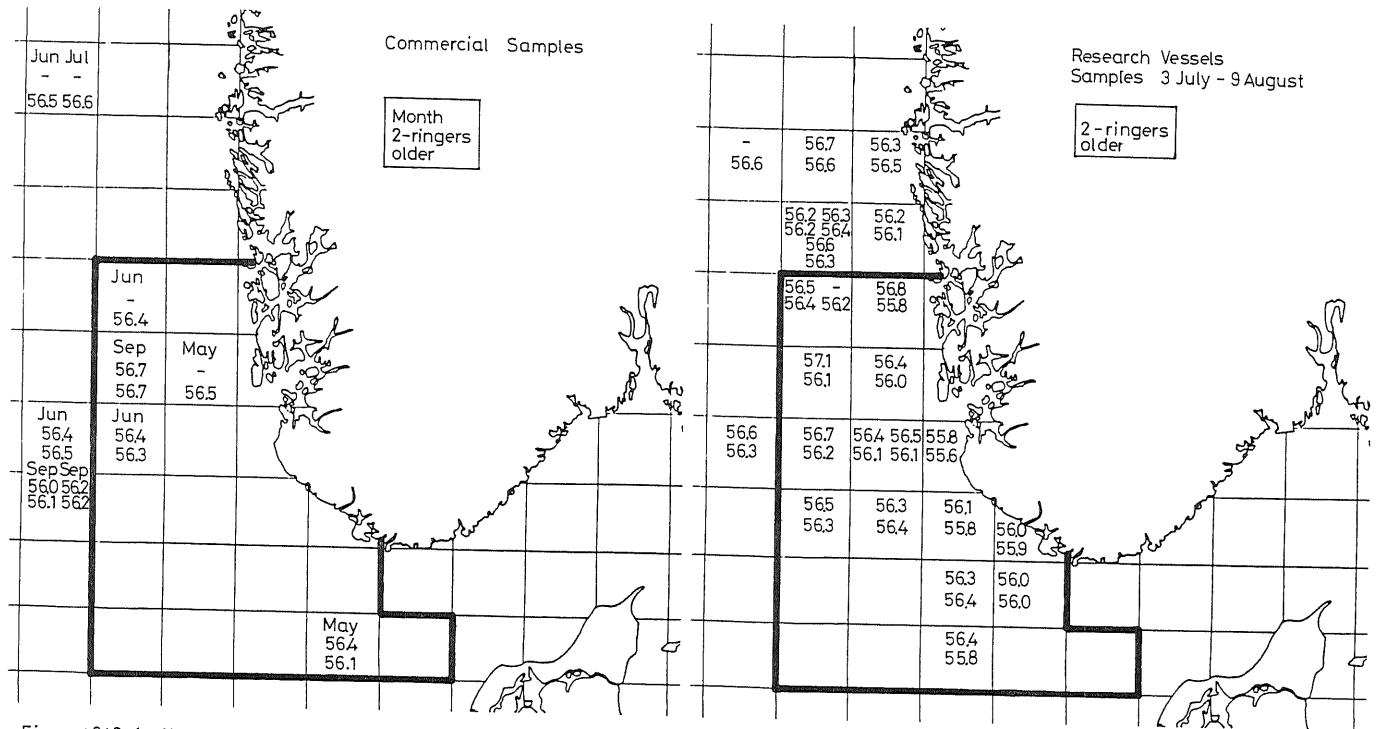


Figure 2.2.1 Mean vertebral counts for 2-ringers (upper figures) and older fish (lower figures) by sample. Heavy line defines the area for transferring catches of Division IIIa/Baltic spring spawners.

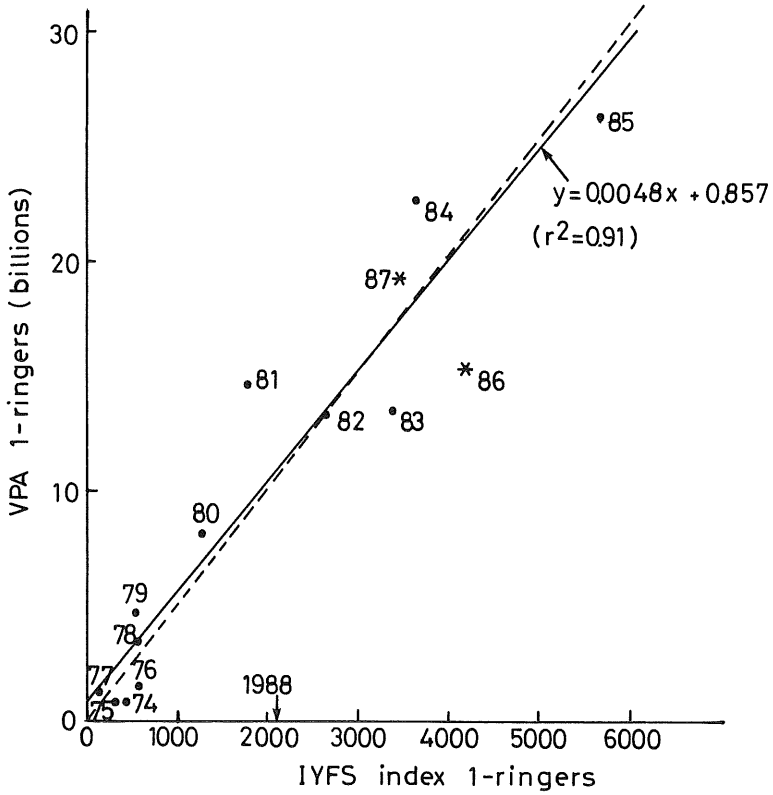
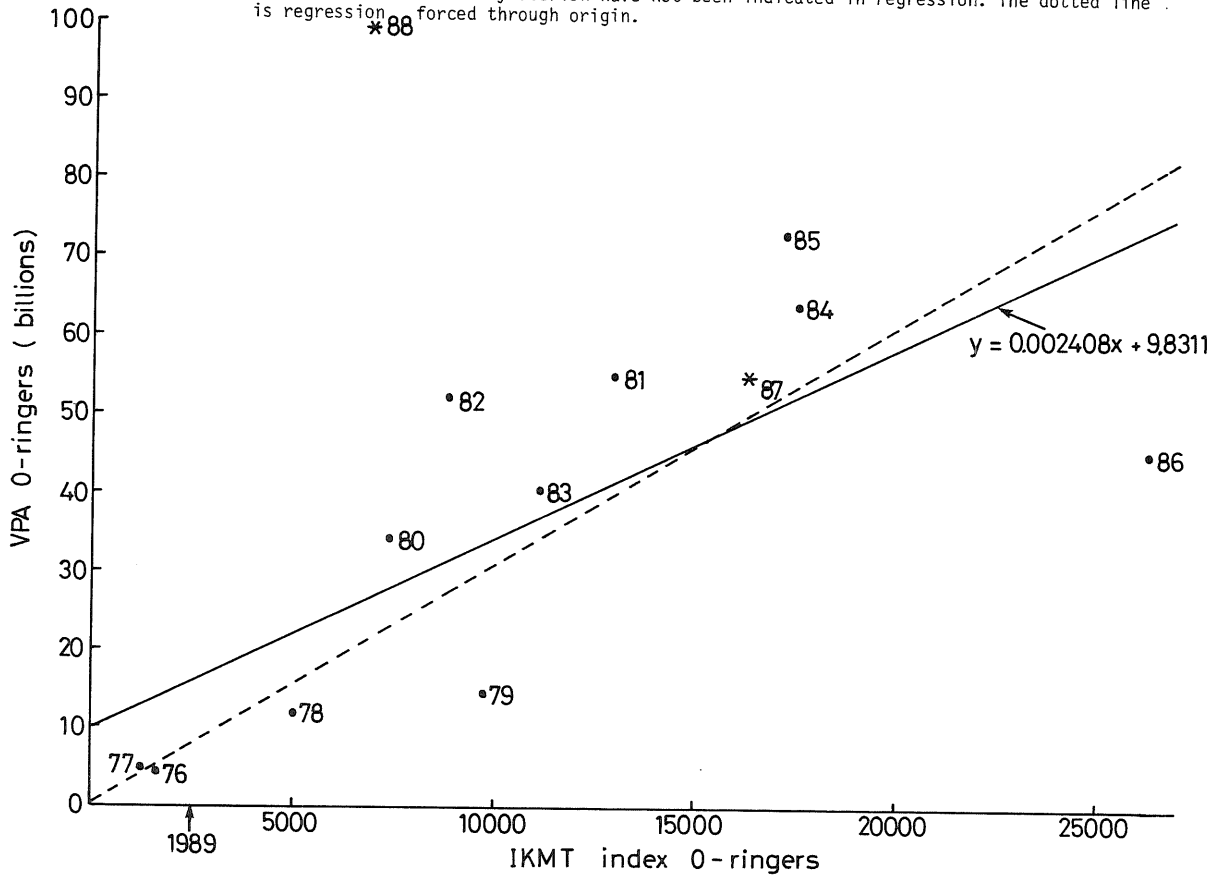


Figure 2.3.1 North Sea HERRING. Regression of VPA 1-ringers on IYFS indices. (Figures denote year classes). Recent year classes indicated by asterisk have not been used in regression. The dotted line is regression forced through the origin.



Figure 2.3.2 North Sea HERRING. Plot of North Sea VPA estimates of 0-ring herring on IKMT indices. Year classes indicated by asterisk have not been indicated in regression. The dotted line is regression forced through origin.



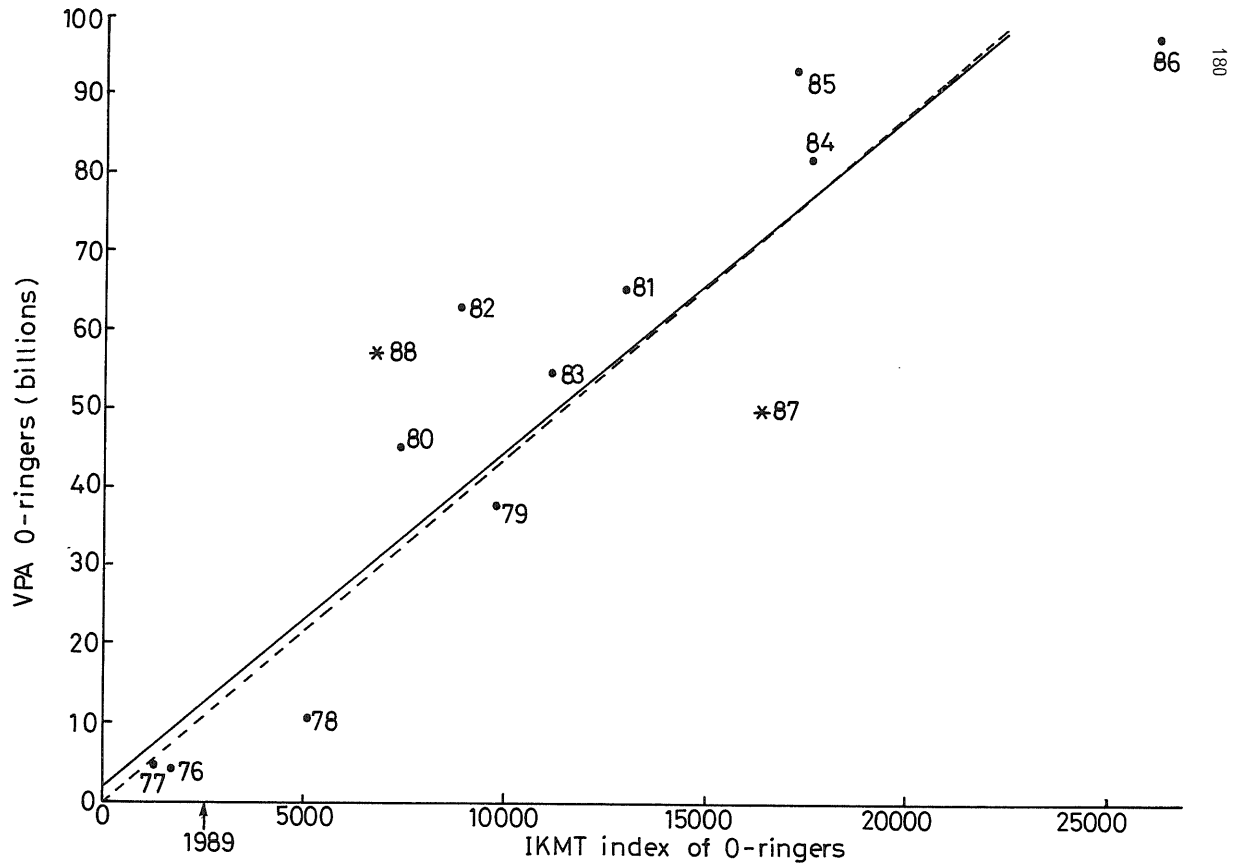


Figure 2.3.3 North Sea HERRING. Plot of VPA estimates of 0-group for North Sea and Division IIIa combined in IKMT indices. Year classes indicated by asterisk have not been included in regression.

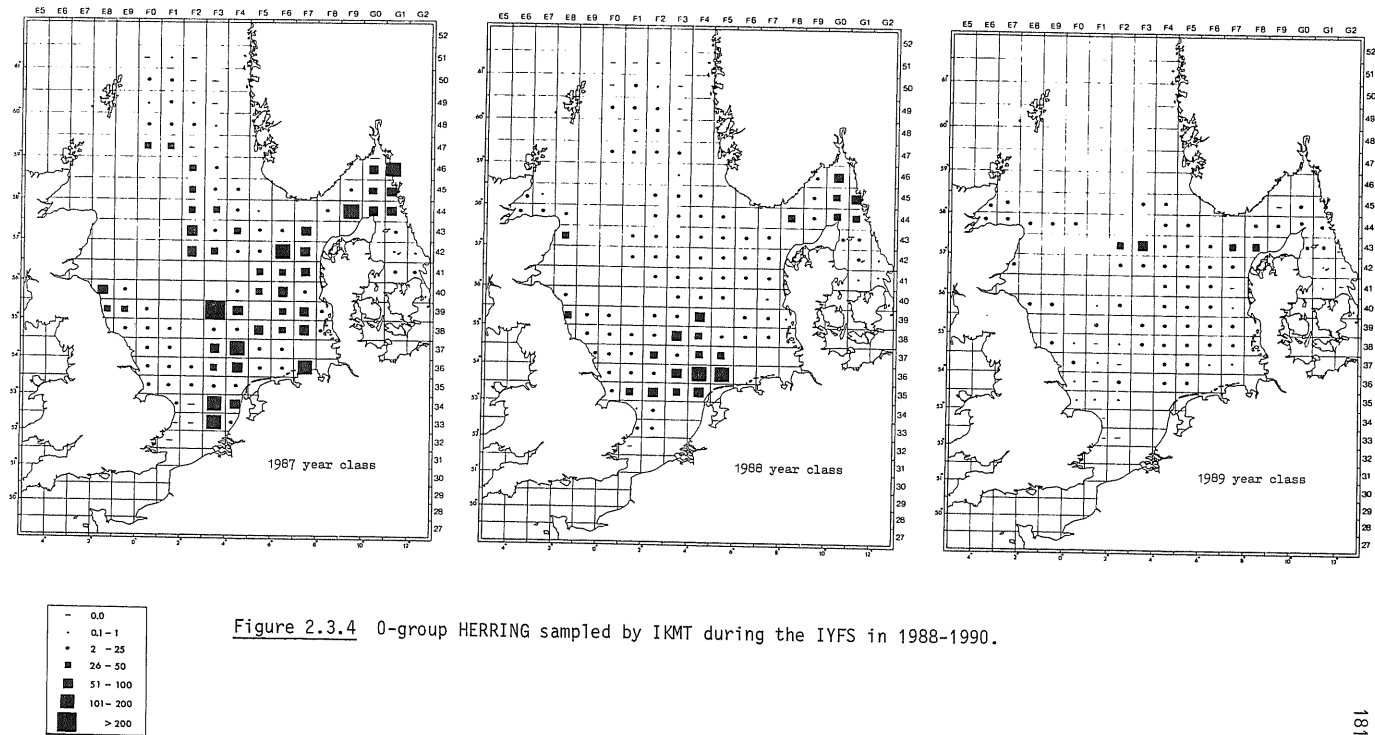


Figure 2.3.5 North Sea HERRING. Recruitment as 1-ringers.

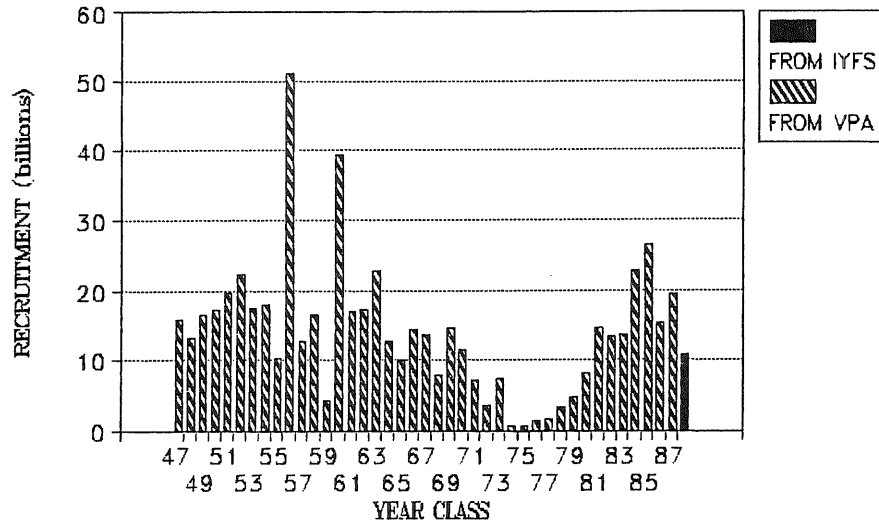


Figure 2.7.1 Cumulative catch by month in the North Sea.

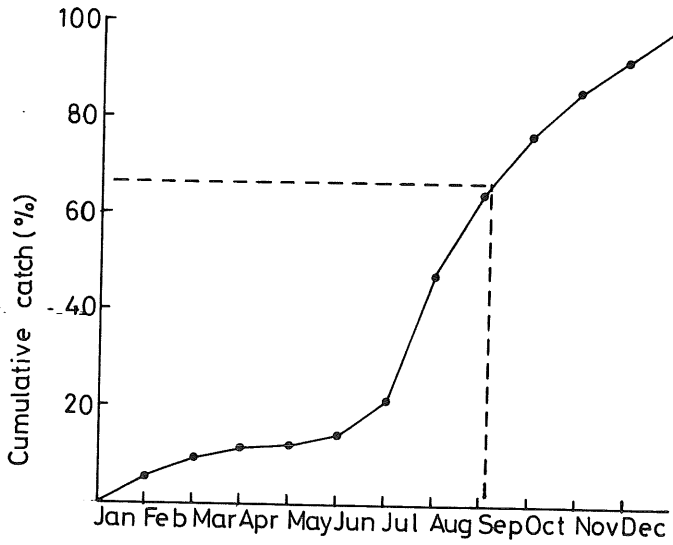


Figure 2.7.2 The relation between SSB from acoustic surveys and VPA tuned by ICES tuning programme (SVPA) by only using acoustic estimates.

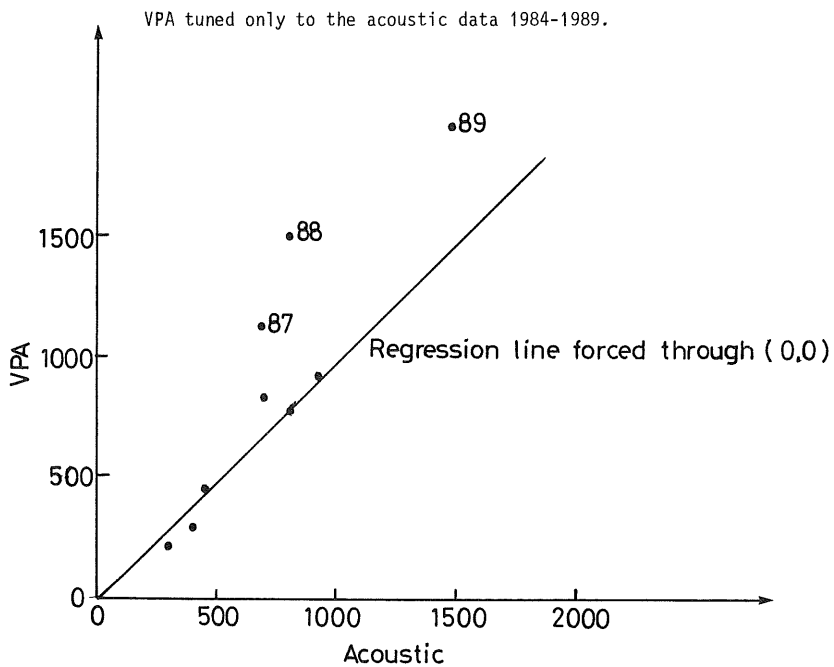


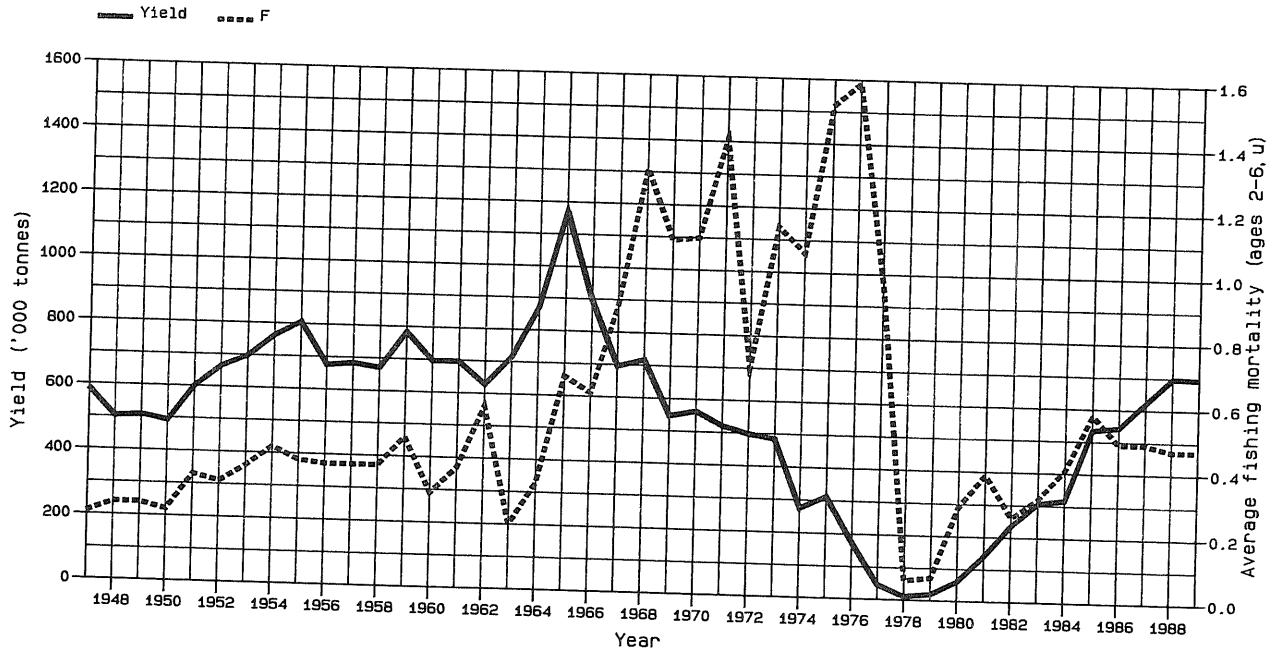
Figure 2.8.1

# FISH STOCK SUMMARY

## STOCK: Herring - Total North Sea

03-05-1990

Trends in yield and fishing mortality (F)

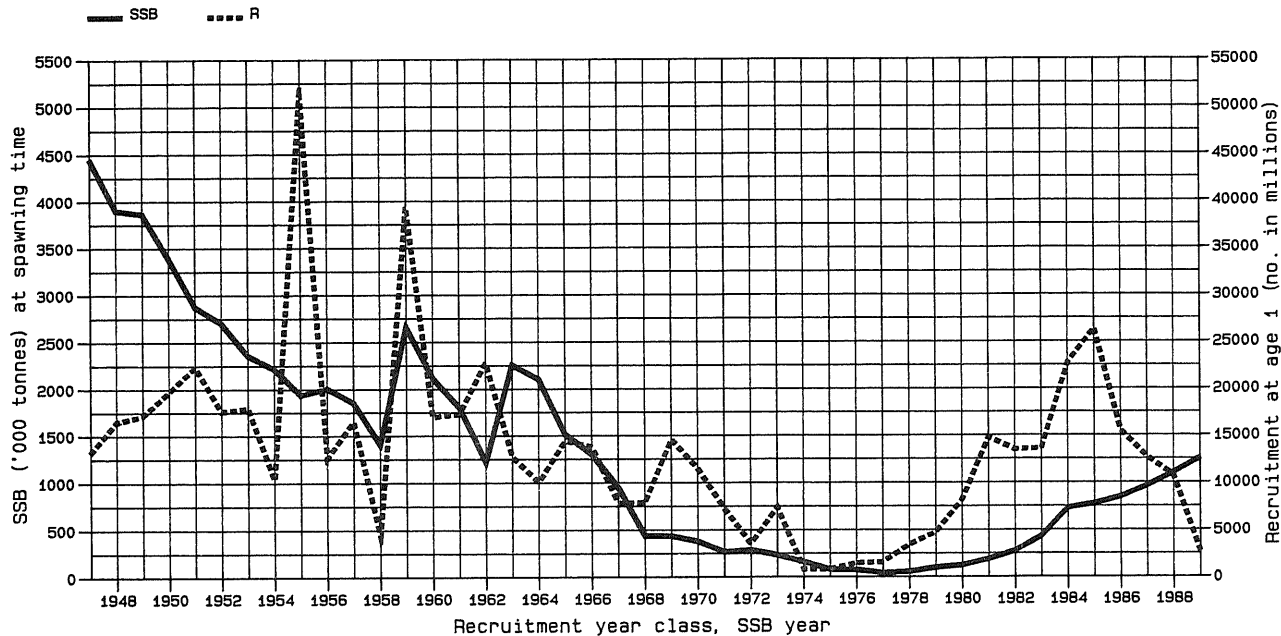


A

Figure 2.8.1 (cont'd)

### FISH STOCK SUMMARY STOCK: Herring - Total North Sea 03-05-1990

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



B



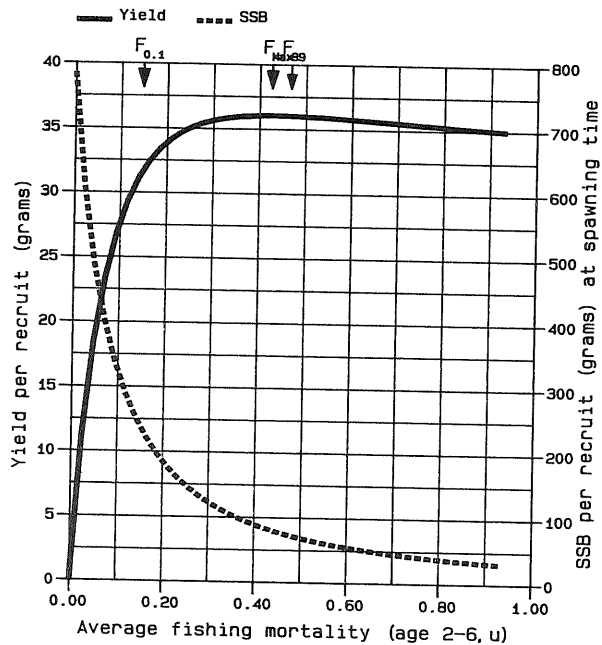
Figure 2.8.1 (cont'd)

## FISH STOCK SUMMARY

### STOCK: Herring - Total North Sea

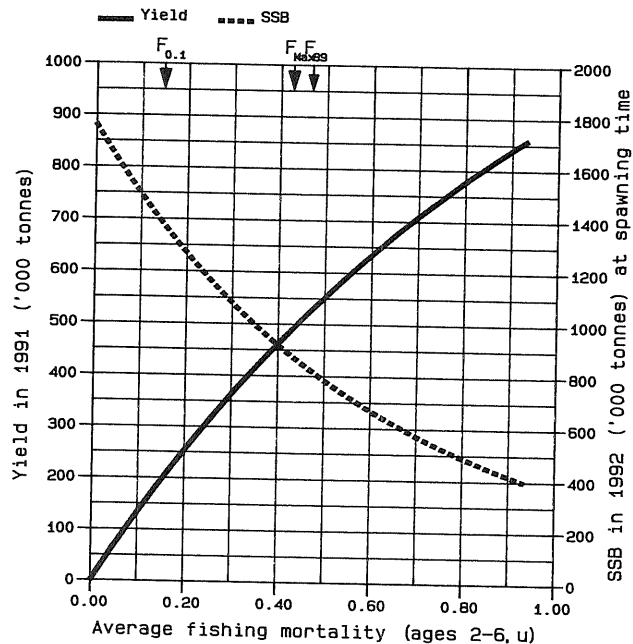
03-05-1990

Long-term yield and spawning stock biomass



C

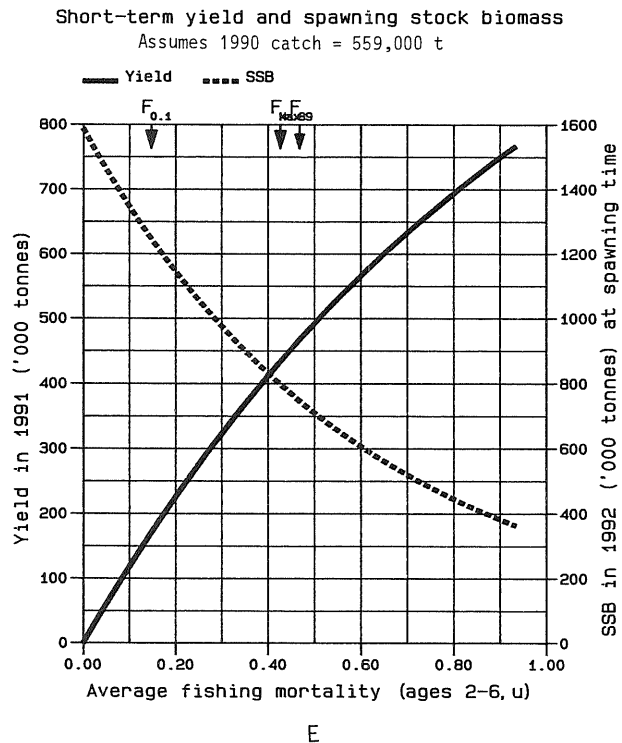
Short-term yield and spawning stock biomass  
Assumes TAC taken in 1990



D

Figure 2.8.1 (cont'd)

FISH STOCK SUMMARY  
STOCK: Herring - Total North Sea  
03-05-1990



E





Figure 2.10.3 North Sea HERRING 1989. Total catch March, 15,666 t.

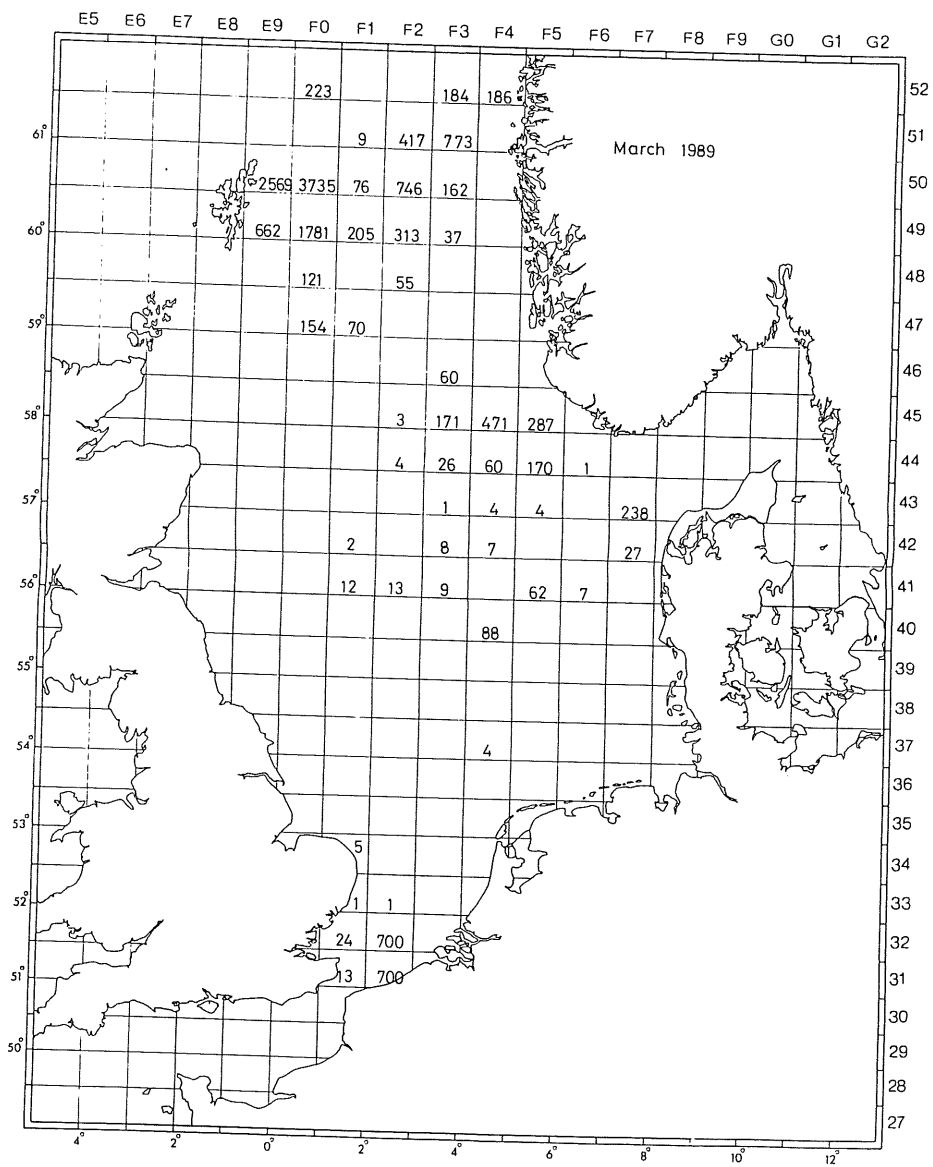






















Figure 4.1 Celtic Sea and Division VIIj HERRING. Stock-recruitment plot.

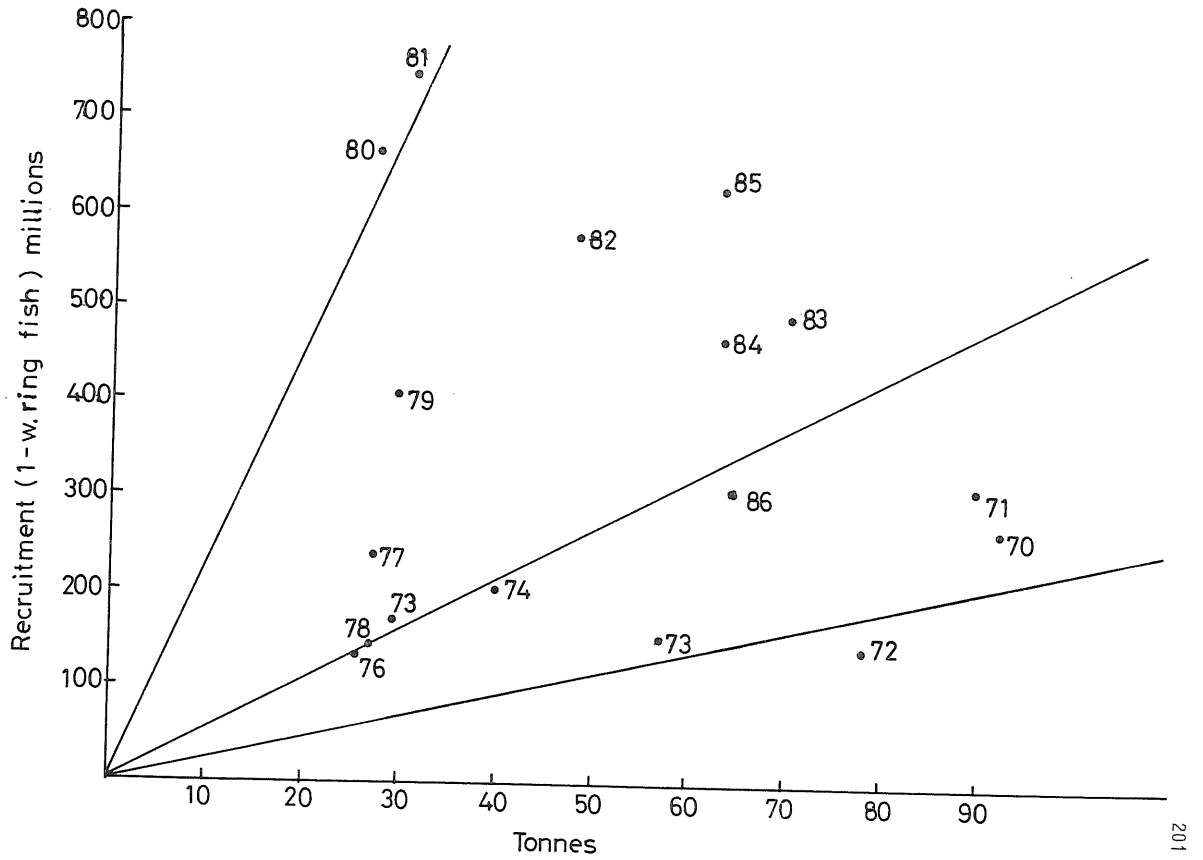


Figure 4.1.1 The assessment covers the area Divisions VIIj and VIIg and that part of Division VIIa below 52°30'. TAC is set by EC for Divisions VIIg-k and that section of Division VIIa below 52°30'.

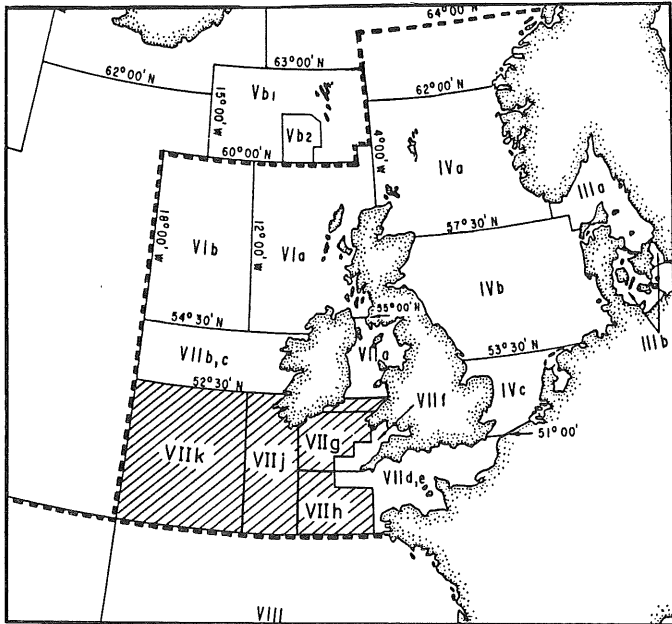




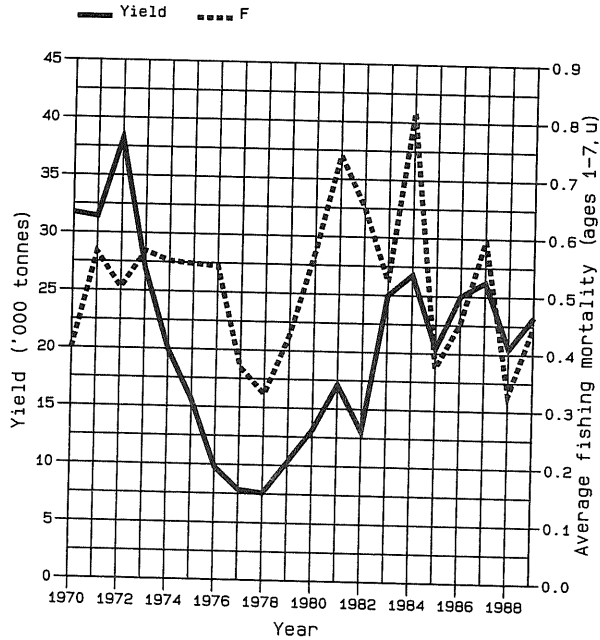
Figure 4.2

## FISH STOCK SUMMARY

### STOCK: Herring - South and South West of Ireland

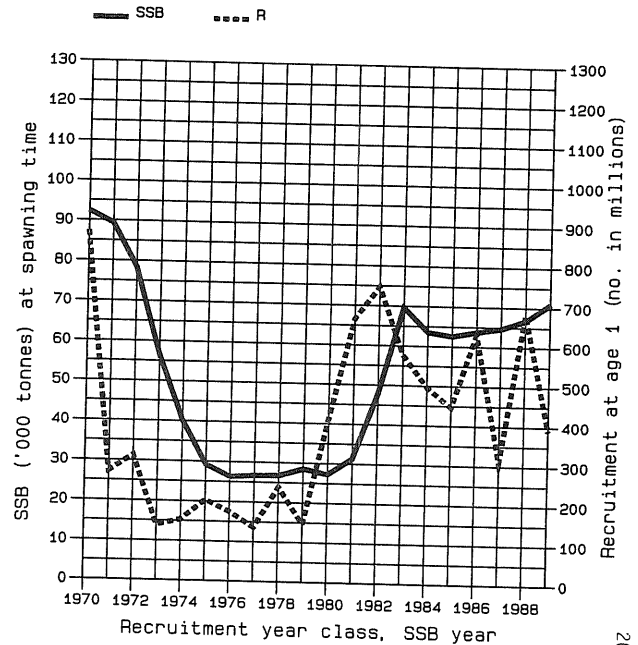
26-04-1990

Trends in yield and fishing mortality (F)



A

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



B

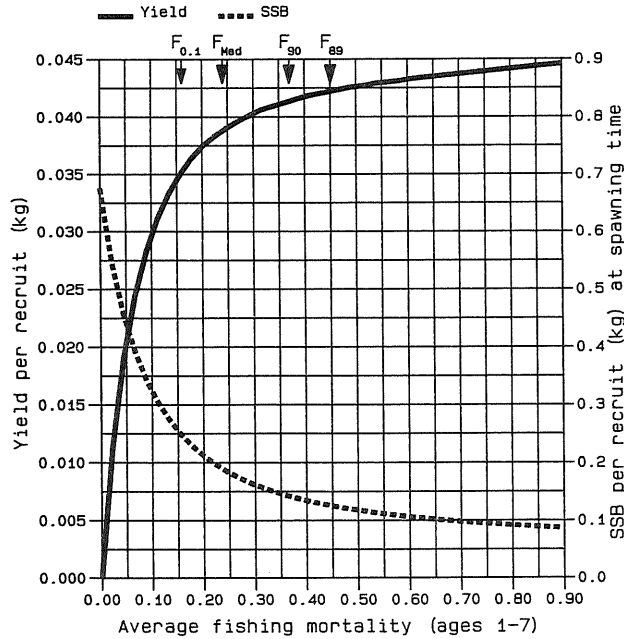
Figure 4.2 (cont'd)

FISH STOCK SUMMARY

STOCK: Herring - South and South West of Ireland

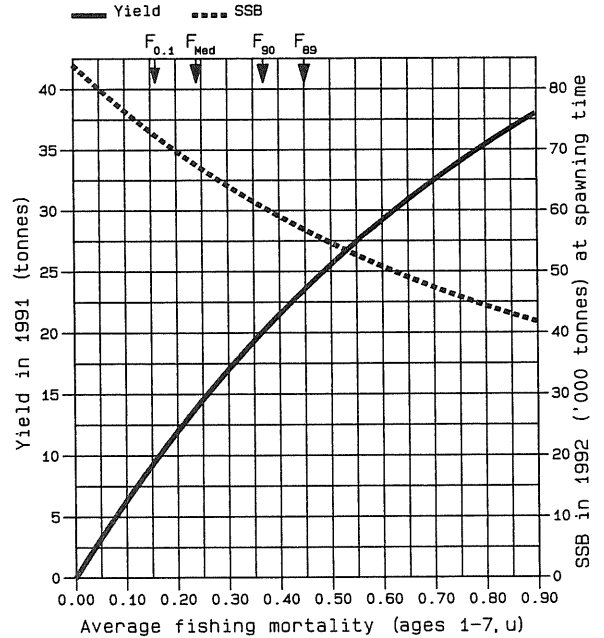
26-04-1990

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass  
Option B



D

Figure 5.1.1.1

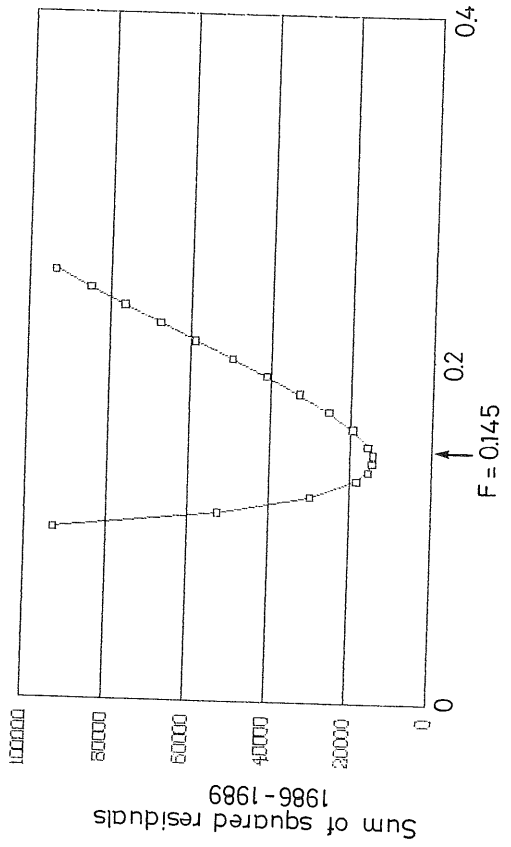


Figure 5.1.2

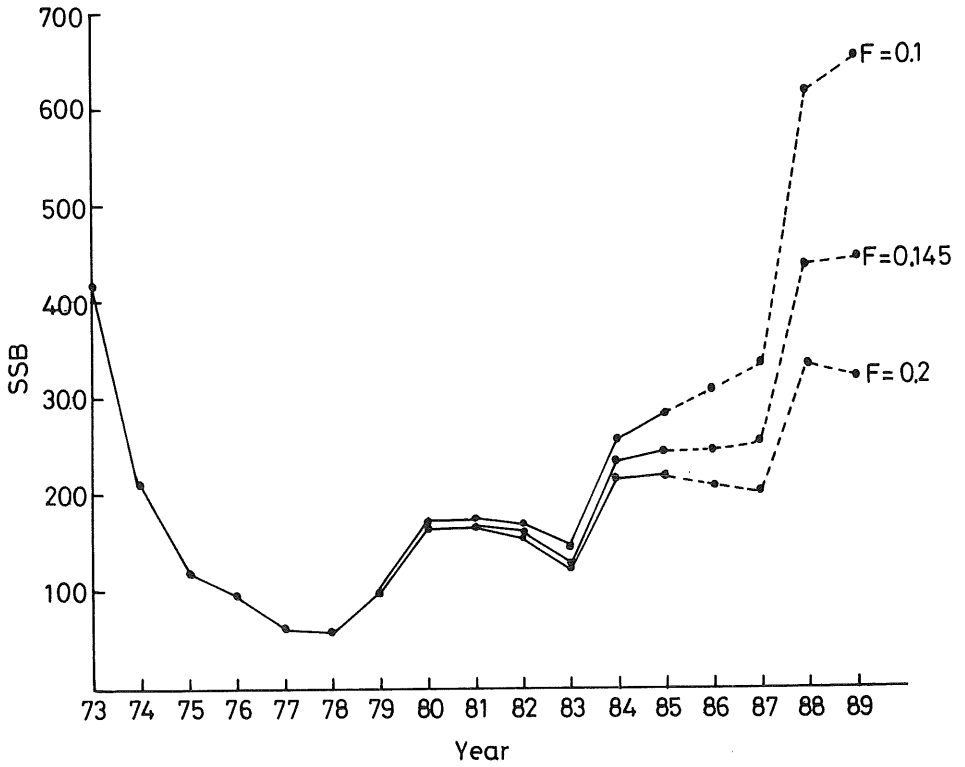


Figure 5.1.3

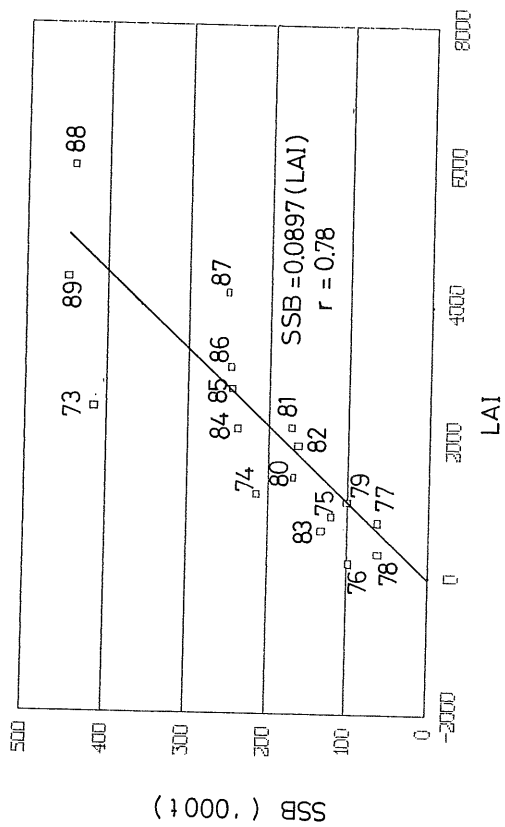


Figure 5.1.4

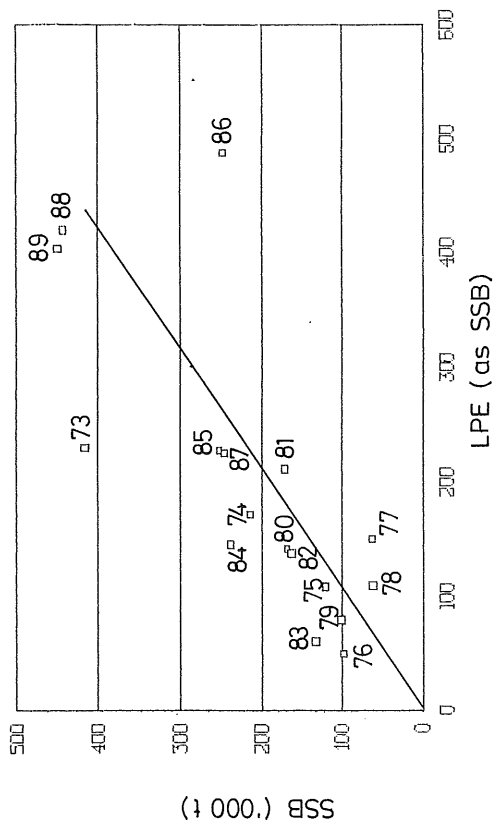


Figure 5.1.5

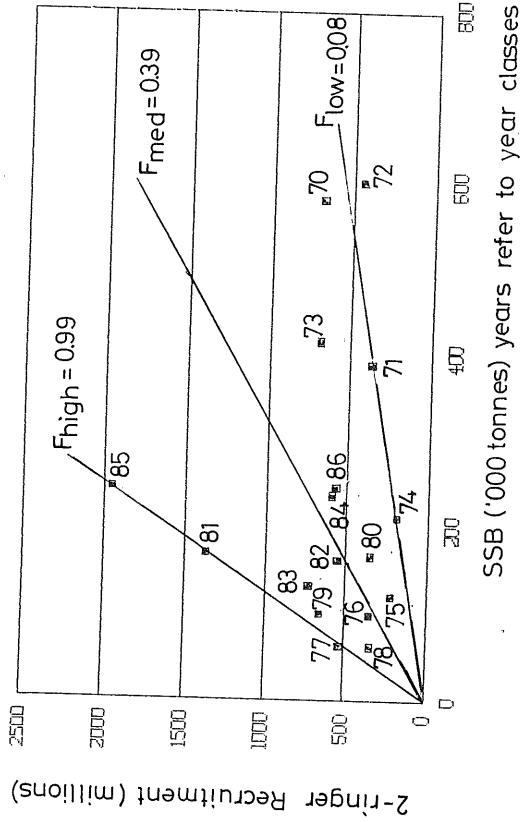
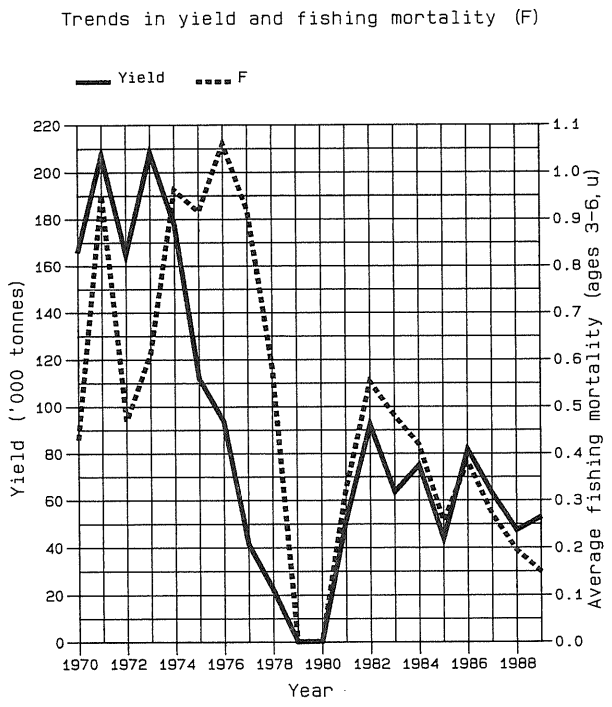


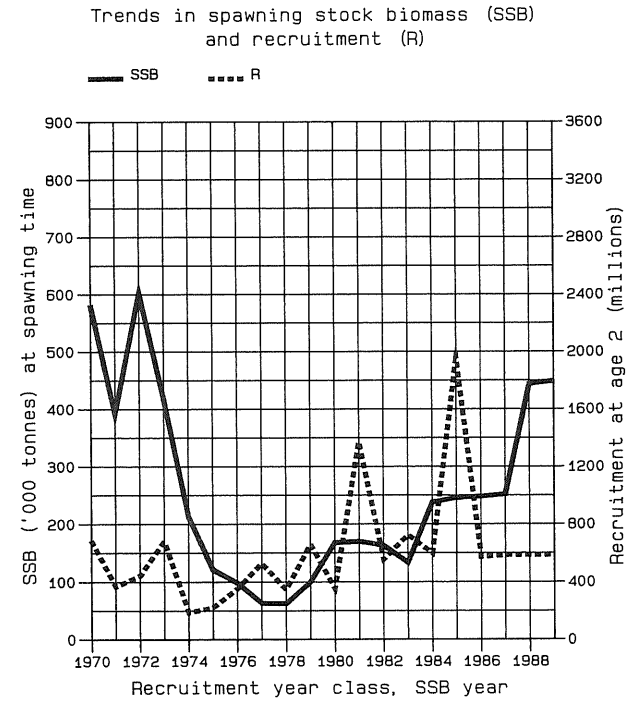
Figure 5.1.6

### FISH STOCK SUMMARY

STOCK: Herring - Vla North  
30-04-1990



A



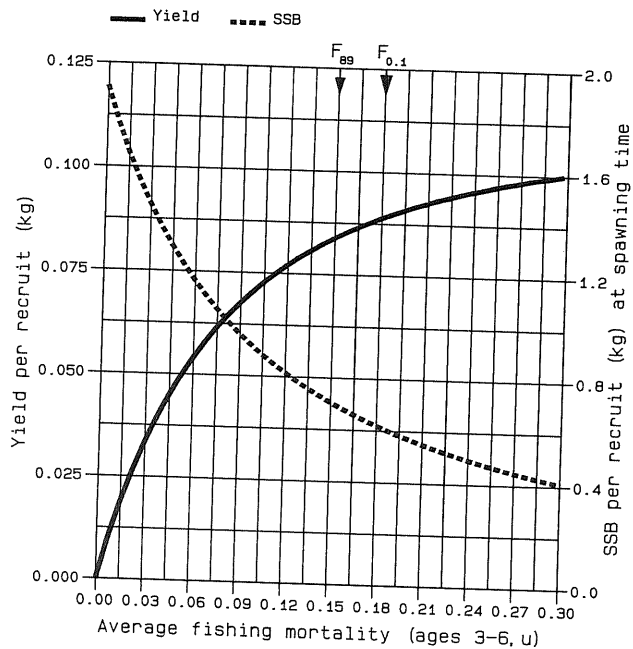
B



Figure 5.1.6 (cont'd)

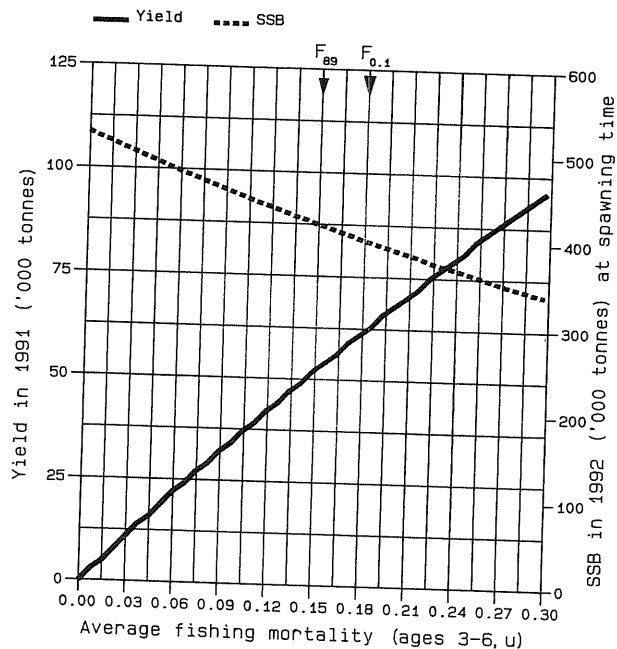
FISH STOCK SUMMARY  
 STOCK: Herring - Vla North  
 30-04-1990

Long-term yield and spawning stock biomass



C

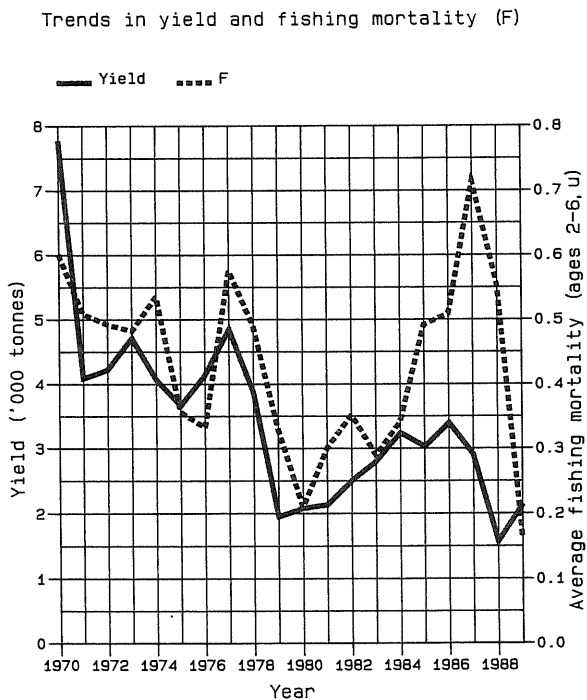
Short-term yield and spawning stock biomass



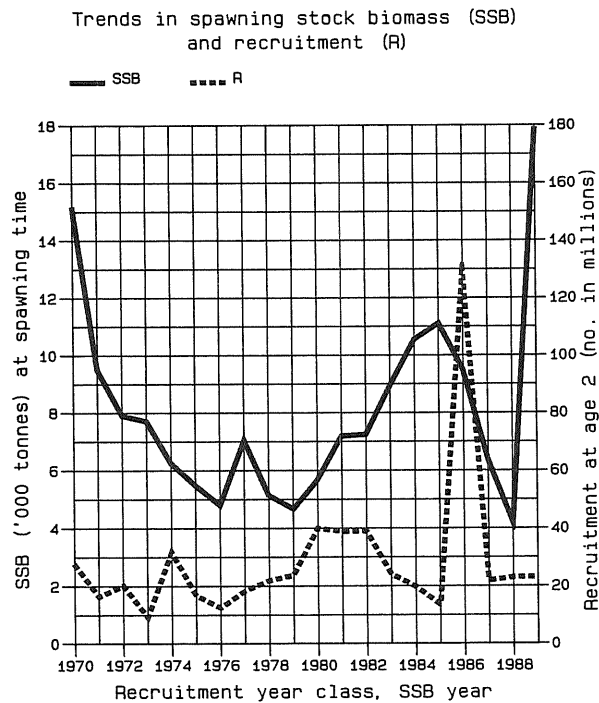
D

Figure 5.2

FISH STOCK SUMMARY  
STOCK: Clyde Herring  
30-04-1990



A

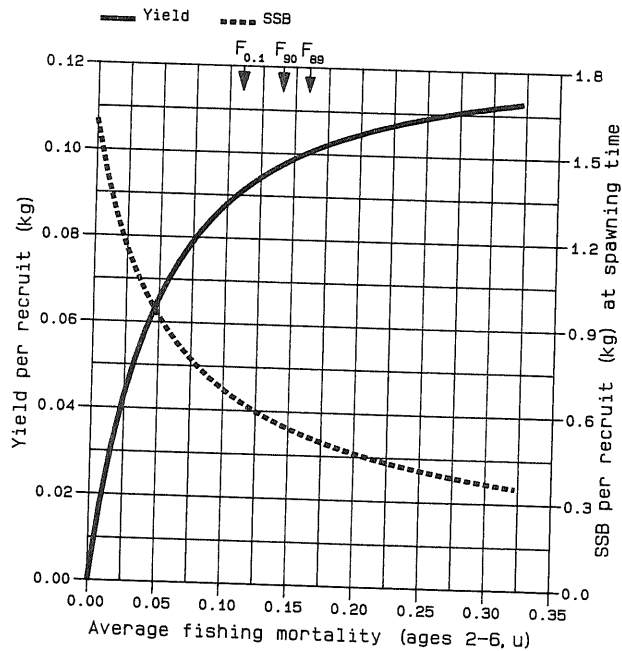


B

Figure 5.2 (cont'd)

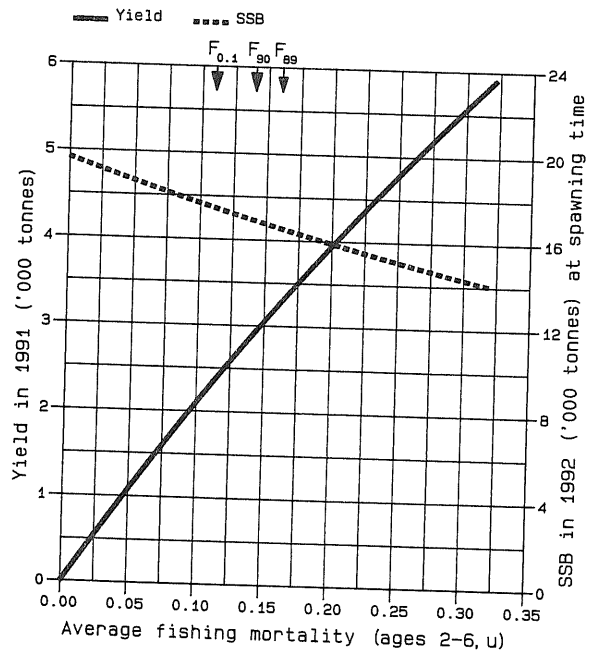
FISH STOCK SUMMARY  
 STOCK: Clyde Herring  
 30.04.1990

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

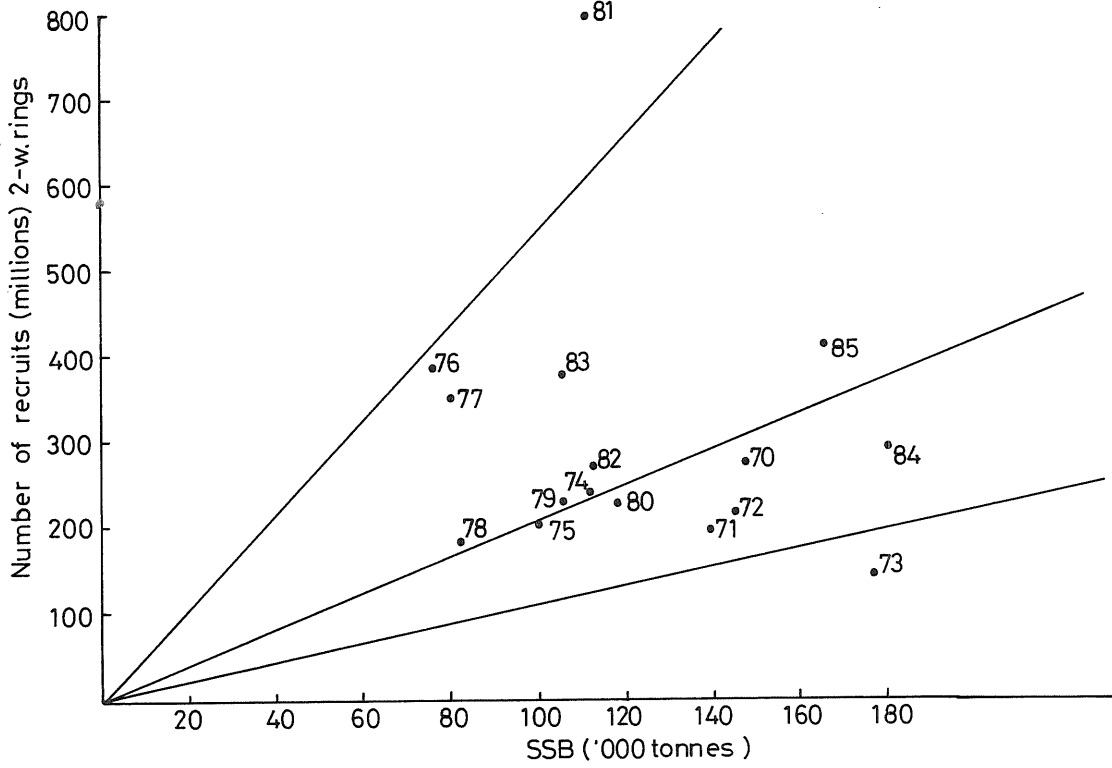


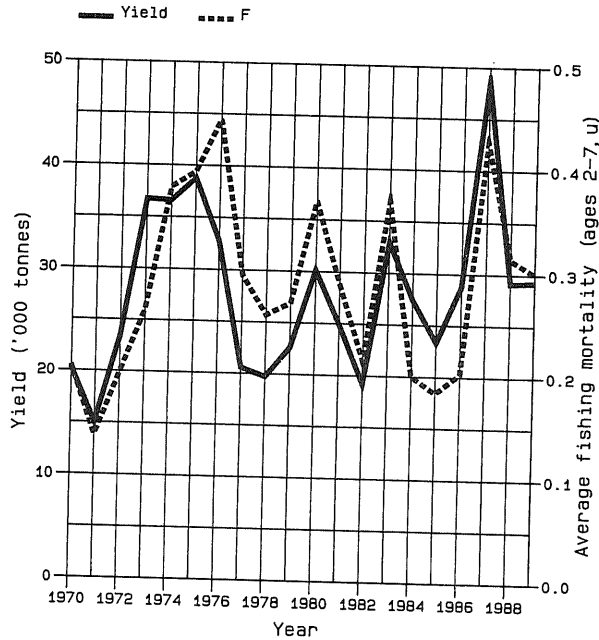
Figure 6.4.1 HERRING in Divisions VIa (S) and VIIb. Stock recruitment scatter plot.

Figure 6.6.1

## FISH STOCK SUMMARY

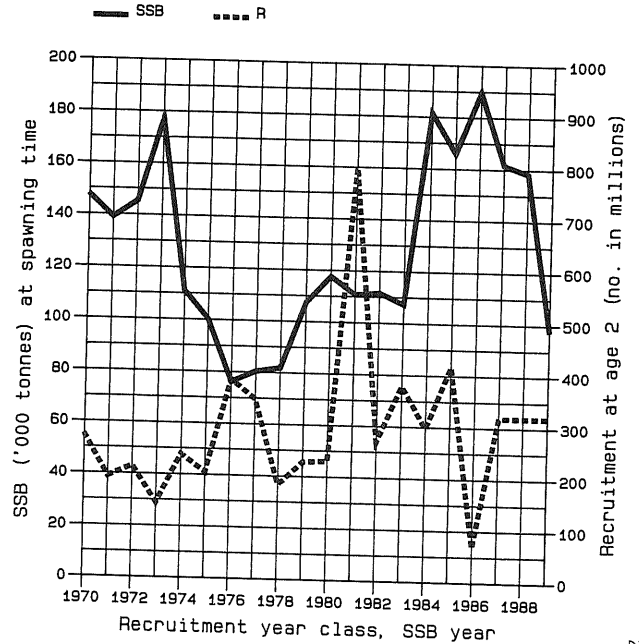
STOCK: Herring - VIa (South) and VIIb,c  
01.05.1990

Trends in yield and fishing mortality (F)



A

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

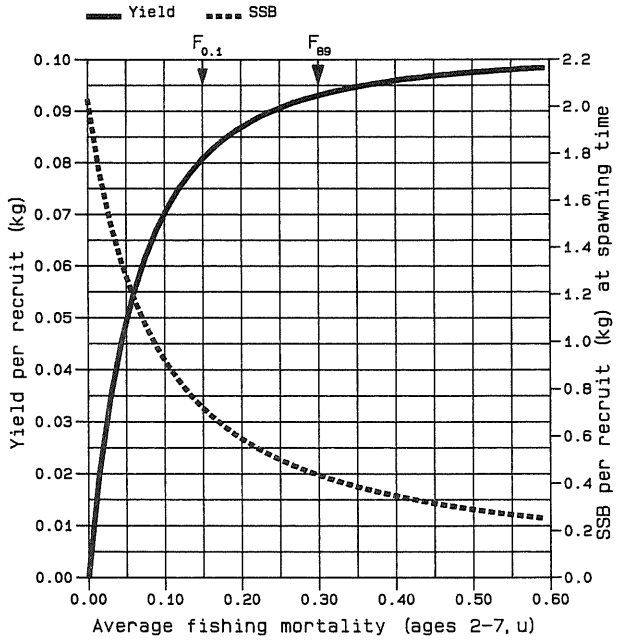


B

Figure 6.6.1 (cont'd)

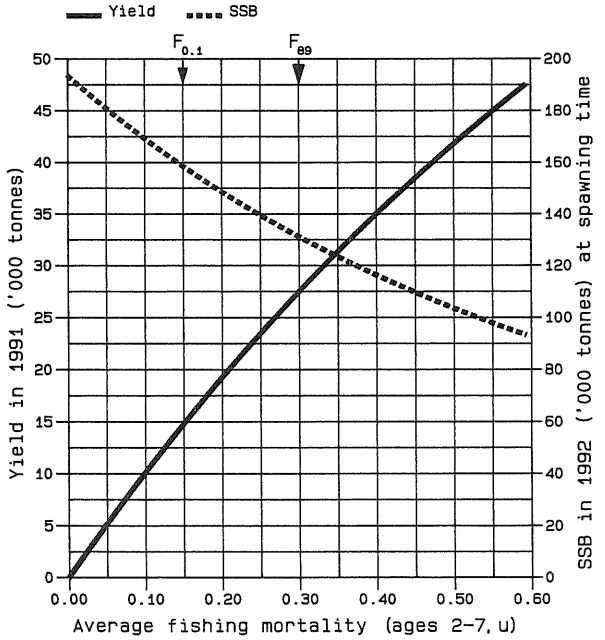
FISH STOCK SUMMARY  
 STOCK: Herring - VIa (South) and VIIb,c  
 01.05.1990

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass  
 Option A



D

Figure 7.3 Spawning stock biomass from VPA with a number of input Fs.

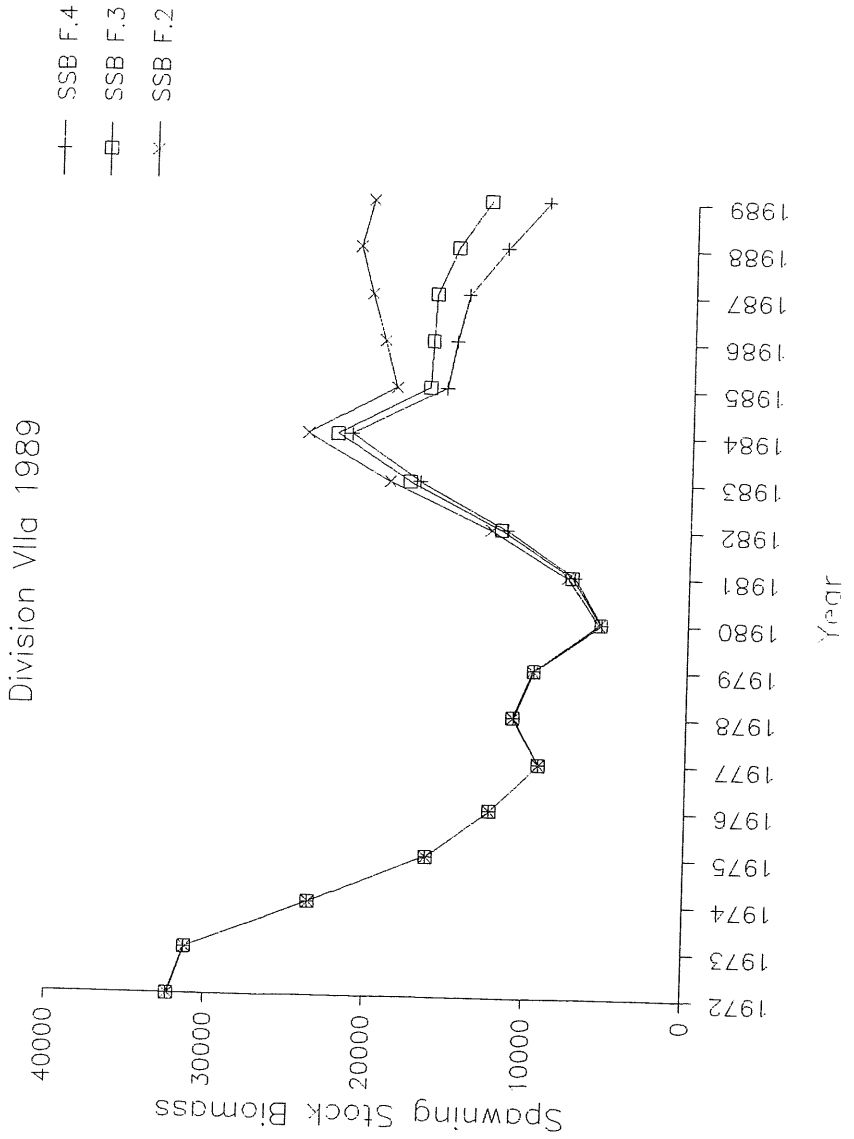


Figure 7.4 North Irish Sea HERRING (Division VIIa).  
SSB: Recruit plot using  $F = 0.2$ .

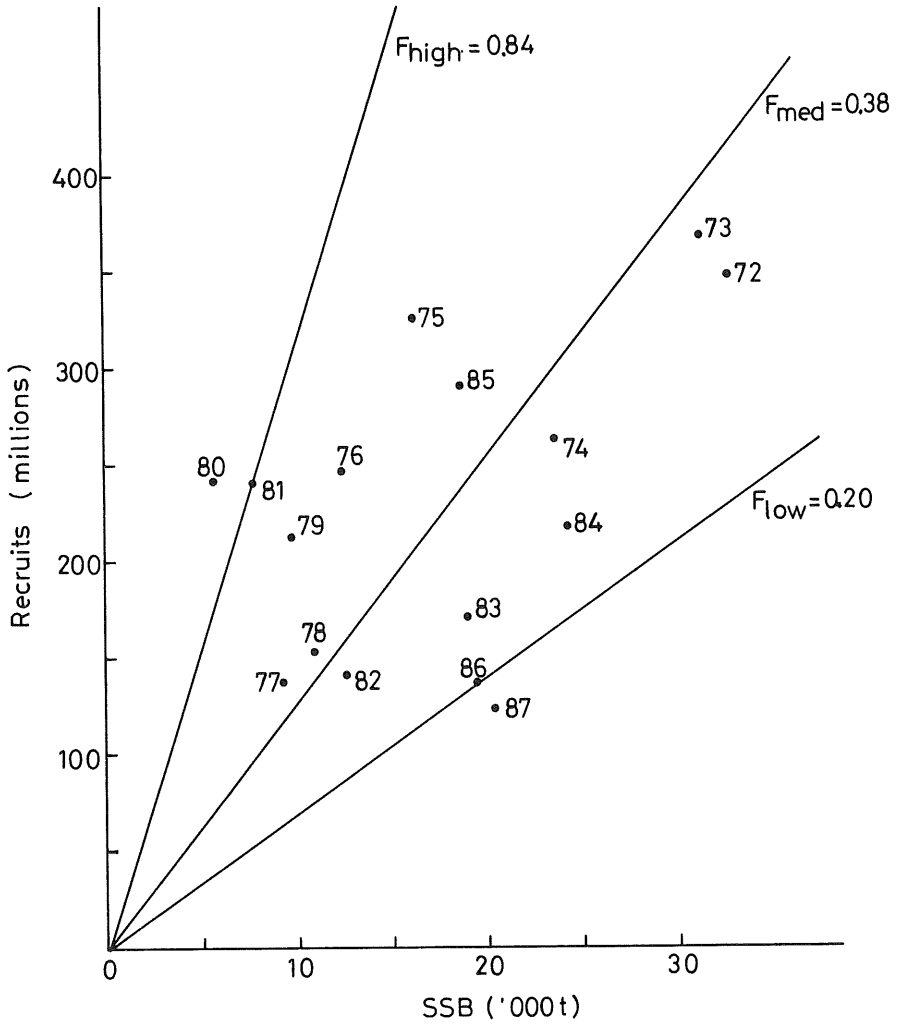


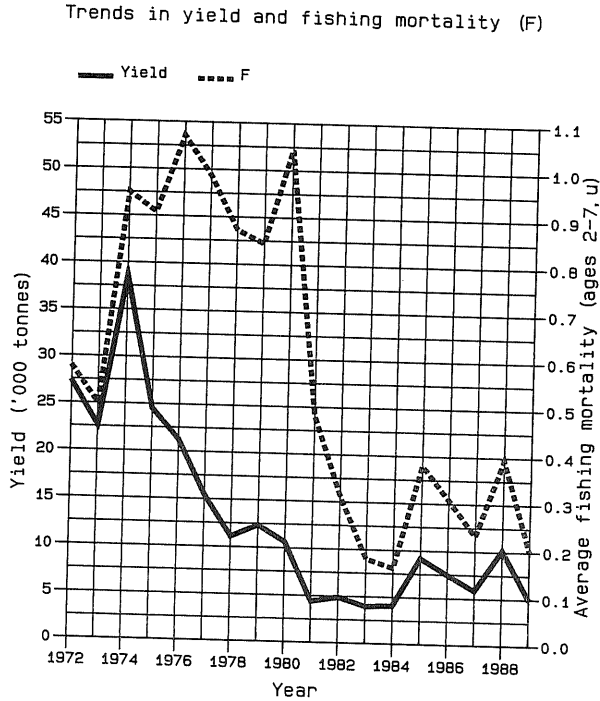


Figure 7.5

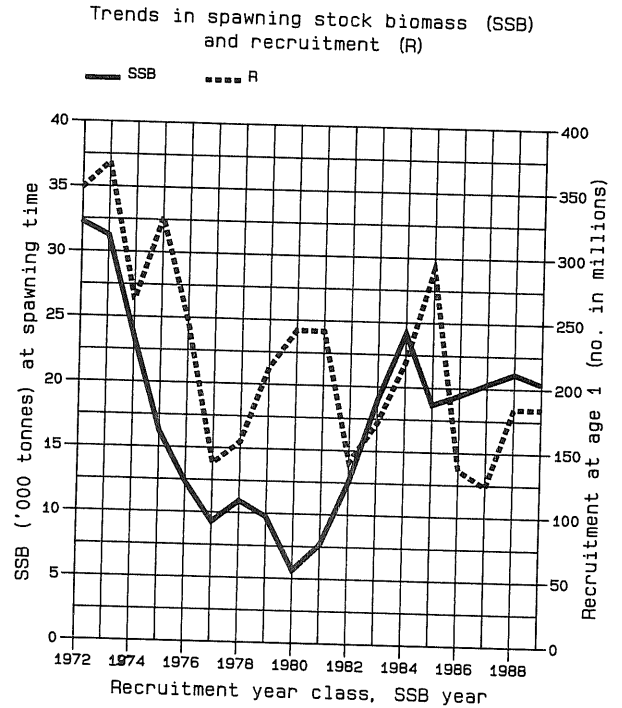
## FISH STOCK SUMMARY

### STOCK: Herring - Northern Irish Sea

30.04.1990



A

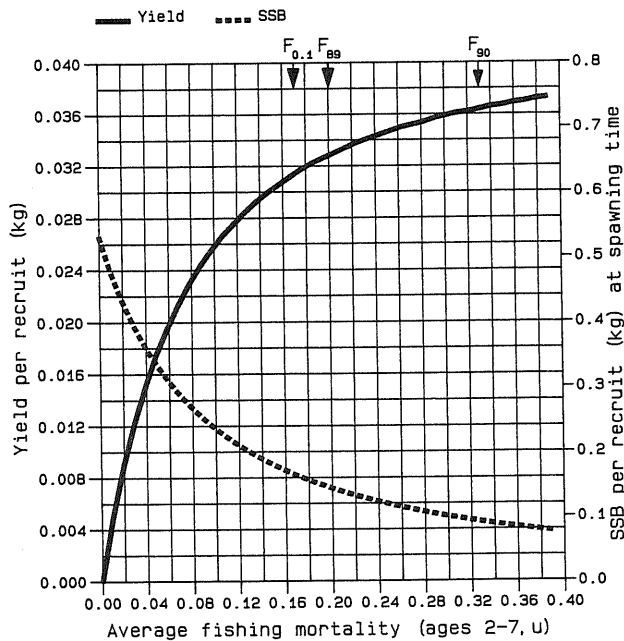


B

Figure 7.5 (cont'd)

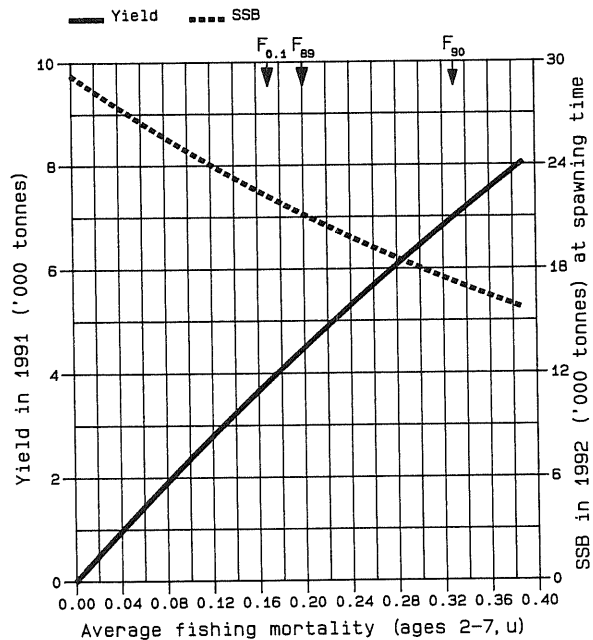
FISH STOCK SUMMARY  
 STOCK: Herring – Northern Irish Sea  
 30.04.1990

Long-term yield and spawning stock biomass

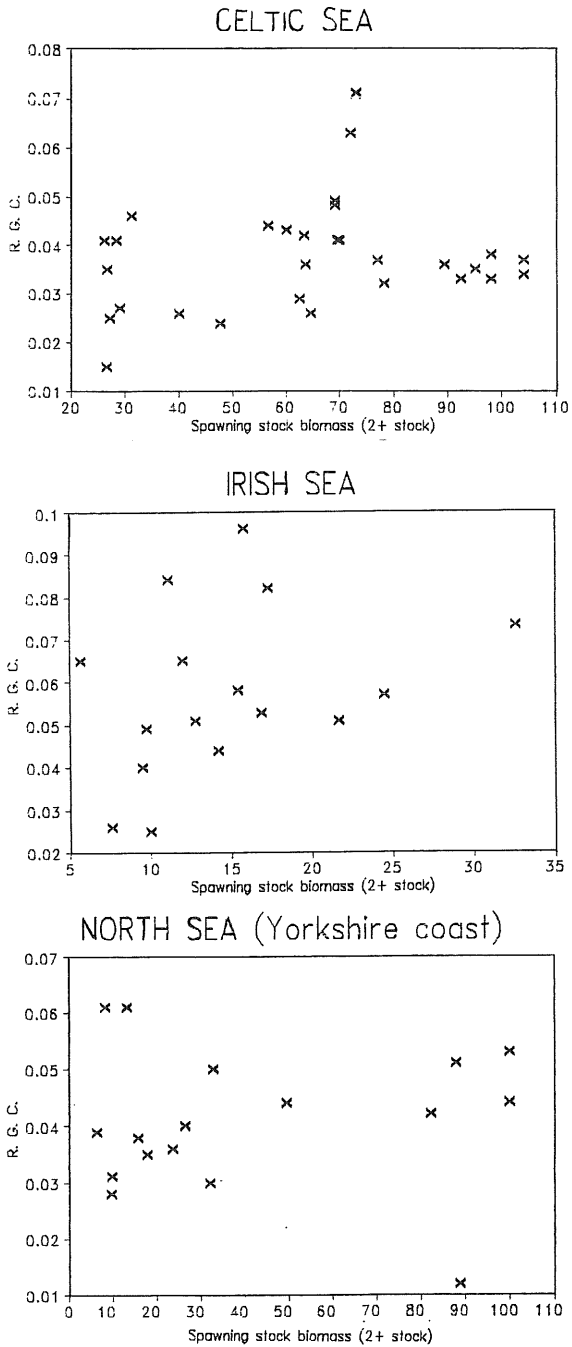


C

Short-term yield and spawning stock biomass



D



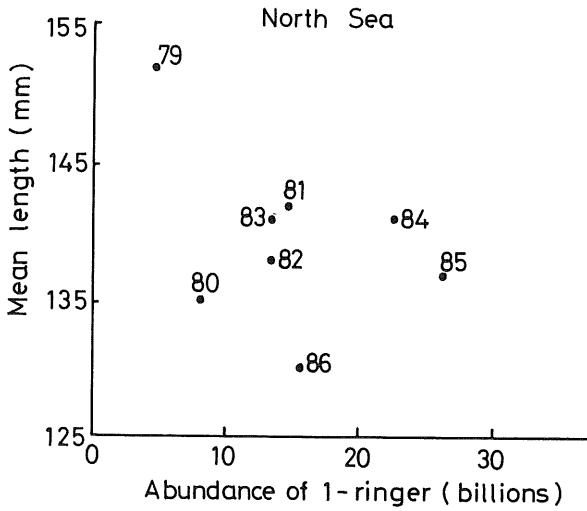


Figure 8.2.a Mean length of 1-ringers in Divisions IVb and IVc plotted against VPA estimates of abundance of 1-ringer. Estimates of mean length were from the IYFS.

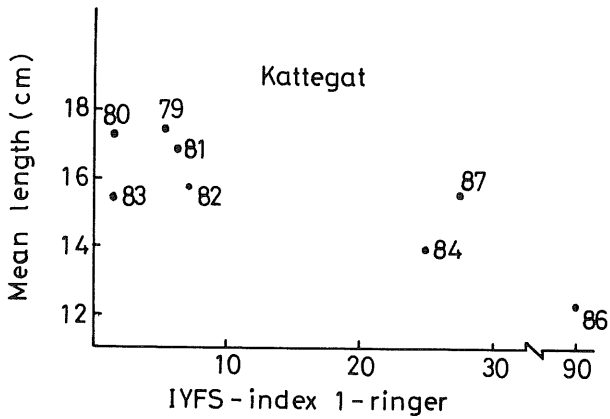
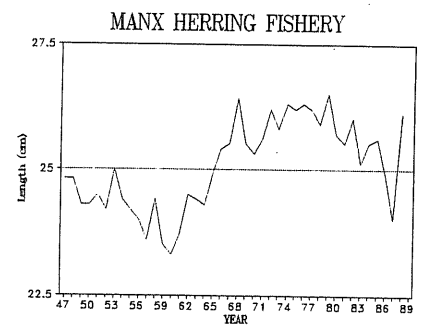
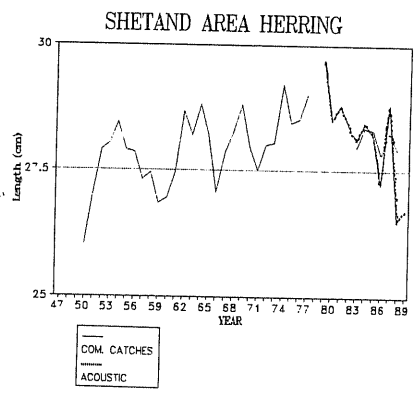
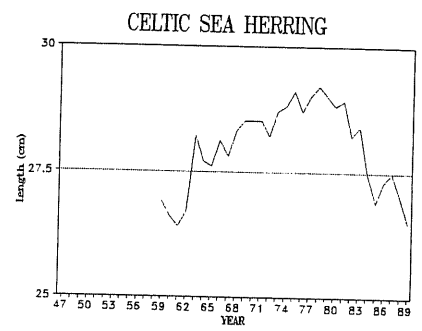
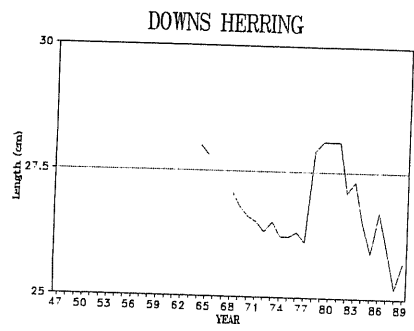


Figure 8.2.b Mean length of 1-ringers in first quarter plotted against the IYFS index of 1-ringers.



— COM. CATCHES  
 — ACOUSTIC

FIG. 8.3. TRENDS IN LENGTH  
Mean length of 3-ringers

Figure 8.4 Mean length at age of 1-6 ringers for the Celtic Sea HERRING.

