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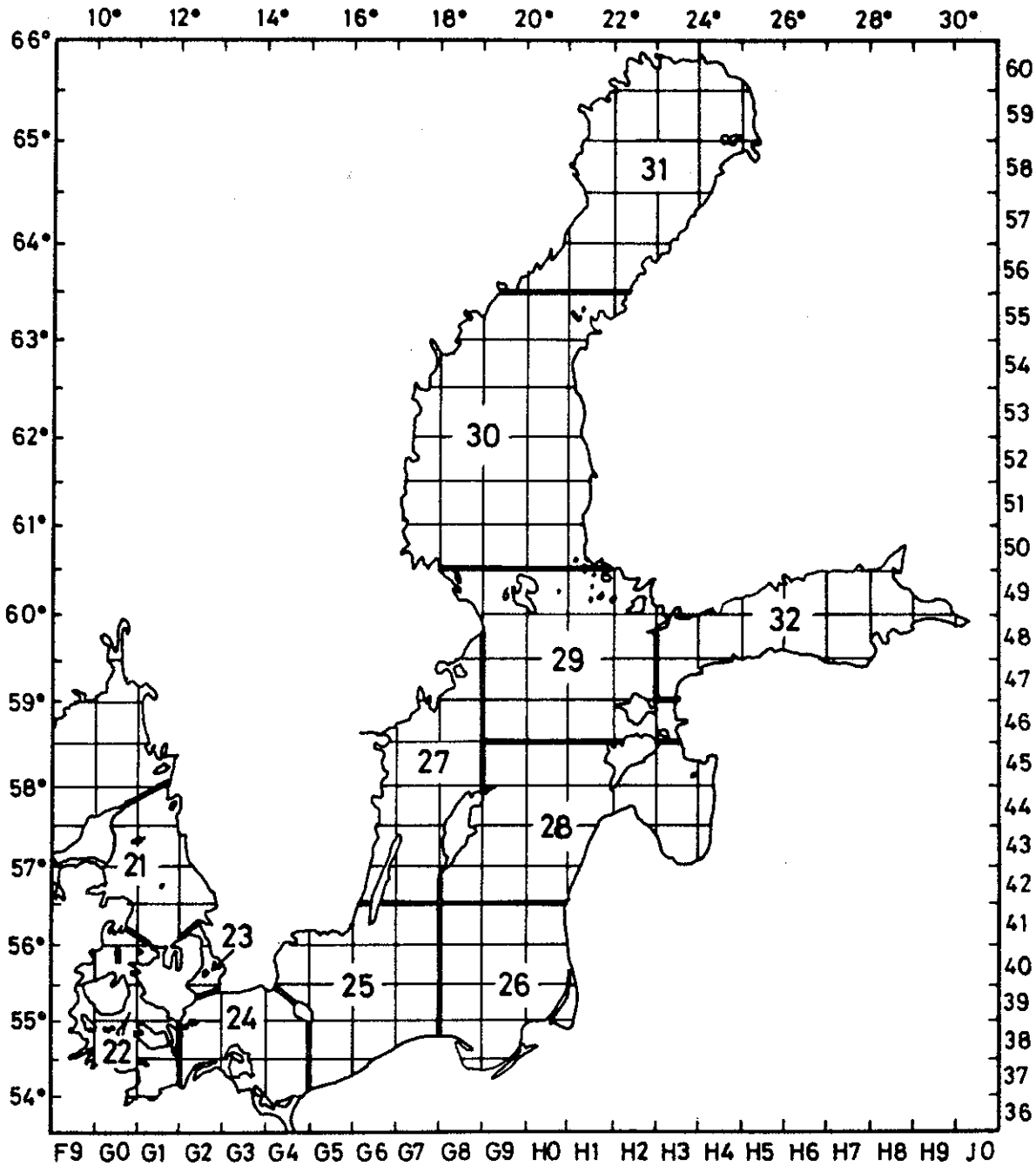
Part 2

CONTENTS

REPORT TO THE INTERNATIONAL BALTIC SEA FISHERY COMMISSION

REPORT TO THE NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION COUNCIL



Baltic Fishing Areas

REPORT TO THE INTERNATIONAL BALTIC SEA FISHERY COMMISSION

1. GENERAL ADVICE TO THE INTERNATIONAL BALTIC SEA FISHERY COMMISSION

Advice on the appropriate units for management of herring was provided in Section 3.1.1 of the 1990 ACFM Report. Advice on appropriate management units for cod was given in Sections 3.1.3 and 3.1.4 of the 1991 ACFM Report.

1.1 Review of Nominal Catches in the Baltic Area

A general review of officially-reported catches in the Baltic is given in Tables 1.1.-1.5. These are the catches officially reported to ICES by national statistical offices for publication in the *ICES Fishery Statistics*.

In the assessments, the working groups try to estimate discards and slipped fish, landings which are not officially reported, and the composition of by-catches. These amounts are included in the estimates of total catch for each stock and are used in the assessments; thus, they appear in the tables and figures produced by working groups. These estimates vary considerably between different stocks and fisheries, being negligible in some cases and constituting important parts of the total removals from other stocks. Further, the catches used by the working groups are broken down into sub-divisions, whereas the officially-reported figures are reported by the larger Divisions IIIb,c and d.

The trends in Tables 1.1-1.5 may not, therefore, correspond with those on which assessments have been based, and are presented for information only, without any comment from ACFM.

The 1990 catches listed under the Federal Republic of Germany and the German Democratic Republic refer to catches taken by vessels from the respective former territories during the whole of 1990, before and after political union. Thus catches taken by vessels registered in the former German Democratic Republic in the months after unification are included in the German Democratic Republic figures.

The catch data used in the assessments are given in other tables.

2. BALTIC PELAGIC STOCKS

For most stocks of pelagic fish in the Baltic, the estimated levels of exploitation (i.e., fishing mortalities) are very low compared to natural mortality. As a consequence, variability in the VPA results (fishing mortality and stock size estimates) may not be related to actual changes in the condition of the stocks. To minimize the impact of this variability on management advice, ACFM gave advice in May 1991 for a two-year period (i.e., 1992 and 1993). An evaluation of the status of the stocks concerned (herring in Sub-divisions 25-29 and 32, in Sub-division 30, and in Sub-division 31 and sprat in Sub-divisions 22-32) in 1992 provided no basis for ACFM to modify its advice for 1993. These stocks are well within safe biological limits. They are exploited at a level of fishing mortality below $F_{0.1}$ and the long-term yield from them could be raised by increasing fishing mortality towards that level.

2.1 Herring

2.1.1 Herring in Sub-divisions 22-24 and Division IIIa

Source of information: Report of the Working Group on Assessment of Pelagic Stocks in the Baltic, April 1992 (C.M.1992/Assess:13). Report of the Herring Assessment Working Group for the Area South of 62°N, March/April 1992 (C.M.1992/Assess:11).

Year	1985	1986	1987	1988	1989	1990	1991	1992	Max[1]	Min[1]	Mean[1]
Rec. TAC spring spawners 22-24	-	-	-	97	90	64	87	80			
Rec. TAC spring spawners IIIa	80[3]	132[3]	112[3]	99[3]	84[3]	67	91	90			
Rec. TAC spring spawners NE N. Sea	-	-	-	-	-	-	-	10			
Agreed TAC IIIa	117	46	138	138	138	120	104.5	124			
Rec. TAC mixed clupeoids	-	-	80	80	80	60	0	0			
Agreed TAC mixed clupeoids	-	80	80	80	80	65	50	50			
Catches:											
Total in IIIa	244	217	220	329	162	202	188				
Autumn spawners in IIIa	124	146	161	201	91	76[4]	77				
Spring spawners in IIIa	120	71	59	129	71	126[4]	114				
Spring spawners in NE N. Sea	17	20	14	23	20	8	8				
Spring spawners in 22-24	110	95	102	99	95	78	69				
Total spring spawners	247	186	175	251	186	212[4]	191	-			
Sp. stock biomass	269	233	187	218	238	217	181	139[2]	238	80	174
Recruitment (age 2)	2942	1691	3432	5226	2349	3007	1219	2383[2]	5226	918	2366
Mean F(2-6,u)	.79	.71	.69	.74	.65	.77	.81	.81	1.14	.63	0.80

[1]Over period 1974-1991. [2]Predicted or assumed. [3]Adult herring fishery in Division IIIa only. [4]Estimated. Weights in '000 t, recruitment in millions.

Catches: There has been a continued decrease in catches in Sub-divisions 22-24 due to reduced effort (Tables 2.1.1.1-2.1.1.2). The total catch (spring and autumn spawners) in Division IIIa remained at a level of about 200,000 t in 1991 (Table 2.1.1.3), but insufficient sampling makes both the total amount and (particularly) the split into spring and autumn spawners uncertain. The amount of spring spawners caught in the eastern parts of the North Sea in 1991 was slightly below 10,000 t.

Data and assessment: Stock estimates from acoustic and trawl surveys used to calibrate the VPA.

Fishing mortality: In recent years fishing mortality has been slightly below or at the long-term average level (Figure 2.1.1). The absolute level of F (about 0.8) is, however, uncertain. Factors such as the low level of natural mortality assumed, and the very complex stock and migration structure contribute to the uncertainty about absolute exploitation level.

Recruitment: The 1990 year class is of average size, whereas 1989 year class is only about 50% of average.

State of stock: Spawning stock biomass has decreased from a high level in the middle of the 1980s and in 1991 was at the 1974-1991 average level.

Forecast for 1993:
Assuming F(92) = 0.81, Basis: F(92) = F(91), Catch(92) = 191, Landings (92) = 191.

Option	Basis	F(93)	SSB(93)	Catch(93)	Lndgs(93)	SSB(94)	Consequences/implications
A	$0.8\ F_{91}$	0.65	131	158	158	149	Long-term benefit from reducing fishing mortality.
B	F_{91}	0.81	129	188	188	130	No change in long-term gain.
C	$1.2\ F_{91}$	0.98	127	214	214	113	Long-term loss from increasing fishing mortality.

Weights in '000 t.

Continued fishing at current levels of fishing mortality will lead to little change in SSB.

Management advice: The stock has been at a fairly stable level over the past 10 years. The 1989 year class is predicted to be below average and the spawning stock size is expected to decrease in 1993. There is a benefit to be gained in long-term yield by decreasing fishing below the level seen in recent years.

Catches of juvenile herring substantially reduce the potential catches of adult herring and the level of SSB in future years. If the management objective is to increase SSB and to maximize catches of adult herring, the catches of juveniles have to be substantially reduced.

Special comments: The spring-spawning herring in Division IIIa and Sub-divisions 22-24 consist of a group of spring- and winter-spawning populations that cannot be separated and thus are treated as unit stock from an assessment point of view. The spring-spawning populations are the major part of this stock. A detailed description of the distribution and migration of the stock was given in the 1991 ACFM report.

As a result of the migration pattern, the stock is exploited in three different management units. The historical catches by management unit are given in the text table below. The catches in Division IIIa are mainly taken in the following fisheries:

- The directed fishery for herring is carried out by purse seiners and trawlers. Because of the mixed occurrence of young and adult herring in Division IIIa, the catches contain varying amounts of young immature herring which are mainly landed for reduction.

- The "mixed fishery" is carried out under the "sprat" TAC. The landings consist of a mixture of industrial species (Norway pout and sandeel), juveniles of "consumption" species (herring and gadoid) and sprat.

- By-catch in other fisheries. Catches of herring occur in the fishery for Norway pout, sandeel and blue whiting.

It has not been possible to separate the by-catch taken in other fisheries or the landings taken in the directed fishery and used for reduction. The majority of the catches landed for industrial purposes are juvenile autumn spawners. The effect of these catches on the yield of the North Sea herring are evaluated in Section 3.1.1 of the Report to NEAFC.

The catches of spring- and autumn-spawning herring in Division IIIa and Sub-divisions 22-24 are predicted for 1993 assuming *status quo* effort in the mixed clupeoid fishery and three different levels of effort (0.8F(1991), F(1991) and 1.2F(1991) in the fleets fishing herring for human consumption. The catches were allocated to management units assuming same relative area distribution as was observed in 1990 and 1991. The predicted catches of autumn spawners in Division IIIa are discussed in Section 3.1.4 of the Report to NEAFC.

Year	1992	1993	1993	1993
Assumption for human consumption fishery	$F_{92}=F_{91}$	$F_{93}=0.8F_{91}$	$F_{93}=F_{91}$	$F_{93}=1.2F_{91}$
Total catch in IIIa	209	284	341	391
Autumn sp. catch in IIIa	96	191	228	263
Spring sp. catch in IIIa	113	93	113	128
Spring sp. catch in IVa (East)	8	8	8	8
Spring sp. catch in 22-24	70	57	68	78
Total spring sp. catch	191	158	189	214

A fungal disease (*Ichthyophonus* sp.) has been identified as a potential source of mortality. It may be necessary to review this assessment at the November 1992 ACFM meeting when more information on the disease should be available.

The sampling from this stock was generally better in 1991 than in 1990. Both landing statistics and sampling for age and weight were of good quality for the part of the landings made for the human consumption market, but there are still large uncertainties about both quantities and age compositions of that part of the landings that goes for reduction. A major part of the Swedish Skagerrak landings for industrial purposes has not been sampled. In 1991 this amounted to about 31,000 t. This lack of sampling makes the assessments, both of the North Sea autumn spawners and of the spring spawners, more uncertain.

2.1.2 Herring in Sub-divisions 25-29 (incl. Gulf of Riga) and 32

Source of information: Report of the Working Group on the Assessment of Pelagic Stocks in the Baltic, April 1992 (C.M.1992/Assess:13).

Year	1985	1986	1987	1988	1989	1990	1991	1992	Max[1]	Min[1]	Mean[1]
Recommended TAC	-	-	-	-	-	-	293	-[2]			
Catch as used by WG	289	268	252	286	290	244	212	-	323	244	295
Sp. stock biomass	1737	1483	1775	2336	2188	2336	2772	-	2772	1483	1967
Recruitment (age 1)	57.6	26.6	61.9	21.9	42.6	78.3	49.0	-	78.3	21.9	46.9
Mean F(3-8,u)	.21	.22	.17	.14	.15	.12	.09	-	.22	.09	.16

[1]Over period 1974-1990. [2]ACFM preference for F near 1990 level. Weights in '000 t, recruitment in 10^9.

Catches: Total catch decreased in 1991 to about 212,000 t (Table 2.1.2), mainly due to problems in the herring markets both for human consumption and for animal fodder.

Data and assessment: The stock estimate from the acoustic survey in autumn 1991 was high compared to the previous year. The values of natural mortality were revised based on new results from the Multispecies VPA. The general level of M was increased, which led to increased estimates of stock size.

Fishing mortality: The increased natural mortalities have influenced the estimates of fishing mortalities which have decreased compared to last year (Figure 2.1.2).

Recruitment: No adequate recruitment data are available.

State of stock: The revised estimates of stock sizes and mortalities indicate an increasing stock size (and decreasing level of exploitation) as the cod stock, and hence predation levels, are decreasing. The effects on the short term predictions are, however, small. The revised estimates of stock sizes could be overestimates due to the major influence of the high acoustic estimate in 1991 in the tuning procedure. Even if the absolute level of stock size is imprecisely estimated, the stock is at a high level and exploited at a level below $F_{0.1}$ ($\sim$ 0.16).

Forecast for 1993:
Assuming F(92) = 0.09, Basis:$F_{(92)} = F_{(91)}$, Catch(92) = 308 t, Landings (92) = 308 t.

Option	Basis	SSB(93)	Catch(93)	Lndgs(93)	SSB(94)	Consequences/implications
A	0.8 $F_{(91)}$	>3000	289	289	>3000	SSB remains at a high level.
B	$F_{(91)}$	>3000	359	359	>3000	
C	1.2 $F_{(91)}$	>3000	427	427	>3000	
D	1.4$F_{(91)}$	>3000	495	495	>3000	

Weights in '000 t.

Continued fishing at current levels of fishing mortality, and even somewhat increased fishing mortality, will lead to an increase in stock size.

Management advice: This stock is well within safe biological limits. It is being exploited at a level of fishing mortality below $F_{0.1}$ and the long-term yield could be raised by increasing fishing mortality towards that level.

2.1.3 Herring in Sub-division 30, Bothnian Sea

Source of information: Report of the Working Group on the Assessment of Pelagic Stocks in the Baltic, April 1992 (C.M.1992/Assess:13).

Year	1985	1986	1987	1988	1989	1990	1991	1992	Max[1]	Min[1]	Mean[1]
Recommended TAC	-	-	-	-	-	-	32	-[3]			
Catch as used by WG	26	26	25	28	29	31	30	-	31	16	23
Sp. stock biomass	133	139	152	144	164	192	191	194[2]	192	107	136
Recruitment (age 1)	3176	1270	2018	879	4036	3072	2024	2160[2]	4036	719	2160
Mean F(2-6,u)	0.19	0.19	0.15	0.15	0.16	0.13	0.16	-	0.19	0.09	0.15

[1]Over period 1974-1991. [2]Predicted or assumed. [3]ACFM preference for F near 1990 level. Weights in '000 t, recruitment in 10^6.

Catches: Slight increase in recent years (Table 2.1.3).

Data and assessment: Analytical assessment using catch-in-number data and VPA tuned with effort data.

Fishing mortality: Low and close to $F_{0.1}$ (0.19) (Figure 2.1.3).

Recruitment: Varied without trend.

State of stock: Stable at a high level.

Forecast for 1993:

Assuming F(92) = 0.16, Basis: F(91), Catch(92) = 31, Landings (92) = 31.

Option	Basis	SSB(93)	Catch(93)	Lndgs(93)	SSB(94)	Consequences/implications
A	$0.8F_{91}$	194	25	25	197	No major changes in SSB
B	F_{91}	193	30	30	190	
C	$1.2F_{91}$	192	36	36	184	

Weights in '000 t.

Continued fishing at current levels of fishing mortality will lead to only small changes in catches and SSB.

Management advice: This stock is well within safe biological limits. It is being exploited at a level of fishing mortality close to $F_{0.1}$.

2.1.4 Herring in Sub-division 31, Bothnian Bay

Source of information: Report of the Working Group on the Assessment of Pelagic Stocks in the Baltic, April 1992 (C.M.1992/Assess:13).

Year	1985	1986	1987	1988	1989	1990	1991	1992	Max[1]	Min[1]	Mean[1]
Recommended TAC	9	-[3]	9	13	≤7	9	9	-[4]			
Catch as used by WG	9.3	9.1	8.1	8.8	4.4	7.8	7.4	-	9.8	4.4	7.9
Sp. stock biomass	37	40	38	38	36	49	76	89[2]	76	32	39
Recruitment (age 1)	347	315	545	162	2752	914	301	737[2]	2752	162	608
Mean F(2-6,u)	0.23	0.18	0.19	0.21	0.11	0.11	0.08	-	0.23	0.08	0.16

[1]Over period 1974-1991. [2]Predicted or assumed. [3]Precautionary TAC based on recent catch levels. [4]ACFM preference for F in 1992 and 1993 near 1990 level. Weights in '000 t, recruitment in 10^6.

Catches: Recent catches at average level (Table 2.1.3).

Data and assessment: Analytical assessment using catch-in-numbers data and VPA tuned with effort data.

Fishing mortality: Low, and about the $F_{0.1}$ level ($\approx$ 0.17) (Figure 2.1.4).

Recruitment: Varies without trend and with the 1988 year class well above the long-term average.

State of stock: The stock size is increasing and the exploitation light.

Forecast for 1993:

Assuming F(92) = 0.08, Basis: $F_{92} = F_{91}$, Catch(92) = 8.2, Landings (92) = 8.2.

Option	Basis	SSB(93)	Catch(93)	Lndgs(93)	SSB(94)	Consequences/implications
A	$0.8F_{91}$	92	6.8	6.8	94	No major changes in SSB
B	F_{91}	91	8.4	8.4	92	
C	$1.2F_{91}$	91	10.0	10.0	90	
D	$1.4F_{91}$	91	11.6	11.6	88	

Weights in '000 t.

Continued fishing at current levels of fishing mortality will lead to only small changes in catches and SSB.

Management advice: This stock is well within safe biological limits. It is being exploited at a level of fishing mortality below $F_{0.1}$ and the long-term yield could be raised by increasing fishing mortality towards that level.

2.2 Sprat in Sub-divisions 22-32

Source of information: Report of the Working Group on the Assessment of Pelagic Stocks in the Baltic, April 1992 (C.M.1992/Assess:13).

Year	1985	1986	1987	1988	1989	1990	1991	1992	Max[1]	Min[1]	Mean[1]
Recommended TAC	68	-	-	-	72[3]	72[3]	150	-[4]			
Agreed TAC	84.8	105.0	117.2	117.2	142	150	163	201			
Catch as used by WG	69	76	88	80	86	86	103	-	242	37	105
Sp. stock biomass	524	458	363	459	479	803	1,233	1,294[2]	1,233	175	555
Recruitment (age 1) 1)	41.6	20.1	79.2	7.2	101.7	102.7	73.8[2]	73.8[2]	279.6	7.2	73.8
Mean F(2-6,u)	.15	.18	.27	.22	.20	.15	.13	-	.33	.10	.21

[1]Over period 1974-1990. [2]Predicted or assumed. [3]For Sub-divisions 26-32. [4]ACFM preference for F in 1992 and 1993 near 1990 level. Weights in '000 t, recruitment in 10^9.

Catches: Total catches increased from a level in 1987-1990 of 80,000-90,000 t to 103,000 t in 1991 (Tables 2.2.1-2.2.2).

Data and assessment: VPA was tuned with acoustic estimates. Age- and time-variable natural mortalities from a multispecies VPA, in which predation mortality by cod plays a major role, were adopted for this year's assessment.

Fishing mortality: Fishing mortality seems to have decreased during the last few years (Figure 2.2). It appears to be low in comparison with the $F_{0.1}$ level (~ 0.4).

Recruitment: Recruitment is very variable with very strong year classes produced in 1975 and 1982 and a very weak one in 1987. The year classes have since then been rather constant.

State of stock: Recent average recruitment and a decreasing predation mortality and stable catches will increase the stock. The present exploitation level is low.

Forecast for 1993:

Assuming F(92) = 0.13, Basis:$F_{(92)}=F_{(91)}$, Catch(92) = 160, Landings (92) = 160.

Option	Basis	F(93)	SSB(93)	Catch(93)	Lndgs(93)	SSB(94)	Consequences/implications
A	$0.8F_{91}$	0.10	1,148	147	147	1,573	All these options lead to an increase in SSB
B	F_{91}	0.13	1,404	182	182	1,530	
C	$1.2F_{91}$	0.16	1,391	216	216	1,489	
D	$1.4F_{91}$	0.18	1,380	245	245	1,420	

Weights in '000 t.

Continued fishing at current levels of fishing mortality will lead to a marked increase in SSB.

Management advice: This stock is well within safe biological limits. It is being exploited at a level of fishing mortality below $F_{0.1}$ and the long-term yield could be raised by increasing fishing mortality towards that level.

3. BALTIC DEMERSAL STOCKS

3.1 Cod

Catches of both cod stocks in the Baltic have declined steadily in recent years. Total landings have been highest in 1984 at 441,000 t and reached 139,000 t in 1991 (Tables 3.1.1-3.1.4). In both stocks the catches are now at record-low levels.

3.1.1 Environmental conditions

Low salinity and poor oxygen conditions in main eastern stock spawning grounds have limited spawning success of cod in recent years. In 1991, spawning occurred in the Bornholm Basin but there was practically no spawning in other areas. An influx of North Sea water into the Bornholm Basin was observed in March 1992. This influx has improved the environmental conditions in 1992 in the Bornholm Basin. In other spawning grounds (Gotland Deep and Gdansk Deep) conditions have not improved.

3.1.2 Management considerations

The spawning stock biomass of the eastern stock has declined rapidly from about 820,000 t in 1980 to 178,000 t in 1991, the lowest value observed in the available time series (1970-1991). ACFM notes that continued fishing at the present level will rapidly reduce the stock biomass even further. With *status quo* fishing mortality, the spawning stock biomass will be only 82,000 t in 1993 and 71,000 t in 1994. The eastern cod stock could be considered as almost non-renewable. With continued low recruitment and present fishing mortality the spawning stock will within a few years reach a level which is less than half of the lowest observed. The rate of recovery from a such a low biomass level is not known. Thus the safest approach would be to cease fishing and thereby protect the remaining biomass to allow cod to take advantage of eventual improvements in environmental conditions.

The western stock also has suffered from poor recruitment. High fishing mortalities have reduced the spawning stock to the lowest level observed in the available time series.

ACFM reiterates its recommendation that these two cod stocks should be managed separately as two different units in order to ensure recovery of both stocks independently from each other. If the stocks are managed as one unit, the possibility of controlling the distribution of fishing effort becomes very limited.

3.1.3 Cod in Sub-divisions 22-24

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the Baltic, April 1992 (C.M.1992/Assess:12).

Year	1985	1986	1987	1988	1989	1990	1991	1992	Max[1]	Min[1]	Mean[1]
Recommended TAC	<33	<24	9	16	14	8	11	-[3]			
Agreed TAC	-	-	-	-	-[4]	-[4]	-[4]				
Discards/slipping	-	1	3	-	-	-		-	3	0	<1
Catch as used by WG	39	26	27	28	18	17	15	-	54	15	40
Sp. stock biomass	40	24	18	25	23	16	14	14[2]	49	14	35
Recruitment (age 1)	24	68	39	14	20	14	24	51[2]	145	14	70
Mean F(3 -7,u)	1.28	1.56	0.90	0.85	0.92	0.98	0.73	-	1.56	0.73	0.98

[1]Over period 1965-1991 for catches and 1970-1991 for assessment data. [2]Predicted or assumed. [3]Lowest possible level. [4]Included in TAC for total Baltic. Weights in '000 t, recruitment in millions.

Catches: Stable catches until 1984 (Table 3.1.3). Since then decreasing gradually to 15,000 t in 1991, which is lowest on record.

Data and assessment: Analytical assessment based on catch-at-age data. VPA-tuning based on three sets of catch and effort and one survey data series. Recruitment estimated from survey data.

Fishing mortality: Peaked in 1985-1986 and decreased thereafter to 0.73 in 1991, a level which far exceeds F_{max} (0.27) (Figure 3.1.3).

Recruitment: Fluctuating, but decreasing since 1986. Year class 1990 estimated as 24 million and 1991 year class 70% of the long-term mean. However, higher recruitment of year class 1991 is somewhat uncertain. Year class 1991 is an important contributor to catches in 1993 and SSB in 1994. Last significant year class was that of 1985 which was followed by five poor or below-average year classes.

State of stock: SSB decreasing. 1991 SSB about 40% of the long-term mean. High fishing mortalities and low recruitment have reduced the spawning stock to the lowest level observed.

Forecast for 1993:

Assuming F(92) = 0.73, Basis: $F_{92} = F_{91}$, Catch(92) = 14, Landings (92) = 14

Option	Basis	F(93)	SSB(93)	Catch(93)	Lndgs(93)	SSB(94)	Consequences/implications
A	$0.0F_{91}$	0.00	19	0	0	46	SSB increase to about half of the average level in 1993 and almost a record high in 1994.
B	$0.2F_{91}$	0.15		5	5	41	Increase in SSB in 1994 to above-average level.
C	$0.4F_{91}$	0.29		9	9	37	SSB in 1994 average level.
D	$0.6F_{91}$	0.44		13	13	33	SSB in 1994 below average level.
E	$0.8F_{91}$	0.58		17	17	30	Increase in SSB in 1994 but SSB remains below average.
F	$1.0F_{91}$	0.73		20	20	27	Increase in SSB in 1994 but SSB remains low

Weights in '000 t.

Continued fishing at current levels of fishing mortality will lead to slight increase of SSB in 1994, but SSB would still be at a low level.

Management advice: High fishing mortalities and low recruitment have reduced the spawning stock to the lowest level observed in the available time series. A substantial reduction in fishing mortality is necessary in order to increase the stock above its present low level. Therefore, ACFM recommends that fishing mortality in 1993 be reduced to the lowest possible level.

Special comments: ACFM reiterates its recommendation that this stock should be managed as one unit in order to ensure the recovery of the stock and have better control of fishing effort.

3.1.4 Cod in Sub-divisions 25-32

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the Baltic, April 1992 (C.M.1992/Assess:12).

Year	1985	1986	1987	1988	1989	1990	1991	1992	Max[1]	Min[1]	Mean[1]
Recommended TAC	<162	<232	<245	150	179	129	122	-[3]			
Agreed TAC	-	-	-	-	220[4]	210.5[4]	171[4]				
Catch as used by WG	315	253	207	194	179	153	122	-	391	122	218
Sp. stock biomass	612	418	375	363	297	240	178	115[2]	811	178	461
Recruitment (age 2)	229	244	329	209	120	118	54	57[2]	773	54	347
Mean F(4-7,u)	0.75	1.16	0.95	0.83	0.96	0.96	0.95	-	1.16	0.53	0.83

[1]Over period 1970-1991. [2]Predicted or assumed. [3]Lowest possible level. [4]For total Baltic. Weights in '000 t, recruitment in millions.

Catches: Total catches very high in 1980-1984 (Table 3.1.4). Catches decreasing since 1985. The 1991 catch was the lowest in the 1970-1991 period (122,000 t).

Data and assessment: Analytical assessment based on catch-at-age data. Tuning with catch and effort data from five fleets. Trawl survey data included. Recruitment estimated from trawl survey data. Exploitation pattern has probably changed as a higher proportion of recent catches has been taken by gillnets.

Fishing mortality: In 1991, fishing mortality remained at the same high level as in the two previous years (Figure 3.1.4). Current fishing mortality far exceeds F_{max} (0.28).

Recruitment: Recruitment decreasing since 1987. The 1989 year class is the poorest on record and the 1990 and 1991 year class also appears to be very poor.

State of stock: Decreasing SSB since 1980. SSB in 1992 is the lowest on record and only 20% of the average 1970-1991 level.

Forecast for 1993:

Assuming F(92) = 0.95, Basis: $F_{92} = F_{91}$, Catch(92) = 74, Landings (92) = 74.

Option	Basis	F(93)	SSB(93)	Catch(93)	Lndgs(93)	SSB(94)	Consequences/implications
A	$0.0F_{91}$	0.00	82	0	0	133	SSB increases to one-third of the long-term average level.
B	$0.2F_{91}$	0.19		14	14	116	SSB increases but only to one quarter of the long-term average level.
C	$0.4F_{91}$	0.38		27	27	102	SSB increases, but remains very low.
D	$0.6F_{91}$	0.57		37	37	90	SSB almost stable at very low level.
E	$0.8\ F_{91}$	0.76		46	46	80	SSB in 1994 decreases to new record-low level.
F	$1.0\ F_{91}$	0.95		54	54	71	

Weights in '000 t.

Continued fishing at current levels of fishing mortality will lead to a further decrease in SSB to a new record-low level.

ctd.

Management advice: The eastern Baltic cod stock is in a depleted state and below the minimum biologically acceptable level (MBAL). Since 1985 both spawning stock biomass and recruitment have declined steeply and are now at record-low levels. Therefore, ACFM recommends that no fishing be allowed in 1993.

Special comments: ACFM reiterates its recommendation that also this eastern stock should be managed as a unit separate from the western stock.

3.2 Flatfish Stocks in the Baltic

3.2.1 State of flounder stocks

The total catches of flounder have remained stable for about the last twenty years, although areal changes have occurred. There seems to be a growing interest in the flounder fishery among some Baltic nations. This applies especially to the eastern Baltic. There are some plans to develop the flounder fishery in order to replace, at least to some extent, the present poor cod fishery.

Some trial assessments of flounder stocks have been made in the Baltic. However, the data base for most of the flounder stocks is still incomplete. Data on discards are poor, effort and catch per unit of effort data are in some cases minimal, and very few indices of recruitment are available.

3.2.2 Flatfish landings

The revised data on landings of flatfishes (flounder, plaice, dab, turbot and brill) by country are shown in Tables 3.2.1-3.2.5.

4. BALTIC SALMON AND TROUT STOCKS

Stock concepts: Three possible ways to consider stock units for wild Baltic salmon are:

a) the northern (Sub-divisions 30-31) and southern (Sub-divisions 24-29) stocks;
b) a separate stock in each river;
c) a separate stock in each tributary.

Ideally stocks would be monitored and managed on the basis of definition c) above, but this is very difficult in practice. ACFM has used different definitions in different situations. The stock concept used affects the management because smaller stock units require more effective management measures.

Reducing exploitation: Apart from TACs, there are several possible ways of reducing exploitation of the wild stocks but these need to be evaluated before they can be recommended. Measures that have been discussed during recent years are increased mesh size in drift nets, reduction in number of gear per boat and a closure of certain fishing areas. There has also been a suggestion to close the offshore fishery outside 24 nautical miles combined with compensatory releases of net-pen reared salmon. However, it has been found recently that net-pen reared salmon have entered rivers throughout the Baltic and this would threaten the genetic identity of the wild salmon stocks in the rivers.

By-catches of fish, birds, and marine mammals in the drift-net fishery: The by-catches of other fish are insignificant compared to the target fisheries for those species. The numbers of seals killed in the fisheries is uncertain but local colonies may be affected by near shore fisheries. The stock level of the Baltic ringed seal is extremely low and by-catches should be minimized. Guillemot and razorbill are the sea birds most significantly affected by the salmon drift-net fishery. The effect of the extensive salmon fishery on the stocks of the sea birds is not very well known.

Fish diseases: There is an increase in the incidence of fish disease among rainbow trout reared in net-pens in the Baltic. This is a potential threat to both wild and reared salmon stocks in the Baltic Sea.

Monitoring of the natural stocks: Given that a management objective is to safeguard wild salmon stocks, it is highly recommended that monitoring programmes for the wild stocks be improved in the relevant countries. Only in the Rivers Simojoki and Tornionjoki are comprehensive yearly monitoring programmes undertaken.

4.1 Baltic Salmon in the Main Basin and the Gulf of Bothnia (Sub-divisions 24-31)

Source of information: Report of the Baltic Salmon and Trout Assessment Working Group, March 1992 (C.M.1992/Assess:10).

Year	1985	1986	1987	1988	1989	1990	1991	1992	Max[6]	Min[6]	Mean[6]
TACs and Landings											
Rec'd TAC	1,700	1,700	-	<3,000	2,900	1,680	-	2820-3130			
Rec'd No.					850	420	-	626			
Agreed							3,350	3,550			
Landing(t)	3,755	3,188	3,634	2,907	3,945	5,157	4,129[1]	-	5,157	2,907	3,816
Landings ('000 fish)											
Wild[2]	170	133	135	102	85	97	117	-	170	85	120
Reared	865	752	762	689	964	1,034	659	-	1,034	659	818
Total	1,043	885	897	791	1,049	1,131	776[1,]	-	1,131	776	939
Smolt-production to Sub-divisions 24-31 (in million smolts)											
Wild[3]	0.42	0.41	0.41	0.40	0.40	0.42	0.39	0.40[4]	0.42	0.39	0.41
Reared	4.43	5.05	5.56	5.68	5.23	4.38	4.01	4.48[4]	5.68	4.01	3.78
Total	5.69	5.46	5.97	6.08	5.64	4.80	4.40	4.88[4]	6.08	4.40	5.36

[1]Landings in 1991 are based on preliminary data. [2]The landings of wild fish are estimated using scale-reading techniques to discriminate wild and reared salmon; partly incomplete sampling and discrimination make these estimates somewhat uncertain. [3]The wild smolt production is yearly estimated only for the rivers Tornionjoki and Simojoki, i.e. the total production is only a crude estimate. [4]The smolt production in 1992 is an assumed figure. [5]The decrease in catch numbers reflects the decrease in fishing effort in offshore fisheries. [6]Over period 1985-1991 for landings and 1985-1992 for smolt production.

Landings: Compared to 1990, total landings decreased somewhat in 1991 but remained at a high level (Table 4.1 and Figure 4.1). As in 1990, the share of the catch taken in the Gulf of Bothnia compared to the Main Basin was considerably higher than in the 1980s as a result of a shift in the exploitation. The TAC (3350 t) was exceeded by 23%.

Data and assessment: There were a number of problems in making assessments for 1993. The catch-at-age data were based on tagging data from only one country because of problems of compatibility of data sets and samples. Discrimination between wild and reared fish remains a difficult problem. The collection of CPUE values for the various fishing methods is also difficult.

Status of stocks:

Wild: Most of the wild stocks of single rivers in the Gulf of Bothnia are below the minimum biologically acceptable level, primarily as a result of overfishing. In the Main Basin, the wild stock of the River Mörrum appears to be in a healthy state. For other rivers in the Main Basin, the smolt production is low (10-20% of potential) and pollution and the poor condition of the spawning grounds seem to be important factors.

Reared: At present, the number of spawning migrators entering the rivers is sufficient for rearing purposes. Thus the reared stocks are not now endangered by fishing.

Recruitment: Total production of smolts has decreased from a high of 6.08 million in 1988 to 4.40 million in 1991 and is assumed to be 4.88 million in 1992. There are no accurate assessments of wild smolt production but it is estimated at 0.4 million in 1992 which is close to the mean 1985-1992.

Growth: Growth of salmon in 1991 remained at the high level of recent years.

Fishing mortality: Effort in offshore fisheries has decreased, possibly as a result of marketing problems with salmon and fishing restrictions due to the TAC.

Management advice: Progress was made in attempting to assess reared and wild stocks separately in 1992. However, problems were identified with technical aspects of the assessments and thus the assessments could not be used for prediction. The assessment results were useful, however, in indicating that the present level of fishing mortality was too high to safeguard the wild stocks. Recognising that there had been a decrease in the number of smolts released and that an increase in the escapement of wild salmon is necessary, particularly in the Gulf of Bothnia, ACFM recommends that fishing mortality should be as low as possible in 1993 and the catch should certainly not exceed 500,000 fish which corresponds to between 2,250-2,700 t. The range is given because of uncertainties in mean weights.

In order to safeguard wild stocks, it is recommended that:

1. Any TAC set should be expressed in numbers so as to eliminate the effect of the variation of the growth on fishing mortality. A TAC in numbers is less sensitive to over exploitation than a TAC in weight which permits a catch of high numbers of salmon with low average weight.

2. The summer closure in the Bothnian Sea offshore fishery should begin on 1 May and end on 1 September. This measure decreases fishing pressure during the time when spawners enter the Gulf of Bothnia.

3. In the mouths of wild salmon rivers, areas closed to fishing of appropriate sizes should be introduced during the entire season to protect spawners when they enter their home rivers.

4.2 Salmon in the Gulf of Finland (Sub-division 32)

Source of information: Report of the Baltic Salmon and Trout Assessment Working Group, March 1992 (C.M.1992/Assess:10).

Year	1985	1986	1987	1988	1989	1990	1991	1992	Max[3]	Min[3]	Mean[3]
TACs and Landings											
TAC	-	-	-	-	-	-	430	430			
Landings (t)	279	404	353	267	398	568	631[1]	-	631	267	414
Landings ('000 fish)	92	121	141	74	106	117	123[1]	-	141	74	111
Smolts production - Sub-division 32 (in '000)											
Wild[2]	20	20	20	15	15	15	15	15			
Reared 1 yr	67	137	224	160	161	223	298	356[1]			
2 yr	486	407	366	409	267	307	202	144[1]			
Total	573	564	610	584	443	545	515	515[1]	610	443	544
Recruitment to Fishery	153	141	134	155	108	118	110	110[2]	155	108	129

[1]Preliminary data. [2]Assumed. [3]Over period 1985-1991 for landings and 1985-1992 for smolt production.

Landings: The landings have increased considerably since 1989 (Table 4.1 and Figure 4.1). The TAC for 1991 of 430 t was greatly exceeded.

Data and assessment: The assessment was performed by cohort analyses. Catches at age data were derived from tagging data. CPUE data was available for the longline fishery.

Fishing mortality 1991: At the average, high level of recent years.

Recruitment: No major changes in smolt production, under 5% of which is from wild stocks. Recruitment to the fishery is almost totally dependent on the post-smolt survival of reared smolts.

Status of stocks:

Wild: Poor, i.e. not within safe biological limits. The reasons are unknown but probably include pollution and the poor condition of spawning grounds, as in the Main Basin.

Reared: Enough spawners for rearing purposes.

Forecast for 1993:

TAC constraint option: Assuming catch (92) = TAC(92) = 430 t (= 76,000 individuals) and post-smolt survival = average (1980-1989), catch(93) would be 109,000 individuals (= 600 t).

Catches in number have been converted to catches in weight by assuming the average weights at age in 1991.

Management advice: The TAC of 109,000 salmon suggested for 1993, subject to the assumptions outlined, would be suitable for reared stock only. Continued fishing at current levels of fishing mortality will not allow an improvement of the wild stocks. A reduction in effort would help the wild stocks but the extent of any improvement is uncertain due to the factors mentioned under Status of Stocks.

4.3 Sea trout

Catches of sea trout are shown in Table 4.3. Landings increased from 250 t in 1980 to 1,447 t in 1990. In 1991 they were about 200 t lower than in 1990. This increase is mainly due to high stocking rates over the last four years, higher survival rates of post-smolts and reduced exploitation in the Main Basin. Widely migrating sea trout, mainly from Polish and southern Swedish rivers, are taken in the offshore salmon fisheries. Finnish and Swedish sea trout from the Gulf of Bothnia are more local and rarely migrate to the Baltic Main Basin.

Table 1.1 Nominal fish catches in the Baltic from 1973-1991 (in '000 t). Anadromous species, except salmon, not included. (Data as officially reported to ICES).

Year	Species							Total
	Cod	Herring	Sprat	Flatfish	Salmon	Freshwater species	Others	
1973	189	404	213	18	2.7	23	55	905
1974	189	407	242	21	2.9	21	54	937
1975	234	415	201	24	2.9	20	60	957
1976	255	393	195	19	3.1	21	46	932
1977	213	413	211	22	2.4	22	42	925
1978	196	420	132	23	2.0	22	44	839
1979	273	459	78	24	2.3	20	47	903
1980	388	453	57	18	2.4	14	29	961
1981	380	419	47	16	2.4	13	31	908
1982	361	442	45	17	2.2	13	30	910
1983	376	459	31	16	2.4	13	20	917
1984	442	426	52	15	3.7	13	17	969
1985	344	431	69	17	4.0	11	16	892
1986	271	401	75	18	3.5	12	19	800
1987	238	373	91	16	3.8	13	24	759
1988	225	407	86	14	3.2	13	31	779
1989	192	414	89	14	4.2	14	18	745
1990	167	360	92	12	5.6	11	18	666
1991[1]	134	236	76	13	4.4	8	6	477

[1]Preliminary.
Note: Figures for 1980-1986 revised.

Table 1.2 Nominal catch (tonnes) of HERRING in Divisions IIIb,c,d, 1963-1991. (Data as officially reported to ICES.)

Year	Denmark	Finland[5]	German Dem.Rep.	Germany, Fed.Rep.	Poland	Sweden	USSR	Total
1963	14,991	48,632	10,900	16,588	28,370	27,691	78,580[1]	225,752
1964	29,329	34,904	7,600	16,355	19,160	31,297	84,956	223,601
1965	20,058	44,916	11,300	14,971	20,724	31,082[2]	83,265	226,216
1966	22,950	41,141	18,600	18,252	27,743	30,511	92,112	251,309
1967	23,550	42,931	42,900	23,546	32,143	36,900	108,154	310,124
1968	21,516	58,700	39,300	16,367	41,186	53,256	124,627	354,952
1969	18,508	56,252	19,100	15,116	37,085	30,167	118,974	295,202
1970	16,682	51,205	38,000	18,392	46,018	31,757	110,040	312,094
1971	23,087	57,188	41,800	16,509	43,022	32,351	120,728	334,685
1972	16,081	53,758	58,100	10,793	45,343	41,721	118,860	344,656
1973	24,834	67,071	65,605	8,779	51,213	59,546	127,124	404,172
1974	19,509	73,066	70,855	9,446	55,957	60,352	117,896	407,081
1975	18,295	69,581	71,726	10,147	68,533	62,791	113,684	414,757
1976	23,087	75,581	58,077	6,573	63,850	41,841	124,479	393,488
1977	25,467	78,051	62,450	7,660	60,212	52,871	126,000	412,711
1978	26,620	89,792	46,261	7,808	63,850	54,629	130,642	419,602
1979	33,761	83,130	50,241	7,786	79,168	86,078	118,655	458,819
1980	29,350	74,852	59,187	9,873	68,614	92,923	118,074	452,873
1981	28,424	65,389	56,643	9,124	64,005	84,500	110,782	418,867
1982	40,289	73,501	50,868	8,928	76,329	92,675	99,175	441,765
1983	32,657	83,679	51,991	9,273	82,329	86,561	112,370	458,860
1984	32,272	86,545	50,073	8,166	78,326	65,519	105,577	426,478
1985	27,847	88,702	51,607	9,079	85,865	57,554	110,783	431,437
1986	21,598	83,800	53,061	9,382	77,109	39,909	115,665	400,524
1987	23,283	82,522[3]	50,037	6,199	60,616	36,446	113,844	372,947
1988	29,950	92,824[3]	53,539	5,699	60,624	41,828	122,849	407,313
1989	26,654	81,122[3]	54,828	5,777	58,328	65,032	121,784	413,525
1990	16,237	66,078[3]	40,187	5,152	60,919	55,174	116,478	360,225

Year	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Sweden	Russia	Total
1991	23,995	n/a	51,546[3]	16,022	33,270	6,468	45,991	59,176	n/a	236,468[4]

[1]Including Division IIIa.
[2]Large quantity of herring used for industrial purposes is included with "Unsorted and Unidentified Fish".
[3]Includes some by-catch of sprat.
[4]Preliminary.
[5]Figures for 1980-1986 revised.
n/a = not available.

Table 1.3 Nominal catch (tonnes) of SPRAT in Divisions IIIb,c,d, 1963-1991. (Data as officially reported to ICES.)

Year	Denmark	Finland[4]	German Dem.Rep.	Germany, Fed.Rep.	Poland	Sweden	USSR	Total
1963	2,525	1,399	8,000	507	10,693	101	45,820[1]	69,045
1964	3,890	2,111	14,700	1,575	17,431	58	55,753	95,518
1965	1,805	1,637	11,200	518	16,863	46	52,829	84,898
1966	1,816	2,048	21,200	366	13,579	38	52,407	91,454
1967	3,614	1,896	11,100	2,930	12,410	55	40,582	72,587
1968	3,108	-	10,200	1,054	14,741	112	55,050	84,265
1969	1,917	1,118	7,500	377	17,308	134	90,525	118,879
1970	2,948	1,265	8,000	161	20,171	31	120,478	153,054
1971	1,833	994	16,100	113	31,855	69	133,850	184,814
1972	1,602	972	14,000	297	38,861	102	151,460	207,294
1973	4,128	1,854	13,001	1,150	49,835	6,310	136,510	212,788
1974	10,246	1,035	12,506	864	61,969	5,497	149,535	241,652
1975	9,076	2,854	11,840	580	62,445	31	114,608	201,434
1976	13,046	3,778	7,493	449	56,079	713	113,217	194,775
1977	16,933	3,213	17,241	713	50,502	433	121,700	210,735
1978	10,797	2,373	13,710	570	28,574	807	75,529	132,360
1979	8,897	3,125	4,019	489	13,868	2,240	45,727	78,365
1980	4,714	2,137	51	706	16,033	2,388	31,359	57,488
1981	8,415	1,895	78	505	11,205	1,510	23,881	47,489
1982	6,663	1,468	1,086	581	14,188	1,890	18,866	44,742
1983	2,861	828	2,693	550	8,492	1,747	13,725	30,896
1984	3,450	374	2,762	642	10,954	7,807	25,891	51,880
1985	2,417	364	1,950	638	22,156	7,111	34,003	68,639
1986	5,693	705	2,514	392	26,967	2,573	36,484	75,328
1987	8,617	287[2]	1,308	392	34,887	870	44,888	91,249
1988	6,869	495[2]	1,234	254	25,359	7,307	44,181	85,699
1989	9,235	222[2]	1,166	576	20,597	3,453	53,995	89,244
1990	8,858	162[2]	518	905	14,299	7,485	59,737	91,964

Year	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Sweden	Russia	Total
1991	21,781	n/a	99[2]	736	17,996	3,569	23,200	8,328	n/a	75,709[3]

[1]Including Division IIIa.
[2]Some by-catch of sprat included in herring.
[3]Preliminary.
[4]Figures for 1980-1986 revised.
n/a = not available.

Table 1.4 Nominal catch (tonnes) of COD in Divisions IIIb,c,d, 1963-1991. (Data as officially reported to ICES.)

Year	Denmark	Faroe Islands	Finland[4]	German Dem.Rep.	Germany, Fed.Rep.	Poland	Sweden	USSR	Total
1963	35,851		12	7,800	10,077	47,514	22,827	30,550[1]	154,631
1964	34,539		16	5,100	13,105	39,735	16,222	24,494	133,211
1965	35,990		23	5,300	12,682	41,498	15,736	22,420	133,649
1966	37,693		26	6,000	10,534	56,007	16,182	38,269	164,711
1967	39,844		27	12,800	11,173	56,003	17,784	42,975	180,606
1968	45,024		70	18,700	13,573	63,245	18,508	43,611	202,731
1969	45,164		58	21,500	14,849	60,749	16,656	41,582	200,558
1970	43,443		70	17,000	17,621	68,440	13,664	32,248	192,486
1971	47,563		3	9,800	14,333	54,151	12,945	20,906	159,701
1972	60,331		8	11,500	13,814	56,746	13,762	30,140	186,301
1973	66,846		95	11,268	25,081	49,790	16,134	20,083	189,297
1974	58,659		160	9,013	20,101	48,650	14,184	38,131	188,898
1975	63,860		298	14,740	21,483	69,318	15,168	49,289	234,156
1976	77,570		278	8,548	24,096	70,466	22,802	51,516	255,276
1977	74,495		310	10,967	31,560	47,703	18,327	29,680	213,042
1978	50,907		1,446	9,345	16,918	64,113	15,996	37,200	195,925
1979	60,071		2,938	8,997	18,083	79,697	24,003	78,730	272,519
1980	76,015	1,250	2,317	7,406	16,363	123,486	34,089	124,359	388,186
1981	93,155	2,765	3,249	12,938	15,082	120,942	44,300	87,746	380,177
1982	98,230	4,300	3,904	11,368	19,247	92,541	44,807	86,906	361,303
1983	108,862	6,065	4,677	10,521	22,051	76,474	54,876	92,248	375,774
1984	121,297	6,354	5,257	9,886	39,632	93,429	65,788	100,761	442,404
1985	107,614	5,890	3,793	6,593	24,199	63,260	54,723	78,127	344,199
1986	98,081	4,596	2,917	3,179	18,243	43,237	48,804	52,148	271,205
1987	85,544	5,567	2,309	5,114	17,127	32,667	50,186	39,203	237,717
1988	75,019	6,915	2,903	4,634	16,388	33,351	58,027	28,137	225,374
1989	66,235	4,499	1,913	2,147	14,637	31,855	55,919	14,722	191,927
1990	56,702	3,558	1,667	1,630	7,225	28,730	54,473	13,461	167,446

Year	Denmark	Estonia	Faroe Islands	Finland	Germany	Latvia	Lithuania	Poland	Sweden	Russia	Total
1991	50,640	n/a	2,992	1,662	8,637	2,627	1,849	25,748	39,552	n/a	133,707[3]

[1]Including Division IIIa.
[2]Includes catches from United Kingdom (England & Wales) of 2,901 t.
[3]Preliminary.
[4]Figures for 1980-1986 revised.
n/a = not available.

Table 1.5 Nominal catch (tonnes) of FLATFISH in Divisions IIIb,c,d, 1963-1991. (Data as officially reported to ICES.)

Year	Denmark	Finland[4]	German Dem.Rep.	Germany, Fed.Rep.	Poland	Sweden	USSR	Total
1963	9,888	-	3,390	794	2,794	1,026	1,460[1]	19,862
1964	9,592	-	4,600	905	1,582	1,147	4,420	22,246
1965	8,877	-	2,300	899	2,418	1,140	5,471	21,105
1966	7,590	-	2,900	647	3,817	1,113	5,328	21,395
1967	8,773	-	3,400	786	2,675	1,077	4,259	20,970
1968	9,047	-	3,600	769	4,048	1,047	4,653	23,164
1969	8,693	-	2,800	681	3,545	953	4,167	20,839
1970	7,937	-	2,200	606	3,962	464	3,731	18,900
1971	7,212	-	2,500	553	4,093	415	4,088	18,861
1972	6,817	-	3,200	542	4,940	412	3,950	19,861
1973	6,181	-	3,419	655	4,278	724	2,550	17,807
1974	9,686	55[2]	2,390	628	4,668	653	2,515	20,595
1975	8,257	100	2,172	937	5,139	658	6,455	23,718
1976	7,572	194	2,801	836	4,394	582	3,018	19,397
1977	7,239	203	3,378	960	4,879	484	4,754	21,897
1978	9,184	390	4,034	1,106	5,418	396	2,500	23,028
1979	10,376	399	4,396	665	5,137	450	2,670	24,093
1980	8,276	52	3,286	460	3,429	427	2,305	18,235
1981	6,674	78	3,031	704	2,958	434	2,323	16,202
1982	5,818	50	3,608	543	4,214	250	2,596	17,079
1983	6,000	39	3,957	751	2,809	217	2,371	16,144
1984	5,165	43	3,173	662	3,865	176	1,859	14,943
1985	6,506	37	4,290	542	3,533	170	1,528	16,606
1986	6,808	52	3,480	494	5,044	250	1,438	17,566
1987	5,734	58	2,457	757	4,468	273	2,194	15,941
1988	5,092	69	3,227	759	3,030	281	1,605	14,063
1989	4,597	70	3,822	644	2,946	245	1,723	14,047
1990	5,682	59	1,722	820	2,253	257	1,427	12,220

Year	Denmark	Estonia	Finland	Germany	Latvia	Poland	Sweden	Russia	Total
1991	5,583	n/a	76	3,055	445	4,009	224	n/a	13,392[3]

[1]Including Division IIIa.
[2]Excluding subsistence fisheries.
[3]Preliminary.
[4]Figures for 1980-1986 revised.
n/a = not available.

Table 2.1.1.1 HERRING, catch in tonnes in Sub-divisions 22 and 24, as reported to the Working Group.

Year	Denmark	German Dem. Rep.	Germany, Fed. Rep.	Poland	Sweden	Total
1978	12,383	40,678	6,849	6,335	6,550	72,795
1979	9,659	46,749	6,672	10,276	10,151	85,549
1980	7,221	58,501	9,323	13,605	12,010	100,337
1981	8,098	54,501	8,300	13,366	7,660	90,159
1982	4,583	50,739	8,300	16,868	6,536	107,519
1983	4,583	50,739	8,300	16,868	6,536	108,103
1984	23,762	49,022	7,085	14,250	7,689	101,808
1985	15,942	46,749	7,888	16,721	11,373	101,870
1986	14,046	51,180	8,850	12,344	5,946	92,066
1987	32,462	47,267	5,806	7,997	7,814	101,346
1988	33,075	49,488	5,188	6,590	4,586	98,927
1989	21,730	51,207	5,166	8,524	6,327	92,954
1990	13,559	40,193	4,981	9,662	8,051	76,446
1991	25,194	14,737[a)]	-[a)]	5,576	19,331	64,838

[a)] FRG and GDR combined.

Table 2.1.1.2 HERRING, catch in tonnes in Sub-division 23, as reported to the Working Group.

Year	Denmark	Sweden	Total
1978	4,090	1,000	5,091
1979	8,817	1,860	10,677
1980	6,313	2,400	8,713
1981	8,098	2,000	10,098
1982	7,139	2,460	9,599
1983	4,583	2,416	6,999
1984	6,935	800	7,735
1985	6,849	1,113	7,962
1986	1,490	1,365	2,855
1987	754	172	926
1988	102	117	219
1989	1,528	102	1,630
1990	1,140	83	1,223
1991	1,726	2,268	3,994

Table 2.1.1.3 HERRING, catch in tonnes in Division IIIa of both spring spawners and North Sea autumn spawners (data from Herring Assessment Working Group for the Area South of 62°N).

Country	1978	1979	1980	1981	1982	1983	1984
				Skagerrak			
Denmark	7,753	8,729	22,811	45,525	43,328	54,102	64,421
Faroe Islands	1,041	817	526	900	715	1,980	891
Germany,Fed.Rep.	28	181	-	199	43	40	-
Norway	4,131	4,719	4,145	7,230	11,700	3,334	1,494
Sweden	11,551	8,140	10,701	30,274	24,859	35,176	59,195
Sub-total	25,504	22,586	38,183	83,876	80,645	94,632	126,201
				Kattegat			
Denmark	29,241	21,337	25,380	48,922	38,609	62,901	71,359
Sweden	35,193	25,272	18,260	38,871	38,892	40,463	35,027
Sub-total	64,434	46,609	43,640	87,833	77,501	103,364	106,386
Division IIIa total	89,938	69,195	81,823	171,709	158,146	197,996	232,587

Country	1985	1986	1987	1988	1989	1990	1991
				Skagerrak			
Denmark	88,192	94,014	105,017	144,421	47,393	62,349	58,658
Faroe Islands	455	520	-	-	-	-	-
Germany, Fed.Rep.	-	11	-	-	-	-	-
Norway	4,425	1,537	1,209	5,674	1,605	5,598	8,127
Sweden	40,349	42,996	51,184	57,159	47,900	56,503	54,679
Sub-total	133,421	139,078	157,410	207,254	96,898	124,450	121,464
				Kattegat			
Denmark	69,235	37,419	46,603	76,175	57,130	32,224	29,653
Sweden	39,829	35,852	29,844	49,653	37,869	45,288	36,732
Sub-total	109,064	73,271	76,447	125,828	94,999	77,512	66,385
Division IIIa total	242,485	212,349	233,857	333,082	191,897	201,962	187,849

Table 2.1.2 Catches of Herring, Sub-divisions 25-29 (including Gulf of Riga) and 32. Catches as reported to the Working Group (t).

Year	Denmark	Germany FR	GDR	Finland	Poland	Sweden	USSR	Total
1977	11,895	-	25,213	33,669	57,229	48,701	136,999	313,709
1978	13,897	58	5,583	38,288	61,347	55,370	130,642	305,185
1979	19,402	-	3,492	40,417	70,370	71,317	118,113	323,111
1980	10,576	-	969	43,973	58,307	72,509	118,048	304,378
1981	14,093	974	2,144	42,547	51,154	72,890	110,196	293,998
1982	15,298	1,320	1,006	47,478	63,003	83,790	99,175	311,070
1983	10,483	974	1,252	59,073	67,055	78,570	112,370	329,777
1984	6,462	31	1,050	54,138	65,775	56,869	105,577	289,902
1985	7,550	37	1,661	54,181	72,810	42,466	110,783	289,488
1986	3,905	-	1,881	49,356	67,841	29,694	115,665	268,342
1987	4,158	-	2,613	50,417	55,493	25,353	113,844	251,878
1988	10,794	-	3,968	58,143	57,156	33,398	122,849	286,308
1989	7,313	-	3,620	49,999	51,754	55,396	121,784	289,866
1990	4,596	-	18	26,898	52,261	44,199	116,193	244,165
1991	6,789	-	-	17,533	47,057	36,530	104,343	212,252

Table 2.1.3 Herring catches in the Baltic Sea by country and sub-division, 1990 and 1991 (t). By-catch of sprat in directed herring fisheries excluded and by-catch of herring in directed sprat fisheries included. (Data as reported to the Working Group.)

Year and Country	Total catch	Sub-division											
		22	23	24	25	26	27	28	29S	29N	30	31	32
1990													
Denmark	19,295	9,346	1,140	4,213	4,596								
Finland	64,376						474	1,796		18,539	29,875	7,603	6,089
German Dem.Rep.	40,211	424		39,769	18								
Germany, Fed.Rep.	4,981	4,978		3									
Poland	61,923			9662	38,575	13,686							
Sweden	55,095		83	8,051	16,654	184	22,852	3,362	435	712	2,467	295	
USSR	116,193				6,439	19,331	7,265	37,381	23,857				21,920
Total	362,074	14,748	1,223	61,698	66,282	33,201	30,591	42,539	24,292	19,251	32,342	7,898	28,009
Year and Country	Total catch	Sub-division											
		22	23	24	25	26	27	28	29S	29	30	31	32
1991[1]													
Denmark	33,709	14,921	1,726	10,273	6,789								
Finland	51,246						157	707		11,375	26,671	7,042	5,294
Germany[2]	14,737			14,737									
Poland	52,633			5,576	34,498	12,559							
Sweden	61,554		2,268	19,331	13,096	29	21,914	976		515	3,044	381	
Estonia	32,683					122		11,692	12,141				8,728
Latvia	33,270				1,973	1,238	2,706	23,389	3,964				
Lithuania	6,456					4,764		1,692[3]					
Russia	31,934					9,374		4,162[3]	2,882				15,516
Total	318,222	14,921	3,994	49,917	56,356	28,086	24,777	42,618	18,987	11,890	29,715	7,423	29,538
ex-USSR[4]	104,343				1,973	15,498	2,706	40,935	18,987				24,244

[1]Preliminary.
[2]Mainly in 24.
[3]Lithuanian and Russian catches from the Swedish fishery zone are allocated to Sub-division 24.
[4]Is the sum of catches by Estonia, Latvia, Lithuania and Russia.

Table 2.2.1 Sprat catches in the Baltic Sea by country and sub-division 1990 and 1991 (t). By-catch of herring in directed sprat fisheries excluded and by-catch of sprat in directed herring fisheries included. (Data as reported to the Working Group.)

SPRAT												
Year and country	Total catch	Sub-division										
		22	23	24	25	26	27	28	29	30	31	32
1990												
Denmark	801	698		103								
Finland	2,692							3	1,680	16		993
German Dem.Rep.	518			518								
Germany,Fed.Rep.	905	905										
Poland	13,296			466	6,999	5,831						
Sweden	7,478			2,099	1,950	2,652	358	419				
USSR	60,022					17,843		28,596	8,105			5,478
Total	85,712	1,603	0	3,186	8,949	26,326	358	29,018	9,785	16	0	6,471
Year and country	Total catch	Sub-division										
		22	23	24	25	26	27	28	29	30	31	32
1991[1]												
Denmark	9,994	2,554		7,440								
Finland	1,642								1,236			406
Germany	706	625		62	19							
Poland	22,501			201	10,287	12,013						
Sweden	8,666			1,463	3,191	1,047	832	2,133				
Estonia	17,893					504		8,487	5,132			3,770
Latvia	17,672					5,643		12,029				
Lithuania	3,570					3,042		528				
Russia	20,542					6,593		6,165	3,157			4,627
Total	103,186	3,179	0	9,166	13,497	28,842	832	29,342	9,525	0	0	8,803
ex-USSR[2]	59,677					15,777		27,209	8,289			8,397

[1]Preliminary.
[2]In the sum of catches by Estonia, Latvia, Lithuania and Russia.

Table 2.2.2 SPRAT catches in tonnes in Sub-divisions 22-32, as reported to the Working Group.

Year	Denmark	Finland	German Dem. Rep.	Germany Fed. Rep.	Poland	Sweden	USSR	Total
1977	7,167	6,702	17,241	766	38,764	428	109,721	180,792
1978	10,815	6,052	13,710	784	24,692	800	75,521	132,382
1979	5,549	7,125	4,018	691	12,395	2,226	45,062	77,066
1980	4,738	6,191	141	541	12,735	2,834	31,359	58,089
1981	8,359	5,952	78	564	8,891	1,550	23,881	49,275
1982	6,662	4,537	1,022	632	14,209	2,750	18,866	48,678
1983	6,202	3,375	2,692	619	7,088	3,639	13,725	37,340
1984	3,179	2,400	2,761	663	9,254	8,397	25,891	52,545
1985	4,148	2,911	1,950	879	18,483	7,111	34,003	69,485
1986	5,954	3,235	2,514	473	23,653	3,469	36,484	75,782
1987	2,593	2,817	1,307	1,125	32,003	3,453	44,888	88,186
1988	1,972	3,025	1,234	330	22,236	7,345	44,181	80,323
1989	5,239	2,752	1,166	565	18,648	3,450	53,996	85,816
1990	801	2,692	518	905	13,296	7,478	60,022	85,712
1991	9,994	1,642	-	706	22,501	8,666	59,677[1]	103,186

[1]Sum of catches by Estonia, Latvia, Lithuania and Russia.

Table 3.1.1 Total catch (t) of COD by countries in Sub-divisions 22-32 as provided by Working Group members.

Year	Denmark	Estonia	Finland	German Dem.Rep.	Germany, Fed.Rep.	Latvia	Lithuania	Poland	Russia	Sweden	USSR	Faroe Islands	Total
1965	35,313	-	23	10,680	15,713	-	-	41,498	-	21,705	22,420	-	147,352
1966	37,070	-	26	10,589	12,831	-	-	56,007	-	22,525	38,270	-	177,318
1967	39,105	-	27	21,027	12,941	-	-	56,003	-	23,363	42,980	-	196,446
1968	44,109	-	70	24,478	16,833	-	-	63,245	-	24,008	43,610	-	216,353
1969	44,061	-	58	25,979	17,432	-	-	60,749	-	22,301	41,580	-	212,160
1970	42,392	-	70	18,099	19,444	-	-	68,440	-	17,756	32,250	-	198,451
1971	46,831	-	53	10,977	16,248	-	-	54,151	-	15,670	20,910	-	164,840
1972	59,717	-	76	13,720	15,516	-	-	57,093	-	16,471	30,140	-	192,733
1973	66,050	-	95	14,408	28,706	-	-	49,790	-	18,389	20,083	-	197,521
1974	57,810	-	160	10,976	22,224	-	-	48,650	-	16,435	38,131	-	194,386
1975	62,524	-	298	14,742	24,880	-	-	69,318	-	17,965	49,289	-	239,016
1976	77,570	-	287	8,552	26,626	-	-	70,466	-	20,188	49,047	-	252,736
1977	73,505	-	310	10,967	30,806	-	-	47,702	-	18,127	29,680	-	211,097
1978	50,611	-	1,437	9,345	15,122	-	-	64,113	-	16,793	37,200	-	194,621
1979	59,704	-	2,938	8,997	19,375	-	-	79,754	-	23,093	75,034	3,850	272,745
1980	75,529	-	5,962	7,406	18,407	-	-	123,486	-	33,201	124,350	1,250	389,591
1981	92,648	-	5,681	12,936	18,281	-	-	120,901	-	44,330	87,746	2,765	385,288
1982	91,927	-	8,126	11,368	21,860	-	-	92,541	-	46,548	86,906	4,300	363,576
1983	107,624	-	8,927	10,521	25,154	-	-	76,474	-	53,740	92,248	6,065	380,753
1984	113,701	-	9,358	9,886	42,031	-	-	93,429	-	65,927	100,761	6,334	441,427
1985	107,627	-	7,224	6,593	31,798	-	-	63,260	-	54,723	78,127	5,890	355,242
1986	98,464	-	5,633	3,179	22,422	-	-	43,236	-	49,572	52,148	4,596	279,250
1987	83,844	-	3,007	5,114	18,816	-	-	32,667	-	47,429	39,203	5,567	235,647
1988	74,742	-	2,904	4,634	18,295	-	-	33,351	-	54,968	28,137	6,915	223,946
1989	65,935	-	2,254	2,147	15,342	-	-	36,855	-	55,919	14,722	4,520	197,694
1990	56,700	-	1,731	1,629[2]	7,745	-	-	32,028	-	54,474	13,461	3,558	171,326
1991[1]	50,606	1,810	1,682	-	9,443[3]	2,627	1,865	25,748	3,299	39,490	-	2,611	139,182

[1]Provisional data.
[2]Includes landings from October-December 1991 in former GDR.
[3]Includes former GDR.

Table 3.1.2 Total catch (t) of COD in Sub-divisions 22-32 by sub-division and country as provided by Working Group members.

	Denmark				Faroe Islands	Finland				
Year	22	23	24	25-28	25-28	25-28	29	30[2]	31	32
1972	17,717	-	7,928	34,072	-	-	-	76	-	-
1973	21,400	-	9,195	35,455	-	-	-	95	-	-
1974	18,300	-	7,482	32,028	-	-	-	160	-	-
1975	15,981	-	7,500	39,043	-	-	270	8	-	20
1976	19,764	712	9,682	47,412	-	-	81	24	-	182
1977	17,726	1,166	10,213	44,400	-	-	85	26	-	199
1978	12,641	1,177	6,527	30,266	-	-	249	323	6	859
1979	16,093	2,029	7,232	34,350	3,850	-	707	518	16	1,697
1980	16,033	2,425	7,367	49,704	1,250	-	2,163	880	45	2,874
1981	15,502	1,473	7,152	68,521	2,765	-	3,036	684	11	1,950
1982	11,669	1,638	7,469	71,151	4,300	-	4,557	1,368	42	2,159
1983	14,100	1,257	7,861	84,406	6,065	-	5,322	2,013	36	1,556
1984	13,867	1,703	8,042	90,089	6,334	-	5,433	2,741	7	1,177
1985	15,563	1,076	7,461	83,527	5,890	-	4,646	1,706	7	865
1986	8,914	748	7,281	81,521	4,596	-	3,571	1,306	2	754
1987	7,990	1,503	5,470	68,881	5,567	-	1,389	1,143	2	473
1988	5,680	1,121	7,505	60,436	6,915	614	998	1,257	1	34
1989	3,422	636	4,637	57,240	4,520	392	603	1,097	1	161
1990	3,235	722	5,349	47,394	3,558	833	187	685	-	26
1991[1]	5,536	1,431	3,847	39,792	2,611	1,014	233	415	-	20

	Federal Republic of Germany						German Democratic Republic						
Year	22	24	25	26	27	28	22	24	25	26	27	28	29
972	10,531	1,782	3,193	10	-	-	4,560	5,105	1,950	2,072	-	33	-
973	12,833	900	9,100	5,200	-	673	4,004	4,370	4,065	1,912	-	57	-
1974	9,998	395	5,242	5,769	-	820	3,028	5,431	1,469	996	-	52	-
1975	12,415	497	8,809	1,975	-	1,184	3,471	2,571	3,320	5,250	50	60	20
1976	12,312	581	7,526	4,490	-	1,717	1,292	3,290	800	3,150	10	10	-
1977	10,807	879	3,649	13,803	-	1,668	977	2,471	324	5,996	73	1,119	7
1978	9,972	880	2,178	1,793	-	299	1,619	5,466	414	1,714	1	131	-
1979	8,910	688	7,616	2,149	-	12	1,024	6,570	54	1,301	1	46	1
1980	5,968	689	10,985	673	-	92	880	4,700	5	1,818	-	3	-
1981	9,095	2,165	7,021	-	-	-	1,743	9,916	2	1,275	-	-	-
1982	7,394	666	13,069	662	-	69	1,908	8,707	-	728	-	25	-
1983	8,937	323	14,179	1,599	-	116	1,441	7,656	-	1,402	-	22	-
1984	11,340	208	21,948	7,926	-	609	1,851	6,242	-	1,793	-	-	-
1985	4,992	531	12,733	11,572	-	1,970	1,508	3,870	-	1,215	-	-	-
1986	2,236	666	10,545	8,399	-	576	825	2,173	1	180	-	-	-
1987	3,611	645	7,757	5,009	-	1,794	504	4,392	1	217	-	-	-
1988	3,670	547	11,321	2,577	-	180	330	4,302	1	1	-	-	-
1989	2,099	399	12,201	640	-	3	217	1,927	3	-	-	-	-
1990	1,997	1,057	3,232	1,427	-	32	129[5]	1,500[5]	+	-	-	-	-
1991[1]	1,648	1,231	5,419	1,114	8	23	-	-	-	-	-	-	-

(cont'd)

Table 3.1.2 Cont'd

	Poland		Sweden								
Year	25[4]	26	23	24	25	26	27[3]	28	29	30	31
1972	24,926	32,167	-	1,277	13,842	-	876	440	-	36	-
1973	29,010	20,780	-	1,655	15,224	-	971	485	-	54	-
1974	25,221	23,429	-	1,937	11,950	-	1,682	825	-	41	-
1975	35,373	33,945	-	1,932	12,511	-	2,052	1,367	103	-	-
1976	26,082	44,384	-	1,800	14,109	-	1,979	2,180	115	5	-
1977	18,172	29,530	550	1,516	11,775	-	2,584	1,560	120	22	-
1978	31,161	32,952	600	1,730	9,017	26	3,207	1,740	417	55	1
1979	40,146	39,608	700	1,800	13,628	50	3,458	2,665	641	145	6
1980	50,832	72,654	1,300	2,610	18,694	88	6,014	3,185	790	516	4
1981	50,698	70,203	900	5,700	24,600	260	7,200	4,450	712	500	8
1982	41,830	50,711	140	7,933	20,429	2,279	4,109	9,264	687	1,669	38
1983	35,153	41,321	120	6,910	27,630	1,810	6,490	9,200	1,260	320	-
1984	35,261	58,168	228	6,014	33,493	4,413	8,223	11,947	1,338	271	-
1985	19,332	43,928	263	4,895	22,737	8,170	7,068	9,523	1,115	929	23
1986	18,297	24,939	227	3,622	19,214	7,764	7,554	9,606	1,233	298	54
1987	12,254	20,413	137	4,314	15,173	7,833	5,708	7,507	903	5,817	37
1988	14,910	18,441	155	5,849	20,893	7,453	6,674	7,946	535	5,456	7
1989	20,819	16,036	192	4,987	28,068	6,742	7,703	6,829	440	927	31
1990	14,528	17,500	120	3,671	23,311	13,512	6,702	6,525	252	353	28
1991[1]	9,853	15,895	232	2,768	18,413	7,034	5,096	5,548	180	207	12

	USSR						
Year	25	26	27	28	29	32	Total
1972	-	23,951	-	6,189	-	-	192,733
1973	-	8,768	1	11,250	50	14	197,521
1974	811	18,633	-	17,677	1,010	-	194,386
1975	946	17,884	3	28,677	1,735	44	239,016
1976	8,855	25,302	126	14,645	106	13	252,736
1977	390	17,880	4	11,304	91	11	211,097
1978	12	18,010	78	18,623	166	311	194,621
1979	13	30,776	-	39,875	1,575	2,795	272,745
1980	7	45,734	-	59,892	4,575	14,142	389,591
1981	2	44,254	-	32,195	3,733	7,562	385,288
1982	5	33,221	-	40,876	3,308	9,496	363,576
1983	-	33,600	-	39,464	6,095	13,089	380,753
1984	-	39,871	-	43,802	6,185	10,903	441,447
1985	-	32,096	-	27,137	8,822	10,072	355,242
1986	-	22,818	-	21,840	3,289	4,201	279,250
1987	-	22,652	-	11,457	1,654	3,440	235,647
1988	-	15,928	-	10,868	172	1,169	223,946
1989	-	8,440	-	6,058	121	103	197,694
1990	-	10,020	-	3,420	3	18	171,310
1991[1]	-	-	-	-	-	-	139,182

Year	Estonia		Latvia			Lithuania		Russia		
	26	28	26	28	29	26	28	26	28	32
1991[1]	1,537	273	1,190	1,432	5	1,854	11	3,034	264	1

[1]Provisional.[2]Finland: 1972-1974, sub-divisions combined.[3]Sweden: 1972-1974, sub divisions combined. [4]Poland: some catches from Division 24 included. [5]Includes landings from October-December 1990.

Table 3.1.3 Total catch (t) of COD in Sub-divisions 22, 23, and 24 as provided by Working Group members.

	Denmark	German Dem.Rep.	Germany, Fed.Rep.	Sweden	Total			
Year	22 + 24	22 + 24	22 + 24	24	22	23	24	22 + 24
1965	19,457	9,705	13,350	2,182	27,867	-	17,007	44,874
1966	20,500	8,393	11,448	2,110	27,864	-	14,587	42,451
1967	19,181	10,007	12,884	1,996	28,875	-	15,193	44,068
1968	22,593	12,360	14,815	2,113	32,911	-	18,970	51,881
1969	20,602	7,519	12,717	1,413	29,082	-	13,169	42,251
1970	20,085	7,996	14,589	1,289	31,363	-	12,596	43,959
1971	23,715	8,007	13,482	1,419	32,119	-	14,504	46,623
1972	25,645	9,665	12,313	1,277	32,808	-	16,092	48,900
1973	30,595	8,374	13,733	1,655	38,237	-	16,120	54,357
1974	25,782	8,459	10,393	1,937	31,326	-	15,245	46,571
1975	23,481	6,042	12,912	1,932	31,867	-	12,500	44,367
1976	29,446	4,582	12,893	1,800	33,368	712	15,353	48,721
1977	27,939	3,448	11,686	1,516	29,510	1,716	15,079	44,589
1978	19,168	7,085	10,852	1,730	24,232	1,777	14,603	38,835
1979	23,325	7,594	9,598	1,800	26,027	2,729	16,290	42,317
1980	23,400	5,580	6,652	2,610	22,881	3,725	15,366	38,247
1981	22,654	11,659	11,260	5,700	26,340	2,373	24,933	51,273
1982	19,138	10,615	8,060	7,933	20,971	1,778	24,775	45,746
1983	21,961	9,097	9,260	6,910	24,478	1,377	22,750	47,228
1984	21,909	8,093	11,548	6,014	27,058	1,931	20,506	47,564
1985	23,024	5,378	5,523	4,895	22,063	1,339	16,757	38,820
1986	16,195	2,998	2,902	3,622	11,975	975	13,742	25,717
1987	13,460	4,896	4,256	4,314	12,105	1,640	14,281	26,926
1988	13,185	4,632	4,217	5,849	9,680	1,276	18,203	27,883
1989	8,059	2,144	2,498	4,987	5,738	828	11,637	17,688
1990	8,584	1,629[2]	3,054	3,671	5,361	842	11,577	16,938
1991[1]	9,383		2,879	2,768	7,184	1,663	7,846	15,030

[1]Provisional data.
[2]Includes landings from October-December 1990 in the former GDR.

Table 3.1.4 Total catch (t) of COD in Sub-divisions 25-32 as provided by Working Group members.

Year	Denmark	Estonia	Finland	German Dem.Rep.	Germany Fed.Rep.	Latvia	Lithuania	Poland	Russia	Sweden	USSR	Faroe Islands	Total
1965	15,856	-	23	975	2,183	-	-	41,498	-	19,523	22,420	-	102,478
1966	16,570	-	26	2,196	1,383	-	-	56,007	-	20,415	38,270	-	134,867
1967	19,924	-	27	11,020	1,057	-	-	56,003	-	21,367	42,980	-	152,378
1968	21,516	-	70	12,118	2,018	-	-	63,245	-	21,895	43,610	-	164,472
1969	23,459	-	58	18,460	4,715	-	-	60,749	-	20,888	41,580	-	169,909
1970	22,307	-	70	10,103	4,855	-	-	68,440	-	16,467	32,250	-	154,492
1971	23,116	-	53	2,970	2,766	-	-	54,151	-	14,251	20,910	-	118,217
1972	34,072	-	76	4,055	3,203	-	-	57,093	-	15,194	30,140	-	143,833
1973	35,455	-	95	6,034	14,973	-	-	49,790	-	16,734	20,083	-	143,164
1974	32,028	-	160	2,517	11,831	-	-	48,650	-	14,498	38,131	-	147,815
1975	39,043	-	298	8,700	11,968	-	-	69,318	-	16,033	49,289	-	194,649
1976	47,412	-	287	3,970	13,733	-	-	70,466	-	18,388	49,047	-	203,303
1977	44,400	-	310	7,519	19,120	-	-	47,702	-	16,061	29,680	-	164,792
1978	30,266	-	1,437	2,260	4,270	-	-	69,319	-	14,463	37,200	-	154,009
1979	34,350	-	2,938	1,403	9,777	-	-	79,754	-	20,593	75,034	3,850	227,699
1980	49,704	-	5,962	1,826	11,750	-	-	123,486	-	29,291	124,350	1,250	347,619
1981	68,521	-	5,681	1,277	7,021	-	-	120,901	-	37,730	87,746	2,765	331,642
1982	71,151	-	8,126	753	13,800	-	-	92,541	-	38,475	86,906	4,300	316,052
1983	84,406	-	8,927	1,424	15,894	-	-	76,474	-	46,710	92,248	6,065	332,148
1984	90,089	-	9,358	1,793	29,577	-	-	93,429	-	59,685	100,761	6,354	391,046
1985	83,527	-	7,224	1,215	26,275	-	-	63,260	-	49,565	78,127	5,890	315,083
1986	81,521	-	5,633	181	19,520	-	-	43,236	-	45,723	52,148	4,596	252,558
1987	68,881	-	3,007	218	14,560	-	-	32,667	-	42,978	39,203	5,567	207,081
1988	60,436	-	2,904	2	14,078	-	-	33,351	-	48,964	28,137	6,915	194,787
1989	57,240	-	2,254	3	12,844	-	-	36,855	-	50,740	14,722	4,520	179,178
1990	47,394	-	1,731	+	4,691	-	-	32,028	-	50,683	13,461	3,558	153,546
1991[1]	39,792	1,810	1,682	-	6,564	2,627	1,865	25,748	3,299	36,490	-	2,611	122,488

[1]Provisional data.

Table 3.2.1 Total catch (in tonnes) of flounder in the Baltic, by sub-divisions and country. (There are some gaps in the information. The "Total", therefore, is preliminary.)

Year	Denmark[1]			Finland			German Dem. Rep.			Germany, Fed. Rep.		Poland		Sweden[3]				
	Sub-divisions																	
	22	23	24(25)	29	30	32	22	24	25(+26)	22	24(+25)	25(+24)	26	24	25	27	28	29
1973	1,983	-	386	-	-	-	181	1,624	1,516		4	1,580	2,070	-	502	-	-	-
1974	2,097	-	2,578	-	-	-	165	1,482	654	349	3	1,635	2,473	-	470	-	-	-
1975	1,992	-	1,678	113	22	47	163	1,469	406	304	1	1,871	2,585	-	400	-	-	-
1976	2,038	-	482	118	23	59	174	1,556	901	469	2	1,549	2,289	-	400	-	-	-
1977	1,974	-	389	115	32	56	555	2,708	1,096	392	4	2,071	2,089	-	416	-	-	-
1978	2,965	-	415	174	61	155	348	2,572	-	393	1	996	2,106	-	346	-	-	-
1979	2,451	-	405	192	54	153	189	2,509	-	477	3	1,230	1,860	-	315	-	-	-
1980	2,185	-	286	194	69	165	138	2,775	-	259	1	1,613	1,380	16	46	20	181	32
1981	1,964	-	548	227	56	135	271	2,595	-	212	1	1,151	1,541	21	30	21	194	34
1982	1,563	104	257	219	58	144	263	3,202	-	351	1	2,484	1,623	22	33	65	16	3
1983	1,714	115	450	181	67	120	280	3,572	-	248	1	1,828	905	72	108	212	52	9
1984	1,733	85	306	174	108	135	349	2,719	-	418	1	2,471	1,288	18	27	53	13	2
1985	1,561	130	649	157	97	137	236	3,253	-	371	4	2,063	1,302	16	24	47	12	2
1986	1,525	65	1,558	199	128	181	127	2,838	-	199	10	3,030	1,784	20	31	60	15	3
1987	1,208	122	1,007	159	106	143	71	2,096	-	125	11	2,530	1,745	17	26	51	13	2
1988	1,162	125	990	177	118	159	92	2,981	-	114	5	1,728	1,292	23	35	68	17	3
1989	1,321	83	1,062	175	122	163	126	3,616	-	133	2	1,896	1,089	22	34	66	16	3
1990	941	-	1,389	182	125	167	52[2]	1,622[2]	-	122	10	1,586	599	-	120	-	-	-
1991	925	-	1,497	238	83	169				183 246[4]	1,814[4]	2,008	1,926	24	31	88	20	-

(cont'd)

Table 3.2.1(cont'd)

Year	USSR				Estonia			Latvia		Lithuania	Russia	Total										
	Sub-divisions																					
	26	28	29	32	26	28	29	26	28	26	26	22	23[5]	24	25	26	27	28	29	30	32	22-32
1973	-	2,610	-	-								2,513	-	2,014	3,598	2,070	-	2,610	-	-	-	12,805
1974	-	2,510	-	-								2,566	-	4,063	2,759	2,473	-	2,510	-	-	-	14,371
1975	-	6,455	-	-								2,624	-	3,148	2,677	2,585	-	6,455	113	22	-	17,624
1976	471	1,779	409	359								2,604	-	2,040	2,850	2,760	-	1,779	527	23	418	13,001
1977	210	1,081	321	414								2,922	-	3,101	3,583	2,299	-	1,081	436	32	470	13,924
1978	288	1,290	334	395								3,790	-	2,988	1,342	2,394	-	1,290	508	61	550	12,923
1979	158	1,170	330	1,012								2,899	-	2,917	1,545	2,018	-	1,170	522	54	1,165	12,290
1980	93	798	334	1,080								2,535	-	3,078	1,659	1,473	20	979	560	69	1,245	11,618
1981	58	742	445	1,078								2,586	-	3,165	1,181	1,599	21	936	706	56	1,213	11,463
1982	195	665	615	1,121								2,074	104	3,482	2,517	1,818	65	681	837	58	1,265	12,901
1983	209	551	497	1,114								2,412	115	4,095	1,936	1,114	212	603	687	67	1,234	12,475
1984	145	202	286	1,226								2,453	85	3,044	2,498	1,433	53	215	462	108	1,361	11,712
1985	268	189	265	806								1,996	130	3,922	2,087	1,570	47	201	424	97	943	11,417
1986	442	159	281	556								1,777	65	4,399	3,061	2,226	60	174	483	128	737	13,110
1987	1,315	203	279	397								1,393	122	3,131	2,556	3,060	57	216	440	106	540	11,615
1988	578	439	257	331								1,387	125	3,999	1,763	1,870	68	456	437	118	490	10,713
1989	783	512	214	214								1,569	83	4,702	1,930	1,872	66	528	392	122	377	11,641
1990	752	390	144	141								1,176	-	3,021	1,706	1,351	-	390	326	125	308	8,403
1991					49	1	135	123	322	125	216	1,171	-	3,335	2,039	2,439	88	343	373	83	169	10,040

[1]For the years 1970-1981 catches in Sub-division 23 are included in Sub-division 22.
[2]Includes landings from October-December.
[3]For the years 1973-1979 and 1990 catches in Sub-divisions 24-29 are included in Sub-division 25.
[4]Includes the former German Democratic Republic.
[5]For the years 1973-1981 catches in Sub-division 23 are included in Sub-division 22.

Table 3.2.2 Total catch (in tonnes) of plaice in the Baltic by Sub-division and country. (There are some gaps in the information. The "Total", therefore, is preliminary.)

Year	Denmark		German[1] Dem. Rep.		Federal Rep. of Germany		Poland		Sweden[2]				Total					
	Sub-division																	
	22	24(+25)	22	24	22	24(+25)	25(+24)	26	24	25	27	28	22	24	25	26	27	28 22-28
1970	3,757	494	-	-	202	16	-	-	149	-	-	-	3,959	659	-	-	-	- 4,618
1971	3,435	314	-	-	160	2	-	-	107	-	-	-	3,595	423	-	-	-	- 4,018
1972	2,726	290	-	-	154	2	-	-	78	-	-	-	2,880	370	-	-	-	- 3,250
1973	2,399	203	2	44	163	1	174	30	75	-	-	-	2,564	323	174	-	-	- 3,091
1974	3,440	126	36	10	166	2	114	86	60	-	-	-	3,642	198	114	-	-	- 4,040
1975	2,814	184	11	67	302	1	158	142	45	-	-	-	3,127	297	158	-	-	- 3,724
1976	3,328	178	11	82	302	3	164	76	44	-	-	-	3,641	307	164	-	-	- 4,188
1977	3,452	221	5	36	348	2	265	26	41	-	-	-	3,805	300	265	-	-	- 4,396
1978	3,848	681	33	1,198	346	3	633	290	32	-	-	-	4,227	1,914	633	-	-	- 7,064
1979	3,554	2,027	10	1,604	195	7	555	224	113	-	-	-	3,759	3,751	555	-	-	- 8,289
1980	2,216	1,652	5	303	84	5	383	53	113	-	-	-	2,305	2,073	383	53	-	- 4,814
1981	1,193	937	6	52	74	31	239	27	118	-	-	-	1,273	1,138	239	27	-	- 2,677
1982	716	393	6	25	39	6	43	64	40	6	7	1	761	464	49	64	7	1 1,346
1983	901	297	5	12	37	14	64	12	133	20	24	2	943	456	84	12	24	2 1,521
1984	803	166	7	2	23	8	106	-	23	3	4	1	833	199	109	-	4	1 1,146
1985	648	771	68	593	26	40	119	49	25	4	5	1	742	1,429	119	49	5	1 2,345
1986	570	1,019	34	372	25	7	171	59	48	7	9	1	629	1,446	171	59	9	1 2,315
1987	414	794	4	142	14	16	188	5	68	10	12	1	432	1,020	198	5	12	1 1,668
1988	234	323	3	16	7	1	9	1	49	7	9	1	244	389	16	1	9	1 660
1989	167	149	-	5	7	-	10	-	34	5	6	1	174	188	15	-	6	1 384
1990	236	100	0	1	9	1	6	0	50	-	-	-	245	152	6	-	-	- 403
1991	328	112	15[3]	9[3]			2	2	5	2	2		343	126	4	2	2	477

[1]Includes 1990 also landings from October-December.
[2]For the years 1970-1981 and 1990 catches in Sub-divisions 25-28 are included in Sub-division 24.
[3]United Germany.

Table 3.2.3 Total catch of dab in the Baltic by Sub-division and country (in tonnes). (There are some gaps in the informaiton. The "Total", therefore, is preliminary.)

Year	Denmark		German[1] Dem.Rep.		Fed.Rep. of Germany		Sweden[2]					Total						
	Sub-division																	
	22	24(+25)	22	24	22	24	24	25	27	28	30	22	24	25	27	28	30	22-28
1970	845	20	11	-	74	-	+	-	-	-	-	930	20	-	-	-	-	950
1971	911	26	10	-	64	-	+	-	-	-	-	985	26	-	-	-	-	1,011
1972	1,110	30	9	-	63	-	23	-	-	-	-	1,182	53	-	-	-	-	1,235
1973	1,087	58	18	-	118	-	30	-	-	-	-	1,223	88	-	-	-	-	1,311
1974	1,178	51	18	-	118	-	34	-	-	-	-	1,314	85	-	-	-	-	1,399
1975	1,273	74	20	-	131	-	32	-	-	-	-	1,424	106	-	-	-	-	1,530
1976	1,238	60	17	-	114	-	27	-	-	-	-	1,369	87	-	-	-	-	1,456
1977	889	32	13	-	89	-	25	-	-	-	-	991	57	-	-	-	-	1,048
1978	928	51	19	14	128	4	-	-	-	-	-	1,075	69	-	-	-	-	1,144
1979	1,413	50	18	25	123	1	9	-	-	-	-	1,554	85	-	-	-	-	1,639
1980	1,593	21	15	25	101	+	3	-	-	-	-	1,709	49	-	-	-	-	1,758
1981	1,601	32	24	39	164	+	5	-	-	-	-	1,789	76	-	-	-	-	1,865
1982	1,863	50	46	38	182	4	6	5	8	6	1	2,001	98	5	8	6	1	2,209
1983	1,920	42	46	28	198	-	24	20	32	22	2	2,164	94	20	32	22	2	2,334
1984	1,796	65	30	47	175	2	4	3	5	4	1	2,001	118	3	5	4	1	2,132
1985	1,593	58	52	51	187	2	3	3	5	3	1	1,832	114	3	5	3	1	1,958
1986	1,655	85	36	35	185	1	1	1	1	1	-	1,876	122	1	1	1	-	2,001
1987	1,706	93	14	87	276	4	1	1	1	1	-	1,996	185	1	1	1	-	2,184
1988	1,846	75	22	91	281	1	1	1	1	1	-	2,149	168	1	1	1	-	2,320
1989	1,722	48	26	19	218	1	1	1	2	1	-	1,966	69	1	2	1	-	2,039
1990	1,743	146	14	11	252	1	8	-	-	-	-	2,009	166	-	-	-	-	2,175
1991	1,731	95	340[3]	5[3]			1	-	-	-		2,071	101	-	-	-	-	2,172

[1]Includes 1990 also landings from October-December.
[2]For the years 1970-1981 and 1990 catches in Sub-divisions 25-30 are included in Sub-division 24.
[3]United Germany.

Table 3.2.4 Total catch of turbot in the Baltic, by sub-divisions and country (in tonnes). (There are some gaps in the information. The "Total", therefore, is preliminary.)

Year	Denmark		German[1] Dem.Rep.		Germany, Fed.Rep.	Poland		Sweden[2]				Total						
	Sub-division																	
	22	24(+25)	24		22	25+(24)	26	24	25	27	28+(29)	22	24	25	26	27	28(+29)	22-28
1965	-	-	3	39	-	-	-	-	-	-	-	-	-	-	-	-	-	42
1966	16	21	5	53	-	-	-	-	-	-	-	21	74	-	-	-	-	95
1967	14	20	7	10	-	-	-	-	-	-	-	21	30	-	-	-	-	51
1968	14	18	3	67	-	-	-	-	-	-	-	17	85	-	-	-	-	102
1969	13	13	4	57	-	-	-	-	-	-	-	17	70	-	-	-	-	87
1970	11	13	5	40	-	-	-	2	-	-	-	16	55	-	-	-	-	71
1971	11	26	4	86	-	-	-	2	-	-	-	15	114	-	-	-	-	129
1972	10	26	3	100	-	-	-	3	-	-	-	13	129	-	-	-	-	142
1973	11	30	3	33	-	58	13	5	-	-	-	14	68	58	13	-	-	153
1974	14	40	2	23	-	34	36	6	-	-	-	16	69	54	36	-	-	155
1975	27	48	3	38	15	23	6	7	-	-	-	45	93	23	6	-	-	167
1976	29	24	0	52	11	14	12	7	-	-	-	40	83	14	12	-	-	149
1977	32	37	0	55	9	12	55	8	-	-	-	41	100	12	55	-	-	208
1978	33	37	2	27	9	7	3	10	-	-	-	44	74	7	3	-	-	128
1979	23	38	3	39	6	29	34	12	-	-	-	32	89	29	34	-	-	184
1980	28	38	0	30	9	12	20	15	-	-	-	37	83	12	20	-	-	152
1981	28	62	1	46	8	10	19	7	-	-	-	37	115	10	19	-	-	181
1982	31	51	1	27	7	2	17	3	4	4	3	39	81	6	17	4	3	150
1983	33	40	3	9	8	5	4	31	41	35	24	44	80	46	4	35	24	233
1984	41	45	4	8	12	13	2	3	4	3	2	57	56	17	2	3	2	137
1985	56	34	5	22	15	67	15	4	5	4	3	76	60	72	15	4	3	230
1986	99	81	6	32	25	32	37	6	8	7	5	130	119	40	37	7	5	338
1987	134	93	4	34	30	155	21	8	11	9	6	168	135	166	21	9	6	505
1988	117	117	3	28	34	7	10	12	16	14	9	154	157	23	10	14	9	367
1989	135	109	7	22	20	-	11	11	15	13	9	161	142	15	11	13	9	351
1990	178	181	4	2	26	23	7	14	-	-	-	208	197	23	7	-	-	435
1991	228	137		39[3]	44[3]	73	19	2	12	16	9	272	178	85	19	16	9	579

[1]Includes 1990 also landings from October-December.
[2]For the years 1970-1981 and 1990 catches in Sub-divisions 25-29 are included in Sub-division 24.
[3]United Germany.

Table 3.2.5 Total landings of brill (in tonnes). (There are some gaps in the information. The "Total", therefore, is preliminary.)

Year	Sub-division 22		Total	Sub-divisions 24-28		Total	Sub-divisions 22-28
	Denmark	Fed.Rep. of Germany		Denmark	Sweden		Total
1970	4	-	4	-	-	-	-
1971	3	-	3	-	-	-	-
1972	7	-	7	-	-	-	-
1973	11	-	11	2	-	2	13
1974	25	-	25	1	-	1	26
1975	38	1	39	1	+	1	40
1976	45	2	47	1	-	1	48
1977	60	5	65	2	-	2	67
1978	37	3	40	-	-	-	40
1979	30	0	30	-	-	-	30
1980	26	0	26	-	-	-	26
1981	22	1	23	-	-	-	23
1982	19	0	19	0	17	17	36
1983	13	0	13	0	42	42	55
1984	12	0	12	-	3	3	15
1985	16	0	16	0	1	1	17
1986	15	0	15	0	3	3	18
1987	12	0	12	0	3	3	15
1988	5	0	5	0	1	1	6
1989	9	0	9	0	1	1	10
1990	0	0	0	-	1	1	1
1991	15						15

Table 4.1 Annual nominal landings in tonnes of Baltic salmon in 1972-1991. (S = Sea; C = Coastal; R = River.)

Year	Baltic Main Basin (Sub-divisions 24-29)											
	Denmark	Finland[5]	FRG	Poland		Sweden		USSR		Total		
	S	S + C	S	S	C	S	R	S	C + R	S	C + R	GT
1972	1,034	122	117	13	-	277	-	-	107	1,563	107	1,670
1973	-	-	-	-	-	-	-	-	-	1,828	122	1,950
1974	-	-	-	-	-	-	-	-	-	2,002	155	2,157
1975	-	-	-	-	-	-	-	-	-	1,795	194	1,989
1976	-	-	-	-	-	-	-	-	-	2,034	123	2,157
1977	-	-	-	-	-	-	-	-	-	1,553	96	1,649
1978	-	-	-	-	-	-	-	-	-	1,369	48	1,417
1979	-	-	-	-	-	-	-	-	-	1,519	29	1,548
1980	-	-	-	-	-	-	-	-	-	1,881	16	1,897

Year	S	S	C	R	S	S	C	S	R	S	C	R	S	C	R	GT
1981	844	310	18		43	45	-	401	-	282	17	-	1,925	35	-	1,960
1982	604	184	16		20	38	-	375	-	275	31	-	1,496	47	-	1,543
1983	697	134	18		25	76	-	370	-	362	105	-	1,664	123	-	1,787
1984	1,145	208	29		32	72	-	549	-	491	89	-	2,497	118	-	2,615
1985	1,345	280	26		30	162	-	842	-	426	90	-	3,085	116	-	3,201
1986	848	306	38		41	137	-	771	-	414	130	-	2,517	168	-	2,685
1987	955	446	40		26	267	-	883	4	551	68	-	3,128	108	4	3,240
1988	778	305	30		41	93	-	713	6	432	96	-	2,362	126	6	2,494
1989	850	365	35		52	80	-	1,053	4	633	131	-	3,033	166	4	3,203
1990	731	467	46	2	36	191	4	939	9	663	188	-	3,027	238	11	3,276
1991[1]	625	454	36	2	40	77	-	602	14	560[3]	120[3]	-	2,358	156	16	2,530

Year	Gulf of Bothnia (Sub-divisions 30-31)									Baltic Main Basin and Gulf of Bothnia (Sub-divisions 24-31) Total		
	Denmark	Finland[5]	Sweden			Total						
	S	S + C	S	C	R	S	C	R	GT	S	C + R	GT
1972	11	143	9	126	65	163	126	65	354	1,726	298	2,024
1973						216	166	134	516	2,044	422	2,466
1974						325	180	155	660	2,327	490	2,817
1975						543	272	127	942	2,338	593	2,931
1976						331	384	80	795	2,365	587	2,952
1977						457	382	60	899	2,010	538	2,548
1978						145	357	40	542	1,514	445	1,959
1979						192	292	35	519	1,711	356	2,067
1980						185	320	35	540	2,066	371	2,437

Year	Gulf of Bothnia (Sub-divisions 30-31)										Baltic Main Basin and Gulf of Bothnia (Sub-divisions 24-31) Total			
	Finland[5]			Sweden			Total							
	S	C	R	S	C	R	S	C	R	GT	S	C	R	GT
1981	125	157	6	26	242	35	151	399	41	591	2,076	434	41	2,551
1982	131	111	3	-	135	30	131	246	33	410	1,627	293	33	1,953
1983	176	118	4	-	140	32	176	258	36	470	1,840	381	36	2,257
1984	401	178	5	-	140	52	401	318	57	776	2,898	436	57	3,391
1985	247	151	4	-	114	38	247	265	42	554	3,332	381	42	3,755
1986	124	176	5	-	157	41	124	333	46	503	2,641	501	46	3,188
1987	66	173	6	-	114	35	66	287	41	394	3,194	395	45	3,634
1988	74	146	6	-	142	45	74	288	51	413	2,436	414	57	2,907
1989	225	207	6	-	241	63	225	448	69	742	3,258	614	73	3,945
1990	597	680	14	-	497	93	597	1,177	107	1,881	3,624	1,415	118	5,157
1991[1]	606	544	14	-	351	84	606	895	98	1,599	2,964	1,051	114	4,129

Continued

Table 4.1 Continued

Year	Gulf of Finland (Sub-division 32)									Total (Sub-divisions 24-32)			
	Finland[5]			Estonia	USSR		Total						
	S + C		R	S	S	C/R	S + C		R	GT	S	C + R	GT
1972	138		-	-	-	-	138		-	138	1,864	298	2,162
1973	135		-	-	-	-	135		-	135	2,179	422	2,601
1974	111		-	-	-	-	111		-	111	2,438	490	2,928
1975	74		-	-	-	-	74		-	74	2,412	593	3,005
	S	C	R	S	S	C/R	S	C	R	GT	S	C + R	GT
1976	81	-	-	-	-	14	81	14	-	95	2,446	601	3,047
1977	75	-	-	-	-	13	175	13	-	88	2,085	551	2,636
1978	68	1	-	-	-	6	68	7	-	75	1,582	452	2,034
1979	63	3	-	-	-	4	63	7	-	70	1,774	363	2,137
1980	51	2	-	-	9	7	60	9	-	69	2,126	380	2,506
	S	C	R	S	S	C/R	S	C	R	GT	S	C	R	GT
1981	46	1	-	-	5	2	51	3	-	54	2,127	437	41	2,605
1982	91	7	-	-	-	5	91	12	-	103	1,718	305	33	2,056
1983	163	32	-	-	-	2	163	34	-	197	2,003	415	36	2,454
1984	210	42	-	-	12	-	222	42	-	264	3,120	478	57	3,655
1985	219	34	2	-	22	2	241	36	2	279	3,573	417	44	4,034
1986	270	79	2	-	52	1	322	80	2	404	2,963	581	48	3,592
1987	257	61	2	-	33	-	290	61	2	353	3,484	456	47	3,987
1988	122	112	2	-	31	-	153	112	2	267	2,589	526	59	3,174
1989	181	145	2	-	70	-	251	145	2	398	3,509	759	75	4,343
1990	118	369	26	-	55	-	173	369	26	568	3,797	1,784	144	5,725
1991[1]	149	404	26	22	30[4]	-	201	404	26	631	3,165	1,455	140	4,760

[1]Preliminary data.
[2]Includes sea trout.
[3]Former USSR preliminary landings include Estonian sea landings 64 t, Lithuanian sea landings including sea trout 62 t, Latvian sea landings 381 t, and Russia 170 t.
[4]Includes landings both in former USSR and in Russia.
[5]Finnish landings in 1990 and 1991 include non-professional landings in Sub-divisions 29-31 106 t, and in Sub-division 32 156 t, respectively, based on the inquiry made from the 1990 non-professional fishery.

Data from Denmark, Federal Republic of Germany, Finland, Poland, and Sweden have been converted from gutted to ungutted weight by the factor 1.1, and approximation to the equation: w ungutted = 1.0972 w gutted estimated by Thurow (1965).

Data from Denmark (before 1983), Federal Republic of Germany, Finland, and the USSR offshore catches include sea trout of an order of 3%, 3%, 10%, and 3%, respectively.

In the Gulf of Finland, the USSR catches do not include breeding fish and fish for control of spawning run taken in the rivers.

Table 4.3 Annual nominal landings in tonnes of SEA TROUT in the Baltic.

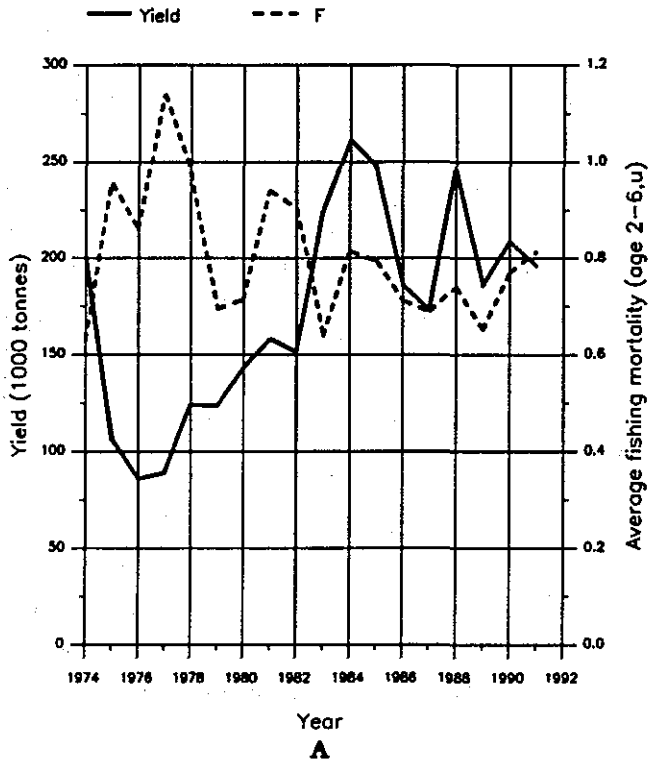
Year	Baltic Main Basin								Gulf of Bothnia		Gulf of Finland			Total
	Denmark[1,4]	Finland[2]	Germany[4]	Sweden[4]	Poland		Latvia	USSR	Finland[2]	Sweden[6]	Finland[2]	Estonia	USSR	
	Coastal	Coastal	Coastal	Offshore +Coastal	Rivers	Coastal	Coastal	Coastal	Coastal	Coastal	Coastal	Coastal	Coastal	
1979	3	10	-	-	24	81[3]	-	-	76	-	73	-	-	267
1980	3	11	-	-	26	48[3]	-	-	87	-	75	-	-	250
1981	6	51	-	-	21	45[3]	-	5	131	-	128	-	2	389
1982	17	52	1	-	31	80	-	13	134	-	140	-	4	472
1983	19	50	-	-	25	108	-	14	134	-	148	-	3	501
1984	29	66	-	-	30	155	-	9	110	-	211	-	2	612
1985	40	62	-	-	26	140	-	9	103	-	203	-	3	586
1986	18	53	-	-	49	91	-	8	118	-	178	-	2	517
1987	31	66	-	13	37	163	-	2	123	25	184	-	-	644
1988	28	99	-	20	33	137	-	8	196	27	287	-	3	838
1989	39	156	18	47	35	149	-	10	215	51	295	-	3	1,018
1990	48[7]	189	21	27	100	388	-	7[8]	328	30	334	-	5[8]	1,477
1991[5]	48[7]	177	7	43	37	272	6	-	356	31	289	2	-	1,268

[1]Additional sea trout catches are included in the salmon statistics for Denmark until 1982 (Table 5.6.1).
[2]Finnish landings include about 70% non-commercial catches.
[3]Figures include both sea trout and rainbow trout catches.
[4]Sea trout are also caught in the Western Baltic in Sub-divisions 22 and 23 by Denmark, Germany, and Sweden.
[5]Estimated.
[6]Catches reported by professional fishermen.
[7]Rainbow trout included.
[8]USSR landings include only official professional catches.

Figure 2.1.1

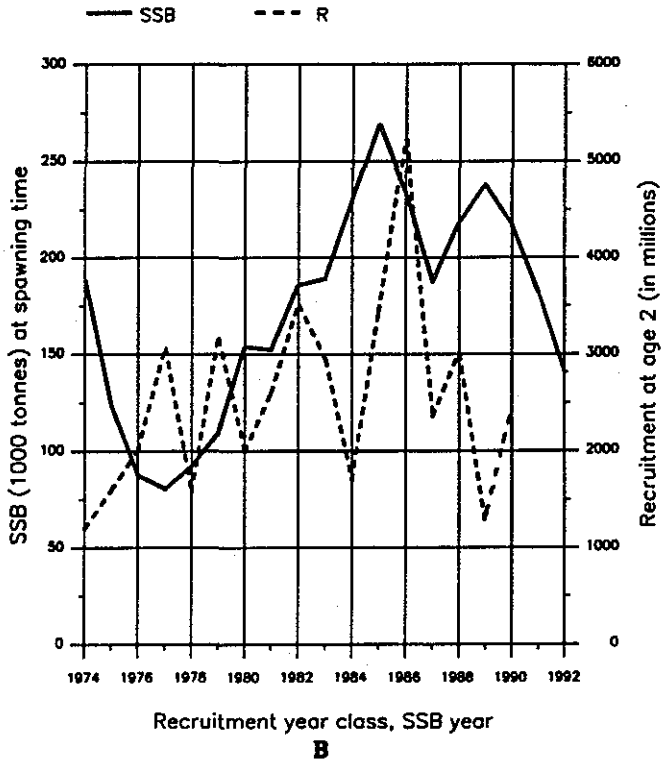
FISH STOCK SUMMARY
STOCK: Herring in the Western Baltic and Kattegat
6–8–1992

Trends in yield and fishing mortality (F)



A

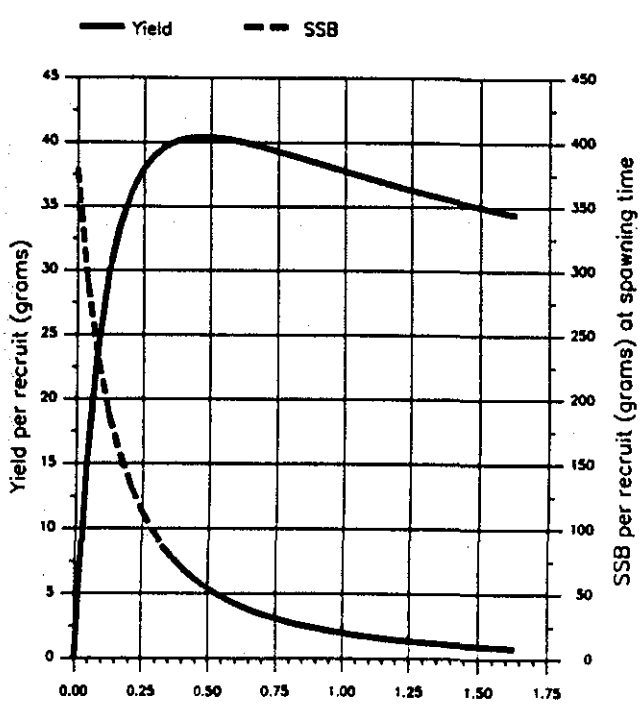
Trends in spawning stock biomass (SSB) and recruitment (R)



B

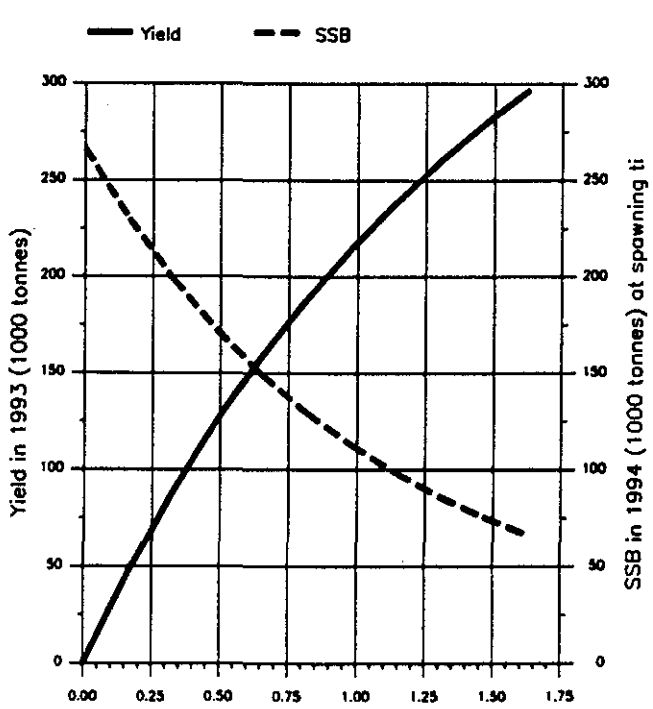
FISH STOCK SUMMARY
STOCK: Herring in the Western Baltic and Kattegat
3–5–1992

Long term yield and spawning stock biomass



C

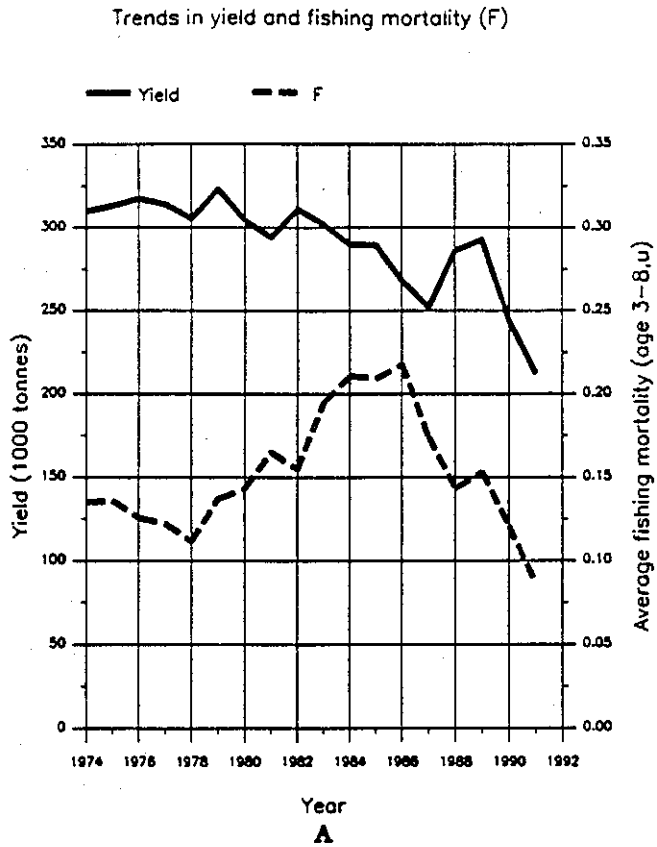
Short–term yield and spawning stock biomass



D

Figure 2.1.2

FISH STOCK SUMMARY
STOCK: Herring in Fishing Areas 25 to 29 and 32 plus Gulf of Riga
8–5–1992



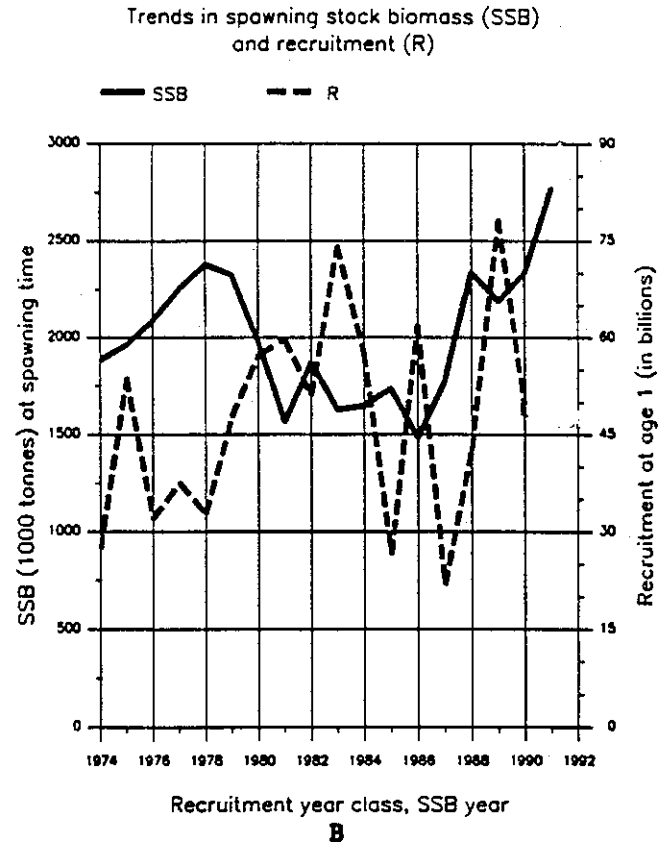
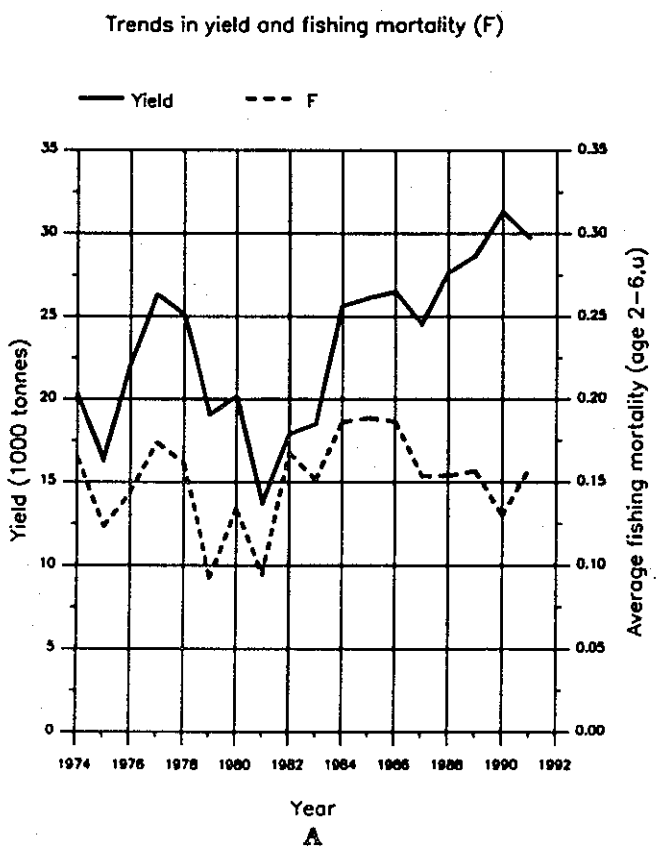


Figure 2.1.3

FISH STOCK SUMMARY
STOCK: Herring in Fishing Area 30
8–5–1992



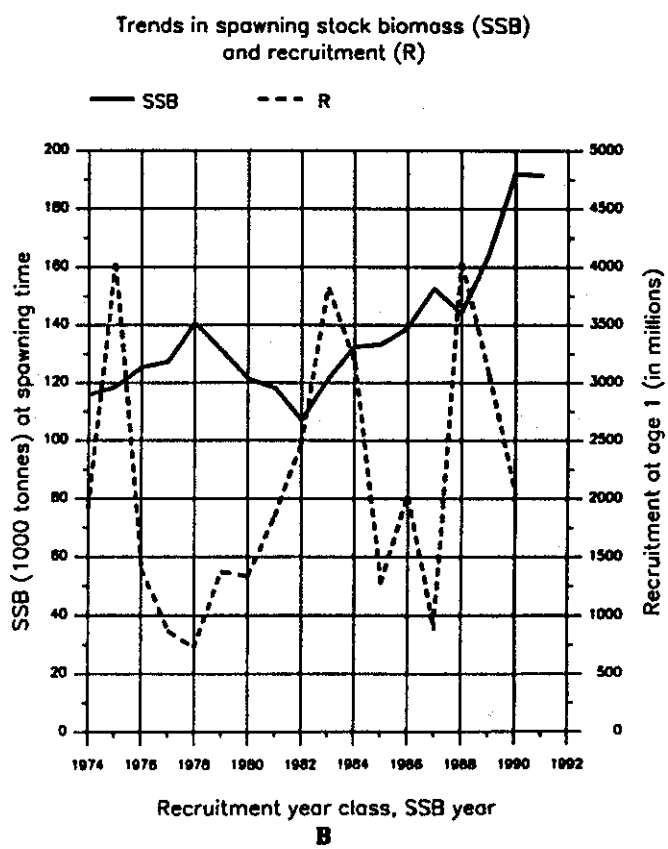
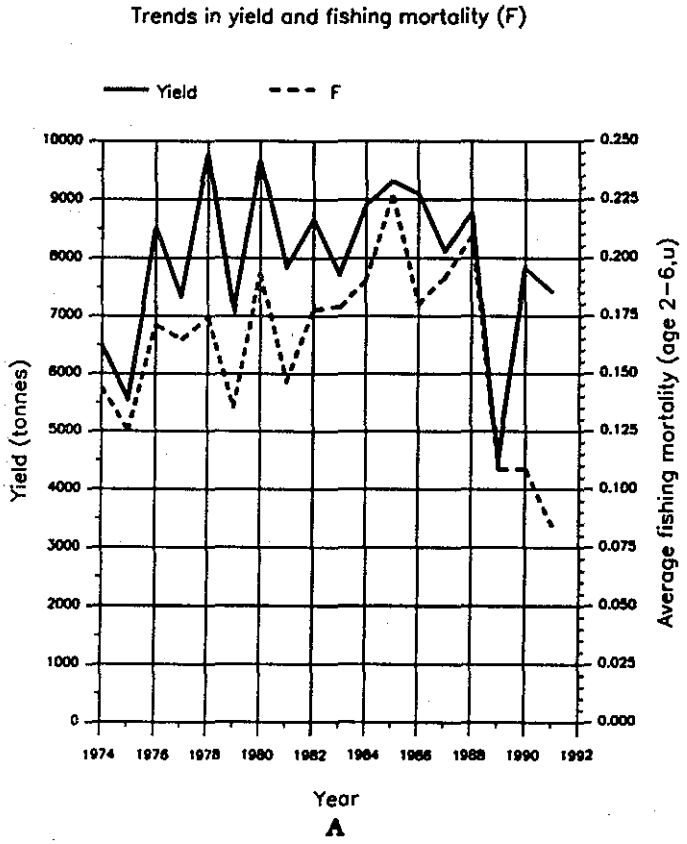


Figure 2.1.4

FISH STOCK SUMMARY
STOCK: Herring in Fishing Area 31
8–5–1992



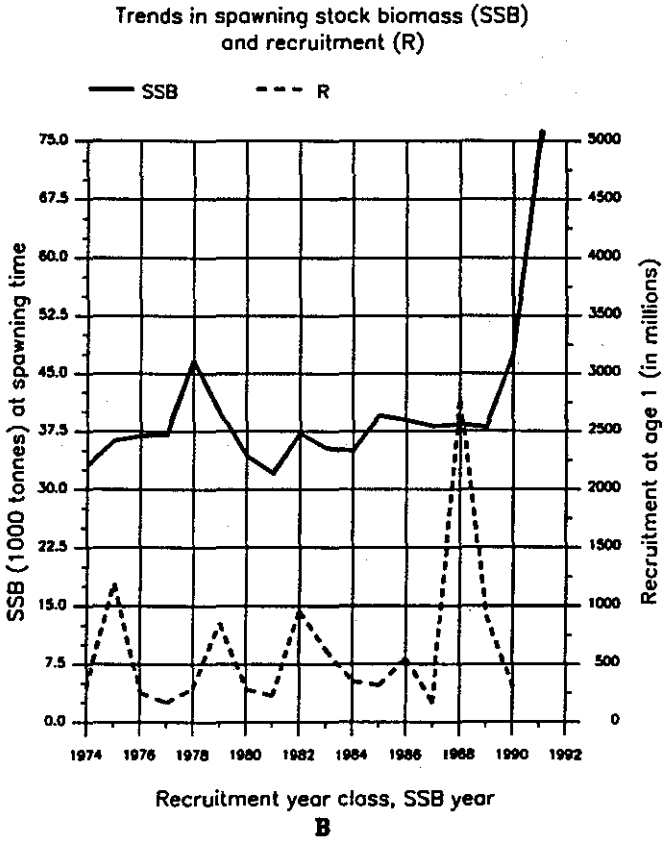
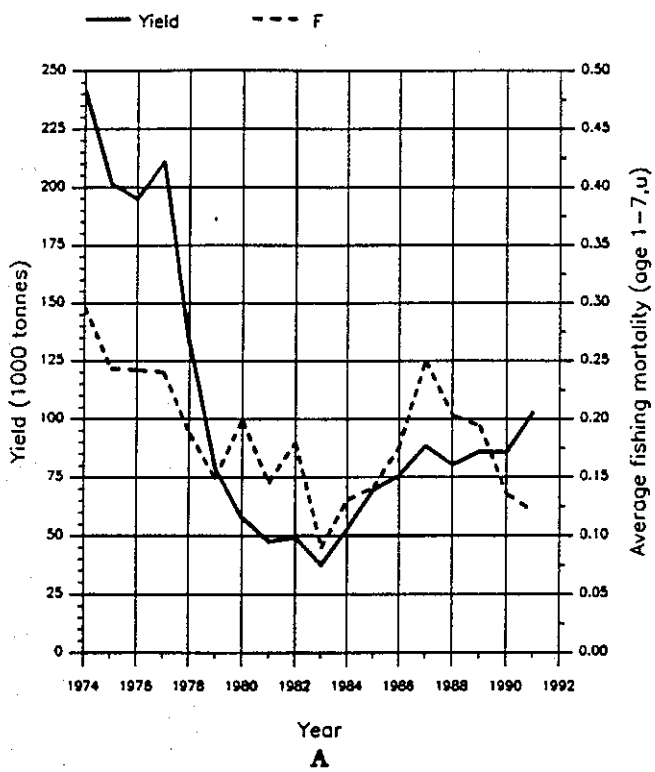


Figure 2.2

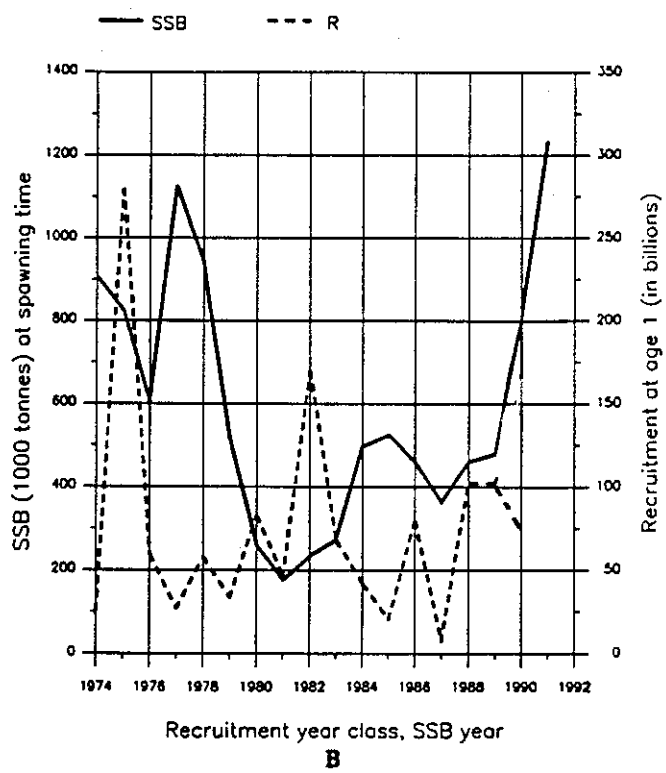
FISH STOCK SUMMARY
STOCK: Sprat in Fishing Areas 22 to 32
25–5–1992

Trends in yield and fishing mortality (F)



A

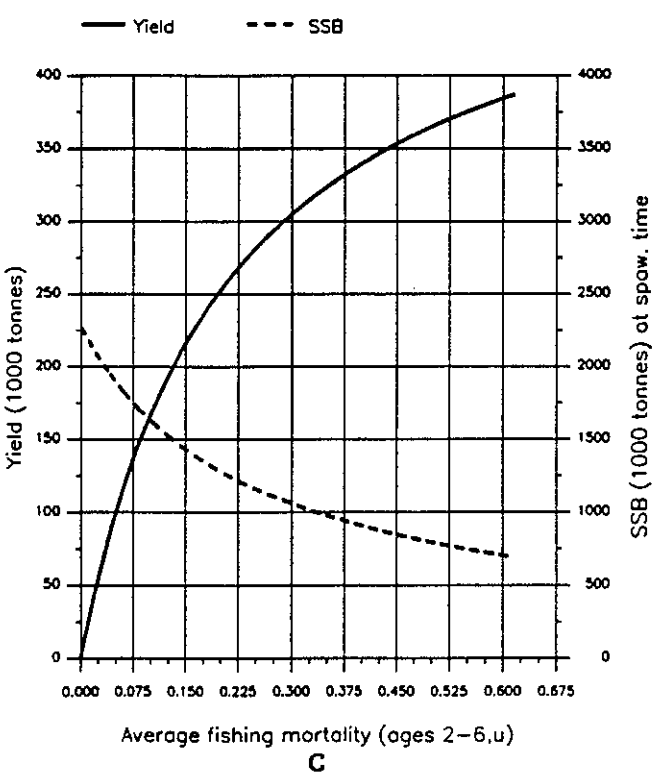
Trends in spawning stock biomass (SSB) and recruitment (R)



B

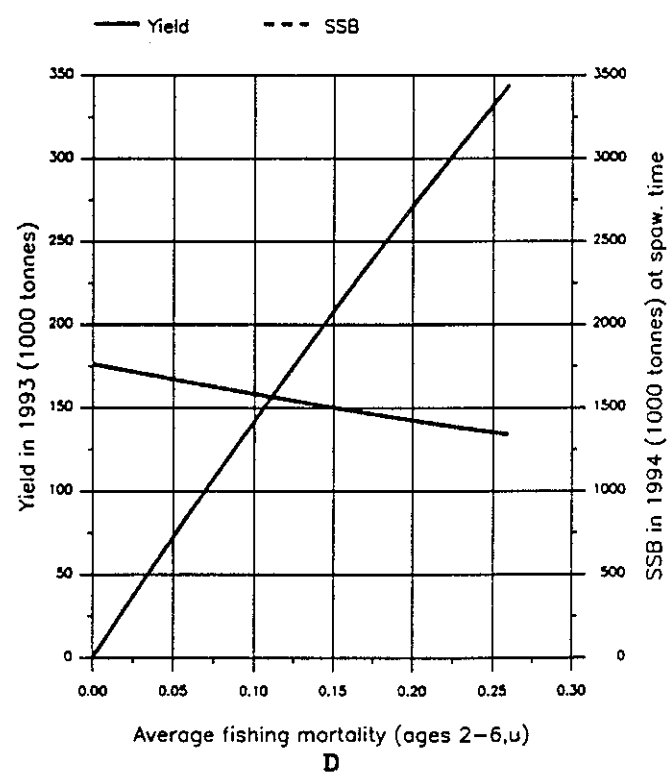
FISH STOCK SUMMARY
STOCK: Sprat in Fishing Areas 22 to 32
25–5–1992

Long term yield and spawning stock biomass



C

Short–term yield and spawning stock biomass

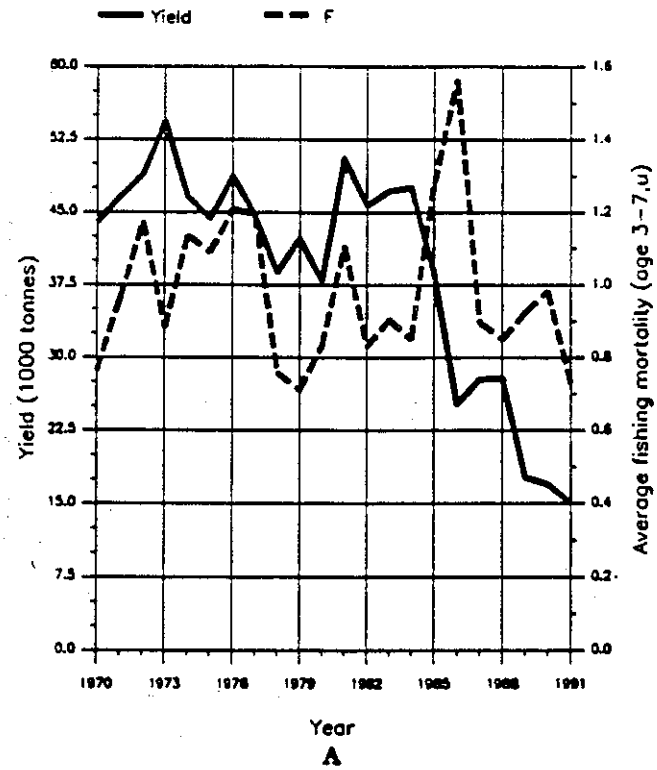


D

Figure 3.1.3

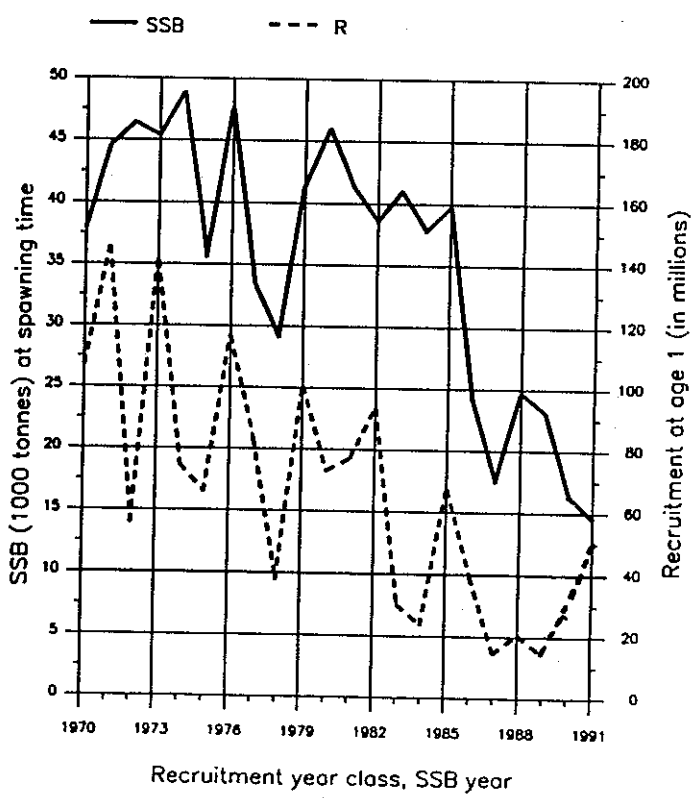
FISH STOCK SUMMARY
STOCK: Cod in Fishing Areas 22 and 24
28–4–1992

Trends in yield and fishing mortality (F)



A

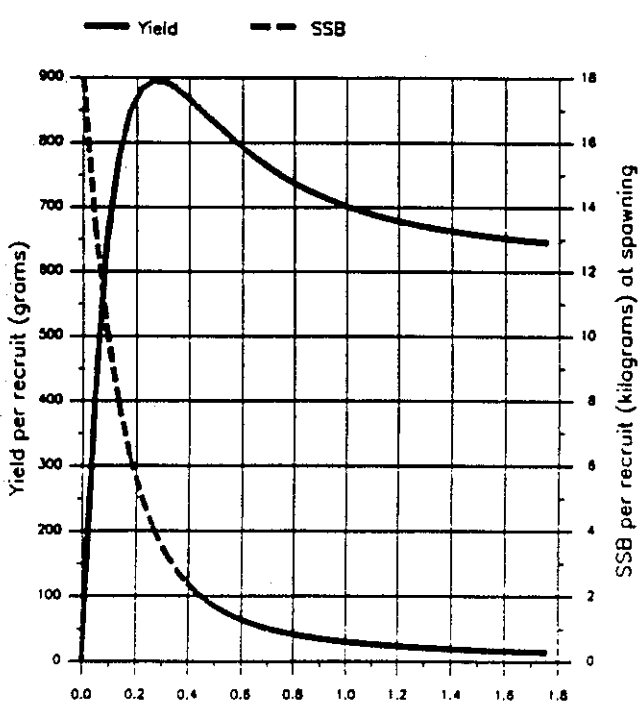
Trends in spawning stock biomass (SSB) and recruitment (R)



B

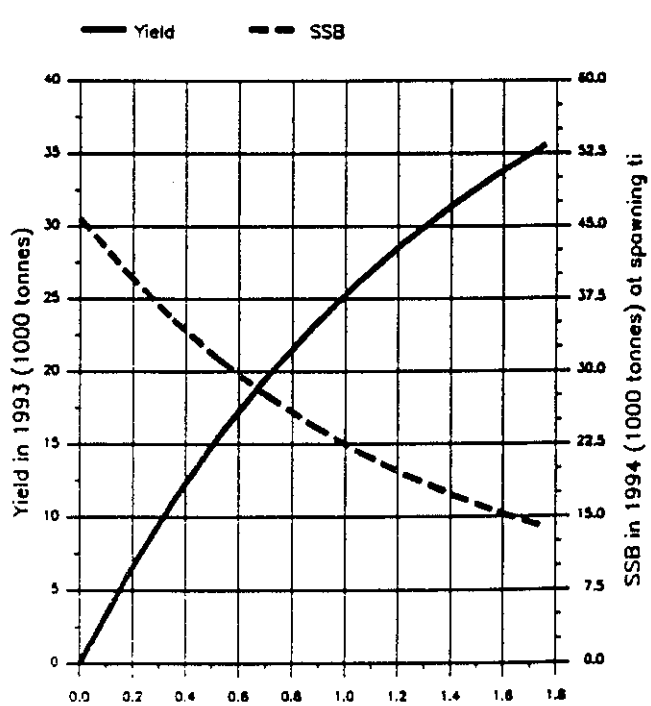
FISH STOCK SUMMARY
STOCK: Cod in Fishing Areas 22 and 24
1–5–1992

Long term yield and spawning stock biomass



C

Short–term yield and spawning stock biomass

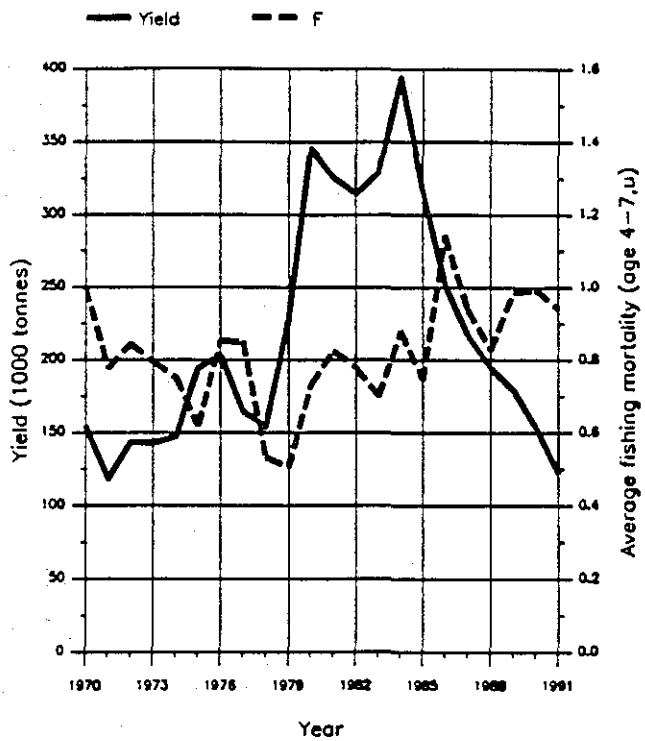


D

Figure 3.1.4

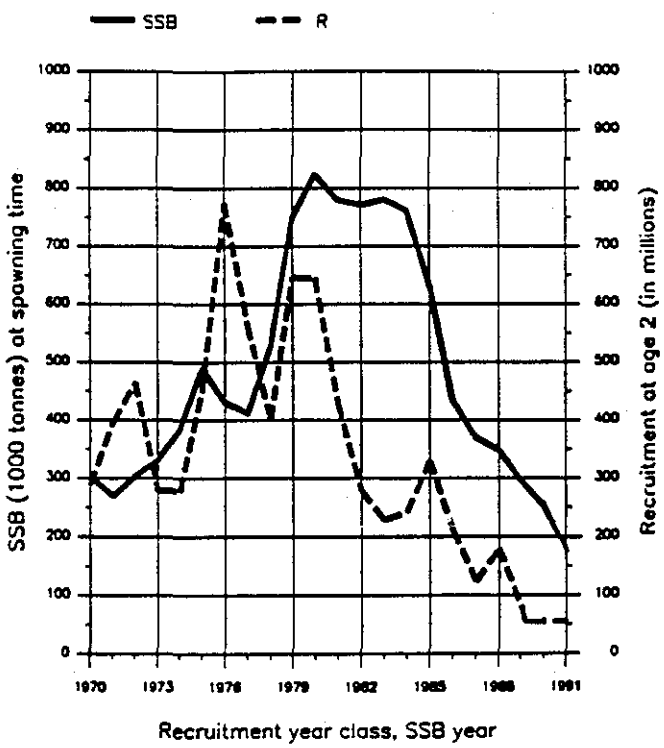
FISH STOCK SUMMARY
STOCK: Cod in Fishing Areas 25 to 32
28–4–1992

Trends in yield and fishing mortality (F)



A

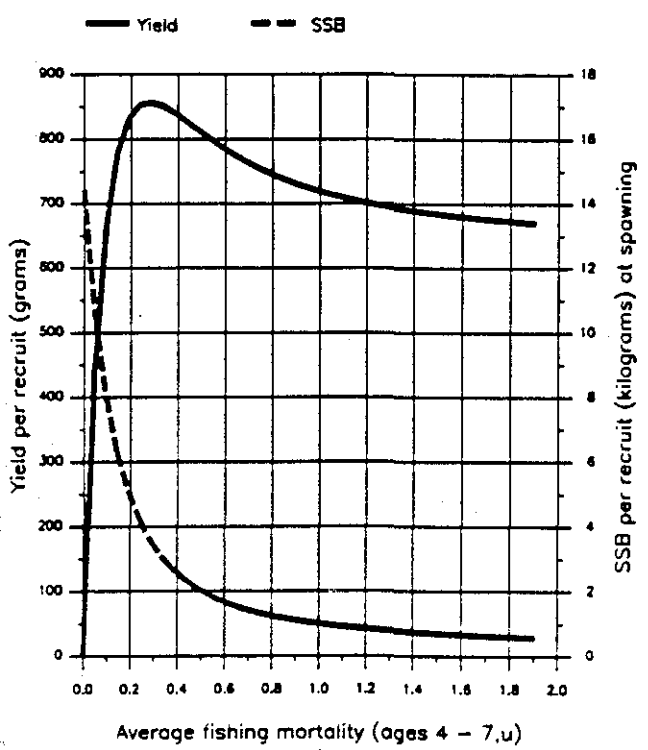
Trends in spawning stock biomass (SSB) and recruitment (R)



B

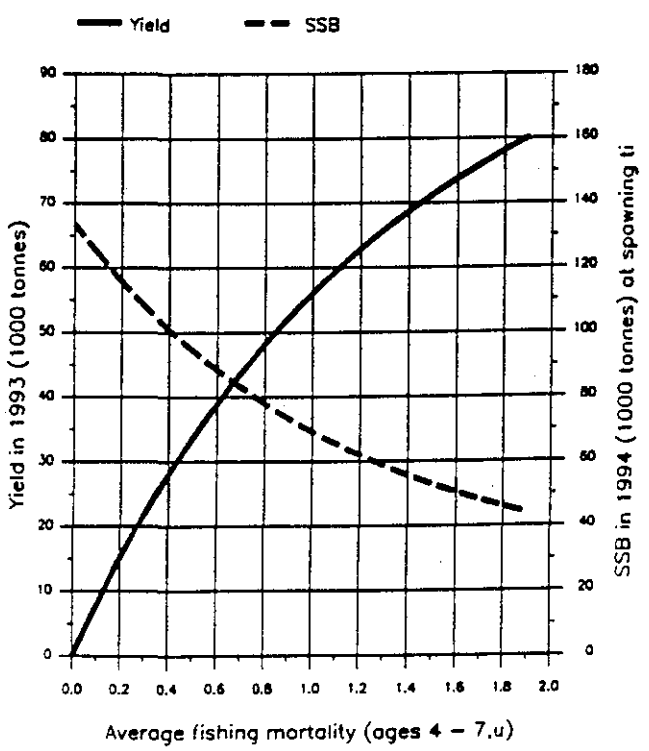
FISH STOCK SUMMARY
STOCK: Cod in Fishing Areas 25 to 32
4–5–1992

Long term yield and spawning stock biomass



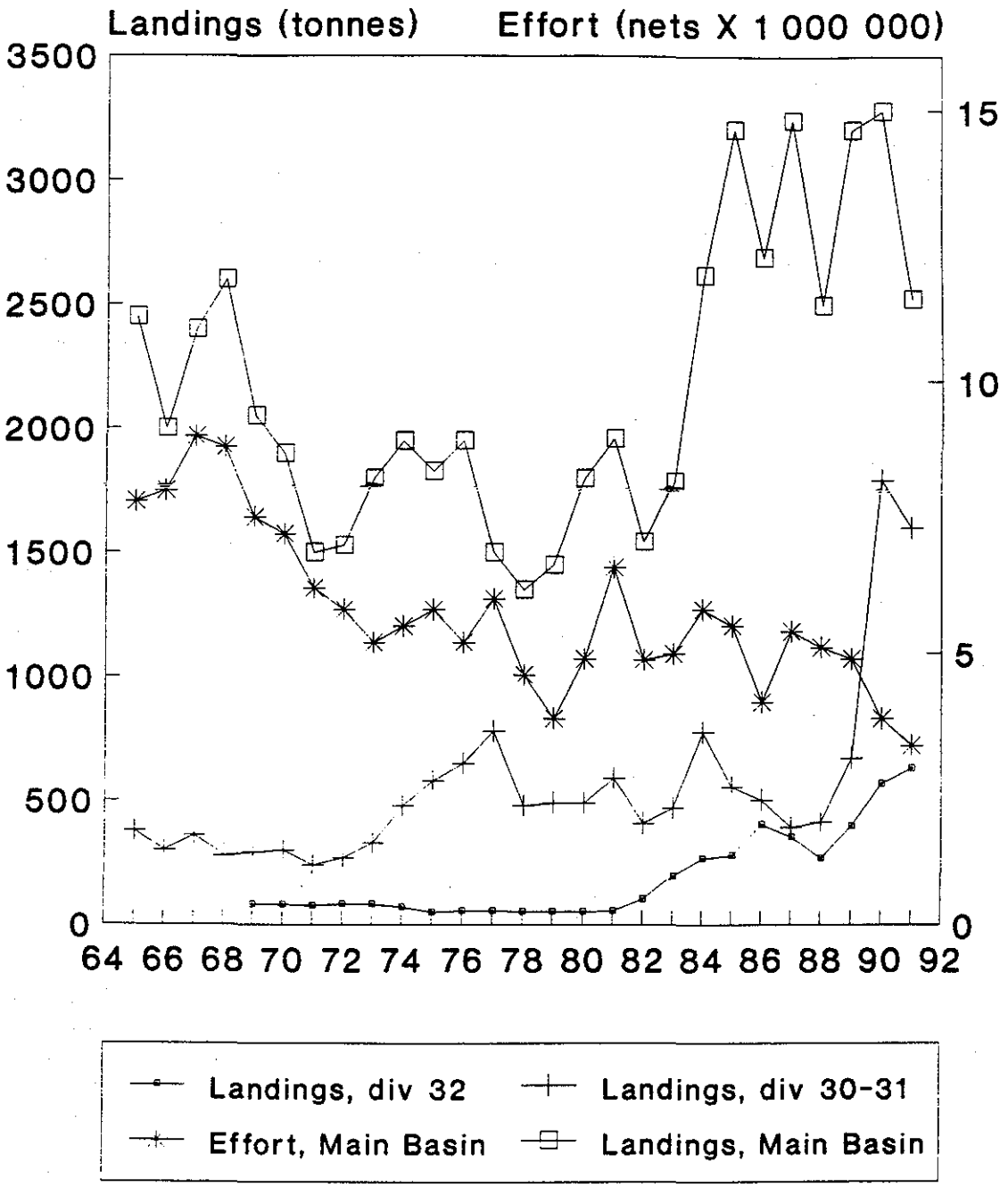
C

Short–term yield and spawning stock biomass



D

Figure 4.1 Landings of salmon in the Baltic and effort of the offshore salmon fishery in the Main Basin (long line effort converted to drift net effort).



1 INFORMATION OF INTEREST TO ALL COMMISSIONS OF NASCO

Source of Information: Report of the Working Group on North Atlantic Salmon, March 1992 (ICES, Doc. C.M.1992/Assess:15.)

1.1 Catches of North Atlantic Salmon

Total nominal catches of salmon by country, in all fisheries 1960-1991 are given in Table 1.1.

The total catch reported for all fisheries (4,030 t) and for homewater fisheries (3,491 t) in 1991 are shown in the text table below. The decline in the catch of wild salmon may be greater than suggested by the total due to the inclusion of fish farm escapees and ranched fish in the North-East Atlantic. Management plans in several countries are designed to decrease catches in the sea.

Catch (t)

Year	1986	1987	1988	1989	1990	1991[1]
Total	9248	8142	7716	5893	4890	4030
Homewater	7737	6598	6573	5190	4333	3491

[1]Preliminary.

The lack of information on fishing effort presents major difficulties in interpreting the catch data as changes in stock size.

1.2 Unreported Catches

1.2.1 Unreported catches within Commission areas

Unreported catches for the North-East Atlantic and North American Commissions were 1,555 t and 127 t, respectively, in 1991. Total non-catch fishing mortality, which includes unreported catches, has been estimated for the West Greenland Commission area (range of values 10 to 30%).

Unreported catches (t)

Year	1986	1987	1988	1989	1990	1991
North-East	-	2554	3087	2103	1779	1555
North America	315	234	161	174	111	127

1.2.2 Unreported catch in international waters

The 1989/90 estimate of unreported catch in international waters in the North East-Atlantic Commission area has been updated to reflect new information and ranged between 180-350 t.

Activity in this area was greatly reduced in 1990/91 with only one or two vessels thought to have been operating. The catch in this area may have been between 25 and 100 t. There are no known catches of salmon in international waters in either the North American Commission area or the West Greenland Commission area.

1.3 Status of Stocks

Status of Atlantic salmon stocks was evaluated over long and short time periods by examining catch, survival, and escapement data for nations and monitored rivers where available. Information on the fisheries is provided in the sections of interest to each Commission.

1.3.1 Eastern North Atlantic

The total nominal landings of salmon in the North-East Atlantic during the period 1960 to 1991, including the European fraction of the Greenland catch, are provided in Figure 1.3.1. The landings increased from more than 5000 t in 1960, peaked at nearly 9000 t in the beginning of the 1970s, and decreased to 1991 when the landings were about 3500 t, the lowest during the period.

The decline of catches in several countries in the North-East Atlantic Commission area suggests reduced abundance of wild salmon in recent years. ACFM examined a number of fishery-independent measures of abundance, but was unable to detect a similar pattern of decline in stocks as noted in the catch data. The number of fishery-independent data series examined was low in number and may not be representative of national stocks.

1.3.2 Western North Atlantic

Abundances of both small and large salmon, as indicated by adult returns and commercial and recreational catches, generally show a downward trend during the last 5-6 years. Similarly, spawning escapements to many rivers of the western North Atlantic were generally low, as inferred from commercial and recreational catches, adult counts at monitoring facilities, and estimated spawning escapements and egg depositions (Figure 1.3.2.1). While large annual variation in smolt survival between years is common, many stocks in the western North Atlantic have exhibited reduced marine survival in recent years.

The abundance of Canadian salmon destined to return as 2SW salmon that contribute to the West Greenland fishery is estimated to have ranged from about 217,000 - 588,0000 fish during the years 1983-90, peaking in 1986 and declining in recent years. These estimates also provide an estimate of the spawning escapement of 2SW salmon:

Year	2SW Spawners (000s)
1984	92.2
1985	104.6
1986	131.5
1987	108.3
1988	125.9
1989	113.4
1990	119.0
1991	99.0

The target number of 2SW spawners for Canada is estimated to be between 150,000 - 200,000 2SW fish per year.

Long-term commercial landings in Canada by province and in Greenland is shown in Figure 1.3.2.2. Abundance of salmon is inferred to have been low at the turn of the century and in the 1950s. Reduced harvests in the last 20 years are in part a result of harvest restrictions designed to increase spawning escapement to many Canadian rivers.

The reasons for low abundance, reduced spawning escapements, and lower smolt survival differ from river systems and include: adverse environmental conditions in homewaters, inadequate egg depositions, and increased marine mortality.

1.3.3 West Greenland Commission

Although not measured precisely, it is believed that the most abundant European stocks at West Greenland originate from the UK and Ireland. It appears that the abundance of some of these stocks has declined in recent years. Similar declines in abundance have been noted in many North American stocks that contribute to the West Greenland fishery. The decline in catch and fishery-independent measures of abundance in North America and the decline in catch beyond expectation that should have resulted from effort reductions implemented in Europe, suggest there is no reason to expect that the status of stocks that contribute to the West Greenland fishery will improve in the near future.

1.4 Inventory of Parasites and Diseases by Country

The Working Group on Pathology and Diseases of Marine Organisms (WGPDMO) was asked by ICES to prepare an inventory of parasites and diseases of wild and reared salmon by country.

WGPDMO presented qualitative data from Faroes, France, Iceland, Ireland, Norway and Scotland (Table 1.4). A large number of different diseases was identified originating from virus, bacteria, fungi, protozoans, monogeans, trematodes, cestodes, nematodes, achanthocephalans, crustaceans, molluscans and leeches. It was noted that there were considerable problems with compiling and presenting these data. The WGPDMO stated that the inventory was incomplete and potentially misleading, and stressed that these data should only be used with full awareness of the following constraints:

(1) The information more likely reflects the amount of research activities in this field rather than the actual situation.

(2) Many reports are single observations, often from individual fish.

(3) The record of a disease/parasite does not necessarily mean that it is still present.

(4) Unless a disease/parasite has been specifically looked for, its absence from the list for a particular country, or in farmed or wild fish, cannot be taken as evidence of its absence.

(5) The compilation of the data were not made on the same basis in all countries.

(6) There is controversy regarding the specific identification of some pathogens/parasites and, consequently, records of a particular species from different countries may in reality refer to different species.

ACFM noted the limitations of the inventory presented and endorsed the statement made by the WGPDMO: "NASCO should take note of the limitations of this inventory and its vulnerability to misinterpretation and the WGPDMO urges caution in its use. For example, the circumstances of pathogen/parasite detection and diagnosis must be taken into account in assessing the relative degrees of significance of the listed examples."

1.5 Report of the Workshop on Salmon Assessment Methodology

ACFM reviewed the report of The Workshop on Salmon Assessment Methodology. The Workshop reviewed and reported on salmon assessment methodologies currently in use in the Baltic and North Atlantic. A further task was to examine the need for standardizing the ageing nomenclatures used for Baltic and Atlantic salmon.

1.6 Production of Farm Salmon

The reported production of farmed salmon by several countries was 217,569 t in 1991. Total farm production was more than 50 times the nominal wild catch.

Production ('000 t)

1986	1987	1988	1989	1990	1991
59	68	111	165	224	218

1.7 Compilation of Tag Releases and Fin-Clip Data for 1991

In excess of 1.76 million microtags (CWTs) and 0.32 million external tags were applied to Atlantic salmon released in 1991. In addition, 1.63 million salmon were finclipped, 1.45 million with adipose finclip only. Thus, more than 3.72 million marked fish were released.

1.8 Recommendations

1. ACFM examined the adequacy of the sampling program at West Greenland and recommended that sampling be maintained in the 3 NAFO Divisions used in the current program and that the duration of sampling within one or two of these Divisions be extended by one or two weeks.

2. ACFM encourages investigations into the decline in marine survival of Atlantic salmon, especially those that examined causality of survival patterns of stock complexes in the North Atlantic. Investigations should include the use of historical data to determine trends in stock status, comparisons of trends between stocks of different river systems that can be ascribed similar migration patterns, and the examination of biological/environmental factors that could explain variation in abundance.

3. ACFM recommends that a new classification methodology, specifically the class of mathematical models referred to as neural networks, be considered and tested as an approach to classifying Atlantic salmon to country or continent of origin.

4. ACFM suggests two investigations be carried out to improve the models used to estimate harvest of individual stocks. Firstly, an investigation should be carried out to examine the assumptions concerning the reporting rate of tags, especially in the light of recently recovered tags from older tag releases. Second, the effect of changes in fleet characteristics at West Greenland should be considered as a means of adjusting non-catch fishing mortality for use in both the proportional and tag return harvest models.

5. ACFM recommends consideration of techniques of time series analysis, such as data smoothing and "route regression" approaches to combine time series, in continuing work on short and long time series of stock status data.

2 INFORMATION OF INTEREST TO THE NORTH-EAST ATLANTIC COMMISSION

2.1 Description of the Fisheries at Faroes

2.1.1 Gear and effort

The gear used in the Faroes fishery is long lines. In recent years, the effort in the salmon fishery has continued to decline, and in the 1990/1991 season only 8 out of 13 licenses were used. The maximum permitted number of licenses is 26.

2.1.2 Catches and discards

The total nominal catch in the Faroes fishery in the 1990/91 season was 202 t. The catch for the calendar year 1991 was only 95 t. This included 13 t caught in December 1991 by a research vessel operating in the Faroes area during the 1991/92 season.

Catch (t)

Year	Catch	Season	Catch
1986	530	1985/86	545
1987	576	1986/87	539
1988	243	1987/88	208
1989	364	1988/89	309
1990	315	1989/90	364
1991	95	1990/91	202

No data are available on the numbers of farmed fish taken in the fishery because appropriate data (e.g., fin measurements or sufficient scale samples) were not collected in the market sampling programme.

Three samples of discards were collected during the fishing season and discard rates ranged from 9.9 to 16.1%; the overall estimate was 14.8%.

2.1.3 Catch per unit effort

The catch in number per 1000 hooks (CPUE) by statistical rectangle for the whole season is shown in Figure 2.1.3. The CPUE values for November and December were the among the highest recorded at this time of year since 1981/82. However, the CPUE fell markedly in February and remained fairly low for the rest of the season.

2.1.4 Biological composition of the catch

In the 1990/91 season, practically all the catch consisted of 2SW fish (91%), with only 1% of 1SW fish and 8% of 3SW fish. These values lie within the ranges observed in previous seasons.

No smolt age composition of the Faroes catch was obtained in the 1990/91 season.

2.1.5 Origin of the catch

Microtagged salmon from the Faroe Islands (2), Iceland (1) Ireland (3), England and Wales (5), Northern Ireland (1) and Scotland (2) were recovered during the 1990/1991 season.

A total of 135 external tags was recovered in the Faroes fishery in 1990/91 of which 116 were from Norway, 16 were from Sweden, and 3 were from Scotland.

2.1.6 Exploitation rates in the Faroes fishery

The exploitation of hatchery stocks from the Rivers Drammen (Norway) and Lagan (Sweden) have shown similar changes with levels being quite low in the 1986/87 and 1987/88 seasons but higher in 1985/86 and in the two most recent seasons. The two Norwegian hatchery stocks (Drammen and Imsa) showed opposite trends, with the exploitation rate on the Drammen stock falling in 1990/91 after a 2-year peak while that on the Imsa stock rose after a 3-year trough. The exploitation rates on wild fish from the Imsa and North Esk Rivers have been very much lower in the past 5 years than previously, although there was a slight rise for 2SW fish in 1990/91. There is no clear relationship between the trends for individual stocks and the catches recorded in the fishery.

Exploitation

Season	86/87	87/88	88/89	89/90	90/91
Drammen	3	6	36	45	24
Imsa (w)	13	5	3	5	13
Imsa (h)	28	21	10	15	40
N. Esk	6	0	0	0	5
Lagan	0	9	13	21	20

2.2 Description of Homewater Fisheries

2.2.1 Gear and effort

No changes in the regulations affecting salmon fishing gear in 1991 were reported for any countries except Norway and Scotland. In Norway, the use of monofilament nets was banned for catching anadromous salmonids. In Scotland there were changes in the regulations affecting gear or fishing period for rod and line fisheries in four rivers.

Fishing effort was thought to have been reduced in France, Ireland, UK(Northern Ireland), UK(England and Wales), UK(Scotland), Russia and Sweden. Factors affecting this reduction are thought to have included perceived reductions in stock abundance and weather conditions (e.g. early freezing in Russia and low river flows in most other countries).

2.2.2 Origin of the catch

Table 2.2.2 indicates the origin of the salmon catches in each country based upon recoveries of tags over a number of years. Double crosses indicate the principal component of the catch and single crosses other significant contributions. Rare recoveries of one country's tags in another country are indicated by dots. These were assumed to indicate very minor contributions to catches. It is apparent that there is normally a pattern of interchange between neighbouring countries, although this exchange may not always be even. It must be noted that this table reflects the relative size of national stocks.

The table below shows estimated contributions of ranched and farmed fish to national catches. In this context, ranching is defined as the release into the wild of reared smolts with the intention of attempting to harvest all returning adults. Releases of reared fish to enhance wild stocks or compensate for lost wild production are, therefore, ignored.

Estimated catches (in tonnes round fresh weight) of wild, farmed and ranched salmon in homewater fisheries in 1991

Country	Catches of salmon			
	Wild	Farmed	Ranched	Total
Finland	68	<1	0	69
France	>12	0	<1	13
Iceland	122	3	394	519
Ireland	<422	+	0	422
Norway	692	26[1]		885
Norway		167[2]		
Russia	215	0	0	215
Sweden	23	1	1+a	38
UK (E+W)	199	0	0	199
UK (N.I.)	54	<1	0	55
UK (Scotl.)	384	12	0	396

[1](FW)
[2](Sea)

The only country in the North-East Atlantic Commission Area known to be ranching in this way is Iceland, where

ranched fish comprised 76% of the catch in 1991. However, in France there is a small experimental ranching exercise. In addition, 14 t of the catch in Sweden comprised fish that have been released for mitigation purposes, but these fish are not expected to contribute to wild spawning populations.

The only countries in which farmed fish are thought to make a significant contribution to fisheries are Norway and UK(Scotland). In Norway, where extensive surveys have been undertaken since 1988, farmed fish appear in both marine and freshwater fisheries. Estimates of the proportion of farmed fish in various Norwegian fisheries were highly variable between sites but indicate that the proportion of farmed salmon was much lower in samples taken in fresh water than in coastal areas. The proportion of farmed fish in the catch seems to have been relatively constant in the period 1989-91.

In UK (Scotland), sampling in 1990 indicated that most of the reared fish caught in fisheries had escaped or been lost from sea cages. In 1991, however, sampling on the west coast revealed that most of the farm-origin fish were derived from losses or releases of smolts or parr. On the east coast, where the incidence of farm escapees was low, most of the farm origin fish were adult escapees.

In all other countries, farmed fish are thought to form only a very minor (or negligible) part of the catch.

2.2.3 Exploitation rates

Exploitation on the River Drammen and Lagan stocks (hatchery reared fish) as higher than average in 1991 while the rates for the North Esk (UK (Scotland)) and Imsa (Norway), and for hatchery-reared fish on the River Bush (UK (Northern Ireland)), were lower. For most other stocks (including wild fish from the R. Bush) rates were similar to those estimated for 1990. On the Russian rivers fishing traps are operated every day and the exploitation rates are adjusted by altering the proportion of days on which the catch is released or killed. Exploitation rates were reduced in 1991 to protect spawning stocks.

Preliminary 1991 exploitation (average)			
Location (River, H/W)	1SW	2SW	All ages
Iceland (Ellidar, W)	37(39)		
Ireland (Burrishoole, H)	65(74)		
Norway (Drammen H)	64(57)	70(53)	
Norway (Imsa, W)	41(62)	74(77)	
Norway (Imsa, H)	54(67)	69(83)	
Russia (Ponoy, W)			20(53)
Russia (Kola, W)			58(80)
Sweden (Lagan, H)	90(82)	92(81)	
UK, E & W (Itchen, net)			-
UK, E & W (Itchen, rod)			-
UK. E & W (Test, rod)			26(30)
UK, N.Ireland (Bush, W)	65(70)	43(45)	
UK, N.Ireland (Bush, H)	57(79)	46(68)	
UK (Scotland (N. Esk)	10(28)	15(31)	

2.2.4 Effects of recent management measures in Norway

Catches in Norwegian home waters during 1986-1991 are shown below:

	Catch (t)					
	1986	1987	1988	1989	1990	1991
Drift	795	552	527	0	0	0
Other	497	461	314	488	514	471
Freshwater	307	372	235	417	416	414
Proportion in freshwater	.19	.27	.22	.46	.45	.47

It is likely that the ban on drift netting in 1989 has resulted in a larger number of salmon being available to the other marine homewater fisheries. The additional regulation of these fisheries has probably resulted in a substantial increase in freshwater escapement as suggested by increased catches in freshwater. In 1989, 1990, and 1991, freshwater catch accounted for 46, 45, and 47% of total nominal catches, respectively, compared to 18 to 27% over the years 1982 to 1988. Increased freshwater escapement is also suggested by the reduction in marine exploitation rates on most components of the River Imsa salmon stock. This was not the case for salmon of the River Drammen stock, however, because drift net exploitation on this stock has always been low.

The salmon fishery on the west coast of Norway intercepts stocks from the USSR, Finland and the Swedish west coast on their return to their home rivers. Exploitation on 1SW fish tagged as smolts on the River Lagan

(Sweden) was lower in 1989, 1990, and 1991 (average 1%) than in 1985-88 (average 7%). This suggests that the management measures introduced in Norway in 1989 also affected Swedish west coast stocks.

The frequency of net-marked salmon entering a river may also give information about changes in netting effort on the migration route. The proportion of net-marked salmon recorded in samples of river fisheries in 1991 was much lower than the un-weighted means during the period 1978-88. The reduced proportion of net-marked fish may be accounted for by the management measures introduced in the Norwegian home water fishery in 1989.

2.2.5 By-catches of fish, birds and mammals in drift-net fisheries

Drift-net fisheries, targeting Atlantic salmon and migratory trout (*Salmo trutta*), are currently operated by six countries in the NEAC area: France, Finland, Ireland, Norway, UK(England and Wales) and UK(Northern Ireland). A variety of species are taken as by-catch in these fisheries; the details of these by-catches are listed by nation in the Report of the Working Group (Anon. 1992).

3 INFORMATION OF INTEREST TO THE WEST GREENLAND COMMISSION

3.1 Description of the Fishery at West Greenland, 1991

In 1991, the fishery at West Greenland (NAFO Sub-area 1) was opened on 5 August and ended in November, although the official closing date was 31 December. The total nominal catch was 437 t.

	Quota and catch (t)					
Year	1986	1987	1988	1989	1990	1991
Quota	909	935	-	900	924	840
Catch	960	966	893	337	227	437[1]

[1]Preliminary.

The TAC for 1991 was set unilaterally at 840 t, and divided into a "free" quota of 373 tonnes and a " small boat" quota of 467 tonnes. Because of the small landings in 1991, those quotas were not restrictive.

The salmon fishery at Greenland is a small boat fishery and is executed in inshore and coastal areas. Approximately 80% of the total landings were taken by boats smaller than 30 feet. No information on effort is available for 1991, but the landings during the two first two weeks are given for 1980 to 1991 in the text table below.

The nominal catch landings during the two first weeks, 1980-991 (in tonnes)

Year	First week	First two weeks	
1980	260	711	(01 - 14 Aug)
1981	465	735	(15 - 28 Aug)
1982	470	766	(25 Aug - 07 Sep)
1983	105	192	(10 - 23 Aug)
1984	17	58	(10 - 23 Aug)
1985	204	361	(01 - 13 Aug)
1986	509	848	(15 - 28 Aug)
1987	439	737	(25 Aug - 07 Sep)
1988	219	337	(25 Aug - 07 Sep)
1989	131	219	(18 - 31 Aug)
1990	12	38	(01 - 14 Aug)
1991	114	191	(05 - 18 Aug)

3.1.1 Composition and origin of the catch in 1991

The results of classifying salmon in samples from commercial catches in 1991 indicated that the North American proportion was 65% (95% CL = 69, 61), and the European proportion was 35% (95% CL = 39, 31).

An alternative estimate of the overall proportion of North American and European-origin salmon for the years 1982-1991 was derived by weighting NAFO Division samples by catch in numbers. Information from the nearest NAFO Division was applies to divisions with no samples. The table below gives the results:

Year	Weighted by catch in numbers			% of all samples		
	NA %	Wt	EU %	Wt	NA	EU
1982	57	-	43	-	62	38
1983	40	-	60	-	40	60
1984	54	-	46	-	50	50
1985	47	-	53	-	50	50
1986	59	537	41	423	57	43
1987	59	556	41	411	59	41
1988	42	349	58	544	43	57
1989	55	179	45	158	56	44
1990	74	168	26	59	75	25
1991	63	267	37	170	65	35

ACFM is concerned about the lack of a suitable test sample of scales of known origin salmon for the discriminant analysis.

In 1991, the estimated number of fish caught was 103,013 from North America and 60,935 from Europe for a total of 163,948.

An estimate of the number of Maine-origin salmon harvested at West Greenland in 1991 using the proportional harvest method was 3,757 fish.

3.1.2 Biological characteristics of the harvest

As previously observed, North American 1SW salmon were significantly shorter and lighter than their European counterparts, both overall and on an individual NAFO Division basis. Two sea-winter salmon of North American origin were not different in length but were lighter than European-origin salmon, both overall and between NAFO Divisions at the 5% level of significance.

The sea age composition in 1991 of 94.7% 1SW, 4.9% MSW, and 0.3% previous spawners indicated that there were proportionately fewer 1SW salmon and more MSW salmon than in 1990. In 1991, the 1SW components for both North American (95.6%) and European (93.4%) salmon were lower than their respective components in 1990.

The proportion of North American-origin river age 1 salmon has been increasing steadily from 2% in the 1986 samples to 8.8% in the 1990 samples. In 1991, it decreased to 5.2%. In 1991, samples (<1.0%) of salmon thought to be fish farm escapees were found in the Greenland catches. The decrease in numbers of North American salmon of river age 4 years and older from the mean value of 22.0% from 1968-90 to 17.8% in 1991 suggests that either production or migration of salmon from the northerly portion of the range in North America has decreased.

3.1.3 Historical data on tag returns and harvest estimates

Thirty USA-origin Carlin tags were returned in 1991 from Greenland without information as to year of recapture. These tags were presumably caught mostly as 1SW fish in the year following release.

The Carlin tag-based harvest estimates of 1SW Maine-origin salmon for the 1990 fishery totalled 1,525 fish.

Carlin Harvest, Maine-Origin Salmon

Year	1985	1986	1987	1988	1989	1990
Harvest	1469	2035	2087	2309	3797	1525

The CWT harvest estimate for Maine-salmon in 1990 was 1,613 fish.

CWT harvest, Maine-Origin Salmon

Year	1987	1988	1989	1990
Harvest	5571	3882	2857	1613

The proportional harvest method provides estimates of harvest significantly higher than the CWT method in recent years (Figure 3.1.3). As escapees from North American aquaculture facilities could increase the estimate provided by the proportional method, ACFM recommends further investigation of the possible explanation of the discrepancy between the two methods.

3.1.4 Patterns of stock composition in the harvest

The recoveries of micro-tagged salmon indicated a north-south trend for tagged North American stocks in some years, with greater numbers in the northern NAFO Divisions. This trend was not as evident for the distribution of European tags. Analysis of the proportions of continental-origin derived from scale characters indicated no consistent north-south distribution of North American or European components. However, in recent years there was an increase in the North American Component at West Greenland.

3.2 Description of Homewater fisheries

European homewater fisheries

Tagging experiments have demonstrated that all countries listed in the National Catch Table (Table 1.1) contribute fish to the West Greenland fishery.

However, stocks from these countries contribute to the fishery to differing extents both because the proportion of MSW salmon in the stocks varies and because of differences in their migratory behaviour in the sea. Although the relative contributions have not been estimated precisely, MSW stocks from UK, Ireland and France are thought to contribute to the fishery at a higher rate than Scandinavian stocks.

MSW salmon stocks have been in decline in many parts of Europe for at least the last 20 years. The extent of the change varies, but catches in some rivers which used to support mainly MSW salmon are now mainly 1SW fish (e.g., Rivers Exe and Eden in UK(England and Wales)).

The closure of the Norwegian drift net fishery has had beneficial effects on other fisheries in Norway, Finland, Russia, and Sweden. The catch in Finland was the highest since the mid 1970s, but exploitation rates were decreased on several rivers in Russia in 1991 to provide increased spawning escapement. Rivers in Sweden, along with many in UK, Ireland and France have

experienced low flows in 1990 and 1991, and these have had adverse affects on catches.

The marine survival of several monitored European stocks has been low in some recent years, particularly for the 1989 and 1990 smolt year classes. This appears to have been reflected more widely in the poor catches of 1SW fish in 1990 and both 1SW and 2SW fish in 1991. Additional information on fisheries in the North East Atlantic is contained in Section 2.

North America Homewater Fisheries

The Canadian homewater fisheries consist of commercial, recreational, and native food fisheries. There were about 3,300 commercial fishermen licensed to fish for salmon primarily with shore-fast set gillnets. The 1991 fisheries were under quota management with either quotas set for specific salmon fishing areas or for individual fishermen. The total commercial landings in Canada during 1991 were 512 t. Recreational fisheries occurred in all Canadian Atlantic provinces. Anglers were permitted to fish only with artificial flies and were restricted by daily and seasonal retention limits. Retention of salmon >63 cm was permitted only in Quebec and Labrador. Some rivers had specific quotas. In 1991 there were about 282,700 rod days of fishing effort which resulted in a catch of 132 t of salmon. Several native groups were permitted to fish for salmon for food in four provinces (Quebec, New Brunswick, Nova Scotia, and Newfoundland and Labrador). The total harvest in all of these fisheries was 29 t. Commercial fisheries in Canada harvest salmon of USA origin.

The USA homewater fisheries consist only of recreational fisheries in the state of Maine. Anglers were permitted to fish only with artificial flies. There were daily and seasonal retention limits. In 1991, there were 3,157 licensed anglers and a harvest of 238 salmon. Additional information on fisheries in North America is contained in Section 4.

3.3 Stock Abundance and Exploitation at West Greenland

The "top-down" constraints run-reconstruction model was improved to include an additional constraint related to catches of grilse in Canada during the same year as the fishery in Greenland. Data necessary to complete this task were available for the fishery years 1983 to 1990 at West Greenland. Model outputs also were used to derive a range of abundance estimates for North American and European stocks at West Greenland prior to the fishery.

Abundance estimates for North American stocks were then used to define a range of estimates of pre-fishery abundance. A simple model was developed to illustrate the effects of various combinations of catches on the numbers of fish returning to spawn in North America. The effects of these catch combinations were illustrated for varying levels of pre-fishery abundance for 1SW salmon destined to return as 2SW spawners.

The implementation of catches required to meet specific escapement targets for various levels of abundance would depend on some pre-season indices of abundance of salmon in the Greenland fishery area.

3.3.1 Determining abundance of North American and European salmon at West Greenland

Application to North American Stocks

The constraints model was used to estimate feasible ranges of exploitation rates for Canada and Greenland for 1983 to 1990 fishery years. The average minimum and maximum exploitation rates for Canada were 57 and 70% respectively. For Greenland the average minimum and maximum exploitation rates depend on the fraction unavailable (FU parameter). When FU was assumed to be 0.05, the average minimum and maximum exploitation rates in Greenland were 25 and 36%, respectively. Exploitation rates in 1983 and 1984 were particularly low, an observation consistent with the low catches in those years. Exploitation rates between 1985 and 1988 were about twice as high (about 30 to 50%); during these years the quota acted to restrict harvests in Greenland. Estimates for 1989 and 1990 are somewhere between the 1983-84 and 1985-88 periods. The 1983-84 and 1989-90 fisheries were unaffected by the quota, suggesting low abundance in the West Greenland area. When the FU parameter is assumed to be 0.3, the estimated range of exploitation rates in Greenland increases over the entire period. The same general patterns described above still apply, with low rates in 1983 and 1984, higher rates ranging between 40 to 58% during the period 1985-88, and intermediate levels in 1989-90.

Year	Exploitation FU = .05		Exploitation FU = .30	
	Min	Max	Min	Max
1983	12	19	16	25
1984	13	21	17	28
1985	29	42	36	51
1986	34	46	41	55
1987	37	49	44	58
1988	30	45	37	55
1989	19	29	24	37
1990	23	36	29	46
Average	25	36	31	44

The total estimated abundance of all non-maturing 1SW salmon of North American origin shows a marked decline since 1986. Estimates were obtained simply by

reconstructing the population for minimum and maximum values of run and harvest (Figure 3.3.1). Thus these estimates represent the entire extant stock. While the data do not indicate abundance by fishing region, the estimates illustrate an over two-fold range of pre-fishery abundance in an 8 year period.

The total abundance of all salmon in the West Greenland area can be estimated by dividing the total catch by the minimum and maximum values of exploitation rates. The derived range of abundance estimates suggest a general downward trend since 1985, regardless of whether FU=0.05 or 0.30. Peak abundance in 1985 probably ranged from 800,000 to 1 million non-maturing salmon of all sea ages (mostly 1SW). Trends for European and North American stocks appear to be more erratic, but both stock complexes exhibit very low abundance in 1989 and 1990.

Year	Total population FU = .05		Total population FU = .30	
	Min	Max	Min	Max
1983	526316	833333	400000	625000
1984	454762	734615	341071	561765
1985	716786	1038103	590294	836250
1986	688761	931853	576055	772756
1987	623878	826216	527069	694773
1988	624044	936067	510582	758973
1989	404897	618000	317351	489250
1990	238833	373826	186913	296483

The derived estimates of fishery area exploitation rates apply collectively to most of the North American stocks that frequent the West Greenland area. To the extent that different stocks have different migration patterns, the period of residence within the fishery would determine the actual rate of exploitation on that stock. Fish that reside within the fishery for longer periods would have greater exploitation rates.

This modelling approach could be applied to specific stocks when data are available. The modelling approach has been applied to all Canadian stocks which have a significant proportion of MSW spawners. For these data, the derived exploitation rates apply to the entire group of stocks and, therefore, represent an average rate for that fraction of the population available to Greenland. The input data could be further disaggregated to incorporate stock complexes, such as northern and southern Canada rivers.

Application to European Stocks

ACFM considered ways to apply similar models to the European stocks exploited at West Greenland. Because of the nature of the fisheries, the constraints model cannot be applied directly. ACFM therefore considered a preliminary estimate of the abundance of non-maturing 1SW salmon in the sea at the time of the West Greenland fishery based upon a run-reconstruction approach. Catches of 2SW salmon in homewater fisheries were used to estimate the numbers of 2SW fish returning to each country. These were then used to estimate the numbers that would have been alive in the previous year.

The assessment was carried out for 1990 catches in homewaters. This gave estimates of the numbers of non-maturing 1SW European salmon alive before the 1989 West Greenland fishery of between 915,000 and 1,242,000 salmon. Using the proportion of European salmon estimated to be in the catch that year (44%), the numbers of European fish in the area is estimated to be between 139,635 and 271,920. This therefore suggests that between 11% and 30% of all the non-maturing 1SW European salmon were in the fishery area in 1989.

It is important to note, however, that there is a marked difference in the proportions of the stocks from the northern and southern countries that go to the West Greenland area.

3.3.2 Modelling interactive effects between abundance and exploitation rates at West Greenland in relation to achievement of North American spawning targets

The number of 2SW spawners migrating to Canadian rivers can be expressed as a function of 1SW catch in Canada (*C1*) and Greenland (*G1*), and 2SW catch in Canada (*C2*) for varying levels of pre-fishery abundance (N1). To illustrate potential utility of the approach, various combinations of catches (*G1*, *C1*, and *C2*) on estimated numbers of spawners were computed for various levels of *N1*. Results illustrate that a wide variety of catches would allow equivalent numbers of spawners to return.

The target number of spawners necessary to achieve conservation objectives can be called *R2_target*. ACFM considered a provisional estimate of *R2_target* of about 175,000 which represents the sum of target spawning requirements for all Canadian rivers. At low levels of pre-fishery non-maturing 1SW abundance (*N1* = 200,000; Figure 3.3.2.1) there would be insufficient numbers of spawners (*R2*) to allow harvest in either Canada or West Greenland. At moderate (*N1*=400,000) and higher (N1=600,000) levels of abundance (Figures 3.3.2.2-3.3.2.3), a range of catch allocations among fisheries (*C1 vs G1*) or years (*G1,C1 vs C2*) would permit sufficient numbers of spawners within safe biological limits, provided that targets for component stocks were met. Based on observed projections since 1983 (Figure 3.3.1), a reasonable range of *N1* values is 200,000 to 600,000 salmon.

ACFM identified several problems with using abundance and exploitation information to provide management advice, especially in relation to spawning targets. Although the combined target spawning requirements for Canadian rivers is probably between 150,000 and 200,000 2SW salmon, meaningful catch advice to provide sufficient spawning escapement for individual stocks is not readily available due to the varying proportions of stocks contributing to the fisheries. Previously, the Working Group (C.M.1982/Assess:19, C.M.1984/Assess:16) advised that "it is not possible at the present time to estimate and advise on a single TAC which would maintain homewater stocks and safeguard the spawning within safe biological limits". It was further advised that regulation by a single TAC would not seem to be a practical method to adequately ensure spawning escapement within safe biological limits for stocks which are, in part, harvested in mixed stock fisheries (C.M.1984/Assess:16).

ACFM, however, noted that if current catches are adversely affecting the total stock, then reductions in catches would benefit the population as a whole. Benefits to specific stocks however, could not be predicted. A method of developing a TAC which reduces catches when stocks are low would provide a means of indicating when catch reductions are biologically justified. Present methods for setting catch levels irrespective of population size pose an even greater risk to the total population during periods of low stock abundance. Future management advice could be improved as additional information on particular stocks becomes available.

ACFM considered two approaches for improving catch advice. Estimates of spawning targets could be improved by taking known individual river spawning targets and scaling these up regionally to identify a minimum overall North American target. Another alternative would be to group North American 2SW-producing stocks into "stock complexes" based on river age distributions and evaluate their contribution to catches in Canada and Greenland.

3.3.3 Indices of abundance at West Greenland

ACFM examined information from Canada which may provide a pre-season index of abundance of North American fish at West Greenland. Among several significant relationships, the predictor judged to have the greatest management potential was the count of "small" salmon in the Millbank trap on the Miramichi River. The relationship of numbers of North American river age 4 and older fish caught in the first two weeks of fishing at West Greenland on catch in number of small salmon in Labrador was also significant. In order for this relationship to be of use to management as an index of abundance of salmon at Greenland, a data series of catches of small salmon in Labrador up to a specific date would have to be developed.

It was felt that many European stocks would be unlikely to provide a pre-season index of abundance at West Greenland due to the 1SW returns being spread over the middle and latter parts of the year and being very variable. However, the Working Group recommended that data from fisheries, river counts and traps be examined further to evaluate this possibility.

3.3.4 Exploitation of Maine-origin (USA) salmon

The extant exploitation rates for 1SW Maine salmon in 1990 were lower than in the previous year but still higher than the long-term average. The extant exploitation rates for 2SW salmon in 1990 were higher than the average for the time series.

Fishery area exploitation for 1990 show exploitation in Canada and Greenland are unchanged compared to the previous year. The effects of different reporting rates of Carlin tags and different proportions of the stock population available to each fishery, are presented in Figure 3.3.4 and these indicate the possible range of fishery area exploitation in 1987-1990.

Estimates of exploitation rates for Maine stocks in Canada and Greenland are generally higher than those estimated by the continental run reconstruction model. Those estimates of fishery area exploitation rates are based on the aggregate behaviour of many hundreds of stocks. Maine stocks are near the southern boundary of Atlantic salmon habitat and likely have different migration routes than the major Canadian stocks.

3.4 Advice on Catch Levels at West Greenland

ICES was asked to propose and evaluate methods to estimate possible catch levels based upon maintaining adequate spawning biomass. The general concerns about the difficulties of applying a TAC are expressed in Section 3.3.2. Although advances has been made in our understanding of population dynamics of Atlantic salmon and the exploitation occurring in the fisheries, the concerns about the implications of application of TACs to mixed stock fisheries are still relevant.

ACFM considered how the predictive measures of abundance could be implemented to give annual catch advice. The aim of the advice would be to limit catch to a level that would facilitate achieving overall spawning escapement equivalent to the sum of spawning targets in individual North American and European rivers (when the latter have been defined). To achieve the desired level of exploitation, for a given level of predicted abundance, either a TAC could be fixed or some form of effort limitation introduced.

Effort limitation would, in theory, provide a greater range of options for management, such as season length

restrictions, regulating the number of boats or licenses or closed periods in the fishery. However, no reliable data exist on the relationship between effort and exploitation in the fishery.

The methodology employed in Section 3.3.2 simply defines the tradeoffs in catches of non-maturing 1SW salmon in Canada and Greenland and 2SW catches in Canada in the following year. In particular, it defines a set of feasible combinations that may ensure that an overall spawning target is met. The advice for any given year is dependent on obtaining a reliable predictor of total non-maturing 1SW abundance for North American stocks. Since pre-fishery abundance for year i is the sum of the catches in year i and catches plus returns in year i+1, the advice for year i+1 fisheries (2SW) could be improved by updating the prediction conditioned on the 1SW catches in year i. For the 1983-1990 data the regression between total 2SW returns plus 2SW catches and total 1SW catches had a coefficient of determination of 0.76. More importantly, the standard error of the prediction was relatively small (i.e., 25,000 fish). Hence, management corrections for 2SW catches may be possible.

In contrast, prediction of pre-fishery abundance of 1SW salmon destined to return as 2SW salmon (*NI*) is much more difficult, as described in previous sections. One possibility would be to use simple trend analysis of the abundance data in Figure 3.3.1 to project future abundance. Such predictions could have wide prediction intervals and it would be important to proceed cautiously by using the lower range of predicted abundance levels for management decisions. Further analysis of the error structure of the *NI* abundance estimates might provide a means of imputing error bounds on the projections. In turn, these error bounds could be incorporated into the catch advice and expressed in terms of the likelihood of achieving spawning targets.

3.5 By-catches in the Greenland Salmon Drift-Net Fishery

By-catch information for the West Greenland salmon drift-net fishery is not routinely recorded. The only information available on by-catch was collected during research investigations of 1970s and in 1980s is not considered applicable to the present fishery due to changes in fishing patterns. Details of these earlier investigations can be found in the Report of the Working Group (C.M.1992/Assess:15).

3.6 Adequacy of Sampling Program at West Greenland

The sampling program at West Greenland was found to be of adequate spatial coverage but of inadequate temporal coverage in some years. ACFM recommends the program be expanded in one or two locations by one to two weeks of additional sampling.

4 INFORMATION OF INTEREST TO THE NORTH AMERICAN COMMISSION

4.1 Description of the Fisheries in Canada

The following were new management measures for commercial fisheries in 1991:

1) In 1991, quotas for the Newfoundland commercial salmon fishery were lower by the following amounts in these Salmon Fishing Areas (SFAs) of Newfoundland: SFA 3 (35 t), SFA 4 (22 t), and SFA 13 (10 t). Salmon Fishing Area 1 had an allowance of 80 t, the same as in 1990 (an allowance is an estimate of expected catch and not a limitation on allowable harvest). In other SFAs, quotas remained as in 1990.

2) In the Québec commercial fishery, the quota in Q7 was reduced by 34% (from 2755 to 1809 fish), commensurate with a reduction in a number of licenses under a buy-back program. In Q8 and Q9, the quota and fishing seasons remained essentially the same as they were in 1990.

The following were new management measures for recreational fisheries in 1991:

1) The seasonal bag limit for the recreational fishery of Newfoundland-Labrador was reduced from 15 to 10 fish. For conservation reasons, most rivers in SFAs 22 and 23 (Inner Bay of Fundy) were not opened to recreational fishing.

The total salmon landings for Canada in 1991 were 679 t; this is the lowest recorded landing in the 1960-91 data set. Of the total Canadian landings by weight, 25% were in Québec, 68% in Newfoundland and Labrador, and 8% in the Maritime Provinces. The recreational fisheries harvested 20%, commercial fisheries 75%, and the native food fisheries 4% of the total landings by weight.

1991		
SFA	Catch (t)	Quota (t)
1	7	80[1]
2	79	200
3	108	120
4	52	78
5	18	25
6	19	20
7-11	70	82
13-14	81	75
Q7-9	77	NA[2]
Q11	1	15

[1]Allowance.
[2]Not applicable.

Catches in the Newfoundland commercial fishery are given in text table below:

Newfoundland Commercial Fishery

Year	1986	1987	1988	1989	1990	1991
Catch (t)	1230	1485	972	867	618	434[1]

[1]Preliminary.

4.1.1 Composition and origin of the catch in 1991

Only salmon of Canadian and USA origin were caught in Canada during 1991. Recaptures of tagged 1SW salmon of USA and Canadian origin occurred in the Newfoundland and Labrador fisheries.

4.1.2 Historical data on tag returns and harvest estimates

ACFM updated the time series of Carlin tag returns and harvest estimates of Maine-origin 1SW salmon in Newfoundland and Labrador. The total harvest of 780 Maine-origin salmon in the 1990 fishery was distributed primarily in SFAs 2-4.

Carlin Harvest, Maine-Origin Salmon

Year	1985	1986	1987	1988	1989	1990
Catch (t)	2288	552	580	393	1722	780

Comparative harvest estimates based on CWT and Carlin tag recoveries were calculated for the communities and Statistical Sections sampled.

4.1.3 Exploitation rates

Exploitation rates for the fisheries in the Miramichi and Margaree were updated and adjusted for mark-recapture techniques. Exploitation is similar to what was previously reported and ranged from 38 to 55%.

4.2 Description of Fisheries in the United States of America

There were no new management measures instituted in the USA during 1991. Recreational catches of Atlantic salmon of 238 were about 63% lower in 1991 than in 1990. The decreased catch was attributed to smaller runs of salmon and slightly (4%) lower license sales. The number of salmon caught and released in Maine rivers exceeded the number caught and killed.

The average exploitation rate on salmon on all age classes in the Penobscot River was 11.5% which is slightly lower then the exploitation rate (13.5%) observed in 1990.

4.3 Description of Fisheries in France (Islands of St. Pierre and Miquelon)

Catch of salmon for the Islands of St. Pierre and Miquelon in 1991 was 1 t. There were 13 professional fishermen and 37 recreational fishermen in 1989. Tag returns from previous years indicate that salmon of Canadian and USA-origin have been caught in the fisheries of St. Pierre and Miquelon

4.4 Effects of Quota Management Measures Taken in 1990 and 1991 in Newfoundland-Labrador Commercial Fisheries

4.4.1 Effects on Canadian stocks and fisheries

The quantities of large and small salmon affected by the early closure of the fisheries were evaluated by applying the closure date in each SFA, in 1990 and 1991, to the temporal distribution of the landings in each SFA and year, 1984-89.

For 1990, the estimated mean total weight of salmon not caught due to the early closure of the fisheries was 79 t of small salmon and 39 t of large salmon. The estimated mean numbers of fish not caught were 41,600 small salmon and 8,600 large salmon. The mean predicted weight of small salmon not caught in 1991 is 21 t and for large salmon is 9 t. These weights are equivalent to about 12,600 small salmon and 2,500 large salmon.

In both 1990 and 1991, the quota had a greater effect on proportionally reducing the catch of small salmon than large salmon in most SFAs. This difference in reduction

was expected because the large salmon tend to migrate earlier along the coast than small salmon.

4.4.2 Effects on USA stocks

The mean percent harvest on 1SW Maine-origin salmon which would not have been caught if the 1991 closure dates were in effect during fishery years 1984-89 is 16%. This is 63% less than if the closure dates from the 1990 fishery were used to evaluate the fishery. This difference suggests that the quotas in 1991 were less effective in proportionally reducing the harvest than in 1990.

4.5 By-catches of Fish, Birds and Marine Mammals in Salmon Drift-net Fisheries

ACFM is not aware of any legal or illegal drift-net fisheries for salmon in the North American Commission area.

Table 1.1

Nominal catch of SALMON by country (in tonnes round fresh weight), 1960-1991 (1991 provisional figures).

Year	Canada (4)	Den.	Faroes	Finland	France	East Grld.	West Grld.	Iceland	Ireland (1)	Norway (3)	Russia	St. P & M.	Sweden (W. C.)	UK E. & W.	UK Scotland	UK N.I.(1,2)	USA	Others (5)	Total
1960	1636	-	-	-	-	-	60	100	743	1659	1100	-	40	283	1443	139	1	-	7204
1961	1583	-	-	-	-	-	127	127	707	1533	790	-	27	232	1185	132	1	-	6444
1962	1719	-	-	-	-	-	244	125	1459	1935	710	-	45	318	1738	356	1	-	8650
1963	1861	-	-	-	-	-	466	145	1458	1786	480	-	23	325	1725	306	1	-	8576
1964	2069	-	-	-	-	-	1539	135	1617	2147	590	-	36	307	1907	377	1	-	10725
1965	2116	-	-	-	-	-	861	133	1457	2000	590	-	40	320	1593	281	1	-	9392
1966	2369	-	-	-	-	-	1370	106	1238	1791	570	-	36	387	1595	287	1	-	9750
1967	2863	-	-	-	-	-	1601	146	1463	1980	883	-	25	420	2117	449	1	-	11948
1968	2111	-	5	-	-	-	1127	162	1413	1514	827	-	20	282	1578	312	1	403	9755
1969	2202	-	7	-	-	-	2210	133	1730	1383	360	-	22	377	1955	267	1	893	11540
1970	2323	-	12	-	-	-	2146	195	1787	1171	448	-	20	527	1392	297	1	922	11241
1971	1992	-	-	-	-	-	2689	204	1639	1207	417	-	18	426	1421	234	1	471	10719
1972	1759	-	9	32	34	-	2113	250	1804	1568	462	-	18	442	1727	210	1	486	10915
1973	2434	-	28	50	12	-	2341	256	1930	1726	772	-	23	450	2006	182	2.7	533	12746
1974	2539	-	20	76	13	-	1917	225	2128	1633	709	-	32	383	1708	184	0.9	373	11941
1975	2485	-	28	76	25	-	2030	266	2216	1537	811	-	26	447	1621	164	1.7	475	12209
1976	2506	-	40	66	9	<1	1175	225	1561	1530	772	2.5	20	208	1019	113	0.8	289	9536
1977	2545	-	40	59	19	6	1420	230	1372	1488	497	-	10	345	1160	110	2.4	192	9495
1978	1545	-	37	37	20	8	984	291	1230	1050	476	-	10	349	1323	148	4.1	138	7650
1979	1287	-	119	26	10	<1	1395	225	1097	1831	455	-	12	261	1076	99	2.5	193	8089
1980	2680	-	536	34	30	<1	1194	249	947	1830	664	-	17	360	1134	122	5.5	277	10080
1981	2437	-	1025	44	20	<1	1264	163	685	1656	463	-	26	493	1233	101	6	313	9929
1982	1798	-	865	54	20	<1	1077	147	993	1348	354	-	25	286	1092	132	6.4	437	8634
1983	1424	-	678	57	16	<1	310	198	1656	1550	507	3	28	429	1221	187	1.3	466	8731
1984	1112	-	628	44	25	<1	297	159	829	1623	593	3	40	345	1013	78	2.2	101	6892
1985	1133	-	566	49	22	7	864	217	1595	1561	659	3	45	361	913	98	2.1	-	8095
1986	1559	-	530	38	28	19	960	310	1730	1598	608	2.5	54	430	1271	109	1.9	-	9248
1987	1784	-	576	49	27	<1	966	222	1239	1385	564	2	47	302	922	56	1.2	-	8142
1988	1311	-	243	34	32	4	893	396	1874	1076	419	2	40	395	882	114	0.9	-	7716
1989	1139	-	364	52	14	<1	337	278	1079	905	359	2	29	296	895	142	1.7	-	5893
1990	911	13	315	59	15	<1	227	426	586	930	315	2	33	338	624	94	2.4	-	4890
1991	679	3.3	95	69	13	4	437	519	422	885	215	1	38	199	395	55	0.8	- -	4030

1. Catch on River foyle allocated 50% Ireland and 50% Northern Ireland.

2. Not including angling catch (mainly grilse).

3. Before 1966, sea trout and sea charr included (5% total).

4. Includes estimates of some local sales and by-catch.

5. Includes catches in Norwegian Sea by vessels from Denmark, Sweden, Germany, Norway and Finland

Table 1.4 Inventory of Parasites and Diseases of Wild and Reared Salmon in Countries in the West Greenland and N.E. Atlantic Commissions Areas of NASCO (no information was made available for Belgium, CIS, Denmark, England, Finland, Greenland, Netherlands, Spain or Sweden).

F = Found in farmed fish.
W = Found in wild fish.
0 = Looked for but not found.
Blank = No records.

Diseases	FAROES	FRANCE	ICELAND	IRELAND	NORWAY	SCOTLAND
A. Viral Diseases						
VHS	0	0	0	0	0	0
IHN	0	0	0	0	0	0
IPN	F	F	0	F	FW	FW
Viral papilloma				FW	FW	FW
VEN/EIBS	F	0		F	FW	F
Swim bladder tumor				0		F
B. Diseases of unknown etiology						
Pancreas Disease	0	F		F	F	F
ISA		0			F	0
Epitheliocystis			F		F	
C. Bacterial diseases						
Aeromonas salmonicida	FW	F	F	FW	FW	FW
Aeromonas sp. (motile)	F	F	F	FW	FW	FW
Renibacterium salmoninarum	F	0	FW	0	FW	FW
Yersinia ruckeri	0	0	F	F	F	F
Vibrio sp.	F	F	F	FW	FW	FW
V. anguillarum	F	F	F	FW	FW	
Vibrio salmonicida	F	0	0	0	F	F
Flexibacter columnaris		F		F	FW	FW
Flexibacter sp.	F				F	
Pseudomonas sp.	F		F	FW	F	F
Serratia sp.				0		F
Lactobacillus sp.			F			
Mycobacterium sp.			F		FW	

Table 1.4 (cont'd)

Diseases	FAROES	FRANCE	ICELAND	IRELAND	NORWAY	SCOTLAND
D. Fungal infections						
Ichthyophonus hoferi		0		W	FW	W
Exophiala salmonis		F	F	F	F	F
Phoma herbarum		0		F	F	F
Saprolegnia parasitica				FW	FW	
Saprolegnia sp.		FW		FW	FW	FW
Saprolegnia diclina				0		F
Dermocystidium sp.					FW	F
Paecilomyces farinosus				0	F	F
Phialophora sp.				F		F
E. Protozoan infections						
Myxobolus neurobius					F	W
Myxidium truttae						W
Myxidium oviforme					W	W
PKX organism (probable myxosporid)				F	FW	F
Ichthyobodo (Costia) necatrix	FW	F	F	F	F	FW
Ichthyophthirius multifiliis		F		F	FW	FW
Hexamita sp.				F	F	F
Trichodina sp.	F	F		FW	F	FW
Leptotheca sp.					FW	FW
Epistylis sp.					F	F
Apiosoma sp.					FW	F
Scyphidia sp.	F			F	FW	FW
Chilodonella cyprini					FW	FW
Trichophyra sp.				F	FW	F
F. *Monogeneans*						
Gyrodactylus derjavini					FW	FW
Gyrodactylus truttae					FW	FW
Gyrodactylus salaris					FW	0
Discocotyle sagittata					W	W
G. *Trematodes*						
Crepidostomum farionis				W	W	W
Diplostomum spathaceum				W	W	W
Diplostomum sp.				FW	W	W
Apatemon sp.						W
Phyllodistomum simile						W
Hemiurus sp.					W	W
Derogenes sp.					FW	W
Lecithaster sp.						W
Brachyphallus sp.						W
Tetracotyle sp.					W	W

continued

Table 1.4 (cont'd)

Diseases	FAROES	FRANCE	ICELAND	IRELAND	NORWAY	SCOTLAND
H. *Cestode infections*						
Cyathocephalus truncatus					W	W
Diphyllobothrium ditremum larvae				W	W	FW
Diphyllobothrium dendriticum larvae				FW	W	FW
Diphyllobothrium sp. larvae				W		W
Eubothrium crassum				FW	FW	FW
Hepatoxylon sp. larvae						W
I. Nematode infections						
Anisakis sp. larvae				W	FW	W
Hysterothylaceum sp. (larvae and adults)					FW	W
Capillaria salvelini						W
Capillaria sp.						W
Metabronema sp.					W	W
Rhabdochona salvelini						W
Rhabdochona sp.					W	W
Cystidicola farionis						W
Cystidicoloides sp.						W
J. *Acanthocephalan* infections						
Neoechinorhynchus rutili						W
Echinorhynchus truttae						W
Pomphorhynchus laevis						W
Acanthocephalus lucii						W
K. Crustacean infections						
Lepeophtheirus salmonis	FW	F	F	FW	FW	FW
Caligus elongatus	FW	F	F	FW	FW	FW
Salmincola salmonea					FW	W
L. Molluscan infections						
Margaritifera margaritifera (glochidia)				F	FW	F
Mytilus edulis					FW	F
M. Leech infections						
Hemiclepsis marginata						W

continued

Table 2.2.2

Origin of catches of salmon in homewater fisheries.

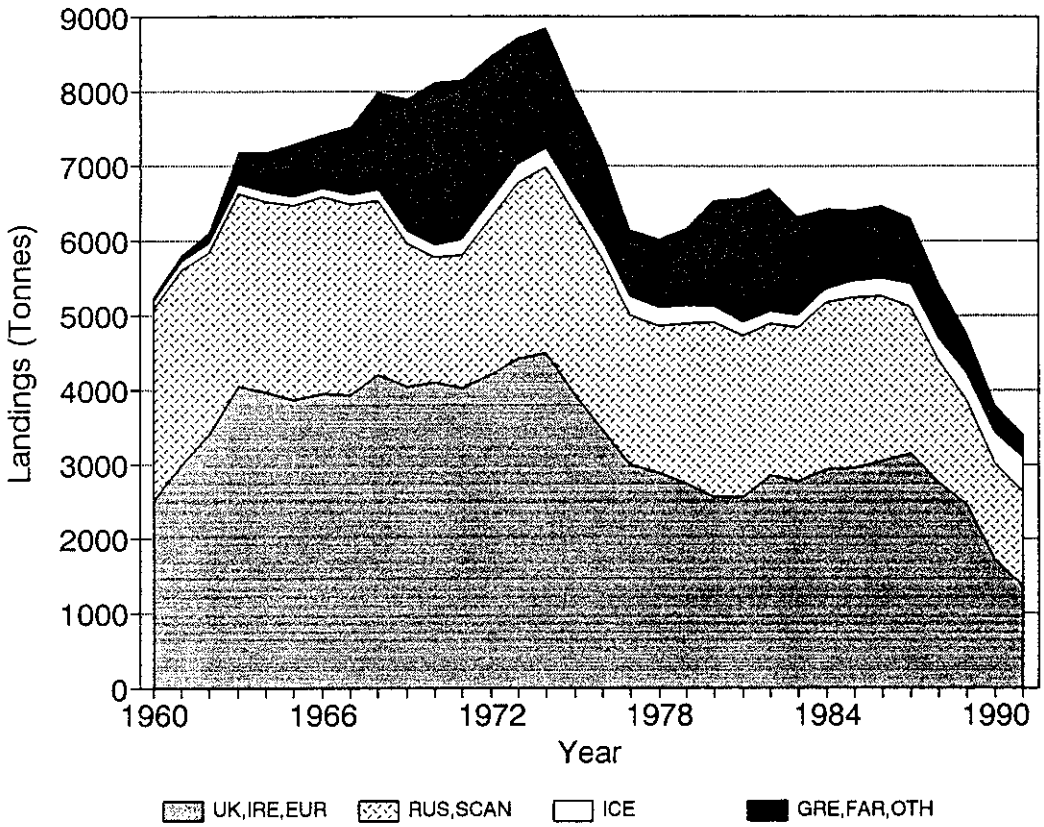
++ = principal component of the catch

+ = other significant contributions

- = occurence

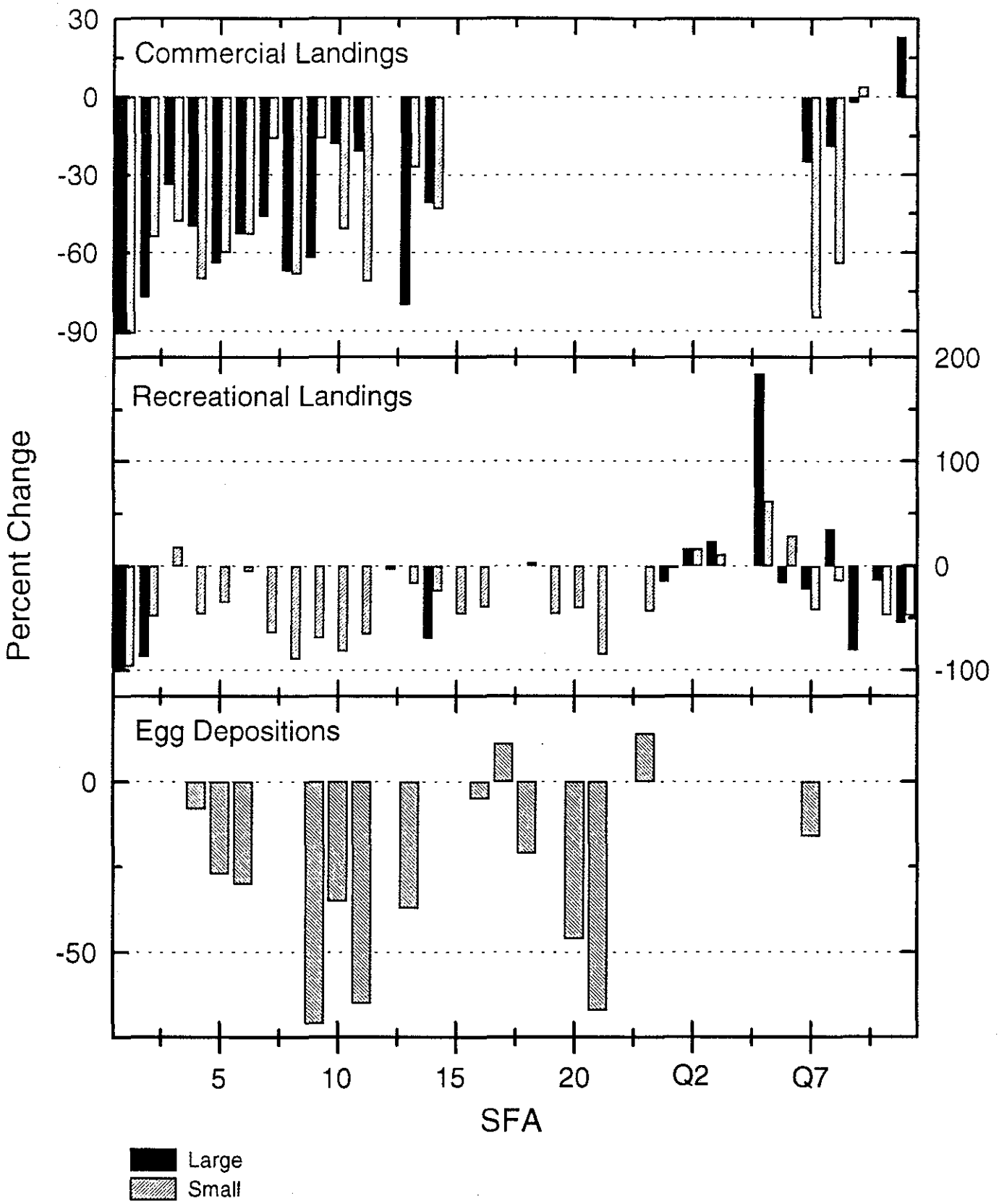
	Catch in Country									
Origin of Catch	Rus	Fin	Nor	Swe	Fr	UK E&W	UK Scot	UK NI	Ire	Ice
Russia	++	-	+							
Finland		++	+							
Norway		+	++	+		-	-		-	
Sweden			+	++						
France					++					
UK (E&W)			-	-	-	++	+	+	+	
UK (Scot)						+	++	+	+	
UK (NI)						-	+	++	+	
Ireland			-	-	-	-	+	+	++	
Iceland			-							++

Figure 1.3.1 Total landings of European stocks in home and distant water fisheries.



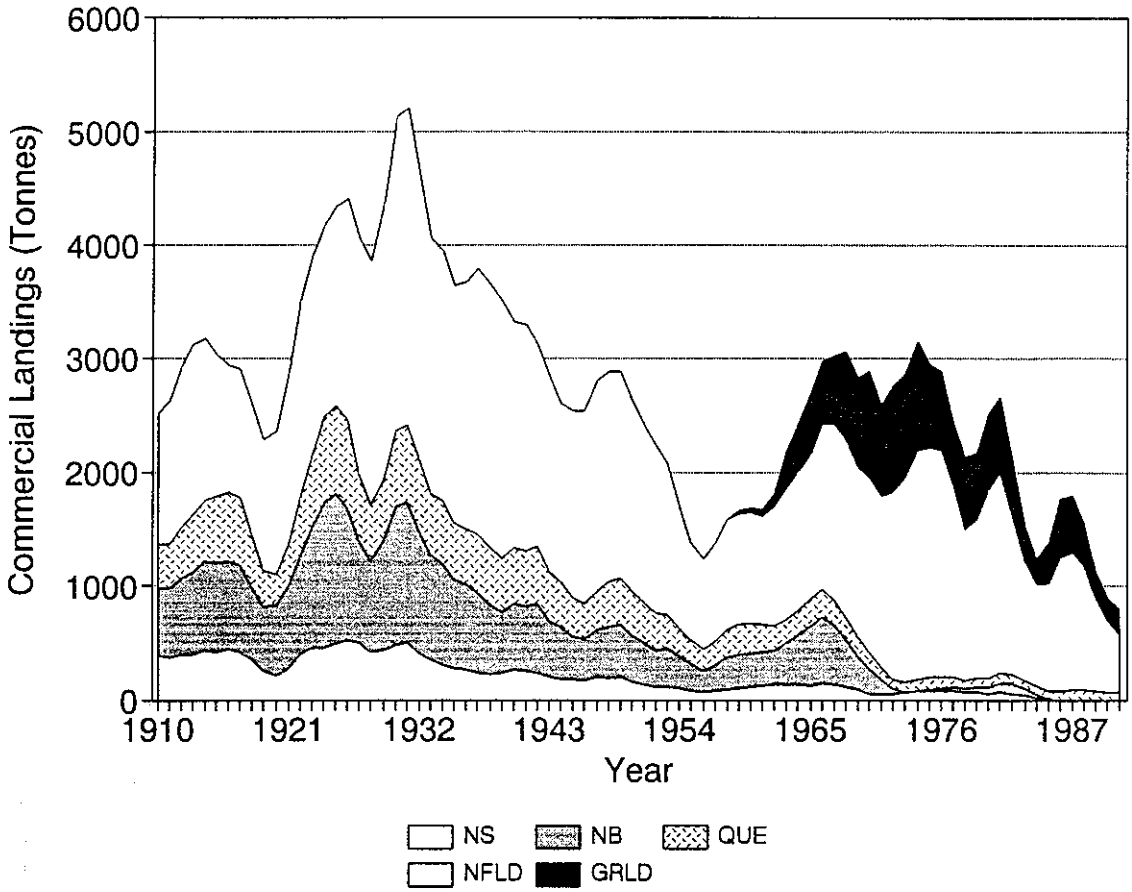
UK,IRE,EUR=United Kingdom, Ireland, mainland Europe
RUS,SCAN=Russia, Scandinavia
ICE=Iceland
GRE,FAR,OTH=European component of Greenland, Faroes, others

Figure 1.3.2.1 Percent change between harvest of salmon in 1991 and the average for 1986-1990 (comm) and 1984-89 (rec) in SFAs or zones of Canada. Percent change in 1991 egg depositions from 1986-90 is for specifc rivers.*



* SFAs without bars (comm) or without bars for large salmon (rec) had no fisheries.

Figure 1.3.2.2 Commercial landings of Canadian origin salmon in home and distant water fisheries.



NS=Nova Scotia
NB=New Brunswick
QUE=Quebec
NFLD=Newfoundland-Labrador
GRLD=North American component of Greenland

Figure 2.1.3 Catch per unit effort (1000 hooks) of salmon by statistical rectangle from logbooks in the 1990/1991 season.

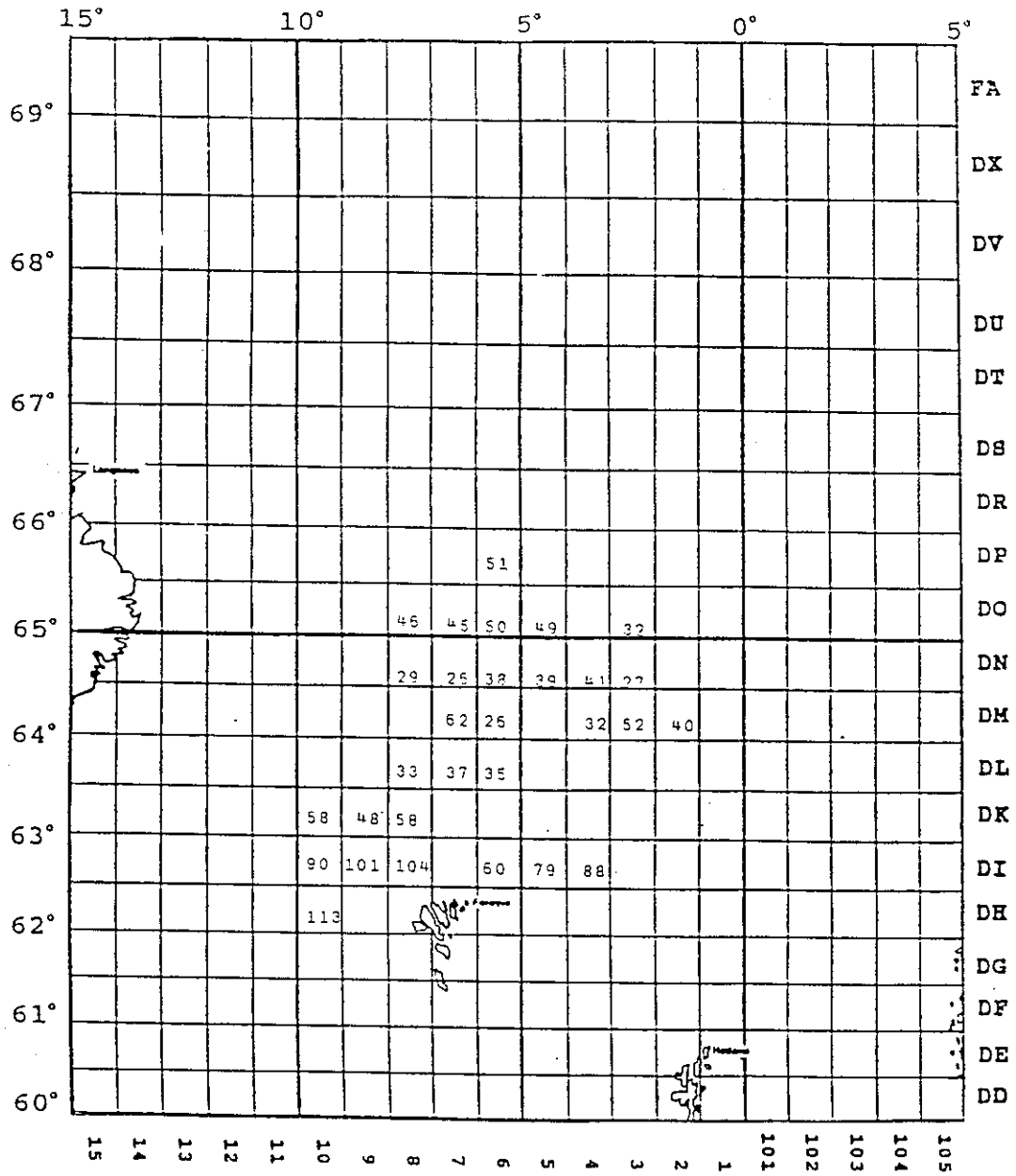


Figure 3.1.3 Harvest with confidence limits for 1987-90.

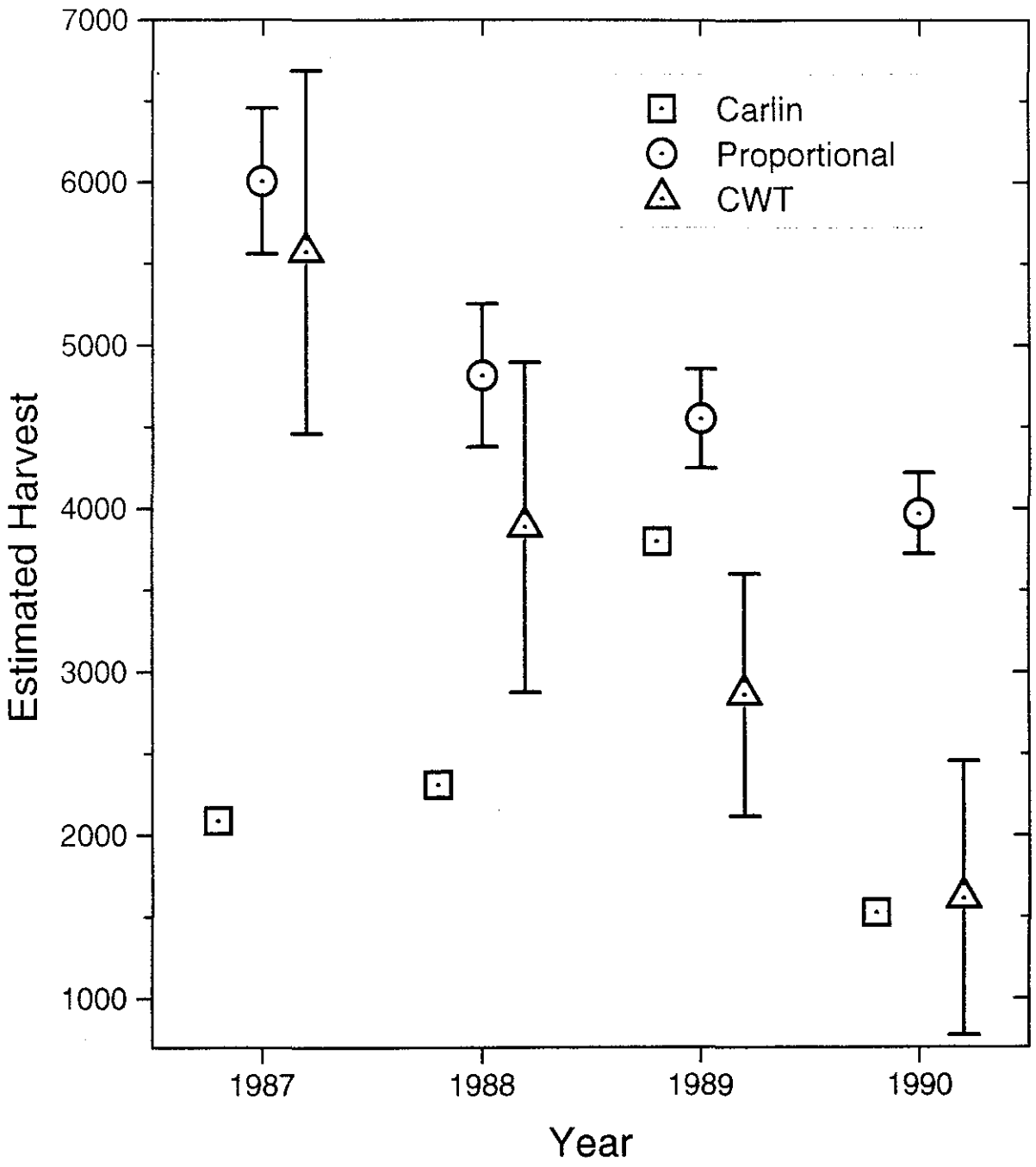


Figure 3.3.1 Estimated pre-fishery abundance (year i) of 1SW salmon of North American origin destined to return as 2SW fish in year (i+1). Estimate includes all salmon regardless of location.

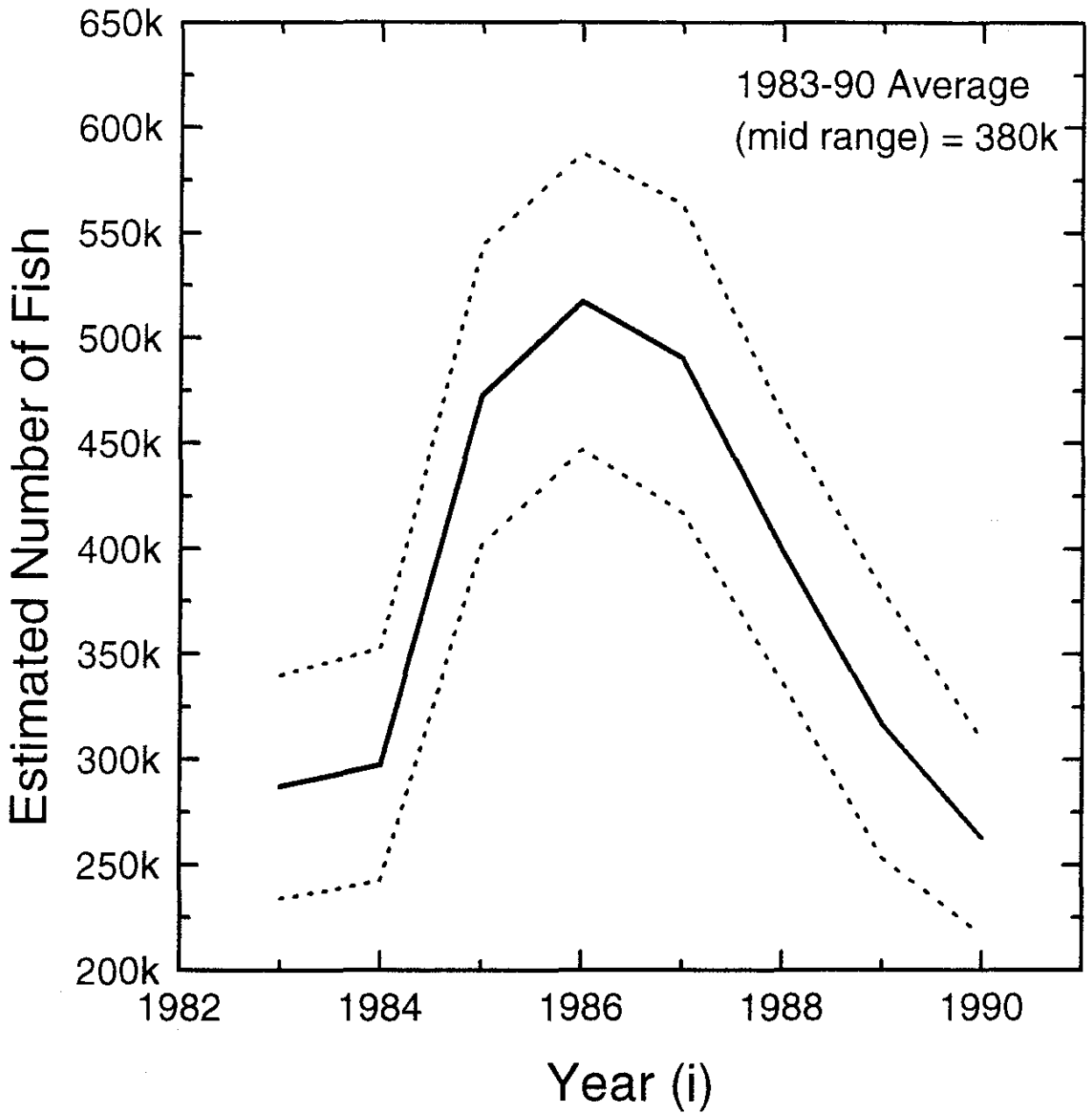


Figure 3.3.2.1 Predicted number of spawners remaining after fisheries on non-maturing 1SW salmon in Canada (C1) and Greenland (G1) and 2SW salmon in Canada (C2). Pre-fishery abundance of 1SW salmon destined to return as 2SW spawners is 200,000 fish.

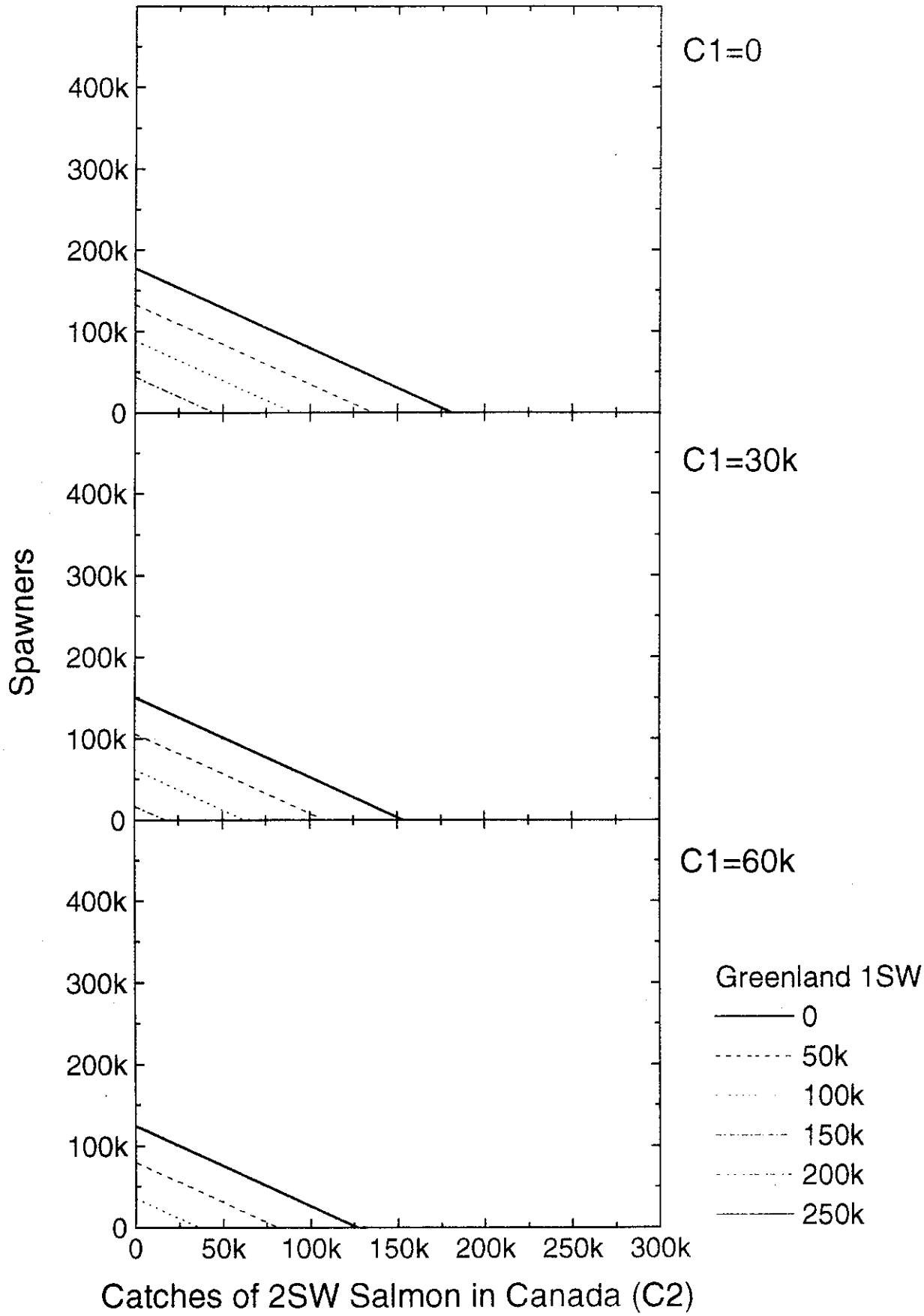


Figure 3.3.2.2 Predicted number of spawners remaining after fisheries on non-maturing 1SW salmon in Canada (C1) and Greenland (G1) and 2SW salmon in Canada (C2). Pre-fishery abundance of 1SW salmon destined to return as 2SW spawners is 400,000 fish.

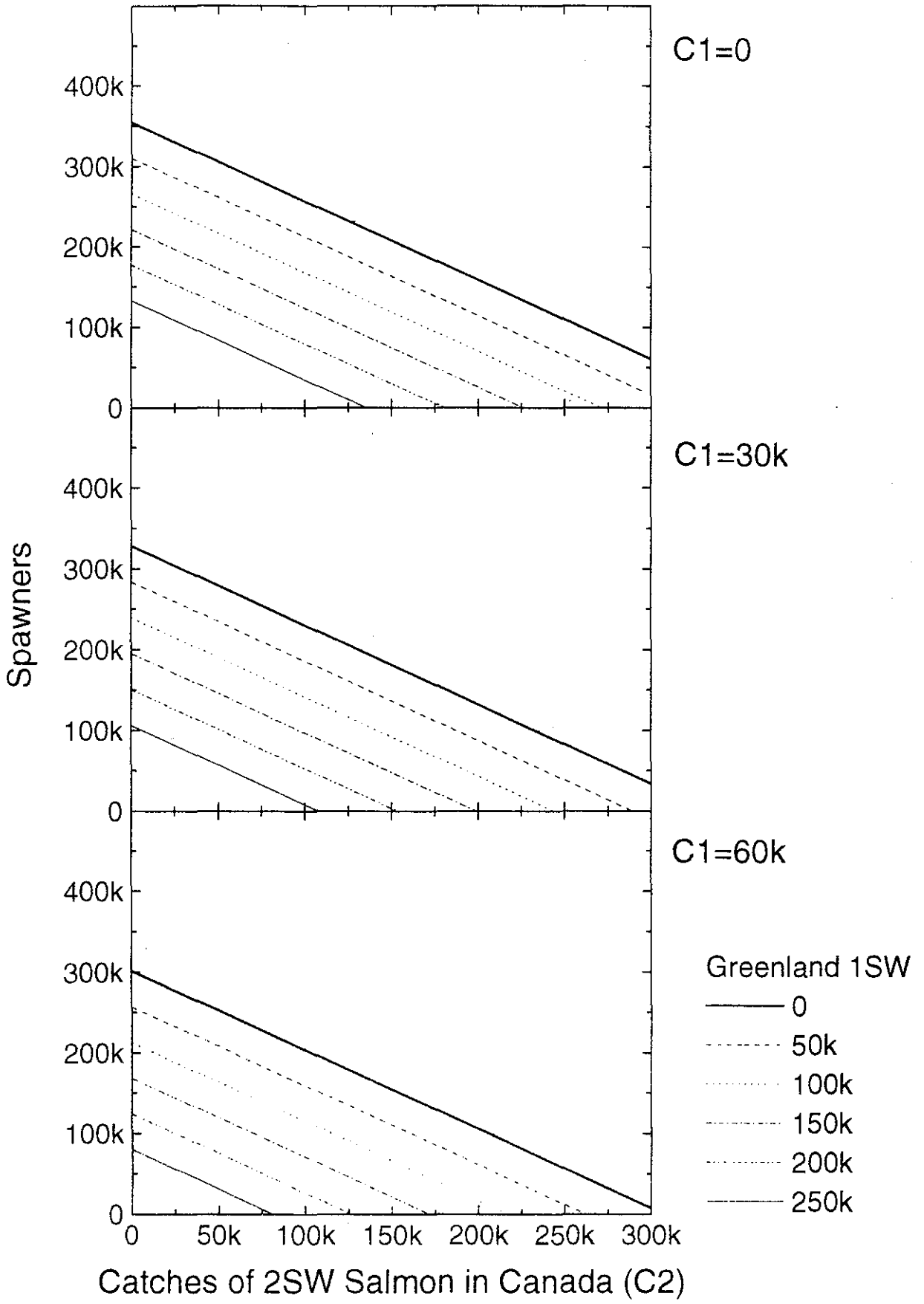


Figure 3.3.2.3 Predicted number of spawners remaining after fisheries on non-maturing 1SW salmon in Canada (C1) and Greenland (G1) and 2SW salmon in Canada (C2). Pre-fishery abundance of 1SW salmon destined to return as 2SW spawners is 600,000 fish.

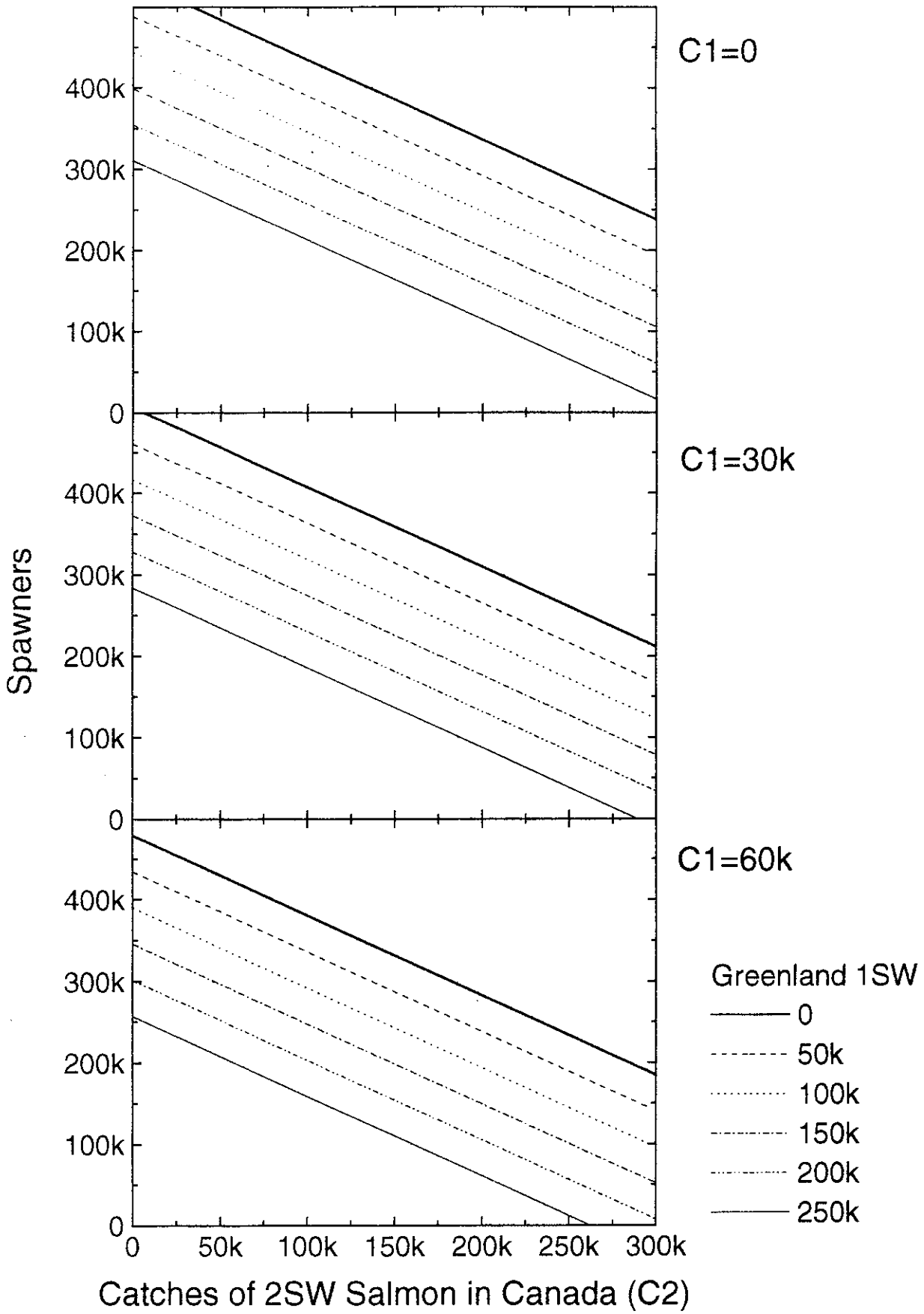


Figure 3.3.4 Effect of Carlin tag reporting rate and proportion of Maine origin stocks available to the fisheries in Greenland and Canada. Upper line of each panel represents fishery area exploitation with a tag reporting rate adjustment of 2; lower line, reporting rate is unadjusted. Midpoint represents average of the perimeter values.