ICES COOPERATIVE RESEARCH REPORT

RAPPORT DES RECHERCHES COLLECTIVES

NO. 210

REPORT OF THE ICES ADVISORY COMMITTEE ON FISHERY MANAGEMENT, 1994

ICES Headquarters, 17-25 May 1994
ICES Headquarters 25 October - 2 November 1994

PART 2

Recommended format for purposes of citation:
ICES. 1995. Reports of the ICES Advisory Committee on Fishery Management, 1994, Part 2. ICES Cooperative Research Report No. 210(2). pp. 222. https://doi.org/10.17895/ices.pub.5319

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

April 1995

ISSN- 2707-7144
ISBN 978-87-7482-454-1

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PART TWO

4. STOCKS IN NEAFC REGIONS 2 AND 3

4.1 Hake in Sub-areas III, IV and VI-IX (Table 4.1.1)

4.1.1 Hake - Northern stock (Division IIIa, Sub-areas IV, VI and VII, and Divisions VIIIa,b)

Catch data (Tables 4.1.1 and 4.1.2):

Year	Rec. TAC	Agreed TAC[2]	ACFM lndgs.	Disc. slip.	ACFM catch
1987	-[1]	63.46	63.3	2.0	65.3
1988	54	66.16	64.8	2.0	66.8
1989	54	59.67	66.5	2.3	68.8
1990	59	65.1	59.9	1.5	61.4
1991	59	67.0	57.6	1.7	59.3
1992	61.5[3]	69.0	56.6	1.7	58.3
1993	-	71.5	52.1	1.5	53.6
1994	<46	60.0			

[1]Based on recent landings. [2]Sum of area TACs corresponding to Northern stock plus Division IIa (EC zone only). [3]Precautionary. Weights in '000 t.

Historical development of the fishery: Since the pre-war period, hake has been the main species supporting the development of the steam-, then motor-trawl, fleets in ports of the Atlantic coasts of France and Spain. In these two countries, which make up about 85% of the landings, it still ranks among the first species in value landed, despite the decline of landings. Hake is present in the catches of nearly all fishery units identified in Sub-areas VII and VIII.

The fishery has been subject to TACs since 1986. Initially these were set on a precautionary basis. In recent years, they exceeded the actual catch possiblities. The fishery is also subject to technical measures regarding mesh sizes of trawls and minimum landing size, but compliance is known to be poor.

State of stock: SSB has been decreasing continuously since 1987, reaching new record-low levels in each year since 1991. Current SSB is about 30% below the long-term average. Fishing mortality has increased steadily since 1988 and is currently at a record-high level. The stock is considered to be outside safe biological limits.

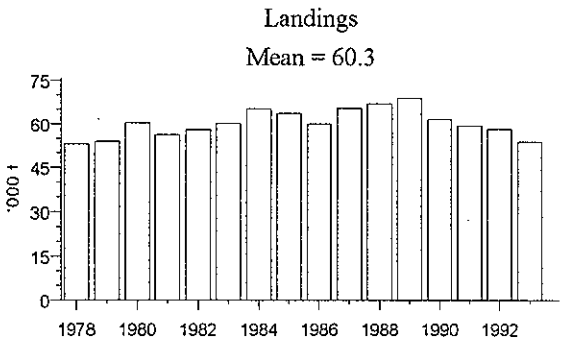
Further details in Table 4.1.2.

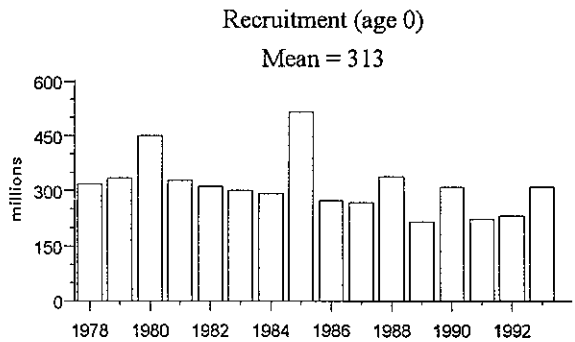
Forecast for 1995:

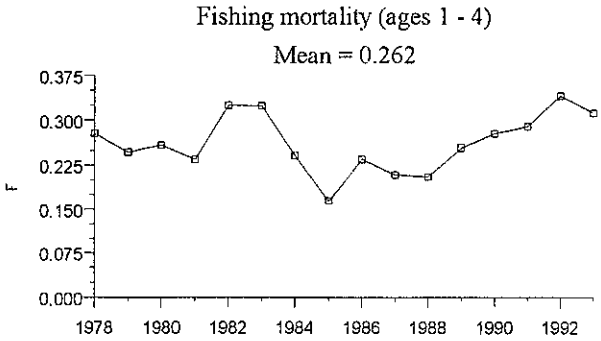
SSB(94) = 113, F(94) = 0.31, Basis:F(94)=F(93), Catch(94) = 47, Landings (94) = 45.

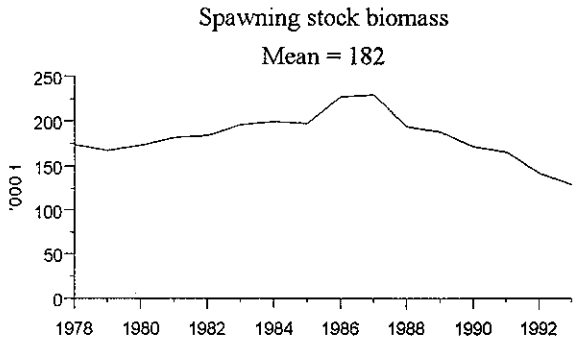
Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	$0.6F_{93}$	0.19	104	29	27	113
B	$0.7F_{93}$	0.22	104	33	31	109
C	$0.8F_{93}$	0.25	104	37	35	105
D	$1.0F_{93}$	0.31	104	45	43	98
E	$1.2F_{93}$	0.37	104	52	49	91

Weights in '000t.









In options B-E given above there will be a continued decrease in SSB and continued fishing at current levels of fishing mortality will lead to a decrease in SSB to a new record low level. A 40% reduction in fishing mortality (option A) is required to stabilise SSB in the short term.

Medium-term considerations: Medium-term predictions indicate that SSB and landings are likely to decrease steadily if the current level of fishing mortality is maintained. A 30% reduction in fishing mortality is required to increase SSB in the medium term to the average of recent years. The results of these simulations, showing the time trajectories of the 25%, 50% and 75% percentiles of the distributions of predicted yield and SSB, are given in the figures headed "medium-term projections" on the next page.

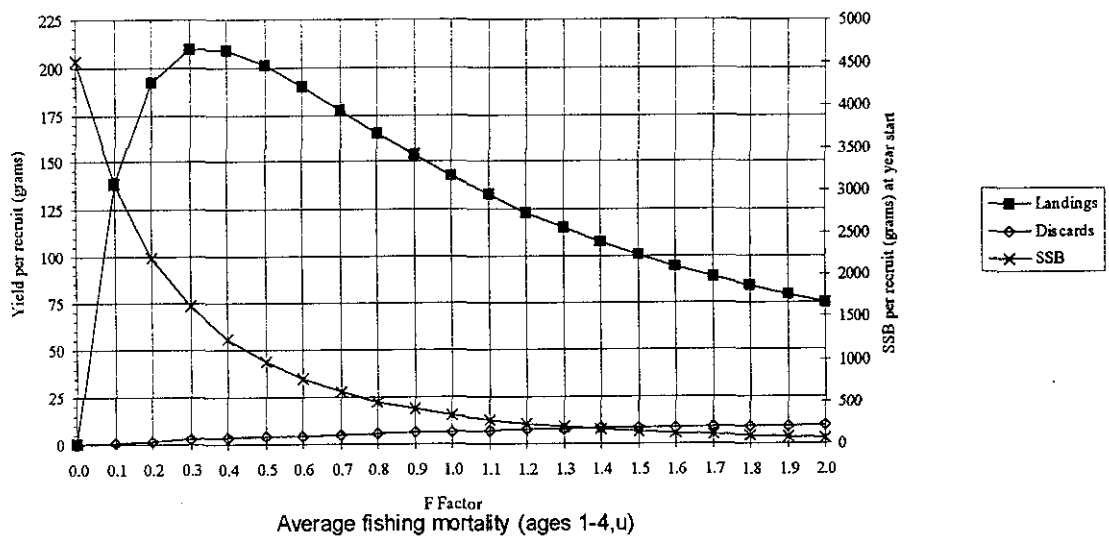
Management advice: ACFM recommends that fishing mortality in 1995 be reduced by 30% from the 1994 level.

ACFM notes that large numbers of juvenile hake are still being caught and recommends that current legislation on mesh size and minimum landing size be enforced. This would assist but would not be sufficient by itself for a prompt recovery of SSB.

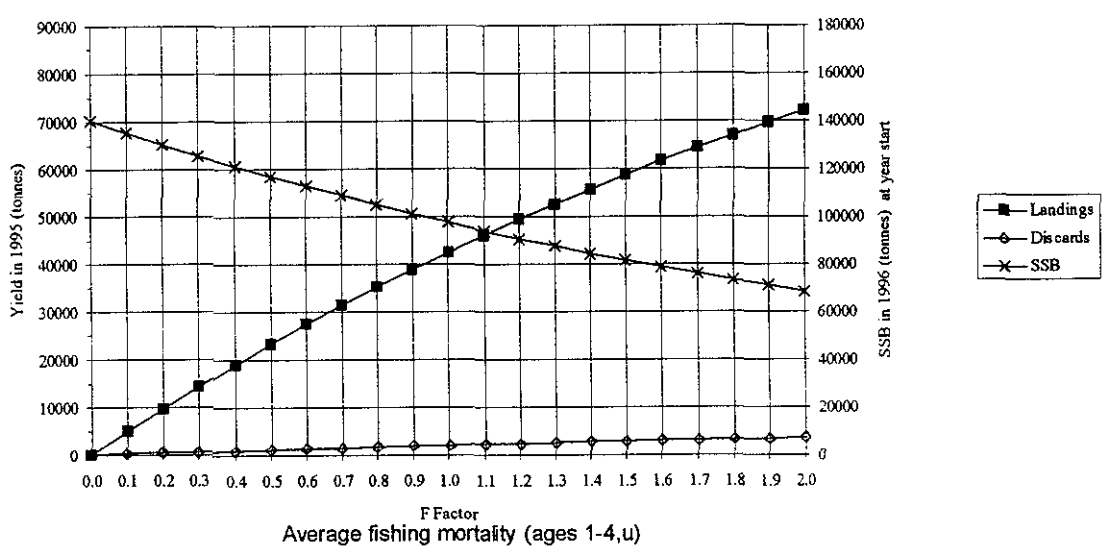
Data and assessment: Length composition data by fishery unit available annually for 1978-1989 and quarterly for 1990-1993. Prior to 1992 converted to age compositions by numerical methods. For 1992-1993 age readings were used. Analytical assessment using CPUE data from 7 commercial fleets and one survey.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 1994 (C.M.1995/Assess:6).

Long Term Yield and Spawning Stock Biomass



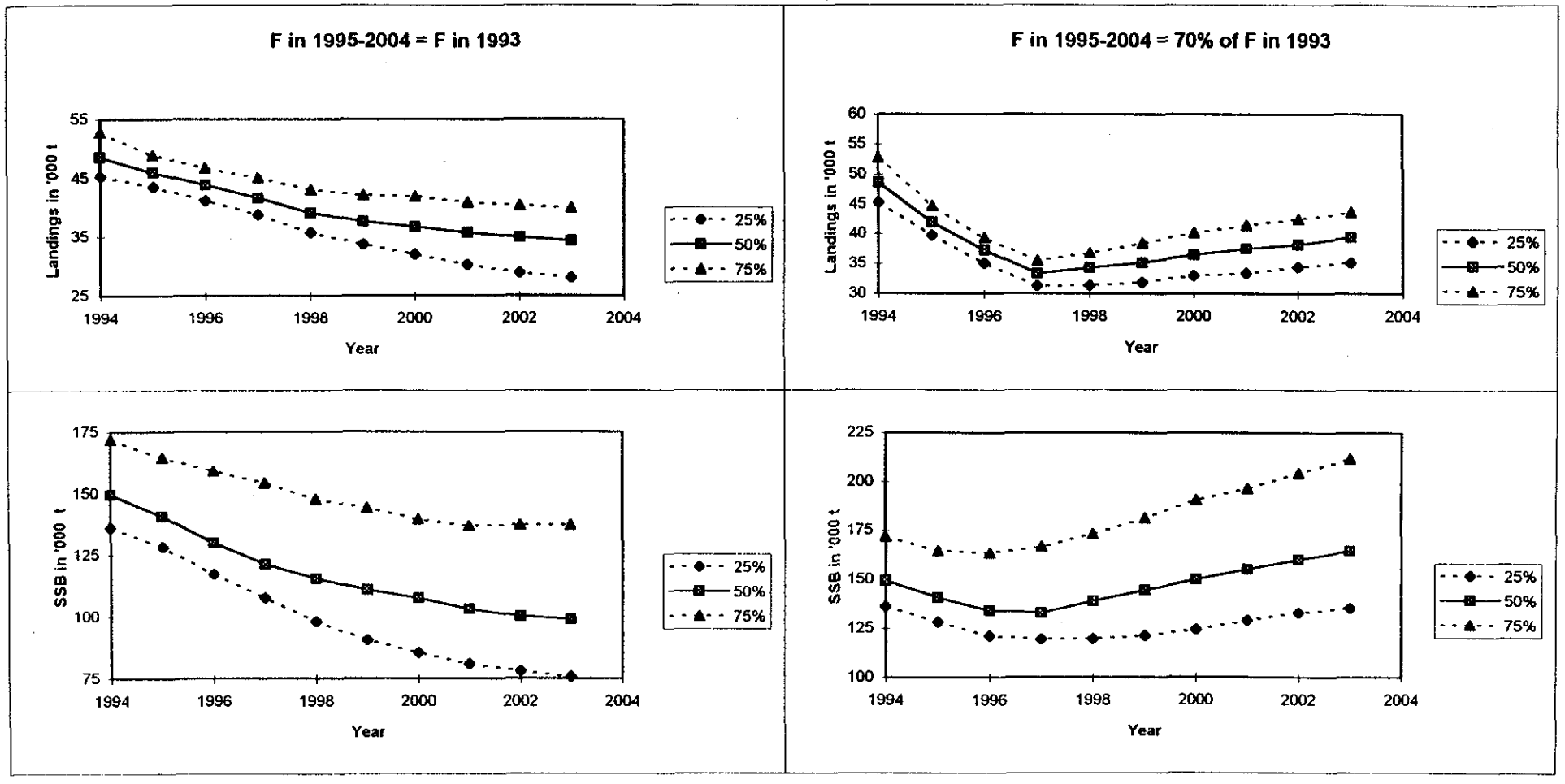
Short Term Yield and Spawning Stock Biomass



-Northern stock. Medium-term projections of landings and spawning stock biomass at:

A) the 1993 fishing mortality rate.

B) 70% of the 1993 fishing mortality rate.



4.1.2 Hake - Southern stock (Divisions VIIIc and IXa)

Catch data (Tables 4.1.3 and 4.1.4):

Year	Rec. TAC	Agreed TAC	ACFM lndgs.	ACFM catch
1987	15.0	25.0	15.2	15.2
1988	15.0	25.0	15.4	15.4
1989	15.0	20.0	12.9	12.9
1990	15.0	20.0	12.0	12.0
1991	10.0	18.0	11.6	11.6
1992	10.3[1]	16.0	12.8	12.8
1993	1.0[2]	12.0	10.9	10.9
1994	2.0[3]	11.5		

[1]Precautionary. [2]Maximum catch that will allow SSB to rebuild to 20.0 t within 3 years. [3] Maximum catch that will allow SSB to rebuild to the level of 1986-1988. Weights in '000 t.

Historical development of the fishery: This stock is fished by Spanish and Portuguese fleets using trawl, gillnets and longlines. In order to protect juvenile fish fishing is prohibited in some areas during part of the year. Landings have declined since 1983 reaching their lowest level in 1993. Agreed TACS have consistently exceeded the actual landings.

State of stock: SSB decreased very sharply between 1984 and 1986 and has remained at this low level through 1993. Recruitment has steadily declined since 1982 and has been poor since 1989. Fishing mortality in 1993 is above F_{max} and F_{med}. The stock is considered to be outside safe biological limits.

Further details in Table 4.1.4.

Forecast for 1995:

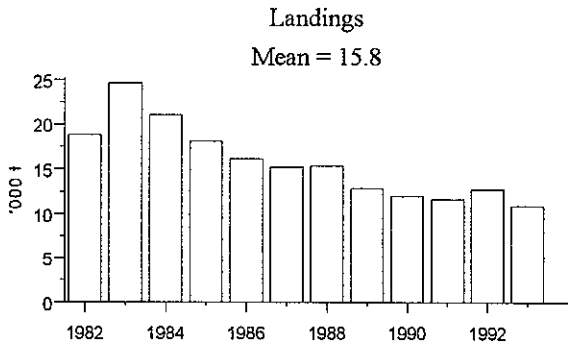
SSB(94) = 16.4, F(94) = 0.31, Basis: F(94)=F(93), Catch(94) = - , Landings (94) = 8.3.

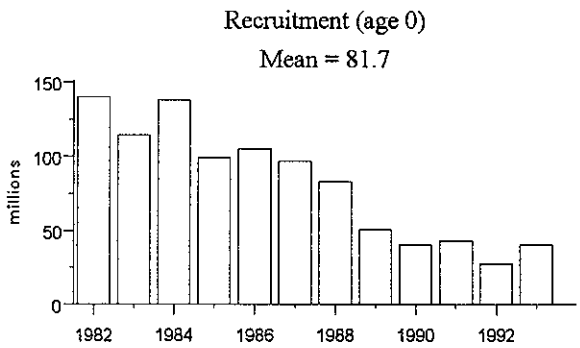
Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	0.0 F_{93}	0.00	13.9	-	0.0	17.8
B	0.2 F_{93}	0.06	13.9	-	1.6	16.4
C	0.4 F_{93}	0.12	13.9	-	3.2	15.2
D	0.6 F	0.18	13.9	-	4.6	14.1
E	0.8 F_{93}	0.24	13.9	-	5.9	13.0
F	1.0 F_{93}	0.31	13.9	-	7.1	12.0

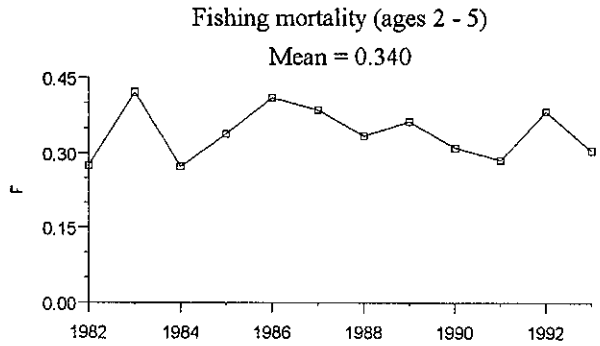
Weights in 000' t.

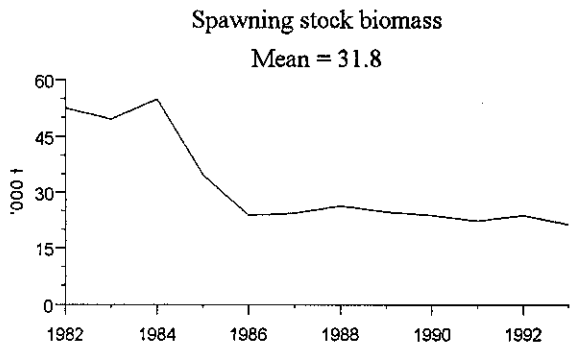
For all options given, SSB decreases or remains at the current low level.

Management advice: Seen in isolation, fishing mortality on hake should be reduced to zero in order to allow for an increase in SSB to a level equivalent to the 1986-1990 average. To achieve this, fishing mortality should be kept at the lowest possible level.







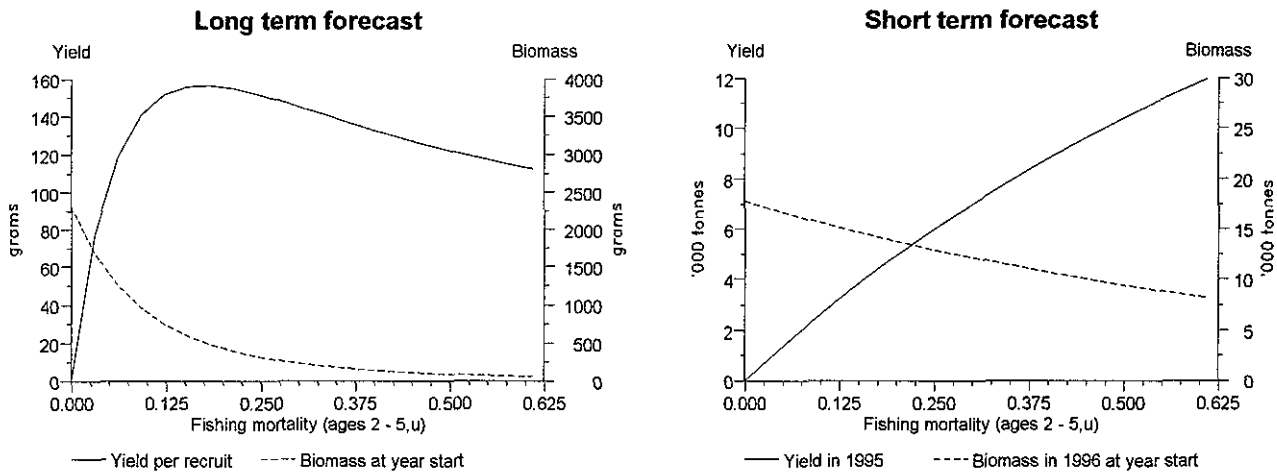


Special comments: Hake are taken as part of a mixed trawl catch and, as such, any management action with regard to this stock may have consequences on other species.

Data and assessment: Catch-at-age data derived from conversion of length to age compositions. Analytical assessment using CPUE data from 3 commercial fleets and 2 surveys. No discard data are available. Difficulties in sampling undersized fish (<27 cm) since 1989.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 1994 (C.M.1995/Assess: 6).

Yield and Spawning Stock Biomass



4.2. Megrim (*L. whiffiagonis*) in Divisions VIIb,c,e-k and VIIIa,b

Catch data (Tables 4.2.1 and 4.2.2):

Year	Rec. TAC	Agreed TAC[1]	ACFM lndgs.	Disc. slip.	ACFM catch
1987	-	16.46	16.8	1.7	18.5
1988	-	18.1	17.3	1.7	19.0
1989	-	18.1	18.9	2.6	21.5
1990	-	18.1	14.1	3.2	17.4
1991	-	18.1	15.0	3.2	18.2
1992	-	18.1	15.5	3.1	18.6
1993	-	21.46	14.8	2.9	17.6
1994	-	20.33			

[1]Includes Division VIIa. Weights '000 t.

Historical development of the fishery: For most fleets megrim is only a by-catch caught with hake, anglerfish, *Nephrops*, cod and whiting. Landings have remained relatively stable over the whole period. Discards average about 15% of total catches by weight and comprise fish over a large range of sizes.

State of stock: SSB was below average in 1989-1992, but increased in 1993. Fishing mortality has declined from the high 1991 level. Recruitment has been quite stable; the 1989 and 1990 year classes are well above average. The time series is short, but the stock appears to be within safe biological limits.

Further details in Table 4.2.2.

Forecast for 1995:

SSB(94) = 91.5, F(94) = 0.26, Basis: F(94)=F(93), Catch(94) = 18.6, Landings (94) = 15.4.
Recruitment of the 1992, 1993 and 1994 year classes set equal to the geometric mean for the period 1984-1991 period.

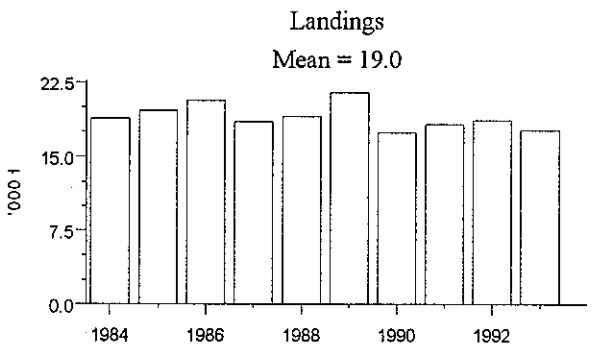
Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	$0.6F_{93}$	0.16	96.5	13.1	11.1	109.1
B	$0.8F_{93}$	0.21	96.5	17.0	14.4	104.1
C	F_{93}	0.26	96.5	20.7	17.5	99.5
D	$1.2F_{93}$	0.31	96.5	24.2	20.5	95.0

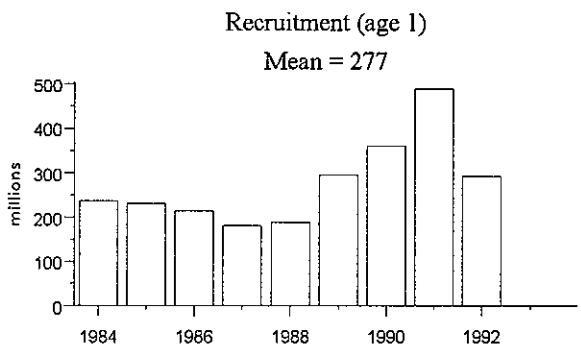
Weights in '000 t.

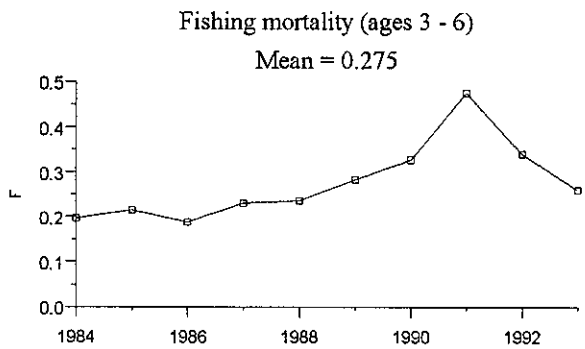
For options A, B and C, SSB increases to record high levels. Under option D, a 20% increase in F will result in a small decrease in SSB compared with 1995, but an increase relative to 1993 and 1994.

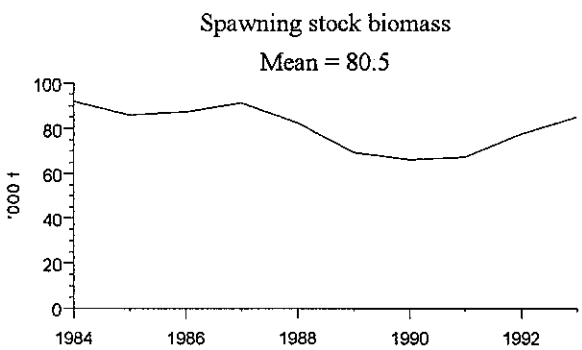
Continued fishing at the current level of fishing mortality in 1996 will lead to landings of 18,400 t, (catches = 21,800 t) and SSB in 1997 of 101,100 t, which is 19% above the 1993 level.

Management advice: No particular concern for this stock.





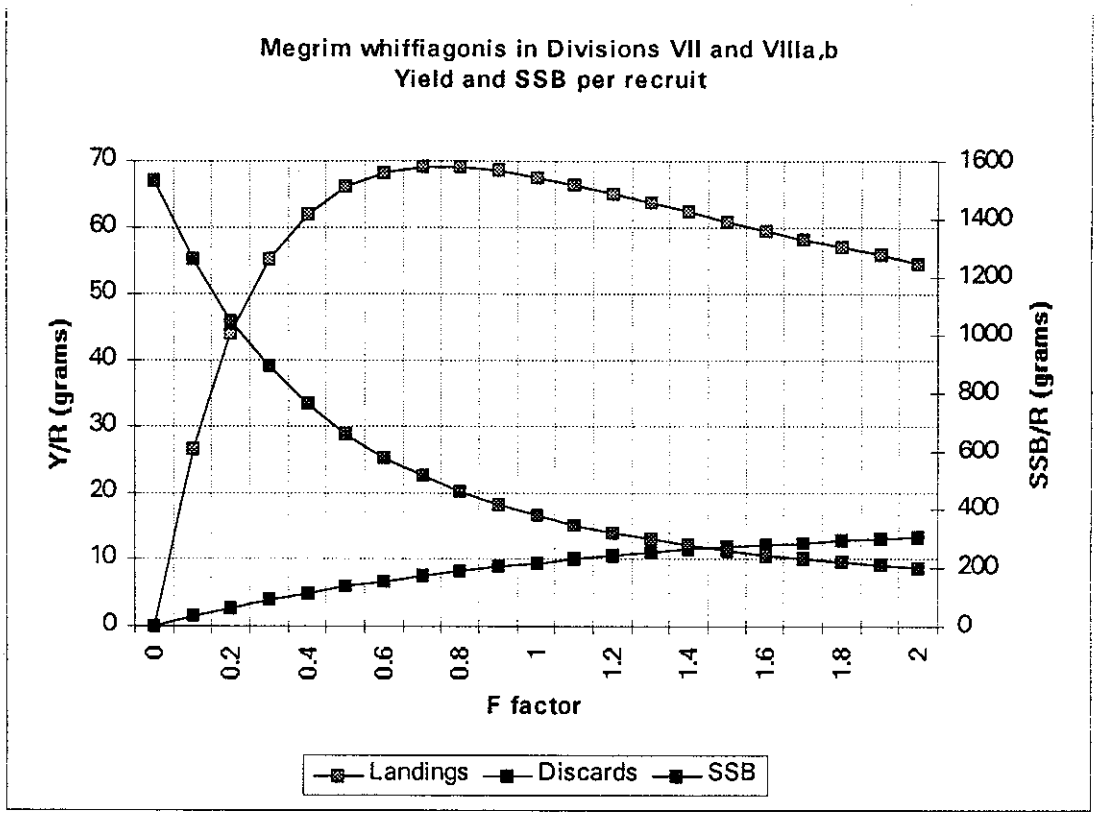


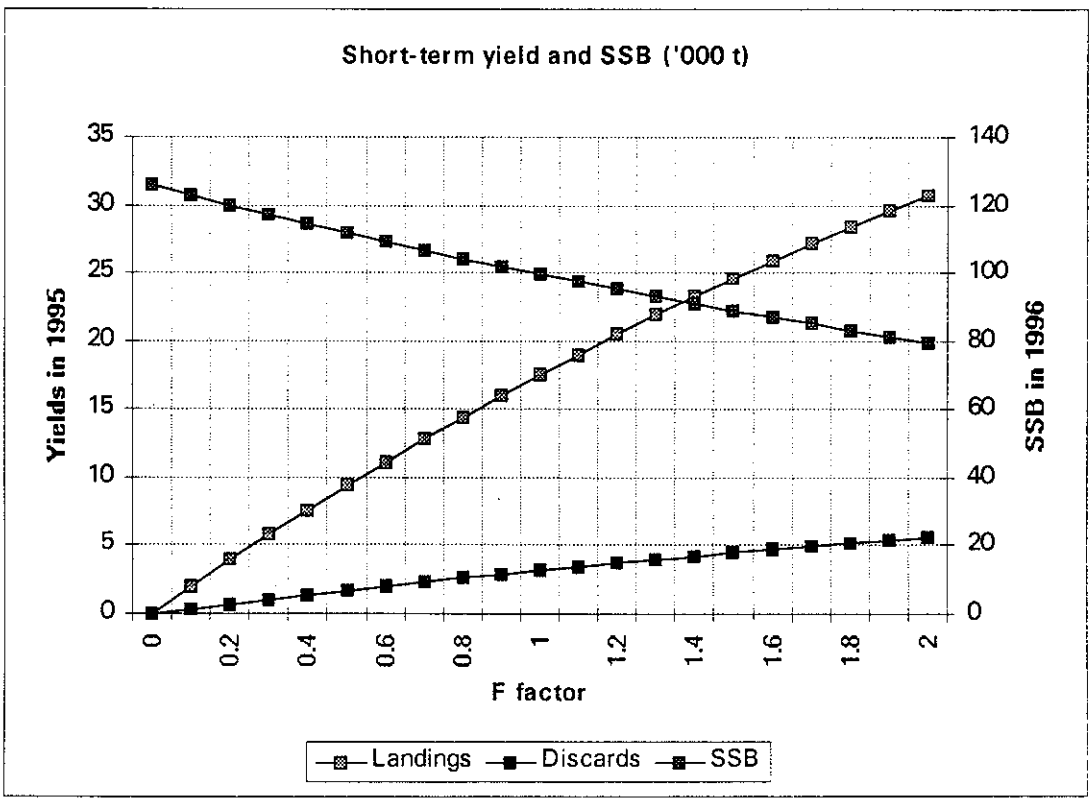


Special comments: It is noted that a large portion of the catch is composed of megrim less than 25 cm. This may not yet be a problem for the stock, but indicates a poor exploitation pattern. An improvement in the exploitation pattern will lead to an increase in long-term yield. Catches of *L. boscii* represent about 5% of the total megrim catch.

Data and assessment: Age-based analytical assessment using catch-per-unit effort from four commercial fleets and one survey.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 1994 (C.M.1995/Assess:6).





4.3 Anglerfish in Divisions VIIb-k and VIIIa,b (*L. piscatorius* and *L. budegassa*)

Catch data (Tables 4.3.1-4.3.7):

Year	Rec. TAC	Agreed TAC[1]	ACFM catch	Catch of *L. piscat.*	Catch of *L. budeg.*
1987	-	39.08	27.0	19.1	7.9
1988	-	42.99	27.3	17.7	9.6
1989	-	42.99	28.3	18.6	9.7
1990	-	42.99	27.3	18.4	8.9
1991	-	42.99	24.4	15.5	8.9
1992	-	42.99	20.2	12.2	8.0
1993	-	25.1[2]	19.2	12.9	6.3
1994	-	23.9[2]			

[1]Includes Division VIIa; applies to both species. [2]Includes Divisions VIIId,e;. Weights in '000 t.

Historical development of the fishery: The fishery for anglerfishes developed in Sub-areas VII and VIII in the 1970s due to gear improvement. From 1970 to 1980, the landings were very high and it is likely that the overall annual landings may have attained 30-35,000 tonnes. The main exploiting nations were Spain and France. It seems also that that period coincided with high recruitments of both stocks.

Even though fishing effort increased until 1990 the yield decreased by 50% between 1985 and 1993.

L. piscatorius

State of stock: Total and spawning stock biomass decreased continuously until 1992. Total biomass increased in 1993 as a consequence of the good recruitment from the 1990 and 1991 year-classes and reduced exploitation by some fleets in recent years. The time series is too short to determine whether the stock is inside or outside of safe biological limits.

Further details in Table 4.3.6.

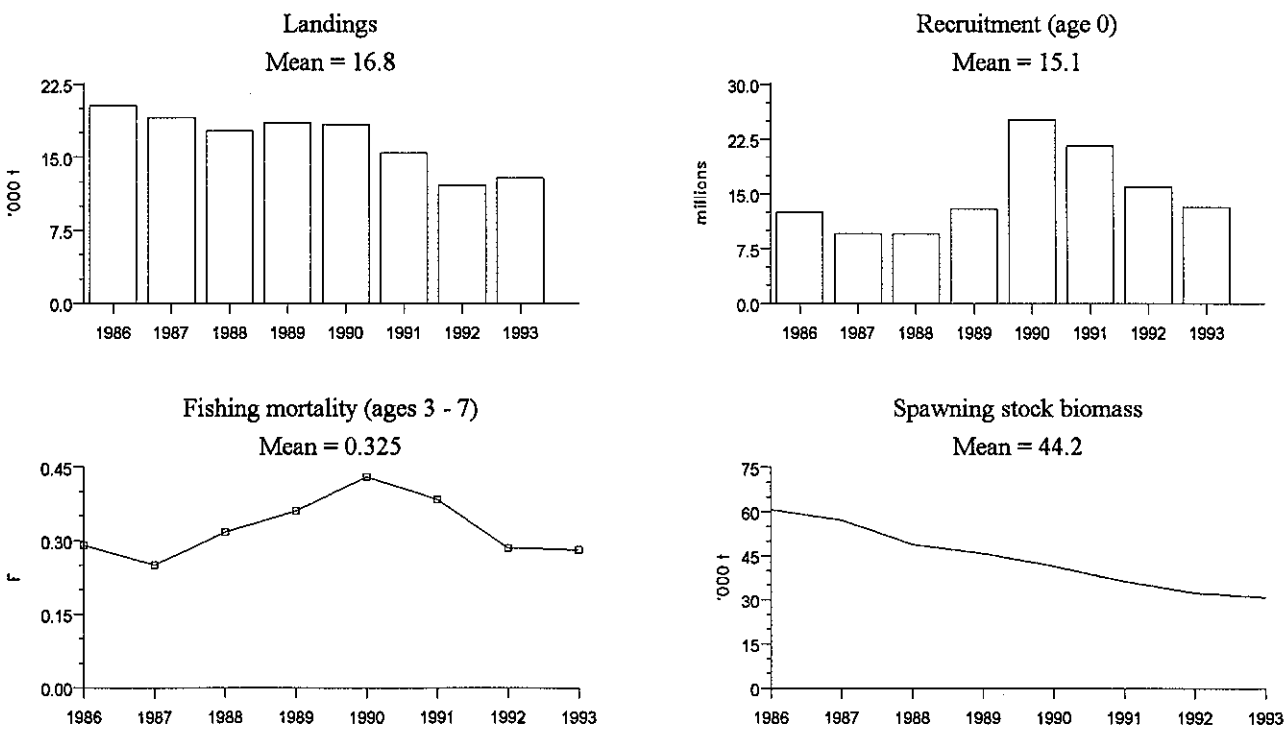
Forecast for 1995:

SSB(94) = 33.4, F(94) = 0.28, Basis: F(94)=F(93), Catch(94) = - , Landings (94) = 13.0.

Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	F_{max}	0.13	40.3	-	7.0	55.5
B	0.6F93	0.17	40.3	-	9.1	53.0
C	0.8F93	0.23	40.3	-	11.7	50.0
D	F 93	0.28	40.3	-	14.2	47.0
E	1.2F93	0.34	40.3	-	16.5	44.3

Weights in 000' t.

L. piscatorius

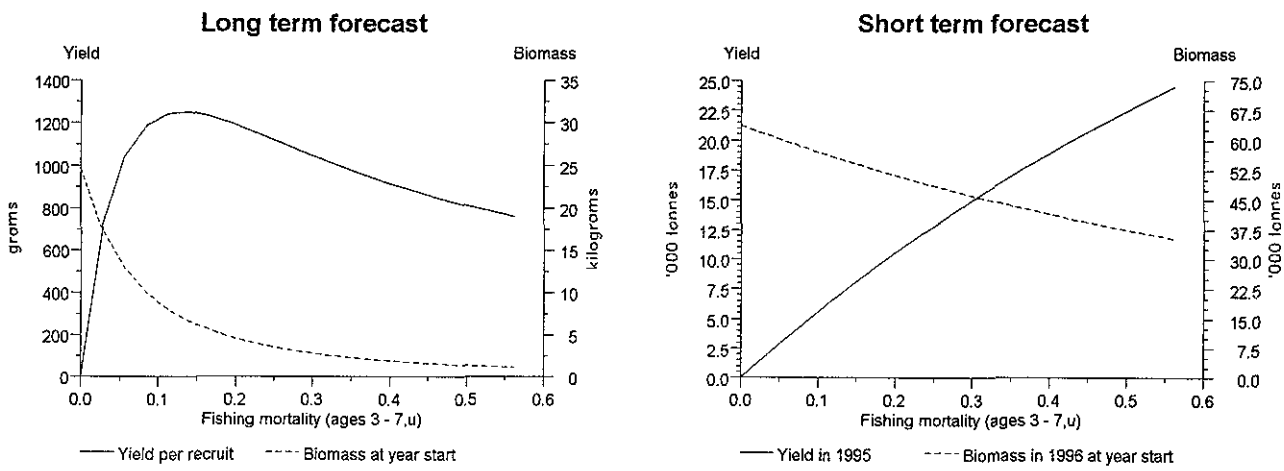


For all options given, SSB is predicted to increase. Continued fishing at the current level of F in 1995 will be accompanied by an increase in SSB in 1996.

Special comment:. *L piscatorius* and *L. budegassa* are both caught on the same grounds by the same fleets; therefore, management measures for *L. piscatorius* must be considered with respect to their impact on *L. budegassa*.

Data and assessment: Age-based assessment using CPUE data for 3 fleets and 2 surveys.

Yield and Spawning Stock Biomass



L. budegassa

State of stock: Total and spawning stock biomass have decreased steadily since 1989. The 1992 year class is above average. The time series is too short to determine whether the stock is inside or outside safe biological limits.

Further details in Table 4.3.7.

Forecast for 1995:

SSB(94) = 30.9, F(94) = 0.18, Basis: F(94)=F(93), Catch(94) = -, Landings (94) = 6.1.

Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	0.6F93	0.11	29.3	-	3.6	30.6
B	F_{max}	0.13	29.3	-	4.2	30.0
C	0.8F93	0.14	29.3	-	4.7	29.3
D	F (93)	0.18	29.3	-	5.8	28.1
E	1.2F93	0.22	29.3	-	6.8	27.0

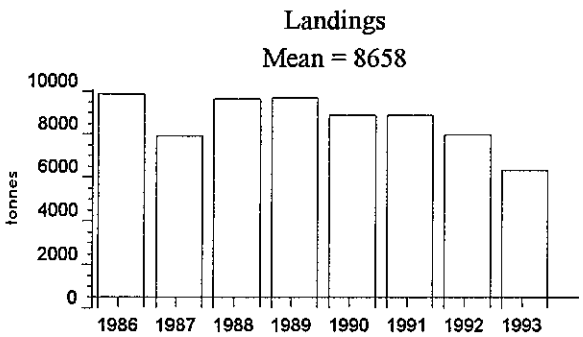
Weights in 000' t.

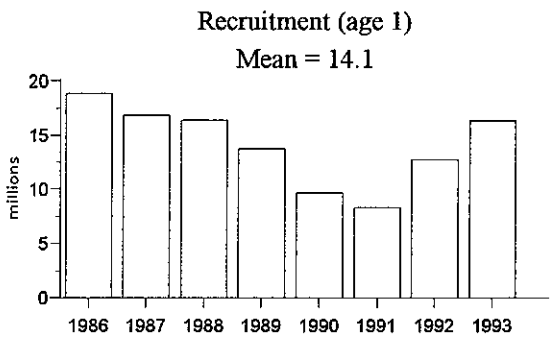
For all options given, SSB is predicted to decrease in 1996 compared with 1994.

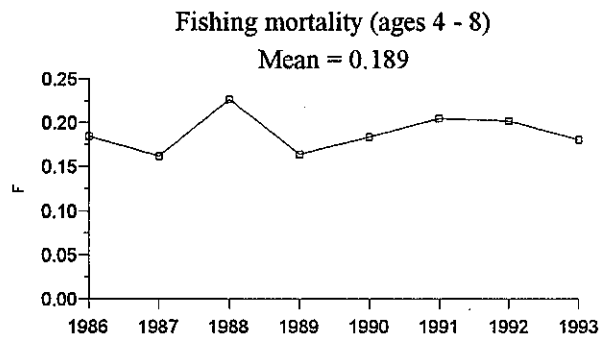
Continued fishing at the current level of F in 1995 will result in a decrease in SSB in 1996.

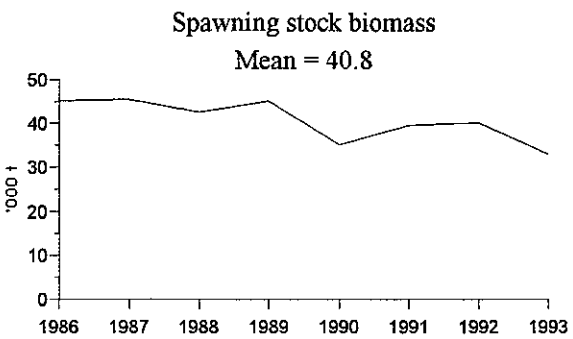
Special comment: *L. piscatorius* and *L. budegassa* are both caught on the same grounds by the same fleets; therefore, management measures for *L. budegassa* must be considered with respect to their impact on *L. piscatorius*.

Data and assessment: Age-based assessment using the CPUE data for 3 fleets and 1 survey.



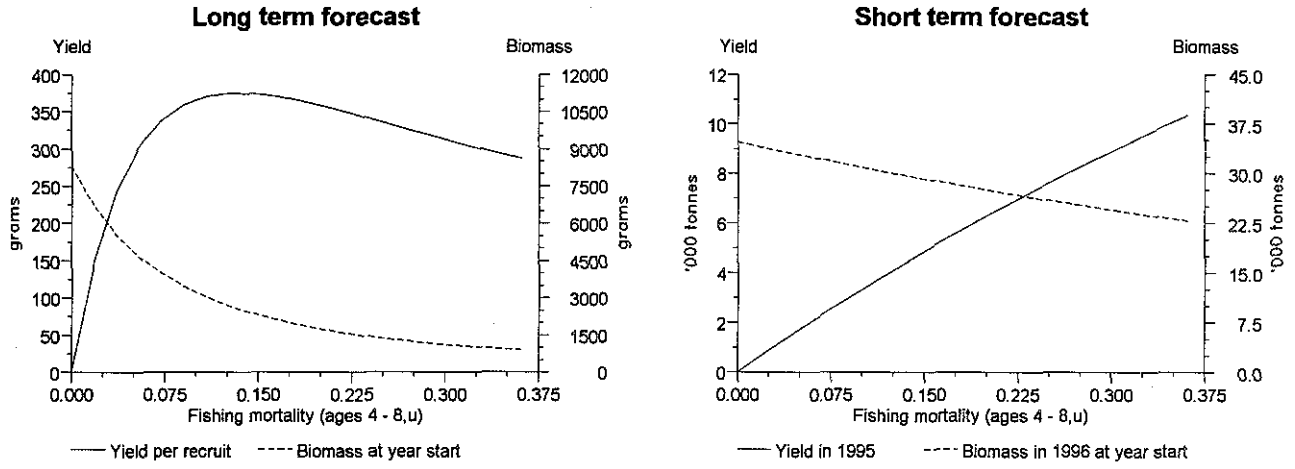






L. budegassa

Yield and Spawning Stock Biomass



L. piscatorius and *L. budegassa*

Management advice: There continues to be concern about the decline in SSB and ACFM notes that there has been a decrease in yield despite increasing effort. Therefore, ACFM advises that fishing mortality on these stocks should not be increased.

Special Comment: Due to poor selectivity of the species by trawls of reasonable mesh sizes, 30% by number of the landed individuals belong to the 0, 1 and 2-groups. A project to develop a trawl with a selective device for avoiding catching small anglerfish, megrims and rays is currently being carried out in France.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 1994 (C.M.1995/Assess: 6).

5 STOCKS IN NEAFC REGION 3

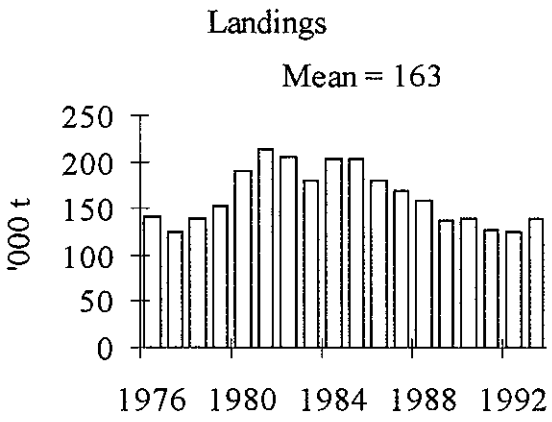
5.1 Sardine in Divisions VIIIc and IXa

Catch data (Table 5.1.1.):

Year	Rec. TAC	Agreed TAC	ACFM catch
1987	140	-	169
1988	150	-	159
1989	212	-	137
1990	-	-	139
1991	176	-	128
1992	-	-	126
1993	135[1]	-	139
1994	118[2]	-	

[1]Precautionary. [2]Estimated catch at *Status quo* F. Weights in '000 t.

Historical development of the fishery: For all available catch data (1940-1993) the total catch decreased. The stock is mainly fished in Division IXa. Portugal has the most important fleet using purse-seiners. Highest catches occur in the second half of the year.



State of stock: All available information indicates that the stock is inside safe biological levels.

Forecast for 1995: Not available

Special comments: The exact state of the stock is unknown but the spawning stock seems to be very stable.

The 1983 year class was the strongest in the historical series and the 1987 year class was relatively strong. After the low recruitment in 1988, 1989 and 1990 the 1991 year class achieved a better level than the 1987 year class. The recruitment estimations in 1993 were low. This is due only to low catches at age 0 in 1993 and there are no survey data for age 0 in 1993.

Data and assessment: Catch-at-age data for ages 0 to 6+ are available for this fishery from 1976 to 1993. An analytical assessment was attempted but not considered reliable.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, June/July 1994 (C.M.1995/Assess:2).

5.2 Anchovy in Sub-area VIII (Bay of Biscay)

Catch data (Table 5.2.1):

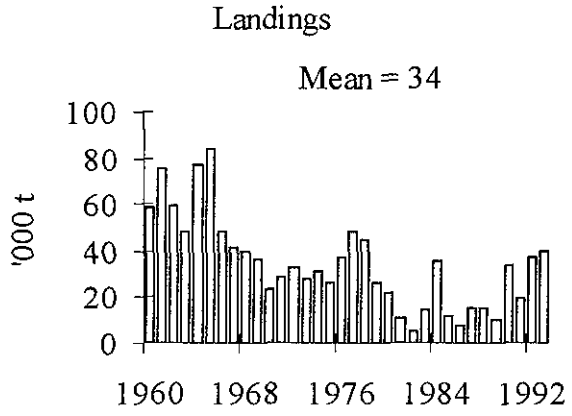
Year	Rec. TAC	Agreed TAC	Off. lndgs.	ACFM catch
1987	-	32	14	15
1988	-[1]	32	14	15
1989	-	32	N/A	10
1990	12.3	30	N/A	34
1991	14.0	30	N/A	19
1992	-	30	N/A	38
1993	-	30	N/A	40
1994	-	30		19[2]

[1]Not greater than the 1985-1987 level. [2]1st half of year. Weights in '000 t.

Historical development of the fishery (Figure 5.2.1): From 1960 to 1989, the number of Spanish purse-seiners decreased but, since 1987, the French pelagic trawlers increased continuously due to a very attractive market. Nowadays, the French catches equal the catches of the traditional Spanish fishery.

State of stock: The stock is likely to fluctuate widely due to the large variations in recruitment. The low catches in the 1980s and the change in the exploitation pattern towards juveniles indicate a relatively low spawning stock biomass.

Forecast for 1995: No forecast available.



Management advice: Reduced fishing mortality on juvenile anchovy will increase the spawning biomass without major loss in total yield. This may be achieved by closing the fishing areas with high abundance of 1-group anchovy. To this end, ACFM reiterates its advice that fishing for anchovy could be prohibited between January and June inclusive within the area defined by the following boundaries:

- from the Spanish coast north along longitude 1°35'W to latitude 44°45'N
- west to longitude 1°45'W
- north to latitude 46°00'W
- and east to the French mainland.

Special comments: The increase in effort in recent years has led the catches to levels higher than the historical average catches recorded for this fishery. Therefore, caution should be paid to the continuous increase of effort, because it is likely that catches could be exceeding the average surplus production of the stock. In this sense an effective management of this fishery is required.

Data and assessment: Catch-at-age and catch-at-length data from French and Spanish fisheries. Stock biomass estimates from egg and acoustic surveys, both of which were ended in 1992. In 1994, egg surveys were again carried out. Analytical assessment of catch at age and survey data was attempted but was considered to be unreliable.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, June/July 1994 (C.M.1995/Assess:2).

5.3 Anchovy in Division IXa

Catch data (Table 5.3.1):

Year	Rec. TAC	Agreed TAC[1]	ACFM catch
1987	-	4.6	N/A
1988	-	6	4.7
1989	-	6	6.2
1990	-	9	6.5
1991	-	9	5.9
1992	-	12	3.2
1993	-	12	1.9
1994	-	12	-

[1]TAC for Sub-areas IX and X and CECAF 34.1.1. Weights in '000 t.

Historical development of the fishery: Anchovy in Division IXa is only a target species for Spain in Sub-division IXa South. Anchovy is not a target species for the Portuguese fleet.

The Spanish catch made up about 93% of the total international catch during the period 1988-1993, and for this period catches decreased. For 1943-1987 data are available for Portugal only, and for this country catches ranged from 88 t to 12,610 t.

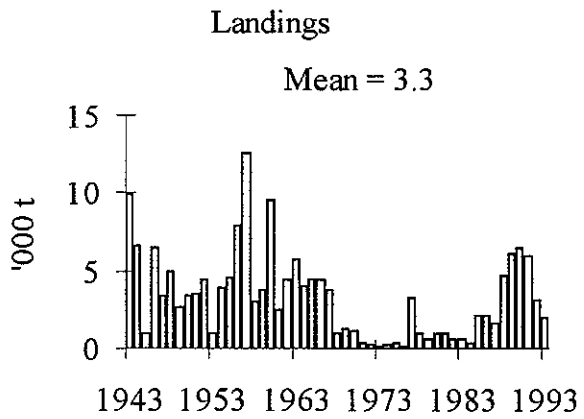
State of stock: Unkown.

Forecast for 1995: Not available.

Management advice: If a TAC is to be set for 1995, a precautionary TAC at the level of recent catches is appropriate.

Data and assessment: No assessment because of insufficient data.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, June/July 1994 (C.M. 1995/Assess:2).



5.4 Megrim in Division VIIIc and IXa

5.4.1 Megrim (*L. boscii*) in Divisions VIIIc and IXa

Catch data (Tables 5.4.1-5.4.2):

Year	Rec. TAC	Agreed TAC[1]	ACFM lndgs.
1987	-	13.0	1.69
1988	-	13.0	2.22
1989	-	13.0	2.63
1990	-	13.0	1.95
1991	-	14.3	1.68
1992	-	14.3	1.92
1993	-	8.0	1.38
1994	-	6.0	

[1]Including *L. whiffiagonis*. Weights in '000 t.

Historical development of the fishery: This species is generally taken as a by-catch in mixed fisheries by Portuguese and Spanish fleets, and accounts for about 80% of combined megrim landings. The historical background for this stock is short (age data series started in 1986). Both species (*L. boscii* and *L. whiffiagonis*) are subject to a common TAC which considerably exceeds the landings.

State of stock: SSB has been decreasing since 1989 and in 1993 is estimated to be the lowest for the period 1986-1993. Recent recruitment has been low compared to the start of the series. The time series is too short to determine whether the stock is inside or outside safe biological limits.

Further details in Table 5.4.2.

Forecast for 1995:.

SSB(94) = 2.94, F(94) = 0.34, Basis: F(94)=F(93), Catch(94) = -, Landings (94) = 1.20.
Recruitment of the 1993 and 1994 year classes set equal to the geometric mean for the period 1986-1991.

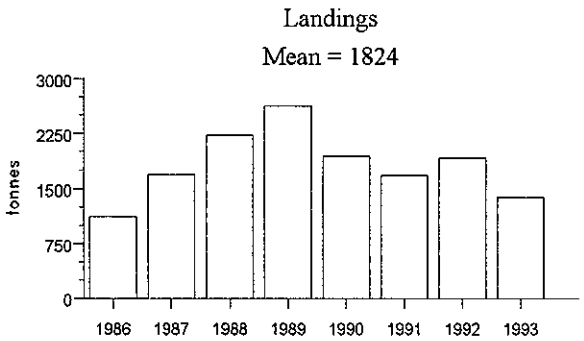
Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	0.6 F_{93}	0.20	3.10	-	0.81	3.64
B	0.8 F_{93}	0.27	3.10		1.04	3.42
C	1.0 F_{93}	0.34	3.10		1.26	3.23
D	1.2 F_{93}	0.40	3.10		1.46	3.04

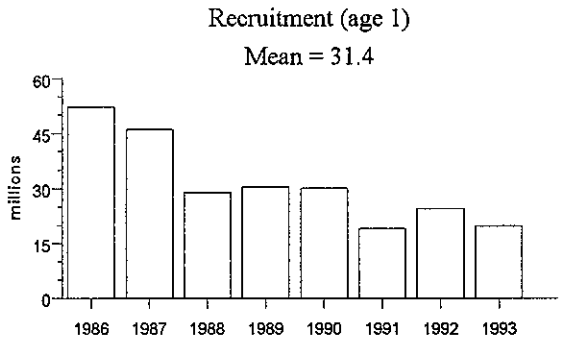
Weights in '000 t.

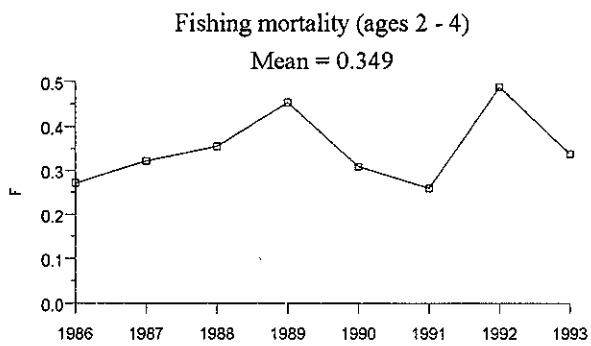
For all options, SSB remains below average in 1996 and with a 20% increase in F it decreases close to the lowest level recorded.

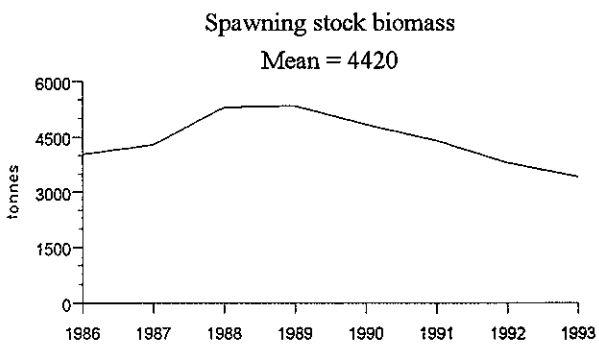
Management advice: The current low level of SSB and recruitment gives rise to concern that the stock is in danger of falling out of the observed range of SSB. Management advice should also take into account that *L. whiffiagonis* is caught in the same fisheries.

Special comments: TACs include both species of megrim and have been well above actual catches in recent years.





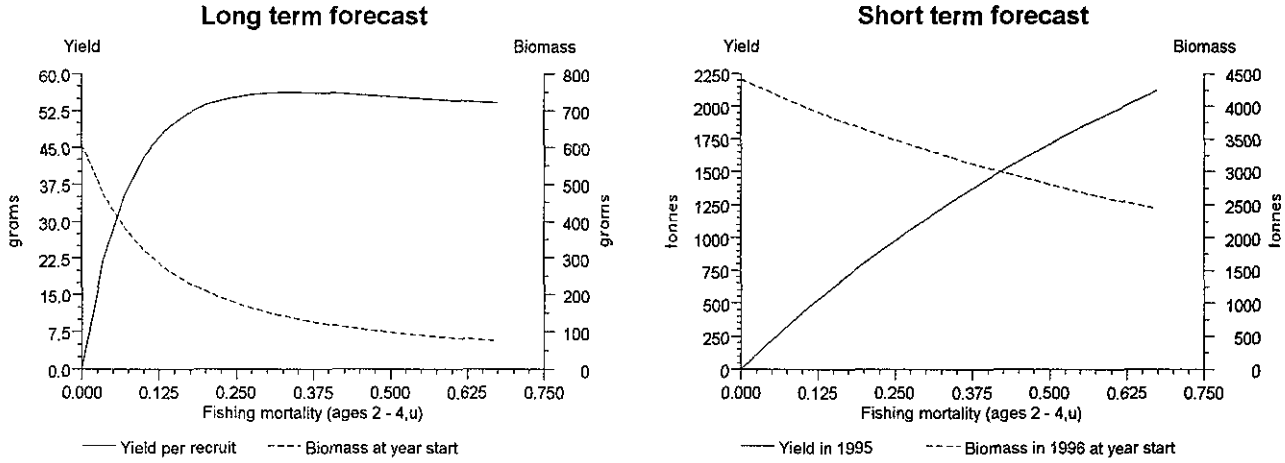




Data and assessment: Analytical assessment based on catch, survey and CPUE data.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 1994 (C.M.1995/Assess:6).

Yield and Spawning Stock Biomass



5.4.2 Megrim (*L. whiffiagonis*) in Divisions VIIIc and IXa

Catch data (Tables 5.4.3 - 5.4.4):

Year	Rec. TAC	Agreed TAC[1]	ACFM lndgs.
1987	-	13.0	0.50
1988	-	13.0	0.82
1989	-	13.0	0.71
1990	-	13.0	0.98
1991	-	14.3	0.61
1992	-	14.3	0.52
1993	-	8.0	0.38
1994	-	6.0	

[1]Including *L. boscii.* Weights in '000 tonnes.

Historical development of the fishery: This species is generally taken as a by-catch in mixed trawl fisheries by Portuguese and Spanish fleets, and accounts for about 20% of combined megrim landings. The historical background for this stock is short (age data series started in 1986). Both species (*L. whiffiagonis* and *L. boscii*) are subject to a common TAC which considerably exceeds the landings.

State of stock: SSB has been declining in recent years and the 1993 estimate is the lowest since 1986. The 1992 year class is estimated to have been near the lowest for the analyzed time series. The time series is too short to determine whether the stock is inside or outside safe biological limits.

Further details in Table 5.4.4.

Forecast for 1995:

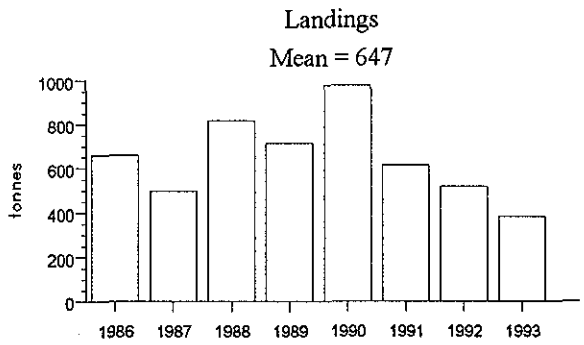
SSB(94) = 0.96, F(94) = 0.47, Basis: F(94)=F(93), Catch(94) = -, Landings (94) = 0.37.
Recruitment of the 1993 and 1994 year classes set equal to the geometric mean for the period 1986-1991.

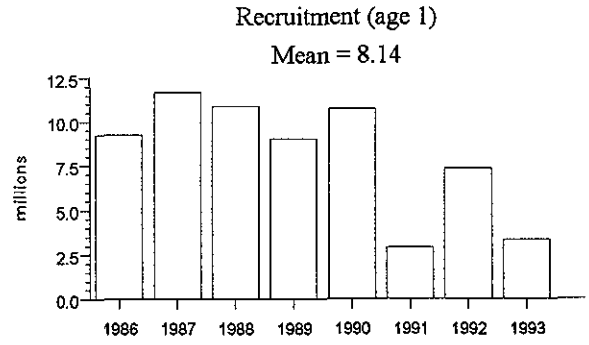
Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	$0.6F_{93}$	0.28	1.01	-	0.27	1.21
B	$0.8F_{93}$	0.38	1.01	-	0.34	1.12
C	$1.0F_{93}$	0.47	1.01	-	0.41	1.03
D	$1.2F_{93}$	0.57	1.01	-	0.47	0.95

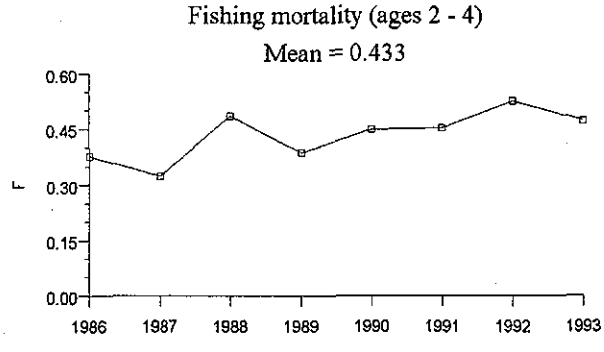
Weights in '000 t.

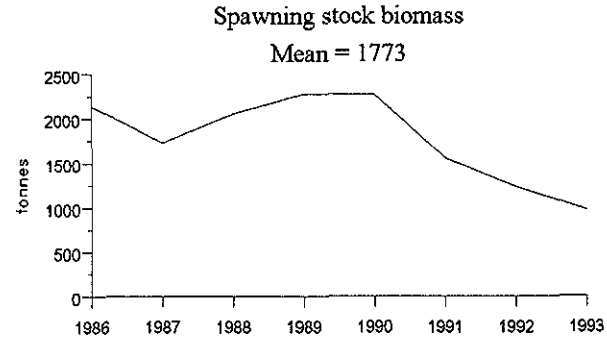
Under options A and B, SSB increases in 1996, under option C SSB remains at a low level and under option D SSB decreases further.

Management advice: The current low level of SSB and recruitment gives rise to concern that the stock is in danger of falling out of the observed range of SSB. Management advice should also take into account that *L. boscii* is caught in the same fisheries.







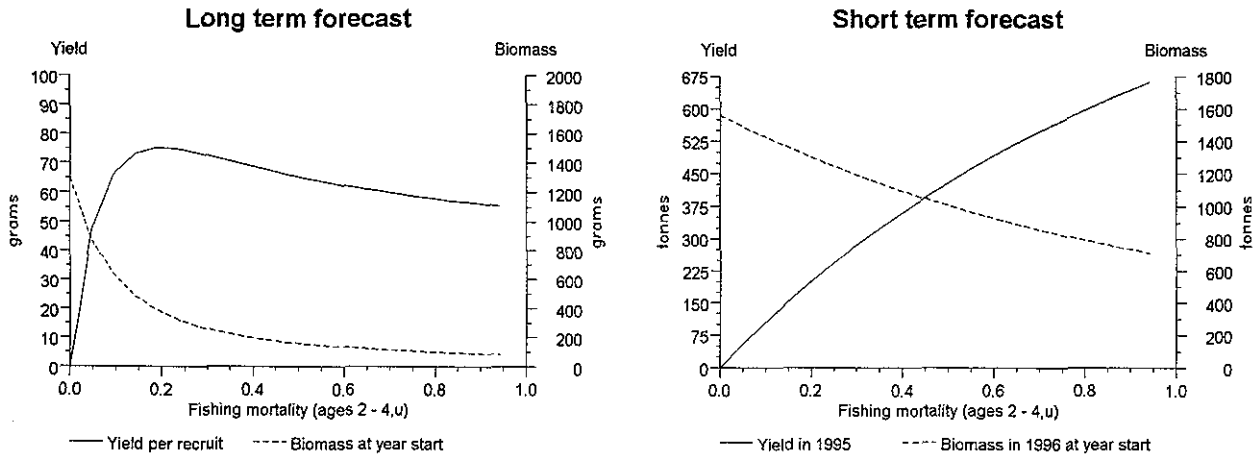


Special comments: TACs include both species of megrim and have been well above actual catches in recent years. The forecast is not of high precision. Much of this is due to dependence of the forecast on recruiting year classes whose abundance cannot be precisely determined.

Data and assessment: Analytical assessment based on catch, survey and CPUE data.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Species, September 1994 (C.M.1995/Assess:6).

Yield and Spawning Stock Biomass



5.5 Anglerfish in Divisions VIIIc and IXa (*L. piscatorius* and *L. budegassa*)

Catch data (Table 5.5.1):

Year	Rec. TAC	Agreed TAC[1]	ACFM catch[1]	Catch of *L. piscat.*	Catch of *L. budeg.*
1987	-	12.0	8.9	5.1	3.8
1988	-	12.0	10.0	6.3	3.7
1989	-	12.0	7.6	5.0	2.6
1990	-	12.0	6.1	3.8	2.3
1991	-	12.0	5.8	3.6	2.2
1992	-	12.0	5.5	3.4	2.1
1993	-	13.0	4.6	2.5	2.1
1994	-	13.0			

[1]For both species combined. Weights in '000 t.

Historical development of the fishery: Both species are caught in mixed fisheries by Portuguese and Spanish fleets. In the early 1970s commercial interest for these species increased and a directed artisanal fishery was developed in Spain.

L. piscatorius

State of stock:. The recent decline in landings and commercial CPUE indicates that the stock is currently at a very low level.

Management advice: If a TAC is to be implemented for this stock, a precautionary TAC should be set on the basis of recent catch levels.

Data and assessment: Analytical assessment attempted but not accepted.

L. budegassa

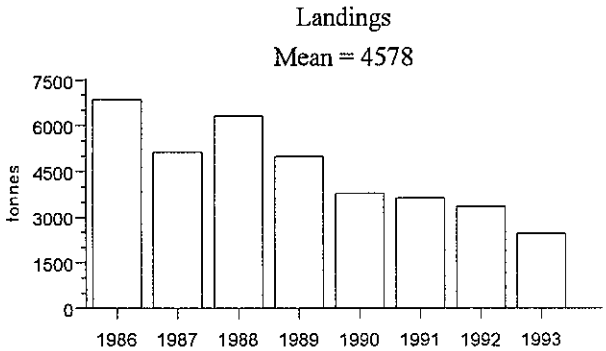
State of stock: The recent decline in landings and commercial CPUE indicates that the stock is currently at a very low level.

Management advice: If a TAC is to be implemented for this stock, a precautionary TAC should be set on the basis of recent catch levels.

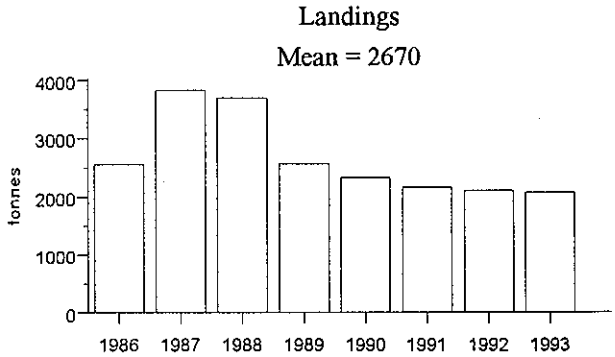
Data and assessment: Analytical assessment attempted but not accepted.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 1994 (C.M.1995/Assess: 6).

L. piscatorius



L. budegassa



5.6 Sole in Divisions VIIIa,b (Bay of Biscay)

Catch data (Tables 5.6.1-5.6.2):

Year	Rec. TAC	Agreed TAC	Off. lndgs.	ACFM lndgs.	Disc. slip.	ACFM catch
1987	-	4.4	4.4	5.1	0.6	5.7
1988	3.7	4.0	4.4	5.4	0.6	6.0
1989	4.5	4.8	5.8[1]	5.8	0.7	6.5
1990	5.1	5.2	5.5[1]	5.9	0.6	6.5
1991	4.7	5.3	4.7[1]	5.6	0.4	6.0
1992	5.0	5.3	5.5[1]	6.6	0.4	7.0
1993	-	5.7	5.6	6.4	0.4	6.8
1994	-	6.6				

[1]Not reported for all countries. Weights in '000 t.

Historical development of the fishery: Catches have increased continuously in the last two decades. Since 1984, the French fixed net fishery expanded and it now accounts for 50% of the total landings. In contrast, catches of sole by small mesh shrimp trawlers decreased drastically. This had the effect of improving the overall exploitation pattern.

State of stock: SSB has fluctuated within a narrow range since the mid -1980s and is above the long-term mean. The 1991 and 1992 year classes are the poorest on record. The time series is short, but the stock is considered to be within safe biological limits.

Further details in Table 5.6.2.

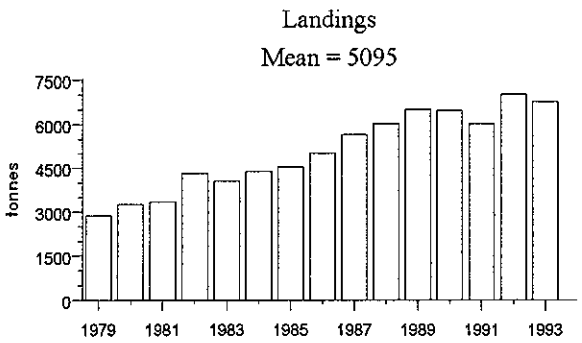
Forecast for 1995:

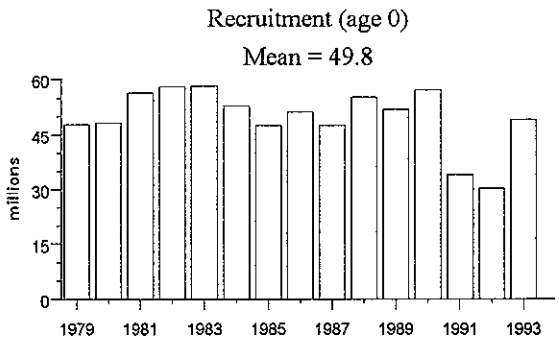
SSB(94) = 12.7, F(94) = 0.53, Basis: F(94)=F(93) Catch(94) = 6.4, Landings (94) = 6.0.

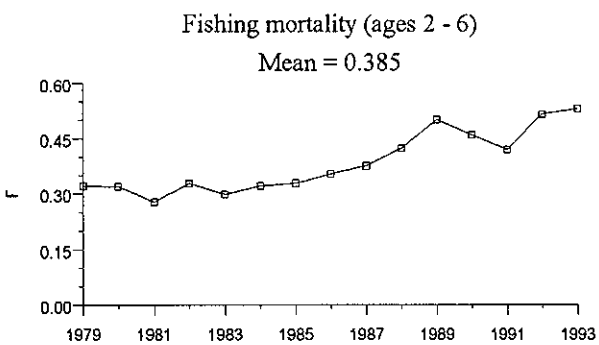
Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	0.6 F_{93}	0.32	10.7	3.9	3.6	13.4
B	0.8 F_{93}	0.42	10.7	4.9	4.5	12.2
C	F_{93}	0.53	10.7	5.8	5.4	11.1
D	1.2 F_{93}	0.64	10.7	6.7	6.1	10.1

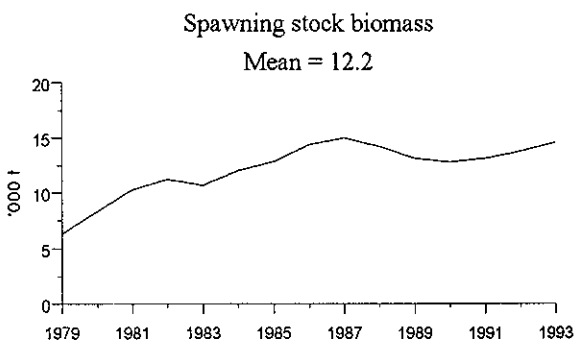
Weights in '000 t.

Under all options, SSB is expected to decline in 1996 compared to 1993. At the current level of F, SSB is predicted to remain at its lowest recorded level in 1996. A reduction in F by 40% would be required to produce a significant increase in SSB.









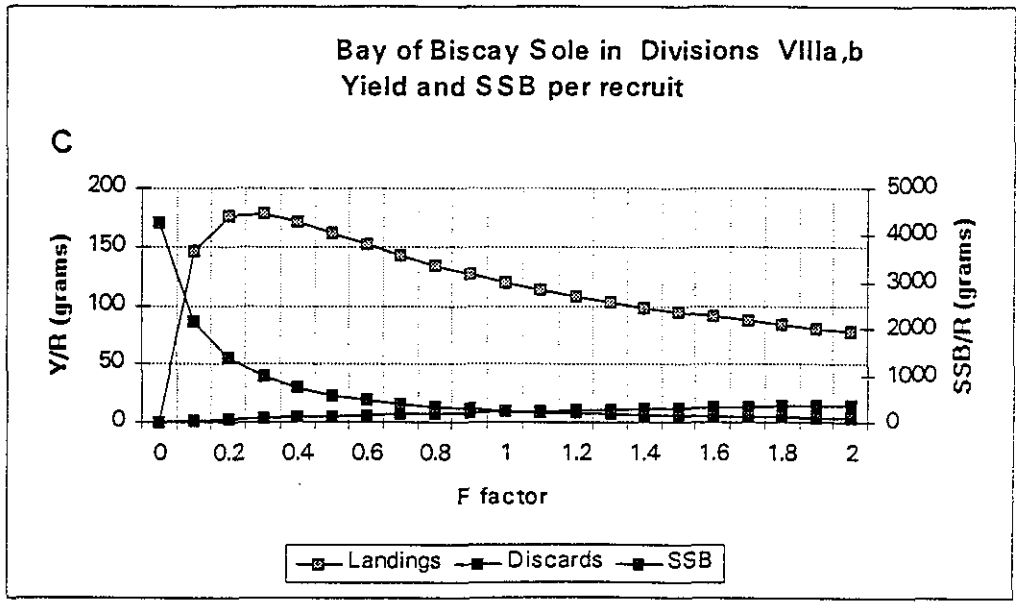
Medium-term considerations: Medium-term simulations show that, under *status quo* fishing mortality, landings are likely to decrease in the short term but they are projected to increase above the 1994 level over the medium term. SSB is predicted to decrease to its lowest recorded level in the short term and there is a high probability that it will not reach the recent average SSB level in the medium term.

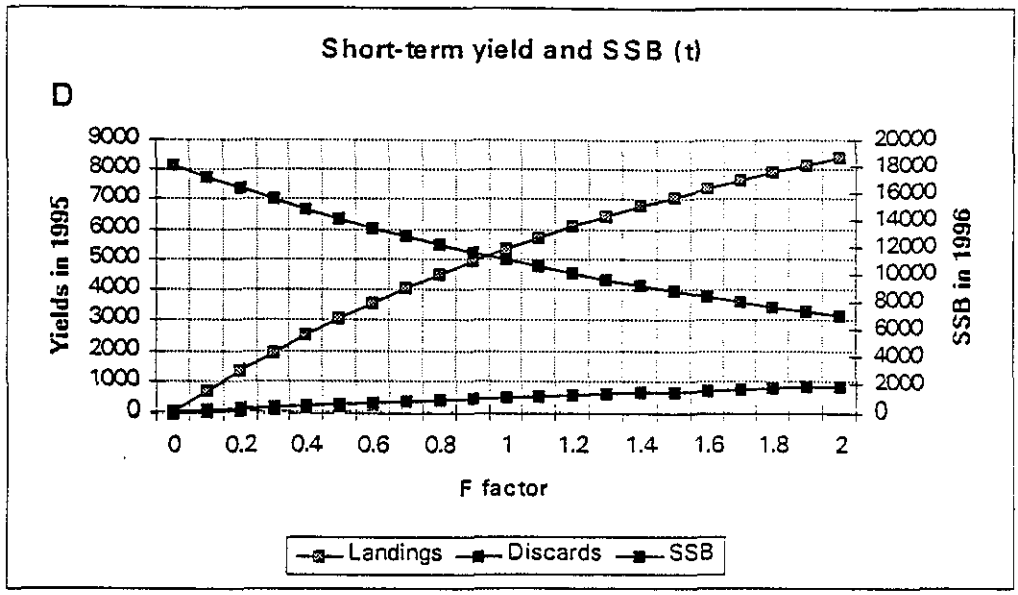
Assuming that F in 1995-2003 is 90% of current F, the landings would decrease in the short term but they would steadily increase to 6,400 t in the long term. The SSB would increase steadily after 1993 and there is a high probability that it will exceeds the recent average level after 1999. The results of these simulations, showing the time trajectories of the 25%, 50% and 75% percentiles of the distributions of predicted yield and SSB, are given in the figures headed "medium-term projections" on the next page.

Management advice: ACFM notes that no long-term gain in yield can be achieved by an increase in fishing mortality.

Data and assessment: Analytical assessment based on landings and CPUE data from 1 survey and 2 commercial fleets. No recruitment indices are available for this stock, and average recruitment was assumed for the more recent year classes. Database considered less reliable prior to 1984.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 1994 (C.M.1995/Assess: 6).

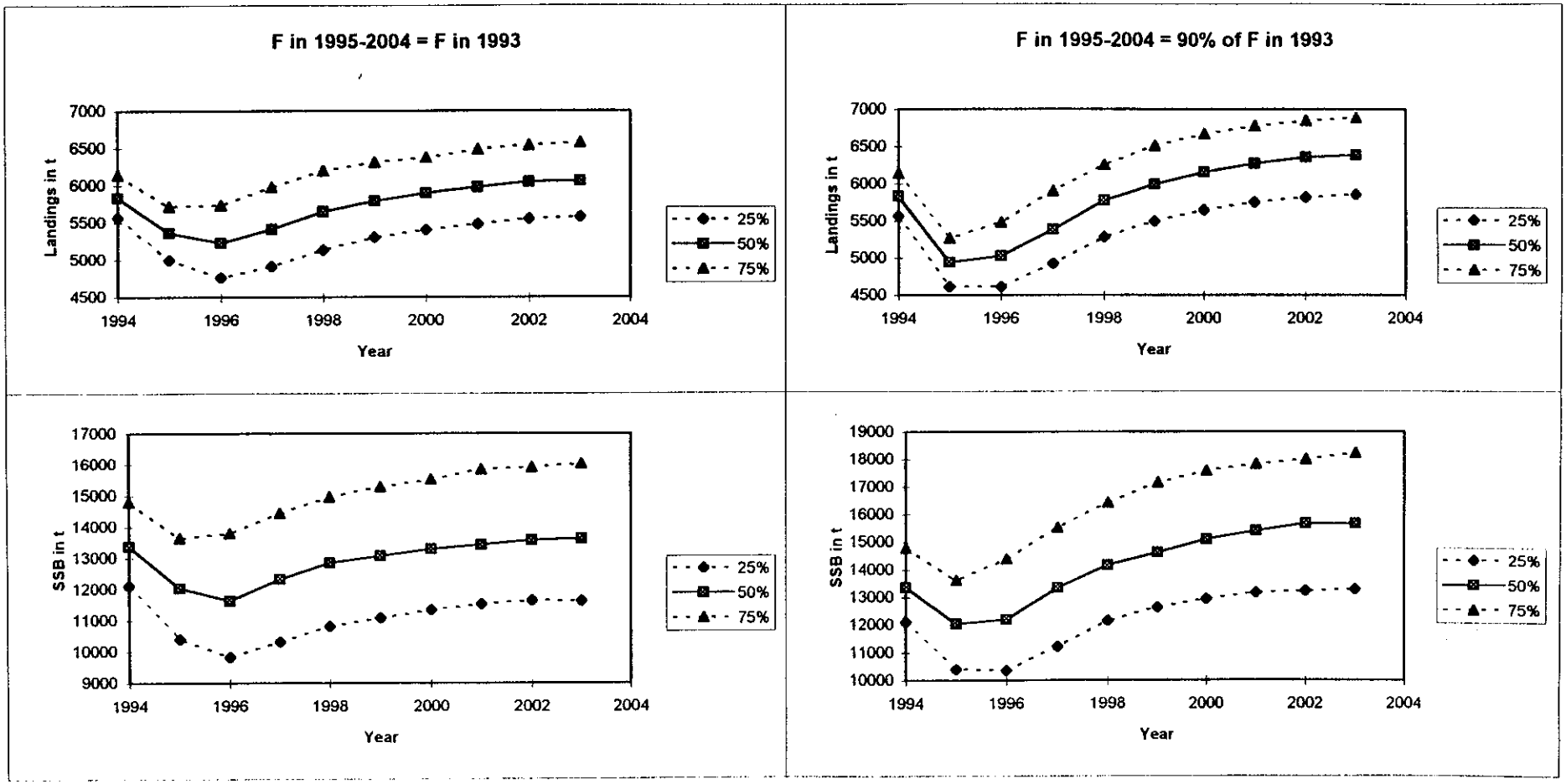




Sole in Divisions VIIIa,b (Bay of Biscay). Medium-term projections of landings and spawning stock biomass at:

A) the 1993 fishing mortality rate.

B) 90% of the 1993 fishing mortality rate.



6 STOCKS IN NEAFC REGIONS 1, 2 AND 3

6.1 *Nephrops* in Sub-areas III-X

6.1.1 Overview

Functional Units and Management Areas

There were no changes to the functional units or management areas listed in 1993; these are summarised in Figure 6.1.1 and Table 6.1.1.

ACFM reiterates the advice given last year that management of *Nephrops* stocks should take place at the management area level as defined in Figure 6.1.1 and Table 6.1.1.

Trends in Landings, Effort, CPUE, LPUE and Mean Size

Trends in landings, effort, catch per unit effort (CPUE), landings per unit effort (LPUE) and mean size of *Nephrops* caught, landed and/or discarded were examined over the past 10 years for all functional units.

Trends over the most recent years continue to cause concern in the Skagerrak (3) and Kattegat (4), particularly the latter where landings continue to fall.

Three other functional units where there continues to be some concern over trends in some of these indicators are Farn Deeps (6), Firth of Forth (8) and Firth of Clyde (13). While these are not currently regarded as requiring restrictive action, they will need to be carefully examined in the future.

In most other functional units, CPUE and/or LPUE have been fairly stable, fluctuated without trend or risen slightly over the most recent years and consequently give little cause for concern.

A second television survey of the Fladen Ground (7) confirms the widespread distribution and large size of this stock and the sustained landings rates there suggest that the advice, revised upwards last year, continues to be appropriate.

Assessments

New length cohort analyses and yield per recruit calculations were carried out for functional units where it was judged there were sufficient new data or changes in parameters to justify this, or where it was considered that the reference period in the previous assessment was no longer relevant to the current situation in the fishery.

Assessments using catch at nominal age data obtained by converting the length compositions into their component age compositions were performed where possible.

Mesh Assessments/Minimum Landing Size

In the light of new Swedish data on the selectivity of various types of *Nephrops* gear, mesh assessments were performed for functional units 3+4 (Skagerrak and Kattegat). The results suggest that there would be considerable gains in long-term yield by adopting more selective gears.

Management Guidelines and Precautionary TACs

Assessments of *Nephrops* stocks remain uncertain owing to the difficulties of ageing and of estimating parameters, and because of the variability within some stocks. For some, however, there are indications of the state of the stock analysis and/or indications of whether they are underexploited, fully exploited or overexploited based on the estimated current level of fishing mortality in relation to the position of the maximum on the yield per recruit curve.

Last year ACFM outlined the basis for the calculations used to provide advised TACs. One of three approaches was used depending on the availability of data for each functional unit.

For this year the new information available did not lead to any major changes in the perceived state of exploitation or stock size and consequently there was no reason to change the advice given for any Management Area for 1995.

6.1.2 *Nephrops* in Division IIIa

Units included in recommended Management Area: a) Skagerrak (Unit 3) and b) Kattegat (Unit 4).

Catch data:

Year	Rec TAC	Agreed TAC	ACFM lndgs
1987			4.0
1988			3.7
1989			3.9
1990			4.4
1991			4.2
1992	~4.0	3.5	2.9
1993	~4.3	3.5	3.2
1994	2.9	3.5	

(Weights in '000 t)

Historical development of the fishery: Landings in the Skagerrak varied between 500 and 1,500t from the 1960s to the 1980s and thereafter showed a marked increase, fluctuating between 2,000 and 2,500t. In the Kattegatt, landings have decreased by 45% since 1984 and are currently the lowest in the recent ten year period (graph a).

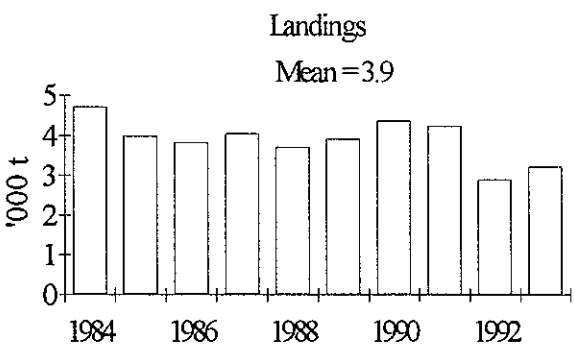
State of stock: The state of the stock cannot be precisely assessed but LPUE has decreased in recent years and there are indications of overexploitation (graph b). The fishing effort in the Skagerrak is now stabilizing but effort in the Kattegat continues to decline. Preliminary assessments suggest that current F is above F_{max} in males and close to F_{max} in females.

Management advice: In 1993, ACFM advised that the precautionary TAC to be set for 1994 should not exceed the 1992 catch, viz 2,900t. There is no new information to revise this figure for 1995. Similar or higher yields could be obtained in the long term at lower cost and with higher catch rates if the effort is reduced and the selection pattern in the fishery is improved.

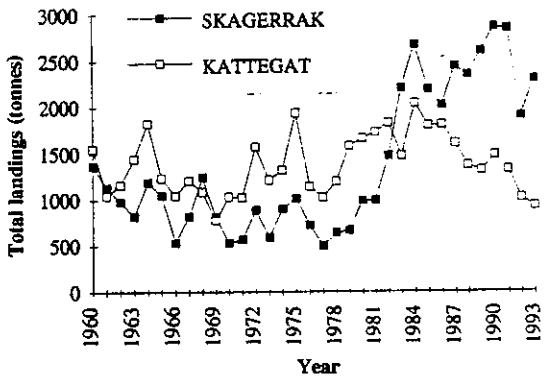
Special comments: The large quantity of undersized *Nephrops* that are discarded in this area (in 1993 estimated to be 75% of the catch in number) reflects the fact that the minimum landing size does not correspond to the current legal mesh size of 70 mm diamond mesh. The results of a mesh assessment based on new selectivity experiments indicate that the gain in long-term landings from introducing more selective gears could be significant. Adoption of more selective gears will probably also increase the selection of unwanted undersized roundfish in this area.

Data and assessment: Landings per unit effort and some CPUE data are available. Length compositions are available from 1990 onwards. Length cohort analysis was carried out for the combined area but biological data are still inadequate to support a reliable analytical assessment. Assessment of the stock is based mainly on CPUE and effort data.

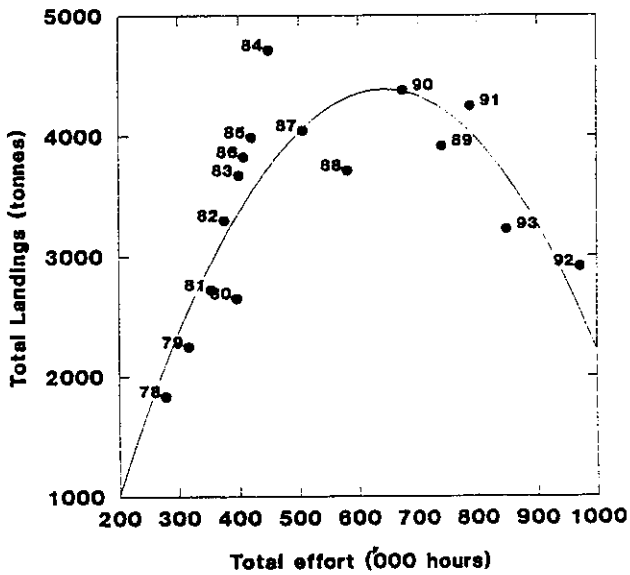
Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).



a) **LONG TERM TREND IN TOTAL LANDINGS**



b)



6.1.3 *Nephrops* in Division IVa Rectangles 44-48 E6-E7+44E8

Units included in recommended Management Area: a) Moray Firth (Unit 9) and b) Noup (Unit 10).

Catch data:

Year	Rec TAC	Agreed TAC[1]	ACFM lndgs
1987			2.1
1988			2.1
1989			2.7
1990			2.3
1991	2.33		1.8
1992	~2.4	12.0	1.8
1993	2.4	12.0	2.2
1994	2.4	13.0	

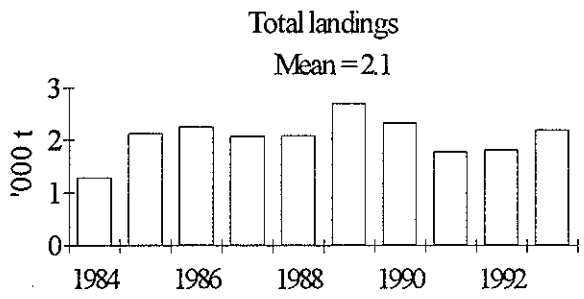
(Weights in '000 t) [1]EU zone of IIa and IV

Historical development of the fishery: Moray Firth landings in 1993 were up compared to the previous year but still below the high level of 1985-1990 (graph a). Landings from the Noup were higher in 1993 than in any previous year.

State of stock: a) Moray Firth: long-term data series show LPUE strongly fluctuating with rising trend (graph c). Yield per recruit analysis suggests that the stock is fully exploited at current levels of effort. Slight increase in effort compared to 1992 but still below the high level of 1986-1990 (graph b). The length-based assessment suggests that current F is above F_{max} in males but well below F_{max} in females (graph d). The age-based assessment suggests that F in males has recently declined from the peak levels of 1989-1990.

b) Noup: LPUE fluctuating strongly and at a high level in 1993. Effort fluctuating, relatively high in 1991 and 1993.

Management advice: The stocks are indicated to be fully exploited. Similar or higher yields could be obtained in the long term at lower cost. ACFM advised a precautionary TAC of about 2,400 t for the Management Area in 1993 and 1994. There is no basis for revising this figure for 1995.



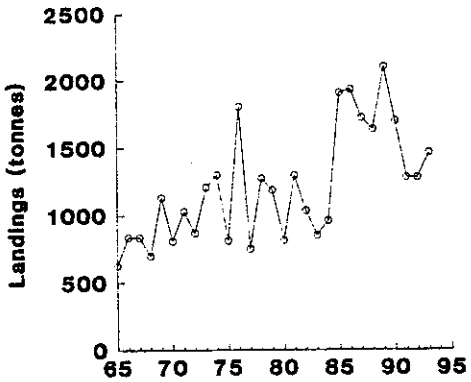
Special comments: It should be noted that this recommended management area includes two functional units and that a TAC set for the entire area will not necessarily result in balanced exploitation between the two units.

Data and assessment: LPUE, landings/area and effort/area data available for both units. Mean size data available for the Moray Firth. The age-based assessment performed reasonably well for males but the assessment is considered to be uncertain due to inadequate biological data. TV camera survey carried out in Moray Firth in 1993. No length composition data available for Noup.

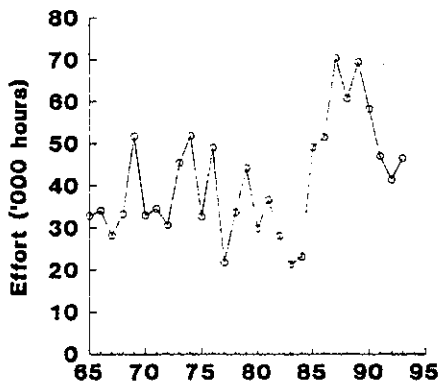
Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

Moray Firth (Functional Unit 9) Scottish *Nephrops* trawlers

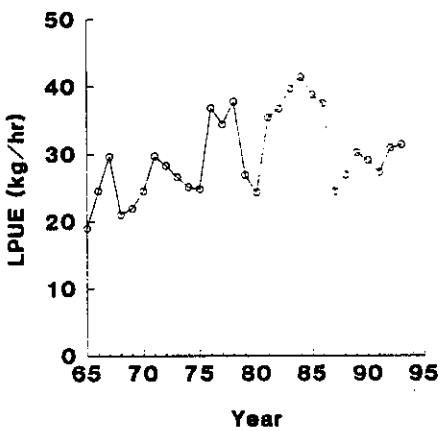
a)



b)

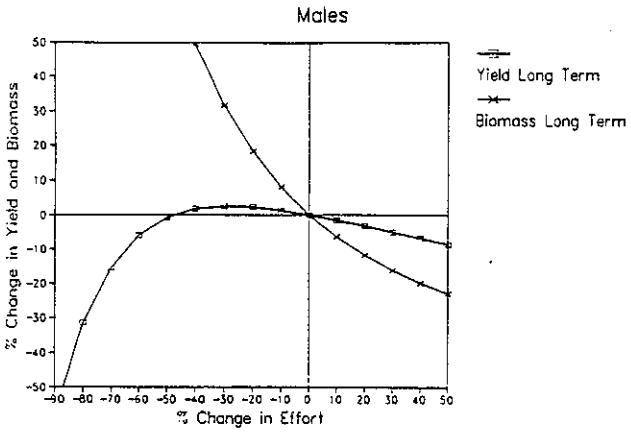


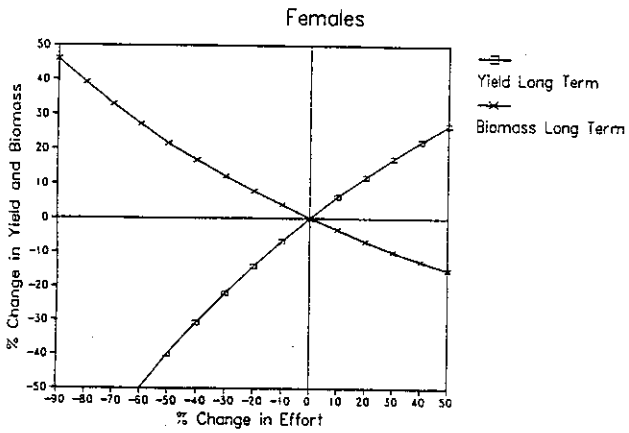
c)



d)

Moray Firth (Functional Unit 9): Percentage changes in long term landings and stock biomass following various changes in fishing effort. Males and females shown separately





6.1.4 *Nephrops* in Division IVa (Rectangles not included under Section 6.1.3)

Units included in recommended Management Area: a) Fladen Ground (Unit 7).

Catch data:

Year	Rec TAC	Agreed TAC[1]	ACFM lndgs
1987			1.7
1988			1.6
1989			2.4
1990			2.7
1991	2.37		4.5
1992	~2.7	12.0	3.5
1993	2.7	12.0	3.8
1994	5.0	13.0	

(Weights in '000 t) [1]EU zone of IIa and IV

Historical development of the fishery: Landings from the Fladen Ground fluctuated at a low level up to the beginning of the 1980s. Thereafter there was a steady increase up to the 1991 peak (graph a).

State of stock: LPUE remains high (Scottish and Danish data) (graph c). TV camera surveys suggest that the stock is not fully exploited and that it could sustain increased fishing effort.

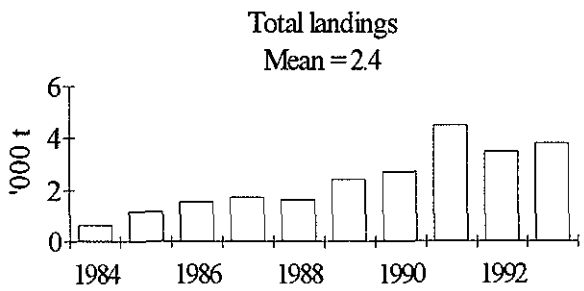
Higher fishing effort in 1993 compared to the previous year but still well below the peak level of 1991 (graph b). Effort is not considered to be high in relation to the area of ground available.

Management advice: In the light of information regarding the distribution of biomass of the stock, ACFM advised a precautionary TAC of 5,000 t for this Management Area for 1994. There is no basis for revising this figure for 1995.

Special comments: Because of the different state of exploitation of the Fladen Ground compared to other units in the North Sea, a separate TAC would be advisable and adoption of the recommended Management Areas is again encouraged.

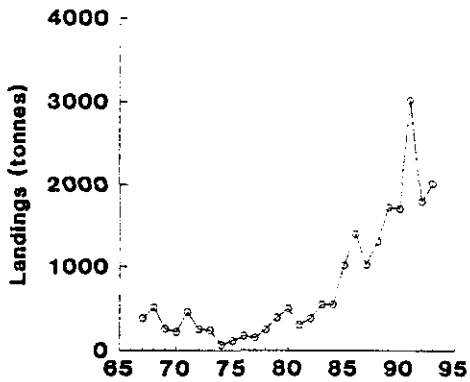
Data and assessment: LPUE, mean size, landings/area and effort/area data available. Length-based and age-based assessments are considered unreliable because of inadequate data. Stock abundance and biomass estimated from TV surveys in 1992-1993. These estimates are considered to be unreliable.

Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

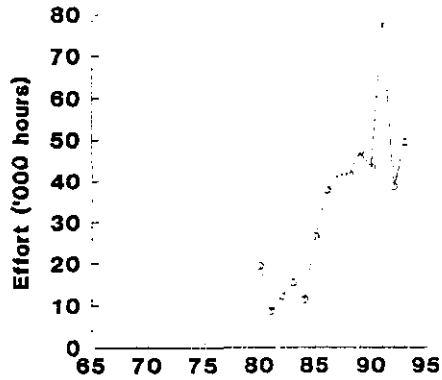


Scottish Nephrops trawlers

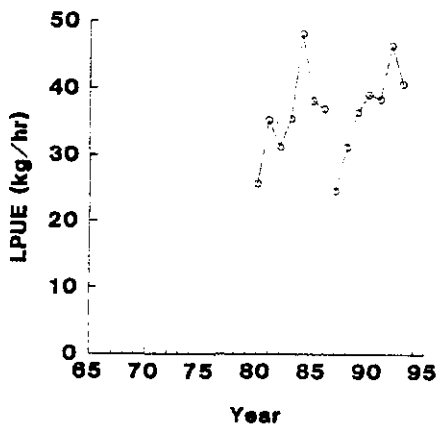
a)



b)



c)



6.1.5 *Nephrops* in Divisions IVb,c east of 1°E

Units included in recommended Management Area: a) Botney Gut and Silver Pit (Unit 5).

Catch data:

Year	Rec TAC	Agreed TAC[1]	ACFM lndgs
1987			>0.52
1988			0.71
1989			0.89
1990			1.00
1991	0.77		1.05
1992	~0.87	12.0	0.81
1993	0.875	12.0	0.95
1994	0.875	13.0	

(Weights in '000 t) [1]EU zone of IIa and IV.

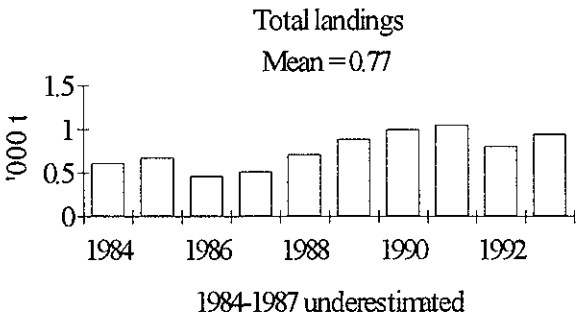
Historical development of the fishery: Available data cover landings from 1986 onwards. Landings increased in the period 1986-1991 and have since fluctuated (graph a). There was a considerable decrease in effort in 1993 and again in early 1994 as a result of decommissioning of vessels (graph b).

State of stock: LPUEs of males increased since 1991 (graph c). Female LPUEs fluctuating depending on availability in the third quarter (graph d). Mean size of males slightly lower, that of females stable over the time series 1986-1993.

Current F close to F_{max} for males, far below F_{max} for females (graph e). The stock is considered to be fully exploited.

Management advice: ACFM advised a precautionary TAC of 875 t for the Management Area in 1993 and 1994. There is no basis for revising this figure for 1995.

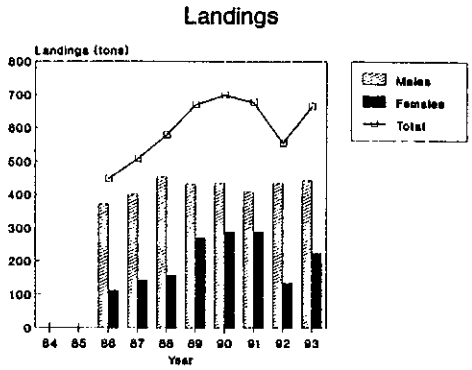
Data and assessment: Landings data revised to take account of non-reported landings. Length-based assessment using length frequency data for 1992-1993 for both males and females. The length frequency data were improved for both landings and discards. The assessment is considered to be uncertain due to inadequate biological data.



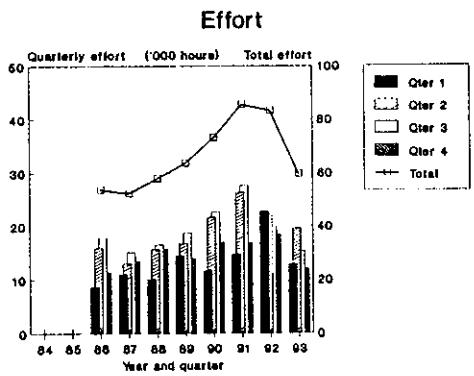
Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

FU 5: Botney Gut: Belgian *Nephrops* trawlers

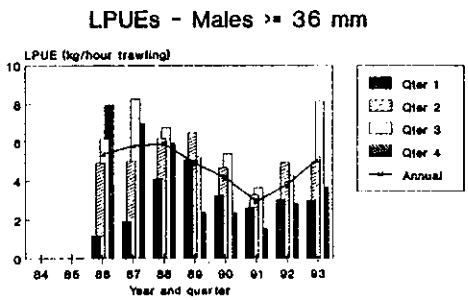
a)



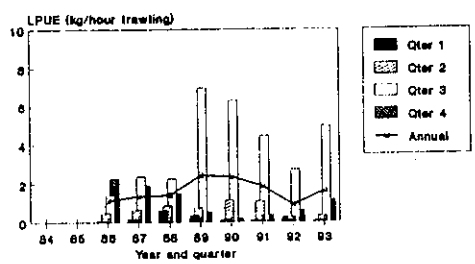
b)



c)

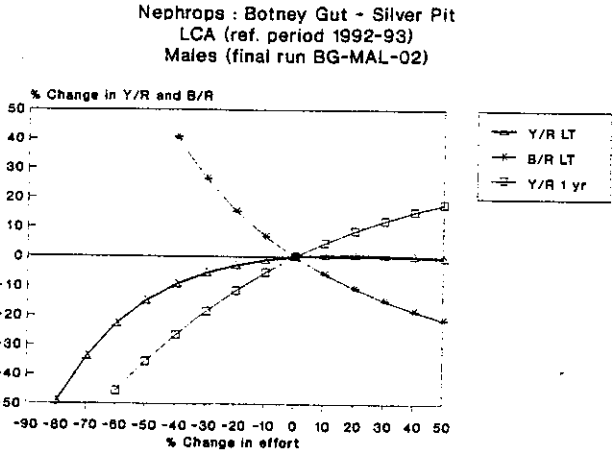


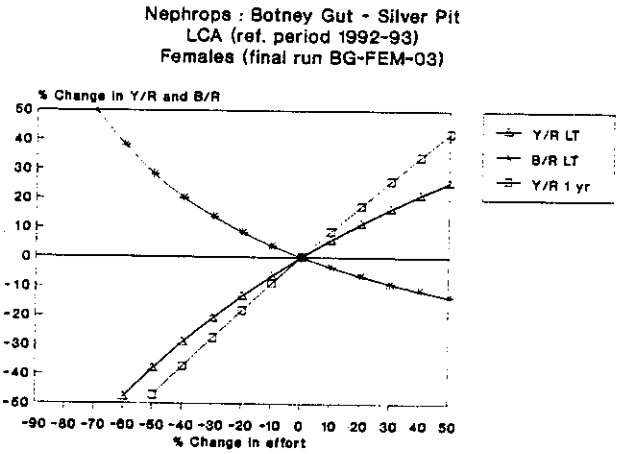
d)



e)

Botney Gut - Silver Pit (Functional Unit 5): Percentage changes in long-term landings and stock biomass following changes in fishing effort.





6.1.6 *Nephrops* in Divisions IVb,c west of 1°E

Units included in recommended Management Area: a) Farn Deeps (Unit 6) and b) Firth of Forth (Unit 8).

Catch data:

Year	Rec TAC	Agreed TAC[1]	ACFM lndgs
1987			4.0
1988			5.3
1989			5.1
1990			4.6
1991	4.49		3.8
1992	~4.60	12.0	3.5
1993	~4.17	12.0	5.6
1994	~4.17	13.0	

(Weights in '000 t) [1]EU zone of IIa and IV

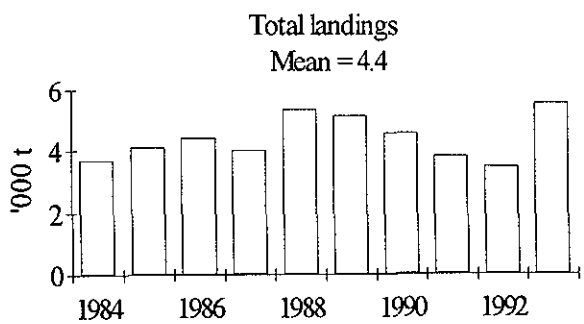
Historical development of the fishery: a) Farn Deeps landings and effort have increased since the 1960s to a peak in 1989 and have since fluctuated (graph d). b) Firth of Forth landings and effort have shown an increasing trend since 1965 and have fluctuated at a high level since 1985 (graph a and b).

State of stock: a) Farn Deeps: CPUE fairly stable, LPUE increased, probably due to change in discarding pattern as mean size in the landings fell. Age-based assessment suggests that male stock has recently been stable, and that female stock is declining. F has increased following recent lower values. Yield per recruit analysis suggests that current F is above F_{max} in males but below F_{max} in females. b) Firth of Forth: LPUE at a low level in long-term series (graph c). Mean size in landings shows decline up to 1988-1989 but increased recently. Age-based assessment suggests that stock has recently fallen compared to the mid-1980s. Effort fluctuating but showing increasing trend. Age-based assessment shows current F in males (=1.0) is below 1988 level. Yield per recruit analysis suggests that current F is well above F_{max} in males and below F_{max} in females (graph e).

Management advice: ACFM advised a precautionary TAC of about 4,170 t for the Management Area in 1993 and 1994. There is no basis for revising this figure for 1995. Higher yields could be obtained in the long term at lower cost by a reduction of effort.

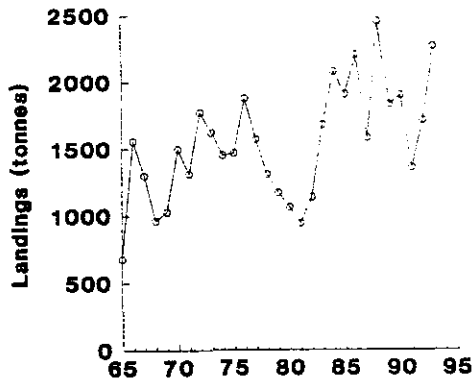
Data and assessment: LPUE and mean size data available for both units. CPUE data available since 1984-1985 for Farn Deeps. Landings/area and effort/area indices for Firth of Forth. Length- and age-based assessments carried out and performed reasonably well but regarded as uncertain. TV survey of Firth of Forth stock carried out in 1993.

Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

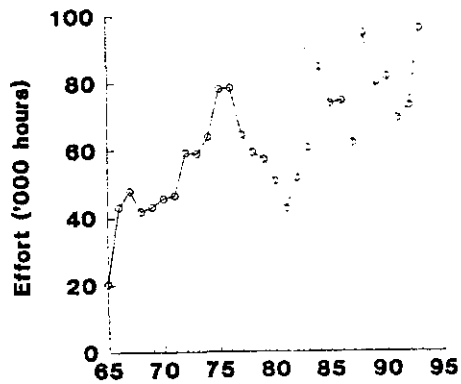


Firth of Forth (Functional Unit 8)

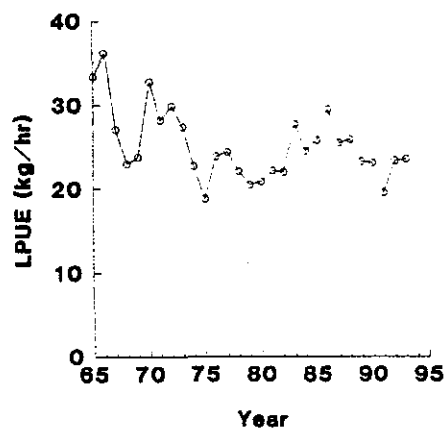
a)



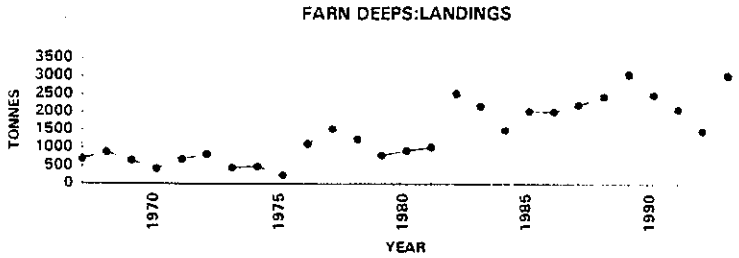
b)



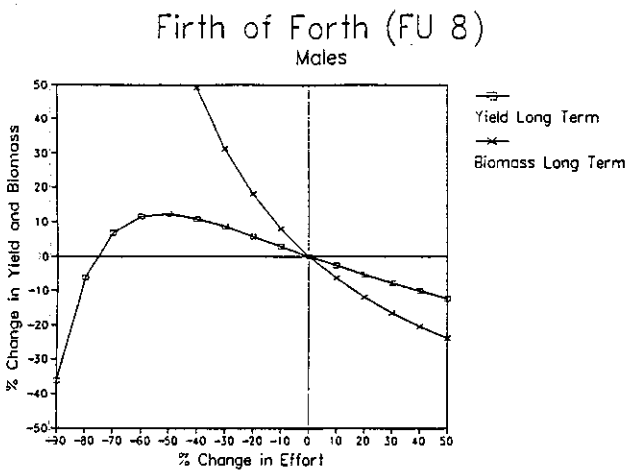
c)

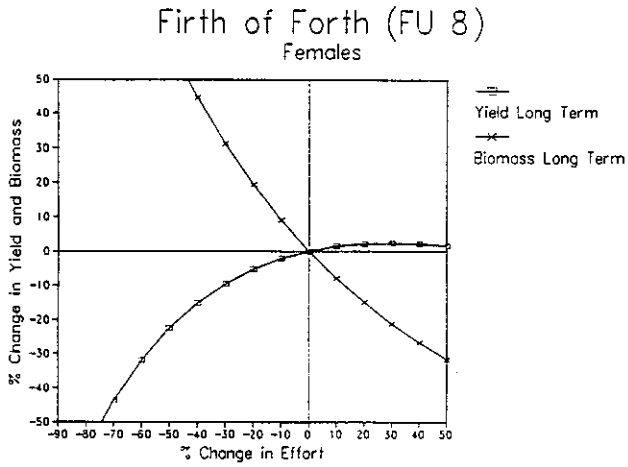


d) Farn Deeps (Functional Unit 6): landings.



e) Firth of Forth (Functional Unit 8): Percentage changes in long-term landings and stock biomass following various changes in fishing effort. Males and females shown separately.





6.1.7 *Nephrops* in Division VIa

Units included in recommended Management Area: a) North Minch (Unit 11), b) South Minch (Unit 12) and c) Firth of Clyde (Unit 13).

Catch data :

Year	Rec TAC	Agreed TAC	ACFM lndgs.
1987		16.0	11.2
1988		16.0	12.7
1989		16.0	11.0
1990		16.0	10.1
1991	11.7	13.5	10.5
1992	~11.4	12.0	10.8
1993	~11.3	12.0	11.1
1994	11.3	12.6	

(Weights in '000 t)

Historical development of the fishery: Landings and effort in all three functional units have increased since the 1960s. In the North Minch and Firth of Clyde landings have fluctuated at a high level since the mid-1980s (graph a and g). Continued increase in South Minch until 1990 (graph d).

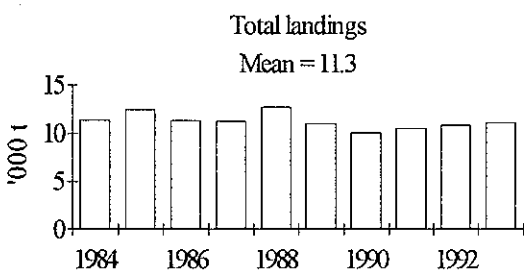
State of stock: a) N.Minch: LPUE fluctuating and recently rather low (graph c). Mean size fluctuations. Effort fell from 1987-1990 but has increased again recently (graph b). Yield per recruit analysis suggests that F is above F_{max} in males and below F_{max} in females.
b) S. Minch: LPUE fluctuating and recently slightly higher (graph f). Mean size fluctuating. Effort increasing up to 1990 but falling in last three years (graph e). Yield per recruit analysis suggests that current F is above F_{max} in males but below F_{max} in females.
c) Clyde: LPUE shows some improvement from recent low values (graph i). Mean size has increased slightly. Effort levelling off but still above the reference period average; 1993 level highest (graph h). Current F above F_{max} in males and below F_{max} in females.

Management advice: ACFM advised a precautionary TAC of 11,300t for the Management Area in 1993 and 1994. There is no basis for revising this figure for 1995. Higher yields could be obtained in the long term by a reduction of effort.

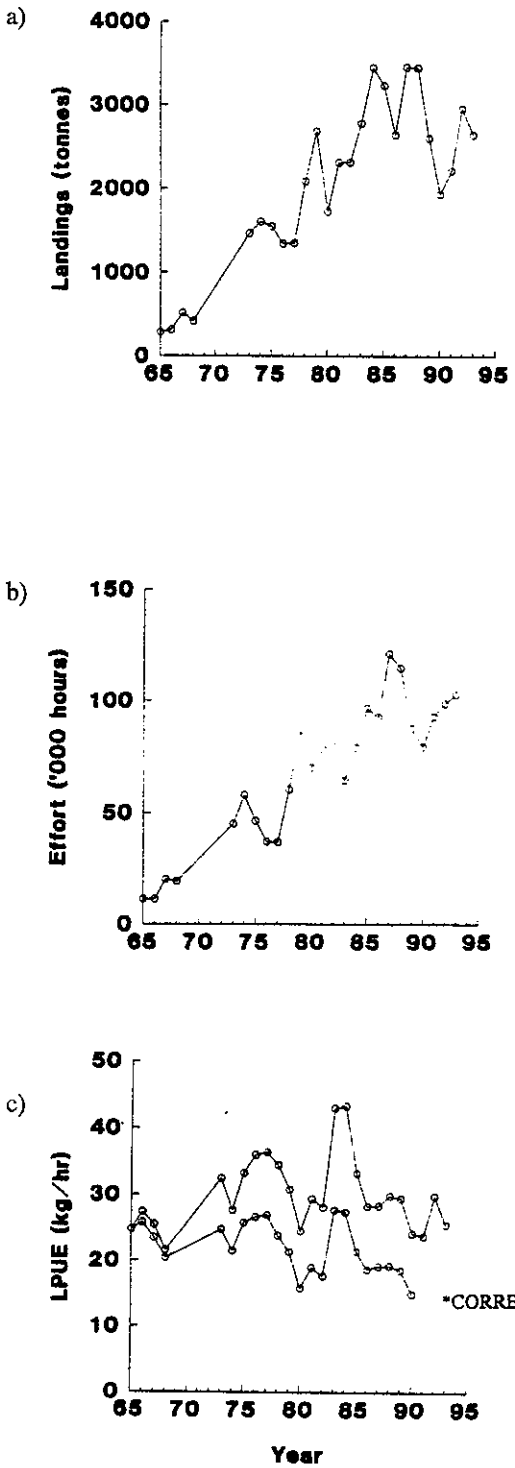
Data and assessment: LPUE, mean size, landings/area and effort/area data available for all units. Yield per recruit analysis repeated using most recent four years' trawl data (all units). No assessments of creel fisheries.

Assessment considered to be uncertain.

Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).



North Minch (Functional Unit 11)

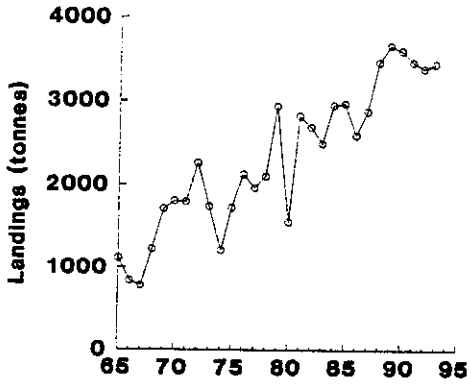


* Corrected for Horse power changes

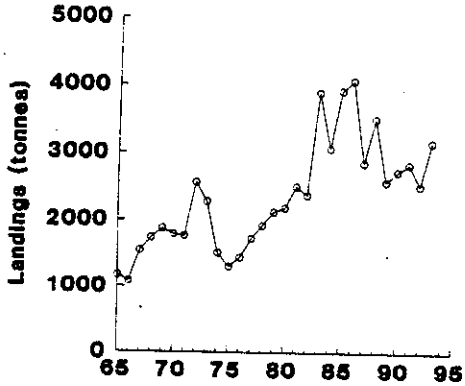
South Minch (Functional Unit 12)

Firth of Clyde (Functional Unit 13)

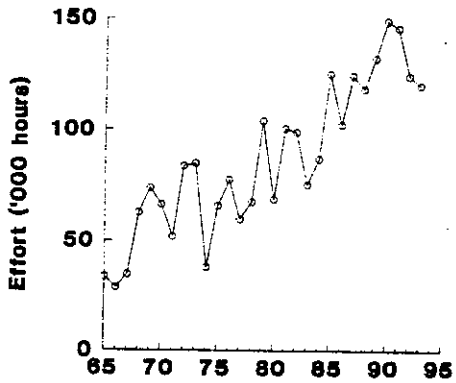
d)



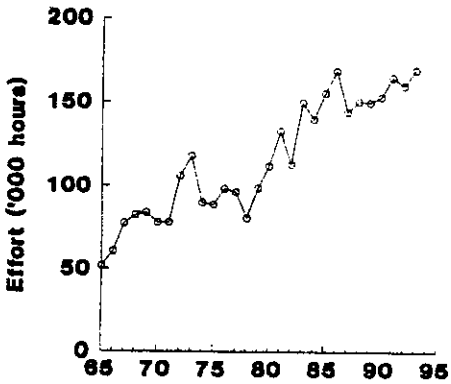
g)



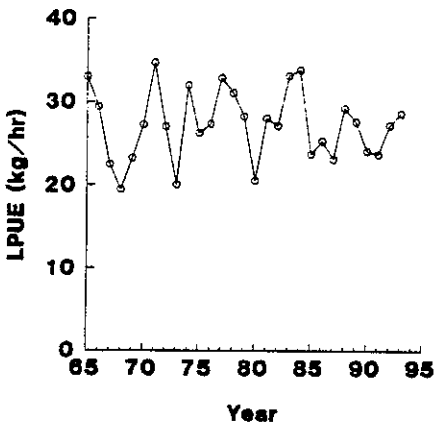
e)



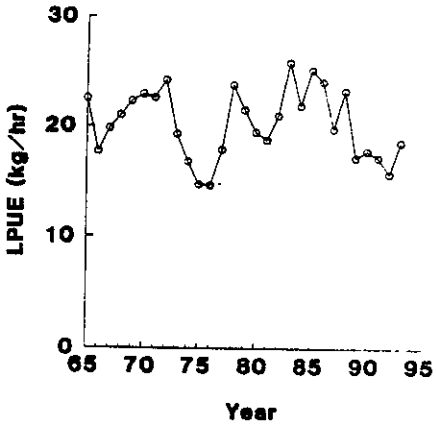
h)



f)



i)



6.1.8 *Nephrops* in Divisions Vb (EU zone) and VIb

Special comments: There are no reported landings of *Nephrops* from this area, so it is suggested that a zero TAC would prevent misreporting.

Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

6.1.9 *Nephrops* in Division VIIa (excluding rectangles 33E2-E5)

Units included in recommended Management Area: a) Irish Sea East (Unit 14) and b) Irish Sea West (Unit 15).

Catch data :

Year	Rec TAC	Agreed TAC[1]	ACFM lndgs
1987			9.7
1988			8.8
1989			8.5
1990			8.9
1991	8.76		10.3
1992	8.9	20.0	8.0
1993	9.40	20.0	8.5
1994	9.40	20.0	

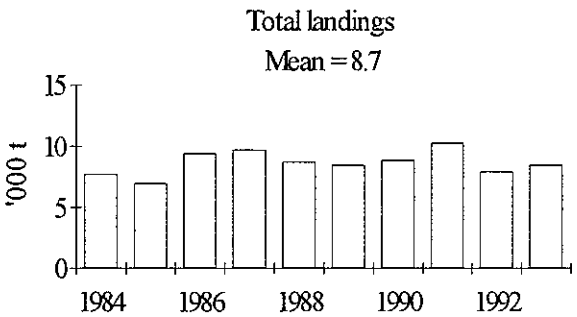
(Weights in '000 t) [1]Sub-area VII

Historical development of the fishery: Landings and effort in Irish Sea East increased to a peak in 1978. Since then landings have decreased more than effort (graph a). In Irish Sea West both landings and effort have increased since 1955.

State of stock: Both stocks are considered to be fully exploited.
In Irish Sea East: Effort fluctuating but high in 1993 (graph a). Current F at F_{max} in males and females.
In Irish Sea West F is high, but there is evidence of a fall in effort and a rise in CPUE in the most recent years (graph b and c). Recruitment relatively stable.

Management advice: ACFM advised a precautionary TAC of about 9,395 t for the Management Area in 1993 and 1994. There is no basis for revising this figure for 1995.

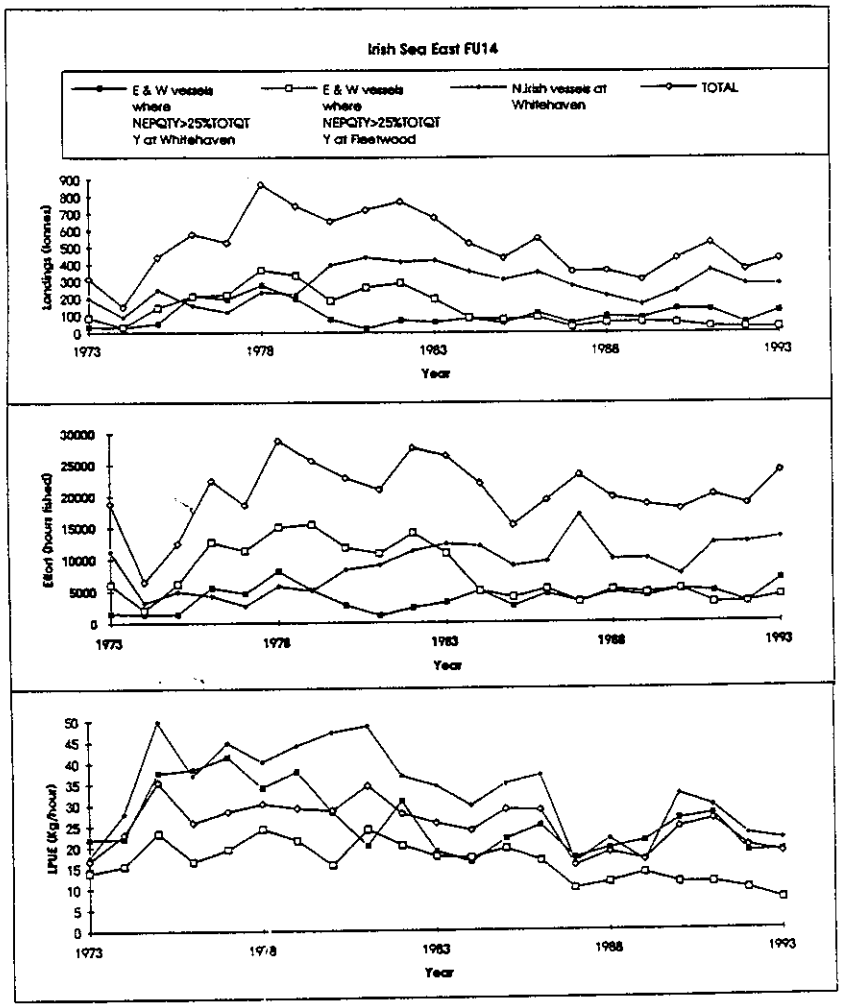
Special comments: The high F values for the Irish Sea suggest that the situation should be very carefully monitored.



Data and assessment: LPUE and mean size data are available for both units. CPUE available for Irish Sea West. Length-based assessment repeated for Irish Sea East and age-based assessment for Irish Sea West with revised Northern Ireland length compositions. The assessments are considered to be uncertain.

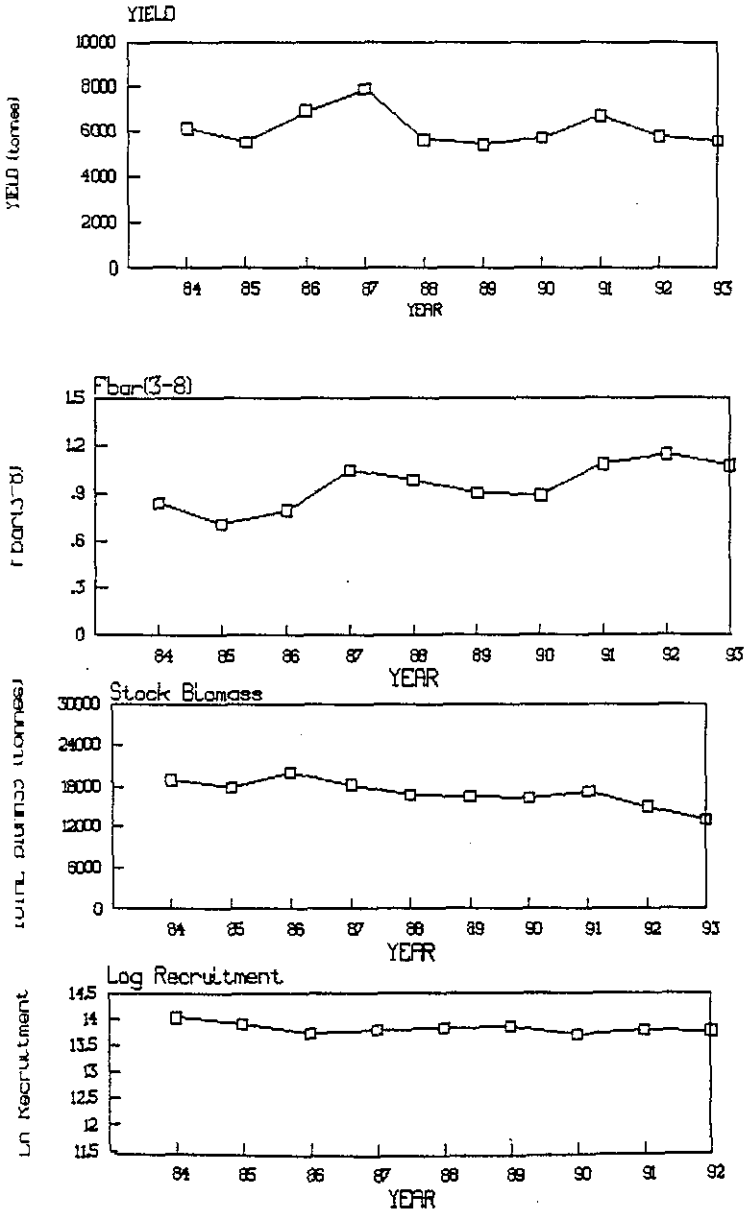
Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

a)

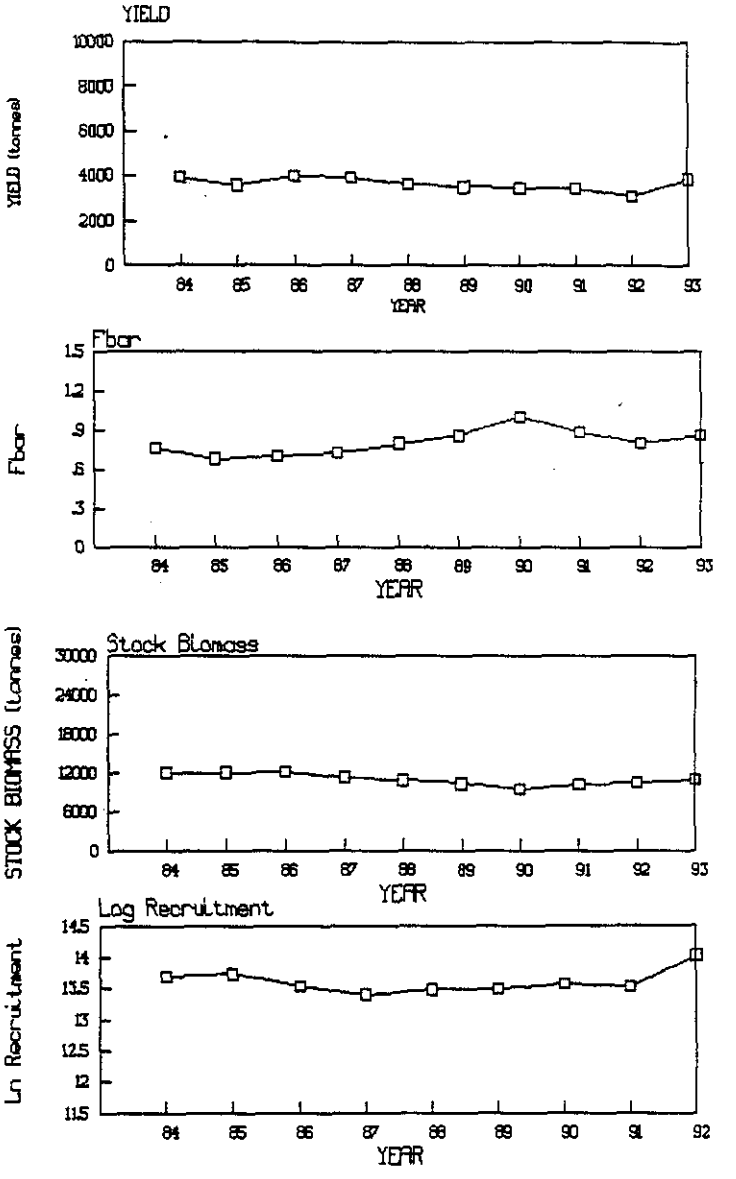


Irish Sea West (Functional Unit 15): Trend in Yield (tonnes), Fbar, stock biomass (tonnes) and Ln recruitment. From VPA 1984-1993

b) Males



c) Females



6.1.10 *Nephrops* in Divisions VIId,e

Special comments: There are no reported landings of *Nephrops* for this area, so it is suggested that a TAC of zero would prevent misreporting.

Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

6.1.11 *Nephrops* in Divisions VIIb,c,j,k

Units included in recommended Management Area: a) Porcupine Bank (Unit 16), b) Aran Islands (Unit 17), c) NW and W Ireland (Unit 18) and d) SW Ireland (Unit 19).

Catch data :

Year	Rec TAC	Agreed TAC[1]	ACFM lndgs
1987			4.5
1988			3.9
1989			3.7
1990			2.9
1991	5.09		3.2
1992	3.8	20.0	3.5
1993	~4.0	20.0	2.8
1994	~4.0	20.0	

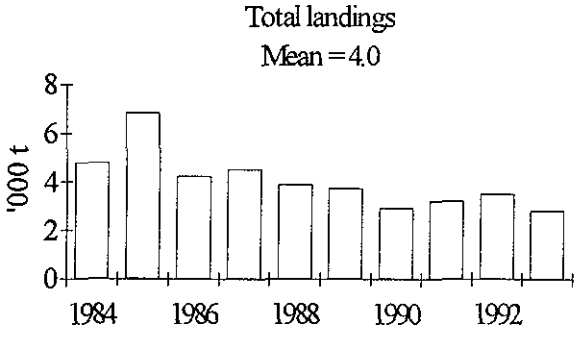
(Weights in '000 t) [1]Sub-area VII

Historical development of the fishery: Landings increased to a peak in the 1980s, and have decreased since (graph a). At Porcupine Bank the 1993 landings are the lowest on record. Total landings show a decreasing trend but increases or high catches are maintained for some functional units.

State of stock: a) Porcupine Bank: CPUE (Spanish fleet) has increased slightly since 1992 (graph c). LPUE (French fleet) fairly stable since 1989. Effort has decreased substantially in the fleets involved (graph b). The yield per recruit analysis carried out in 1993 suggested that current F is above F_{max} in males and close to F_{max} in females. Mean size is fairly stable in males and females, although in 1993 slightly above two previous years.

b) Aran Islands: the assessment (1992) suggests that the current F is close to F_{max} in both males and females. No assessments for other units.

Management advice: ACFM advised a precautionary TAC of about 4,000 t for the Management Area in 1993 and 1994. There is no basis for revising this figure for 1995.



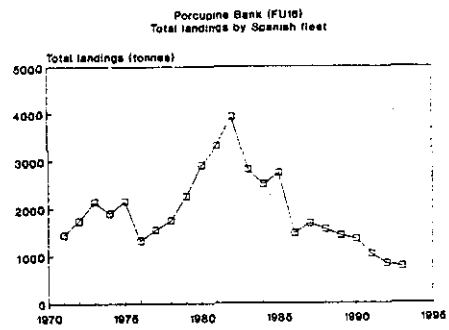
Special comments: It should be noted that this Management Area includes four functional units and that a TAC set for the entire area will not necessarily result in a balanced exploitation between the four units. At present this Management Area is within a much larger TAC area where the problem referred to will be even greater.

Data and assessment: CPUE, LPUE and mean size data were available for Porcupine Bank. A yield per recruit assessment was not carried out this year due to inadequate length sampling in 1993. An age-based assessment was performed for Porcupine Bank (1993) but is considered still to be uncertain. Assessments were not possible for c) NW and W Ireland and d) SW Ireland.

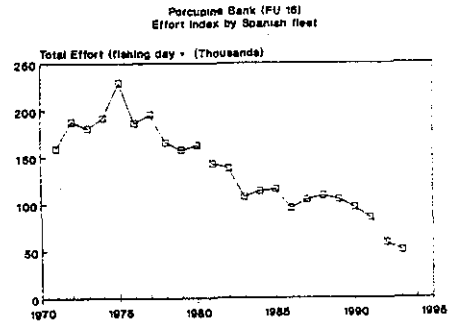
Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

Porcupine Bank (Functional Unit 16) : Spanish fleet

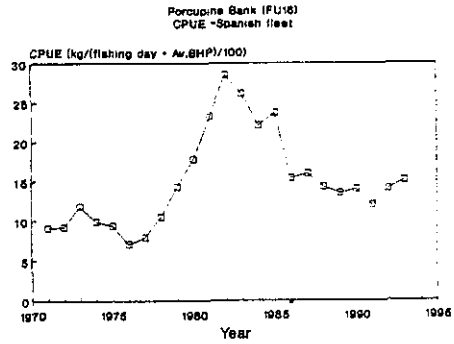
a)



b)



c)



6.1.12 *Nephrops* in Divisions VIIf,g,h and VIIa Rectangles 33E2-E5

Units included in recommended Management Area: a) Celtic Sea (Units 20, 21 and 22 combined).

Catch data :

Year	Rec TAC	Agreed TAC[1]	ACFM lndgs
1987			3.4
1988			3.1
1989			4.0
1990			4.4
1991	3.83		3.3
1992	~3.8	20.0	4.2
1993	3.8	20.0	5.3
1994	3.8	20.0	

(Weights in '000 t) [1)]Sub-area VII

Historical development of the fishery: Landings have fluctuated without trend and there has been an increasing trend in effort in recent years, with a record high in 1993 (graph a and b).

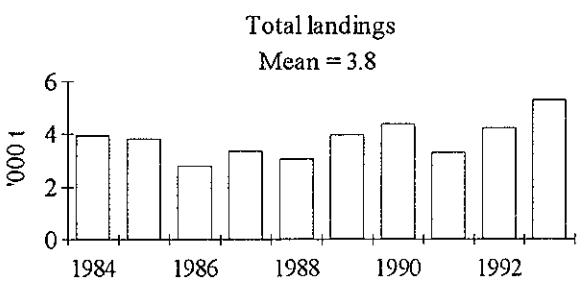
State of stock: Total stock biomass decreasing for females and without trend for males (graph c and d). Fishing mortality without trend for males but slightly increasing for females. Current fishing mortality is estimated to be above F_{max} for both sexes (graph e); hence the stock is regarded as overexploited at present.

Management advice: ACFM advised a precautionary TAC of 3,800 t for the Management Area in 1993 and 1994. There is no basis for revising this figure for 1995.

Special comments: The Celtic Sea comprises three functional units which should ideally involve separate monitoring and assessment.

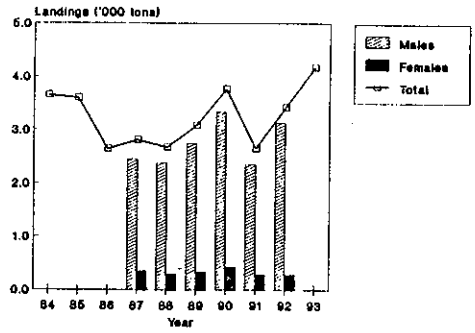
Data and assessment: LPUE, mean size data and length composition of catches available - changes in size at maturity and length composition of discards. Length-based and age-based assessments performed on both sexes, but not regarded as reliable.

Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

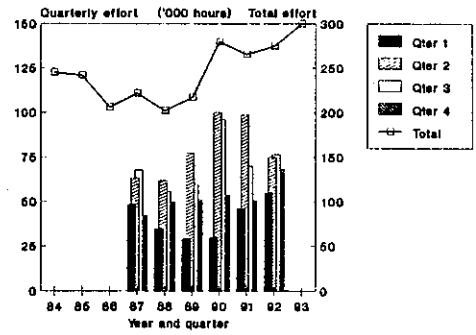


Celtic Sea (Functional Units 20-22): French *Nephrops* trawlers

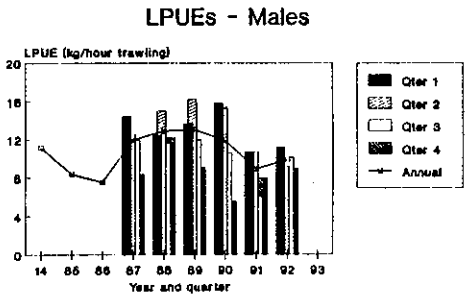
a)



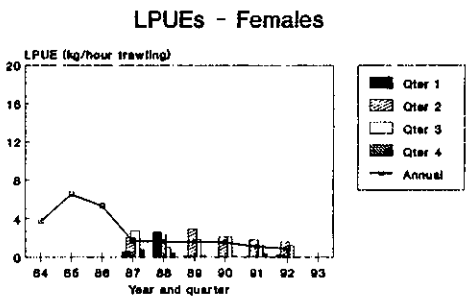
b)



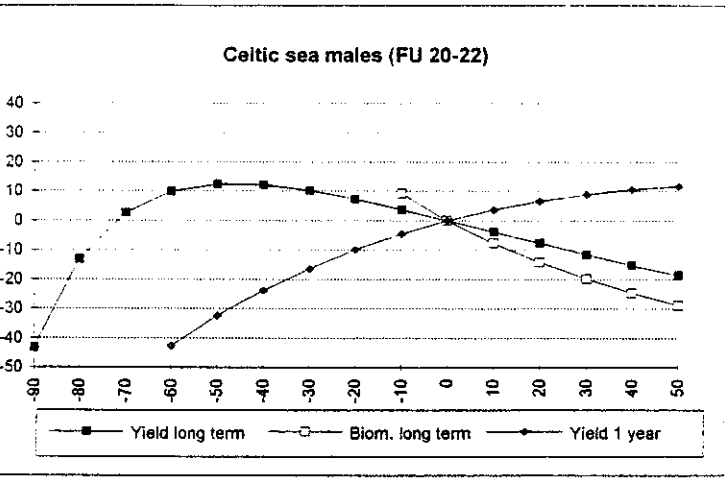
c)

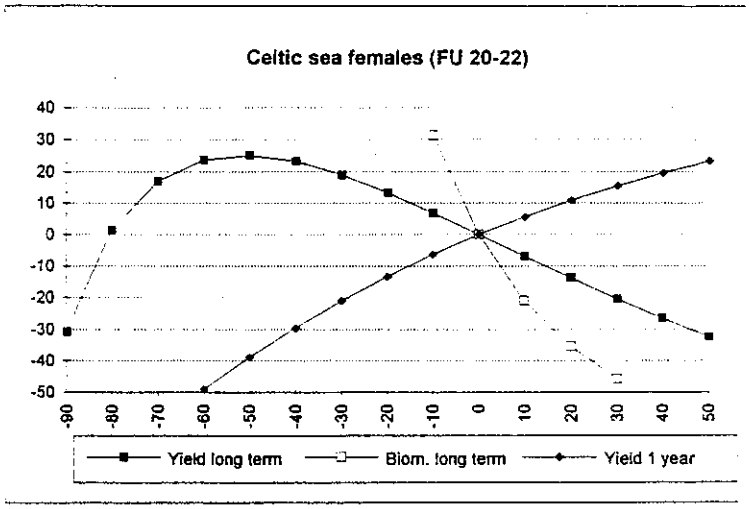


d)



e) Celtic Sea (Functional Units 20-22): Percentage change in long-term yield and biomass following various changes in fishing effort. Males and females shown separately.





6.1.13 *Nephrops* in Divisions VIIIa,b

Units included in recommended Management Area: a) Bay of Biscay North (Unit 23) and b) Bay of Biscay South (Unit 24).

Catch data :

Year	Rec TAC	Agreed TAC	ACFM lndgs
1987		7.5	5.7
1988		7.5	6.8
1989		7.5	5.4
1990		7.5	5.1
1991	5.19	6.5	4.8
1992	6.8	6.8	5.7
1993	6.8	6.8	4.7
1994	6.8	6.8	

(Weights in '000 t)

Historical development of the fishery: Landings fluctuating without trend (graph a). Effort showed an increase up to 1991, thereafter decreasing (graph b).

State of stock: Total stock biomass slightly decreasing for males (graph c). Diagnostics for females suggest that more caution is required, but relative stability of the SSB is apparent (graph d).

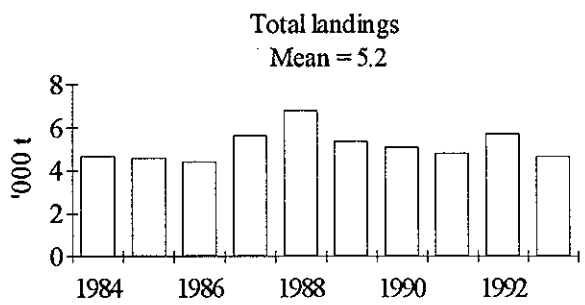
Fishing mortality for both males and females is fairly stable. Current F is estimated to be far above F_{max} for both sexes.

Management advice: ACFM advised a precautionary TAC of 6,800 tonnes for the Management Area in 1993 and 1994. There is no basis for revising this figure for 1995.

Special comments: It should be noted that this recommended Management Area includes two functional units and that a TAC set for the entire area will not necessarily result in balanced exploitation between these two units.

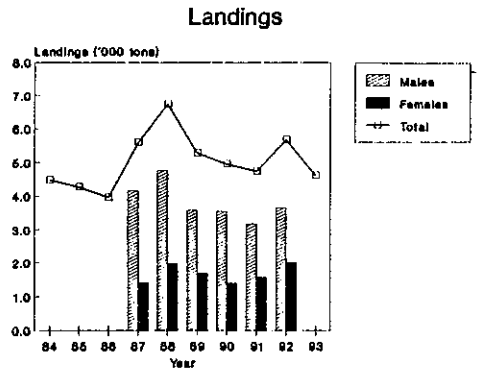
Data and assessment: LPUE, length compositions of discards and landings and mean sizes were available for Bay of Biscay North. Length-based assessments were carried out on data for the three last years. An age-based assessment based on real ages was also performed on the whole data set. The Assessments are not considered reliable.

Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

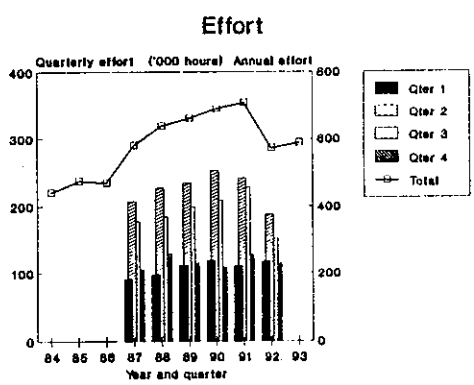


Bay of Biscay (Functional Units 23 and 24): French *Nephrops* trawlers

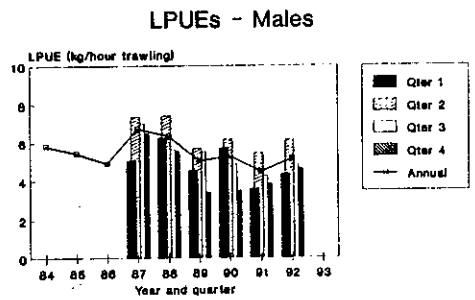
a)



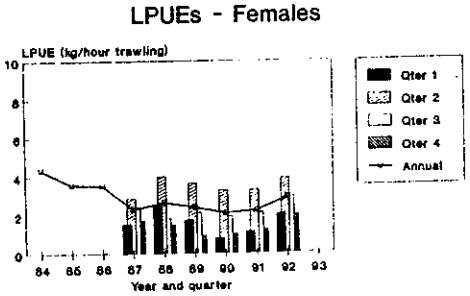
b)



c)



d)



6.1.14 *Nephrops* in Division VIIIc

Units included in recommended Management Area: a) North Galicia (Unit 25) and b) Cantabrian Sea (Unit 31).

Catch data :

Year	Rec TAC	Agreed TAC	ACFM lndgs
1987		0.5	0.53
1988		0.5	0.60
1989		0.6	0.52
1990		0.8	0.47
1991	0.51	0.6	0.56
1992	0.51	0.8	0.52
1993	0.51	1.0	0.36
1994	0.51	1.0	

(Weights in '000 t)

Historical development of the fishery: Landings and effort have declined since the 1970s in the North Galicia fishery, and are at present close to record low values (graphs a and b). The Cantabrian Sea fishery has been fluctuating. For the whole area the 1993 landings are among the lowest in the time series.

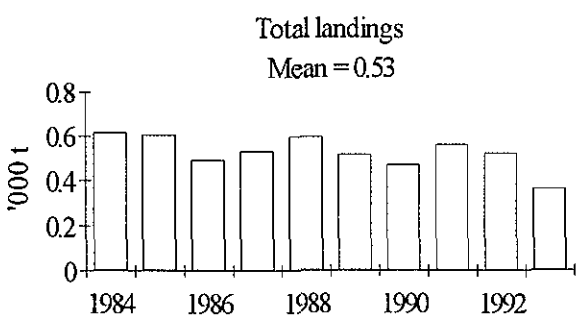
State of stock: a) North Galicia: CPUE falling in 1993 (graph c). Mean size of males and females fluctuating without obvious trend. Effort fluctuating. Yield-per-recruit analysis suggests that current F is above F_{max} in males, although long-term gains in moving to F_{max} are less than 5%; in females current F is below F_{max} (graph d).
b) Cantabrian Sea: CPUE slowly decreasing below the level of the period 1987-1990. Mean size of males increasing, and females stable. Effort decreasing. Current F is above Fmax in males and below F_{max} in females.

Both stocks are considered to be fully exploited.

Management advice: ACFM advised a precautionary TAC of about 510 t for the Management Area in 1993 and 1994. There is no basis for revising this figure for 1995.

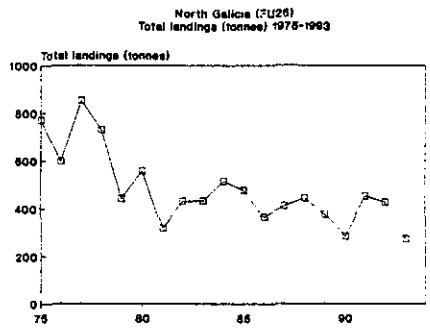
Special comments: It should be noted that this recommended Management Area includes two functional units and that a TAC set for the entire area will not necessarily result in balanced exploitation between the two units.
Data and assessment: CPUE and mean size data available for both units. a) North Galicia: Yield per recruit length-based analysis (1994). Age-based (North Galicia) and length-based assessment (Cantabrian Sea) performed in 1991 but not regarded as reliable.

Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

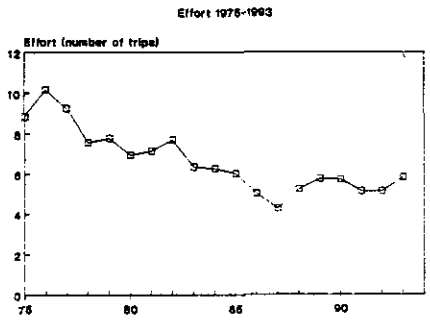


North Galicia (Functional Unit 25)

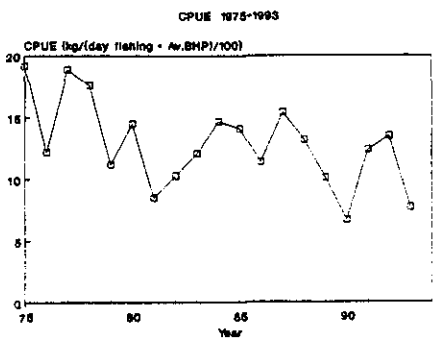
a)



b)

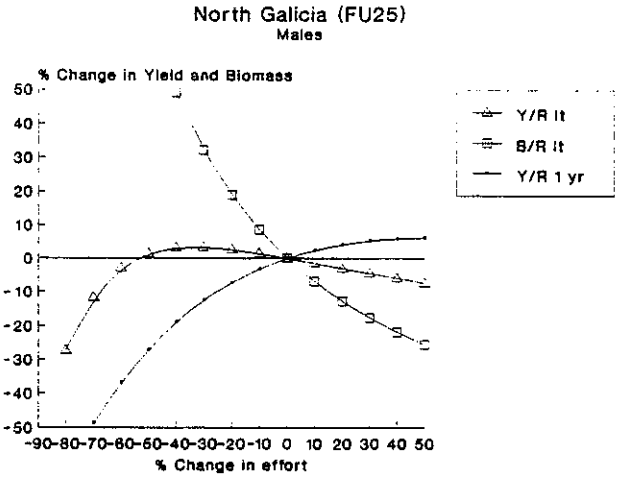


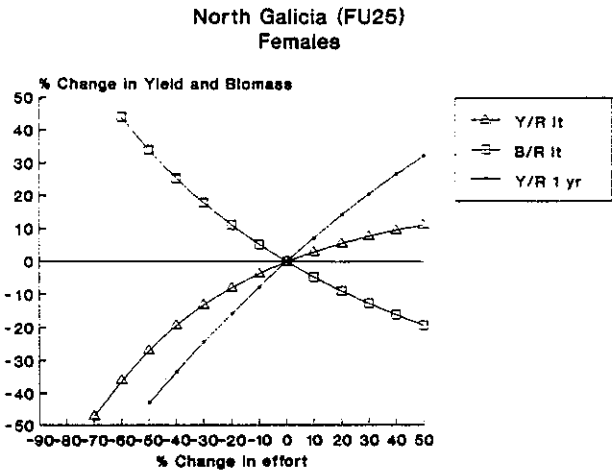
c)



d)

North Galicia (Functional Unit 25): Percentage changes in long term landings and stock biomass following various changes in fishing effort. Males and females shown separately.





6.1.15 *Nephrops* in Divisions VIIId,e

Special comments: There are no reported landings of *Nephrops* from this area, so it is suggested that a zero TAC would prevent misreporting.

Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

6.1.16 *Nephrops* in Division IXa

Units included in recommended Management Area: a) West Galicia (Unit 26), b) North Portugal (Unit 27), c) Southwest Portugal (Unit 28), d) South Portugal (Unit 29) and e) Gulf of Cadiz (Unit 30).

Catch data :

Year	Rec TAC	Agreed TAC	ACFM lndgs
1987		4.8	1.6
1988		4.8	1.3
1989		4.8	1.4
1990		4.7	1.2
1991	1.84	3.0	1.3
1992	1.3	2.5	1.3
1993	1.3	2.5	1.1
1994	1.3	2.5	

(Weights in '000 t)

Historical development of the fishery: Landings from Management Area fluctuating without clear trend since 1984. For West Galicia data suggest stability in landings since 1975 (graph a).

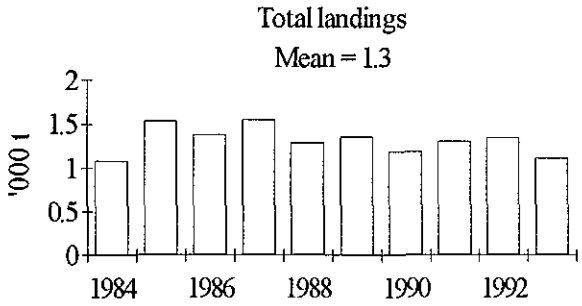
State of stock: a) West Galicia: CPUE fluctuating without trend. Mean size fluctuating. Effort fluctuating without trend. The last yield per recruit analysis (1993) suggested that current F is above F_{max}.
b) North Portugal (graph b): CPUE fluctuating with no obvious trend - mean size now increasing. Effort generally stable but a fall in 1993. The last yield per recruit analysis (1991) suggested that F is above F_{max} in males but below F_{max} in females.
c) + d) SW and S Portugal (graph c): CPUE generally stable but a decline in kg/day in the last two years. TSB and recruitment relatively stable. Effort stable at present. The last yield per recruit analysis (1993) showed that F is above F_{max} in both sexes. F stable in age-based assessment.
e) Gulf of Cadiz: no information.

Management advice: ACFM advised a TAC of about 1,300 t for the management area in 1993 and 1994. There is no basis for revising this figure for 1995.

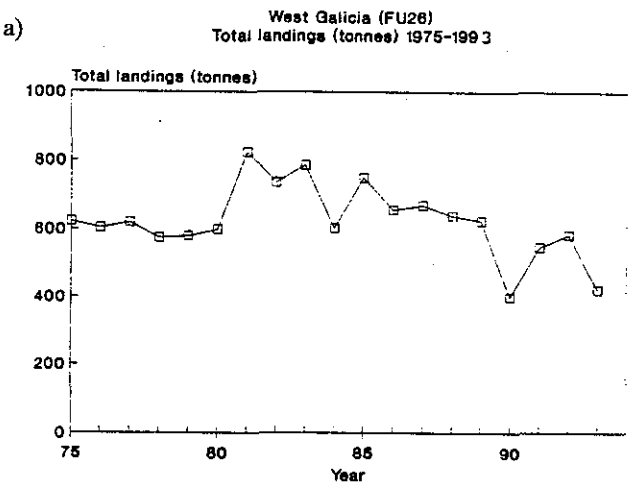
Special comments: It should be noted that this recommended management area includes five functional units and that a TAC set for the entire area will not necessarily result in balanced exploitation between the five units.

Data and assessment: a) CPUE and mean size data - no new assessments. b) CPUE, effort and mean size available but quality questionable - no new assessments. c) + d) CPUE, effort and mean size data. Age-based assessment carried out, but not considered reliable. e) No data - no assessment.

Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

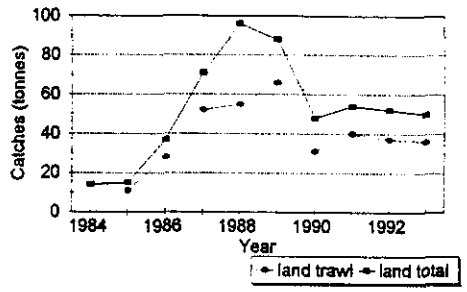


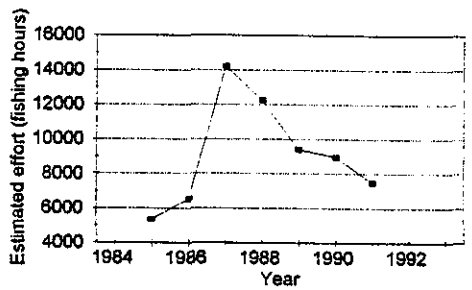
a)

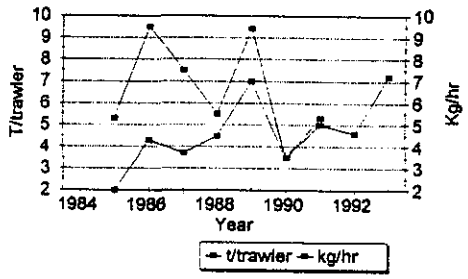


North Portugal (FU27)

b)

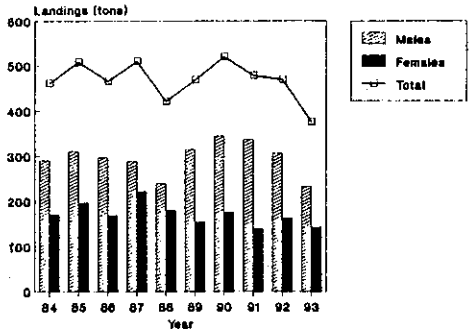




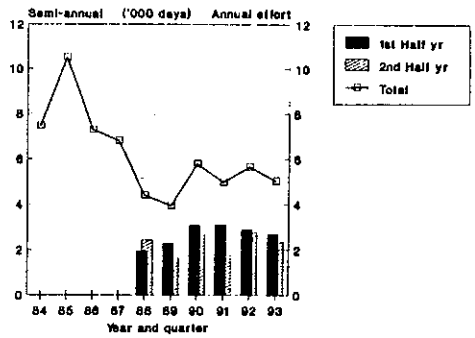


c) **Portuguese trawlers: SW and S Portugal (Fus 28+29)**

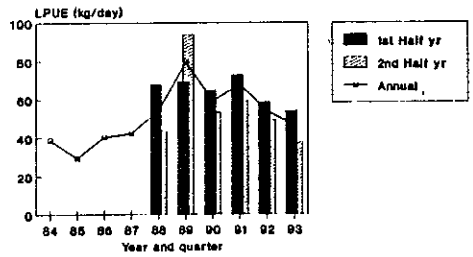
Landings



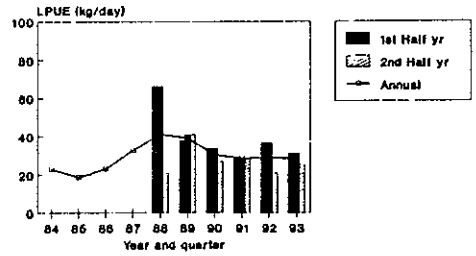
Effort



LPUEs - Males



LPUEs - Females



6.1.17 *Nephrops* in Division IXb and Sub-area X

Special comments: There are no reported landings of *Nephrops* from this area, so it is suggested that a zero TAC would prevent misreporting.

Source of information: Report of the Working Group on *Nephrops* and *Pandalus* Stocks, March 1994 (C.M.1994/Assess:12).

6.2 Mackerel
(Tables 6.2.1 - 6.2.8)

6.2.1 General comments

Based on tagging experiments and egg surveys it is clear that different spawning areas occur (Central North Sea, Western Ireland, Bay of Biscay, W. Iberian peninsula) and based on this, as in previous years, assessments were carried out on the assumption that the fisheries exploit three separate units independent of each other: the North Sea stock, the Western stock and the Southern stock. However, it is known that the distribution of the stocks is seasonally overlapping, and therefore it could be questioned whether this splitting into unit stocks (and stock components in catches), which was mainly based on previous tagging experiments and egg surveys, is still valid.

During the major part of the year, i.e. during the feeding period, the distribution of these stocks mix. As a result the identification and amount of the associated catches is extremely difficult to determine. A major difficulty in the current assessments is the influx of mackerel of the Western stock in the North Sea and the overlapping in the distribution of the Western and the Southern stock. Difficulties are thus experienced, particularly in the apportioning of the catches to the stocks.

6.2.2 North Sea mackerel

Catch data (Tables 6.2.2 and 6.2.4-6.2.6):

Year	Rec. TAC[1,2]	Agreed TAC[3]	ACFM catch[4]
1987	LPL	55	3
1988	LPL	55	6
1989	LPL	49.2	7
1990	LPL	45.2	10
1991	LPL	65.5	-[5]
1992	LPL	76.3	-[5]
1993	LPL	83.1	-[5]
1994	LPL	95.7	

[1]TAC for Sub-area IV and Division IIIa. [2]LPL = Lowest Practicable Level. [3]TAC for Sub-area IV, Divisions IIIa, IIIb,c,d (EU zone) and Division IIa (EU zone). [4]Estimated landings of North Sea stock. [5]No information. Weights in '000 t.

Historical development of the fishery: Catch data for this stock are arbitrary, due to the fact that the North Sea stock mix partly with the Western stock in the wintering areas. However, large catches were taken in the sixties in the purse seine fishery reaching a maximum level of about 1 million t in 1967.

Since 1987 it has not been possible to split the catches taken in the North Sea and adjacent areas into their North Sea or Western mackerel stock components, but spawning stock estimates based on the egg surveys in 1988 and 1990 indicated a catch of about 10,000 t in 1990. A catch of the same level as in 1990 is assumed for 1991 to 1993.

State of stock: Tagging experiments demonstrate a SSB in the early sixties, before the boom in the purse seine fishery, of above 3 million t. The last big year-class observed in this stock was the 1969 year class. The stock rapidly declined as shown by the assessment carried out in 1985 (see below). The SSB declined to less than 200,000 t in the early 1980s.

The stock is still at a historically low level and is outside safe biological limits. Egg surveys in 1991 and 1992 indicate no change in the SSB since 1990.

Forecast for 1995: Not available

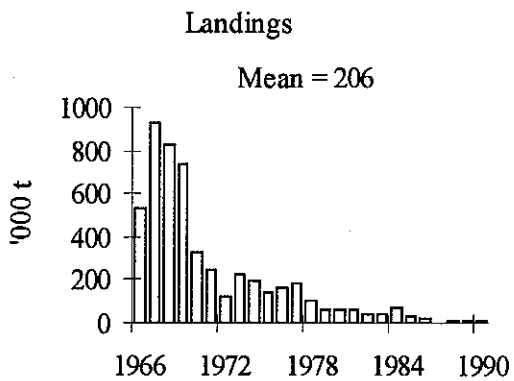
Management advice: This stock still needs the maximum possible protection and ACFM therefore reiterates its previous recommendation that:

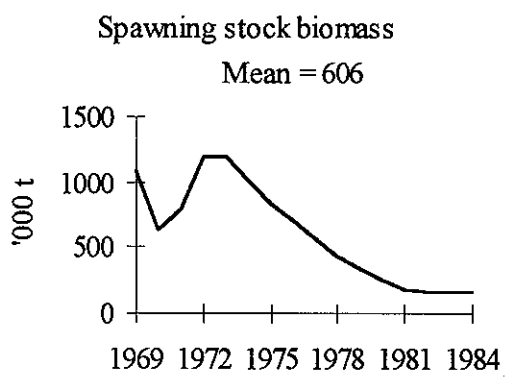
a) There should be no fishing for mackerel in Divisions IIIa and IVb, c at any time of the year.

b) There hould be no fishing for mackerelin Division IVa during the period 1 January - 31 July.

c) The 30 cm minimum landing size at present in force in Sub-area IV should be maintained.

Special comments: These measures are aimed at enhancing the probability of the recovery of this stock. Maximum protection could be given to the North Sea stock by closing mackerel fisheries in the North Sea and Subareas II, III and VI but, since a considerable quantity of Western mackerel are present in these areas during the second half of the year, this would seriously affect the fishery for Western mackerel. The closure of Divisions IVb,c will also give protection to juvenile mackerel of the Western stock which is quite abundant in the area.





Data and assessment: No analytical assessment possible. There are problems in estimating catches from the stock due to overlap of distribution with Western mackerel. Egg surveys carried out on an international basis every second year up to 1990. In 1996 extensive egg surveys are planned in the North Sea.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, June/July 1994 (C.M.1995/Assess:2).

6.2.3 Western mackerel

Catch data (Tables 6.2.1-6.2.5 and 6.2.7):

Year	Rec. TAC[1]	Agreed TAC[2]	Off. lndgs.	Disc. slip.	ACFM catch[3]
1987	380	405	567	11	615
1988	430	573[2]	557	36	628
1989	355	495[2]	539	7	567
1990	480	525[2]	597	19	606
1991	500	575[2]	603	31	646
1992	670	670[2]	702	25	742
1993	670	730[2]	787	18	805
1994	831[4]	792[2]			

[1]Recom. TACs for areas VI, VII, VIIIa,b, Vb, IIa and, from 1988, IV.[2]TAC for mackerel taken in all areas (excluding VIIIc, IXa), including IV, IIIa and IIa. [3]Landings and discards of Western stock. [4]Catch at *Status quo* F. Weights in '000 t.

Historical development of the fishery: The fishery has developed from low levels in the sixties to more than 800,000 t in 1993. The main catches are taken by purse seiners and trawlers. Over the time period 1970-1984 there have been considerable changes in the migration pattern of this stock. Due to these changes large proportions of the catches are now taken in Division IVa and IIa while in earlier years the main catches were taken in Sub-areas VII and VI, and Divisions VIII a, b, d.

State of stock: The spawning stock is at present just above 2 million t which is close to the historical low level. Fishing mortality was rather constant from 1981 to 1990 and has increased each year since and is now at the highest historical level.

Since the stock is at present just above its historical low level it is considered to be close to or at safe biological limits.

(Further details in Table 6.2.7)

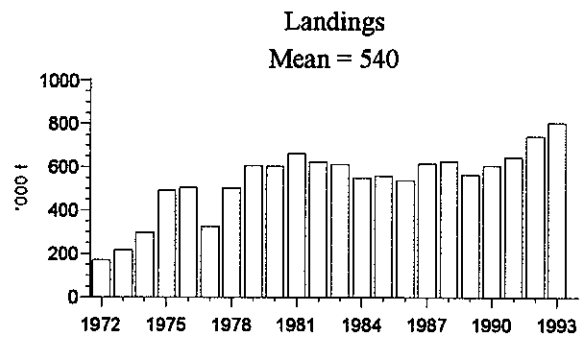
Forecast for 1995: The forecast for 1995 is based on geometric mean recruitment of 3,517 million 0-group and a catch level in 1994 equal to the agreed TAC plus a likely catch in international waters of 50,000 t, giving a total catch of about 850,000 t.

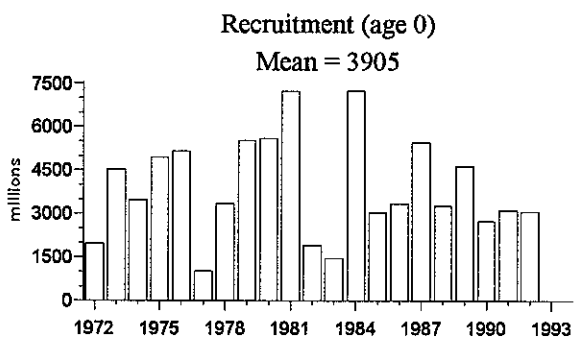
SSB(94) = 2025, F(94) = 0.35, Basis: > TAC, Catch(94) = 850 , Landings (94) = 825.

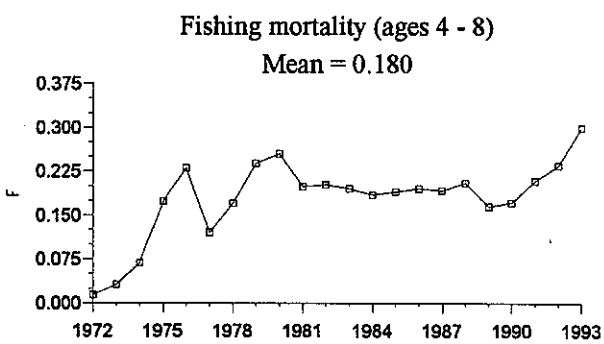
Option	Basis	F (95)	SSB (95)	Catch (95)	SSB (96)
A	0.6F(93)	0.18	1913	409	2018
B	0.8F(93)	0.24	1873	532	1892
C	F(93)	0.30	1834	648	1775
D	F(94)	0.35	1805	731	1692
E	C(95)=C(94)	0.41	1760	850	1577

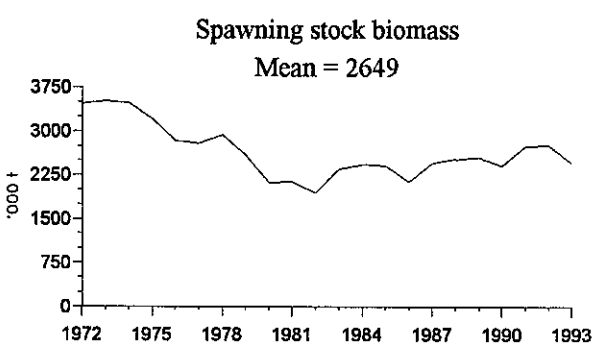
Weights in '000 t.

Continuous fishing at any of these options will lead to a decrease in SSB.









Medium-term considerations: A medium-term projection demonstrated that a 20% reduction in the current fishing mortality will stabilize the SSB just above safe biological limits in the medium term. (Figure 6.2.1).

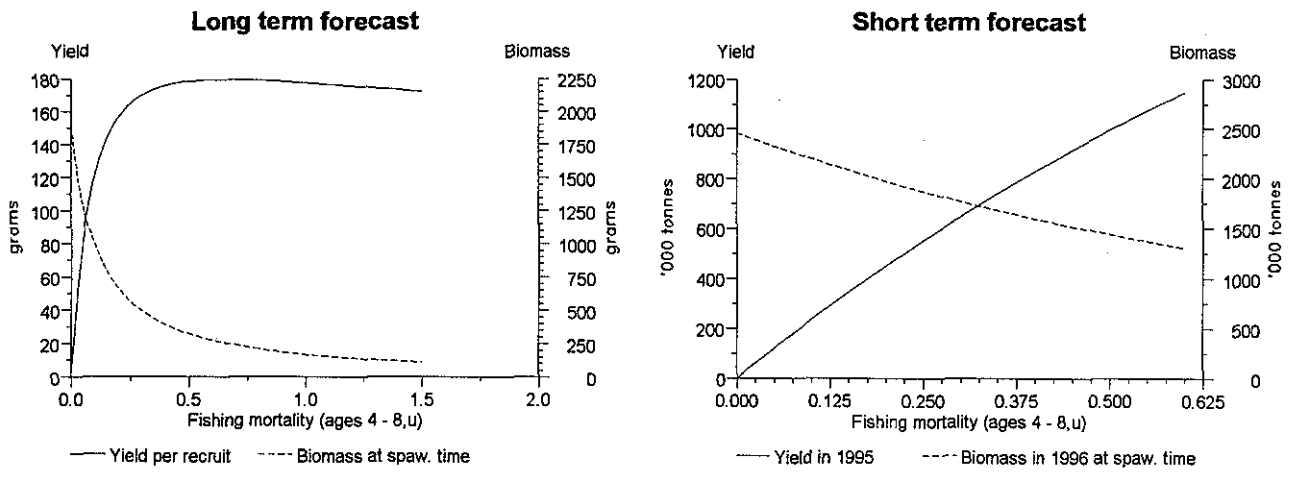
Management advice: To prevent the spawning stock from going below safe biological limits in the medium term ACFM recommends that the current level of fishing mortality should be reduced by 20% corresponding to a total catch of 530,000 t in 1995. The recommended catch for this stock applies to all areas in which the stock is caught including international waters.

Special comments: There are considerable changes in the predicted SSB of the western mackerel stock made by ACFM in 1993 and this year. The underlying causes of the difference between the 1993 and 1994 projections from the two assessments are the revision of the abundance estimates of the 1991 and 1992 year classes. In 1993 the SSB in 1994 was predicted to be 2.9 million t assuming catches of 750,000 t and 850,000 t in 1993 and 1994 respectively. The fishery in 1992 and 1993 demonstrated that the 1991 year class was only 50% of the level indicated by the recruitment surveys which was applied in the projection in 1993. The recruitment indices from these surveys were revised at this ACFM meeting according to differences in area covered and survey effort over the years. This resulted in the 1992 year class also having to be reduced compared with the level applied in 1993 and the 1992 year cleass is now estimated to be close to the geometric mean. In addition, the catch recommended by ACFM for 1993 was overshot by 135,000 t.

Data and assessment: There are uncertainties about the catch figures due to underreporting of catches, discards and slipping. The discard level in 1993 is the estimated discards of only one country. No other countries provide such data and information. ACFM therefore recommends that data on discards and slipping should be provided.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, June/July 1994 (C.M.1995/Assess:2) and additional information supplied to ACFM.

Yield and Spawning Stock Biomass



6.2.4 Mackerel in Divisions VIIIc and IXa

Catch data (Tables 6.2.4-6.2.5 and 6.2.8):

Year	Rec. TAC	Agreed TAC[1]	ACFM catch
1987	-	36.57	22
1988	-	36.57	25
1989	-	36.57	18
1990	-	36.57	21
1991	-	36.57	21
1992	-	36.57	18
1993	-	36.57	20
1994	-	36.57	

[1]Division VIIIc, Sub-Areas IX and X, and CECAF Division 34.1.1 (EC waters only). Weights in '000 t.

Historical development of the fishery: Mackerel is a target species for the hand-line fleet during the spawning season (March and April) in Sub-Division VIIIc east, and is a by-catch for other fleets. The highest catches (about 80%) are taken in the first half of the year and mainly in Division VIIIc with adult fish. In the second half of the year adult fish practically disappear, and the catches are formed of juveniles, mainly in Division Ixa.

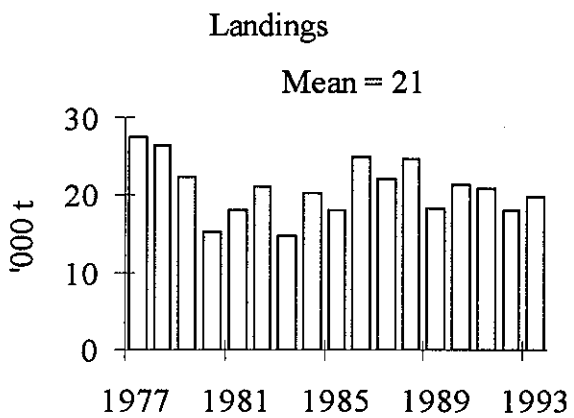
State of stock: Unknown.

Forecast for 1995: Not available

Special comments: The low level of catches, the seemingly small fishing areas compared to the spawning grounds and the high egg productions detected in the area allocated to the southern stock during egg surveys in 1988, 1990 and 1992 suggest that catches are only a small fraction of the total biomass in the area.

Data and assessment: Catch-at-age from the Spanish and Portuguese fleets. CPUE from commercial trawlers and an index from bottom trawl surveys of both countries. Analytical assessment attempted but not considered reliable.

Source of assessment: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, June/July 1994 (C.M.1995/Assess:2).



6.3 Horse Mackerel
(Tables 6.3.1 - 6.3.11)

6.3.1 General comments

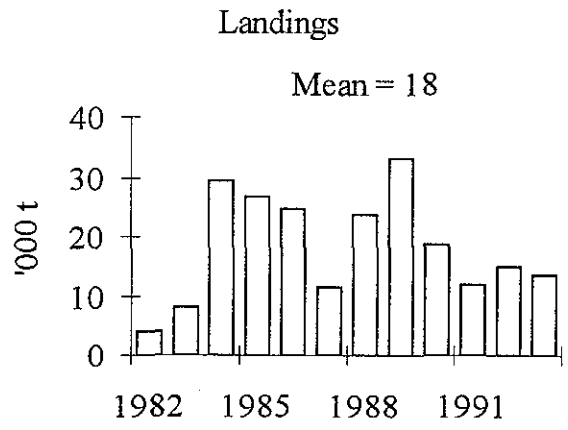
In recent years ACFM has considered the horse mackerel as separated into three stocks, the North Sea, the Southern and the Western stocks. This separation is mainly based on the known distribution of eggs combined with the location and time of the different fisheries in recent years. However, there is no well established biological basis for such a separation, as for the mackerel stock (Section 6.2).

6.3.2 North Sea horse mackerel (Divisions IIIa, IVb,c, VIId)

Catch data (Table 6.3.8):

Year	Rec. TAC	Agreed TAC[1]	ACFM catch[2]
1987	-	30	12
1988	-	50	24
1989	-	45	33
1990	-	40	19
1991	-	45	12
1992	-	55	15
1993	-	60	14
1994	-	60	

[1]Division IIa and Sub-area IV (EC waters only). [2]See Table 6.3.8. Weights in '000 t.



Historical development of the fishery: North Sea horse mackerel are caught predominantly in Divisions IIIa (the Kattegat and eastern part of the Skagerrak), IVb,c and VIId. The majority of the catch is taken as by-catch in the small-mesh industrial fishery while landings from the directed fishery for horse mackerel are limited.

State of stock: The SSB increased from 1988 to 1990 and the egg surveys indicate a spawning stock biomass of more than 200,000 t for the years 1989 to 1991. There is no information as to the present state of the stock.

Forecast for 1995: No forecast is available.

Data and assessment: As the available biological samples are not considered to be representative of the total catch, no estimates of the catch in numbers at age were made and it was not possible to do an analytical assessment.

Source of information: Report of othe Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, June/July 1994 (C.M.1995/Assess:2).

6.3.3 Western horse mackerel (Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, VIIIa,b,d,e)

Catch data (Table 6.3.8):

Year	Rec. TAC	Agreed TAC[1]	ACFM lndgs.	Disc. slip.	ACFM catch[2]
1987	-	155	157	-	157
1988	-	169	184	4	188
1989	100	153	267	1	269
1990	~200	203	363	10	373
1991	-	230	328	5	334
1992	-	250	369	2	371
1993	-	250	424	9	433
1994	-	300			

[1]Division Vb (EC waters only), Sub-areas VI and VII, Divisions VIIIa,b,d,e. [2]See Table 6.3.8. Weights in '000 t.

Historical development of the fishery: The catches increased in the 1980s due to changes in migration pattern which made the stock available in Divisions IVa and IIa during the 3rd and 4th quarters of the year. Since 1987 considerable catches have been taken by the Norwegian purse seine fleet particularly in Division IVa. The catches are mainly used for reduction purposes. The 1982 year class has dominated the catches for many years and still constitutes a major part (56% by weight) of the catches.

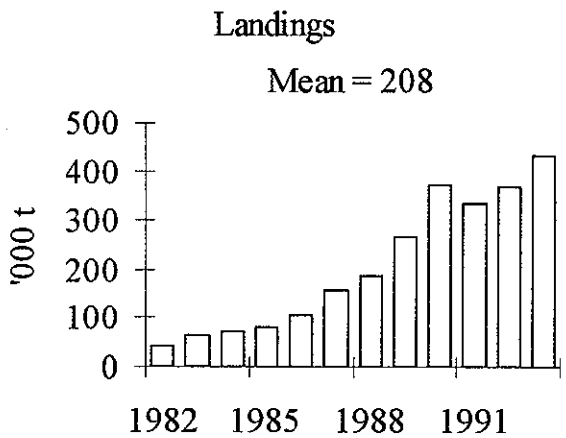
State of stock: Based on the egg surveys in 1992 and the results from the forecast the present level of the stock is considered to be within safe biological limits

Forecast for 1995: A forecast based on different constant yearly catch levels from 1995 onwards and constant low recruitment as observed since 1983 (500 million fish at age 1 per year) was carried out. The underlying basis for the forecast was the estimated SSB of 2.32 million t from the egg surveys in 1992, the actual catches in 1992, 1993 and the assumed catch of 450,000 t in 1994. The forecast was carried out using three different catch options: 200,000 t, 300, 000 t and 400,000 t per year. The results are shown in Figure 6.3.1. The large 1982 year class was generated by a SSB of presumably 500,000 t. This is at present considered to be the best available estimate of the minimum biologically acceptable level. With catch levels of 200,000 t and 400,000 t per year the SSB is predicted to be outside safe biological limits by 2000 and 1997 respectively.

Management advice: To prevent the SSB going below safe biological limits in two years ACFM recommends a reduction in the present catch level.

Data and assessment: An asssessment was attempted but not considered reliable due to poor data. As in previous years a major part of the catch was unsampled. Sampling needs to be improved.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, June/July 1994 (C.M.1995/Assess:2)



6.3.4 Southern horse mackerel (Divisions VIIIc and IXa)

Catch data (Tables 6.3.7-6.3.11):

Year	Rec. TAC[1]	Agreed TAC[1]	ACFM catch[2]
1987	-	72.5[3]	53
1988	-	82.0[3]	56
1989	-	73.0[3]	56
1990	38	55.0[4]	49
1991	61	73.0[4]	46
1992	61[5]	73.0[4]	51
1993	-	73.0[4]	57
1994	55[6]	73.0[4]	

[1]Includes all *Trachurus* spp. [2]Includes only *Trachurus trachurus* L. (see Table 6.3.8). [3]Division VIIIc, Sub-areas IX and X, and CECAF Division 34.1.1 (EC waters only). [4]Division VIIIc and Sub-area IX. [5]Precautionary TAC. [6]*Status quo* catch applies only to *Trachurus trachurus* L. Weights in '000 t.

Historical development of the fishery: The proportion of trawl catches has increased in recent years while the purse seine catch has decreased. In general the major catches of horse mackerel occur during the third and fourth quarters. The catch data have been revised since 1981 to correspond only to those of *Trachurus trachurus*.

State of stock: Even though the time series makes it difficult to evaluate the state of the stock in relation to the historical perspective, the stable SSB in the recent period indicates that it is probably within safe biological limits.

Further details in Table 6.3.11.

Forecast for 1995: Forecast for 1995 based on geometric mean 0-group recruitment of 1,270 million fish.

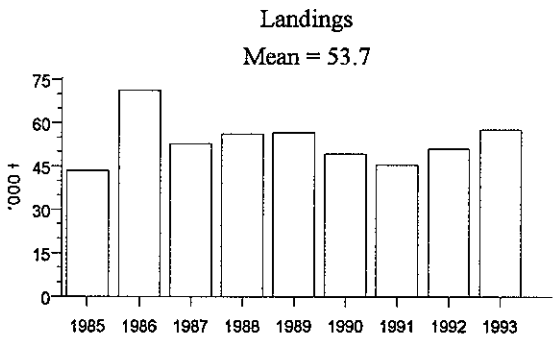
SSB(94) = 185, F(94) = 0.21, Basis: TAC, Catch(94) = 73, Landings (94) = 73.

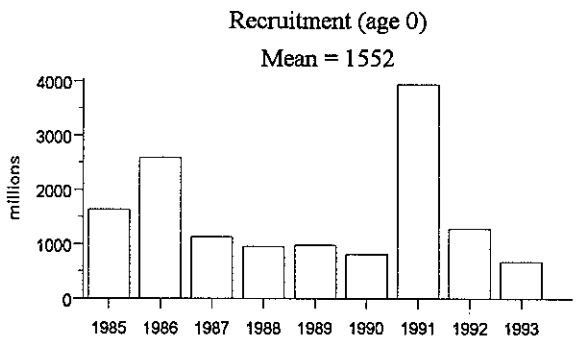
Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	F_{med}	0.11	217	37	37	245
B	0.6F(93)	0.14	216	44	44	238
C	0.8F(93)	0.19	214	57	57	225
D	F_{94}	0.21	212	63	63	219
E	F(93)	0.24	211	69	69	213
F	1.2F(93)	0.28	209	82	82	202

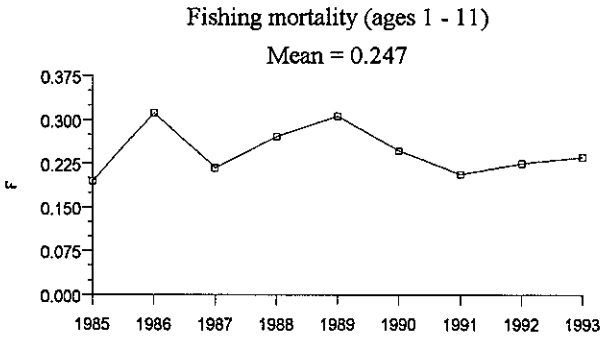
Weights in '000 t.

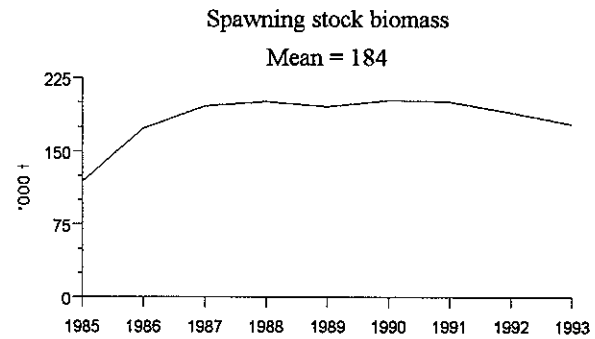
All options lead to an increase in SSB.

Management advice: The stock is considered to be inside safe biological limits. ACFM noted that no long-term gain in yield is expected by increasing fishing mortality.





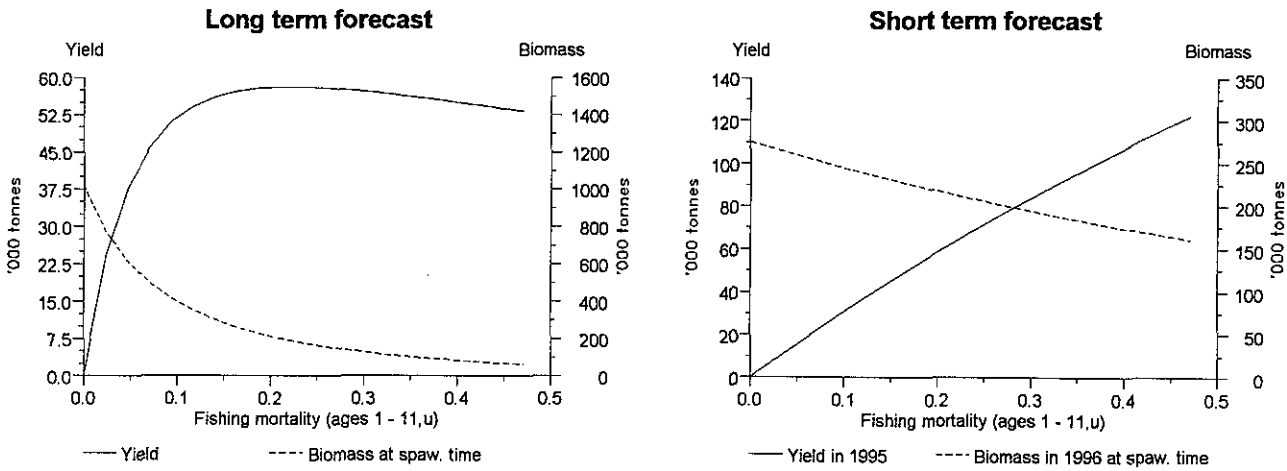




Data and assessment: Catch at age data for both Spain and Portugal are available from 1984 onwards. CPUE series from Portuguese commercial fisheries started in 1973 and ended in 1990. Two CPUE series from commercial Spanish catches starting in 1983 were presented. Fishery-independent information was derived from trawl surveys, egg surveys and acoustic surveys.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, June/July 1994 (C.M.1995/Assess:2).

Yield and Spawning Stock Biomass



6.4 Blue Whiting

6.4.1 General Comments

The Blue Whiting has this year been treated as one stock as it has not been possible to clearly demonstrate significant differences between fishes from various parts of the distribution area, or to define an unambiguous borderline between populations. The distribution area for adult blue whiting and the fishing areas are given in Figures 6.4.1 and 6.4.2.

6.4.2 Blue whiting combined stock (Sub-areas I-IX, XII and XIV)

Catch data (Tables 6.4.1-6.4.6)

Year	Rec TAC	Agreed TAC	ACFM Catch
1987	950	-	665
1988	832	-	554
1989	630	-	626
1990	600	-	562
1991	670	-	371
1992	-	-	475
1993	490[1]	-	515
1994	485[2]	650[3]	

[1]Catch at *status quo* F. [2]Precautionary. [3]NEAFC proposal.
Weights in '000 t.

Historical development of the fishery: The fishery for blue whiting was fully established in 1977. Most of the catches are taken in the directed pelagic trawl fishery in the spawning and post-spawning areas (Divisions Vb, VIa,b and VIIb,c) but they are also caught in an industrial mixed fishery in Sub-area IV and Division IIIa and in the pelagic trawl fishery in the Norwegian Sea (Sub-areas I+II, Divisions Va, XIVa, b). The catches in the southern fishery (Sub-areas VIII, IX, Divisions VIId,e and g-k) have been stable in the range 29,000 - 43,000 t.

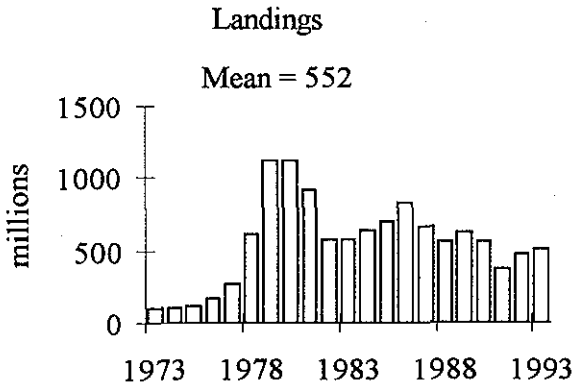
State of stock: The trends in spawning stock biomass appear somewhat different from the acoustic data series and from the catch analyses. The acoustic data indicate a decrease in SSB of about 30% from 1988 to 1992. The catch analysis points to a decrease from 1986 to 1990, an increase to 1992 and then a drop in 1993 (see Figure below). Both sources indicate, however, that the spawning stock size in 1993 is close to the 1986 - 1993 average level.

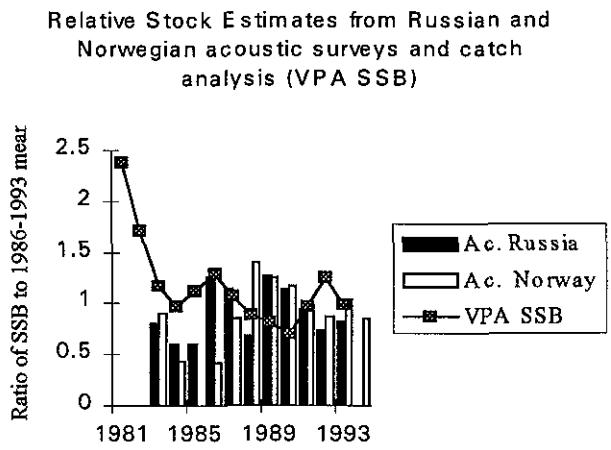
Management advice: If a TAC is to be set for this stock, a precautionary TAC based on catches in recent years seems appropriate (the 1988-1992 mean equals 518,000 t).

Special comments: ACFM is uncertain as to the actual level of this stock as the estimates based on acoustic surveys are in the order of 4-5 million t and the VPA calculations point to around 1.8 million t. Until the causes for the discrepancies are found ACFM cannot produce a reliable stock estimate.

Data and assessment: An analytical assessment using catch at age data tuned to acoustic survey results was attempted. The assessment is not considered reliable due to inconsistencies in the catch at age data and different trends in the acoustic and analytical SSB estimates.

Source of information: Report of the Blue Whiting Assessment Working Group, September 1994 (C.M. 1995/Assess:7).





6.5 Deep-Water Fisheries Resources South of 63°N

Source of Information: Report of the Study Group on the Biology and Assessment of Deep-Sea Fisheries Resources, August 1994 (C.M. 1995/Assess:4).

1. **Background**

During the past two or three decades a certain amount of research and exploratory work was undertaken into deep-water resources. Dwindling resources on the continental shelves of the North Atlantic have increased dependence on fisheries in deeper waters. There has been a tendency for fisheries for species such as anglerfish and Greenland halibut to extend into deeper waters and new fisheries have developed to target new deep-water species found there.

In some parts of the Northeast Atlantic where the continental shelf is virtually non-existent, such as off Portugal including Madeira and the Azores, there are traditional fisheries which have been exploiting deep-water species for many years.

There is also an expansion into deeper waters and new areas of fisheries on species already under management regimes, such as Greenland halibut, redfish and blue ling. There is concern that species such as these will be depleted before advice on appropriate management measures can be provided.

Experience in other parts of the world has shown that deep-water fisheries can develop rapidly and that the resources which they exploit may be especially vulnerable to overfishing.

2. **The species**

The term deep-water was defined to include waters of depths greater than 400 m. The following were identified as some of the most important deep-water species.

DEEP-WATER SPECIES LIST

Alepocephalus bairdii	Baird's smoothhead
Aphanopus carbo	Black scabbardfish
Argentina silus	Argentine, Greater silver smelt
Beryx decadactylus	Red bream, Alfonsino
Beryx splendens	Golden eye perch
Chimaera monstrosa	Rabbitfish
Coryphaenoides rupestris	Roundnose grenadier
Epigonus telescopus	Big eye, Deep-water cardinalfish
Helicolenus dactylopterus	Bluemouth
Hoplostethus atlanticus	Orange roughy
Hoplostethus mediterraneus	Silver roughy
Lepidopus caudatus	Silver scabbardfish
Macrourus berglax	Roughhead grenadier
Mora moro	Mora
Pagellus bogaraveo	Red seabream
Phycis blennoides	Greater forkbeard
Polyprion americanus	Wreckfish
Trachyrhynchus trachyrhynchus	Roughnose grenadier
Sharks, various	
Chaecon (Geryon) affinis	Deep-water red crab
Aristeomorpha foliacea	Giant red shrimp

The main shark species caught in deep-water fisheries are:

Centrophorus granulosus	Gulper shark
Centrophorus squamosus	Leafscale gulper shark
Centroscillium fabricii	Black dogfish
Centroscymnus coelolepis	Portuguese dogfish
Centroscymnus crepidater	Longnose velvet dogfish
Dalatias licha	Kitefin shark
Deania calcea	Birdbeak dogfish
Etmopterus princeps	Great lantern shark
Etmopterus spinax	Velvetbelly
Scymnodon ringens	Knifetooth dogfish

There are a number of other species which might be considered as deep-water species for which advice is already provided.

Micromesistius poutassou	Blue whiting
Reinhardtius hippoglossoides	Greenland halibut
Sebastes spp.	Redfish
Molva molva	Ling
Molva dypterygia	Blue ling
Brosme brosme	Tusk

In addition, there are other species which have been fished on the continental shelf but whose distribution extends into deeper waters. This group includes hake (*Merluccius merluccius*) anglerfish (*Lophius* spp.) and megrim (*Lepidorhombus* spp.) and recent years have seen an extension of fishing into deeper waters for these species in ICES Sub-areas VI, VII, VIII, and IX. Advice is provided on these species.

3. **Description of National Deep-Water Fisheries**

Deep-water fish as defined in the list in Section 2 are exploited by many directed fisheries and are taken as by-catches and are discarded. Table 6.5.1 shows the type of fishery and the type of exploitation by ICES Sub-area.

In ICES Sub-area II there is a directed pelagic trawl fishery on argentines and roundnose grenadiers are taken as by-catch. There is a directed trawl fishery on grenadiers, smoothheads, black scabbard and rabbitfish and bluemouth are discarded in long line fisheries for ling and tusk while roughhead grenadier are discarded in a trawl fishery and in a gill net fishery for Greenland halibut. Roughhead grenadier, mora and greater forkbeard are taken as by-catch in the long line fishery for ling and tusk.

In Sub-area III there are directed trawl fisheries for argentines and they are also taken as a by-catch in the shrimp fishery. There is a directed trawl fishery for roundnose grenadiers and they are also taken as a by-catch in the argentine trawl fishery.

In Sub-area IV there is a directed trawl fishery for argentines and they are taken as a by-catch in the shrimp fishery. There is a directed trawl fishery for roundnose grenadier and they are also taken as by-catch in the argentine trawl fishery. Smoothheads, black scabbard, rabbitfish, and blue mouth are discarded in the long line fishery for ling and tusk while roughhead grenadier, mora and greater forkbeard are recorded as by-catch in this fishery.

In Sub-Area V there are directed trawl fisheries for argentines and they are taken as a by-catch in the redfish fishery and are discarded in the blue ling fishery. There are directed long line fisheries on roundnose grenadiers, bluemouth, black scabbard and roughhead grenadier.. Rabbitfish, smoothheads, black scabbard, argentines, cardinal fish, bluemouth and greater forkbeard are discarded in the blue ling and tusk and the ling and tusk fisheries, while mora and greater forkbeard are taken as by-catch. Rabbitfish are taken as by-catch in the Danish seine fishery and orange roughy are taken as by-catch in a trawl fishery. Deep sea red crab are taken as a by-catch in the gill net fishery for anglerfish.

In Sub-area VI there are directed long line fisheries for black scabbard, roundnose grenadier, bluemouth and roughhead grenadier and directed trawl fisheries on smoothheads, mora, greater forkbeard, roundnose grenadier, Portuguese shark, longnose velvet dogfish and birdbeak dogfish. Smoothheads, black scabbard, argentines, rabbitfish, cardinalfish and greater forkbeards are discarded in the blue ling and tusk and the ling and tusk fisheries while mora, roundhead grenadier and forkbeards are recorded as by-catch.

In Sub-area VII there are directed trawl fisheries for smootheads, black scabbard, roundnose grenadier, orange roughy, mora and three shark species. There is a directed trawl fishery on general deep-water species which takes black scabbard, mora, roundnose grenadier and greater forkbeard. Smoothheads, black scabbard, rabbitfish, and bluemouth are discarded in the blue ling and tusk and the ling and tusk fisheries while roundnose grenadier and mora are recorded as by-catch. There is a trawl fishery for mixed deep-water species including roundnose grenadier, bluemouth, mora and greater forkbeards. Greater forkbeards are also taken as a by-catch in the prawn fishery.

In Sub-area VIII there are directed long line fisheries on mora, greater forkbeard and gulper shark and a directed trawl fishery on orange roughy. In a mixed trawl fishery for deep-water species black scabbard, roundnose grenadier, bluemouth, mora and greater forkbeard are taken.

In Sub-area IX there is a directed long line fishery on black scabbard. Bluemouth, greater forkbeard and kitefin shark are taken as by-catch in the crustacean and artisanal fisheries. Black scabbard is taken as by-catch in the long line fishery for gulper shark.

In Sub-area X there are directed long line and pelagic trawl fisheries on golden eye perch, long line fisheries on red seabream and general deep-water species

including smoothheads, greater forkbeard and silver scabbard and a gill net fishery for kitefin shark.

In Sub-area XIV smoothheads, black scabbard, rabbitfish and bluemouth are discarded from the ling and tusk fisheries while roughhead grenadier, mora and greater forkbeards are recorded as by-catch. Roughhead grenadier are also reported as by-catch in the Greenland halibut and redfish fisheries.

4. Catch and Effort Statistics

Data on landings available to ACFM included data officially reported to ICES, national data supplied by Study Group members, data from ICES Working Group reports, some recent French Statlant 27 reports provided to ICES, and some published data.

For the deep-water species there are problems in compiling statistics of landings because of differences in the way in which the data are reported, particularly in the degree to which species are aggregated in the catch reports. For the species included in the list in Section 2 above, the ICES statistical system can currently accept single species reports for the following species:

Aphanopus carbo	(Black scabbardfish)
Coryphaenoides rupestris	(Roundnose grenadier)
Hoplostethus atlanticus	(Orange roughy)
Lepidopus caudatus	(Silver roughy)
Macrourus berglax	(Roughhead grenadier)
Pagellus bogaraveo	(Red seabream)
Phycis blennoides	(Greater forkbeard)
Polyprion americanus	(Wreckfish)

Argentina spp. can be reported at the genus level but virtually all fish thus reported are likely to be *Argentina silus*. There is also provision for *Beryx* spp to be reported at the genus level. Even where reporting at the species level is possible, landings may not be sorted to this level and may, therefore, be reported to a group category. For sharks it is often the case that only livers are landed and there may be difficulties in estimating whole fish weight and obtaining a species breakdown.

ACFM noted that reporting of official landings statistics to ICES is not complete for recent years and that 1988 is the latest year for which reports have been received from all countries. As France was not represented at the meeting the Study Group extracted French landings data from the sources available to it.

However there were problems in interpreting the Statlant data forms and the figures reported in the various sources were not always consistent. Landings data for Spain were very limited with no information for years after 1988.

In view of the limited and diffuse nature of the data ACFM provided two tables compiled from all available data sources. Table 6.5.2 gives the catches in tonnes by ICES Sub-area for the main species and Table 6.5.3 gives the catches in tonnes for the main species by each ICES Sub-area.

In terms of the quantities landed from all areas combined it is clear that the most important deep-water species are argentines and roundnose grenadiers with landings of each species of about 20,000 t in 1992. Higher landings of argentines were recorded in some earlier years. Next in order of importance are species for which annual landings in the range of 1,000-10,000 t have been recorded in at least one of the last six years. These are:

Black scabbardfish	8063 t	(1992)
Sharks, various	5085	(1992)
Orange roughy	5027	(1991)
Silver scabbardfish	5010	(1992)
Red (black-spot) seabream	2336	(1988)
Greater forkbeard	1589	(1992)

For the other species annual landings have not exceeded 1,000 t.

5. Biology of the species

There is a great deal of information, both published and in reports at various fisheries laboratories. A great deal of samples have not yet been fully reported on.

The data available are summarised in Table 6.5.4. The quality and quantity of the data varies and this is indicated by (1) basic comment, (1+) data available and (0) absence of comment.

It can be seen that whereas there is a good deal of information on geographical distribution and distribution at depth, and some information on length and weight, the areas where data are most lacking is on abundance, age and growth, biomass and stock identification. There is some infor-mation on reproduction for many species but the information is not sufficiently detailed in many cases to assist in the provision of management advice.

6. **Assessment**

Very few time series exist of data based on the regular sampling of commercial landings. The poor quality of basic statistics on catches and effort and the lack of information on the general biology of these species, in particular on age and growth, seasonal behaviour, migration and stock discrimination, suggests that the possibilities for analytical assessments are very limited. However, analytical assessments (VPA) have been attempted for red seabream in the Azores area and for black scabbardfish in Sub-area IX.

Developments in acoustic survey techniques may eventually lead to biomass estimates for some species. In the short term the use of trawl surveys (swept area) may be the best method of monitoring these stocks.

Advice on management could be strengthened by the use of simulation models using biological data.

7. **Management considerations**

Very little information is currently available on the state of exploitation of deep-water species. In some recently developed fisheries information is being withheld for commercial reasons. The quantities that are recorded are probably not well estimated as some landings are reported in grouped categories because of difficulties in separating species. In many cases significant proportions of the catch are discarded at sea and not recorded.

Deep-water species are particularly vulnerable to exploitation. Unexploited populations have a high proportion of fish of great age, their fecundities are generally low, and growth rates can also be very slow. Some species, such as orange roughy, golden eye perch and alfonsinos which aggregate in shoals, often associated with sea mounts, can be subjected to high catch rates once the shoals are located. The danger for the species is that these high catch rates can be maintained by continually moving from one concentration to another and progressively depleting the stock. Regeneration and growth is so slow that stock numbers will not increase in these areas in the short or even medium term.

It is known that exploitation is increasing on a number of species as fishing extends into deeper water but it is not possible, at present, to determine whether exploitation is exceeding an optimum level. Fisheries for deep-water species are developing in areas inside and outside national jurisdiction.

The survival of discards and fish encountering gears and escaping is unknown but most species are expected to be very vulnerable to injury.

The species in these fisheries are therefore more vulnerable than traditional species fished in shallower waters. There is no doubt that these stocks could be depleted very quickly and that recovery will be very slow.

Management advice: It is not possible to advise on whether the stocks can sustain current levels of exploitation or not, but because of the vulnerable nature of the stocks **ACFM recommends that a cautious approach should be adopted.**

To enable sustainable fisheries to be established on these species **ACFM recommends that fishing effort should be kept at a low level until sufficient information is gathered from existing fisheries to enable scientifically-based management decisions.**

To monitor the exploitation of the stocks **ACFM recommends that a comprehensive data collection system should be urgently initiated and that research on the stocks should be increased to provide the data necessary for assessment.**

ACFM therefore recommends that provision should be made for reporting landings to ICES at the species level for all species, including sharks, listed in Section 2 of this report and that provision is retained, or made, for reporting at genus and higher grouped levels to allow for reports of landings which have not been sorted to the species level. In this context a hierarchical system of reporting should be put in place.

Special Comments: Assessment and the provision of management advice on these stocks will be difficult. It will be necessary to devote substantial time and expertise to the study of these stocks if the necessary information is to be provided.

If some species which are landed and reported at the genus or group level become sufficiently important it is likely that biological sampling of the landings will be initiated. At the sampling stage it should be possible to identify fish to species level, thus providing a means of apportioning landings of mixed species into the quantities of each species separately. This approach is already adopted, for example, for redfish, anglerfish and megrim.

Table 4.1.1 Nominal landings (tonnes) of HAKE as reported to ICES.

HAKE IIIa

Country	1988	1989	1990	1991	1992	1993*
Belgium	5	3	13	15	15	5
Denmark	576	952	1,584	1,623	1,546	1,188
Germany, Fed. Rep.	-	-	-	-	-	1
Netherlands	1	-	-	-	-	-
Norway	60	56	113	115	152*	121
Sweden	38	50	98	103	141	162
Total	680	1,061	1,808	1,856	1,854	1,476

*Preliminary.

HAKE IVa

Country	1988	1989	1990	1991	1992	1993*
Belgium	+	+	+	+	1	1
Denmark	232	245	336	343	322	478
France	380	585[1*]	748[1*]	134[1*]	109*	151[1]
Germany, Fed. Rep.	30	29	9	19	28	70
Netherlands	+	8	1	4	18	4
Norway	202	269	420	505	436*	458
Sweden[a)]	33	24	41	138	60	38
UK (England & Wales)	67	4	9	13	23	5
UK (Isle of Man)	-	-	-	-	+	-
UK (N. Ireland)	3	+	-	-	+	-
UK (Scotland)	353	188	235	360	412	451
Total	1,300	1,352	1,799	1,516	1,409	1,656

*Preliminary. [a)]Includes IVb. [1]Includes IIa(EC) and IVb,c.

Continued...

HAKE IVb

Country	1988	1989	1990	1991	1992	1993*
Belgium	32	25	78	115	116	69
Denmark	790[1]	860[2]	934[3]	1,374[4]	1,500	1,511[5]
France	1	...[a)*]	...[a)*]	...[a)*]	12*	...[a)]
Germany, Fed. Rep.	8	5	13	11	22	48
Netherlands	149	117	89	81	162	135
Norway	2	2	2	8	2*	+
Sweden[a)]	...	...	...	...	...	...
UK (England & Wales)	18	15	16	24	47	10
UK (Isle of Man)	-	-	-	-	+	-
UK (N. Ireland)	-	-	-	+	+	-
UK (Scotland)	34	31	30	54	37	11
Total	1,034	1,055	1,162	1,667	1,898	1,784

*Preliminary. [a)]Included in IVa. [1]Includes 12 t reported as Sub-area IV. [2]Includes 4 t reported as Sub-area IV. [3]Includes 11 t reported as Sub-area IV. [4]Includes 7 t reported as Sub-area IV. [5]Includes 1 t reported as Sub-area IV.

HAKE IVc

Country	1988	1989	1990	1991	1992	1993*
Belgium	6	5	1	2	1	2
Denmark	+	+	1	1	+	+
France	-	...[1*]	...[1*]	...[1*]	1*	...[1]
Netherlands	4	-	1	1	2	1
UK (England & Wales)	2	1	-	1	4	-
UK (Scotland)	-	-	+	+	+	-
Total	12	6	3	5	8	3

*Preliminary. [1]Included in IVa.

Continued...

HAKE VIa

Country	1988	1989	1990	1991	1992	1993*
Belgium	2	2	-	+	-	1
Denmark	+	+	+	+	+	1
France	1,909	9,417[1*]	6,539[1*]	3,162[1*]	1,197*	3,261[1]
Germany, Fed. Rep.	2	2	+	+	+	1
Ireland	265	730	207	151	241	251
Netherlands	-	-	14	3	-	-
Norway	5	1	+	+	+*	+
Spain	1,340					
UK (England & Wales)	1,169	506	279	497	452	24
UK (Isle of Man)	-	+	-	-	+	-
UK (N. Ireland)	83	77	115	278	283	168
UK (Scotland)	1,329	1,380	1,399	1,692	1,340	1,325
Total	6,104					

*Preliminary. [1]Includes Vb(EC), VIb and VII.

HAKE VIb

Country	1988	1989	1990	1991	1992	1993*
France	-	...[1*]	...[1*]	...[1*]	-*	...[1]
Ireland	-	-	115	76	102	1
Norway	-	-	+	1	-*	+
Spain	1,336					
UK (England & Wales)	75	8	16	1	7	+
UK (N. Ireland)	-	+	+	3	+	1
UK (Scotland)	5	6	12	15	7	9
Total	1,416					

*Preliminary. [1]Included in Via.

HAKE VIIa

Country	1988	1989	1990	1991	1992	1993*
Belgium	17	19	16	6	10	7
France	187	...[1*]	...[1*]	...[1*]	61*	...[1]
Ireland	237	321	106	85	122	242
UK (England & Wales)	186	284	139	77	95	140
UK (Isle of Man)	2	7	8	15	7	7
UK (N. Ireland)	523	1,024	1,336	1,042	736	644
UK (Scotland)	202	117	84	68	35	54
Total	1,354	1,772	1,689	1,293	1,066	1,094

*Preliminary. [1]Included in VIa.

Continued...

HAKE VIIb,c

Country	1988	1989	1990	1991	1992	1993*
France	478	...[1*]	...[1*]	...[1*]	69*	...[1]
Ireland	128	89	219	133	196	424
Netherlands	-	-	-	7	-	4
Norway	-	-	+	+	1*	-
Spain	4,033					
UK (England & Wales)	859	207	157	223	598	22
UK (N. Ireland)	2	-	-	1	2	11
UK (Scotland)	8	3	10	38	116	47
Total	5,508					

*Preliminary. [1]Included in VIa.

HAKE VIId

Country	1988	1989	1990	1991	1992	1993*
Belgium	26	1	1	2	3	1
Denmark	-	-	-	-	+	-
France	4	...[1*]	...[1*]	...[1*]	4*	...[1]
UK (England & Wales)	2	3	3	3	1	1
UK (Scotland)	-	-	-	-	+	+
Total	32	4	4	5	8	2

*Preliminary. [1]Included in VIa.

HAKE VIIe

Country	1988	1989	1990	1991	1992	1993*
Belgium	3	3	1	+	+	1
France	1,185	...[1*]	...[1*]	...[1*]	503*	...[1]
Ireland	-	-	-	11	11	-
UK (England & Wales)	329	353	439	506	293	265
UK (Scotland)	-	1	9	-	+	-
Total	1,517	357	449	517	807	266

*Preliminary. [1]Included in VIa.

Continued...

HAKE VIIf

Country	1988	1989	1990	1991	1992	1993*
Belgium	30	35	28	10	12	10
France	551	...[1*]	...[1*]	...[1*]	296*	...[1]
Ireland	-	-	26	16	30	-
UK (England & Wales)	505	502	296	265	174	291
UK (Isle of Man)	-	-	-	3	+	-
UK (N. Ireland)	-	-	-	1	-	-
UK (Scotland)	-	16	9	6	-	-
Total	1,086	553	359	301	512	301

*Preliminary. [1]Included in VIa.

HAKE VIIg-k

Country	1988	1989	1990	1991	1992	1993*
Belgium	16	29	19	8	11	13
Denmark	+	-	+	+	-	-
France	3,332	...[1*]	...[1*]	...[1*]	1,579*	...[1]
Ireland	1,331	965	1,593	1,301	1,812	1,621
Netherlands	-	4	-	15	-	-
Norway	-	-	+	-	-*	-
Spain	5,229					
UK (England & Wales)	2,539	1,189	1,499	2,274	2,730	798
UK (Isle of Man)	-	-	+	-	-	-
UK (N. Ireland)	+	+	2	1	1	12
UK (Scotland)	1	9	17	214	166	23
Total	12,448					

*Preliminary. [1]Included in VIa.

Continued...

HAKE VIII

Country	1988	1989	1990	1991	1992	1993*
Belgium	2	15	8	12	13	7
Denmark	-	-	-	-	+	-
France	13,85	13,678[1*]	12,979[2]	15,607[3*]	11,426[4*]	8,972[5]
Ireland	3	2	-	-	-	-
Netherlands	-	-	28	-	-	-
Portugal	23	21	20	23	37	
Spain	13,63					
UK (England & Wales)	2	-	-	-	+	-
Total	27,51					

*Preliminary. [1]VIIIa,b,d,e 13,663 t; VIIIc, IX, X, COPACE(EC) 15 t. [2]VIIIa,b,d,e 12,977 t; VIIIc, IX, X COPACE (EC) 2 t. [3]VIIIa,b,d,e 15,591 t; VIIIc, IX, X, COPACE(EC) 16 t. [4]VIIIa,b 11,284 t, VIIIc 19 t, VIIId 119 t and VIIIe 4 t. [5]VIIIa,b,d,e 8,957 t; VIIIc, IX, X, COPACE(EC) 15 t.

HAKE IX

Country	1988	1989	1990	1991	1992	1993*
Portugal	5,469	3,111	3,074	3,564	4,582	
Spain	6,060					
Total	11,529					

*Preliminary.

Continued...

Table 4.1.2 Hake - Northern Stock (Division IIIa, Sub-areas IV, VI, VII and Divisions VIIIa,b). Weights in '000 t and numbers in millions.

	Recruitment	Spawning Stock		Fishing Mortality
Year	Age 0	Biomass	Landings	Age 1-4
1978	319	174	53	0.28
1979	334	167	54	0.25
1980	450	173	60	0.26
1981	329	182	56	0.23
1982	311	184	58	0.33
1983	300	196	60	0.32
1984	291	199	65	0.24
1985	516	197	64	0.16
1986	272	228	60	0.23
1987	268	230	65	0.21
1988	337	194	67	0.21
1989	216	188	69	0.25
1990	309	171	61	0.28
1991	222	166	59	0.29
1992	230	142	58	0.34
1993	310	129	54	0.31
Average	313	182	60	0.26

Table 4.1.3 HAKE - SOUTHERN STOCK - Landings estimates ('000 t) for the Southern Hake Stock (Divisions VIIIc and IXa) by country and gear as determined by the Working Group, 1972-1993.

	Spain						Portugal			France	
Year	Gill-net	Small gill-net	Long-line	Total artis-anal	Trawl	Total	Artis-anal	Trawl	Tota	Total	Stock total
1972	-	-	-	7.1	10.2	17.3	4.7	4.1	8.8	-	26.1
1973	-	-	-	8.5	12.3	20.8	6.5	7.3	13.8	0.2	34.8
1974	2.6	1.0	2.2	5.8	8.3	14.1	5.1	3.5	8.6	0.1	22.8
1975	3.5	1.3	3.0	7.8	11.2	19.0	6.1	4.3	10.4	0.1	29.5
1976	3.1	1.2	2.6	6.9	10.0	16.9	6.0	3.1	9.1	0.1	26.1
1977	1.5	0.6	1.3	3.4	5.8	9.2	4.5	1.6	6.1	0.2	15.5
1978	1.4	0.1	2.1	3.6	4.9	8.5	3.4	1.4	4.8	0.1	13.4
1979	1.7	0.2	2.1	4.0	7.2	11.2	3.9	1.9	5.8	-	17.0
1980	2.2	0.2	5.0	7.3	5.3	12.6	4.5	2.3	6.8	-	19.4
1981	1.5	0.3	4.6	6.4	4.1	10.5	4.1	1.9	6.0	-	16.5
1982	1.3	0.4	5.3	7.0	4.4	11.4	5.0	2.5	7.5	-	18.9
1983	1.5	0.9	7.2	9.6	7.0	16.6	5.2	2.9	8.1	-	24.6
1984	1.6	0.8	8.2	10.6	4.9	15.5	4.3	1.2	5.5	-	21.0
1985	1.8	0.8	4.4	7.0	5.3	12.3	3.8	2.0	5.8	-	18.1
1986	2.1	0.8	3.5	6.4	4.9	11.2	3.2	1.8	5.0	0.0	16.2
1987	2.0	0.5	4.4	6.9	3.5	10.4	3.5	1.3	4.8	0.0	15.2
1988	2.0	0.7	3.0	5.7	3.7	9.4	4.3	1.7	6.0	0.0	15.4
1989	1.9	0.6	1.9	4.4	3.9	8.3	2.7	1.8	4.6	0.0	12.9
1990	1.7	0.6	2.1	4.4	4.1	8.5	2.3	1.1	3.4	0.0	12.0
1991	1.4	0.4	2.2	4.0	3.6	7.6	2.7	1.2	4.0	0.0	11.6
1992	1.5	0.4	2.1	3.9	3.8	7.7	3.8	1.3	5.1	0.0	12.8
1993	1.3	0.4	2.8	4.4	2.7	7.0	3.0	0.9	3.9	0.0	10.9

Table 4.1.4 Hake - Southern Stock (Divisions VIIIc and IXa). Weights in '000 t and numbers in millions.

	Recruitment	Spawning Stock		Fishing Mortality
Year	Age 0	Biomass	Landings	Age 2-5
1982	140	52	19	0.27
1983	115	50	25	0.42
1984	138	55	21	0.27
1985	99	35	18	0.34
1986	105	24	16	0.41
1987	97	24	15	0.39
1988	83	26	15	0.33
1989	51	25	13	0.36
1990	41	24	12	0.31
1991	43	22	12	0.29
1992	27	24	13	0.38
1993	41	21	11	0.31
Average	82	32	16	0.34

Table 4.2.1 **Megrim (L. whiffiagonis) in sub-areas VII and VIIIa,b.**
Nominal landings and catches (t) provided by the Working Group.

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
France			4462	4892	5084	5417	4258	3647	4069	3478
Spain			10242	8772	9247	9482	7127	7780	7349	6526
U.K.			2048	1600	1956	1451	1380	1617	1982	2164
Ireland			1563	1561	995	2548	1381	1956	2113	2592
Total landings	16659	17865	18315	16825	17282	18898	14146	15000	15513	14759
Total discards	2169	1732	2321	1705	1725	2582	3216	3214	3118	2870
Total catches	18828	19597	20636	18530	19007	21480	17362	18214	18631	17629

Table 4.2.2 Megrim (*L. whiffiagonis*) in Divisions VIIb,c,e-k and VIIIa,b. Weights in '000 t and numbers in millions.

Year	Recruitment Age 1	Spawning Stock Biomass	Catches	Fishing Mortality Age 3-6
1984	237	92	19	0.20
1985	232	86	20	0.21
1986	214	87	21	0.19
1987	181	91	19	0.23
1988	189	83	19	0.24
1989	296	69	21	0.28
1990	360	66	17	0.33
1991	489	67	18	0.48
1992	293	78	19	0.34
1993		85	18	0.26
Average	277	81	19	0.28

Table 4.3.1 Lophius piscatorius in Divisions VIIb-k and VIIIa,b
Nominal landings in tonnes

	VIIb-k													VIIIa,b				
Year	IRELAND Trawl (Unit 4)	IRELAND Trawl (Unit 5)	BELGIUM Beam Trawl (Unit 6)	UK Gill-Net (Unit 3)	UK Trawl (Unit 4)	UK Trawl (Unit 5)	UK Beam Trawl (Unit 6)	FRANCE Gill-Net (Unit 3)	FRANCE Trawl (Unit 4)	FRANCE Trawl (Unit 5)	FRANCE Neph.Trawl (Unit 8)	SPAIN Trawl (Unit 4)	SPAIN Trawl (Unit 7)	FRANCE Neph.Trawl (Unit 9)	FRANCE Trawl (Unit 10)	FRANCE Trawl (Unit 14)	SPAIN Trawl (Unit 14)	TOTAL VII + VIII
1986	369	344	326	429	1058	372	741		6031	708	1732	4439		1408	500	1168	735	20360
1987	333	345	81	560	778	262	1286		6626	478	1321	3748		1461	585	1572	648	19084
1988	84	227	144	643	684	305	1530		5482	332	1256	2800	287	1235	640	1272	811	17732
1989	123	1102	521	481	201	456	1793	300	4936	677	1173	3759		926	554	958	609	18569
1990	596	835	216	416	337	387	1521	600	4803	642	1319	3482		668	403	1329	799	18353
1991	203	809	51	428	687	211	1090	1300	3870	269	1025	3533		363	255	869	502	15455
1992	197	788	108	533	997	181	803	1200	2441	171	975	2517		235	98	522	296	12162
1993*	947	210	100	434	614	235	1035	1300	1584	850	1535	2501		323	370	561	274	12873

* preliminary

Table 4.3.2 Lophius budegassa in Divisions VIIb-k and VIIIa,b
Landings in tonnes by fleet

	VIIb-k												VIIIa,b				
Year	IRELAND Trawl (Unit 4)	IRELAND Trawl (Unit 5)	BELGIUM Beam Trawl (Unit 6)	UK Gill-net (Unit 3)	UK Trawl (Unit 4)	UK Trawl (Unit 5)	UK Beam Trawl (Unit 6)	FR Gill-net (Unit 3)	FRANCE Trawl (Unit 4)	FRANCE Trawl (Unit 5)	FRANCE Neph.Trawl (Unit 8)	SPAIN Trawl (Unit 4)	FRANCE Neph.Trawl (Unit 9)	FRANCE Trawl (Unit 10)	FRANCE Trawl (Unit 14)	SPAIN Trawl (Unit 14)	TOTAL VII + VIII
1986	431	68	277	23	798	41	632		1760	87	458	3377	784	90	633	415	9874
1987	333	98	37	30	401	74	578		1205	98	648	2380	675	119	616	648	7940
1988	409	122	77	34	404	161	814		1972	171	579	2814	608	132	661	668	9624
1989	47	520	280	25	118	235	865	15	2255	83	879	1948	611	204	940	577	9702
1990	231	323	104	22	161	28	729	30	2309	47	899	1655	706	153	950	552	8899
1991	174	687	18	22	408	23	381	65	1833	37	690	2088	575	196	935	773	8905
1992	170	669	16	28	669	38	289	60	1733	22	740	1668	428	102	810	518	7979
1993*	562	36	20	30	360	20	330	70	1156	169	619	1266	396	145	611	549	6339

*preliminary

Table 4.3.3 **Landings(tonnes) of both species of anglerfish in Divisions VIIb-k and VIIIa,b**

Working group estimate Year	VIIb-k	VIIIa,b	Total
1985	23,132	6,250	29,382
1986	24,501	5,733	30,234
1987	20,700	6,324	27,024
1988	21,331	6,025	27,356
1989	22,892	5,379	28,271
1990	21,692	5,560	27,252
1991	19,902	4,458	24,360
1992	17,132	3,009	20,141
1993	15,983	3,229	19,212

Table 4.3.4 **Landings of L.piscatorius in Divisions VIIb-k and in VIIIa,b**

Working group estimate Year	VIIb-k	VIIIa,b	Total
1985	18,263	4,160	22,423
1986	16,549	3,811	20,360
1987	14,818	4,266	19,084
1988	13,774	3,958	17,732
1989	15,522	3,047	18,569
1990	15,154	3,199	18,353
1991	13,476	1,979	15,455
1992	11,011	1,151	12,162
1993	11,345	1,528	12,873

Table 4.3.5 **Landings of Lophius budegassa in areas VIIb-k and VIIIa,b**

Working group estimate Year	VIIb-k	VIIIa,b	Total
1986	7,952	1,922	9,874
1987	5,882	2,058	7,940
1988	7,557	2,067	9,624
1989	7,370	2,332	9,702
1990	6,538	2,361	8,899
1991	6,426	2,479	8,905
1992	6,121	1,858	7,979
1993	4,638	1,701	6,339

Table 4.3.6 Anglerfish (*L. piscatorius)* in Divisions VIIb-k and VIIIa,b. Weights in '000 t and numbers in millions.

	Recruitment	Spawning Stock		Fishing Mortality
Year	Age 0	Biomass	Landings	Age 3-7
1986	13	61	20	0.29
1987	10	57	19	0.25
1988	10	49	18	0.32
1989	13	46	19	0.36
1990	25	41	18	0.43
1991	22	36	15	0.38
1992	16	32	12	0.29
1993	13	31	13	0.28
Average	15	44	17	0.33

Table 4.3.7 Anglerfish (*L. budegassa*) in Divisions VIIb-k and VIIIa,b. Weights in '000 t and numbers in millions.

	Recruitment	Spawning Stock		Fishing Mortality
Year	Age 1	Biomass	Landings	Age 4-8
1986	19	45	10	0.18
1987	17	46	8	0.16
1988	16	43	10	0.23
1989	14	45	10	0.16
1990	10	35	9	0.18
1991	8	40	9	0.21
1992	13	40	8	0.20
1993	16	33	6	0.18
Average	14	41	9	0.19

Table 5.1.1 Annual landings (t) of SARDINE in Divisions VIIIc and IXa by country.

Country	1976	1977	1978	1979	1980	1981
Portugal	79,649	79,819	83,553	91,294	106,302	113,253
Spain	62,041	45,931	56,437	62,147	85,380	100,880
Total	141,690	125,750	139,990	153,441	191,682	214,133

	1982	1983	1984	1985	1986	1987
Portugal	100,859	85,922	95,110	111,709	103,451	90,214
Spain	103,645	95,217	107,576	92,398	77,155	78,611
Total	204,504	181,139	202,686	204,107	180,606	168,825

	1988	1989	1990	1991	1992	1993
Portugal	93,591	91,091	92,404	92,638[1]	83,315	90,404
Spain	64,949	46,035	46,753	35,118	42,739	48,391
Total	158,540	137,126	139,157	127,756	126,054	138,795

[1]Discards included.

Table 5.2.1 Annual catches (tonnes) of Bay of Biscay anchovy (Sub-area VIII). As estimated by the Working Group.

	COUNTRY		
	FRANCE	SPAIN	INTERNATIONAL
YEAR	VIIIab	VIIIbc	VIII
1960	1085	57000	58085
1961	1494	74000	75494
1962	1123	58000	59123
1963	652	48000	48652
1964	1973	75000	76973
1965	2615	81000	83615
1966	839	47519	48358
1967	1812	39363	41175
1968	1190	38429	39619
1969	2991	33092	36083
1970	3665	19820	23485
1971	4825	23787	28612
1972	6150	26917	33067
1973	4395	23614	28009
1974	3835	27282	31117
1975	2913	23389	26302
1976	1095	36166	37261
1977	3807	44384	48191
1978	3683	41536	45219
1979	1349	25000	26349
1980	1564	20538	22102
1981	1021	9794	10815
1982	381	4610	4991
1983	1911	12242	14153
1984	1711	33468	35179
1985	3005	8481	11486
1986	2311	5612	7923
1987	5061	9863	14924
1988	6743	8266	15009
1989	2200	8174	10374
1990	10598	23258	33856
1991	9708	9573	19281
1992	15207	22468	37675
1993	20914	19173	40087
1994	6000	13000	19000 [1]
AVERAGE (1960-93)	3936	30553	34490

[1] Preliminary data for the first half of the year.

Table 5.3.1 Portuguese and Spanish annual landings (tonnes) of ANCHOVY in Division IXa. (From Pestana, 1989 and Working Group members).

Year	Portugal	Spain	TOTAL
1943	9975	---	
1944	6651	---	
1945	992	---	
1946	6520	---	
1947	3392	---	
1948	4938	---	
1949	2684	---	
1950	3377	---	
1951	3594	---	
1952	4415	---	
1953	1033	---	
1954	3919	---	
1955	4523	---	
1956	7898	---	
1957	12610	---	
1958	3030	---	
1959	3788	---	
1960	9503	---	
1961	2492	---	
1962	4446	---	
1963	5714	---	
1964	4118	---	
1965	4460	---	
1966	4460	---	
1967	3818	---	
1968	970	---	
1969	1243	---	
1970	1172	---	
1971	326	---	
1972	207	---	
1973	126	---	
1974	238	---	
1975	372	---	
1976	88	---	
1977	3261	---	
1978	1011	---	
1979	655	---	
1980	980	---	
1981	978	---	
1982	656	---	
1983	673	---	
1984	392	---	
1985	2122	---	
1986	2153	---	
1987	1622	---	
1988	442	4263	4705
1989	823	5336	6159
1990	541	5911	6452
1991	210	5711	5921
1992	138	3028	3166
1993	23	1961	1984

--- No data

Table 5.4.1 Four Spot Megrim (L. boscii) in Divisions VIIIc, IXa. Total landings (Tonnes).

	Spain			Portugal	Total
Year	VIIIc	IXa	Total	IXa	VIIIc, IXa
1986	799	197	996	128	1124
1987	995	586	1581	107	1688
1988	917	1099	2016	207	2223
1989	805	1548	2353	276	2629
1990	927	798	1725	220	1945
1991	841	634	1475	207	1682
1992	654	938	1592	324	1916
1993	744	419	1163	221	1384

Table 5.4.2 Megrim (*L. boscii*) in Divisions VIIIc and IXa.
Weights in t and numbers in thousands.

	Recruitment	Spawning Stock		Fishing Mortality
Year	**Age 1**	**Biomass**	**Landings**	**Age 2-4**
1986	52,238	4,028	1,124	0.27
1987	45,939	4,293	1,688	0.32
1988	28,938	5,298	2,223	0.35
1989	30,386	5,325	2,629	0.45
1990	30,123	4,822	1,945	0.31
1991	19,130	4,402	1,682	0.26
1992	24,568	3,788	1,916	0.49
1993	19,814	3,407	1,384	0.34
Average	31,392	4,420	1,824	0.35

Table. 5.4.3 Megrim *(L. whiffiagonis)* in Divisions VIIIc, IXa. Total landings (Tonnes).

Year	VIIIc	Spain IXa	Total	Portugal IXa	Total VIIIc, IXa
1986	508	98	606	53	659
1987	404	46	450	47	497
1988	657	59	716	101	817
1989	533	45	578	136	714
1990	841	25	866	111	977
1991	494	16	510	104	614
1992	474	5	479	37	516
1993	338	7	345	38	383

Table 5.4.4 Megrim (*L. whiffiagonis*) in Divisions VIIIc and IXa. Weights in tonnes and numbers in millions.

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-4
1986	9	2,132	659	0.38
1987	12	1,725	497	0.32
1988	11	2,045	817	0.48
1989	9	2,274	714	0.39
1990	11	2,265	977	0.45
1991	3	1,548	614	0.45
1992	7	1,230	516	0.52
1993	3	968	383	0.47
Average	8	1,773	647	0.43

Table 5.5.1 Anglerfish (*L. piscatorius*) and (*L. budegassa*) in Divisions VIIIc and IXa. Weights in '000 t.

	Landings	
Year	*L. piscatorius*	*L. budegassa*
1986	6.87	2.56
1987	5.14	3.83
1988	6.32	3.70
1989	5.00	2.58
1990	3.79	2.33
1991	3.64	2.16
1992	3.38	2.11
1993	2.48	2.08
Average	4.58	2.67

Table 5.6.1 Bay of Biscay sole (Divisions VIIIa,b). International landings and discards as used by the Working Group (in tonnes).

Years	Official landings	Unreported landings	Used landings	Used catches	Discards
1979	2,443	176	2,619	2,866	247
1980	2,689	297	2,986	3,255	269
1981	2,694	242	2,936	3,352	416
1982	1,746	2,067	3,813	4,321	508
1983	2,669	959	3,628	4,073	445
1984	3,183	855	4,038	4,402	365
1985	3,925	326	4,251	4,556	305
1986	4,567	238	4,805	5,031	226
1987	4,379	707	5,086	5,676	590
1988	4,443	939	5,382	6,029	647
1989	5,782	63	5,845	6,524	679
1990	5,532	384	5,916	6,471	555
1991	4,704	865	5,569	6,047	478
1992	5,484	1,066	6,550	7,027	477
1993	5,622	798	6,420	6,791	371
Mean	3,991	665	4,656	5,095	438

Table 5.6.2 Sole in Division VIIIa,b (Bay of Biscay). Weights in '000 t and numbers in millions.

	Recruitment	Spawning Stock		Fishing Mortality
Year	**Age 0**	**Biomass**	**Landings**	**Age 2-6**
1979	47.80	6.29	2.87	0.32
1980	48.40	8.37	3.26	0.32
1981	56.43	10.29	3.35	0.28
1982	58.06	11.24	4.32	0.33
1983	58.28	10.69	4.07	0.30
1984	52.94	12.03	4.40	0.32
1985	47.68	12.83	4.56	0.33
1986	51.26	14.38	5.03	0.35
1987	47.52	15.01	5.68	0.38
1988	55.42	14.27	6.03	0.42
1989	51.92	13.16	6.52	0.50
1990	57.23	12.79	6.47	0.46
1991	34.14	13.14	6.05	0.42
1992	30.30	13.80	7.03	0.52
1993		14.58	6.79	0.53
Average	49.81	12.19	5.09	0.39

Table 6.1.1 Description of Management Areas together with their *Nephrops* Working Group labels and the Functional Units contained within them.

Working Group Label	Management Area Description	Functional Units
A	Va	1 Iceland
B	Vb (non EU)	2 Faroe Islands
C	VIa	11 North Minch
		12 South Minch
		13 Clyde
D	Vb (EU) + VIb	None
E	IIIa	3+4 Skagerrak and Kattegat
F	IVa: rect., 44-48 E6-E7 + 44E8	9 Moray Firth
		10 Noup
G	IVa: remainder	7 Fladen
H	IVb,c E of 1° E	5 Botney Gut
I	IVb,c W of 1° E	6 Farn Deeps
		8 Firth of Forth
J	VIIa: excluding rect. 33 E2-E5	14 Irish Sea East
		15 Irish Sea West
K	VIId,e	None
L	VIIb,c,j,k	16 Porcupine Bank
		17 Aran Grounds
		18+19 Irish coast
M	VIIf,g,h and VIIa 33E2-E5	20+21+22 Celtic Sea
N	VIIIa,b	23+24 Bay of Biscay
O	VIIIc	25 North Galicia
		31 Cantabrian Sea
P	VIIId,e	None
Q	IXa	26 West Galicia
		27 N. Portugal
		28+29 S. and SW Portugal
		30 Gulf of Cadiz
R	IXb + X	None

Table 6.2.1 Catches (t) of MACKEREL in the Norwegian Sea (Division IIa) and off the Faroes (Division Vb), 1982-1993. (Data submitted by Working Group members).

Country	1982	1983	1984	1985	1986	1987[1]
Denmark	1,008	10,427	11,787	7,610	1,653	3,133
Faroe Islands	180	-	137	-	-	-
France	8	-	-	16	-	-
Germany, Fed. Rep.	-	5	-	-	99	-
German Dem. Rep.	-	-	-	-	16	292
Ireland	-	-	-	-	-	-
Norway	34,540	38,453	82,005	61,065	85,400	25,000
Poland	231	-	-	-	-	-
UK (England & Wales)	-	-	-	-	-	-
UK (Scotland)	-	-	-	-	2,131	157
USSR	1,641	65	4,292	9,405	11,813	18,604
Discards	-	-	-	-	-	-
Total	37,608	48,950	98,222	78,096	101,112	47,186

Country	1988[1]	1989	1990	1991	1992[2]	1993[2]
Denmark	4,265	6,433	6,800	1,098	251	-
Estonia					216	-
Faroe Islands	22	1,247	3,100	5,793	3,347	1,167
France	-	11	-	23	6	6
Germany, Fed. Rep.	380	-	-	-	-	-
German Dem. Rep.	-	2,409	-	-	-	-
Ireland	-	-	-	-	-	-
Latvia					100	4,700
Norway	86,400	68,300	77,200	76,760	91,900	110,500
Poland	-	-	-	-	-	-
Russia					42,440	49,600
UK (England & Wales)	-	-	+	-	1	-
UK (Scotland)	1,413	-	400	514	801	-
USSR	27,924	12,088	30,000	13,631[3]	-	-
Discards	-	-	2,300	-	-	-
Total	120,404	90,488	118,700	97,819	139,062	165,973

[1]Includes catches probably taken in the northern part of Division IVa.
[2]Preliminary.
[3]Russia.

Table 6.2.2 Catch (t) of MACKEREL in the North Sea, Skagerrak, and Kattegat (Sub-area IV and Division IIIa), 1982-1993. (Data submitted by Working Group members.)

Country	1982	1983	1984	1985	1986	1987[1]
Belgium	102	93	68	-	49	14
Denmark	2,034	11,285	10,088	12,424	23,368	28,217
Faroe Islands	720	-	-	1,356	-	-
France	3,041	2,248	-	322	1,200	2,146
Germany, Fed. Rep.	28	10	112	217	1,853	474
Ireland	-	-	-	-	-	-
Netherlands	390	866	340	726	1,949	2,761
Norway	27,966	24,464	27,311	30,835	50,600	108,250
Sweden	692	1,903	1,440	760	1,300	3,162
UK (Engl. & Wales)	16	16	2	143	18	94
UK (Scotland)	44	4	13	7	541	19,763
UK (N.Ireland)	-	-	-	-	-	-
USSR	-	-	-	-	-	-
Unallocated, discards and misreported	450	96	202	3,656	162,822	136,737
Total	35,483	40,985	39,576	50,466	243,700	301,618
Misreported[3]					148,000	117,000

Country	1988	1989	1990	1991	1992[2]	1993[2]
Belgium	20	37	-	125	102	191
Denmark	32,588	26,831	29,000	38,834	41,719	42,502
Estonia					400	-
Faroe Islands	-	2,685	5,900	5,338	-	11,408
France	1,806	2,200	1,600	2,362	956	1,480
Germany, Fed. Rep.	177	6,312	3,500	4,173	4,610	4,940
Ireland	-	8,880	12,800	13,000	13,136	13,206
Latvia					211	-
Netherlands	2,564	7,343	13,700	4,591	6,547	7,770
Norway	59,750	81,400	74,500	102,350	115,700	112,700
Sweden	1,003	6,601	6,400	4,227	5,100	5,934
UK (Engl. & Wales)	160	5,618	1,300	2,671	2,258	2,262
UK (Scotland)	616	33,042	28,100	33,991	32,879	38,747
UK (N.Ireland)	100	-	1,400	255	-	1
USSR	-	-	-	-	-	-
Unallocated, discards,	233,532	100,651	126,900	153,958	143,546	149,417
Total	338,316	281,600	305,100	365,875	367,164	390,558
Misreported[3]	180,000	92,000	126,000	130,000	127,000	146,697

[1] May includes catches taken in Division IIa.
[2] Preliminary.
[3] Catches reported as taken in Division VIa.

Table 6.2.3 Catch (t) of MACKEREL in the Western area (Sub-areas VI and VII andDivisions VIIIa,b,d,e).(Data submitted by Working Group members.)

Country	1982	1983	1984	1985	1986	1987
Belgium	-	+	+	-	+	-
Denmark	15,000	15,000	200	400	300	100
Faroe Islands	11,100	14,900	9,200	9,000	1,400	7,100
France	12,300	11,000	12,500	7,400	11,200	11,100
Germany, Fed. Rep.	11,200	23,000	11,200	11,800	7,700	13,300
Ireland	109,700	110,000	84,100	91,400	74,500	89,500
Netherlands	67,200	73,600	99,000	37,000	58,900	31,700
Norway	19,000	19,900	34,700	24,300	21,000	21,600
Poland	-	-	-	-	-	-
Spain	-	-	100	+	-	-
UK (Engl. & Wales)	82,900	62,000	30,000	9,600	9,100	25,200
UK (N.Ireland)	9,600	800	10,600	12,200	9,700	10,700
UK (Scotland)	147,400	120,100	157,700	184,100	137,500	164,800
USSR	-	+	200	+	-	-
Unallocated + misreported	97,300	105,500	18,000	75,100	-98,701	-91,000
Discard	24,900	11,300	12,100	4,500	-	-
Grand Total	607,700	567,100	479,600	467,700	232,599	284,000
Misreported[3]					-148,000	-117,000

Country	1988	1989[2]	1990	1991	1992[2]	1993[2]
Belgium	-	-	-	-	-	-
Denmark	-	1,000?	-	1,573	194	-
Faroe Islands	2,600	1,100	1,000	4,095	-	2,350
France	8,900	12,700	17,400	10,364	9,109	8,296
Germany, Fed. Rep.	15,900	16,200	18,100	17,138	21,952	23,776
Ireland	85,800	61,100	61,500	64,827	76,313	81,773
Netherlands	26,100	24,000	24,500	29,156	32,365	44,600
Norway	17,300	700	-	-	-	600
Poland	-	-	-	-	-	-
Spain	1,500	1,400	400	4,020	2,764	3,162
UK (Engl. & Wales)	24,100	14,700	19,200	25,500	29,978	40,111
UK (N.Ireland)	8,900	11,000	12,800	2,995	2,238	1,476
UK (Scotland)	175,400	123,400	130,700	134,093	164,674	173,678
USSR	+	-	-	-	-	-
Unallocated + misreported	-175,300	-73,100	-114,500	-133,802	-125,528[1]	-146,697[1]
Discard	5,800	4,900	11,300	23,550	22,020	15,660
Grand Total	377,000	288,900	302,900	183,509	236,079	248,785
Misreported[3]	-180,000	-92,000	-126,000	-130,000	-127,000	-146,697

[1]Includes catches taken in Division IVa, but misreported to Division VIa.
[2]Preliminary.
[3]Catches taken in Division IVa but reported for Division VIa.

Table 6.2.4 Catches of MACKEREL by area. Discards not estimated prior to 1978. (Data submitted by Working Group members.)

Year	Sub-area VI			Sub-area VII and Divisions VIIIa,b,d,e			Sub-area IV and Division IIIa			Divs. IIa,Vb[1]	Divs. VIIIc, IXa	Total		
	Landings	Discards	Catch	Landings	Discards	Catch	Landings	Discards[2]	Catch	Landings	Landings	Landings	Discards	Catch
1969	4,800	-	4,800	66,300	-	66,300	739,182	-	739,182	+		810,282	-	810,282
1970	3,900	-	3,900	100,300	-	100,300	322,451	-	322,451	163		426,814	-	426,814
1971	10,200	-	10,200	122,600	-	122,600	243,673	-	243,673	358		376,831	-	376,831
1972	10,000	-	10,000	157,800	-	157,800	188,599	-	188,599	88	Not	356,487	-	356,487
1973	52,200	-	52,200	167,300	-	167,300	326,519	-	326,519	21,600	available	567,619	-	567,619
1974	64,100	-	64,100	234,100	-	234,100	298,391	-	298,391	6,800		603,391	-	603,391
1975	64,800	-	64,800	416,500	-	416,500	263,062	-	263,062	34,700		779,062	-	779,062
1976	67,800	-	67,800	439,400	-	439,400	303,842	-	303,842	10,500		821,542	-	821,542
1977	74,800	-	74,800	259,100	-	259,100	258,131	-	258,131	1,400	27,417	620,848	-	620,848
1978	151,700	15,100	166,900	355,500	35,500	391,000	148,817	-	148,817	4,200	26,508	686,725	50,700	737,425
1979	203,300	20,300	223,600	398,000	39,800	437,800	152,323	500	152,823	7,000	22,475	783,098	60,600	843,698
1980	218,700	6,000	224,700	386,100	15,600	401,700	87,391	-	87,391	8,300	15,964	716,455	21,600	738,055
1981	335,100	2,500	337,600	274,300	39,800	314,100	64,172	3,216	67,388	18,700	18,053	710,325	45,516	755,841
1982	340,400	4,100	344,500	257,800	20,800	278,600	35,033	450	35,483	37,600	21,076	691,009	25,350	716,359
1983	315,100	22,300	337,400	245,400	9,000	254,400	40,889	96	40,985	49,000	14,853	665,242	31,396	696,638
1984	306,100	1,600	307,700	176,100	10,500	186,600	39,374	202	39,576	93,900	20,308	635,782	12,302	648,084
1985	308,140	2,735	390,875	75,043	1,800	76,843	46,790	3,656	50,446	78,000	18,111	606,084	8,191	614,275
1986	104,100	+	104,100	128,499	+	128,499	236,309	7,431	243,740	101,000	24,789	594,697	7,431	602,128
1987	183,700	+	183,700	100,300	+	100,300	290,829	10,789	301,618	47,000	22,187	644,016	10,789	654,805
1988	115,600	3,100	118,700	75,600	2,700	78,300	308,550	29,766	338,316	116,200	24,772	640,772	35,566	676,288
1989	121,300	2,600	123,900	72,900	2,300	75,200	279,410	2,190	281,600	86,900	18,321	578,831	7,090	585,921
1990	114,800	5,800	120,600	56,300	5,500	61,800	300,800	4,300	305,100	116,800	21,311	610,011	15,600	625,611
1991	109,500	10,700	120,200	50,500	12,800	63,300	358,700	7,200	365,900	97,800	20,683	637,183	30,700	667,883
1992	141,906	9,620	151,526	72,153	12,400	84,553	364,184	2,980	367,164	139,062	18,046	735,351	25,000	760,351
1993	133,497	2,670	136,167	99,828	12,790	112,618	387,838	2,720	390,558	165,973	19,720	806,856	18,180	825,036

[1]For 1976-1985 only Division IIa.
[2]Discards estimated only for one fleet.

NB: Landings from 1969-1978 were taken from the 1978 Working Group report (Tables 2.1, 2.2 and 2.5).

Table 6.2.5 Catches of mackerel by Division and Sub-area in 1993. (Data submitted by Working Group members.)

Division/ Sub-area	Quarter				Total
	1	2	3	4	
IIa + Vb	900	11,300	120,800	32,900	165,900
IVa	67,800	400	62,800	250,900	381,900
IVb	-	100	1,200	100	1,400
IVc	+	400	1,200	700	2,300
IIIa	-	100	3,700	1,100	4,900
VI	108,900	4,600	5,700	17,000	136,200
VII	51,100	32,500	6,700	17,500	107,800
VIIIa,b,d,e	2,100	2,300	200	200	4,800
Sub-total	230,800	51,700	202,300	320,400	805,200
VIIIc	6,200	9,600	600	300	16,700
IXa	600	900	1,100	500	3,100
Grand total	237,600	62,200	204,000	321,200	825,000

Catches rounded to nearest 100.
Catches less than 50 t = +.

Table 6.2.6 North Sea Mackerel. Weights in '000 t.

	Spawning Stock	
Year	**Biomass**	**Landings**
1966		530
1967		930
1968		825
1969	1,087	739
1970	630	322
1971	788	243
1972	1,185	125
1973	1,184	226
1974	1,005	190
1975	826	138
1976	700	165
1977	583	188
1978	436	103
1979	336	66
1980	258	61
1981	189	60
1982	162	40
1983	168	43
1984	159	67
1985		35
1986		25
1987		3
1988		6
1989		7
1990		10
Average	606	206

Table 6.2.7 Western Mackerel. Weights in '000 t and numbers in millions.

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 4-8
1972	1,960	3,472	171	0.01
1973	4,528	3,517	219	0.03
1974	3,475	3,483	298	0.07
1975	4,945	3,209	491	0.17
1976	5,155	2,835	507	0.23
1977	1,009	2,792	326	0.12
1978	3,338	2,936	504	0.17
1979	5,526	2,597	606	0.24
1980	5,591	2,124	605	0.26
1981	7,236	2,135	662	0.20
1982	1,900	1,950	624	0.20
1983	1,447	2,355	614	0.20
1984	7,251	2,435	551	0.18
1985	3,022	2,408	561	0.19
1986	3,347	2,131	538	0.20
1987	5,447	2,454	615	0.19
1988	3,260	2,522	628	0.21
1989	4,641	2,552	567	0.17
1990	2,744	2,407	606	0.17
1991	3,110	2,742	646	0.21
1992	3,068	2,764	742	0.24
1993		2,452	805	0.30
Average	3,905	2,649	540	0.18

Table 6.2.8 Landings (tonnes) of MACKEREL in Divisions VIIIc and IXa, 1977-1993. (Data submitted by Working Group members.)

Division VIIIc

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Spain	19,852	18,543	15,013	11,316	12,834	15,621	10,390	13,852	11,810	16,533	15,982	16,844	13,446	16,086	16,940	12,043	16,675
Total	19,852	18,543	15,013	11,316	12,834	15,621	10,390	13,852	11,810	16,533	15,982	16,844	13,446	16,086	16,940	12,043	16,675

Division IXa

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Portugal	1,743	1,555	1,071	1,929	3,108	3,018	2,239	2,250	4,178	6,419	5,714	4,388	3,112	3,819	2,692	3,576	2,015
Spain	2,935	6,221	6,280	2,719	2,111	2,437	2,224	4,206	2,123	1,837	491	3,540	1,763	1,406	1,051	2,427	1,027
Poland	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
USSR	2,879	189	111	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	7,565	7,965	7,462	4,648	5,219	5,455	4,463	6,456	6,301	8,256	6,205	7,928	4,875	5,225	3,743	6,003	3,042

Divisions VIIIc + IXa

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	27,417	26,508	22,475	15,964	18,053	21,076	14,853	20,308	18,111	24,789	22,187	24,772	18,321	21,311	20,683	18,046	19,720

Table 6.3.1 Landings (t) of HORSE MACKEREL by Sub-area. Data as submitted by Working Group members.)

Sub-area	1979	1980	1981	1982	1983	1984
II	2	-	+	-	412	23
IV + IIIa	1,412	2,151	7,245	2,788	4,420	25,987
VI	7,791	8,724	11,134	6,283	24,881	31,716
VII	43,525	45,697	34,749	33,478	40,526	42,952
VIII	47,155	37,495	40,073	22,683	28,223	25,629
IX	37,619	36,903	35,873	39,726	48,733	23,178
Total	137,504	130,970	129,074	104,958	147,195	149,485

Sub-area	1985	1986	1987	1988	1989	1990
II	79	214	3,311	6,818	4,809	11,414
IV + IIIa	24,238	20,746	20,895	62,892	112,047	145,062
VI	33,025	20,455	35,157	45,842	34,870	20,904
VII	39,034	77,628	100,734	90,253	138,890	192,196
VIII	27,740	43,405	37,703	34,177	38,686	46,302
IX	20,237	31,159	24,540	29,763	29,231	24,023
Total	144,353	193,607	222,340	269,745	358,533	439,901

Sub-area	1991	1992	1993[1]
II + Vb	4,487	13,457	3,168
IV + IIIa	77,994	113,141	140,383
VI	34,455	40,921	53,822
VII	201,326	188,135	221,120
VIII	49,426	54,186	53,753
IX	21,778	26,713	31,944
Total	389,466	436,553	504,190

[1]Preliminary.

Table 6.3.2 Landings (t) of HORSE MACKEREL in Sub-area II. (Data as submitted by Working Group members.)

Country	1979	1980	1981	1982	1983	1984
Denmark	-	-	-	-	-	-
France	+	-	-	-	-	1
Germany, Fed.Rep.	2	-	+	-	-	-
Norway	-	-	-	-	412	22
USSR	-	-	-	-	-	-
Total	2	-	+	-	412	23

Country	1985	1986	1987	1988	1989	1990
Denmark	-	-	39	-	-	-
Faroe Islands	-	-	-	-	-	964[3]
France	1	-[2]	-[2]	-[2]	-	-
Germany, Fed.Rep.	-	-	-	64	12	+
Norway	78	214	3,272	6,285	4,770	9,135
USSR	-	-	-	469	27	1,298
UK (England + Wales)	-	-	-	-	-	17
Total	79	214	3,311	6,818	4,809	11,414

Country	1991	1992	1993[1]
Denmark	-	-	-
Faroe Islands	1,115[3]	9,157[3]	1,068
Germany	-	-	-
Norway	3,200	4,300	2,100
Russia	172	-	-
UK (England + Wales)	-	-	-
Total	4,487	13,457	3,168

[1]Preliminary.
[2]Included in Sub-area IV.
[3]Includes catches in Division Vb.

Table 6.3.3 Landings (t) of HORSE MACKEREL in Sub-area IV by country. (Data submitted by Working Group members.)

Country	1979	1980	1981	1982	1983	1984
Belgium	9	8	34	7	55	20
Denmark	496	199	3,576	1,612	1,590	23,730
Faroe Islands	-	260	-	-	-	-
France	221	292	421	567	366	827
Germany, Fed.Rep.	376	+	139	30	52	+
Ireland	-	1,161	412	-	-	-
Netherlands	88	101	355	559	2,029[4]	824[4]
Norway	199	119	2,292	7	322	94
Poland	-	-	-	-	2	-
Sweden	+	-	-	-	-	-
UK (Engl. + Wales)	23	11	15	6	4	3
UK (Scotland)	+	-	-	-	-	489
USSR	-	-	-	-	-	-
Total	1,412	2,151	7,245	2,788	4,420	25,987

Country	1985	1986	1987	1988	1989	1990	1991	1992[7]	1993[1]
Belgium	13	13	9	10	10	13	-	+	74
Denmark	22,495	18,652[2]	7,290[2]	20,323[2]	23,329[2]	20,605[2]	6,982[2]	7,755	6,120
Estonia	-	-	-	-	-	-	-	293	-
Faroe Islands	-	-	-	-	-	942	340	-	360
France	298	231[3]	189[3]	784[3]	248	220	174	162	302
Germany, Fed.Rep.	+	-	3	153	506	2,469[6]	5,995	2,801	1,570
Ireland	-	-	-	-	-	687	2,657	2,600	4,086
Netherlands	160[4]	600[4]	850[4]	1,060[4]	14,172	1,970	3,852	3,000	2,470
Norway[2]	203	776	11,728[5]	34,425[5]	84,161	117,903[2]	50,000[2]	96,000	126,800
Poland	-	-	-	-	-	-	-	-	-
Sweden	-	2[2]	-	-	-	102	953[2]	800	697
UK (Engl. + Wales)	71	3	339	373	10	10	132	4	115
UK (N. Ireland)	-	-	-	-	-	-	350	-	-
UK (Scotland)	998	531	487	5,749	2,093	458	7,309	996	1,059
USSR	-	-	-	-	-	-	-	-	-
Unallocated + discards	-	-	-	-	-12,482[5]	-317[5]	-750[5]	-278	-3,270
Total	24,238	20,746	20,895	62,892	112,047	145,062	77,994	113,141	140,383

[1]Preliminary.
[2]Includes Division IIIa.
[3]Includes Division IIa.
[4]Estimated from biological sampling.
[5]Assumed to be misreported.
[6]Includes 13 t from the German Democratic Republic.
[7]Includes a negative unallocated catch of -4,000 t.

Table 6.3.4 Landings (t) of HORSE MACKEREL in Sub-area VI by country. (Data submitted by Working Group members.)

Country	1979	1980	1981	1982	1983	1984
Denmark	443	734	341	2,785	7	-
Faroe Islands	-	-	-	1,248	-	-
France	151	45	454	4	10	14
Germany, Fed. Rep.	155	5,550	10,212	2,113	4,146	130
Ireland	-	-	-	-	15,086	13,858
Netherlands	6,910	2,385	100	50	94	17,500
Norway	-	-	5	-	-	-
Spain	20	-	-	-	-	-
UK (Engl. + Wales)	73	9	5	+	38	+
UK (Scotland)	39	1	17	83	-	214
USSR	-	-	-	-		-
Total	7,791	8,724	11,134	6,283	24,881	31,716

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993
Denmark	-	-	769	1,655	973	615	-	42	-
Faroe Islands	4,014	1,992	4,450[3]	4,000[3]	3,059	628	255	-	820
France	13	12	20	10	2	17	4	3	+
Germany, Fed. Rep.	191	354	174	615	1,162	2,474	2,500	6,281	10,023
Ireland	27,102	28,125	29,743	27,872	19,493	15,911	24,766	32,994	44,802
Netherlands	18,450	3,450	5,750	3,340	1,907	660	3,369	2,150	590
Norway		83	75	41	-	-	-	-	-
Spain		-[2]	-[2]	-[2]	-[2]	-[2]	1	3	-
UK (Engl. + Wales)	996	198	404	475	44	145	1,229	577	144
UK (N.Ireland	-	-	-	-	-	-	1,970	723	-
UK (Scotland)	1,427	138	1,027	7,834	1,737	267	1,640	86	4,523
USSR	-	-	-	-	-	44	-	-	-
Unallocated + discards	-19,168	-13,897	-7,255	-	6,493	143	-1,278	-1,940	-6,960[4]
Total	33,025	20,455	35,157	45,842	34,870	20,904	34,455	40,919	53,942

[1]Preliminary.
[2]Included in Sub-area VII.
[3]Includes Divisions IIIa, IVa,b and VIb.
[4]Includes a negative unallocated catch of -7,000 t.

Table 6.3.5 Landings (t) of HORSE MACKEREL in Sub-area VII by country. (Data submitted by the Working Group members.)

Country	1979	1980	1981	1982	1983	1984
Belgium	3	-	1	1	-	-
Denmark	4,287	5,045	3,099	877	993	732
France	4,407	1,983	2,800	2,314	1,834	2,387
Germany, Fed.Rep.	5,333	2,289	1,079	12	1,977	228
Ireland	-	-	16	-	-	65
Netherlands	25,174	23,002	25,000	27,500[2]	34,350	38,700
Norway	959	394	-	-	-	-
Spain	676	50	234	104	142	560
UK (Engl. + Wales)	2,686	12,933	2,520	2,670	1,230	279
UK (Scotland)	-	1	-	-	-	1
USSR	-	-	-	-	-	-
Total	43,525	45,697	34,749	33,478	40,526	42,952

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993[1]
Belgium	+	+	2	-	-	+	-	-	-
Denmark	1,477[2]	30,408[2]	27,368	33,202	34,474	30,594	28,888	18,984	16,978
Faroe Islands	-	-	-	-	-	28	-	-	-
France	1,881	3,801	2,197	1,523	4,576	2,538	1,230	1,198	1,001
Germany, Fed.Rep.	-	5	374	4,705	7,743	8,109	12,919	12,951	15,684
Ireland	100	703	15	481	12,645	17,887	19,074	15,568	16,363
Netherlands	33,550	40,750	69,400	43,560	43,582	111,900	104,107	109,197	157,110
Norway	-	-	-	-	-	-	-	-	-
Spain	275	137	148	150	14	16	113	106	54
UK (Engl. + Wales)	1,630	1,824	1,228	3,759	4,488	13,371	6,436	7,870	6,090
UK (N.Ireland)	-	-	-	-	-	-	2,026	1,690	587
UK (Scotland)	1	+	2	2,873	+	139	1,992	5,008	3,123
USSR	120	-	-	-	-	-	-	-	-
Unallocated + discards	-	-	-	-	28,368	7,614	24,541	15,563	4,010[3]
Total	39,034	77,628	100,734	90,253	138,890	192,196	201,326	188,135	221,000

[1]Provisional.
[2]Includes Sub-area VI.
[3]Includes a negative unallocated catch of -4,000 t.

Table 6.3.6 Landings (t) of HORSE MACKEREL in Sub-area VIII by country. (Data submitted by Working Group members.)

Country	1979	1980	1981	1982	1983	1984
Denmark	127	-	-	-	-	-
France	4,240	3,361	3,711	3.073	2,643	2,489
Netherlands	-	-	-	-	-	-[2]
Spain	42,766	34,134	36,362	19,610	25,580	23,119
UK (Engl. + Wales)	22	-	+	1	-	1
USSR	-	-	-	-	-	20
Total	47,155	37,495	40,073	22,683	28,223	25,629

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993[1]
Danmark	-	446	3,283	2,793	6,729	5,726	1,349	5,778	1,955
France	4,305	3,534	3,983	4,502	4,719	5,082	6,164	6,220	4,010
Germany	-	-	-	-	-	-	80	62	-
Netherlands	-[2]	-[2]	-[2]	-	-	6,000	12,437	9,339	19,000
Spain	23,292	40,334	30,098	26,629	27,170	25,182	23,733	27,688	27,921
UK (Engl. + Wales)	143	392	339	253	68	6	70	88	123
USSR	-	656	-	-	-	-	-	-	-
Unallocated + discards	-	-	-	-	-	1,500	2,563	5,011	700
Total	27,740	45,362	37,703	34,177	38,686	43,496	46,396	54,186	53,709

[1]Preliminary.
[2]Included in Sub-area VII.

Table 6.3.7 Annual catches (tonnes) of SOUTHERN HORSE MACKEREL by countries by gear in Divisions VIIIc and IXa. Data from 1984-1993 are Working Group estimates.

Year	Portugal (Division IXa)				Spain (Divisions IXa + VIIIc)					Total VIIIc+IXa
	Trawl	Seine	Artisanal	Total	Trawl	Seine	Hook	Gillnet	Total	
1962	7,231	46,345	3,400	56,976	-	-	-	-	53,202	110,778
1963	6,593	54,267	3,900	64,760	-	-	-	-	53,420	118,180
1964	8,983	55,693	4,100	68,776	-	-	-	-	57,365	126,141
1965	4,033	54,327	4,745	63,105	-	-	-	-	52,282	115,387
1966	5,582	44,725	7,118	57,425	-	-	-	-	47,000	104,425
1967	6,726	52,643	7,279	66,648	-	-	-	-	53,351	119,999
1968	11,427	61,985	7,252	80,664	-	-	-	-	62,326	142,990
1969	19,839	36,373	6,275	62,487	-	-	-	-	85,781	148,268
1970	32,475	29,392	7,079	59,946	-	-	-	-	98,418	158,364
1971	32,309	19,050	6,108	57,467	-	-	-	-	75,349	132,816
1972	45,452	28,515	7,066	81,033	-	-	-	-	82,247	163,280
1973	28,354	10,737	6,406	45,497	-	-	-	-	114,878	160,375
1974	29,916	14,962	3,227	48,105	-	-	-	-	78,105	126,210
1975	26,786	10,149	9,486	46,421	-	-	-	-	85,688	132,109
1976	26,850	16,833	7,805	51,488	89,197	26,291	376[1]	-	115,864	167,352
1977	26,441	16,847	7,790	51,078	74,469	31,431	376[1]	-	106,276	157,354
1978	23,411	4,561	4,071	32,043	80,121	14,945	376[1]	-	95,442	127,485
1979	19,331	2,906	4,680	26,917	48,518	7,428	376[1]	-	56,322	83,239
1980	14,646	4,575	6,003	25,224	36,489	8,948	376[1]	-	45,813	71,037
1981	11,917	5,194	6,642	23,733	28,776	19,330	376[1]	-	48,482	72,235
1982	12,676	9,906	8,304	30,886	-[2]	-[2]	-[2]	-	28,450	59,336
1983	16,768	6,442	7,741	30,951	8,511	34,054	797	-	43,362	74,313
1984	8,603	3,732	4,972	17,307	12,772	15,334	884	-	28,990	46,297
1985	3,579	2,143	3,698	9,420	16,612	16,555	949	-	34,109	43,529
1986	-[2]	-[2]	-[2]	28,526	9,464	32,878	481	143	42,967	71,493
1987	11,457	6,744	3,244	21,445	-[2]	-[2]	-[2]	-[2]	33,193	54,648
1988	11,621	9,067	4,941	25,629	-[2]	-[2]	-[2]	-[2]	30,763	56,392
1989	12,517	8,203	4,511	25,231	-[2]	-[2]	-[2]	-[2]	31,170	56,401
1990	10,060	5,985	3,913	19,958	10,876	17,951	262	158	29,247	49,205
1991	9,437	5,003	3,056	17,497	9,681	18,019	187	127	28,014	45,511
1992	12,189	7,027	3,438	22,654	11,146	16,972	81	103	28,302	50,956
1993	14,706	4,679	6,363	25,747	14,506	16,897	124	154	31,681	57,428

[1]Estimated value.
[2]Not available by gear.

Table 6.3.8 Landings and discards of HORSE MACKEREL (t) by year and division, for the North Sea, Western and Southern horse mackerel.(Data submitted by Working Group members.)

Year	North Sea horse mackerel					Western horse mackerel							Southern horse mackerel			Total
	IIIa		IVb,c	Discards	VIId	Total	IIa	IVa	VIa	VIIa-c,e-k	VIIIa,b,d,e	Discards	Total	VIIIc	IXa	Total	All stocks
1982	-	2,788[3]	-		1,247	4,035	-	-	6,283	32,231	3,073	-	41,587	19,610	39,726	59,336	104,958
1983	-	4,420[3]	-		3,600	8,020	412	-	24,881	36,926	2,643	-	64,862	25,580	48,733	74,313	147,195
1984	-	25,893	-		3,585	29,478	23	94	31,716	38,782	2,510	500	73,625	23,119	23,178	46,297	149,400
1985	1,138	[3]	22,897		2,715	26,750	79	203	33,025	35,296	4,448	7,500	80,551	23,292	20,237	43,529	150,830
1986	396		19,496		4,756	24,648	214	776	20,343	72,761	3,071	8,500	105,665	40,334	31,159	71,493	201,806
1987	436		9,477		1,721	11,634	3,311	11,185	35,197	99,942	7,605	-	157,240	30,098	24,540	54,638	223,512
1988	2,261		18,290		3,120	23,671	6,818	42,174	45,842	81,978	7,548	3,740	188,100	26,629	29,763	56,392	268,163
1989	913		25,830		6,522	33,265	4,809	85,304[2]	34,870	131,218	11,516	1,150	268,867	27,170	29,231	56,401	358,533
1990	14,872[1]		17,437		1,325	18,762	11,414	112,753[2]	20,794	182,580	21,120	9,930	373,463	25,182	24,023	49,205	441,430
1991	2,725[1]		11,400		600	12,000	4,487	63,869[2]	34,415	196,926	25,693	5,440	333,555	23,733	21,778	45,511	391,066
1992	2,374[1]		13,955	400	688	15,043	13,457	101,752	40,881	180,937	29,329	1,820	370,550	24,243	26,713	50,955	436,548
1993	850[1]		3,895	930	8,792	13,617	3,168	134,908	53,782	204,318	27,519	8,600	433,145	25,483	31,945	57,428	504,190

[1]Norwegian and Danish catches are included in the Western horse mackerel.
[2]Norwegian catches in Division IVb included in the Western horse mackerel.
[3]Divisions IIIa and IVb,c combined.

Table 6.3.9 Catches (t) and percentages (%) of *Trachurus mediterraneus* in relation to total landings of *Trachurus trachurus* in Divisions VIIIa,b, VIIIc and IXa in 1993.

	Trachurus mediterraneus										*T. trachurus*
	1Q		2Q		3Q		4Q		Total		Total
	(t)	%	(t)	(%)	(t)	(%)	(t)	(%)	(t)	(%)	(t)
Div. VIIIc	1,727	26.9	341	4.3	1,099	13.4	2,408	39.6	5,576	17.9	25,482
Sub-div. VIIIc East											
East of 3°W	1,330	90.4	330	17.8	713	53.6	1,669	89.6	4,042	62.1	2,462
West of 3°W	397	16.6	12	0.5	386	12.6	739	27.6	1,534	14.5	9,057
Sub-div. VIIIc West	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	13,963
Sub-div. IXa north	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6,198
Sub-div. IXa central north central south south	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	25,747
Div. VIIIa,b (Spain)	507	41.2	60	8.7	42	6.9	40	7.2	649	21.1	2,431

Table 6.3.10 Catches (t) of *Trachurus trachurus* and *Trachurus picturatus* in ICES Division IXa, Sub-area X, and in CECAF Division 34.1, in the period 1986-1993.

		1986	1987	1988	1989	1990	1991	1992	1993
Trachurus trachurus (*)	Div. IXa	28,526	19,554	25,125	25,226	19,959	17,497	22,653	25,747
Trachurus picturatus	Div. IXa	367	181	2,370	2,394	2,012	1,700	1,035	1,028
	Div. X Azorean area	3,331	3,020	3,079	2,866	2,510	1,274	1,255	1,732
	34.1.1 Madeira's area	2,006	1,533	1,687	1,564	1,863	1,161	792	530

(*) As estimated by the Working Group.

Table 6.3.11 Southern Horse Mackerel (Divisions VIIIc and IXa). Weights in '000t and numbers in millions.

	Recruitment	Spawning Stock		Fishing Mortality
Year	Age 0	Biomass	Landings	Age 1-11
1985	1,630	119	44	0.20
1986	2,586	174	71	0.31
1987	1,130	196	53	0.22
1988	945	201	56	0.27
1989	974	196	56	0.31
1990	806	202	49	0.25
1991	3,943	201	46	0.21
1992	1,280	190	51	0.23
1993	672	178	57	0.24
Average	1,552	184	54	0.25

Table 6.4.1. Landings (tonnes) of BLUE WHITING from the main fisheries, 1984-1993, as estimated by the Working Group.

Area	1984	1985	1986	1987	1988
Norwegian Sea fishery (Sub-areas I + II and Divisions Va, XIVa + XIVb)	65,932	90,742	160,061	123,042	55,829
Fishery in the spawning area (Divisions Vb, VIa, VIb and VIIb + VIIc)	421,865 [2]	464,265 [2]	534,263 [2]	445,884 [2]	421,636
Icelandic industrial fishery (Division Va)		-	-	-	-
Industrial mixed fishery (Divisions IVa-c, Vb, IIIa)	122,806	97,769	99,580	62,689	45,110
Sub-total northern fishery	610,603	652,776	793,904	631,615	522,575
Southern fishery (Sub-areas VIII + IX, Divisions VIId,e + VIIg-k)	31,173 [3]	42,820 [3]	33,082 [3]	32,819 [3]	30,838
Total	641,776	695,596	826,986	664,434	553,413

Area	1989	1990	1991	1992	1993 [1]
Norwegian Sea fishery (Sub-areas I + II and Divisions Va, XIVa + XIVb)	37,638	2,106	78,703	62,312	43,240
Fishery in the spawning area (Divisions Vb, VIa, VIb and VIIb + VIIc)	473,165	463,495	218,946	317,237	346,803
Icelandic industrial fishery (Division Va)	4,977	-	-	-	-
Industrial mixed fishery (Divisions IVa-c, Vb, IIIa)	75,958	63,192	39,872	66,174	92,480
Sub-total northern fishery	591,738	528,793	337,521	445,723	482,523
Southern fishery (Sub-areas VIII + IX, Divisions VIId,e + VIIg-k)	33,695	32,817	32,003	28,772	32,256
Total	625,433	561,610	369,524	474,495	514,779

[1]Preliminary.
[2]Including directed fishery also in Divisions VIIg-k, IVa and Sub-area XII.
[3]Excluding directed fishery also in Divisions VIIg-k.

Table 6.4.2 Landings (tonnes) of BLUE WHITING from the directed fishery in the Norwegian Sea (Subareas I and II, Divisions Va, XIVa and XIVb) fisheries, 1984-1993, as estimated by the Working Group.

Country	1984	1985	1986	1987	1988
Faroes	-	-	-	9,290	-
France	-	-	-	-	-
German Dem.Rep.	8,193	1,689	3,541	1,010	3
Germany, Fed.Rep.	35	75	106	-	-
Greenland	-	-	10	-	-
Iceland	105	-	-	-	-
Norway	689	-	-	-	-
Poland	-	-	-	56	10
UK (Engl. & Wales)	-	-	-	-	-
USSR	56,817	88,978	156,404	112,686	55,816
Total	65,932	90,742	160,061	123,042	55,829

Country	1989	1990	1991	1992	1993[1]
Faroes	1,047	-	-	-	-
France	-	-	-	-	-
German Dem.Rep.	1,341	-	-	-	-
Germany, Fed.Rep.	-	-	-	-	-
Greenland	-	-	-	-	-
Iceland	-	-	-	-	-
Norway	-	566	100	912	240
Poland	-	-	-	-	-
UK (Engl. & Wales)	-	-	-	-	-
USSR/Russia[2]	35,250	1,540	78,603	61,400	43,000
Total	37,638	2,106	78,703	62,312	43,240

[1]Preliminary.
[2]In 1991.

Table 6.4.3 Landings (tonnes) of BLUE WHITING from directed fisheries in the spawning area (Divisions Vb, VIa,b, VIIb,c and since 1984 Divisions VIIg-k and Sub-area XII), 1984-1993, as estimated by the Working Group.

Country	1984	1985	1986	1987	1988
Denmark	26,445	21,104	11,364	2,655	797
Faroes	62,264	72,316	80,564	70,625	79,339
France	3,882	-	-	-	-
German Dem.Rep.	1,171	6,839	2,750	3,584	4,663
Germany, Fed.Rep.	994	626	-	266	600
Ireland	-	668	16,440	3,300	245
Netherlands	1,000	1,801	8,888	5,627	800
Norway	211,773	234,137	283,162[2]	191,012	208,416
UK (Engl. & Wales)	33	2	10	5	3
UK (Scotland)	-	-	3,472	3,310	5,068
USSR	114,303	126,772	127,613	165,497	121,705
Total	421,865	464,265	534,263	445,884	421,636

Country	1989	1990	1991	1992	1993[1]
Denmark	25	-	-	3,167	-
Faroes	70,711	43,405	10,208[2]	12,731[2]	14,984
France	2,190	-	-	-	1,195
German Dem.Rep.	3,225	230	-		
Germany, Fed.Rep.	848	1,469	349	1,307[4]	91[4]
Ireland	-	-	-	-	-
Netherlands	2,078	7,280	17,359	11,034	18,436
Norway	258,386	281,036[2]	114,866[2]	148,733[2]	198,916
UK (Engl. & Wales)	1,557	13	-	356	2
UK (Scotland)	6,463	5,993	3,541	6,493	2,030
USSR/Russia[3]	127,682	124,069	72,623	115,600	96,000
Japan	-	-	-	918	1,742
Estonia	-	-	-	6,156	10,328
Latvia	-	-	-	10,742	2,046
Total	473,165	463,495	218,946	317,237	346,803

[1]Preliminary.
[2]Including directed fishery also in Division IVa.
[3]In 1991.
[4]Germany

Table 6.4.4 Landings (tonnes) of BLUE WHITING from the mixed industrial fisheries and caught as by-catch in ordinary fisheries in Divisions IIIa, IVa-c, Vb and IIa, 1984-1993, as estimated by the Working Group.

Country	1984	1985	1986	1987	1988
Denmark	49,032	35,843	57,315	28,541	18,114
Faroes	9,740	3,606	5,678	7,051	492
France	-	-	-	-	-
German Dem.Rep.[2]	-	-	-	53	-
Germany,Fed.Rep.[2]	556	52	-	62	280
Netherlands	122	130	1,114	-	-
Norway	58,038	54,522	26,941	24,969	24,898
Sweden	5,401	3,616	8,532	2,013	1,226
UK (Engl. & Wales)[2]	-	-	-	-	-
UK (Scotland)	-	-	-	-	100
Total	122,806	97,769	99,580	62,689	45,110

Country	1989	1990	1991	1992	1993[1]
Denmark	26,605	27,052	15,538	31,389	41,053
Faroes	3,325	5,281	355	705	1,522
France	-	-	-	-	-
German Dem.Rep.[2]	-	-	-	-	-
Germany,Fed.Rep.[2]	3	-	-	25	9
Netherlands	-	20	-	2	46
Norway	42,956	29,336[3]	22,644	31,977	12,333
Sweden	3,062	1,503	1,000	2,058	37,265
UK (Engl. & Wales)[2]	7	-	-	17	-
UK (Scotland)	-	-	335	1	2,52
Total	75,958	63,192	39,872	66,174	92,480

[1]Preliminary.
[2]Including directed fishery also in Division IVa.
[3]Including mixed industrial fishery in the Norwegian Sea.
[4]Germany

Table 6.4.5 Landings (tonnes) of BLUE WHITING from the Southern areas (Sub-areas VIII and IX and Divisions VIIg-k and VIId,e; from 1984, the Divisions VIIg-k are not included) 1984-1993 as estimated by the Working Group.

Country	1984	1985	1986	1987	1988
France	-	-	-	-	-
Netherlands	-	-	-	-	-
Norway	-	-	-	4	-
Portugal	5,252	6,989	8,116	9,148	5,979
Spain	25,921	35,828	24,965	23,644	24,847
UK (England & Wales)	-	3	1	23	12
Total	31,173	42,820	33,082	32,819	30,838

Country	1989	1990	1991	1992	1993
France	1	-	-	-	-
Netherlands	-	450	10	-	-
Norway	-	-	-	-	-
Portugal	3,557	2,864	2,813	4,928	1,236
Spain	30,108	29,490	29,180	23,794	31,020
UK (England & Wales)	29	13	-	-	-
Total	33,695	32,817	32,003	28,722	32,256

[1]Preliminary.

Table 6.4.6 Blue whiting combined stock catch (t) 1973-1993.

Year	Landings
1973	103
1974	108
1975	112
1976	164
1977	269
1978	609
1979	1,119
1980	1,123
1981	910
1982	576
1983	570
1984	642
1985	696
1986	827
1987	664
1988	553
1989	625
1990	562
1991	370
1992	474
1993	515
Average	552

Table 6.5.1 Deep-water fisheries in the ICES area by species, gear and ICES Sub-area. The entries in each cell indicate the target species in fisheries in which the deep-water species are taken.

Species/Area	II	III	IV	V
Smoothhead Alepocephalus bairdii	DIS LL Ling Tusk		DIS LL Ling Tusk	DIS LL BLing Tusk
Black scabbard Aphanopus carbo	DIS LL Ling Tusk		DIS LL Ling Tusk	Dir LL DIS LL Ling Tusk
Argentine Argentina silus	BYC Roundnose Dir Pelagic TRL	Dir BYC Shrimp	Dir BYC Shrimp	Dir TRL BYC Redfish DIS LL BLing Tusk
Golden eye perch Beryx splendens				
Rabbitfish Chimaera monstrosa	DIS LL Ling Tusk		DIS LL Ling Tusk	DIS LL BLing Tusk BYC Dan Seine
Roundnose grenadier Coryphaenoides rupestris	Dir TRL	Dir TRL BYC Arg TRL	Dir TRL BYC Arg TRL	Dir LL
Cardinalfish Epigonus telescopus				DIS LL BLing Tusk
Bluemouth Helicolenus dactylopterus	DIS LL Ling Tusk		DIS LL Ling Tusk	DIS LL Ling Tusk Dir LL
Orange roughy Hoplostethus atlanticus				BYC TRL
Roughhead grenadier Macrourus berglax	DIS TRL Gill GHal BYC LL Ling Tusk		BYC LL Ling Tusk	Dir LL BYC LL Halibut BYC Redfish,
Mora Mora mora	BYC LL Ling Tusk		BYC LL Ling Tusk	BYC LL Ling Tusk

DIS = Discarded
LL = Long Line Fishery
BYC = By Catch in a fishery
Dir = Directed fishery
TRL = Trawl fishery
Gill = Gillnet fishery
GHal = Greenland Halibut
Arg = Argentines
BLing = Blue ling
Dan = Danish Seine
Crust = Fishery for crustaceans
Artis = Artisinal Fishery
DWS = Deep Water Species
HL = Hand Line Fishery

Continued..

Table 6.5.1 Continued

Species/Area	II	III	IV	V
Red seabream Pagellius bogaroveo				
Greater forkbeard Phycis blennoides	BYC LL Ling Tusk		BYC LL LIng Tusk	BYC DIS LL BLing Tusk
Silver scabbard Lepidopus caudatus				
Gulper Centrophorus squamosus				
Black Dog Fish Centroscillium fabricii				
Portuguese shark Centroscymnus coelolepis				
Longnose velvet dogfish Centroscymnus crepidater				
Kitefin shark Dalatias licha				
Birdbeak dogfish Deania calcea				
Deep Water Red Crab Chaecon (Geryon) affinis				BYC Gill Angler

Continued..

Table 6.5.1 Continued

Species/Area	VI	VII	VIII	IX	X	XIV
Smoothhead Alepocephalus bairdii	DIS LL BLing Tusk Dir TRL	DIS LL BLing Tusk Dir TRL			BYC DIS LL D WS	DIS LL Ling Tusk
Black scabbard Aphanopus carbo	Dir LLTRL DIS LL Ling Tusk	DWS Dir TRL DIS LL Ling Tusk	DWS	Dir LL		DIS LL Ling Tusk
Argentine Argentina silus	DIS LL Ling Tusk					
Golden eye perch Beryx splendens					Dir Pelagic TRL Dir LL	
Rabbitfish Chimaera monstrosa	DIS LL BLing Tusk	DIS LL Ling Tusk			BYC DIS LL DWS	DIS LL Ling Tusk
Roundnose grenadier Coryphaenoides rupestris	Dir LL Dir TRL	DWS Dir TRL	DWS			
Cardinalfish Epigonus telescopus	DIS LL BLing Tusk					
Bluemouth Helicolenus dactylopterus	Dir LL	DIS LL Ling Tusk DWS	DWS	BYC Crust. Artis	Dir LL	DIS LL Ling Tusk
Orange roughy Hoplostethus atlanticus		Dir TRL	Dir TRL			
Roughhead grenadier Macrourus berglax	Dir LL BYC LL Ling Tusk	BYC LL Ling Tusk				BYC LL Ling Tusk BYC GHal
Mora Mora mora	BYC LL Ling Tusk Dir TRL	BYC LL Ling Tusk Dir TRL, DWS	Dir LL DWS			BYC LL Ling Tusk

Continued..

Table 6.5.1 Continued

Species /Area	VI	VII	VIII	IX	X	XIV
Red seabream Pagellius bogaroveo					Dir LL	
Greater forkbeard Phycis blennoides	BYC DIS LL BLing Tusk BYC LL Ling Tusk Dir TRL	DWS Dir TRL BYC Prawn BYC LL Ling Tusk	DWS Dir LL	BYC Crust BYC Artis	BYC DIS LL DWS	BYC LL Ling Tusk
Silver scabbard Lepidopus caudatus					BYC DIS LL DWS	
Gulper Centrophorus granulosus		Dir LL	Dir LL	BYC LL Black Scabbard		
Black Dog Fish Centroscillium fabricii						
Portuguese shark Centroscymnus coelolepis	Dir TRL	Dir TRL				
Longnose velvet dogfish Centroscymnus crepidater	Dir TRL	Dir TRL				
Kitefin shark Dalatias licha				BYC Crust Artis	Dir Gill HL	
Birdbeak dogfish Deania calcea	Dir TRL	Dir TRL				
Deep Water Red Crab Chaecon (Geryon) affinis						

Continued..

Table 6.5.2 Reported landings (tonnes) of deep-water species by ICES Sub-areas and Divisions, 1988-1993.

I+II	Species	1988	1989	1990	1991	1992	1993
	ALFONSINOS (Beryx spp.)						
	ARGENTINES (Argentina silus)	11351	8390	9123	7668	8234	5716
	BLACK SCABBARDFISH (Aphanopus carbo)						
	GREATER FORKBEARD (Phycis blennoides)	0	0	23	39	33	1
	MORIDAE						
	ORANGE ROUGHY (Hoplostethus atlanticus)						
	ROUGHHEAD GRENADIER (Macrourus berglax)	0	0	589	829	424	136
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	0	22	42	54	41	2
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)						
	SHARKS, VARIOUS	37	15	0	0	0	0
	SILVER SCABBARDFISH (Lepidopus caudatus)						
	WRECKFISH (Polyprion americanus)						

III+IV	Species	1988	1989	1990	1991	1992	1993
	ALFONSINOS (Beryx spp.)						
	ARGENTINES (Argentina silus)	2718	3786	2322	2554	4434	567
	BLACK SCABBARDFISH (Aphanopus carbo)	0	2	67	103	210	202
	GREATER FORKBEARD (Phycis blennoides)	15	12	115	181	145	28
	MORIDAE						
	ORANGE ROUGHY (Hoplostethus atlanticus)	0	0	0	10	32	0
	ROUGHHEAD GRENADIER (Macrourus berglax)	0	0	0	0	7	0
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	618	1047	1432	2049	4246	59
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)						
	SHARKS, VARIOUS	5	16	11	17	0	4
	SILVER SCABBARDFISH (Lepidopus caudatus)	0	0	0	0	27	0
	WRECKFISH (Polyprion americanus)						

Va	Species	1988	1989	1990	1991	1992	1993
	ALFONSINOS (Beryx spp.)						
	ARGENTINES (Argentina silus)	206	8	112	247	657	1255
	BLACK SCABBARDFISH (Aphanopus carbo)						
	GREATER FORKBEARD (Phycis blennoides)						
	MORIDAE						
	ORANGE ROUGHY (Hoplostethus atlanticus)	0	0	0	65	382	717
	ROUGHHEAD GRENADIER (Macrourus berglax)						
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	2	4	3	48	206	276
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)						
	SHARKS, VARIOUS	0	0	0	0	2	0
	SILVER SCABBARDFISH (Lepidopus caudatus)						
	WRECKFISH (Polyprion americanus)						

Vb	Species	1988	1989	1990	1991	1992	1993
	ALFONSINOS (Beryx spp.)	0	0	4	34	0	0
	ARGENTINES (Argentina silus)	278	227	92	60	1443	1062
	BLACK SCABBARDFISH (Aphanopus carbo)	0	0	861	323	140	224
	GREATER FORKBEARD (Phycis blennoides)	2	1	38	52	49	22
	MORIDAE	0	0	0	5	0	0
	ORANGE ROUGHY (Hoplostethus atlanticus)	0	0	0	0	4	36
	ROUGHHEAD GRENADIER (Macrourus berglax)						
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	1	77	2225	2128	3548	1440
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)						
	SHARKS, VARIOUS	0	0	0	3	36	378
	SILVER SCABBARDFISH (Lepidopus caudatus)						
	WRECKFISH (Polyprion americanus)						

Continued

Table 6.5.2 Continued.

VI+VII	Species	1988	1989	1990	1991	1992	1993
	ALFONSINOS (Beryx spp.)	0	12	8	0	3	0
	ARGENTINES (Argentina silus)	10438	25523	7294	5197	5906	0
	BLACK SCABBARDFISH (Aphanopus carbo)	0	154	996	2149	3300	1051
	GREATER FORKBEARD (Phycis blennoides)	799	369	549	621	903	53
	MORIDAE	0	0	0	1	25	0
	ORANGE ROUGHY (Hoplostethus atlanticus)	2	8	19	4952	4121	2100
	ROUGHHEAD GRENADIER (Macrourus berglax)						
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	32	2734	7532	10172	10230	264
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)	330	130	78	101	22	0
	SHARKS, VARIOUS	182	64	424	1505	2730	124
	SILVER SCABBARDFISH (Lepidopus caudatus)	0	0	0	0	703	2
	WRECKFISH (Polyprion americanus)	7	0	2	10	15	0

VIII+IX	Species	1988	1989	1990	1991	1992	1993
	ALFONSINOS (Beryx spp.)	0	0	1	0	1	0
	ARGENTINES (Argentina silus)						
	BLACK SCABBARDFISH (Aphanopus carbo)	2602	3473	3274	3979	4407	4513
	GREATER FORKBEARD (Phycis blennoides)	57	7	16	22	17	8
	MORIDAE						
	ORANGE ROUGHY (Hoplostethus atlanticus)						
	ROUGHHEAD GRENADIER (Macrourus berglax)						
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	0	0	4	0	11	0
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)	1369	298	226	183	167	0
	SHARKS, VARIOUS	3545	0	1318	1433	1556	1517
	SILVER SCABBARDFISH (Lepidopus caudatus)	2666	1385	584	808	2211	0
	WRECKFISH (Polyprion americanus)	198	284	163	194	269	0

X	Species	1988	1989	1990	1991	1992	1993
	ALFONSINOS (Beryx spp.)	122	113	137	203	247	511
	ARGENTINES (Argentina silus)						
	BLACK SCABBARDFISH (Aphanopus carbo)	0	0	0	166	0	0
	GREATER FORKBEARD (Phycis blennoides)	423	476	530	487	442	327
	MORIDAE	0	0	50	0	0	
	ORANGE ROUGHY (Hoplostethus atlanticus)	0	0	0	0	0	7
	ROUGHHEAD GRENADIER (Macrourus berglax)						
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)						
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)	637	924	889	874	1110	829
	SHARKS, VARIOUS	549	560	602	896	761	592
	SILVER SCABBARDFISH (Lepidopus caudatus)	70	91	120	166	2160	264
	WRECKFISH (Polyprion americanus)	191	235	224	170	237	311

XII	Species	1988	1989	1990	1991	1992	1993
	ALFONSINOS (Beryx spp.)						
	ARGENTINES (Argentina silus)						
	BLACK SCABBARDFISH (Aphanopus carbo)	0	0	0	0	6	0
	GREATER FORKBEARD (Phycis blennoides)						
	MORIDAE						
	ORANGE ROUGHY (Hoplostethus atlanticus)						
	ROUGHHEAD GRENADIER (Macrourus berglax)						
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	1060	9495	2838	4310	1992	39
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)						
	SHARKS, VARIOUS						
	SILVER SCABBARDFISH (Lepidopus caudatus)	0	102	20	0	0	0
	WRECKFISH (Polyprion americanus)						

Continued

Table 6.5.2 Continued

XIV	Species	1988	1989	1990	1991	1992	1993
	ALFONSINOS (Beryx spp.)						
	ARGENTINES (Argentina silus)	0	0	6	0	0	0
	BLACK SCABBARDFISH (Aphanopus carbo)						
	GREATER FORKBEARD (Phycis blennoides)						
	MORIDAE						
	ORANGE ROUGHY (Hoplostethus atlanticus)						
	ROUGHHEAD GRENADIER (Macrourus berglax)	0	0	0	0	0	34
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	52	45	47	29	31	4
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)						
	SHARKS, VARIOUS						
	SILVER SCABBARDFISH (Lepidopus caudatus)						
	WRECKFISH (Polyprion americanus)						

Continued

Table 6.5.3 Reported landings (tonnes) of deep-water fish by species, 1988-1993.

ALFONSINOS (*Beryx spp.*)

Area	1988	1989	1990	1991	1992	1993
I+II						
III+IV						
Va						
Vb	0	0	4	34	0	0
VI+VII	0	12	8	0	3	0
VIII+IX	0	0	1	0	1	0
X	122	113	137	203	247	511
XI						
XII						
XIV						
TOTAL	122	125	150	237	251	511

ARGENTINES (*Argentina silus*)

Area	1988	1989	1990	1991	1992	1993
I+II	11351	8390	9123	7668	8234	5716
III+IV	2718	3786	2322	2554	4434	567
Va	206	8	112	247	657	1255
Vb	278	227	92	60	1443	1062
VI+VII	10438	25523	7294	5197	5906	0
VIII+IX						
X						
XI						
XII						
XIV	0	0	6	0	0	0
TOTAL	24991	37934	18949	15726	20674	8600

BLACK SCABBARDFISH (*Aphanopus carbo*)

Area	1988	1989	1990	1991	1992	1993
I+II						
III+IV	0	2	67	103	210	202
Va						
Vb	0	0	861	323	140	224
VI+VII	0	154	996	2149	3300	1051
VIII+IX	2602	3473	3274	3979	4407	4513
X	0	0	0	166	0	0
XI						
XII	0	0	0	0	6	0
XIV						
TOTAL	2602	3629	5198	6720	8063	5990

GREATER FORKBEARD (*Phycis blennoides*)

Area	1988	1989	1990	1991	1992	1993
I+II	0	0	23	39	33	1
III+IV	15	12	115	181	145	28
Va						
Vb	2	1	38	52	49	22
VI+VII	799	369	549	621	903	53
VIII+IX	57	7	16	22	17	8
X	423	476	530	487	442	327
XI						
XII						
XIV						
TOTAL	1296	865	1271	1402	1589	439

MORIDAE

Area	1988	1989	1990	1991	1992	1993
I+II						
III+IV						
Va						
Vb	0	0	0	5	0	0
VI+VII	0	0	0	1	25	0
VIII+IX						
X	0	0	50	0	0	0
XI						
XII						
XIV						
TOTAL	0	0	50	6	25	0

ORANGE ROUGHY (*Hoplostethus atlanticus*)

Area	1988	1989	1990	1991	1992	1993
I+II						
III+IV	0	0	0	10	32	0
Va	0	0	0	65	382	717
Vb	0	0	0	0	4	36
VI+VII	2	8	19	4952	4121	2100
VIII+IX						
X	0	0	0	0	0	7
XI						
XII						
XIV						
TOTAL	2	8	19	5027	4539	2860

Continued

ROUGHHEAD GRENADIER (*Macrourus berglax*)

Area	1988	1989	1990	1991	1992	1993
I+II	0	0	589	829	424	136
III+IV	0	0	0	0	7	0
Va						
Vb						
VI+VII						
VIII+IX						
X						
XI						
XII						
XIV						34
TOTAL	0	0	589	829	431	170

ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*)

Area	1988	1989	1990	1991	1992	1993
I+II	0	22	42	54	41	2
III+IV	618	1047	1432	2049	4246	59
Va	2	4	3	48	206	276
Vb	1	77	2225	2128	3548	1440
VI+VII	32	2734	7532	10172	10230	264
VIII+IX	0	0	4	0	11	0
X						
XI						
XII	1060	9495	2838	4310	1992	39
XIV	52	45	47	29	31	4
TOTAL	1765	13424	14123	18790	20305	2084

RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*)

Area	1988	1989	1990	1991	1992	1993
I+II						
III+IV						
Va						
Vb						
VI+VII	330	130	78	101	22	0
VIII+IX	1369	298	226	183	167	0
X	637	924	889	874	1110	829
XI						
XII						
XIV						
TOTAL	2336	1352	1193	1158	1299	829

SHARKS, VARIOUS

Area	1988	1989	1990	1991	1992	1993
I+II	37	15	0	0	0	0
III+IV	5	16	11	17	0	4
Va	0	0	0	0	2	0
Vb	0	0	0	3	36	378
VI+VII	182	64	424	1505	2730	124
VIII+IX	3545	0	1318	1433	1556	1517
X	549	560	602	896	761	592
XI						
XII						
XIV						
TOTAL	4318	655	2355	3854	5085	2615

SILVER SCABBARDFISH (*Lepidopus caudatus*)

Area	1988	1989	1990	1991	1992	1993
I+II						
III+IV	0	0	0	0	27	0
Va						
Vb						
VI+VII	0	0	0	0	703	2
VIII+IX	2666	1385	584	808	2211	0
X	70	91	120	166	2160	264
XI						
XII	0	102	20	0	0	0
XIV						
TOTAL	2736	1578	724	974	5101	266

WRECKFISH (*Polyprion americanus*)

Area	1988	1989	1990	1991	1992	1993
I+II						
III+IV						
Va						
Vb						
VI+VII	7	0	2	10	15	0
VIII+IX	198	284	163	194	269	0
X	191	235	224	170	237	311
XI						
XII						
XIV						
TOTAL	396	519	389	374	521	311

Table 6.5.4 Summary of status of biological information available on each species of deep-water fish. 1+ data available, 1 basic comments available, - no comments available.

Deep water species list

Species	Geog Dist	Depth Dist	Abund-ance	Length Freq	Length/ Weight	Age Growth	Feeding	Repro-duction	Biomass	Catch-ability	Stock ID
Alepocephalus bairdii	1+	1+	1	1+	1+	0	1+	1+	0	0	0
Aphanopus carbo	1+	1+	1	1+	1+	0	1+	1+	0	1	0
Argentina silus	1+	1+	0	1+	1+	1+	1+	1+	1+	1	0
Beryx splendens	1	1+	0	1+	1+	1+	1+	1+	0	1+	0
Chimaera monstrosa	1+	1+	0	1	0	0	1+	1+	0	0	0
Coryphaenoides rupestris	1+	1+	0	1+	1+	1+	1+	1+	0	0	1
Epigonus telescopus	1+	1+	0	1+	1+	0	1	1	0	0	0
Helicolenus dactylopterus	1+	1	0	1	0	0	1	1	0	0	0
Hoplostethus atlanticus	1+	1+	0	1+	1+	1+	1+	1+	0	1	1
Hoplostethus mediterraneus	1+	1	0	1+	1+	0	1+	1	0	0	0
Macrourus berglax	1+	1+	1+	:	1+	1	1+	1+	0	1	0
Mora mora	1+	1+	0	1+	1+	0	1	1	0	1	0
Pagellius bogaroveo	1	1	0	1	1+	1+	0	1+	0	0	0
Phycis blennoides	1+	1+	1	1+	1+	1+	1+	0	0	1	0
Trachyrhynchus trachyrhynchus	1	1	0	1	0	0	0	0	0	0	0
Deep Water Sharks											
Centrophorus squamosus	1+	1+	1	1+	0	1	1	1	0	0	0
Centroscillium fabricii	1+	1+	1+	1+	1+	0	1	1	0	0	0
Centroscymnus coelolepis	1+	1+	0	1+	1+	0	1	1	0	1+	0
Centroscymnus crepidater	1+	1+	1	1+	1+	0	1	1	0	0	0
Dalatias licha	1+	1	0	1+	1+	1+	1	1+	0	0	0
Deania calcea	1+	1+	0	1+	1+	0	1+	1	0	0	0
Etmopterus princeps	1+	1+	0	1+	1+	0	1	1	0	0	0
Etmopterus spinax	1+	1+	0	1+	1+	0	1+	1	0	0	0
Scymnodon ringens	1	1+	0	1	1+	0	1	0	0	0	0
Crustacea											
Chaecon (Geryon) affinis	1+	1	0	1	0	0	0	1	0	0	0

Figure 5.2.1 Bay of Biscay Anchovy Historical evolution of the fishery. Landings since 1940.

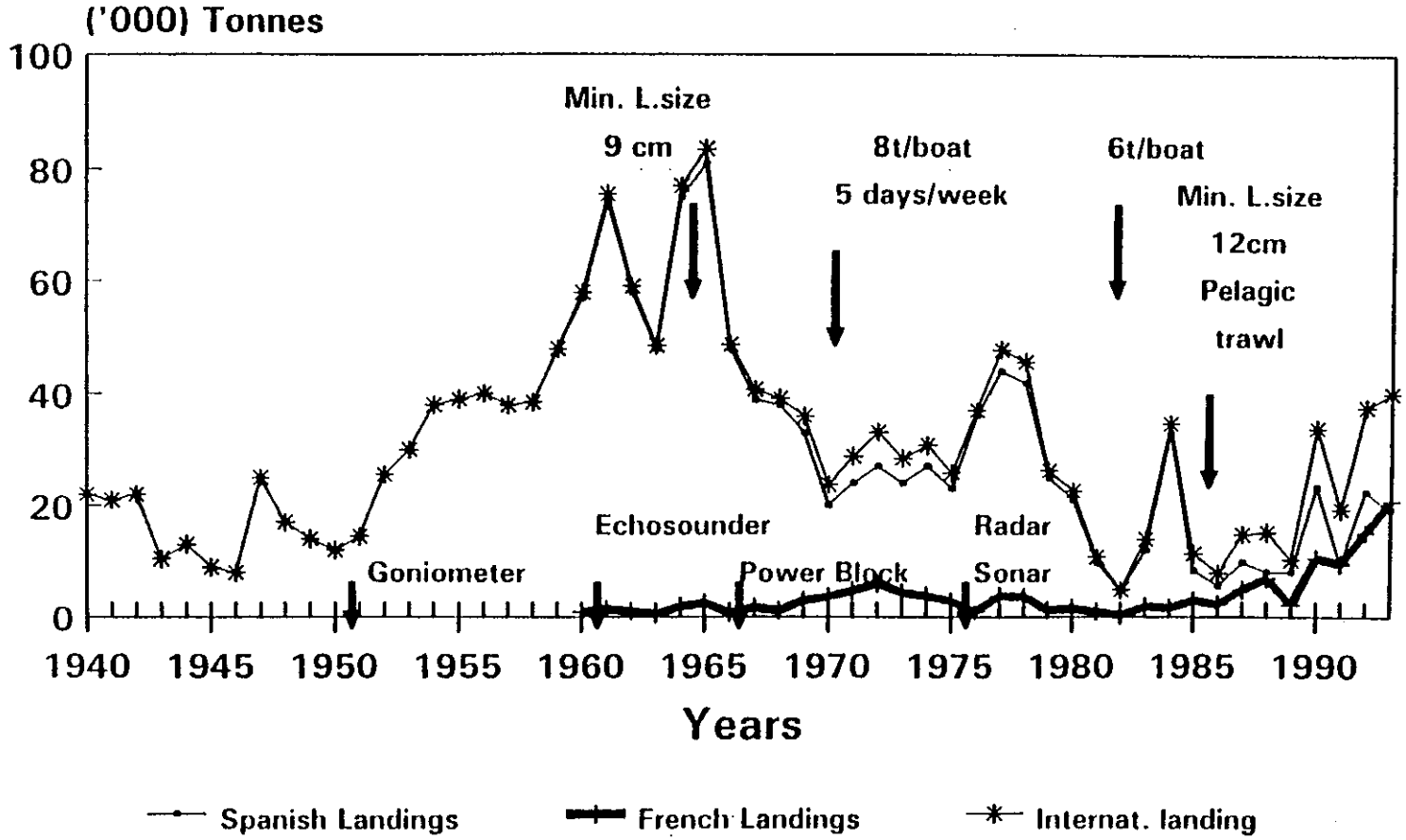


Figure 6.1.1 *Nephrops* Functional Units and Management Areas.

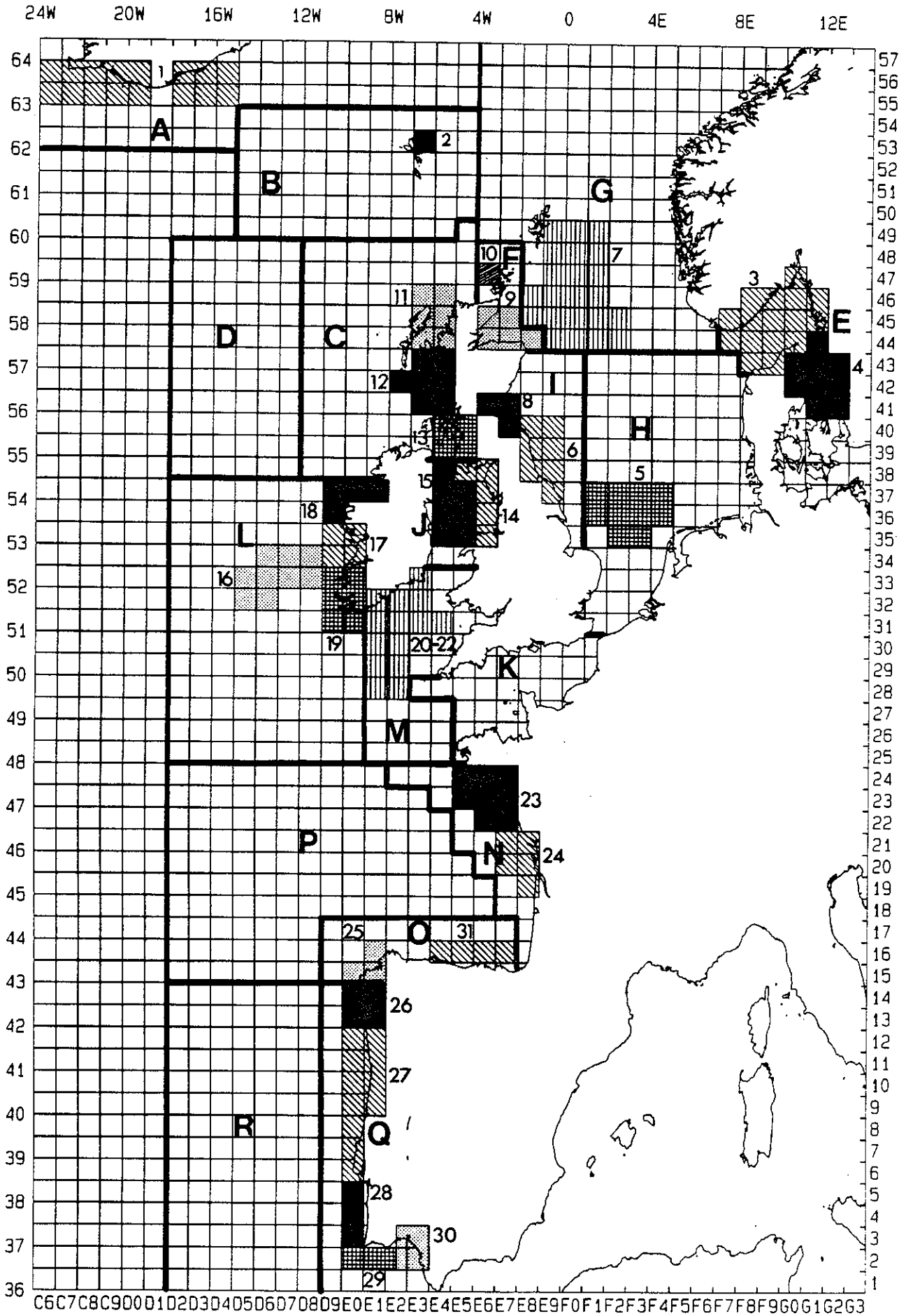


Figure 6.2.1 Mackerel, Western Stock. Medium term projections. Solid lines show 5,25,50,75 and 95 percentiles. The thickness of the line indicates the probability level. The thicker the line the more likely the outcome.

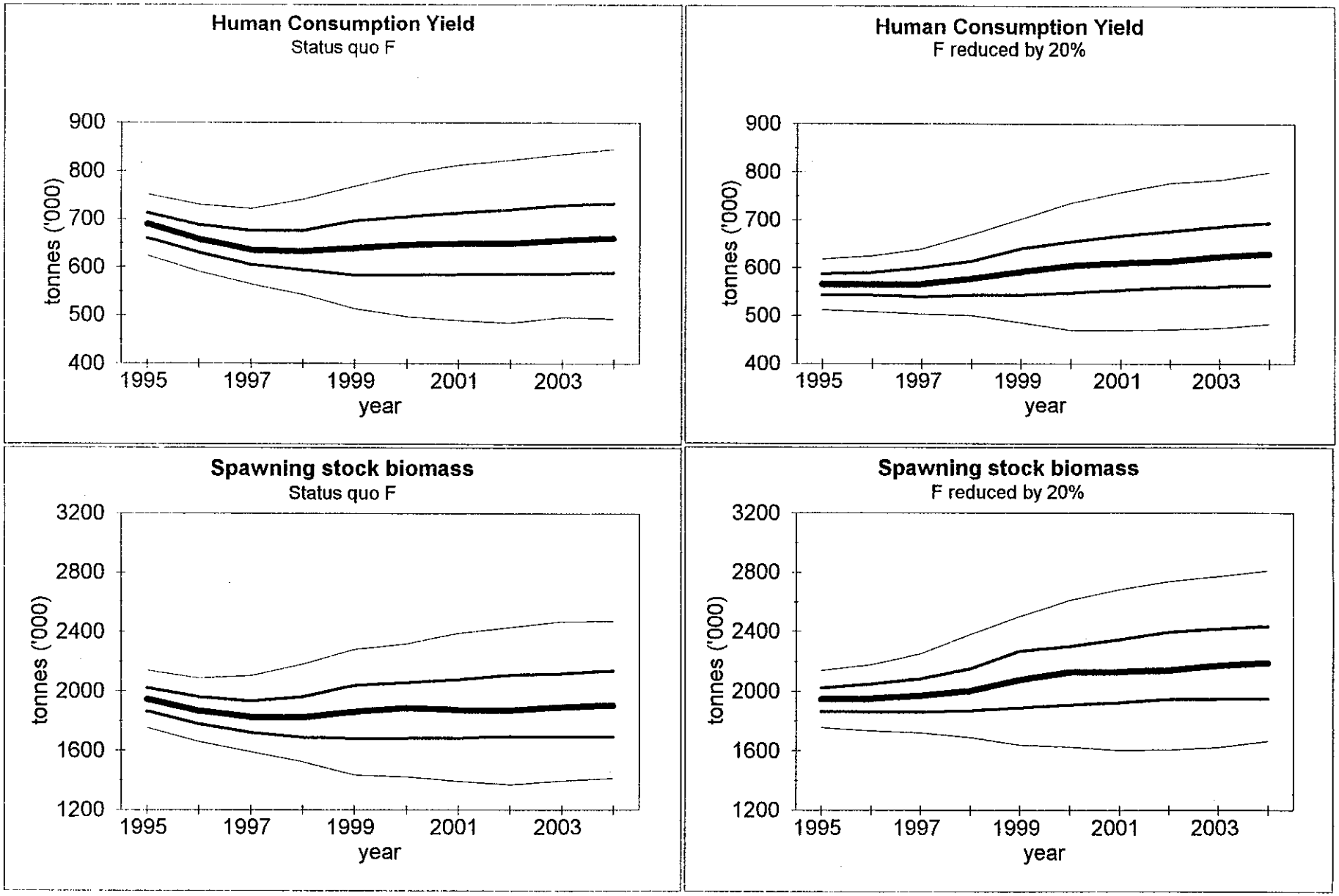


Figure 6.3.1 The predicted decrease in SSB of western horsemackerel for different catch levels per year from 1995 and onwards

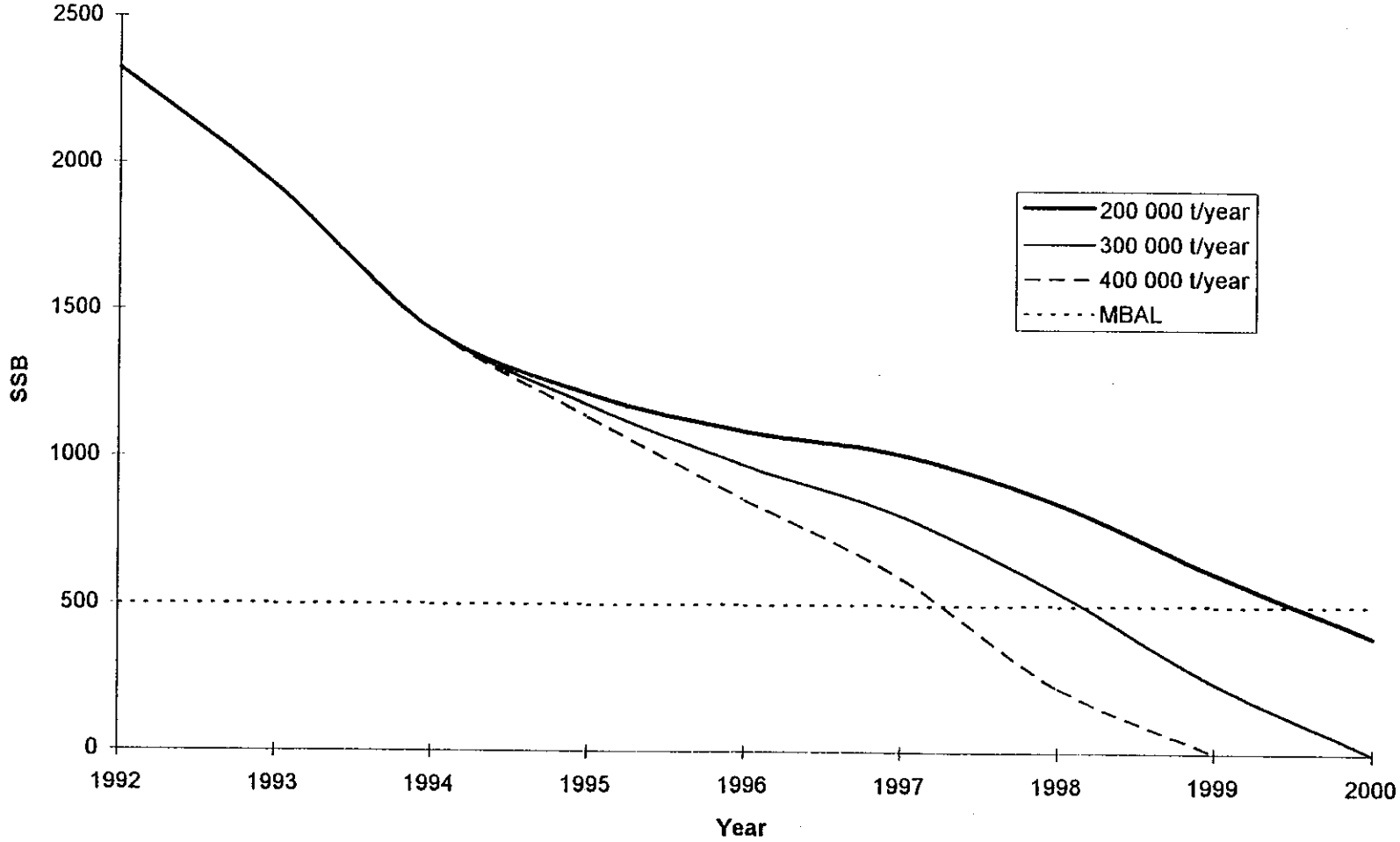


Table 6.4.1 Blue Whiting adult distribution.

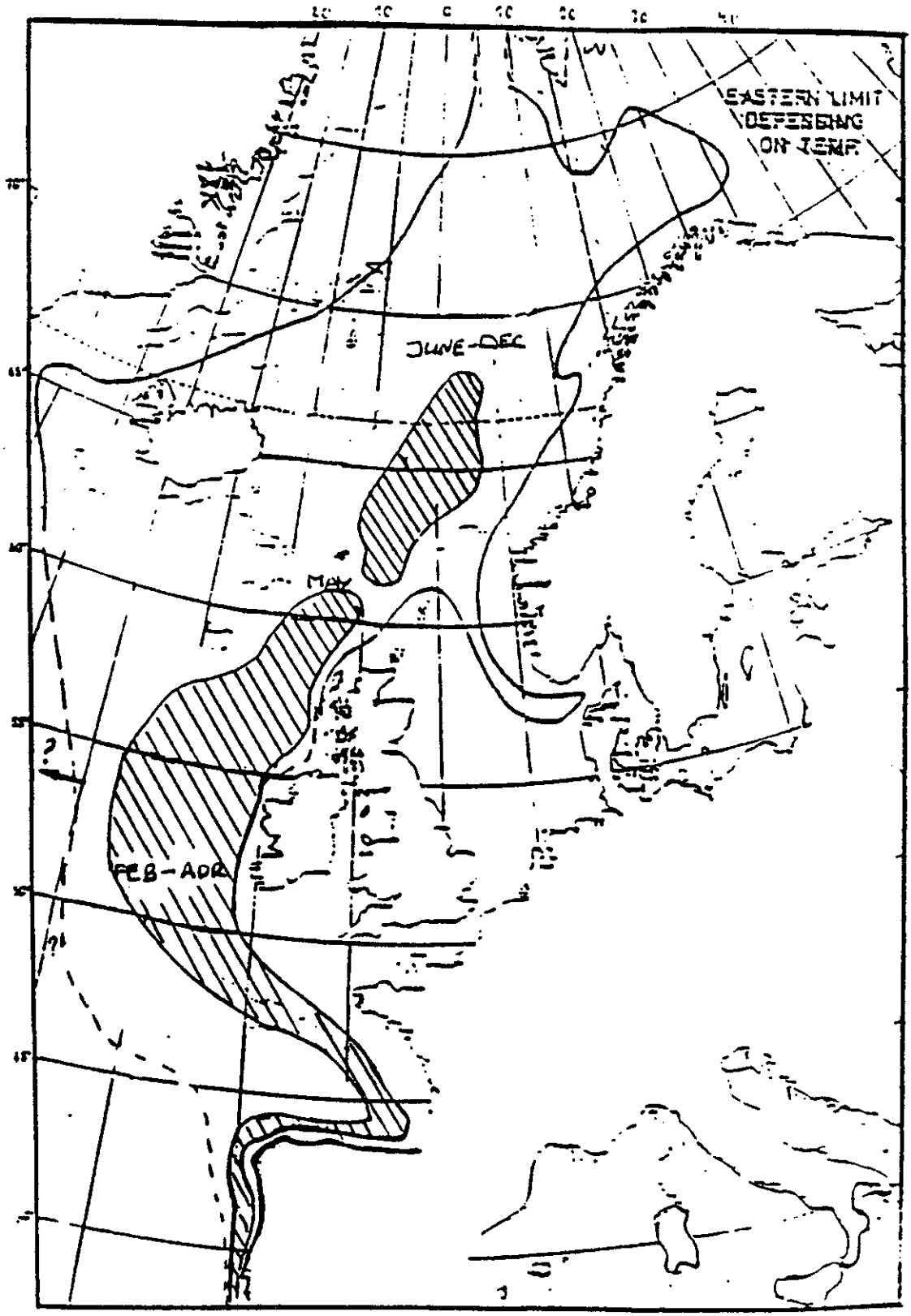
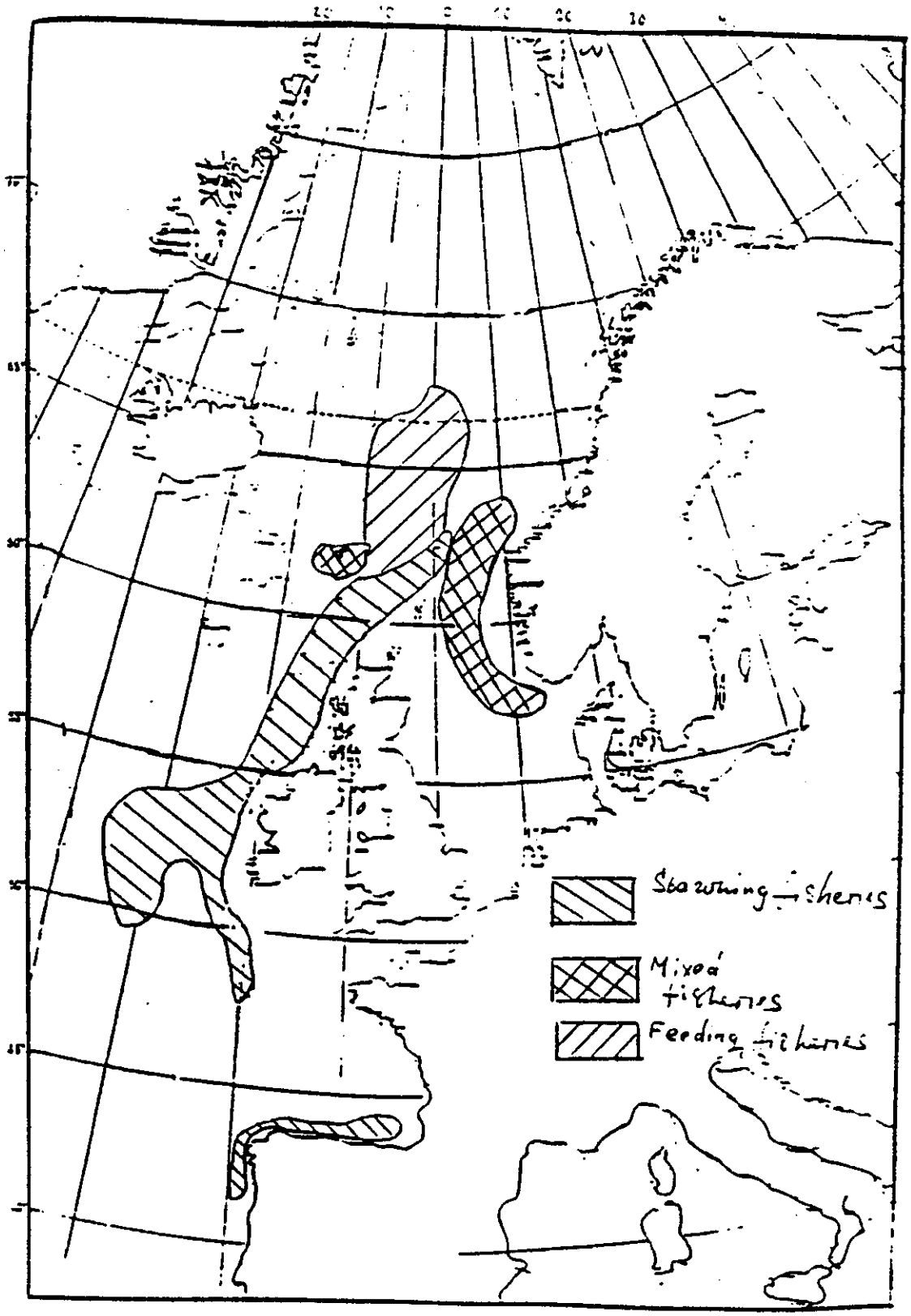


Table 6.4.2 Fishing areas for the various fisheries on the blue whiting stock.



REPORT TO THE EUROPEAN COMMISSION

Evaluation of the North Sea Plaice Box

Following a request from the European Commission ACFM initiated a Study Group on the North Sea Plaice Box, which met at the Danish Institute for Fisheries and Marine Research from 11-15 April 1994 to

a) investigate appropriate modifications to the plaice box;
b) quantify the expected short- and long-term effects of such modifications on both yield and biomass for plaice and all other relevant species;
c) identify possible additional regulations associated with the "plaice box".

There were no new data available which suggest that modification of the area would be appropriate and only modifications in the period during which the closure of the box is enforced were considered.

It has not been possible to quantify the short-term effects, because the regulations affect the relative size of the different fleets in the area and the developments in these fleets are unpredictable.

The analyses were restricted to plaice and sole. The only other relevant species which may be significantly affected by the plaice box is cod, but this species has recently been subjected to extensive analyses by the North Sea Cod Task Force and therefore no new analyses were carried out for this species.

The evaluation included a detailed description of the development in the fleets operating in the area, an analysis of available data which might signify any changes in survival, and a simulation study to assess the effects of a limited number of scenarios.

Background

In 1987, ACFM provided advice on measures to improve the exploitation pattern of North Sea plaice, based on historical information on the distribution of juvenile plaice from research vessel surveys and commercial catch-per-unit-of-effort data, and on fishing effort. A simulation study of the effect of closing an area off the coast of Denmark, Germany and the Netherlands (Figure1),covering the major distribution area of undersized plaice to all fisheries exploiting flatfish indicated the following predicted gains in recruitment by period of the year:

Period	% gain
Q1	2
Q2	10
Q3	14
Q4	7
Q2 + Q3	25
Total Year	34

Following discussions with the Dutch fishing industry, legislation was introduced in 1989 to establish a "plaice box" (EEC Council Regulation No 4193/88). The area of this box differed slightly from the original one evaluated (Figure 2), but the differences were not expected to affect significantly the conclusions obtained from the simulation study. Whereas the original calculations were based on a box consisting of entire rectangles, the borders in the agreed box were adjusted to take account of more detailed information on the distribution of juvenile plaice derived from research vessel surveys.

The box has been enforced during the second and third quarter from 1989 onwards. The following conditions apply to the box:

Figure 1 Proposed 'plaice box' in 1987

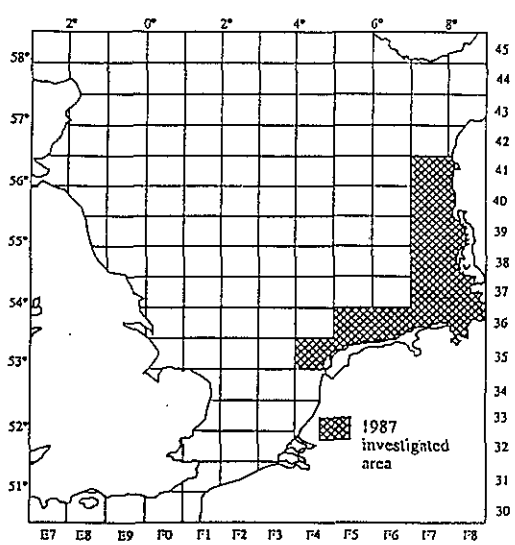
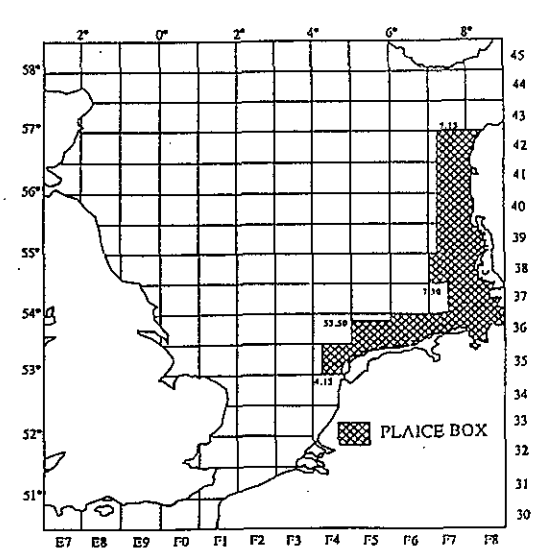


Figure 2 Agreed 'plaice box' in 1989



1. Fishing is not allowed within 12 miles of the coast by vessels exceeding 8 m overall employing beam and otter trawls (EEC Council Regulation 3094/86);
2. Fishing is not allowed inside the box by trawlers (beam and other) exceeding 300 HP (221 kW) during the period 1 April - 30 September.
3. Fishing by other vessels is permitted provided that they are

a) on an authorized list, do not exceed 300 HP, and do not employ beam trawls with a beam length exceeding 8m;
b) not on the list but fishing for shrimp;
c) not on the list, but employing otter trawls with a mesh size of 100 mm in the cod-end (even if exceeding 300 HP), provided that catches of plaice and sole in excess of 5% by weight of the total catch on board are discarded immediately.

The practical effect of the derogations is that fishing for plaice inside the box by exemption fleets has continued.

In 1994, the period of closure for large beam trawlers has been extended to include also the 4th quarter.

Development in fishing effort.

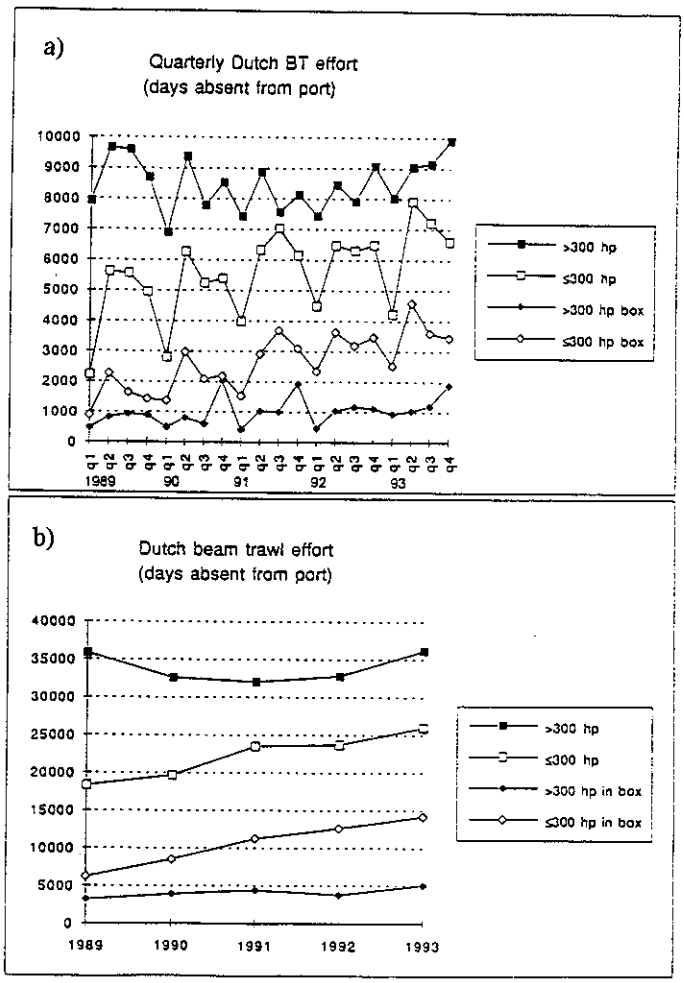
Table 1 lists the main fleets fishing for plaice and sole in the North Sea in 1991 according to the STCF database. The plaice and sole landings are dominated by the >300HP beam trawl fleets from the Netherlands, England and Belgium, which together took 63% and 65%, respectively, of the landings. Danish gill-netters have increased substantially in recent years and were responsible for approximately 27% of the Danish landings in 1991.

The implementation of the plaice box has affected the way in which the different fleets fishing traditionally in the area of the plaice box have adapted their fishing effort and location of fishing. The large beam trawlers were forced to move out, which may have increased the opportunities for fishing for smaller vessels belonging to the exemption fleets. Also, interference between active and passive gears can be expected to have been reduced. Thus, short-term losses to the larger beam trawlers may have partly contributed to increased catches by other fleets. In order to assess these changes, detailed information is required on the redistribution in fleet effort and this information is not yet available for all fleets.

In 1993, a sample of 25 Dutch beam trawlers was equipped with data loggers linked to the navigation system on board, which register the fishing position automatically every 6 minutes. The results indicate that the large beam trawlers are concentrated along the borders of the box during the time when the box is closed, suggesting that the box is respected by the fleet. Also, this suggests that opportunities for fishing are enhanced by the temporal protection of the stock inside the box.

Figure 3 shows the development in the Dutch beam trawl effort in the box as well as the total effort by quarter (a) and by year (b) for the two size categories separately.

Figure 3. Development in the Dutch beam trawl effort inside the plaice box and for the total fleet.
a) by quarter
b) by year



These data are based on log book information by statistical rectangle. As a consequence, the information on the effort inside the box is slightly biased, because effort recorded in rectangles which are cut in two parts by the borders of the box cannot be properly assigned. In view of the concentration along the borders of the box discussed above, it is likely that the baseline effort of large beam trawlers assigned to the box during quarter 2 and 3 should actually be removed. However, the data clearly indicate that the effort of the exemption fleet of smaller beam trawlers in the box has more than doubled over the period of five years. The increase in the box matches the increase in the total effort of this fleet, indicating that effort has remained constant outside the box.

The data also indicate marked increases in the effort of large beam trawlers within the box during the 4th quarter

in most years, which suggest that part of the protection offered during the preceding months is nullified.

Dutch vessels fishing for shrimps have increased their effort within the box.

Data from the large English beam trawlers indicate a sharp increase in effort inside the box in the 4th quarter since 1991, whereas the smaller beamers showed a clear preference for rectangles within the box.

The Danish gill-net fishery on the west coast of Jutland used to be mainly directed towards sole, but since 1987 there has been a shift towards a combined sole and plaice fishery. There has been a general increase in this fishery, but particularly the plaice fishery has expanded, because the quota could not be filled. Smaller vessels concentrated in the box but most of the effort of larger vessels was exerted outside the box.

Danish seiners exhibit an overall decrease in effort since 1989, both inside and outside the box, but the relative distribution has not changed.

Indications of improved survival

As a consequence of the large variation in recruitment, it is not possible to investigate the effect of the plaice box directly on the basis of the estimated recruitment. It would be more appropriate to look for evidence of improved survival in the estimates of fishing mortality from virtual population analysis or for trends in catchability. However, the analyses carried out failed to show unequivocally that patterns had changed since 1989.

Nevertheless, survey data indicate that the relative abundance of plaice in the area of the box compared to the abundance outside the area has increased since 1989, when the box was implemented. This is true for the fish less than 3 years old, but much more pronounced for older fish, at least for the period 1985-1987.

Altogether, the available data do not provide ultimate proof that survival has improved.

Simulation study

The simulation model used was the same as that used during the study in 1987 when the effects of a closed area were first evaluated. The model simulates the equilibrium situation with fixed distribution patterns of the fish and the fishing effort and uses a time step of one quarter and a spatial resolution of one statistical rectangle. The data entering the model are:

1. The %-distribution by age group and statistical rectangle during the third quarter, based on commercial catch-per-unit-of-effort data for the fish older than 3 years (reference period: 1970-1986 for plaice; 1974-1977 for sole) and survey data for the younger ones (1970-89 for both species);

2. The standardized effort for 1991 by statistical rectangle for three different fleet categories (fleets excluded from the plaice box; fleets exempted from the regulations making no discards; fleets exempted from the regulations making discards) based on the STCF database.

In order to obtain the standardized effort, a general linear model was fitted to the catch rates of all fleets, so that the effort could be expressed in terms of Dutch beam trawlers > 300 HP. In order to express effort in terms of fishing mortality, a catchability coefficient was estimated, so that the fishing mortality for the 4 youngest age groups estimated from the model corresponded to the value estimated by virtual population analysis.

The procedure followed includes the estimation of survivors from a cohort which are redistributed each quarter according to the age-specific distribution pattern. The numbers caught in each rectangle by the fishery are calculated and separated into discards and marketable fish.

The evaluation of the existing plaice box is hampered by the fact that the borders do not follow the statistical rectangles, because all data are available only at this level of disaggregation. In order to do the simulations, effort data pertaining to rectangles which were split by the borders of the plaice box were allocated to the adjacent rectangle to the west, immediately outside the box.

Four scenarios were evaluated against the baseline assuming the present situation of a closed area for large trawlers with a mesh size of 80mm during the second and third quarter:

a) No plaice box. In this case, fishing effort from rectangles crossing the border of the box was not shifted to the west. It was assumed that effort from neighbouring rectangles was not redistributed over the box area, because a reliable prediction of such a redistribution is impossible.
b) Plaice box closed during the entire year, with continued fishing of all exemption fleets as presently defined.
c) As for (b) but with continued fishing of the non-discarding fleet only.
d) Plaice box closed during quarters 2, 3 and 4, with continued fishing of the exemption fleets as presently defined.

The results are shown in the following text table as percentage change from the baseline:

	PLAICE		SOLE	
Scenario	Yield	SSB	Yield	SSB
(a)	-8	-9	-3	-2
(b)	14	17	3	7
(c)	24	29	5	11
(d)	11	14	2	7

The estimated 8% decrease in yield of plaice if the box is opened again is much lower than the 25% increase estimated in 1987 by the closure. This discrepancy is largely due to the fact that under the current management regulations an exemption is made for a number of fleets. This is illustrated by a comparison of the estimated gain in yield when the plaice box is closed for the entire year (c) with the situation without a box (a). The present estimate of a 32% difference between these two options is very similar to the increase of 34% estimated in 1987 (cf Background Section above; Anon., 1987).

In addition, heavy fishing in the fourth quarter appears to have reduced the protection provided during quarters 2 and 3. This effect is illustrated by comparing the 14% predicted for option (b) with the 10% gain estimated in 1987.

Since the predicted effect of the plaice box under the present regime is less than 10%, it is not surprising that there are no clear signs of improved survival in either the assessment or the survey data, because such small differences will be masked by the variations inherent in the data.

The effect of the present plaice box compared to the situation without a plaice box (a) indicates a marginal gain in yield of 3% for sole. Further extensions in time and exclusion of the discard fleets suggests that a further 5% gain is possible. The total of 8% compared to (a) is close to the 11% estimated previously (Rijnsdorp & van Beek, 1991). However, the effect may have been considerably underestimated, if the effective mesh size in use is lower than 80 mm due to the widespread use of blinders and if sole escaping through meshes of towed gears suffer a significant mortality. In this case there is an additional positive effect of a reduction in escapement mortality as a direct result of closing the fishery.

In recent years there has been a decrease in the growth of plaice and to a lesser extent in that of sole. This decrease is possibly partly due to density-dependent effects. If so, the gains may be smaller than predicted, because the plaice box leads to higher densities. However, the causes of this phenomenon are still very uncertain and it is not possible to make reliable predictions in this respect.

Management advice

The implementation of the plaice box has not had the effects predicted in 1987 as a consequence of the derogations in the regulations, which have allowed other plaice fisheries to develop or continue at the cost of the large beam trawlers.

There is no basis for changing the borders of the box, although ACFM notes that a proper evaluation of the effects is somewhat hampered by the fact that the borders do not follow statistical rectangles.

A closure of the box during the entire year for all fleets that produce discards would maximize the protection of juvenile flatfish and prevent the development of fisheries which reduce the beneficial effects of the box.

Table 1. List of fleets fishing for flatfish in 1991 from the STCF database used to construct a spatial distribution pattern of standardized effort for three categories: d - fleets making discards; n -fleets with no discards; e - fleets not allowed to fish in the box during quarter 2 and 3.

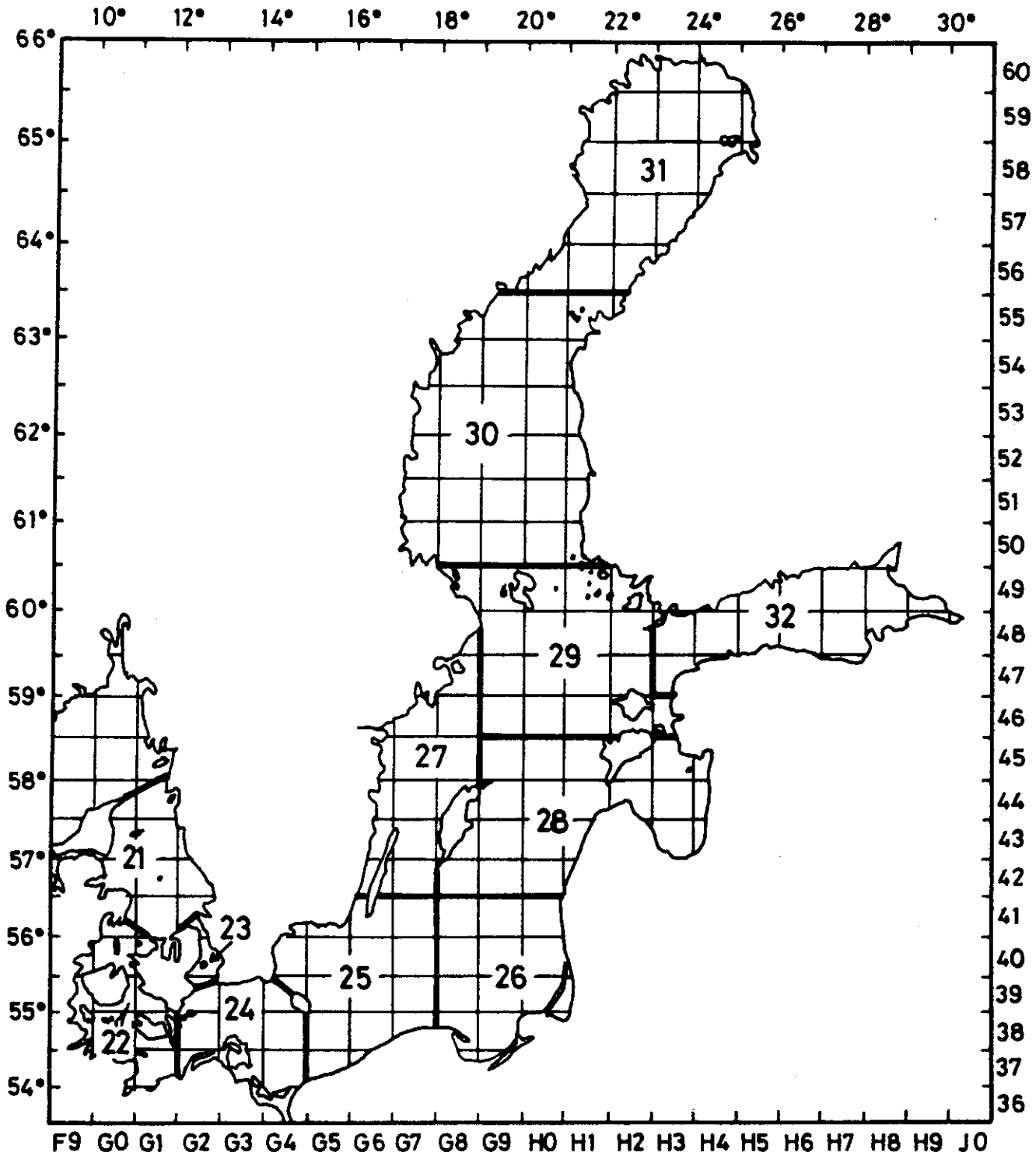
Nation	Fleet	Mesh size (effective)	Effort unit	% of total catch plaice	% of total catch sole	Category
NED	Beam trawl >300 HP	80	days from port	55.1	55.8	de
BEL	Beam trawl >300 HP	80	hrs fishing	8.2	6.7	de
NED	Beam trawl <300 HP	75	days from port	4.4	6.6	d
BEL	Beam trawl <300 HP	70	hrs fishing	-	1.3	d
FRA	Beam trawl <300 HP	90	hours	-	0.5	d
ENG	Beam trawl all	80	nr of hauls	9.2	3.4	de
NED	Otter trawl	85	days from port	-	0.3	d
ENG	Otter trawl	90	nr of hauls	0.9	-	d
BEL	Otter trawl	.	hrs fishing	-	1.0	d
DEN	Trawl 0-50 GRT	100	days absent	2.0	-	d
DEN	Trawl 51-100 GRT	100	days absent	1.2	-	d
DEN	Trawl >100 GRT	100	days absent	1.0	-	d
SCO	Light trawl	90	hrs fishing	1.4	-	d
DEN	Gill-net	-	days absent	2.4	2.0	n
ENG	Seine	90	nr of hauls	1.4	-	d
SCO	Seine	90	hrs fishing	1.0	-	d
DEN	Danish seine	90	days absent	5.0	0	d

References

Anonymous, 1987. Report of the ad hoc Meeting of the North Sea Flatfish Working Group. ICES C.M. 1987/Assess:14

Rijnsdorp, A.D., and F.A.van Beek, 1991. The effects of the plaice box on the reduction in discarding and on the level of recruitment of North Sea sole. ICES C.M. 1991/G:4

Source of information: Report of the Study Group on the North Sea Plaice Box, Charlottenlund, 12-15 April 1994. ICES C.M. 1994/Assess:14.



Baltic Fishing Areas

REPORT TO THE INTERNATIONAL BALTIC SEA FISHERY COMMISSION

1. GENERAL ADVICE TO THE INTERNATIONAL BALTIC SEA FISHERY COMMISSION

1.1 Nominal Catches in the Baltic Area

Officially reported catches in the Baltic are given in Tables 1.1.1-1.1.5. 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 1.1.1-1.1.5 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 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

2.1 Overview

The spring-spawning stock of herring in Sub-divisions 22-24 and Division IIIa mixes with the North Sea herring stocks in the northeastern North Sea and Skagerrak during the feeding period. This stock is probably exploited at a higher level than other stocks in the Baltic area, but problems in separating catches from the considerably larger North Sea stock and uncertain catch statistics makes a reliable assessment impossible.

For other pelagic stocks in the Baltic (herring in Sub-divisions 25-32 including the Gulf of Riga; sprat in Sub-divisions 22-32) the situation is characterized by:

1. Low to medium exploitation

   Certain stocks (herring in Sub-divisions 30 and 31) are exploited at such low levels that fishing mortality is insignificant compared with natural mortality. Other stocks seem to be exploited at low to medium levels (sprat in Sub-divisions 22-32, herring in Sub-divisions 25-29,32). The stocks are increasingly being exploited in mixed industrial fisheries targeting both sprat and herring.

2. Stock sizes above historical average levels

   The small cod stock has resulted in low predation mortalities on the pelagic stocks in the Baltic. This, combined with the low exploitation rates, has resulted in these stocks being at levels above historical averages.

3. Uncertainties and revisions of assessments and forecasts

   The low fishing mortality on herring in Sub-divisions 30 and 31 makes an assessment based on an analysis of catch data unreliable. For other stocks (herring in Sub-divisions 25-29,32 and sprat in Sub-divisions 25-32) the acoustic surveys in recent years have given inconsistent results. The survey in 1991 resulted in high estimates which seemed unreasonable in relation to information from catch data, while the estimates in 1992 and 1993 have been rejected for technical reasons.

The assessments of the sprat and herring stocks in the Main Basin have been revised in the light of new and lower estimates of the predation mortality by cod. These estimates are based on multispecies assessment models which take the lower abundance of predator stocks into consideration. This has led to considerably lower estimates of stock size for especially sprat and herring in the Main Basin than those presented last year.

However, none of these uncertainties/revisions are of such a character or extent to invalidate the general picture of the state of these stocks as stated in points 1 and 2 above.

The general assessment of the state of these stocks is therefore that they are well within safe biological limits and exploited at low to intermediate levels of fishing mortality.

The forecasts that can be made for these stocks have varying degrees of certainty and must in some cases be considered as rough indications only.

Given the stock situation, the character of the fisheries and the uncertainties in the forecasts, ACFM considers it prudent to take a common and precautionary approach to stock management for these stocks while at the same time allowing for a gradual increase in exploitation. It is suggested that this should be implemented by setting for 1995 for each relevant stock a TAC consistent with a 40% increase in fishing mortality and to implement that TAC also in 1996. For herring in Sub-division 31, a doubling of fishing mortality is considered to be within safe biological limits. The stock situation is not expected to change to such an extent in the short term that new management advice or measures are needed.

2.2 Herring

Catches of herring by Sub-division of the Baltic in 1992 and 1993 are given in Table 2.2.1

2.2.1 Herring in Sub-divisions 22-24 and Division IIIa (spring spawners)

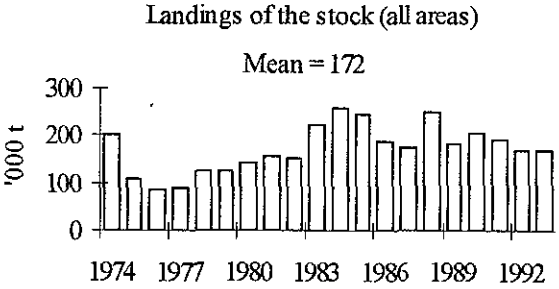
Catch data for Division IIIa and Sub-divisions 22-24 (Table 2.2.2):

Year	Rec. TAC[2]	ACFM catch of stock[1]
1987	-	175
1988	196	251
1989	174	186
1990	131	204
1991	178	192
1992	170	168
1993	150-181	171
1994	130-180	

(Weights in '000 t). [1]Including North Sea.
[2]Spring-spawners in IIIa and 22-24.

Details by fleet, stock, and area are provided in Table 2.2.3.

Historical development of the fishery : After a period of high landings in the early 1980s the landings in 1993 have decreased to the long-term average.



State of Stock: The state of the stock is uncertain as the information available provides conflicting evidence. Indications are, however, that the stock is well inside safe biological limits and that the spawning stock biomass has increased and the fishing mortality decreased since the late 1970s.

Forecast for 1995: Due to the uncertainties in the data sources it is not possible to provide a reliable catch forecast.

Management Advice: If a precautionary TAC is required, ACFM advises that it should not exceed recent catch levels.

Special Comments: In Division IIIa this stock is exploited in fisheries which also exploit the North Sea stock. An increase in this fishery may hamper recovery of the North Sea stock which is considered to be close to the minimum biologically acceptable level (see Section 3.1.2). This should be taken into consideration when a precautionary TAC is to be set for Division IIIa.

Data and Assessment: Catch at age data are uncertain due to undersampling of landings, particularly in Division IIIa, and to problems with stock separation in the historical data. Data from acoustic and bottom trawl surveys do not signal the same development as the catch data. The analytical assessment may indicate major trends but it is considered too unreliable as a basis for forecasts.

Source of Information : Report of the Herring Assessment Working Group for the Area South of 62°N, March 1994. (C.M. 1994/Assess:13).

2.2.2 Herring in Sub-divisions 25-29 (including Gulf of Riga) and 32

Catch data (Table 2.2.4):

Year	Rec TAC	ACFM Catch
1987		252
1988		286
1989		293
1990		244
1991	293	213
1992	343	218
1993		228
1994		

(Weights in '000 t)

Historical development of the fishery: From the beginning of the 1970s to 1985 annual landings fluctuated around 300,000 t. Due to market problems the landings decreased and in the last three years they have been at a level somewhat higher than 200,000 t.

State of stock: The declining trend in stock size from 1974-1989 has halted and the stock has since increased in 1992-1993. A further increase is predicted for 1994.

Fishing mortality has decreased since 1986 and is now at the same level as prior to the "cod outburst". The influence of cod predation on the natural mortality of herring appears now to be insignificant.

Year classes 1988-1993 are all below the long-term average with the exception of the 1989 year class, which is well above average.

Details given in Table 2.2.5.

Forecast for 1995:
Assuming F(94)=0.18, Basis: F94=F93, Catch(94)=259, SSB(94)=1592.

Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	0.8F(93)	0.14	1760	236	236	1974
B	1.0F(93)	0.18	1740	290	290	1903
C	1.2F(93)	0.22	1721	343	343	1835
D	1.4F(93)	0.25	1702	394	394	1770

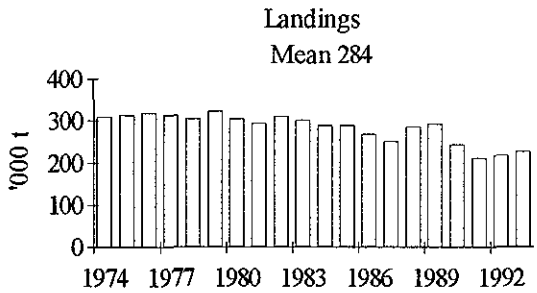
(Weights in '000 t)

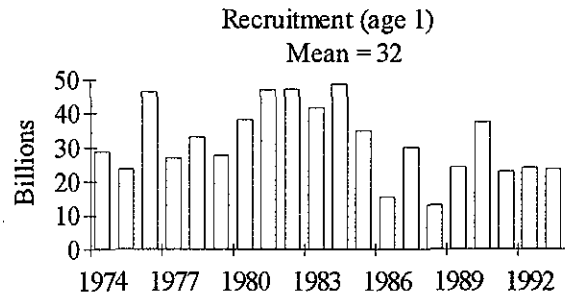
The spawning stock will increase in all the above predictions.

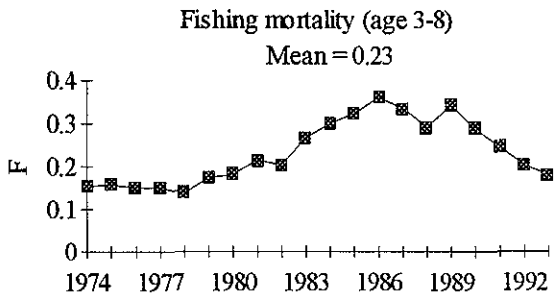
Management advice: This stock is well within safe biological limits. It is being exploited at a low level of fishing mortality and the long-term yield could be raised by increasing fishing mortality. A 40% increase in fishing mortality is considered to be within safe biological limits. The catch corresponding to this level is 394,000 t, and this could be taken in both 1995 and 1996.

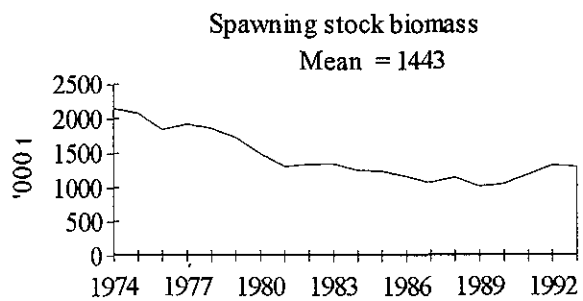
Data and assessment: Increased imprecision in catch information has been caused by insufficient sampling of an expanding fishery for industrial purposes. Assessment tuned with acoustic stock estimates from 1982-1991. Survey results from both 1992 and 1993 not usable. A further decrease in mean weights at age in the catch was reported for 1993.

Source of information: Report of the Working Group on the Assessment of Pelagic Stocks in the Baltic, April 1994 (C.M. 1994/Assess:18).









2.2.3 Herring in Sub-division 30, Bothnian Sea

Catch data (Table 2.2.1):

Year	Rec TAC	Catch
1987		25
1988		28
1989		29
1990		31
1991	32	26
1992	39	39
1993	39	40
1994	41[1]	

(Weights in '000 t) [1] Catch at $F_{0.1}$.

Historical development of the fishery: Landings increased from 1991 to 1993.

State of stock: SSB increased from 1987 to 1991 and has subsequently levelled off at a record high level.

Fishing mortality is at the lowest level since 1973.

Year class strength in recent years has been well above average with the highest on record in 1992.

Details given in Table 2.2.6.

Forecast for 1995:

Assuming F(94) = 0.11, Basis: F(94) = F(93), Catch(94) = 48, Landings (94) = 48, SSB(94) = 387.

Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	0.8 F(93)	0.09	421	43	43	419
B	1.0 F(93)	0.11	420	53	53	407
C	1.2 F(93)	0.13	418	63	63	396
D	1.4 F(93)	0.15	416	73	73	386

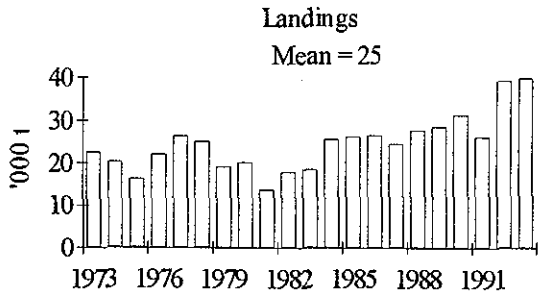
(Weights in '000 t)

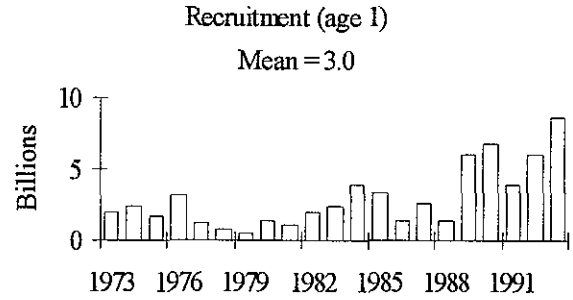
In all the above predictions the spawning stock will increase to the highest observed level.

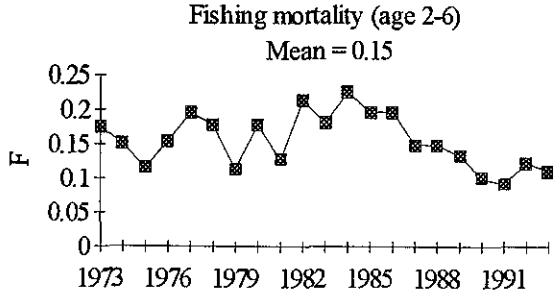
Management advice: The stock is well within safe biological limits and is currently being exploited at a low level of fishing mortality. A 40% increase in fishing mortality is considered to be within safe biological limits. The catch corresponding to this level is 73,000 t, and this could be taken in both 1995 and 1996.

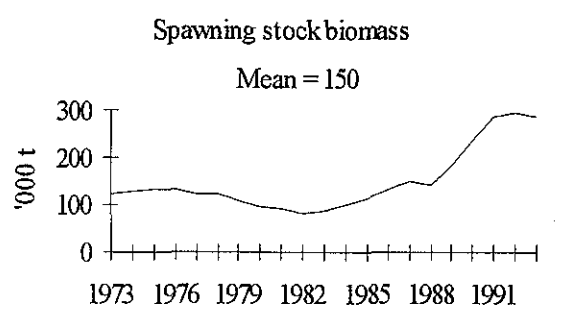
Data and assessment: Assessment tuned using effort data.

Source of information: Report of the Working Group on the Assessment of Pelagic Stocks in the Baltic, April 1994 (C.M.1994/Assess:18).









2.2.4 Herring in Sub-division 31, Bothnian Bay

Catch data (Table 2.2.1):

Year	Rec TAC	ACFM Catch
1987	9	8.1
1988	13	8.8
1989	7	4.4
1990	9	7.8
1991	9	6.8
1992	8	6.5
1993		7.9
1994		

(Weights in '000 t)

Historical development of the fishery: Landings during the last 10 years have fluctuated without trend..

State of stock: The assessment of this stock is very uncertain and the actual level of SSB and fishing mortality is not known. The stock is considered to be almost unexploited.

Details given in Table 2.2.7.

Forecast for 1995:
Assuming F(94) = 0.032, Basis: F(94) = F(93), Catch(94) = 9.2, Landings (94) = 9.2, SSB(94) = 283.

Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	F(93)	0.032	302	9.5	9.5	314
B	1.5 F(93)	0.048	301	14.1	14.1	309
C	2.0 F(93)	0.064	301	18.4	18.4	304

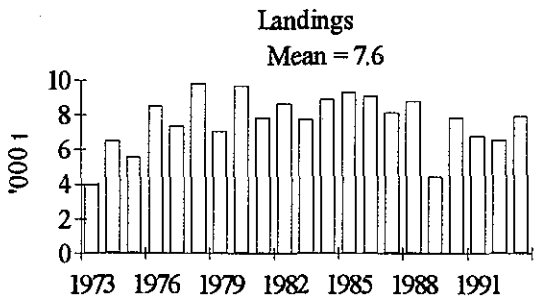
(Weights in '000 t)

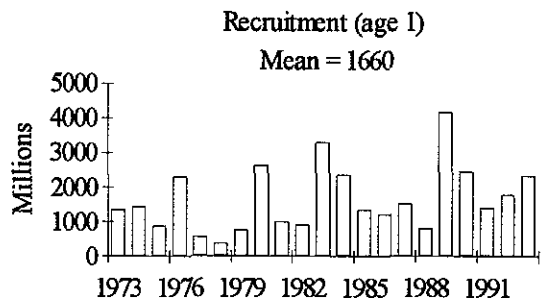
All the above predictions result in a further increase in SSB.

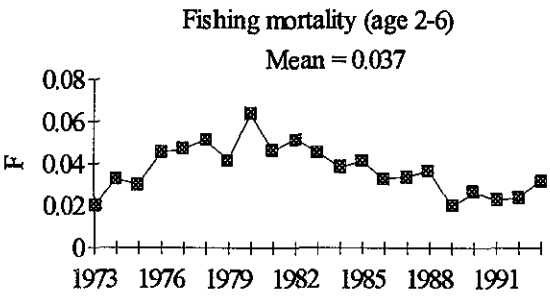
Management advice: The stock is hardly exploited and ACFM considers that a doubling of fishing mortality would be within safe biological limits. The catch corresponding to this level is 18,400 t and this could be taken in 1995 and 1996.

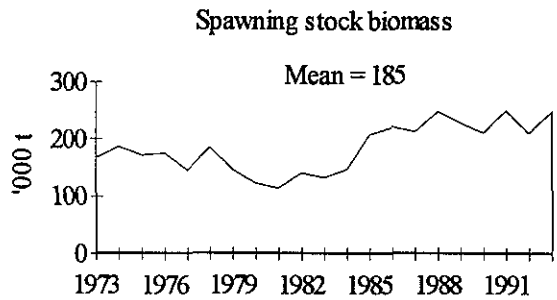
Data and assessment: Assessment tuned using effort data.

Source of information: Report of the Working Group on the Assessment of Pelagic Stocks in the Baltic, April 1994 (C.M.1994/Assess:18).









2.3 Sprat

2.3.1 Sprat in Sub-divisions 22-32

Catch data (Table 2.3.1 - 2.3.2):

Year	Rec TAC	Agreed TAC	ACFM Catch
1987		117.2	88
1988		117.2	80
1989	72	142	86
1990	72	150	86
1991	150	163	103
1992	143	290	142
1993		415	178
1994		700	

(Weights in '000 t)

Historical development of the fishery: Landings increased from 1983 to 1993. The increase in landings in 1992 and 1993 was due to the development of a sprat-directed industrial fishery. The catches in this fishery consist mainly of sprat (about 70%) and herring (about 30%).

State of stock: SSB has increased and is at its highest historical level. Fishing mortality is at a low level. Year classes from 1988-1992 average, the 1993 year class estimated to be poor.

Details given in Table 2.3.3.

Forecast for 1995:

Assuming F(94) = 0.14, Basis: F(94) = F(93), Catch(94) = 160, Landings (94) = 160, SSB(94) = 1179.

Option	Basis	F (95)	SSB (95)	Catch (95)	Lndgs (95)	SSB (96)
A	0.8F(93)	0.11	1091	121	121	1061
B	1.0F(93)	0.13	1079	150	150	1027
C	1.2F(93)	0.16	1070	177	177	994
D	1.4F(93)	0.19	1057	205	205	963

(Weights in '000 t)

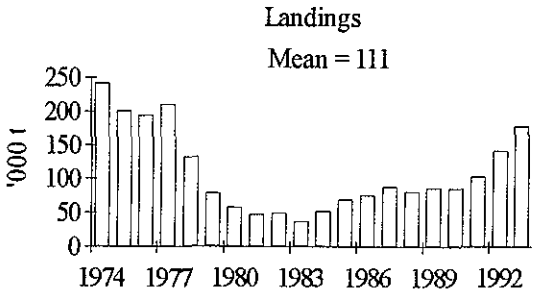
In all the above predictions the spawning stock will remain at high levels.

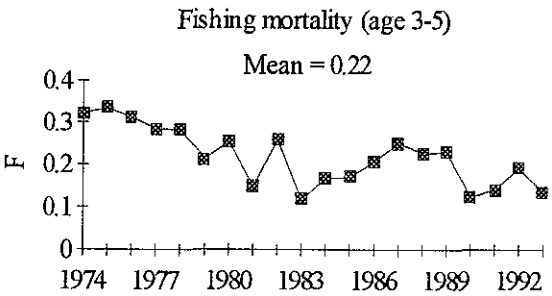
Management advice: This stock is well within safe biological limits and is exploited at a low level of fishing mortality. A 40% increase in fishing mortality is considered to be within safe biological limits. The corresponding catch is 205,000 t, and this catch could be taken in both 1995 and 1996.

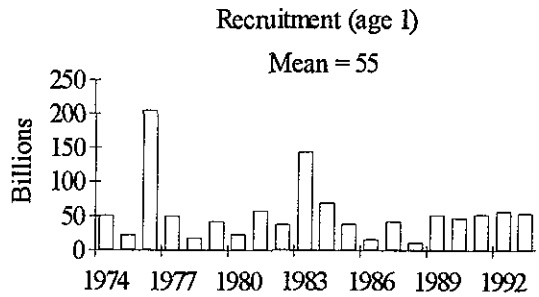
Special comments: The present assessment differs substantially from the assessment made last year (see Overview Section 2).

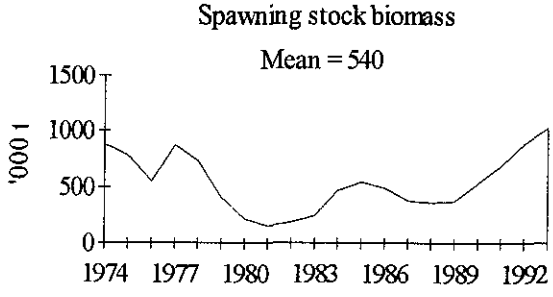
Data and assessment: Assessment tuned using acoustic stock estimates. Effect of predation by cod on natural mortality now negligible. About 50% of the catches were not sampled for age. The species composition of industrial catches is only approximate.

Source of information: Report of the Working Group on the Assessment of Pelagic Stocks in the Baltic, April 1994 (C.M.1994/Assess:18).









3 BALTIC DEMERSAL STOCKS

3.1 Cod

3.1.1 Overview

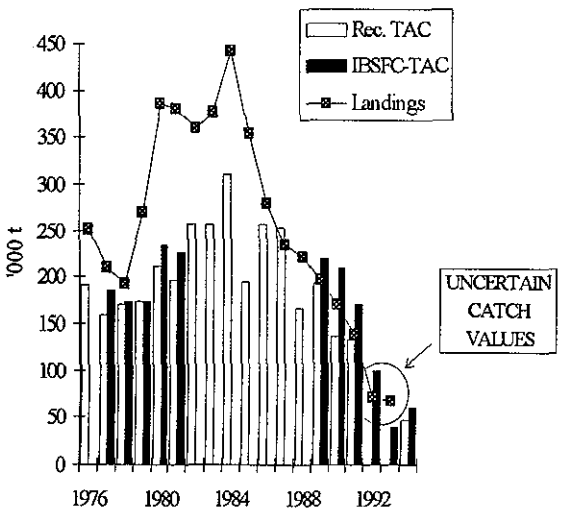
Development in Stocks and Fisheries: Unusually strong year classes in 1976, 1979 and 1980 made the basis for an increasing cod stock and an expanding fishery. Catch levels more than doubled and the fishery attracted vessels from other Baltic fisheries and also from fleets normally operating outside the Baltic. Landings have in almost all years been far above the levels recommended by ACFM. The decline in stock size and landings started around 1984 and has continued since. Fleet capacity and fishing effort have not been reduced at the same rate and in fact the fishing mortality has increased.

Due to low recruitment and the continued high fishing effort the stocks declined to record low levels in the beginning of the 1990s.

Management: The 1976-1994 suite of TAC recommendations, agreed TACs and annual landings are given in the Figure below.

As in previous reports, ACFM recommends that the two cod stocks in the Baltic should be managed separately.

Environmental factors: Cod reproduction is dependent on suitable environmental conditions and needs certain minimum levels of salinity and oxygen concentration for the fertilisation and survival of the eggs. The unusually long period with hardly any influx of North Sea water from 1983-1991 coincided with low recruitment for the cod. The improved environment now allows the possibility of improved recruitment but does not ensure it.



Assessment Data:

Catch data

The officially-reported catches are given in Tables 3.1.1-3.1.4.

In its 1993 report ACFM expressed great concern over the quality of the catch and effort data from a number of important fisheries. It was pointed out that under-reporting as well as misreporting had increased dramatically in recent years. ACFM then stressed that the immediate consequence of this is that ACFM will be unable to provide reliable estimates of current stock sizes and forecasts of future catch levels. Trends in stock size and the overall state of the stock can sometimes be evaluated from research vessels surveys, but such information alone is not sufficient to give the short-term TAC advice usually requested.

Catch data from the cod fisheries in the Baltic are unreliable for 1992 and 1993 as a result of under- and misreporting.

Catch per unit effort (CPUE)

Catch-per-unit effort is conventionally the most valuable abundance index for demersal stocks used for calibrating the catch analyses (VPA). The deterioration in the quality of catch data also make CPUE data of limited value.

Biological data from catches

Intensified collaboration between laboratories around the Baltic is recommended in order to improve and standardize the age reading of cod.

Survey data

Information on CPUE by age groups from research vessel surveys becomes increasingly important as catch information deteriorates.

3.1.2 Cod in Sub-divisions 22 and 24

Catch data (Tables 3.1.2 and 3.1.3):

Year	Rec TAC	Agreed TAC[1]	Disc. slip.	ACFM catch
1987	9		3	28
1988	16			28
1989	14			18
1990	8			17
1991	11			15
1992	LPL			15
1993	LPL			18
1994	22			

(Weights in '000 t) [1]Included in TAC for total Baltic.

Historical Development of the Fishery: The landings have varied between 40,000 and 50,000 t during the period 1965-1985. They thereafter decreased and have remained below 20,000 t for the last five years, although the precise level is uncertain for 1992 and 1993 due to incomplete reporting of landings. Discarding of young cod occurs and can be significant when a large year class enters the fishery.

State of stock: Both Total Stock and Spawning Stock size have been declining from levels around 90,000 and 45,000 t to about 30,000 and 15,000 t, respectively. Their present levels are uncertain.

Fishing mortality was high at least up to 1992, viz. 3-4 times the level corresponding to F_{max}. There are, however, indications that fishing mortality has been decreasing since 1992.

Recent recruitment is characterized by a series of below average year classes; they were very low from 1986 to 1990, whereas the 1991 and 1992 year classes are estimated to be stronger, but still below average.

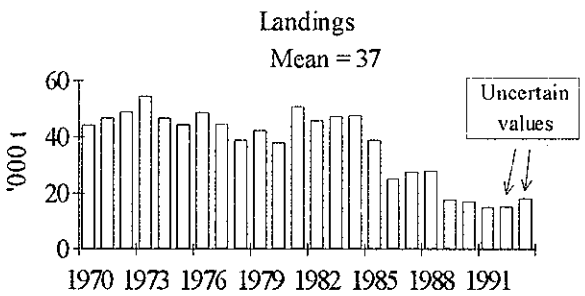
The situation is, in summary, that the exact level of the stock is uncertain but that some indications of improvement - lower fishing mortality and higher recruitment compared with two years ago - are emerging.

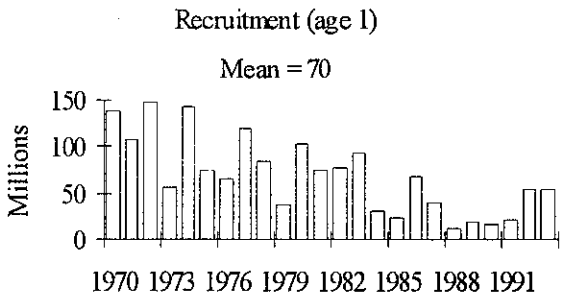
Details given in Table 3.1.5.

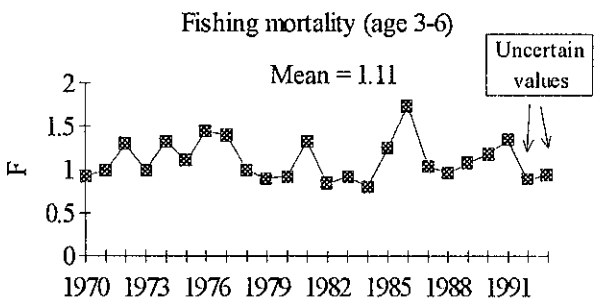
Forecast: Not available.

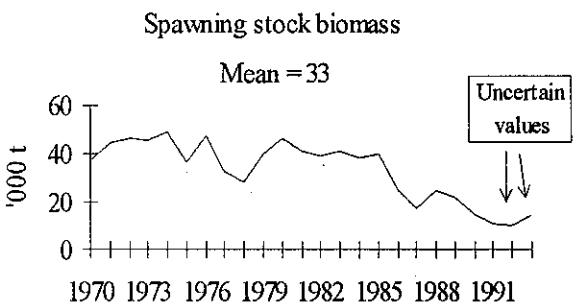
Management advice for 1994: ACFM has no basis for changing its advice concerning the 1994 catch.

Management advice for 1995: ACFM recommends as a precautionary measure that the effort in 1995 should not be increased above its 1994 level.









Special comments: Uncertainties in the data make the estimates of stock size and exploitation level for the last three years very variable and therefore not useful as a basis for catch predictions.

There are indications that the stock is developing in a positive direction. As it is not possible to provide a catch prediction the standard form of advice would be to advise a precautionary TAC based on recent catch levels. This approach is, however, not practical due to the lack of knowledge about actual catches and is also not appropriate in a situation where the stock situation is improving. In the absence of these options ACFM therefore advises that effort levels should be kept constant to prevent the recent lower levels of fishing mortality from increasing and thus hampering a full recovery of the stock on the basis of recent improved recruitment.

Data and assessment: The data from the commercial fisheries (information on catches/landings and effort) in both 1992 and 1993 are regarded as highly uncertain. The results from the catch analyses, tuned by abundance indices from trawl surveys, become imprecise for the most recent years. Also the data on age distribution and mean weights at age are imprecise (and could be biased), thereby adding to the uncertainty. Year class strengths are estimated from young fish surveys.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the Baltic, April 1994 (C.M. 1994/Assess:17) and reanalysis of catch data carried out by ACFM.

3.1.3 Cod in Sub-divisions 25-32

Catch data (Tables 3.1.2 and 3.1.4):

Year	Rec TAC	Agreed TAC[2]	ACFM catch
1987	245		217
1988	150		194
1989	179	220	179
1990	129	210	154
1991	122	171	122
1992	LPL	100	55
1993	-[1]	40	40
1994	25	60	

(Weights in '000 t) [1]No fishing. [2]For total Baltic.

Historical Development of the Fishery: The landings increased in the late 1970s from about 150,000 t to around 350,000 t in the early 1980s, but decreased thereafter. The level of landings in 1992 and 1993 is not precisely known due to incomplete reporting. The likely ranges are thought to be 55,000 - 80,000 t in 1992 and 25,000 - 50,000 t in 1993.

State of stock: Spawning Stock size has been declining from a high level during 1980-1983 to a record low level in recent years. The pronounced uncertainties in reported landings for the last few years have caused the estimates of present stock levels to be imprecise.

Fishing mortalities have been high and, at least up to 1992, increasing. They are at a level about three times the F_{max} reference point.

Recruitment (at age 2) has been below the long-term average and decreased after the 1985 year class. Both the 1989 and 1990 year classes are very small (i.e. 15% and 25% of the average). The 1991 recruits are more numerous (about 50% of the average). The first estimate obtained for the 1992 year class indicates a strength about 30% of the average.

Details given in Table 3.1.6.

Forecast: Not available.

Management advice for 1994: ACFM has no basis for changing its advice concerning the 1994 catch.

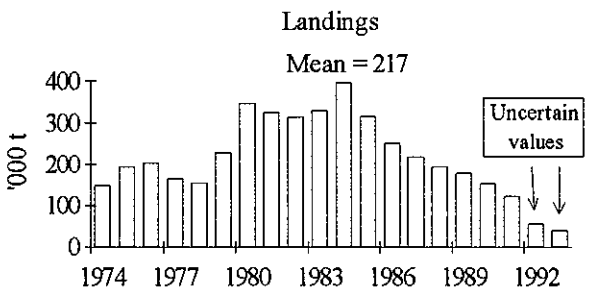
Management advice for 1995: ACFM considers this stock to be in a depleted state and recommends no fishing in 1995.

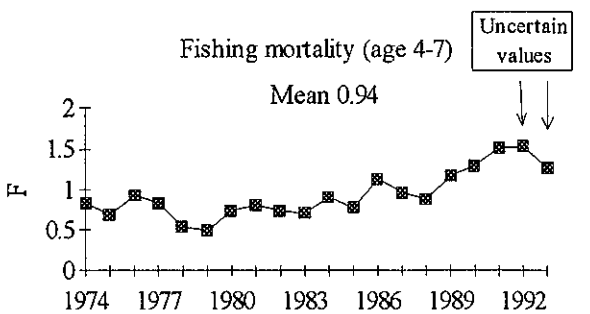
Special comments: It is not possible for ACFM to provide management advice based on precise estimates of stock size due to the large uncertainties in the catch data for 1992 and 1993. Due to the recruitment of the 1991 year class the stock size may have increased somewhat from its minimum level. The very high fishing mortalities indicated at present, however, may hamper a rebuilding of the spawning stock. Last time ACFM was able to provide advice based on sufficient information the stock was in a depleted state. In view of the poor quality of the information added since, ACFM has no basis for a revision of its position concerning the state of the stock and advises a very cautionary approach in the management of it.

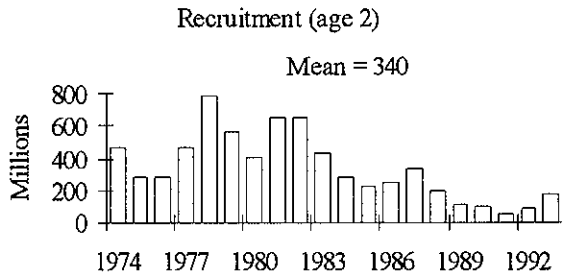
Catch rates were reported to be good during the first months of 1994. These catches were dominated by the 1991 year class. The data available on these catches have not been sufficient to enable ACFM fully to explain the observed increase.

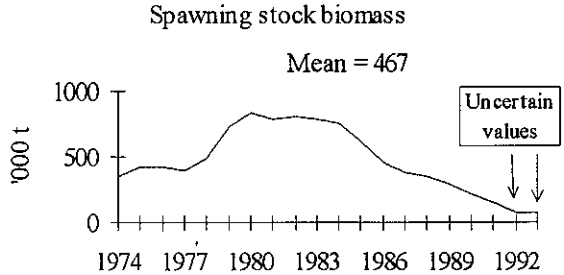
Data and assessment: The information on catches, landings and effort from the commercial fisheries in both 1992 and 1993 is regarded as highly unreliable. The results from the catch analyses, tuned by abundance indices from trawl surveys, therefore become imprecise for the most recent years. Year class strength is estimated from surveys.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the Baltic, April 1994 (C.M. 1994/Assess:17).









3.1.4 Selection properties of cod trawls

Reply to a Swedish request for an evaluation of experiments on the introduction of square mesh panels in the cod-end of cod trawls.

Experiments were performed in 1993 in order to improve selectivity in cod trawls by means of selection windows. The idea is that selection can be improved by incorporating a small window about (5.2 x 0.75 m) along the side of the cod-end. The meshes used were not genuine square meshes but diamond meshes kept open by a special mounting technique and by having the net material coated with plastic. The window is easy and inexpensive to install and does not affect fishing effectiveness or behaviour of the trawl. The selection window has been tested both in controlled experiments and by the commercial fishing fleet. The results obtained so far show that the window substantially improves the selection properties: selection factor about 3.7 and a narrow selection range of 2.6 cm. The test by the commercial fleet supports the results and no negative impacts on efficiency or in handling were reported. The wearing of the window material was insignificant after two months' fishing.

Experiments are being continued to document the selectivity properties further and to determine the mesh size equivalent to a 35 or 37 cm minimum landing size of cod.

ACFM is aware of the need for further documentation of the properties of the selection window and is also aware that the method presented may not be the final solution. If the further results confirm that the new experimental window is as successful in preventing young cod from being caught as the increase in mesh size to 120 mm (diamond mesh) recommended by ACFM in 1993 then the selection window can be used as an alternative.

3.2 Flatfish stocks in the Baltic

3.2.1 Flounder

The total catch of flounder has remained stable for about 20 years although area changes have occurred. During recent years the catch has decreased slightly in the eastern Baltic (Table 3.2.1) in Sub-divisions 26 and 28, where most of the catches are taken in a directed flounder fishery and as by-catches in the cod fishery. In the western Baltic flounder catches consist mostly of by-catches in the cod fishery. In 1993 a large increase in landings was observed in Sub-division 25. Because of the decreasing importance of cod, there has been a growing interest in developing the flounder fishery in some areas.

The data base for most of the flounder stocks is incomplete and it has not been possible to carry out an assessment for any of the stocks. Data on discards are lacking in most areas and data on effort and CPUE are minimal. Very few indices of recruitment are available.

3.2.2 Plaice

Sub-divisions 22 and 24 are the important areas for the plaice fishery in the Baltic. The total catches of plaice (Table 3.2.2) were high in the 1970s and a decrease in catches was observed at the beginning of the 1980s. Since then catches have been at a lower level and in 1993 they were the lowest on record.

3.2.3 Dab

The total catches of dab have been rather stable in the last ten years and about 90% of the catches are taken in the western Baltic in Sub-divisions 22 and 24 (Table 3.2.3).

3.2.4 Turbot

The total catches of turbot in the Baltic have been increasing since 1984 and reached their highest level in 1993 (Table 3.2.4). There are indications that a directed turbot gill-net fishery is developing in Sub-division 25.

3.2.5 Brill

Data on landings of brill are given in Table 3.2.5. There are gaps in the information and thus the total catch figures are preliminary.

4 BALTIC SALMON AND TROUT STOCKS

4.1 Overview

Salmon stocks

Naturally reproducing salmon stocks exist in about 30 rivers in the Baltic area. A rough estimate of the smolt run in 1993 suggests that approximately 0.5 million wild smolts migrated. Many rivers have been dammed and spawning and nursery areas have disappeared. To compensate, hatcheries have been built on these rivers and reared stocks are released. Normally these fish feed in the sea and migrate to rivers as spawners where they are taken and used as broodstock. The fish are reared in the hatchery to the smolt stage and released. However, in Finland hatchery-reared stocks are kept in hatcheries for their entire life span and are used as broodstock. The broodstock is genetically strengthened by using some spawning fish returning from the sea. A total of 6.1 million hatchery-reared smolts were released in a number of river mouths and coastal release sites in 1993.

While feeding in the sea, salmon are caught by drift nets and long lines while, during the spawning run, they are caught along the coast by trap nets. In the river mouths set gills nets are used and there is an angling fishery in the rivers. The offshore fishery and most of the coastal fisheries exploit both wild and reared salmon. Wild salmon cannot easily be distinguished from reared fish and therefore it is only possible to exploit reared fish separately during the homing migration when salmon approach their release sites near river mouths.

Status of stocks

Since 1974 there has been fry mortality (10-30%) associated with the M74 syndrome. This was first observed in Swedish and later in Finnish hatcheries. In 1992 a remarkable increase in mortality was observed (70-90%) and mortalities are currently at that level.

Wild salmon stocks have been well below optimal levels and recent low parr densities suggest that there will be a severe decline in smolt runs in 1995 and onwards. This is thought to be the result of M74 affecting the wild stocks.

Reared smolt production has not decreased in 1994 but will decrease in Sweden in 1995 and onwards where the M74 syndrome has affected hatchery production.

Management

To safeguard wild stocks the offshore and coastal fisheries should be closed in 1995 and reared fish should be harvested close to their points of release. Smolt releases should be restricted to those rivers where they can be harvested without interacting with wild stocks. All hatchery-reared smolts should be finclipped and subsequently no salmon without finclips should be landed.

Sea Trout

Most of the sea trout stocks in the Baltic make short migrations into coastal waters but the Polish stocks and some Swedish stocks in the Main Basin area migrate into the offshore area. Coastal stocks are mainly taken in directed fisheries using anchored floating nets or traps. The stocks entering the offshore area are exploited by salmon drift netting and long lining.

Status of stocks

Naturally reproducing sea trout stocks exist in at least 250 rivers or brooks. Stocks in at least 24 rivers are in good condition with parr densities at optimal levels. However, knowledge of the remaining stocks is scarce and many of the stocks are thought to be in poor condition. A rough estimate of the wild smolt production is around 0.5 million smolts taking into account that there are a number of stocks that have not been surveyed.

Hatchery-reared smolt production in 1993 was about 3 million and much of the sea trout catch is based on smolt releases. Sea trout stocks do not seem to be affected by M74.

Management

Sea trout stocks feeding in coastal waters are exploited in local fisheries and should be managed on a national or local basis. The stocks entering the offshore areas would benefit from restrictions to salmon fisheries.

4.2 Salmon

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

Catch data (Table 4.2.1):

TACs

Year	Rec TAC		Agreed TAC	
	'000 t	'000 fish	'000 t	'000 fish
1987				
1988	<3.00			
1989	2.90			
1990	1.68			
1991	-[2]	-[2]	3.35	
1992		688	3.55	
1993		500[3]		650
1994		500[3]		600

Landings

Year	Coast & rivers	Offshore	Total	
	'000 t	'000 t	'000 t	'000 fish
1987	0.43	3.21	3.64	897
1988	0.47	2.43	2.90	791
1989	0.73	3.27	4.00	1049
1990	1.43	3.65	5.07	1131
1991	1.14	3.00	4.15	776
1992	1.35	2.66	4.01	726
1993[1]	0.96	2.55	3.51	659

1) Preliminary data. 2) TAC much below present levels
3) Equivalent to 2.25-2.70 thousand t.

The landings in both the offshore fishery and the coastal and river fisheries peaked in 1990 and have since declined. The largest catches are taken in the offshore fisheries in the Main Basin and in the Gulf of Bothnia. However, the proportion of the total catch taken by the coastal and river fisheries has increased in recent years.

Historical development of the fishery: The management objective for Baltic salmon fisheries as stated by the International Baltic Sea Fishery Commission is to safeguard wild salmon stocks. However, the wild salmon populations are at extremely low levels, and in recent years, reared fish have probably constituted more than 90% of the catch. This makes the management of the fishery difficult as wild fish cannot easily be distinguished from reared fish and are taken in most of the fisheries that exploit the reared stocks. The only fisheries that do not exploit wild salmon are those in the mouths of rivers which support no wild stocks.

There has been a single TAC in operation for all the marine fisheries for salmon since 1991. Until 1992 the TAC was expressed in weight and subsequently it has been expressed in numbers of fish.

State of stocks: Salmon smolt production in the Gulf of Bothnia and Baltic Main Basin are shown below (in millions):

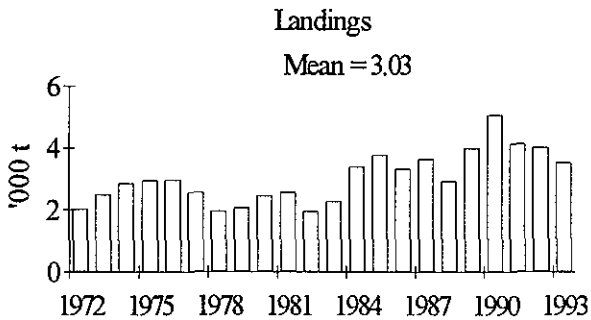
Year	Wild[2]	Reared	Total
1987	0.41	5.56	5.97
1988	0.40	5.68	6.08
1989	0.41	5.23	5.64
1990	0.41	4.39	4.80
1991	0.42	4.09	4.51
1992	0.45	4.71	5.16
1993	0.50	5.71	6.21
1994[1]	0.65	4.49	5.14

1) Preliminary data 2) Wild smolt production estimated annually only for rivers Tornionjoki and Simojoki; the total production is therefore a rough estimate.

Wild stocks: Wild salmon stocks have been well below optimal levels for many years. It is now feared that M74 is affecting the wild spawning stocks in Swedish and Finnish rivers thereby causing a severe decline in numbers of wild parr.

Although limited data are available, wild salmon in Latvian rivers do not appear to be depleted. This may be because they are not as heavily exploited in coastal fisheries and because they may not have been affected by M74.

Reared stocks: Production of reared salmon smolts has fluctuated around 5 million for at least the last 10 years. However, the presence of M74 in broodstock is now affecting production in Swedish hatcheries. Reared production in other countries has not been reduced as yet.



Forecast for 1995: *Wild stocks:* Surveys of juvenile salmon in streams and rivers around the Baltic show that the wild smolt runs will increase to 645,000 in 1994. This is the highest number for at least 10 years but it is still only a very small proportion of the optimum production. The numbers of parr, however, are currently extremely low and future smolt runs in these areas are expected to be greatly reduced. It is estimated that the 1995 run of smolts will be 265,000. This will result in a significant reduction in returns of adult wild salmon from 1996.

Reared stocks: The forecast production of reared smolts in 1994 is 4.49 million. Reared production in some areas is affected by M74 and is therefore likely to be low for at least the next 2-3 years. This will result in a reduction in stocks of reared adult salmon from 1996.

Management Advice: In order to safeguard the wild stocks, the offshore and coastal fisheries should be closed in 1995. If fishing is permitted the catch should be as close to zero as possible.

Reared fish should be harvested close to their points of release where this can be achieved without taking wild fish (i.e. in the mouths of rivers which support no wild stocks and at certain coastal release sites).

Special comments: In 1993, ACFM indicated that "if reproduction and/or survival of wild smolts is shown to be seriously affected by M74, a ban on all fishing for wild salmon may be required". Data presented in 1994 indicate that runs of wild salmon smolts in Swedish and Finnish rivers will fall to critically low levels from 1995, possibly as a result of M74. Thus, in order to realise the management objective of safeguarding the wild salmon stocks in the Baltic, major changes in policy will have to be adopted. It is vitally important that as many wild fish as possible are allowed to spawn in order to maintain a reasonable level of juvenile salmon production and redress the current situation of critically low juvenile numbers.

If wild fish are to be protected, it will not be possible to exploit reared fish in the offshore or coastal fisheries. To safeguard the genetic integrity of the wild stocks it will also be necessary to ensure that reared fish do not enter rivers where there are existing wild stocks.

Consequently:

- Reared smolt releases should be restricted to rivers where they can be recaptured and where their exploitation will not affect wild salmon stocks.
- The areas where exploitation of reared stocks is allowed should be delimited and should be designed to ensure that there is no exploitation of wild stocks.
- All reared smolts released should be finclipped to allow their identification in fisheries.
- No salmon without finclips should be landed.

More information is required on wild stocks in Latvian rivers. If it can be confirmed that spawning and nursery areas are being well utilised and that wild smolt runs are close to optimal levels, a fishery of 16,000 fish could be permitted within the Gulf of Riga to exploit fish returning to local rivers.

Data and assessment: Estimates of wild smolt production are available for each region, but many estimates are based on limited surveys.

Source of information: Report of the Baltic Salmon and Trout Assessment Working Group, April 1994 (C.M. 1994/Assess:15).

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

Catch: The catches in the coastal and river fisheries increased up to 1990 and have remained around 400 t since then. Catches in the offshore fishery have declined since the late 1980s and have been between 110 and 190 t during the 1990s (See Table 4.2.1).

TAC:

Year	Rec TAC	Agreed TAC	
	'000 fish	'000 t	'000 fish
1987			
1988			
1989			
1990			
1991		0.43	
1992		0.43	
1993	109[2]		109
1994	65[3]		120

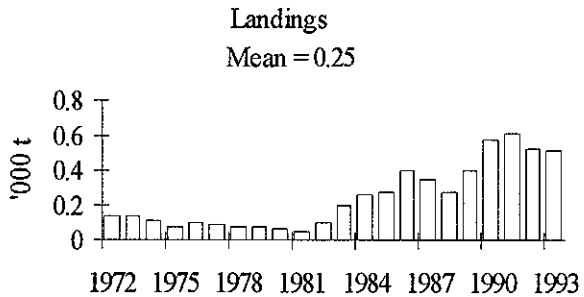
Landings

Year	Coast & rivers	Offshore	Total	
	'000 t	'000 t	'000 t	'000 fish
1987	0.06	0.29	0.35	141
1988	0.11	0.16	0.27	74
1989	0.15	0.25	0.40	106
1990	0.40	0.18	0.57	117
1991	0.42	0.19	0.62	122
1992	0.42	0.11	0.53	74
1993[1]	0.38	0.13	0.51	99

1) Preliminary data. 2) Reared stock only; equivalent to 600 t. 3) Reared stock only; equivalent to 400 t.

Historical development of the Fishery:

From the 1950s to the 1970s there was a small offshore long-line fishery in the Gulf of Finland based on wild salmon production and releases of reared smolts in the former USSR. This fishery expanded and a coastal trap net fishery developed with the growth of smolt rearing programmes in Finland in the 1980s. The management objective in this region is currently the same as for the remainder of the Baltic, to safeguard wild stocks.



A TAC of 430 t was introduced for 1991 and 1992. In 1993 and 1994, the TACs were expressed in numbers rather than weight and were 109 and 120 thousand fish respectively. The latter figure was approximately twice the recommended figure.

State of stocks: Salmon smolt production in the Gulf of Finland is shown below (in thousands):

Smolt production:

Year	Wild[2]	Reared	Total
1987	15	593	608
1988	15	569	584
1989	15	432	447
1990	15	573	588
1991	15	501	516
1992	15	415	430
1993	15	424	439
1994	15	370[1]	385[1]

1) Preliminary data. 2) Assumed.

Wild stocks: There are thought to be wild salmon stocks in six rivers in the Gulf of Finland, but information on these is very limited. Production of wild smolts in the 1980s was assumed to be about 15,000.

Reared stocks: Hatchery production in the Finnish smolt rearing programme is stable at around 400,000 fish per annum. This production is supported by hatchery broodstock and is not expected to be affected by M74 in the short term.

Forecast for 1995: *Wild stocks:* Only one river was surveyed in 1993 and no 0+ parr were found. It is possible that wild stocks are very severely depleted and some may even be extinct.

Reared stocks: Hatchery-reared smolt production is expected to remain at around 400,000.

Management advice: To safeguard the wild stocks, the offshore and coastal fisheries should be closed in 1995. If fishing is permitted the catch should be as close to zero as possible. Reared fish should be harvested close to their points of release in river mouths and at coastal release sites.

Special comments: From the available evidence it is uncertain whether there are any wild stocks remaining in the Gulf of Finland. Surveys should be undertaken to determine the status of wild stocks in this region and to investigate their patterns of migration and exploitation. If all wild stocks are shown to be extinct the fisheries need no longer be constrained by the management objective of safeguarding wild stocks.

Source of information: Report of the Baltic Salmon and Trout Assessment Working Group, April 1994 (C.M. 1994/Assess:15).

4.3 Sea Trout

Catch data: Catches of sea trout have increased over the past seven years, particularly in the Baltic Main Basin (See Table 4.3.1)

Year	Baltic Main Basin	Gulf of Bothnia	Gulf of Finland	Total
1987	319	150	184	653
1988	331	282	290	903
1989	460	331	298	1089
1990	794	432	337	1563
1991	613	463	297	1373
1992	611	469	322	1402
1993[1]	897	240	718	1855

(Weights in t) 1) Preliminary data.

Description of fishery: The International Baltic Sea Fishery Commission has not stated a management objective for sea trout stocks in the Baltic.

Sea trout stocks in the Baltic exhibit two types of migration pattern. Most of the stocks only migrate into coastal waters, but some, particularly those from Poland and southern Sweden, move further into offshore areas. The fish that migrate only short distances are mainly exploited in coastal and river fisheries, while those that migrate offshore are also taken as a by-catch in the offshore salmon fishery.

The pattern of exploitation therefore varies between stocks. In the Bothnian Bay, the stocks are mainly caught in gill nets set for whitefish. This fishery uses nets with small mesh sizes which take small (young) sea trout, often in large numbers. In Sub-divisions 28, 29, 30 and 32, sea trout are mainly taken in directed fisheries using anchored floating nets or trap-nets. The stocks that migrate into the offshore areas in the Main Basin are, like the salmon, exposed to all fisheries.

Status of stocks: Currently at least 250 rivers in the Baltic support natural stocks of sea trout. There are no estimates of the number of sea trout that previously existed or of the current levels of natural smolt production. However, stocks in at least 24 rivers are thought to be in good condition with nursery areas well utilised. Many of the remaining stocks are thought to be in poor condition and some of these stocks are enhanced by releases of fry and parr. Compensatory releases of smolts are also made in several of the main rivers used for hydroelectric power generation.

Sea trout stocks do not seem to be affected by M74.

Forecast for 1995:

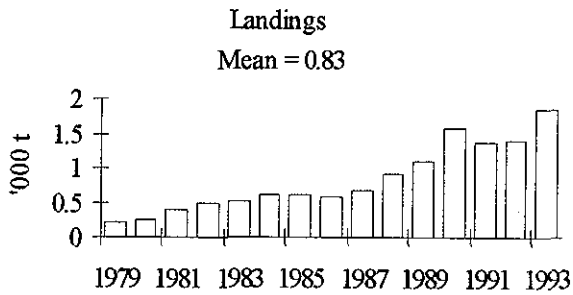
Not available

Management advice: The stocks remaining in coastal waters are only exploited in local fisheries and should therefore be managed on a national or local basis.

The stocks moving into offshore areas would benefit from any restriction to the salmon fisheries.

Special comments: Management of sea trout stocks in the Baltic is complicated by the lack of data on their current status. Information is also required on patterns of migration of individual stocks. If sea trout stocking programmes expand, wild stocks could face similar problems to the salmon.

Source of information: Report of the Baltic Salmon and Trout Assessment Working Group, April 1994 (C.M. 1994/Assess:15).



4.4 Information on M74

Description of M74

M74 is a syndrome which causes severe mortality in the early life stages of Baltic salmon. The 'M' stands for the Swedish word 'Miljön', meaning environment, and the '74' for the year when the syndrome was first observed. Behavioural disorders, characterised by 'wiggling behaviour' have been observed in both male and female adult salmon broodstock in the Baltic. Offspring from females exhibiting this behaviour are nearly always affected by M74; furthermore, one study has shown that the offspring of over 70% of apparently 'normal' females were also affected.

The first signs of M74 in yolk sac fry are usually observed 2-3 weeks after hatching when about two-thirds of the yolk sac has been absorbed. Compared with normal yolk sac fry, those affected by M74 reveal the following symptoms:

- lethargy and weak avoidance reactions (swimming movements are short, uncoordinated rushes leading to quick exhaustion);
- the yolk sac fry are greyish in colour;
- fragility of blood vessels is seen as haemorrhages (primarily in the heart region) and precipitates in the yolk sac close to fat droplets;
- the yolk sac may be swollen and exophthalmus is observed, indicating osmoregulatory disturbances;
- the hepatocytes show increased vacuolisation and lower glycogen content compared to normally developing fry;
- the hepatic cytochrome P450-dependent 7-ethoxyresorufin-O-deethylase (EROD) activity is very high.

Nearly all the fry in an affected family normally die within 3-5 days.

Possible causes of M74

ACFM considered the available information on factors which may be involved in causing M74:

Infectious agents: There are no indications that infectious agents are involved in the etiology of the M74 syndrome.

Rearing environment: There are no indications that hatchery rearing environments or rearing practices (e.g. chemical treatments) cause or exacerbate the M74 syndrome.

Genetic factors: It is possible that the different mortality rates observed in different hatcheries could reflect different tolerance of the stocks to M74 thus indicating the influence of genetic factors. However, no genetic link with M74 has yet been demonstrated.

Prey species: Sprat is one of the main food items of salmon in the Baltic and there has been a significant positive correlation between the incidence of M74 and the size of the spawning stock of Baltic sprat. Herring also constitute a major part of the diet. Growth of Baltic herring has been reduced since the late 1980s. Thus, if salmon select prey of a particular size, the mean age of the herring in their diet may be 1-2 years older than previously. As concentrations of organochlorine contaminants in fish species increase with age, this could have resulted in an increase in the uptake of contaminants (e.g. DDT and PCBs) in the salmon.

Carotenoids: Uptake of the carotenoid astaxanthin has decreased in recent years. This is shown by the paler flesh colour of these fish. Primary production of astaxanthin occurs in phytoplankton and is transferred by crustaceans eaten by herring and sprat to salmon. Astaxanthin acts as provitamin A in salmon and is essential for the growth and survival of fry.

Milder winters in recent years: The occurrence of mild winters between 1988 and 1992 has resulted in higher average winter temperature of sea water in the southern Main Basin. This is correlated with the occurrence of M74. This may be because at temperatures above 3°C, salmon may be expected to have a comparatively high food intake and the transfer of lipophilic contaminants from sprat may be increased.

Chemical contaminants: There are some indications of links between offspring mortality and the concentrations of several organochlorine compounds (PCBs, DDT, PAHs, polychlorinated dioxins and dibenzofurans (PCDD/PCDF)) in the parent fish. Significant correlations have been found between concentrations of chlordane and toxaphene in the muscle tissue of spawning females and mortality of offspring in early stages. Dioxins and polychlorinated diphenyl ethers (PCDEs) contribute to the toxic load in salmon when calculated by toxic equivalency loading but insufficient data are available to show a link with M74. Polychlorinated naphthalenes (PCNs) have been detected in somewhat higher concentrations in females affected by M74 than in females with viable offspring. Concentrations of heavy metals are now low in the Baltic and are thus unlikely to contribute significantly to the M74 syndrome.

Other factors: In recent decades the Baltic Sea has been heavily influenced by natural and anthropogenic factors which have considerably changed the structure and function of its ecosystem. Many of these changes have been on a large scale and include both biotic and abiotic changes (e.g. water quality, water temperature, food web structure) which may directly or indirectly affect the reproduction of fish.

Conclusion: There was a dramatic increase in mortalities attributed to M74 in 1992, and they have remained at a high level since that time. The first year classes of reared salmon which produced offspring with high levels of M74 emigrated as smolts in 1988. All subsequent year classes appear to have been affected. Although no clear conclusions can be drawn about the causes of M74 at present, it appears likely that it is related to the marked environmental changes that have been observed in the Baltic since 1988. It appears that the syndrome may be mediated through the diet and that chemical contaminants may play a major role.

Impact of M74 on stocks

The impact of M74 on the wild and reared stocks of salmon and sea trout in the Baltic has been discussed in Sections 4.2 and 4.3 of this report.

Source of information: Report of the Study Group on Occurrence of M74 in Fish Stocks, March 1994 (ICES C.M. 1994/ENV:9).

5. SEALS IN THE BALTIC

5.1 Harbour seals

The numbers of harbour seals in the Baltic are undoubtedly very much lower than they were at the beginning of the century. There are two apparently distinct populations of harbour seals in the Baltic. The population in ICES Division IIId, approximately equivalent to Sub-divisions 24-32 is small and genetically distinct. This population was not affected by the 1988 epizootic. The population in ICES Divisions IIIb and c, approximately equivalent to Subdivisions 23 and 22 respectively suffered 60% mortality during the 1988 epizootic and this population has not recovered from the effects of the 1988 phocine distemper epidemic. Levels of contaminants in all Baltic harbour seals are relatively high and there is a by-catch of harbour seals in the drift net fisheries for salmon. Although the official statistics suggest that only a few animals are killed each year, these by-catches might be a significant factor in slowing down the recovery of the numerically small Baltic population.

5.2 Ringed seals

There is considerable uncertainty about the total number of ringed seals in the Baltic because no information has been available for the Gulf of Finland, which holds an appreciable part of the population, since 1984. However, an aerial survey of the Gulfs of Finland and Riga is scheduled for April 1994. Regular aerial surveys of ringed seals in the Bay of Bothnia commenced in 1984. These suggest that numbers have increased, although this may be the result of immigration by seals from the Gulf of Finland in response to the greatly reduced ice cover during the last five winters. At present, there are about 3,000 animals in the Bay of Bothnia. It has been estimated that there may have been at least 300,000 ringed seals in the Baltic at the beginning of the century from catch statistics and an estimate of population size in the 1970s. This analysis needs to be repeated with a wider range of demographic parameter values to provide an estimate of the range of initial population sizes which are consistent with the catch history and recent survey results. Nevertheless, it is clear that the present population represents only a small fraction of the historic level. Until the 1960s, hunting was the major cause of the marked decline in the numbers of ringed seals in the Baltic. However, the decline continued after hunting pressure was reduced, due to reduced population fecundity which may have been caused by pollution.

There is a by-catch of ringed seals in the fixed-net fishery for salmon. This mortality appears to be low (< 1% per annum), but its impact on the recovery of the population should be evaluated.

High levels of contaminants were found in Baltic ringed seals in the 1960s and 1970s. In addition, a large proportion of the adult females had uterine occlusions, resulting in reduced fecundity (when only one horn was occluded) or sterility (when both horns were occluded). There are signs that the level of DDT and PCBs in the blubber of ringed seals are decreasing and there has also been a reduction in the incidence of uterine occlusions. The proportion of young (ages 1-4) animals taken during the spring hunt for scientific sampling has started to increase, which provides indirect evidence of an increase in population fertility.

5.3 Grey seals

1,300 pups were counted at colonies in Estonia in 1992. The historic population was undoubtedly much larger. A figure of 100,000 has been proposed in the literature but the basis for this is unclear. However, catch statistics are available and an estimate of numbers at the beginning of the century could be back-calculated.

The reported by-catch for the last three years has averaged 90 animals. This represents an annual mortality of 2-3%.

High pollution levels were found in Baltic grey seals in the 1960s and 1970s. Uterine occlusions were also common, although the incidence was only about half that recorded for ringed seals. There has been a reduction in the levels of DDT in grey seal blubber, but PCB levels have not changed significantly. PCB levels in grey seals may have remained relatively high if there has been a shift in the diet of the seals from white fish to fatty fish in response to recent changes in prey availability.

Table 1.1.1 Nominal fish catches in the Baltic from 1973-1993 (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]	139	295	111	14	4.6	17	19	600
1992[1]	71	336	145	12	4.7	8	13	590
1993[1]	40	348	191	12	3.4	10	7	611

[1]Preliminary.

Table 1.1.2 Nominal catch (tonnes) of HERRING in Divisions IIIb,c,d, 1963-1993. (Data as officially reported to ICES.)

Year	Denmark	Finland	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	27,034[4]	51,546[3]	16,022	33,270	6,468[5]	45,991	59,176	31,755	295,257[6]
1992	33,855	29,556	72,171[3]	17,746	25,965	n/a	52,864	75,907	27,979	336,043[6]
1993	34,945	32,982	77,353[3]	20,143	21,949	n/a	50,833	86,497	23,545	348,247[6]

[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]As reported by Estonian authorities; 32,683 t reported by Russian authorities.
[5]As reported by Lithuanian authorities; 6,456 t reported by Russian authorities.
[6]Preliminary
n/a = not available.

Table 1.1.3 Nominal catch (tonnes) of SPRAT in Divisions IIIb,c,d, 1963-1993. (Data as officially reported to ICES.)

Year	Denmark	Finland	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	14,124[3]	99[2]	736	17,996[4]	3,569	23,200	8,328	20,736	110,569[5]
1992	28,210	4,140	893[2]	608	17,388	n/a	30,126	53,558	9,851	144,774[5]
1993	27,435	5,763	206[2]	8,267	12,553	n/a	33,701	92,416	10,745	191,086[5]

[1]Including Division IIIa.
[2]Some by-catch of sprat included in herring.
[3]As reported by Estonian authorities; 17,893 t reported by Russian authorities.
[4]As reported by Latvian authorities; 17,672 t reported by Russian authorities.

Table 1.1.4 Nominal catch (tonnes) of COD in Divisions IIIb,c,d, 1963-1993. (Data as officially reported to ICES.)

Year	Denmark	Faroe Islands	Finland	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[2]
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	1,805[3]	2,992	1,662	8,637	2,627	1,849	25,748	39,552	3,196	138,708[4]
1992	30,418	1,369	593	460	6,668	1,250	n/a	13,314	16,244	404	70,720[4]
1993	10,919	70	558	203	5,127	1,333	n/a	8,909	12,201	483	39,803[4]

[1]Including Division IIIa.
[2]Includes catches from United Kingdom (England & Wales) of 2,901 t.
[3]As reported by Estonian authorities; 1,812 t reported by Russian authorities.
[4]Preliminary.
n/a = not available.

Table 1.1.5 Nominal catch (tonnes) of FLATFISH in Divisions IIIb,c,d, 1963-1993. (Data as officially reported to ICES.)

Year	Denmark	Finland	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	248[3]	76	3,055	445[4]	4,009	224	317[5]	13,957[6]
1992	4,579	164	64	2,287	624	3,906	337	75	12,036[6]
1993	3,275	165	85	2,156	475	5,101	271	159	11,687[6]

[1]Including Division IIIa.
[2]Excluding subsistence fisheries.
[3]As reported by Estonian authorities; 236 t reported by Russian authorities.
[4]As reported by Latvian authorities; 466 t reported by Russian authorities.

Table 2.2.1 Catches of herring ('000 t) in the Baltic by country and sub-division, 1992 and 1993.

Year and	*Total*					*Sub-division*						
country	*catch*	22	23	24	25	26	27	28	29	30	31	32
1992												
Denmark	37.9	9.0	2.9	17.9	8.1							
Estonia	29.7							10.9	4.5			14.2
Finland	72.6						0.1	1.0	20.8	35.6	6.9	8.1
Germany	15.6	4.6		11.0								
Latvia	25.8					0.5		25.3				
Lithuania	4.6					3.0		1.5				
Poland	54.6			15.5	22.2	17.0						
Russia	29.5					10.2		3.3				16.1
Sweden	71.08		1.7	22.3	19.5	1.2	18.1	3.3	0.8	3.7	0.4	
Total	341.3	13.5	4.5	66.7	49.8	32	18.2	45.4	26.1	39.3	7.3	38.4
1993												
Denmark	49.8	14.6	3.3	23.0	8.9							
Estonia	32.7							9.6	4.9			18.2
Finland	75.4						0.05	0.7	22.5	36.2	7.5	8.4
Germany	11.0	2.1		8.9								
Latvia	25.4					0.7	0.04	24.7				
Lithuania	3.0					3.0						
Poland	41.1				25.9	15.2						
Russia	21.6					10.6	3.5					7.5
Sweden	87.2		0.7	16.2	16.7	8.6	20.9	20.2		3.5	0.4	
Total	347.1	16.7	4.0	48.1	51.4	38.1	24.5	55.1	27.4	39.7	7.9	34.1

Lithuania 1993: Assumed value.

Table 2.2.2

HERRING in Division IIIa and Sub. Division 22-24. 1985 - 1993
Landings in thousands of tonnes.
(Data provided by Working Group members 1993).

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993*
Skagerrak									
Denmark	88.2	94.0	105.0	144.4	47.4	62.3	58.7	64.7	87.8
Faroe Islands	0.5	0.5							
Norway	4.5	1.6	1.2	5.7	1.6	5.6	8.1	13.9	24.2
Sweden	40.3	43.0	51.2	57.2	47.9	56.5	54.7	88.0	56.4
Total	133.5	139.1	157.4	207.3	96.9	124.4	121.5	166.6	168.4
Kattegat									
Denmark	69.2	37.4	46.6	76.2	57.1	32.2	29.7	33.5	28.7
Sweden	39.8	35.9	29.8	49.7	37.9	45.2	36.7	26.4	16.7
Total	109.0	73.3	76.4	125.9	95.0	77.4	66.4	59.9	45.4
Sub. Div. 22+24									
Denmark	15.9	14.0	32.5	33.1	21.7	13.6	25.2	26.9	38.0
Germany	54.6	60.0	53.1	54.7	56.4	45.5	15.8	15.6	11.1
Poland	16.7	12.3	8.0	6.6	8.5	9.7	5.6	15.5	11.8
Sweden	11.4	5.9	7.8	4.6	6.3	8.1	19.3	22.3	16.2
Total	98.6	92.2	101.4	99.0	92.9	76.9	65.9	80.3	77.1
Sub. Div. 23									
Denmark	6.8	1.5	0.8	0.1	1.5	1.1	1.7	2.9	3.3
Sweden	1.1	1.4	0.2	0.1	0.1	0.1	2.3	1.7	0.7
Total	7.9	2.9	1.0	0.2	1.6	1.2	4.0	4.6	4.0
Grand Total	349.0	307.5	336.2	432.4	286.4	279.9	257.8	311.4	294.9

* Preliminary data.

Table 2.2.3 Herring in Sub-divisions 22-24 and Division IIIa

Year	1987	1988	1989	1990	1991	1992	1993	1994
				NORTH SEA				
CATCH								
Baltic-Div.IIIa-type spring spawners	14	23	20	8	8	8	9	
TAC				**DIVISION IIIa**				
Pred. catch of autumn spawners						96	153	
Recommended spring spawners	112[1]	99[1]	84[1]	67	91	90	93-113	[5]
Recommended mixed clupeoids	80	80	80	60	0	0	0[2]	
Agreed herring TAC (spr. & aut. spawn.)	138	138	138	120	104.5	124	165	148
Agreed mixed clupeoid TAC	80	80	80	65	50	50	45	43
CATCH								
National landings[3]	234	333	192	202	188	227	214	
Catch as used by ACFM	220	330	162	195	191	227	214	
CATCH BY FLEET/STOCK								
Autumn spawners landed for human con.					26	47	44	
Autumn spawners in mixed clupeoid fish.		Not available			13	23	25	
Autumn spawners in other ind. landings					38	82	63	
Autumn spawners total	161	201	91	77[4]	77	152	132	
Spring spawners landed for human con.					68	53	68	
Spring spawners in mixed clupeoid fishery		Not available			5	2	1	
Spring spawners in other ind. landings		Not available			40	20	12	
Spring spawners total	59	129	71	118[4]	114	75	81	
TAC				**SUB-DIVISIONS 22-24**				
Recommended TAC		97	90	64	87	80	57-68	[5]
Agreed TAC Sub-divisions 22-29 and 32	399	399	399	399	402	402	560	560
(Agreed TAC Sub-divisions 30 and 31	91	91	91	84	84	84	90	90)
CATCH								
National landings	102	99	95	78	70	85	81	
Catch as used by ACFM	102	99	95	78	70	85	81	
SUB-DIVISIONS 22-24 AND DIVISION IIIa SPRING SPAWNERS								
Total catch as used by ACFM	175	251	186	204[4]	192	168	171	

[1]Adult herring fishery in Division IIIa only. [2]Substantial reduction. [3]As reported by Working Group members. [4]Estimated. [5]130-180 for spring spawners in all areas. Weights in '000

Table 2.2.4 Catches of HERRING, Sub-divisions 25-29 (including Gulf of Riga) and 32. Catches as reported to the Working Group ('000 t).

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Denmark	11.9	13.9	19.4	10.6	14.1	15.3	10.5	6.5	7.6	3.9	4.2	10.8	7.3	4.6	6.8	8.1	8.9
Estonia															32.7	29.7	32.7
Finland	33.7	38.3	40.4	44.0	42.5	47.5	59.1	54.1	54.2	49.4	50.4	58.1	50.0	26.9	18.1	30.0	31.6
Germany	0.0	0.1	0.0	0.0	1.0	1.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Latvia															33.3	25.8	25.4
Lithuania															6.5	4.6	n/a
Poland	57.2	61.3	70.4	58.3	51.2	63.0	67.1	65.8	72.8	67.8	55.5	57.2	51.8	52.3	47.1	39.2	41.1
Russia	137.0	130.6	118.1	118.0	110.2	99.2	84.6	105.6	110.8	115.7	113.8	122.8	121.8	116.2	31.9	29.5	21.6
Sweden	48.7	55.4	71.3	72.5	72.9	83.8	78.6	56.9	42.5	29.7	25.4	33.4	55.4	44.2	36.5	43.0	66.4
Total	313.7	305.2	323.1	304.4	294.0	311.1	302.0	289.9	289.5	268.3	251.9	286.3	289.9	244.2	212.8	209.9	227.6

Table 2.2.5 Herring in Sub-divisions 25-29 (incl. Gulf of Riga) and 32. Weights in '000 t and numbers in billions.

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-8
1974	29	2142	310	0.15
1975	24	2072	313	0.16
1976	46	1840	318	0.15
1977	27	1916	314	0.15
1978	33	1859	305	0.14
1979	28	1728	323	0.17
1980	38	1494	304	0.18
1981	47	1313	294	0.21
1982	47	1340	311	0.20
1983	42	1349	302	0.27
1984	49	1252	290	0.30
1985	35	1245	289	0.32
1986	16	1168	268	0.36
1987	30	1079	252	0.33
1988	13	1147	286	0.29
1989	24	1019	293	0.34
1990	37	1057	244	0.29
1991	23	1196	213	0.24
1992	24	1327	218	0.20
1993	24	1310	228	0.18
Average	32	1443	284	0.23

Table 2.2.6 Herring in Sub-division 30, Bothnia Sea. Weights in '000 t , and numbers in millions.

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality 2-6
1973	1924	124	23	0.17
1974	2359	128	20	0.15
1975	1678	131	16	0.11
1976	3244	130	22	0.15
1977	1185	121	26	0.19
1978	762	122	25	0.18
1979	476	108	19	0.11
1980	1380	98	20	0.18
1981	1129	93	14	0.13
1982	1918	81	18	0.21
1983	2362	88	19	0.18
1984	3909	102	26	0.23
1985	3346	114	26	0.20
1986	1327	134	26	0.20
1987	2501	152	25	0.15
1988	1360	143	28	0.15
1989	6008	180	29	0.13
1990	6778	236	31	0.10
1991	3919	284	26	0.09
1992	6037	296	39	0.12
1993	8679	286	40	0.11
Average	2966	150	25	0.15

Table 2.2.7 Herring in Sub-division 31, Bothnian Bay. Weights in '000 t, and numbers in millions.

Year	*Recruitment Age 1*	*Spawning Stock Biomass*	*Landings*	*Fishing Mortality Age 2-6*
1973	1358	168	4	0.02
1974	1438	187	6	0.03
1975	866	173	6	0.03
1976	2291	176	9	0.05
1977	560	146	7	0.05
1978	366	186	10	0.05
1979	756	147	7	0.04
1980	2621	123	10	0.06
1981	1005	115	8	0.05
1982	918	141	9	0.05
1983	3301	133	8	0.05
1984	2344	148	9	0.04
1985	1346	208	9	0.04
1986	1229	222	9	0.03
1987	1522	214	8	0.03
1988	799	249	9	0.04
1989	4158	229	4	0.02
1990	2451	212	8	0.03
1991	1419	251	7	0.02
1992	1784	211	7	0.02
1993	2327	249	8	0.03
Average	1660	185	8	0.04

Table 2.3.1 Sprat catches in Sub-divisions 22-32. Data supplied by Working Group members.

Year	Sub-divisions 22-32							Total
	Denmark	Finland	German Dem. Rep.	Germany Fed. Rep.	Poland	Sweden	USSR	
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	2,734	518	789	13,296	7,478	60,002	85,638
1991	9,994	1,642	-	706	22,501	8,666	59,677[1]	103,186

Year	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Russia	Sweden	Total
1992	24,339	4,138	1,764	584	17,398	3,298	28,343	8,104	54,200	142,168
1993	18,423	5,752	1,696	643	12,553	3,300	31,765	11,241	92,700	178,073

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

Table 2.3.2

Sprat catches in the Baltic Sea by country and Sub-division

Year 1992

Country	Total catch	22	23	24	25	26	27	28	29	30	31	32
Denmark	24339	9663		3958	10718							
Estonia	4138							146	1988			2004
Finland	1764								1271	71	1	421
Germany	584	562		22								
Latvia	17398					6742		10656				
Lithuania	3298					3298						
Poland	28343			372	12432	15539						
Russia	8104					8104						
Sweden	54200			6200	20200	7600	4400	15600	200			
Total	142168	10225	0	10552	43350	41283	4400	26402	3459	71	1	2425

Year 1993

Country	Total catch	22	23	24	25	26	27	28	29	30	31	32
Denmark	18423	2564		195	15664							
Estonia	5752								2133			3619
Finland	1696								1288	11		397
Germany	643	427		216								
Latvia	12553					2192		10361				
Lithuania	3300					3300						
Poland	31765			23	9635	22107						
Russia	11241					11241						
Sweden	92700			4300	11200	20300	26500	30400				
Total	178073	2991	0	4734	36499	59140	26500	40761	3421	11	0	4016

Table 2.3.3 Sprat in Sub-divisions 22-32. Weights in '000 t and numbers in billions.

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-5
1974	51	879	242	0.32
1975	23	777	201	0.33
1976	205	551	195	0.31
1977	50	869	211	0.28
1978	18	731	132	0.28
1979	43	408	78	0.21
1980	24	221	58	0.25
1981	59	159	47	0.15
1982	37	193	49	0.26
1983	144	249	37	0.12
1984	69	473	53	0.17
1985	39	545	69	0.17
1986	16	491	75	0.21
1987	42	382	88	0.25
1988	12	361	80	0.23
1989	52	376	86	0.23
1990	47	535	86	0.12
1991	53	688	103	0.14
1992	57	886	142	0.19
1993	55	1025	178	0.13
Average	55	540	111	0.22

Table 3.1.1 Total catch (t) of COD by countries in Sub-divisions 22-32 as officially recorded.

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	10,970	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	6,354	441,447
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	197,654
1990	56,700	-	1,731	1,629[2]	7,745	-	-	32,028	-	54,474	13,461	3,558	171,326
1991	50,606	1,810	1,712	-	9,443	2,627	1,865	25,748	3,299	39,491	-	2,611	139,212
1992	30,420	1,368	485	-	6,449	1,250	1,266	13,314	1,793	15,940	-	605	72,890
1993[1]	11,707	70	230	-	4,635	1,333	605	8,909	892	12,048	-	-	40,429

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

Table 3.1.2 Total catch (t) (officially recorded) of COD in Sub-divisions 22-32 by sub-division and country.

Year	Denmark				Faroe Islands	Finland				
	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	5,536	1,431	3,847	39,792	2,611	1,061	228	404	-	18
1992	7,567	2,449	2,379	18,025	605	253	48	174	-	10
1993[1]	4,901	1,001	3,765	2,040	-	64	11	143	2	10

Year	Federal Republic of Germany						German Democratic Republic						
	22	24	25	26	27	28	22	24	25	26	27	28	29
1972	10,531	1,782	3,193	10	-	-	4,560	5,105	1,950	2,072	-	33	-
1973	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	1,648	1,231	5,419	1,114	8	23	-	-	-	-	-	-	-
1992	2,320	1,336	2,187	586	-	20	-	-	-	-	-	-	-
1993[1]	2,690	1,456	393	96	-	-	-	-	-	-	-	-	-

Table 3.1.2 (cont'd)

Year	Poland		Sweden								
	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	9,853	15,895	232	2,768	18,413	7,034	5,096	5,548	180	207	12
1992	5,449	7,865	290	1,655	7,169	2,133	2,145	2,153	93	301	1
1993[1]	5,039	3,870	274	1,675	5,872	2,161	940	972	40	114	-

Year	USSR						Total
	25	26	27	28	29	32	
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	-	-	-	-	-	-	139,212
1992	-	-	-	-	-	-	72,890
1993[1]	-	-	-	-	-	-	40,429

Year	Estonia				Latvia			Lithuania		Russia		
	26	28	29	32	26	28	29	26	28	26	28	32
1991	1,537	273	-	-	1,190	1,432	-	1,854	11	3,034	264	1
1992	1,011	352	5	-	383	867	-	1,266	-	1,793	-	-
1993[1]	61	8	-	1	761	572	-	605	-	892	-	-

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

Table 3.1.3 Total catch (t) (officially recorded) of COD in Sub-divisions 22, 23, and 24.

Year	Denmark		German Dem.Rep	Germany, Fed.Rep.	Sweden		Total			
	23	22 + 24	22 + 24	22 + 24	23	24	22	23	24	22 + 24
1965		19,457	9,705	13,350	-	2,182	27,867	-	7,007	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	712	29,446	4,582	12,893	-	1,800	33,368	712	15,353	48,721
1977	1,166	27,939	3,448	11,686	550	1,516	29,510	1,716	15,079	44,589
1978	1,177	19,168	7,085	10,852	600	1,730	24,232	1,777	14,603	38,835
1979	2,029	23,325	7,594	9,598	700	1,800	26,027	2,729	16,290	42,317
1980	2,425	23,400	5,580	6,652	1,300	2,610	22,881	3,725	15,366	38,247
1981	1,473	22,654	11,659	11,260	900	5,700	26,340	2,373	24,933	51,273
1982	1,638	19,138	10,615	8,060	140	7,933	20,971	1,778	24,775	45,746
1983	1,257	21,961	9,097	9,260	120	6,910	24,478	1,377	22,750	47,228
1984	1,703	21,909	8,093	11,548	228	6,014	27,058	1,931	20,506	47,564
1985	1,076	23,024	5,378	5,523	263	4,895	22,063	1,339	16,757	38,820
1986	748	16,195	2,998	2,902	227	3,622	11,975	975	13,742	25,717
1987	1,503	13,460	4,896	4,256	137	4,314	12,105	1,640	14,281	26,926
1988	1,121	13,185	4,632	4,217	155	5,849	9,680	1,276	18,203	27,883
1989	636	8,059	2,145	2,498	192	4,987	5,738	828	11,637	17,689
1990	722	8,584	1,629[2]	3,054	120	3,671	5,361	842	11,577	16,938
1991	1,431	9,383	-	2,879	232	2,768	7,184	1,663	7,846	15,030
1992	2,449	9,946	-	3,656	290	1,655	9,887	2,739	5,370	15,257
1993[1]	1,001	8,666	-	4,146	274	1,675	7,591	1,275	6,896	14,487

[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 officially recorded.

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	-	-	120,001	-	37,730	87,746	2,765	330,742
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	-	2,594	2	14,078	-	-	33,351	-	48,964	28,137	6,915	194,477
1989	57,240	-	2,254	3	12,844	-	-	36,855	-	50,739	14,722	4,520	179,172
1990	47,394	-	1,731	+	4,691	-	-	32,028	-	50,683	13,461	2,882	152,870
1991	39,792	1,810	1,711	-	6,564	2,627	1,865	25,748	3,299	36,490	-	2,611	122,517
1992	18,025	1,368	485	-	2,793	1,250	1,266	13,314	1,793	13,995	-	605	54,894
1993[1]	2,040	70	230	-	489	1,333	605	8,909	892	10,099	-	-	24,667

[1]Provisional data.

Table 3.1.5 Cod in Sub-divisions 22 and 24. Weights in '000 t and numbers in millions.

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-6
1970	139	37	44	0.93
1971	109	45	47	1.00
1972	148	47	49	1.30
1973	57	45	54	0.99
1974	143	49	47	1.33
1975	76	36	44	1.11
1976	67	48	49	1.44
1977	119	33	45	1.41
1978	84	28	39	1.00
1979	39	40	42	0.90
1980	102	46	38	0.93
1981	74	41	51	1.33
1982	78	39	46	0.84
1983	95	41	47	0.92
1984	31	38	48	0.81
1985	24	40	39	1.24
1986	68	24	25	1.74
1987	39	17	28	1.05
1988	13	24	28	0.96
1989	19	22	18	1.08
1990	17	14	17	1.18
1991	22	11	15	1.35
1992	54*	10	15	0.89
1993	54*	14	18	0.95
Average	71	33	37	1.11

*From surveys.

Table 3.1.6 Cod in Sub-divisions 25-32. Weights in '000t and numbers in millions.

Year	Recruitment Age 2	Spawning Stock Biomass	Landings	Fishing Mortality Age 4-7
1974	472	342	148	0.83
1975	281	426	195	0.69
1976	281	424	203	0.92
1977	462	399	165	0.84
1978	784	488	154	0.54
1979	567	727	228	0.50
1980	402	828	346	0.74
1981	656	780	326	0.81
1982	652	806	314	0.74
1983	433	783	329	0.71
1984	280	759	395	0.91
1985	227	616	316	0.77
1986	244	451	252	1.13
1987	330	372	217	0.96
1988	202	354	194	0.88
1989	113	284	179	1.17
1990	104	216	154	1.31
1991	48	146	122	1.52
1992	81	72	55	1.54
1993	173*	68	40	1.28
Average	348	467	217	0.94

*From surveys.

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]						
	22	23	24(25)	29	30	32	22	24	25(+26)	22	24(+25)	25(+24)	26	23	24	25	26	27	28	29
1973	1,983	-	386	-	-	-	181	1,624	1,516	349	4	1,580	2,070		-	502	-	-	-	-
1974	2,097	-	2,578	-	-	-	165	1,482	654	304	3	1,635	2,473		-	470	-	-	-	-
1975	1,992	-	1,678	113	22	47	163	1,469	406	469	1	1,871	2,585		-	400	-	-	-	-
1976	2,038	-	482	118	23	59	174	1,556	901	392	2	1,549	2,289		-	400	-	-	-	-
1977	1,974	-	389	115	32	56	555	2,708	1,096	393	4	2,071	2,089		-	416	-	-	-	-
1978	2,965	-	415	174	61	155	348	2,572	-	477	1	996	2,106		-	346	-	-	-	-
1979	2,451	-	405	192	54	153	189	2,509	-	259	3	1,230	1,860		-	315	-	-	-	-
1980	2,185	-	286	194	69	165	138	2,775	-	212	1	1,613	1,380		16	46	-	20	181	32
1981	1,964	-	548	227	56	135	271	2,595	-	351	1	1,151	1,541		21	30	-	21	194	34
1982	1,563	104	257	219	58	144	263	3,202	-	248	1	2,484	1,623		22	33	-	65	16	3
1983	1,714	115	450	181	67	120	280	3,572	-	418	1	1,828	905		72	108	-	212	52	9
1984	1,733	85	306	174	108	135	349	2,719	-	371	1	2,471	1,288		18	27	-	53	13	2
1985	1,561	130	649	157	97	137	236	3,253	-	199	4	2,063	1,302		16	24	-	47	12	2
1986	1,525	65	1,558	199	128	181	127	2,838	-	125	10	3,030	1,784		20	31	-	60	15	3
1987	1,208	122	1,007	159	106	143	71	2,096	-	114	11	2,530	1,745		17	26	-	51	13	2
1988	1,162	125	990	177	118	159	92	2,981	-	133	5	1,728	1,292		23	35	-	68	17	3
1989	1,321	83	1,062	175	122	163	126	3,616	-	122	2	1,896	1,089		22	34	-	66	16	3
1990	941	-	1,389	182	125	167	52	1,622	-	183	10	1,617	599		-	120	-	-	-	-
1991	925	-	1,497	236	82	167	-	-		246	1,814	2,008	1,905		24	31	-	88	20	-
1992	713	185	975	405	40	627	-	-		227	1,972	1,877	1,869		41	88	3	86	11	3
1993	649	194	635	438	57	683	-	-		235	1,230	3,276	1,229	26	27	63	1	83	10	-

(cont'd)

Table 3.2.1 (cont'd)

Year	USSR				Estonia				Latvia		Lithuania	Russia		Total										
	26	28	29	32	26	28	29	32	26	28	26	26	28	22	23[4]	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	1,737	1,351	-	390	326	125	308	8,434
1991	-	-	-	-	49	1	135	51	123	323	125	216	10	1,171	-	3,335	2,039	2,418	88	354	371	82	218	10,076
1992	-	-	-	-	-	47	47	46	26	664	483	146	-	940	165	2,988	1,965	2,527	86	722	455	40	673	10,561
1993[5]	-	-	-	-	-	52	86	55	107	368	-[6]	225	-	884	220	1,892	3,339	1,562	83	430	524	57	738	9,729

[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]For the years 1973-1981 catches in Sub-division 23 are included in Sub-division 22.
[5]Provisional.
[6]No reported.

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								
	22	24(+25)	22	24	22	24(+25)	25(+24)	26	23	24	25	27	28	29	22	23	24	25	26	27	28	29	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[3]	9	1	6	0		50	-	-	-	-	245	-	152	6	-	-	-	-	403
1991	328	112	-	-	15	9	2	1		5	2	2	-	-	343	-	126	4	1	2	-	-	476
1992	316	74	-	-	11	4	6	+		3	1	1	+	+	327	-	81	7	+	1	+	+	416
1993[4]	171	66	-	-	16	6	4	+	2	4	+	-	-	-	187	2	76	4	+	-	-	-	269

[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]Includes landings from Oct-Dec.
[4]Provisional.

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

Year	Denmark		German[1] Dem. Rep.		Fed. Rep. of Germany		Sweden[2]							Total								
	22	24(+25)	22	24	22	24	23	24	25	27	28	29	30	22	23	24	25	27	28	29	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	5		1	-	-	-	-	-	2,071		101	-	-	-	-	-	2,172
1992	1,406	81	-	-	409	6		+	1	1	+	4	-	1,406		87	1	1	+	1	+	1,496
1993[4]	996	155	-	-	556	10	7	1	1	-	+	1	-	1,552	7	166	1	-	+	1	-	1,727

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

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]						Russia	Total							
	22	23	24(+25)	24		22	24	25+(24)	26	23	24	25	26	27	28+(29)	26	22	23	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	-	24	25		14	-	-	-	-	-	208	-	197	24	25	-	-	454
1991	228		137	-	-	44	39	73	20		2	12	-	16		-	272	-	178	85	36	16	9	596
1992	267		127	-	-	55	68	80	55		12	12	+	21	36	30	322	-	207	92	55	21	36	733
1993[3]	159	29	152	-	-	74	56	521	71	2	4	14	+	13	38	34	233	31	212	535	105	13	38	1,167

[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]Provisional.

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		23	Total	Sub-divisions 24-28		Total	Sub-divisions 22-28
	Denmark	Fed.Rep. of Germany	Denmark		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	0		0	-	-	-	15
1992	28	0		28	-	-	-	28
1993	29	-	5	34	1	+	1	35

Table 4.2.1 Annual nominal landings in tonnes of Baltic salmon in 1972-1993.(S = Sea; C = Coastal; R = River.)

Year	Baltic Main Basin (Sub-divisions 24-29)										
	Denmark	Finland	Germany	Poland	Sweden		USSR		Total		
	S	S + C	S	S	S	R	S	C + R	S	C + R	GT
1972	1,034	122	117	13	277		-	107	1,563	107	1,670
1973	1,107	190	107	17	407	3	-	122	1,828	125	1,953
1974	1,224	282	52	20	403	3	21	155	2,002	158	2,160
1975	1,112	211	67	10	352	3	43	194	1,795	197	1,992
1976	1,372	181	58	7	332	2	84	123	2,034	125	2,159
1977	951	134	77	6	317	3	68	96	1,553	99	1,652
1978	810	191	22	4	252	2	90	48	1,369	50	1,419
1979	854	199	31	4	264	1	167	29	1,519	30	1,549
1980	886	305	40	22	325	1	303	16	1,881	17	1,898

Year	Baltic Main Basin (Sub-divisions 24-29)																			
	Denmark	Faroe Islands	Estonia		Finland			Germany	Latvia		Lithuania	Poland	Russian Fed.	Sweden			Total			
	S	-	S	C	S	C	R	S	S	C	S	S	S	S	C	R	S	C	R	GT
1981	844	-	23		310	18	-	43	167	17	36	45	56	401	-	1	1,925	35	-	1,961
1982	604	-	45		184	16	-	20	143	31	30	38	57	376	-	1	1,496	47	-	1,544
1983	697	-	55		134	18	-	25	181	105	33	76	93	370	-	2	1,664	123	-	1,789
1984	1,145	-	92		208	29	-	32	275	89	43	72	81	549	-	4	2,497	118	-	2,619
1985	1,345	-	87		280	26	-	30	234	90	41	162	64	842	-	5	3,085	116	-	3,206
1986	848	-	52		306	38	-	41	279	130	57	137	46	764	-	4	2,530	168	-	2,702
1987	955	-	82		446	40	-	26	327	68	62	267	81	887	-	4	3,133	108	4	3,245
1988	778	-	60		305	30	-	41	250	96	48	93	74	710	-	6	2,359	126	6	2,491
1989	850	-	67		365	35	-	52	392	131	70	80	104	1,053	-	4	3,033	166	4	3,203
1990	729	-	68		467	46	2	36	419	188	66	195	109	949	-	9	3,038	234	11	3,283
1991	625	-	64		478	35	2	28	361	120	62	77	86	641	-	14	2,422	155	16	2,593
1992	645	-	19	4	354	25	2	27	204	74	20	170	37	694	-	7	2,170	103	9	2,282
1993[1]	556	16	23	4	425	76	1	31	204	52	15	191	49[2]	754	7	5	2,264	139	6	2,409

[1]Preliminary data.
[2]Estimated from number of salmon and Lithuanian mean weight per salmon.

Cont'd.....

Table 4.2.1 (cont'd)

Year	Gulf of Bothnia (Sub-divisions 30-31)											Baltic Main Basin and Gulf of Bothnia (Sub-divisions 24-31) Total		
	Denmark	Finland			Sweden			Total						
	S	S	S + C	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	12		191		13	166	134	216	166	134	516	2,044	425	2,469
1974	0		310		15	180	155	325	180	155	660	2,327	493	2,820
1975	98		412		33	272	127	543	272	127	942	2,338	596	2,934
1976	38	271		155	22	229	80	331	384	80	795	2,365	589	2,954
1977	60	348		142	49	240	60	457	382	60	899	2,010	541	2,551
1978	0	127		145	18	212	40	145	357	40	542	1,514	447	1,961
1979	0	172		121	20	171	35	192	292	35	519	1,711	357	2,068
1980	0	162		148	23	172	35	185	320	35	540	2,066	372	2,438

Year	Gulf of Bothnia (Sub-divisions 30-31)										Main Basin and Gulf of Bothnia (Sub-divisions 24-31)			
	Finland			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	42	2,552
1982	131	111	3	-	135	30	131	246	33	410	1,627	293	34	1,954
1983	176	118	4	-	140	32	176	258	36	470	1,840	381	38	2,259
1984	401	178	5	-	140	52	401	318	57	776	2,898	436	61	3,395
1985	247	151	4	-	114	38	247	265	42	554	3,332	381	47	3,760
1986	124	176	5	11	146	41	235	322	46	603	2,765	490	50	3,305
1987	66	173	6	8	106	35	74	279	41	394	3,207	387	45	3,639
1988	74	146	6	1	141	45	75	287	51	413	2,434	413	57	2,904
1989	225	207	6	10	281	63	235	488	69	792	3,268	654	73	3,995
1990	597	680	14	12	395	93	609	1,075	107	1,791	3,647	1,309	118	5,074
1991	580	523	14	1	350	84	581	873	98	1,552	3,003	1,028	114	4,145
1992	487	746	14	7	386	87	494	1,132	101	1,727	2,664	1,235	110	4,009
1993[1]	279	447	16	10	267	83	289	714	99	1,102	2,553	853	105	3,511

Table 4.2.1 (cont'd)

Year	Gulf of Finland (Sub-division 32)					Total (Sub-divisions 24-32)		
	Finland			USSR				
	S	S + C	C	S	C + R	S	C + R	GT
1972		138				1,864	298	2,162
1973		135		-		2,179	425	2,604
1974		111		-		2,438	493	2,931
1975		74		-		2,412	596	3,008
1976	81		-	-	14	2,446	603	3,049
1977	75		-	-	13	2,085	554	2,639
1978	68		1	-	6	1,582	454	2,036
1979	63		3	-	4	1,774	364	2,138
1980	51		2	-	7	2,126	381	2,507

Year	Gulf of Finland (Sub-division 32)											(Sub-divisions 24-32) Total			
	Estonia			Finland			Russian Fed.	Total							
	S	C	R	S	C	R	S*	S	C	R	GT	S	C	R	GT
1981	-	2	-	46	1	-	5	51	3	-	54	2,127	437	42	2,606
1982	-	5	-	91	7	-	-	91	12	-	103	1,718	305	34	2,057
1983	-	3	-	163	32	-	-	163	35	-	198	2,003	416	38	2,457
1984	-	5	-	210	42	-	7	217	47	-	264	3,115	483	61	3,659
1985	-	4	-	219	34	2	20	239	38	2	279	3,571	419	49	4,039
1986	24	-	-	270	79	2	28	322	79	2	403	3,087	569	52	3,708
1987	10	-	-	257	61	2	23	290	61	2	353	3,497	448	47	3,992
1988	19	-	-	122	112	2	15	156	112	2	270	2,590	525	59	3,174
1989	36	-	-	181	145	2	37	254	145	2	401	3,522	799	75	4,396
1990	25	-	-	118	369	26	35	178	369	26	573	3,825	1,678	144	5,647
1991	22	-	-	140	398	26	30	192	398	26	616	3,195	1,426	140	4,761
1992	6	3	-	77	415	2	28	111	418	2	531	2,775	1,653	112	4,540
1993[1]	3	1	1	91	373	3	36[2]	130	374	4	508	2,683	1,227	109	4,019

[1]Preliminary data.
[2]Estimated from number of salmon and Finnish mean weight per salmon.

Table 4.2.1 (cont'd)

Danish, Finnish, German, Polish and Swedish catches have been converted from gutted to ungutted weight by the factor 1.1. Estonian, Latvian, Lithuanian and Russian Federation catches are reported ungutted.

Sea trout are included in the sea catches in the order of about 3% for Denmark (before 1983), Estonia, Germany, Latvia, Lithuania and Russian Federation, about 5% for Poland and about 10% for Finland.

Based on an inquiry in 1990 non-professional catches in 1990, 1991 and 1992 are included in the Finnish landings from Sub-divisions 29-31 and 32 fixed to an annual quantity of 106 t and 156 t respectively.

Estonia sea catches in Sub-division 32 in 1986-1991 include an inconsiderable quantity of coastal catches.

An estimate of a fishery previously not included in the Hanö Bay area, Sub-division 25, have from 1993 been included in the statistics. These estimates are 7 tonnes, 1,400 individuals coastal catch, 10 tonnes 2,000 individuals sea catch.

Table 4.3.1 Annual nominal landings (tonnes) of SEA TROUT in the Baltic.

Year	Baltic Main Basin										Gulf of Bothnia				Gulf of Finland		Total
	Denmark[1,4]	Estonia	Finland[2]	Germany[4]	Latvia	Poland		Sweden[4,6]			Finland[2]	Sweden[6]			Estonia	Finland	
	S + C	C	C	C	C	R	S + C	S	C	R	C	R	C	S	C	C	
1979	3	-	10	-	-	24	81[3]	-	-	3	6	-	-	-	-	73	200
1980	3	-	11	-	-	26	48[3]	-	-	3	87	-	-	-	-	75	253
1981	6	-	51	-	5	21	45[3]	-	-	3	131	-	-	-	2	128	392
1982	17	-	52	1	13	31	80	-	-	3	134	-	-	-	4	140	475
1983	19	-	50	-	14	25	108	-	-	3	134	-	-	-	3	148	504
1984	29	-	66	-	9	30	155	-	-	5	110	-	-	-	2	211	617
1985	40	-	62	-	9	26	140	-	-	13	103	-	-	-	3	203	599
1986	18	-	53	-	8	49	91	7	9	8	118	-	24	1	2	178	566
1987	31	-	66	-	2	37	163	6	9	5	123	-	26	1	-	184	653
1988	28	-	99	-	8	33	137	7	12	7	196	42	44	-	3	287	903
1989	39	-	156	18	10	35	149	30	17	6	215	37	78	1	3	295	1,089
1990	48[3]	-	189	21	7	100	388	15	15	10	318	43	71	-	4	334	1,563
1991	48[3]	1	185	7	6	37	272	26	24	7	349	54	60	-	2	295	1,373
1992	27[3]	1	173	-	6	60	221	103	26	1	350	48	71	-	8	314	1,402
1993[5]	59	1	386	14	17	70	202	125	21	2	150[7]	43	47	-	14	704[7]	1,855

[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 in 1979-1992.
[3]Rainbow trout included.
[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]Finnish landings include about 85% non-commercial catches in 1993.

REPORT TO THE NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION COUNCIL

Sources of information: Reports of the Working Group on North Atlantic Salmon, April 1994 (ICES, Doc. C.M. 1994/ Assess:16) and the Study Group on Interactions of Wild, Ranched (Enhanced) and Reared Salmon, April 1994 (ICES, Doc C.M. 1994/M:3)

The following report is laid out in the format of the questions from NASCO to ICES (Appendix 1).

1. EVENTS OF THE 1993 FISHERIES AND THE STATUS OF STOCKS BY COMMISSION AREAS

1.1 Overview of catches in the North Atlantic

1.1.1 Nominal catches of salmon in the North Atlantic

Nominal catches of salmon by country in the North Atlantic for 1960-93 are shown in Table 1.1.1 and catches by NASCO Commission Areas for 1988-93 are summarised below (in tonnes).

Area	1988	1989	1990	1991	1992	1993
NEAC	5507	4412	3748	2936	3361	3195
NAC	1314	1143	915	713	525	369
WGC	897	338	275	476	232	-
Total	7718	5893	4938	4125	4118	3564

Figures for 1993 are provisional, but it appears likely that the final data will still show a decrease from 1992. This is the sixth year in which the total catch has decreased from the previous year. Management plans in several countries have reduced fishing effort and this accounts for some of the decline in catches. However, a greater decline in the catch of wild fish may be masked by the inclusion of fish farm escapees and ranched fish in the statistics.

1.1.2 Unreported catches

The total unreported catch within NASCO Commission Areas in 1993 was estimated to be 1644t, a decrease of 26% compared with the 1988-92 five-year mean of 2212t. Estimates for 1988-1993 by Commission area are given below (in tonnes):

Area	1988	1989	1990	1991	1992	1993
NEAC	3087	2103	1779	1555	1825	1471
NAC	161	174	111	127	137	161
WGC	N/A	N/A	N/A	N/A	N/A	12
International waters	-	-	180-359	25-100	25-100	25-100

Many of the national estimates are based upon the level of declared catches, and thus the total unreported catch tends to vary in line with the nominal catch figures.

1.2 Fisheries and stocks in the North-East Atlantic Commission (NEAC) Area

1.2.1 Fishery at Faroes

Gear and effort: In accordance with the agreement between the Faroese Salmon Fishermen's Association and the North Atlantic Salmon Fund, commercial fishing for salmon in Faroese territorial waters was suspended for the years 1994 to 1996.

A research fishery for salmon took place in the Faroes area in the 1992/93 season and the gear used was the same as in previous seasons. One research vessel fished a total of 39 sets on 3 trips during the season. There has been a progressive decline in the number of vessels operating in the fishery since 1981 (Figure 1.2.1).

Catch: The total catch in the research fishery in the 1992/93 season was 22 t, and the preliminary catch for the calendar year 1993 was 21 t excluding fish that were tagged and released (Table 1.1.1, Figure 1.2.1). The proportion of fish less than 60 cm (that would normally have been discarded) was 9.4 %, which is within the range observed since the 1982/83 season.

CPUE (Catch per unit effort): The average CPUE was the highest recorded since the 1981/82 season (Figure 1.2.2). However, it is difficult to compare this with other years as only one boat was fishing in the last two seasons. The high incidence of farmed fish in the fishery will also have affected the CPUE.

Composition of catch: Marked differences were observed in the river and sea age composition and size distribution of catches between the autumn and spring in the 1992/93 season. This suggests that different stocks were being exploited at these times, with stocks from more southerly areas probably being taken in the autumn. The incidence of reared fish is discussed in Section 4.

Origin of the catch: External tags (ext.) and CWTs were recovered from countries regularly represented in the tag recovery programmes in the past, namely: Norway (58 ext.), Sweden (7 ext.), Ireland (12 CWT) and UK (England and Wales) (2 CWT).

A total of 3667 salmon have been tagged and released in the open sea to the north of the Faroe Islands in the 1992/93 and 1993/94 seasons. After one fishing season (i.e. 1993), 51 recaptures have been reported by commercial fishermen and anglers in homewater fisheries as shown below:

Country	No. Recaptures	%
Norway	31	61
Sweden	3	6
Scotland	8	16
England	1	2
Ireland	3	6
Iceland	1	2
Spain	1	2
Denmark	2	4
Canada	1	2
No. released	1991/92: 3050	
	1992/93: 617	

The pattern of recaptures confirms earlier information that the majority of the salmon in the Faroes area originate from Norway. It appears that the recapture rate for farmed fish may be considerably lower than for wild fish.

Exploitation rates: Exploitation rates in the Faroes fishery on 1SW fish from monitored stocks in Norway and Sweden and on both 1SW and 2SW fish from monitored stocks in UK and Ireland were very low in the 3 seasons prior to the suspension of commercial fishing and have been less than 1% in the 2 seasons since. Exploitation rates on 2SW fish from Norwegian and Swedish monitored stocks (shown below) have been below 10% since the suspension of commercial fishing.

Country	River	Mean exploitation rate (%)	
		1987/88-1990/91	1991/92-1992/93
Norway	Drammen	25	1
	Imsa (Wild)	7	5
	Imsa (Hatchery)	21	3
Sweden	Lagen	15	8

Biological data: Preliminary results from the stomach analysis of salmon caught in the fishery show that the most important items in the diet were hyperiid amphipods of the genus *Parathemisto* and Euphausiids. The fishes were mainly lantern fishes and *Maurolicus* sp.

1.2.2 Homewater fisheries in the NEAC Area

Gear and effort: Restrictions on rod fishing methods were introduced in two districts in UK (Scotland) in 1993. Decreases in effort in net fisheries were reported in Ireland, Sweden and UK (England and Wales) and UK (N. Ireland). Increases in rod fishing effort were reported in Finland and France.

Catch: In general, catches in the North-East Atlantic Area in 1993 were lower than in 1992, although increases were recorded in a few countries (Iceland, Sweden and UK (England and Wales)) (Table 1.1.1). Catches in Iceland continue to reflect the increasing importance of ranched fish. In a number of areas grilse were reported to have appeared in fisheries later than usual, and there were observations of substantial numbers of fish entering rivers after the end of the fishing seasons in some countries. (Unreported catches in the NEAC Area are discussed in Section 1.1)

CPUE: CPUE data were available for a limited number of fisheries/countries. CPUE in rod fisheries in France and Finland were higher in 1992 and 1993 than in previous years and a similar pattern has been evident for the River Bush (UK, N. Ireland). Finnish catch rates have benefited from the closure of the Norwegian coastal fisheries while the Bush has been supplemented by ranching. CPUE data were also available for regional net fisheries in UK (England and Wales) and showed an improvement in catch rates in 1993 after a steady decline from 1988-92. Long-term CPUE data for net fisheries in UK (Scotland) suggest that catch rates increased from 1950-70 but have declined since.

Composition of catch: Finland, Russia and Sweden reported decreases in the proportions of grilse in their catches. Elsewhere, however, there was a perception that the grilse component of catches was increasing.

Origin of catch: Table 1.2.1 indicates the estimated origin (in %) of the 1992 catch in each country. Percentages can only be estimated where countries have suitable monitoring programmes. Where catches are known to occur but percentages could not be estimated they are indicated by a '+'. The results, although very approximate, confirm that there are exchanges between fisheries in most adjacent countries, particularly Ireland and the countries of the UK. The table also shows estimates of the proportions of the catches in 1992 that were of ranched and farmed origin (see also Section 4).

Exploitation rates: Exploitation rates for monitored stocks in homewater fisheries in the NEAC area in 1993 were generally within the ranges observed between 1988 and 1992 and less than the means for that period (Table 1.2.2). The main exceptions were the Itchen (UK, England & Wales) and Ponoy (Russia), where net exploitation rates were greatly reduced in 1993, and the Imsa and Lagan, where exploitation rates on 1SW hatchery fish were the highest for at least five years.

1.2.3 Status of stocks in the NEAC Area

Short-term: 1993

Comparison of recruitment and escapement indices for 1993 from monitored rivers in the NEAC area gave variable results. In Russia, 1993 seemed to be an average year in terms of adult returns. In Scandinavia and western Europe, smolt output seemed to be relatively poor (in all but one case output was below the long-term average), while adult counts were fairly high, some rivers being close to or at the maximum level on record. There were, however, some notable exceptions, with counts on 3 rivers being near the minimum

recorded. In addition, it must be noted that the good returns appeared to be mainly attributable to the 1SW fraction of the stocks. If survival at sea does not increase significantly, the low levels of smolt production observed in 1993 will have a negative impact on grilse returns in 1994 and on returns of 2SW salmon in 1995.

Indices of marine survival for wild 1SW fish, before exploitation in coastal waters, were higher in 1993 than in 1992 in 3 out of 4 cases, while falling within the range of values observed in the past. Information on salmon of hatchery origin confirmed the general improvement of sea survival of 1SW fish. When compared with previous years' data, return rates of 2SW salmon showed variable results depending on the river and on the origin of the fish (wild or reared); average return rates remained low.

Long-term trends

Smolt counts in Scandinavian and West European stocks do not seem to have followed any common trend over the past 5 and 10 years. However, except in Russia, adult returns have tended to improve in rivers for which counts are available. Sea survival of 1SW fish has decreased over the last decade, but this was probably outweighed by a reduction in exploitation rates in coastal waters. No common trend can be detected for survival at sea of 2SW salmon.

Optimum spawning levels

The use of optimum salmon spawning stock levels in the north-east Atlantic would be a valuable tool in assessing the status of stocks and ensuring that quotas can be set at a level which will allow sufficient spawning escapement to maximise smolt production. There is also a need to develop regional estimates of spawning stocks in the north-east Atlantic for use in stock assessments.

1.2.4 Data deficiencies and research needs for the NEAC Area

ACFM identified three areas where there was a particular need for work in the NEAC Area in the next year:

- effort should be made to improve the methods used to estimate unreported catches;
- provisional optimal spawning levels should be developed for appropriate monitored rivers, (at least one river per country) and historical and current attainment with respect to these spawning targets should be assessed;
- work should be carried out to develop models for use in the provision of catch advice in relation to stock abundance for European stocks.

1.3 Fisheries in the North American Commission (NAC) Area

1.3.1 Fisheries in NAC Area

Canada

Gear and effort: The moratorium on the commercial fishery in Newfoundland continued in 1993. Quotas were reduced in commercial fisheries in parts of Labrador and Quebec. Quotas and daily catch limits were also reduced in rod fisheries and some rivers were closed to rod exploitation for all or part of the season. Further details of the 1993 management restrictions are given in Appendix 2. There were no changes in gear used in Canada.

Catch: The total salmon landings for Canada in 1993 were 367t, which was the lowest recorded since 1960 (Table 1.1.1). The landings of small and large salmon were 36% and 44% of the previous 5 year averages respectively. The decline in catches from 1593 t in 1987 has been influenced by the closure of fisheries in SFAs 3-14A in 1992 and the general decline in population size. Figure 1.3.1 shows the 1993 rod catches in each SFA as a percentage of the quota. Recreational catches of both small and large fish have generally decreased or remained stable. Unreported catches are discussed in Section 1.2.

Composition and origin of catch: Only salmon of Canadian and USA origin were recorded in Canadian catches in 1993. CWTs were recovered from 1SW salmon from USA (7) and Canada (2) in Labrador (31% of the catch was scanned). Only one Carlin tag from a Maine-origin salmon was reported from Canada in 1993. Catches of farmed fish are discussed in Section 4.

USA

Gear and effort: There were no changes in gear used in 1993. In 1993 the season limit in boundary waters with Canada was made consistent with all other Maine waters (i.e. 1 fish/angler/season).

Catch: The total harvest of 152 salmon in the Maine sport fishery in 1993 was 21% lower than in 1992 and 58% lower than the 1988-92 average. The decrease was attributed to reduced runs and restrictive management measures.

Composition and origin of catch: All salmon caught were of local origin and no salmon of farmed origin are known to have been taken.

Exploitation rates: The average exploitation on combined age classes in the Penobscot River in 1993 was 7.4%, which was approximately equal to that in 1992.

France (Islands of St. Pierre and Miquelon)

The catch of salmon for the Islands of St. Pierre and Miquelon in 1993 was 1.8 t, which was similar to previous years.

1.3.2 Status of stocks in the NAC Area

Stock abundance and stock status were quite variable within the NAC Area. Populations of small and large salmon (mostly measured as returns to rivers) were lower than in 1992 for most stocks in New Brunswick, Nova Scotia, Québec Zones Q1-8, Q10 and Q11, Labrador (SFA 1,2) and Maine. Increased population sizes were observed in Newfoundland SFA 3-5, 14A, Labrador SFA 14B and Québec Q9. Population sizes were similar to 1992 in Newfoundland SFA 6-13 and in the Miramichi R (large salmon only).

Although the population sizes have increased in many northern Newfoundland rivers in 1992 and 1993, they are still lower than observed in years prior to the moratorium. Generally, the population sizes of large and small salmon in rivers in Canada and USA were lower than expected given that 1993 is the second year of the closure of the Newfoundland commercial fisheries. There is evidence that the marine survival rates have been unusually low for the past several years which may have off-set the reduction in fishing mortality.

Estimates of egg deposition were provided for 20 rivers in Canada and 3 rivers in Maine for which targets are available (Figure 1.3.2). Of the Canadian rivers 55% (12) had less than 75% of their target spawning levels and 35% of the rivers exceeded their target levels. The other 10% of the rivers were between 75 and 100% of the target. All of the Maine rivers had less than 20% of their target spawning levels. USA salmon production remains hatchery dependent. Data from the Penobscot reveal a progressive decline in marine survival for MSW fish (Figure 1.3.3). The salmon stocks in SFAs 1, 2, 19-23 and Maine appear to be at very low levels and ACFM recommends that fishing mortalities on these stocks should be kept as low as possible.

1.3.3 Data deficiencies and research needs for the NAC Area

ACFM identified the need for:

- spawning targets for North American stocks to be further refined as additional information on sea age composition of spawners becomes available and as further understanding of life history strategies is gained.

1.4 Fishery in the West Greenland Commission (WGC) Area

1.4.1 Fishery at West Greenland

In accordance with the agreement between the Organisation of Hunters and Fishermen in Greenland and the North Atlantic Salmon Fund, all fishing for salmon in Greenland territorial waters was suspended for the two years 1993 and 1994. The agreement allowed for a small subsistence harvest of 12 t each year. Salmon caught in the subsistence fishery could not be sold to factories, marketing associations or for export.

No information is available on the 1993 harvest either for the actual catch or the catch composition.

1.4.2 Status of stocks in the WGC Area

The salmon caught in the West Greenland Area are non-maturing 1SW salmon or older fish, all of which would return to homewaters in Europe or North America as MSW fish if they survived. The most abundant European stocks in West Greenland are thought to originate from the UK and Ireland. The MSW component of most 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. Thus the overall status of the stocks and stock components contributing to the West Greenland fishery remains poor. (See Sections 1.2.3, 1.3.3 and 3.4 for information on stocks contributing to the fishery)

1.4.3 Data deficiencies and research needs for the WGC Area

Until 1992, a sampling programme was conducted in the West Greenland commercial fishery in order to provide data on the stocks in the area. With the suspension of commercial fishing sampling became impossible.

ACFM therefore identified the need for:

- a research programme including experimental fishing should be undertaken at West Greenland to provide up-to-date information on the parameters necessary to assess the stocks in the area.

2. EVALUATION OF EFFECTS OF NEW MANAGEMENT MEASURES ON STOCKS AND FISHERIES.

2.1 Quota management measures and closures implemented after 1991 in the Canadian commercial salmon fisheries

Effects on Canadian Stocks and Fisheries

ACFM evaluated the effects of the management measures taken in coastal waters of insular Newfoundland by estimating the total returns of salmon to the area and estimating the increased numbers of salmon that returned as a result of the management measures. These estimates are summarised below:

Year	Angling catch	Total returns	Increase in returns	
			Small salmon	Large salmon
		(,000)	(,000)	(,000)
1992	36,926	123-246	62-123	12-24
1993	42,623	142-284	71-142	5-11

The management changes resulted in an increase in the proportion of large salmon from 6% (1987-91) to 9% (1992-93) as evident from counts of salmon at fish counting facilities.

In Labrador, the small reductions in effort in 1992 are unlikely to have significantly reduced the exploitation rate of salmon in the commercial fisheries. Since the quotas were not attained in either 1992 or 1993, this quota measure did not put any restrictions on the fishery and did not affect returns to rivers. However, the combined licensed effort reduction in 1992 and 1993 was 60% of the 1991 licensed effort, which should have reduced the commercial exploitation on Labrador salmon stocks and may have resulted in a doubling of the returns of small and large salmon to rivers in SFA 2 and 14B.

In zones Q7 and Q8, the commercial exploitation rate in 1990-1992 was calculated to be 3-4% for small salmon and 26-33% for large salmon. The reductions in quota of 98% in 1993 may have resulted in 96 to 187 small salmon and 967 to 1711 large salmon not being caught assuming that the same exploitation rates as in 1990-92 would have applied in 1993 with no management change.

Although the Newfoundland and Labrador commercial salmon fisheries used to harvest small and large salmon with origins in Nova Scotia, New Brunswick, and Québec, the increase in returns to these provinces cannot be quantified.

The moratoria on the commercial cod fishery in Canada in 1992 and 1993 would have reduced the by-catch of salmon.

Effects on USA stocks

ACFM estimated the effects of the 1992 salmon fishery moratorium in Canada upon Maine stocks by estimating the average harvest during the base period 1984-1989 in the SFAs affected. On this basis it was estimated that the harvest of Maine-origin salmon in Canada was reduced by 67%. Given the documented presence of Merrimack and Connecticut river-origin salmon in Labrador, similar reductions in the harvest of these stocks would have been expected.

2.2 Effects of the suspension of commercial fishing activity at Faroes

Assuming that monitored stocks have been relatively stable over the past four years, the suspension of commercial fishing at Faroes should have reduced exploitation in the Faroes fishery to about 10% of the levels in the previous three seasons. In practice, there was a significant reduction in the exploitation rate on 2SW fish from R. Imsa and R. Lagan from a mean of 18% in the 1988/89 to 1990/91 seasons to 5% in the 1991/92 and 1992/93 seasons (see Section 1.2.1). In most years, exploitation rates on both 1SW and 2SW fish from UK and Ireland have been very low and the effects of the buy-out are therefore difficult to detect.

The estimated reduction in returns to all homewaters that might have been expected in 1993 if the full quota in Faroese waters (550 t) had been taken in the 1991/92 and 1992/93 seasons were as follows:

Age/Origin	Estimated reduction in returns if quota had been taken
Wild 1SW	9,000
Wild 2SW	48,000
Wild 2SW+	38,000

In addition, the fishery would have taken an extra 94,000 fish of farmed origin in these two seasons. It is not possible to project the return rates to home waters for these fish.

The expected increases in total returns to all homewaters and in stock in Scandinavia, Finland and Russia in 1993 resulting from the reduction in Faroese catches in the 1991/92 and 1992/93 seasons compared with the period 1988/89 to 1990/91 were as follows:

Age/ Origin	Increase in total returns	Estimated increase in stocks in Scandinavia, Finland and Russia	
		Number	%
Wild 1SW	2,000	1,200-1,600	<1%
Wild MSW	47,000	28,200-37,600	11-21%

In addition, about 37,000 fewer fish of farmed origin are estimated to have been taken in each season. It is not known how many of these would have returned to homewaters.

The above increases will have been hidden within the annual variation of catches in these countries.

Catches for Ireland, Scotland (large salmon) and Russia (2SW salmon) in 1992 and 1993 were not significantly greater than those in 1987-1991.

3. ADVICE WITH RESPECT TO THE FISHERY IN THE WEST GREENLAND COMMISSION AREA

3.1 Continue development of the model used in providing advice on catch quotas in relation to stock abundance

Models of North American stocks

ACFM has previously provided catch advice based upon a prediction of the pre-fishery abundance using thermal habitat as the independent variable. The time series of thermal habitat data and revised pre-fishery abundance estimates (see Section 3.3) were used to examine further relationships that could be employed to predict pre-fishery abundance in 1994. A number of relationships between habitat and pre-fishery abundance estimates were tested but those with March values of habitat proved the best and were similar to the results provided in 1993.

Although the relationship with thermal habitat is considered to be statistically sound, efforts were made to improve the predictive models. Relationships between pre-fishery abundance of non-maturing 1SW salmon and a combination of wind and thermal habitat variables were therefore examined. The best of the new relationships tested was based upon wind speed in an area to the south west of Greenland in December (year 1) combined with thermal habitat in March (in year 2).

The forecasts of pre-fishery abundance by these models were not in good agreement, and ACFM therefore considered information on the maturing 1SW component of the stock in 1993 as an independent means of evaluating the two approaches. The pre-fishery abundance for all North American non-maturing 1SW fish was shown to be correlated to the grilse returns in some SFAs in Canada. This relationship could therefore be used to estimate the pre-fishery abundance of non-maturing 1SW fish in 1993 from the grilse returns in the same year. This estimate of pre-fishery abundance was in good agreement with the forecast from the thermal habitat model but not from the model based on wind and thermal habitat model. ACFM therefore considers the thermal habitat model used in 1993 to be more supportable.

Models of European stocks

ACFM reviewed work in progress towards the development of European models for the provision of catch advice. A number of studies of European stocks have revealed similar correlations between stock abundance and environmental conditions to those currently used for North American stocks. ACFM therefore recommends that work should carried out to develop models for use in the provision of catch advice in relation to stock abundance for European stocks.

3.2 Estimate the pre-fishery abundance of non-maturing 1SW salmon at the time of the fishery

ACFM updated the databases used in the North American run-reconstruction model to derive revised estimates of pre-fishery abundance for 1974-92. Although the exact error bounds for the estimates of pre-fishery abundance are unknown, minimum and maximum values of catch and return data have been estimated and give minimum and maximum estimates of the pre-fishery abundance (Figure 3.2.1). The new estimates are slightly lower than reported in 1993, but the differences are minor and become smaller in more recent years. The new pre-fishery abundance estimate (mid-point of range) for 1992 was the lowest in the 19 year time series with a range between 120 and 224 thousand salmon; the upper value of this range was less than the lower bound for 1991. These results suggest a continuing downward trend in pre-fishery abundance for North American MSW stocks.

The thermal habitat model presented in 1993 was used to forecast the pre-fishery abundance of non-maturing 1SW salmon for 1993 and 1994:

Year	Pre-fishery abundance forecast
1993	243,043
1994	280,028

3.3 Provide catch options with an assessment of risks relative to the management objective of achieving various levels of target spawning escapement

The goal in Atlantic salmon management is to ensure that there are adequate numbers of spawners in each river. In mixed stock fisheries this may be difficult owing to varying migration patterns and exploitation rates experienced by individual stocks. Nonetheless, a composite spawning target of 193,741 2SW salmon has been defined for North America by summing the spawning targets of Salmon Fishing Areas and Zones in Canada and river basins within the USA.

To achieve this spawning target, a reserve of fish must be set aside prior to fishery allocation in order to allow for natural mortality in the intervening months between the fishery and spawning migration. Thus, 216,270 (i.e. 193,741/exp*(-.01*11)) fish must be reserved before the fishery to ensure achievement of the target after allowing for natural mortality.

This reserve is subtracted from the appropriate forecast of the pre-fishery abundance to give the harvestable surplus of North American non-maturing 1SW fish. This surplus may be taken at West Greenland as 1SW fish or in Canada as 1SW fish in the same year or 2SW fish in

fish in the following year. In the latter case, natural mortality will reduce the numbers of fish that may be harvested.

The proportion of the allowable harvest of North American fish to be allocated to West Greenland ($F_{(NA)}$) must be set by managers. This then allows the number of North American fish which may be caught at West Greenland to be calculated. This can then be converted to a total catch quota in tonnes by converting the numbers to weights and adding the catch of European fish and of fish older than 1SW that are expected to be taken at the same time. The formulae for this process are given in Appendix 3.

Estimates of the parameters used in the assessment (PropNA, WT1SWNA, WT1SWE and ACF) (see Appendix 3) were obtained by simple exponential smoothing of the observed 1978-92 values, as no new data were available for 1993. These estimates are given below:

Parameter	Forecast for 1993
PropNA	0.540
WT1SWNA	2.525
WT1SWE	2.660
ACF	1.121

The probability density function of this forecast was estimated and is shown as a cumulative function below:

Cumulative Density Function (%)	Forecast
25	182,500
30	203,750
35	225,000
40	242,000
45	263,250
50	280,250
55	297,250
60	318,500
65	335,500
70	356,750
75	378,000

The probability density function of the pre-fishery abundance forecast (Section 3.2) gives the probability of the true stock abundance being lower than the value selected. For example there is a 35% chance that the pre-fishery abundance will not exceed 225,000 fish. The probability level also provides a measure of the chance of reaching escapement targets assuming fishery allocations are taken without error. The probability levels associated with certain reference points can be classified into broad categories termed "risk neutral", "risk averse", and "risk prone". The mid-point estimate of the forecast represents a reference point at which there is a 50% chance that the true abundance is lower than required to achieve the spawning target. This level is termed the "risk neutral" forecast. Likewise, the forecast value at the 25th percentile, or the value with a 25% chance that the abundance is lower, is the "risk averse" forecast. The forecast value at the 75th percentile, or the value with a 75% chance that the abundance is lower, is the "risk prone" forecast. ACFM considers that it is important to proceed cautiously by using the mid to lower part of the range of predicted abundance levels for management decisions.

In Table 3.3.1, the West Greenland quota is computed for a range of pre-fishery abundance values between interquartile limits of the probability density function and for different values of $F_{(NA)}$. For the mid-point estimate level (i.e. 50% level), the quota options range from 0 to 344t.

ACFM notes that the risk neutral approach only ensures that there is a 50% chance that the spawning escapement in North America will exceed the target level for all rivers combined. Even if this overall target is achieved, it is likely that some stocks will fail to meet their individual target spawner requirements while others will exceed target levels (Figure 1.3.2). This may result from random variation between years or from systematic differences in the patterns of exploitation on fish from different rivers or regions. In the latter case, adoption of a risk-neutral approach may result in some stocks failing to meet target levels over an extended period. This would be likely to result in the long-term decline in those stocks. If the objective is to meet the spawning target in every river, then the 50% level will not be adequate and some lower value should be chosen.

The assessment models used for the provision of catch advice are based almost entirely upon data for North American stocks. While it is believed that European stocks are generally less vulnerable to the West Greenland fishery than North American stocks, there has been evidence of a more rapid decline in these stocks, in the West Greenland area at least, than the North American stock. ACFM therefore emphasised the importance of developing similar assessment methods for the stocks in the North-East Atlantic area.

3.4 Describe which stocks make the greatest numerical contributions of salmon to the fishery

Within North America and Europe, there are large numbers of salmon rivers which produce MSW salmon that may contribute to the West Greenland fishery. However, it is not possible to determine the absolute or relative contribution of each stock to the fishery in the absence of stock identification information for West Greenland nor accurate return information for all stocks. This information could not be obtained without a very extensive research programme.

In recent years, estimates based on the smolt age composition of catches suggest that approximately 10% of the catch of North American fish at West Greenland comes from United States rivers and hatcheries and one Canadian hatchery (Mactaquac); about 75% come from Southern stocks (SFA5-23, Q1-7, and Q10); and about 15% come from Northern stocks (Q8-9, Q11, SFA1-4).

Crude examination of river age distributions of European salmon in the West Greenland fishery suggests that wild stocks in northern Norway, Finland and Russia are relatively poorly represented in comparison with stocks from UK, Ireland and southern Europe.

3.5 Evaluate the relationship between spawning escapement and subsequent pre-fishery abundance

Published studies on monitored stocks in the North Atlantic have demonstrated stock and recruitment relationships for Atlantic salmon. These relationships indicate that, below optimal spawning stock levels, reducing the number of spawners would be expected to decrease the production of smolts. However, increasing the number of spawners above these levels will not improve smolt production.

The relationships established between pre-fishery abundance and various environmental parameters suggest that environmental conditions influence the survival of salmon during the first year in the sea (i.e. smolt production to pre-fishery abundance). These relationships have been established assuming that natural mortality after the first year in the sea is relatively low and stable. It is apparent that the environmental influences may mask the relationship between spawning escapement and pre-fishery abundance. This will make it difficult to demonstrate these effects, although they are most likely to become apparent at low stock levels.

4. IMPACTS OF FISH FARM ESCAPEES AND SEA-RANCHED FISH

4.1 Evaluate the abundance of fish farm escapees and sea-ranched fish in fisheries and rivers

4.1.1 Faroes fishery

Scale samples collected at Faroes have been examined to estimate the proportion of the catch that was of farmed origin:

Season	% farmed
1982/83	1
1985/86	4
1989/90	44
1990/91	42
1991/92	37
1992/93	27

It appears that the occurrence of escapees in the Faroes fishery has paralleled trends in production of farmed salmon, being low in the early 1980's and peaking during the early 1990's.

4.1.2 West Greenland fishery

The proportion of escaped farmed Atlantic salmon at the feeding grounds at West Greenland was estimated to be 1.1% in 1991 and 1.4% in 1992.

4.1.3 Homewater fisheries and rivers in the NEAC Area

Ranched fish have comprised between 70 and 75% of the catch in Iceland for the past three years and in Sweden between 35 and 50% of the catch has been made up of released fish that are not expected to contribute to natural spawning stocks.

The proportion of farm escapees in homewater fisheries is greatest in areas where there are large numbers of salmon farms (e.g. Norway and west coast of UK (Scotland)). In Norway, the occurrence of farmed salmon in catches in coastal fisheries in 1993 (47%) was comparable to that in previous seasons, while a 20% contribution to catches in fjord fisheries was comparable to that in 1992 but higher than the 1989-1991 average (13%). Data from 1993 from UK (Scotland) were similar to previous years, with highest proportions of farmed fish being reported in catches in the north and west coastal fisheries (20-37%) and much lower proportions being seen in the larger east coast fisheries and in the south-west (0-3%). These data reflect the geographical location and extent of salmon farming in those countries.

Farmed salmon are believed to occur in most other countries in the north-east Atlantic, but contributions to fisheries are thought to be low (Table 1.2.1). There have been no records of farmed fish in catches in France, Russia and UK (England and Wales). In Ireland less than 2% of catches were estimated to be of farm origin although this may be an underestimate.

Data on the contribution of farmed salmon to spawning stocks in the NEAC Area were available from Norway, UK (Scotland) and UK (N. Ireland). In Norway, sampling of rod catches and broodstock in numerous rivers indicated that in 1993 about 4% of rod catches and 21% of broodstock comprised farmed salmon. Both figures are lower than previously observed. In UK (N Ireland) 0.5% of fish entering the River Bush were of farm origin. No new data are available on the incidence of fish farm escapees or their progeny in freshwater in UK (Scotland), but it is likely that these fish contribute to spawning populations in some rivers on the west coast in particular.

4.1.4 Homewater fisheries and rivers in NAC Area

Salmon returning to the Mactaquac hatchery on the Saint John River (SFA 23) were monitored in 1990, subsequent to a purported loss of 16000-20000 fish from sea-cages. There were 221 fish identified as being of sea-cage origin, based on scale patterns and fin conditions, out of a total of 3919 large fish counted at the fishway, approximately 6% of the return.

The incidence of farm fish in the Magaguadavic River, Canada (SFA 23) since 1992 is shown below:

Year	1SW	% farm origin	MSW	% farm origin
1992	238	35	201	31
1993	208	46	177	29

4.2 Evaluate the genetic, disease and parasite, ecological and environmental impacts of fish farm escapees and ranched fish on wild stocks

4.2.1 Genetic impacts

Enhanced, ranched and farmed salmon have the potential to interact genetically with wild fish altering the natural balance of genetic population structure through the following mechanisms:

- relaxation of competition/selection;
- inadvertent or passive selection;
- selective breeding;
- genetic drift;
- transfer of non-local stocks.

These factors will be further affected by the number of fish released or escaping into the wild, the stage at which they enter the wild and their relative fitness. The factors would normally be expected to reduce fitness, and it has generally been observed that cultured fish are reproductively inferior. Although this will tend to reduce the impact on wild stocks, short-term adverse effects may still result from single interactions. Repeated interactions in succeeding generations will complicate the assessment of the effects.

Genetically modified salmon may become available for use in aquaculture in the future. The full implications for wild salmon stocks will need to be assessed. The use of triploid stocks in salmon rearing would reduce possibilities for genetic interaction with wild fish.

4.2.2 Disease and parasite impacts

Most of the disease organisms present in farmed salmon are also present among wild fish. However, the aquaculture industry has been responsible for introducing diseases and parasites into some areas with serious detrimental effect on wild stocks. Examples include the introduction of *Gyrodactylus salaris* and furunculosis into Norway. Although wild fish are thought to be more likely to act as a reservoir of diseases for farmed fish than vice versa, the high frequency of diseases on farms and the concentrations of pathogens have the potential to cause outbreaks of diseases in wild fish populations.

Insufficient information is available to assess the risks of disease/parasite interactions.

4.2.3 Ecological and environmental impacts

Reared fish may cause the following ecological and environmental impacts on wild stocks:

- predator attraction and increased predation rates where reared or ranched fish are present among wild fish;
- inadvertent harvesting of wild fish among ranched salmon where groups occur together near the harvesting site;
- local degradation of natural freshwater habitat caused by effluent from freshwater rearing units.

These mechanisms have not been widely explored. Some effects may extend to other species and may be to the detriment of the genetic population structure in both species.

4.3 Evaluate the impacts of current hatchery practices on wild stocks

With the information available ACFM were not in a position to assess the impacts of current hatchery practices on wild stocks.

5. EVALUATE GRILSIFICATION MECHANISMS AND ASSESS THE IMPACT THAT GRILSIFICATION MAY HAVE ON STOCK ABUNDANCE AND FUTURE SPAWNING REQUIREMENTS

ACFM considered the differing trends that may be observed in the proportion of stocks that mature as 1SW fish. No trend was evident in the proportion of grilse in returns from the River Figgjio (Norway) (1965-91). In the North Esk (UK, Scotland) the proportion of grilse in catches has increased from about 25% in 1952 to about 60% in 1992, while in the Bush (UK, N. Ireland) the proportion of grilse has decreased during the period 1974-91.

In Iceland short-term changes in grilse/salmon ratios could be explained by changes in marine conditions. Climatic changes also appeared to be responsible for long-term changes in the sea-age composition of Icelandic stocks examined, although stocks from different areas were differently affected.

The annual variation in early maturation for a hatchery-dependent stock (Penobscot River, USA) was investigated by comparing scale circuli patterns. In a cohort, the fish with the fastest growth rates tended to return as grilse. It was also found that the maturation fraction was significantly and positively correlated with late summer growth, suggesting that growth during this season is central to the determination of the proportion of a smolt class that matures as grilse.

6. EVALUATE EVIDENCE FOR RECRUITMENT OVER-FISHING OCCURRING ON ATLANTIC SALMON POPULATIONS

The level of recruitment to the fishery each year is dependent on the environmental and ecological conditions experienced by the young fish between the time they are spawned and when they become available to the fishery. Since these conditions are variable, recruitment is also variable and does not appear to be simply proportional to the size of the parent stock. There must, nevertheless, be a level of spawning stock below which recruitment will be affected as a result of low egg production. The likelihood that the stock will fall below this level depends on both natural and fishing mortality. Stocks that have been reduced below this level by fishing are said to be suffering from 'recruitment overfishing'.

Whereas time-series of stock and recruitment data are available for some salmon stocks the levels of fishing mortality are not generally known. Without these values it is not possible to assess the impacts of fishing mortality on the spawning stocks.

ACFM therefore considered evidence from a number of salmon stocks for cohorts of spawners failing to replace themselves in succeeding generations as a result of fishing. While, this may occur at any level of spawning escapement, it is only likely to be a matter of concern when this replacement failure occurs with some regularity. Overfishing of this form may be considered by examining spawner to spawner relationships on both a regional basis and for individual rivers. Spawner to spawner relationships were derived in two ways, by estimating the number of spawners of a given sea-age either producing or produced by the spawner cohort of the same sea-age in each year. The results are summarised in Table 6.1.

Only the 2SW stocks in the Gulf Region (Canada) have tended to be above replacement level. This result suggests that these stocks should have an ability to increase rapidly should environmental conditions become favourable. Stocks in most other areas appear to be replacing themselves, even when they are below target levels. However, 2SW stocks in Labrador have been below replacement level throughout the period suggesting that they are being seriously overfished.

Several distinct patterns were readily apparent for the individual stocks. In most instances spawner to spawner relationships for grilse were stable with about a 50:50 split between points above and below the replacement line. This pattern held even in stocks where MSW spawners were consistently below target levels. For example, grilse spawners exceeded replacement in 10 of 23 years for the North Esk (UK (Scotland)) (Figure 6.1) whereas 3SW spawners were below replacement in 18 of 22 years. In contrast, spawner recruits for the Nordura River stock (Iceland), which is fished only in the river, were evenly distributed around the replacement line for both grilse and MSW salmon (Figure 6.2). This was also the pattern seen for many North American stocks such as the River de la Trinite (Figure 6.3).

7. EVALUATE THE PROSPECTS OF DEVELOPING PREDICTIVE MODELS OF ANNUAL MIGRATION AND DISTRIBUTION OF ATLANTIC SALMON STOCK COMPLEXES

ACFM considered an Atlantic salmon migration model intended to explore the relative role that different factors play in migration. The model simulates the movement of individual fish through sea surface temperature and surface current fields of the North Atlantic.

The initial results from the model were encouraging with the simulated distribution of fish originating in North America being in general agreement with known data from marine surveys and fisheries (Figure 7.1).

The model as it is presently formulated can be used to evaluate the role of temperature and currents in defining the transoceanic migration of Atlantic salmon. However, it can only deal with the directed movement of salmon related to other cues, such as geomagnetic or celestial cues, by empirically matching the model output with validation data. The geomagnetic field of the earth, in terms of its properties such as field strength and declination, are known to produce gradients across the North Atlantic. If these properties of the field can be detected by Atlantic salmon, much of the directed movement of the migration could be explained. The model could be modified to allow salmon to orient to geomagnetic field, however, this orientation would have to be parameterized in an arbitrary fashion.

8. EVALUATE THE RESULTS OF THE RESEARCH PROGRAMME AT FAROES

Information derived from the research fishing programme at Faroes is presented in Section 1.2.1.

9. PROVIDE A COMPILATION OF MICROTAG, FINCLIP AND EXTERNAL TAG RELEASES BY MEMBER COUNTRIES IN 1993

Records of tags releases and finclip data were compiled as a separate report. In excess of 1.64 million CWTs and 0.21 million external tags were applied to Atlantic salmon in 1993. In addition, 1.77 million salmon were finclipped, 1.73 million with adipose finclips only.

The compilation of tag releases in 1993 has been issued as CM 1994/M:28.

Table 1.1.1 Nominal catch of Atlantic salmon by country (in tonnes round fresh weight), 1960-1993 (1993 provisional figures).

Year	Canada (5)	Den.	Faroes	Finland	France	East Grld.	West Grld. (7)	Iceland	Ireland (1, 3)	Norway (4, 8)	Russia	St. P. & M.	Sweden (West)	UK E. & W.	UK Scotland	UK N.I.(1,2)	USA	Other (6)	Total Rep Catch	Unreported catches NASCO Areas	Unreported catches Internal waters (9)	'Total Catch
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	1835	710	-	45	318	1736	358	1	-	8650	-		-
1963	1861	-	-	-	-	-	486	145	1456	1788	480	-	23	325	1725	306	1	-	8576	-		-
1964	2069	-	-	-	-	-	1539	135	1817	2147	590	-	38	307	1907	377	1	-	10725	-		-
1965	2116	-	-	-	-	-	861	133	1457	2000	590	-	40	320	1593	281	1	-	9392	-		-
1966	2389	-	-	-	-	-	1370	106	1238	1791	570	-	36	387	1595	287	1	-	9750	-		-
1967	2863	-	-	-	-	-	1601	146	1463	1980	683	-	25	420	2117	449	1	-	11948	-		-
1968	2111	-	5	-	-	-	1127	162	1413	1514	627	-	20	282	1578	312	1	403	9755	-		-
1969	2202	-	7	-	-	-	2210	133	1730	1383	380	-	22	377	1955	287	1	893	11540	-		-
1970	2323	-	12	-	-	-	2148	195	1787	1171	446	-	20	527	1392	287	1	922	11241	-		-
1971	1992	-	-	-	-	-	2869	204	1639	1207	417	-	18	428	1421	234	1	471	10719	-		-
1972	1759	-	9	32	34	-	2113	250	1804	1568	462	-	18	442	1727	210	1	486	10915	-		-
1973	2434	-	26	50	12	-	2341	258	1930	1728	772	-	23	450	2008	182	2.7	533	12746	-		-
1974	2539	-	20	76	13	-	1917	225	2128	1633	709	-	32	363	1708	184	0.9	373	11941	-		-
1975	2485	-	28	76	25	-	2030	266	2216	1537	811	-	26	447	1821	184	1.7	475	12209	-		-
1976	2508	-	40	66	9	<1	1175	225	1561	1530	772	2.5	20	208	1019	113	0.8	269	9536	-		-
1977	2545	-	40	59	19	6	1420	230	1372	1468	497	-	10	345	1160	110	2.4	192	8495	-		-
1978	1545	-	37	37	20	6	884	291	1230	1050	478	-	10	349	1323	148	4.1	138	7650	-		-
1979	1287	-	119	26	10	<1	1395	225	1097	1831	455	-	12	261	1078	99	2.5	193	8069	-		-
1980	2680	-	536	34	30	<1	1194	249	947	1830	664	-	17	360	1134	122	5.5	277	10060	-		-
1981	2437	-	1025	44	20	<1	1264	163	665	1656	463	-	26	493	1233	101	6	313	8929	-		-
1982	1798	-	865	54	20	<1	1077	147	993	1348	354	-	25	286	1092	132	6.4	437	8634	-		-
1983	1424	-	676	56	16	<1	310	198	1658	1550	507	3	28	429	1221	167	1.3	466	8732	-		-
1984	1112	-	628	46	25	<1	297	159	829	1623	593	3	40	345	1013	78	2.2	101	6894	-		-
1985	1133	-	568	49	22	7	864	217	1595	1581	659	3	45	361	813	98	2.1	-	8095	-		-
1986	1550	-	530	37	28	19	960	310	1730	1598	608	2.5	54	430	1271	108	1.9	-	9247	-		9247
1987	1784	-	576	49	27	<1	966	222	1239	1385	584	2	47	302	922	56	1.2	-	8142	2788		10930
1988	1311	-	243	36	32	4	893	398	1874	1076	419	2	40	395	882	114	0.9	-	7716	3248		10966
1989	1139	-	384	52	14	<1	337	278	1078	905	358	2	29	298	895	142	1.7	-	5893	2277		8170
1990	911	13	315	60	15	<1	274	428	586	930	315	2	33	338	624	94	2.4	-	4938	1890	180-350	6828
1991	711	3.3	95	70	13	4	472	505	404	876	215	1	36	200	462	55	0.6	-	4125	1682	25-100	5807
1992	522	10	23	77	20	5	237	635	630	867	166	1.3	49	186	600	89	0.7	-	4118	1962	25-100	6080
1993	367	9	21	70	16	-	-	656	551	895	140	1.8	58	274	424	83	0.6	-	3584	1644	25-100	5208
5YM	919	-	208	59	19	3	443	448	915	931	295	2	38	283	893	99	1	-	5358	2212	-	7570
10YM	1161	-	402	53	21	4	581	335	1162	1237	441	2	40	328	880	102	2	-	6780	-	-	-

5YM - 1988-1992 Mean
10YM - 1983-1992 Mean

1. Catch on River Foyle allocated 50% Ireland and 50% N. Ireland
2. Not including angling catch (mainly 1SW)
3. Includes only those catches sold through dealers.
4. Before 1966, sea trout and sea charr included (5% of total).
5. Includes estimates of some local sales, and, prior to 1984, by-catch.
6. Includes catches in Norwegian Sea by vessel from Denmark, Sweden, Germany, Norway and Finland.
7. Includes catches made in the West Greenland area by Norway, Faroes, Sweden and Denmark for the years 1965-1975.
8. 1993 data are estimated from the average of the previous four years.
9. Estimates refer to season ending in given year.

Table 1.2.1 Percentages of catches in homewater fisheries in the north-east Atlantic originating from different countries and from reared sources in 1992.

Origin of stock		Catch by country									
		Russia	Finland	Norway	Sweden	UK(E&W)	UK(Scot)	UK(NIre)	Ireland	France	Iceland
Wild	Russia	100%	-	+	-	-	-	-	-	-	-
	Finland	-	99%	+	-	-	-	-	-	-	-
	Norway	-	+	75%	6%	-	-	-	+	-	-
	Sweden	-	-	1%	46%	-	-	-	-	-	-
	UK(E&W)	-	-	-	-	62%	+	+	10%	-	-
	UK(Scotlan	-	-	-	-	38%	95%	3%	5%	-	-
	UK(N.Irela	-	-	-	-	+	+	92%	5%	-	-
	Ireland	-	-	-	-	+	+	+	80%	-	-
	France	-	-	-	-	+	+	+	+	100%	-
	Iceland	-	-	-	-	-	-	-	-	-	28%
Reared	Escapees	-	<1%	23%	2%	-	5%	1%	-	-	-
	Ranched	-	-	1%	46% a	-	-	3	<1%	-	72%

'a' = fish released for mitigation purposes and not expected to contribute to spawning.

'+' = catches known to occur but not estimated and thus not included in composition

'-' = catches rare or not known to occur.

Table 1.2.2 Exploitation rates in homewater fisheries in the NEAC area for 1988-92 (mean) and 1993.

Country	River	Wild/ Hatchery	Sea age	Method	Exploitation rate (%)	
					1988-92	1993
Iceland	Ellidaar	W	1	rod	43	41
Ireland	Burrishoole	H	all	total	69	59
Norway	Imsa	W	1	total	51	48
			2	total	69	80
Russia	Ponoy	W	all	total	47	10
	Kola	W/H	all	total	77	79
	Tuloma	W	all	total	49	39
Sweden	Lagan	H	1	total	79	94
			2	total	89	82
UK (England & Wales)	Dee	W	all	rod	12	12
	Itchen	W	all	net	17	0
			all	rod	42	42
	Test	W	all	rod	31	33
UK (Northern Ireland)	Bush	W	1	net	67	41
			2	net	42	12
UK (Scotland)	N.Esk	W	1	river net	27	25
			2	river net	28	19

Table 3.3.1 Quota options (in tonnes) for 1994 at West Greenland based on regression forecasts of fishery abundance. The probability levels refer to the pre-fishery abundance levels derived from the probability density function.

Probability	Proportion of allowable harvest allocated to West Greenland (Fna)										
level	**0**	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**1**
25	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0
35	0	5	9	14	19	23	28	33	38	42	47
40	0	14	28	41	55	69	83	97	111	124	138
45	0	25	50	76	101	126	151	177	202	227	252
50	**0**	**34**	**69**	**103**	**137**	**172**	**206**	**241**	**275**	**309**	**344**
55	0	43	87	130	174	217	261	304	348	391	435
60	0	55	110	165	220	275	329	384	439	494	549
65	0	64	128	192	256	320	384	448	512	576	640
70	0	75	151	226	302	377	453	528	604	679	754
75	0	87	174	261	347	434	521	608	695	782	869

Spawning Target = 193,741
Proportion of target = 1.00
Prop NA = 0.540
WT1SWNA = 2.525
WT1SWE = 2.660
ACF = 1.121
M = 0.01

Table 6.1 Summary of spawner-recruit (resultant spawners) analyses for individual and composite stocks in North America and Europe. Analyses types refer to tracking of offspring from a spawning year class (forward) or estimation of the number of spawners contributing to the spawnersin year i (backward). Probabilities are exact binomial probabilities under the null hypothesis: p = 0.5.

Region	River	Analysis type	Years	Sea-age	Replacement line			Prob. P≤ No. above
					Number above rep.line	Number below rep.line	Number below in last 5 yrs	
NORTH AMERICA								
Labrador	Composite	Back	1983-93	2SW	0	11	5	0
Newfoundland	Composite	Back	1982-93	2SW	6	6	4	0.613
Quebec	Composite	Back	1982-93	2SW	6	6	1	0.619
Gulf	Composite	Back	1981-93	2SW	9	4	1	0.954
Scotia-Fundy	Composite	Back	1980-93	2SW	7	7	4	0.605
Quebec	R. de la Trinité	Forward	1980-88	1SW	3	6	3	0.254
Quebec	R. de la Trinité	Forward	1980-87	2SW	4	4	3	0.637
Newfoundland	Gander R.	Forward	1974-87	1SW	7	7	3	0.605
Newfoundland	Conne R.	Forward	1974-87	1SW	5	9	5	0.212
Newfoundland	Middle Brook	Forward	1974-87	1SW	5	9	3	0.212
Newfoundland	Biscay Bay R.	Forward	1974-87	1SW	6	8	5	0.395
Newfoundland	Humber R.	Back	1979-93	1SW	7	8	2	0.500
EUROPE								
Iceland	R. Nordura	Forward	1962-88	1SW	15	12	2	0.779
Iceland	R. Nordura	Forward	1962-87	MSW	14	12	2	0.721
Scotland	R. North Esk	Forward	1963-85	1SW	10	13	0	0.339
Scotland	R. North Esk	Forward	1963-85	2SW	6	17	4	0.017
Scotland	R. North Esk	Forward	1963-84	3SW	4	18	5	0.002
France	R. Scorff	Back	1970-93	MSW	8	16	5	0.076
Finland	R. Teno	Forward	1979-85	1SW	7	0	0	1.000
Finland	R. Teno	Forward	1979-84	2SW	5	1	1	0.984
Finland	R. Teno	Forward	1979-83	3SW	2	3	3	0.500
Finland	R. Teno	Forward	1979-82	4SW	1	3	3	0.313
Russia	R. Tuloma	Forward	1982-84	1SW	4	1	1	0.969
Russia	R. Tuloma	Forward	1982-84	MSW	0	3	3	0.125

Figure 1.2.1 Nominal catch of salmon and number of fishing vessels at Faores for the fishing seasons 1981/1982 to 1992/1993.

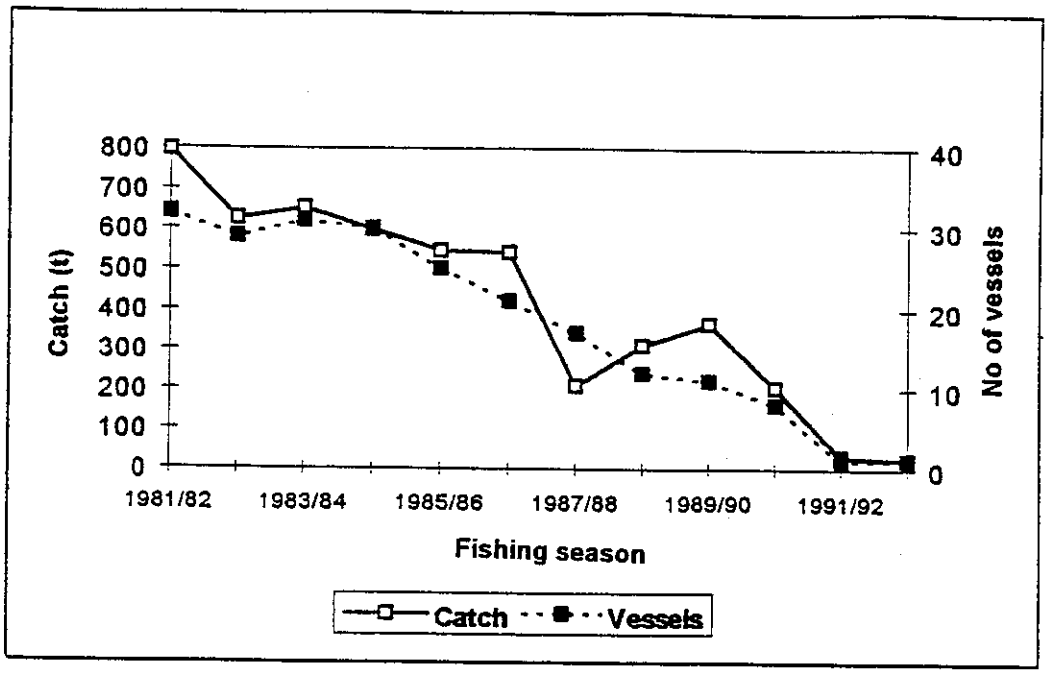


Figure 1.2.2 Catch per unit of effort (1000 hooks) inside the Faores EEZ for the fishing seasons 1981/1982 to 1992/1993.

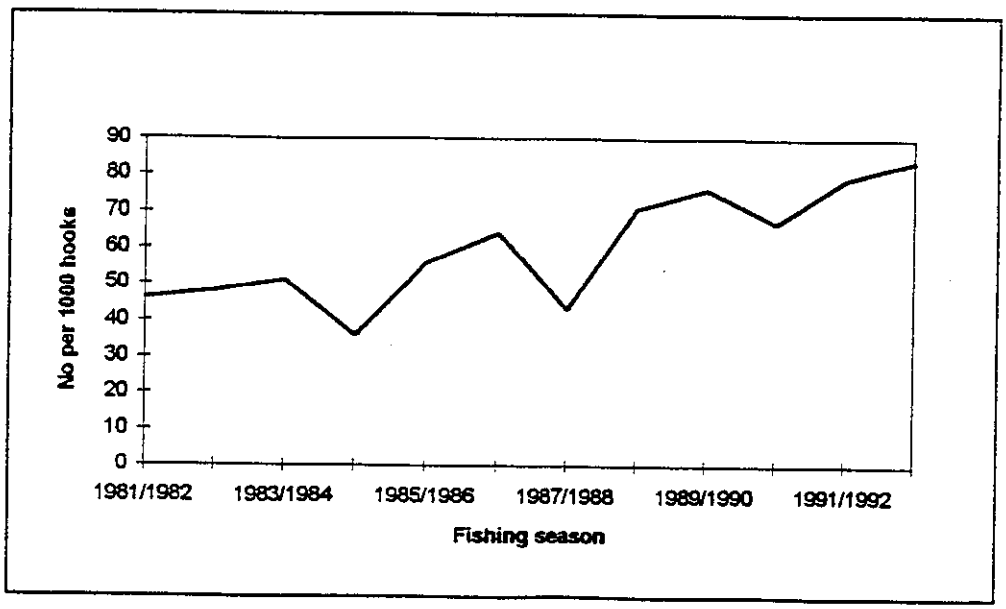


Figure 1.3.1 Retained catch expressed as a percentage of quotas for the recreational fishery in Newfoundland-Labrador by SFA. Quotas (numbers) shown in parenthesis for each SFA.

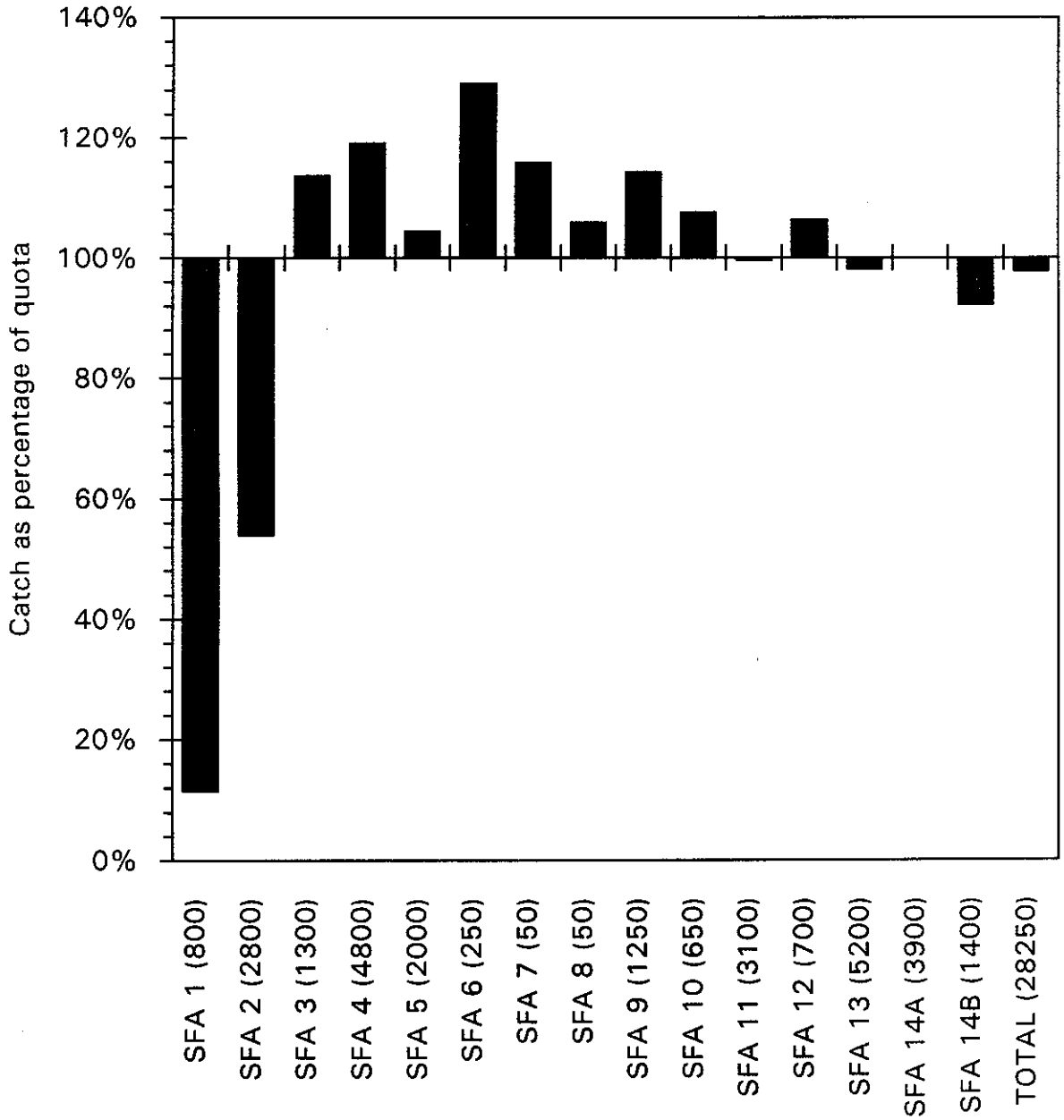


Figure 1.3.2 Percentage of target egg deposition attained in 23 rivers in Canada and USA in 1993.

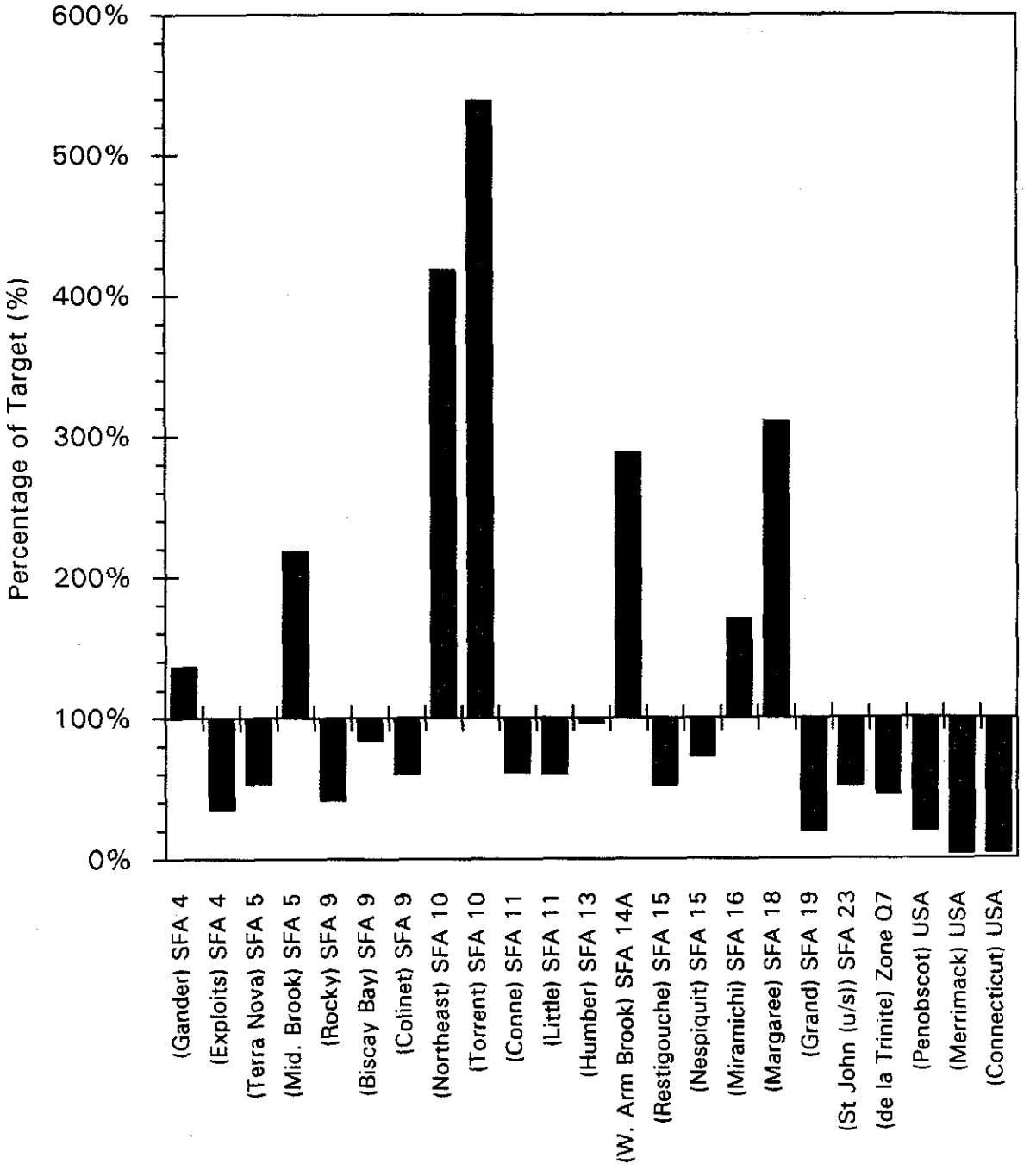


Figure 1.3.3 Return rates of hatchery smolts to homewaters as 1SW and MSW salmon for the Penobscot River (USA) (3 yr running mean)

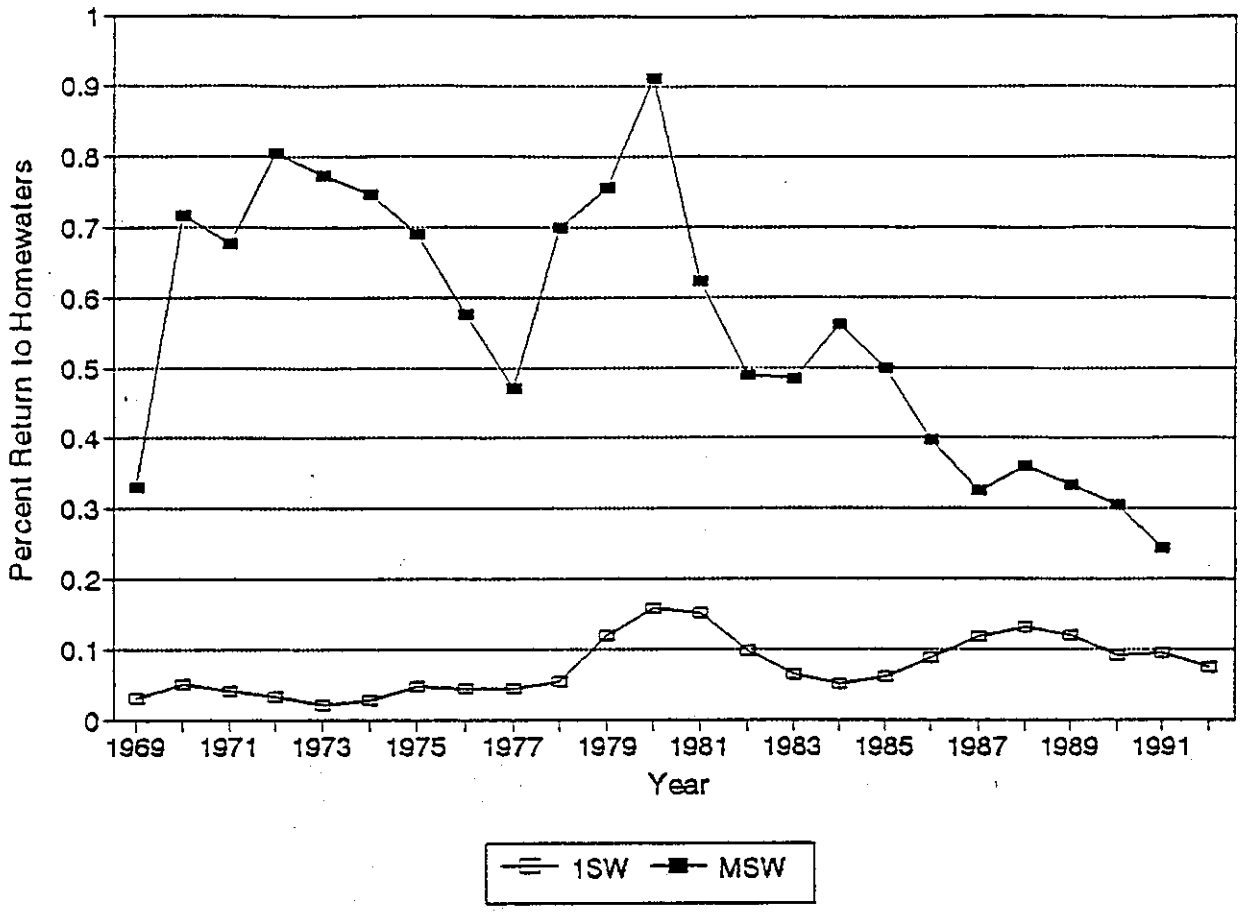


Figure 3.2.1 Estimated pre-fishery abundance of non-maturing 1SW salmon from North America (1974-92) (solid line) with maximum and minimum estimates (dashed lines).

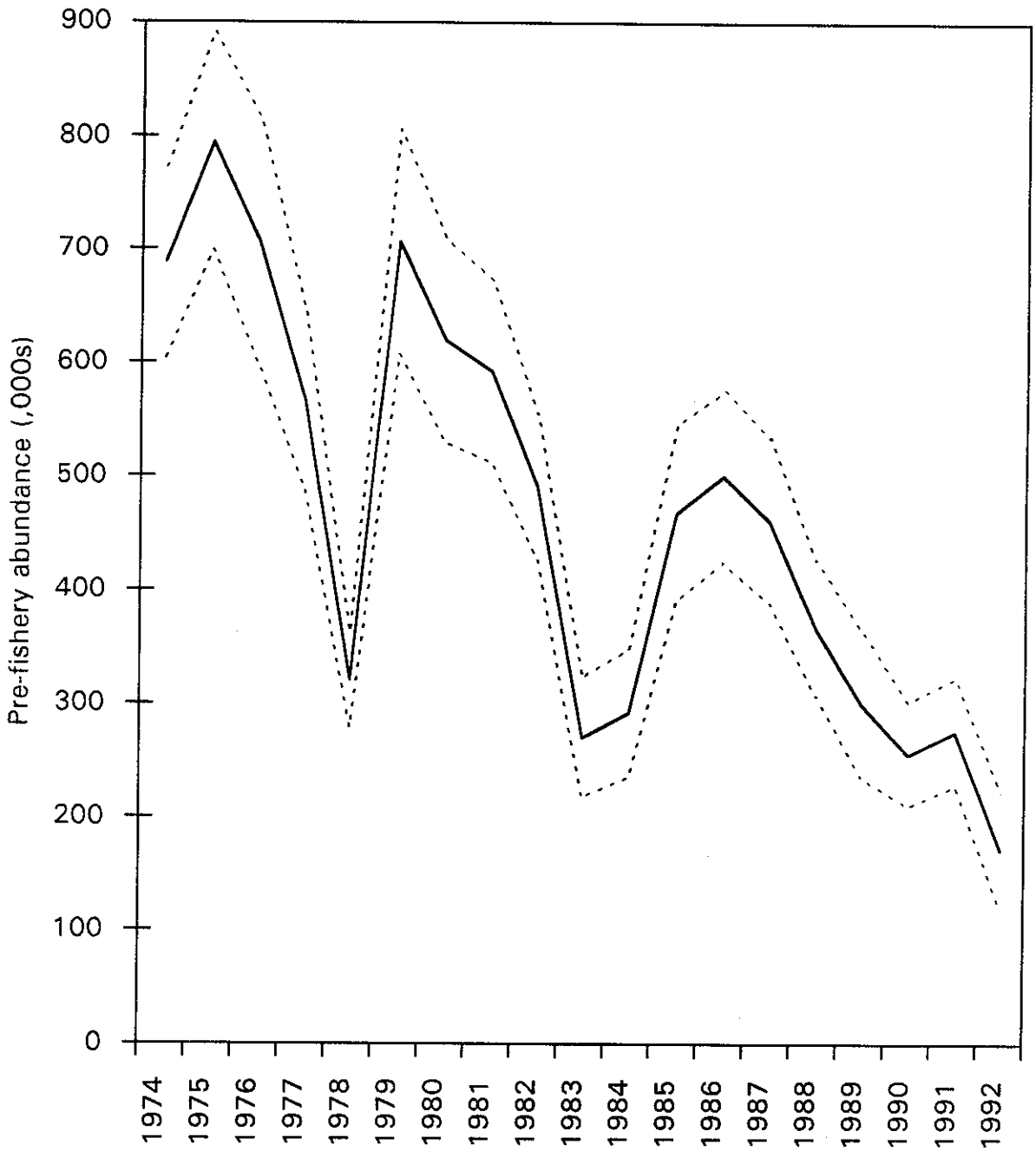
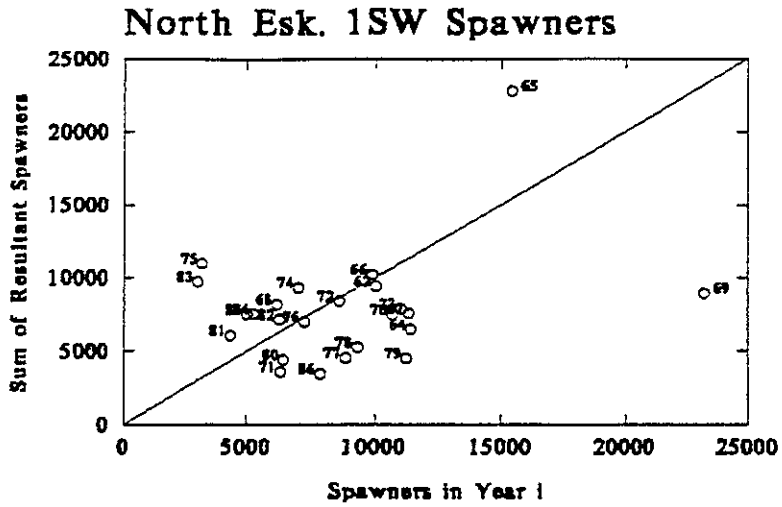
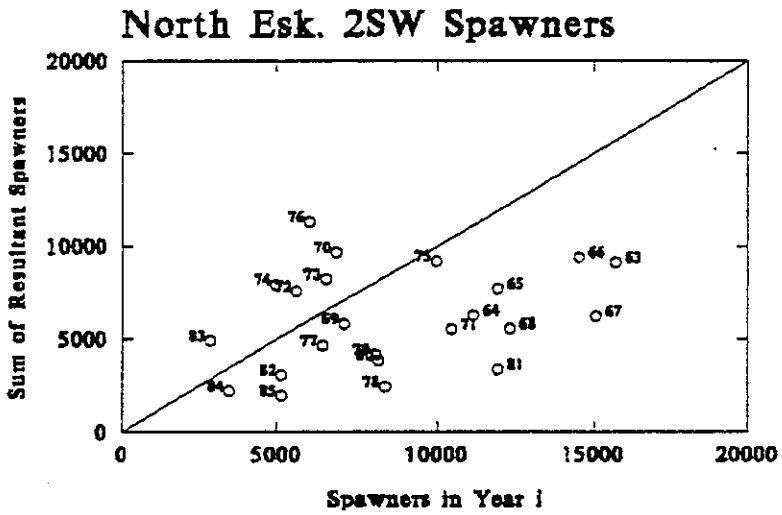


Figure 6.1 Comparison of spawners in year i (x-axis) with cumulative spawners produced (y-axis) for 1SW, 2SW and 3SW salmon in North Esk, Scotland. Years represent the year of the spawner. Diagonal line represents replacement of the spawners.





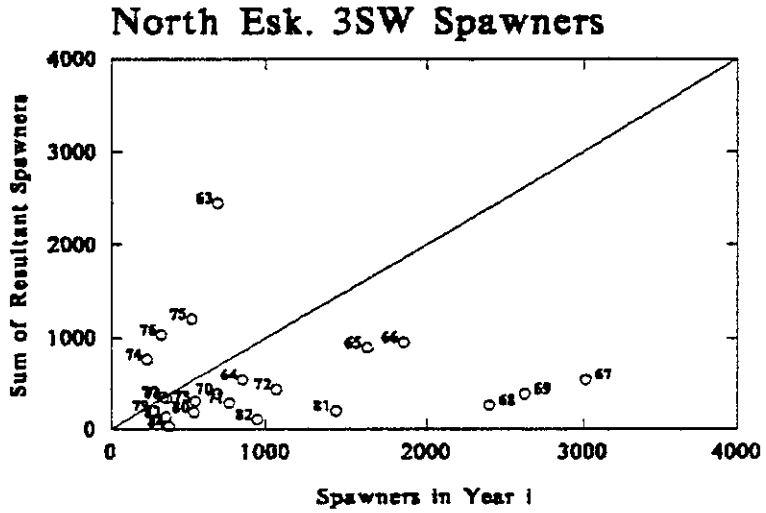
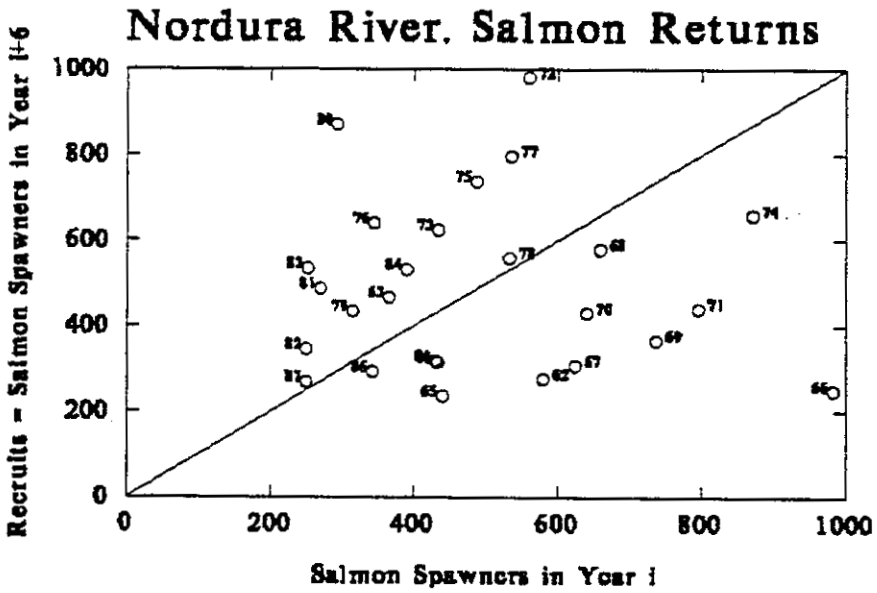


Figure 6.2 Comparison of spawners in year i (x-axis) with cumulative spawners produced in year i+5 for 1SW salmon and year i+6 for 2SW (y-axes) in the Nordura River, western Iceland. Years represent the year of the spawner. Diagonal line represents replacement of the spawners.



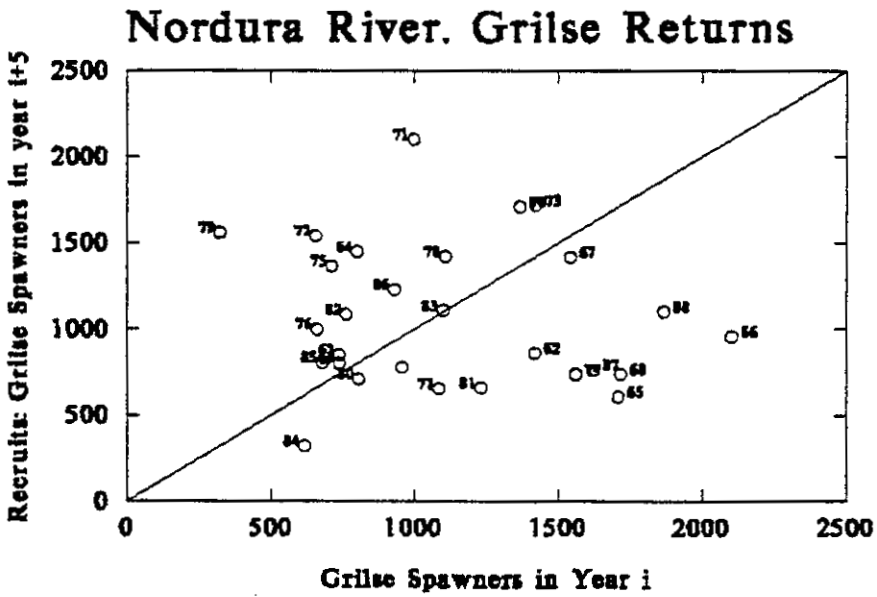
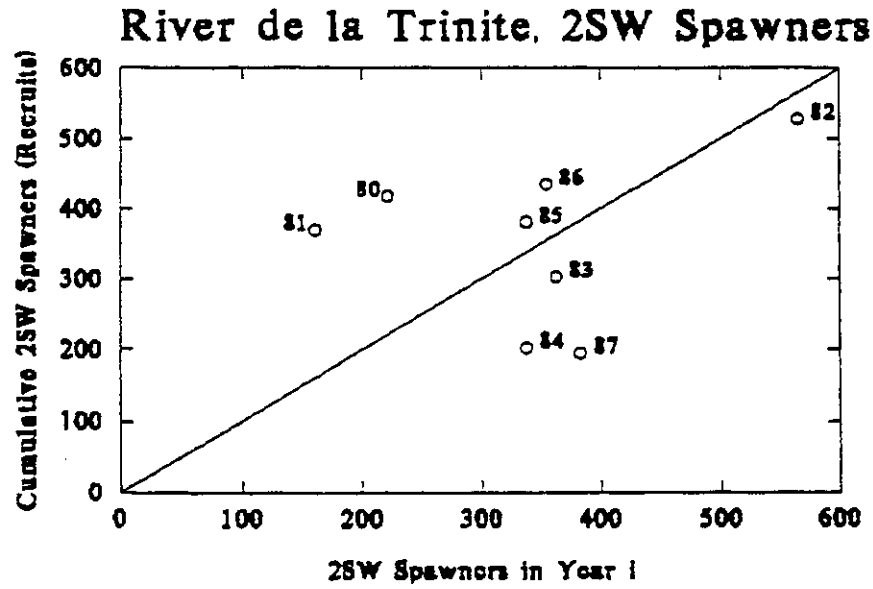


Figure 6.3 Comparison of spawners in year i (x-axis) with cumulative spawners produced (y-axis) for 1SW and 2SW salmon in the River de la Trinite. Years represent the year of the spawner. Diagonal line represents replacement of the spawners.



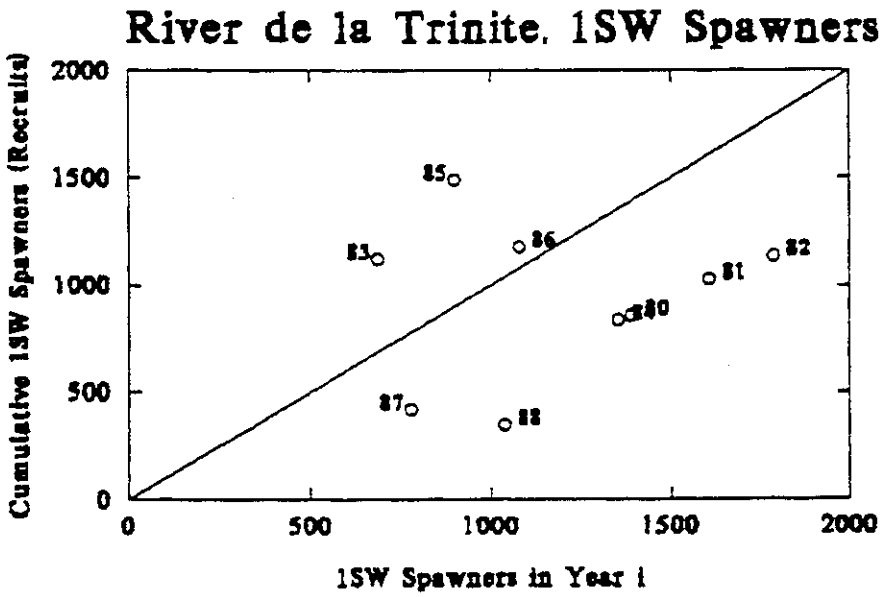
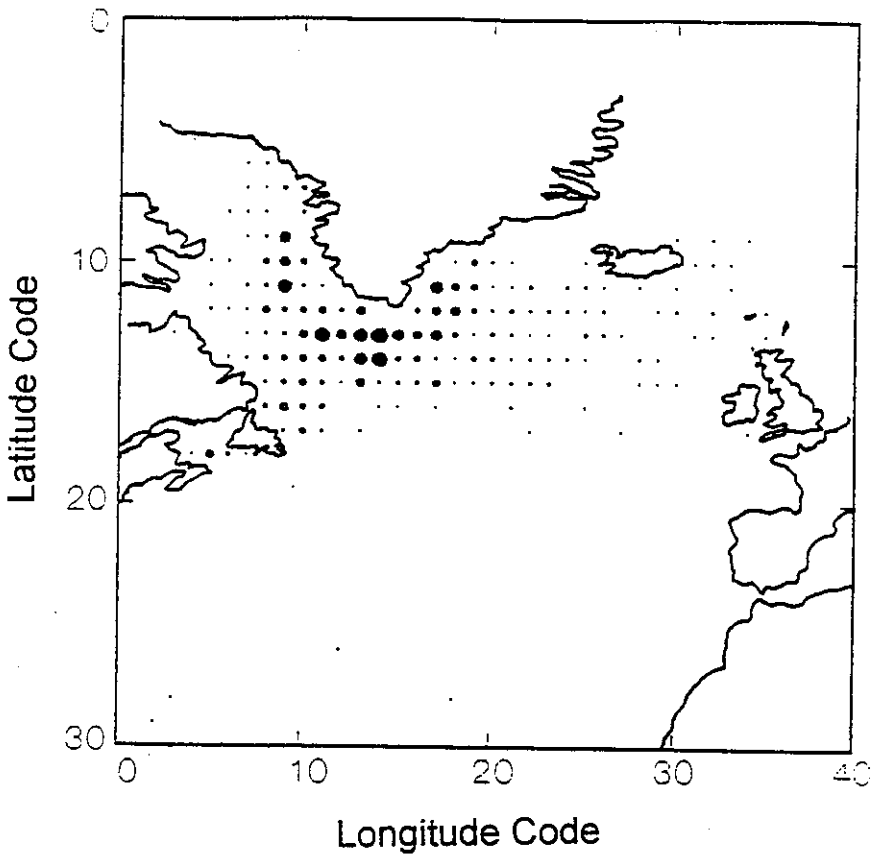


Figure 7.1 Distribution of southern North American stocks during 1SW summer from migration model. Dot size increases with larger numbers of fish.



APPENDIX 1

DECISION OF THE COUNCIL OF NASCO TO REQUEST SCIENTIFIC ADVICE FROM ICES

1. With respect to Atlantic salmon in each Commission area, where relevant:

   a) describe the events of the 1993 fisheries with respect to catches (including unreported catches) gear, effort, composition and origin of the catch and rates of exploitation;

   b) describe the status of the stocks occurring in the Commission area and, where possible, evaluate escapement against targets;

   c) specify data deficiencies and research needs.

2. Evaluate the following management measures on the stocks and fisheries occurring in the respective Commission areas:

   a) quota management measures and closures implemented after 1991 in the Canadian commercial salmon fisheries;

   b) the suspension of commercial fishing activity at Faroes;

3. With respect to the fishery in the West Greenland Commission area:

   a) continue development of the model used in providing advice on catch quotas in relation to stock abundance;

   b) estimate the pre-fishery abundance of non-maturing 1SW salmon at the time of the fishery;

   c) provide catch options with a assessment of risks relative to the management objective of achieving various levels of target spawning escapement;

   d) describe which stocks make the greatest numerical contributions of salmon to the fishery;

   e) evaluate the relationship between spawning escapement and subsequent prefishery abundance.

4. Evaluate the abundance of fish farm escapees and sea-ranched fish in fisheries and rivers and the genetic, disease and parasite, ecological and environmental impacts of these fish on the wild stocks and any impacts from current hatchery practices.

5. Evaluate grilsification mechanisms and assess the impact that grilsification may have on stock abundance and future spawning requirements.

6. Evaluate evidence for recruitment overfishing occurring on Atlantic salmon populations.

7. Evaluate the prospects of developing predictive models of annual migration and distribution of Atlantic salmon stock complexes.

8. Evaluate the results of the research programme at Faroes.

9. With respect to Atlantic salmon in the NASCO area, provide a compilation of microtag of microtag, finclip and external tag releases by ICES Member Countries in 1993.

APPENDIX 2

NEW MANAGEMENT MEASURES FOR CANADIAN COMMERCIAL FISHERIES IN 1993

1) The 5-year moratorium which was placed on the commercial fishery in insular Newfoundland in 1992 continued. Fishing was permitted in Labrador, Salmon Fishing Areas (SFA) 1, 2 and 14B. Quotas in SFAs 2 and 14B were reduced from those of 1992 by 90 t in SFA 2 and 5 t in SFA 14B. Quotas for the Newfoundland and Labrador commercial fishery for 1993 and previous years are shown below:

Year	SFA 1*	SFA 2 North	SFA 2 South	SFA 2 Total	SFA 14B
1990	80			200	50+10**
1991	80	65	135	200	15
1992	80	60	120	180	13
1993	80	27	63	90	8

* allowance catch; an estimate of expected catch and not a limitation on allowable harvest
** The 1990 quota of 50 t was for all of SFA 14; there was also a supplementary quota of 10 t for SFA 14B.

A voluntary commercial salmon/charr license buy-back program was implemented for fishermen in SFA 1. Fishermen were allowed to apply for the buy-back until October 31, 1993, but the value of catch taken during 1993 was to be subtracted from their compensation.

2) In Québec the commercial fishery in areas Q7 and most of Q8 was closed in 1993. The quota in Q8 was reduced to 150 salmon for the remaining 4 fishermen. In area Q9, the number of fishermen and quota were slightly reduced; 90 fishermen had a combined quota of 15,175 salmon.

The following were new management measures for recreational fisheries in 1993:

1) While the seasonal bag limit for the recreational fishery of Newfoundland-Labrador, Nova Scotia, and New Brunswick remained at 8 fish (SFAs 1-16, and 18-23) and in Prince Edward Island at 7 fish (SFA 17), the daily limit was reduced from 2 to 1 fish in Newfoundland and Labrador. Most rivers of the inner Bay of Fundy (SFA 22 and parts of SFA 23) were not opened to recreational fishing for conservation reasons. As a result of low returns to many rivers in Atlantic Canada in 1993, some rivers were closed to exploitation for either the whole or part of the season. As in previous years, large salmon could be retained as part of seasonal and daily limits only in Labrador (SFAs 1, 2, and 14B) and in Québec (Q1-Q11).

2) Quotas continued in the recreational fishery of Newfoundland and Labrador and these were generally increased from 1992. These quotas were subdivided into early and late seasons and as the quota for each time period within each SFA was reached, the retention of salmon in the recreational fishery was not permitted for all rivers of that SFA; only hook-and-release fishing was allowed thereafter. Some rivers of SFAs 11, 13 and 14 were managed by individual river quotas.

APPENDIX 3

COMPUTATION OF CATCH ADVICE FOR WEST GREENLAND

The North American Spawning Target (SpT) for 2SW salmon has been set at 193,741 fish.

This number must be divided by the survival rate for the fish from the time of the West Greenland fishery to their return of the fish to home waters (11 months) to give the Spawning Target Reserve (SpR). Thus:

Eq. 1. $SpR = SpT * (\exp(11*M)$ (where $M = 0.01$)

The Maximum Allowable Harvest (MAH) may be defined as the number of non-maturing 1SW fish that are available for harvest. This number is calculated by subtracting the Spawning Target Reserve from the pre-fishery abundance (PFA).

Eq. 2. $MAH = PFA - SpR$

To provide catch advice for West Greenland it is then necessary to decide on the proportion of the MAH to be allocated to Greenland (f_{NA}). The allowable harvest of North American non-maturing 1SW salmon at West Greenland (NA1SW) may then be defined as

Eq. 3. $NA1SW = f_{NA} * MAH$

The estimated number of European salmon that will be caught at West Greenland (E1SW) will depend upon the harvest of North American fish and the proportion of the fish in the West Greenland fishery that originate from North America [PropNA]. Because there are no samples for 1993, simple exponential smoothing of the observed 1978-1992 values of PropNA is used to generate a forecast for 1994. Thus

Eq. 4. $E1SW = (NA1SW / PropNA) - NA1SW$

To convert the numbers of North American and European 1SW salmon into total catch at West Greenland in metric tonnes it is necessary to incorporate the mean weights of salmon for North America [WT1SWNA] and Europe [WT1SWE] and an adjustment for the age composition of the catch [ACF]. The quota (in tonnes) at Greenland is then estimated as

Eq. 5. $Quota = (NA1SW * WT1SWNA + E1SW * WT1SWE) * ACF/1000$

where

WT1SWNA = mean weight (kg) of North American salmon at Greenland, the 1994 value was forecasted as described below

WT1SWE = mean weight (kg) of European salmon at Greenland, the 1994 value was forecasted as described below

ACF = age correction factor for multi-sea winter salmon at Greenland based on the total weight of salmon caught divided by the weight of 1SW salmon.

Mean weights by continent [WT1SWNA, WT1SWE] and the age correction factor [ACF] for 1994 were forecasted from the 1978-1992 observations. The exponentially smoothed values were based on estimation of an optimal smoothing coefficient and are given in Section 3.3.