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Exploration of the Sea

C.M.1978/H:3-APPENDIX
Pelagic Fish Committee



REVIEW OF HERRING, SPRAT AND BLUE WHITING WITHIN THE
NEAFC CONVENTION AREA

(in partial revision of Doc. C.M.1977/H:3 APPENDIX and
Cooperative Research Report, No.74)

Note: only paragraphs or parts which have been revised
are included in this document.

This Report has not yet been approved by the International Council for the Exploration of the Sea; it has therefore at present the status of an internal document and does not represent advice given on behalf of the Council. The proviso that it shall not be cited without the consent of the Council should be strictly observed.

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1. NORTH SEA HERRING (*Clupea harengus*) - see CRR, No.74.

1.1 Distribution of Catches in Relation to Zones of Extended Fisheries Jurisdiction

Table 1 gives catches of herring in the North Sea and Skagerrak after World War II, broken down by ICES Divisions. This split has to be used as the best approximation to zones of extended fisheries jurisdiction, as there is no more detailed information available on the origin of the catches made by some major fishing countries in the years of the highest catches.

In practice, Division IVa east (east of 2°E) is almost coincidental with the Norwegian zone, and Division IVa west (west of 2°E) is almost entirely within the EEC zone. Division IVb includes several statistical rectangles belonging to the Norwegian zone. In some years, considerable catches have been taken in these rectangles, but at present these cannot be quantified. Divisions IVc and VIId,e are entirely within the EEC zone, and Division IIIa is shared by Norway, Sweden, and the EEC.

From Sections A.1.2 and A.1.3 in C.C.R., No.74, it is obvious that the catches in various parts of the North Sea and in the Skagerrak cannot be ascribed to independent populations that only inhabit the specific areas concerned. In all areas, the catch taken consisted of fish belonging to populations that occur in other parts of the North Sea at different times of the year.

2. CELTIC SEA HERRING - see Doc. C.M.1977/H:3-APPENDIX

2.1 Spawning Areas and Times

No new information is available about the location and extent of spawning. Because of the restrictions on fishing during 1977/78, it is not possible to tell whether the trend towards an earlier spawning time noticed since 1974 has been maintained.

2.2 Exploitation and Management

The exploitation and management of the fishery have been described in the previous paper (Doc. C.M.1977/H:3-APPENDIX). In 1977/78 fishing was prohibited throughout the Celtic Sea because of the serious state of the stock. In spite of this, however, over 3 000 tons were taken. The updated table of catches in the area since 1951 are shown in Table 2. A summary of the management measures introduced on the fishery is shown in the text table below:

		1974/5	1975/6	1976/7	1977/8	1978/9
TAC advised by Liaison Cttee	Original advice	25 000	19 000	10/12 000	6 500	0
	Revised advice			6 500	0	
TAC set by NEAFC or EEC	Original	32 000	25 000	16 800	0	0
	Revised			10 850		
Actual catch		17 684	13 915	7 078	2 828	

As has been mentioned in the previous report, the TACs advised by the Liaison Committee for 1974/75 and 1975/76 were too high, largely due to overestimation of recruitment; those set by NEAFC, in all seasons, much too high. The collapse in recruitment which has taken place in this stock after 1971 had not been realised because of the absence of any information about incoming year classes. The catch in 1976/77 slightly exceeded that recommended by the Liaison Committee, while in 1977/78 over 3 000 tons were taken in spite of the recommended complete closure of the fishery.

3. DIVISION VIa HERRING - see Doc. C.M.1977/H:3 - APPENDIX

3.1 Exploitation and Management

3.1.1 The total annual international catches in the period 1963-77 taken in Division VIa(excluding the Clyde) and in that part of Division VIIb contained within Donegal Bay are as follows ('000 metric ton units):

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
54	70	66	92	103	100	124	179	221	175	247	210	141	116	48

After a period of relatively stable annual catches, in the range of 50 - 70 000 tons, in the 1950s and early 1960s, the catch increased markedly in 1966 and continued to increase in subsequent years to attain a figure of 246 000 tons in 1973. Since 1973, it has declined progressively in each year to about 48 000 tons in 1977 with a zero TAC recommendation for 1978.

3.1.2 The increase in catch in the period 1966-73 can be largely accounted for by the recruitment of the extremely strong 1963 year class in 1966 and by a sustained higher average level of recruitment in subsequent years. However, since 1970, the stock has also been exploited at a rate appreciably above the MSY per recruit level, and according to the latest assessment the mortality rate has risen to an even higher level since 1974. The Liaison Committee advised NEAFC in 1974 that this stock was being overexploited and recommended TACs for 1974 and 1975 to reduce the exploitation rate to that corresponding to the MSY per recruit. NEAFC adopted TACs for this stock for 1975 and 1976, but at levels considerably in excess of those recommended, and a serious overestimation of the spawning stock at this time meant that the levels of fishing mortality actually went up in 1975 and 1976.

3.1.3 Estimates of the sustainable yield for this stock are highly dependent on the assumptions made about the long-term recruitment level and at present this cannot be predicted with any degree of confidence because of its very high apparent variability.

3.1.4 For a considerable number of years 0 and 1 group herring from Division VIa stock have been exploited in their nursery areas in the North Sea, i.e., the Moray Firth and Bløden. Whilst the implementation of NEAFC Recommendation (18) (the prohibition of landings of herring under 20 cm) and the introduction of the 10% by-catch for Recommendation (2) species, which came into force in October 1975 have had the effect of reducing this exploitation on 0 and 1 ringers, these measures have so far not been in operation for long enough to gauge their effect in helping the recovery of the stock.

See Figure 1 (p.13) for distribution of the main fishing areas.

4. IRISH SEA HERRING - see Doc. C.M.1977/H:3 - APPENDIX

4.1 General Biology

4.1.1 Spawning areas and larval drift

No new information is available.

4.1.2 Nursery grounds

The nursery grounds usually lie entirely within the North Irish Sea. Exceptionally 0-group herring of the Manx stock may be found in the Firth of Clyde.

0-group herring usually live near the coast in spring and summer, with the Mourne stock found on N.Ireland, Republic of Ireland, southern Scottish and northwest English coasts and the Manx stock confined to the coasts of southern Scotland and northwest England. 0- and 1-group herring are widely distributed through the N.Irish Sea in winter.

4.1.3 Distribution and migration of adults

From May to August, pre-spawning shoals of adult fish are usually found in statistical rectangles 36 E4, 37 E4 and in 37 E5 west of the Isle of Man. There is some mixing of Manx and Mourne stocks in 37 E4 at this time. In August and September, Manx herring are found south and east of the Isle of Man, and Mourne herring near the east coast of Ireland. The Mourne herring remain off the Irish coast until spent. The Manx herring are distributed fairly widely between the east coast of the Isle of Man and the west coast of England from September to November, but most of them are near the coast of the Isle of Man (Figure 2).

Young adults of both stocks are widely distributed throughout the Irish Sea in winter and spring (December to April). Winter distribution of older adults of both stocks is imperfectly known; it is unlikely that they are exploited outside the Irish Sea.

Ocasional small catches are made in the Irish Sea of adult herring which cannot be referred to either Manx stock or Mourne stock; these fish are thought to belong to very small local stocks. They are not found every year, and they can be ignored for management purposes because they have never formed more than 1% of the total catch.

4.2 Exploitation and Management

4.2.1 Manx stock - Exploitation

Between 1948 and 1962, catches varied between 4 000 and 8 000 tons per year. Biomass of the exploited stock fluctuated between 13 000 and 31 000 tons. In 1963 and 1964, recruitment was poor and catches were low. Trends since 1965 may be seen in Figure 3, which gives biomass and catch of the exploited stock, fishing effort and fishing mortality. Up to 1964, drifters and ringnetters took most of the catch; from 1965 onwards, trawling increased in importance, and by 1970, trawlers accounted for over 90% of the catch. In 1976 and 1977 trawlers took the whole catch except for one or two landings by purse-seine. The Manx fishery was a summer and autumn fishery up till 1976; in 1976 and 1977 catches were made in every month of the year but most of the fish were caught in August and September.

4.2.2 Manx stock - Management

Fishing was virtually unrestricted until 1973, but high fishing mortality in 1971 and 1972 (Figure 3) caused concern in the United Kingdom, and, on a United Kingdom national basis, herring fishing within 12 miles of the Isle of Man coast was prohibited for 6 weeks from 1 October in 1973. This measure has been repeated in each subsequent year in an attempt to reduce effort at a time when fish congregating for spawning are highly vulnerable to trawling. In 1973, this action had the effect of reducing effort and fishing mortality by about 21% from the previous high level (Figure 3). In 1974, however, effort, catch and fishing mortality rose sharply to the highest recorded levels. Consequently, a TAC was set for United Kingdom fishermen in 1975 and 1976, and for all fishermen in 1977. Table 3 gives the TACs recommended by fishery scientists, those subsequently adopted, and the actual catch taken each year. TACs and catches quoted refer to the sum of calculated allowable catches

and recorded actual catches of Manx and Mourne stocks. It is considered impracticable to administer and manage separate TACs for the two stocks inhabiting the same geographical area.

4.2.3 Mourne stock - Exploitation

The wording of the previous report (Doc. C.M.1977/H:3-APPENDIX) has not been changed.

4.2.4 Mourne stock - Management

Conservation measures, consisting of a closure of the fishery on the spawning grounds for two weeks in October each year, from 1973, and a $3\frac{1}{2}$ day working week introduced in 1974 for the adult fishery, have been ineffective in reducing the fishing mortality on the Mourne stock. No restrictions were enforced on the industrial fishery despite Recommendation 8 (C) which became effective in October 1975. It is imperative that the industrial fishery be stopped.

4.3 Geographical Distribution of the Fishery

The fishery in the North Irish Sea is confined to the area bounded by the coasts of England, Scotland and Ireland between $53^{\circ}30'N$ and $55^{\circ}N$. The Isle of Man lies approximately in the centre of this area. Nearly all the catch is taken in statistical rectangles 36 E4, E5, E6 and 37 E4, E5 and E6. This fishery is entirely within the zone of the EEC and its associates.

Table 4 gives the proportion of the catch taken by vessels of different countries for the area of the fishery as a whole for the periods 1965-69 and 1970-74, when the fishery was unrestricted, 1975-76 when fishing by United Kingdom vessels was controlled by national conservation measures, and 1977 when all fishing was controlled by EEC conservation measures. It should be noted that the figures include the industrial catch taken by Ireland.

5. SKAGERRAK, KATTEGAT AND NORWEGIAN FJORD SPRAT - see CRR, No.74.

5.1 Spawning Areas and Times, Larval Drift

The main spawning area in the region is located between the northern point of Jutland and the Swedish coast. It typically has a sharp northern boundary. Spawning also occurs on Jutland Bank in some years, but Kattegat seems to be of little importance for spawning. There are other spawning areas of minor importance in the fjords along the Norwegian east and west coasts, in the Oslofjord, and in the Swedish archipelagoes and the Danish Limfjord and Isefjord.

Spawning starts about the end of April and lasts to the end of July, with a peak in May and June, though there are indications that the spawning time has become longer recently. The eggs and larvae drift with the Baltic current eventually entering the archipelagoes and fjords along the coast of Sweden, and both east and west coasts of Norway. Current vortices in the Skagerrak carry many larvae back to their point of origin. Most of the sprat population in the Norwegian west coast fjords probably originate from larvae drifted from the Skagerrak and very few from local spawning within the fjords.

5.2 Exploitation and Management

For stock assessment purposes the sprat in the Kattegat, Skagerrak and the Norwegian west coast fjords are considered as a single unit. Although the origin of the sprat in the Norwegian fjords north of 62°N and their relationship to the Skagerrak spawning stock is uncertain, it seems rational to consider them together for management purposes. Within the total area of distribution, there are local populations inside the skerries with different growth rates and age of spawning. They are, however, small and of negligible importance in relation to the main population.

The mean age of sprat in the catches in the Skagerrak and Kattegat remained very stable until pelagic trawls were introduced in the 1950s.

Although no detailed numerical assessments of this sprat stock have yet been possible, the Herring Assessment Working Group considered in 1976 that any further increase in fishing effort might reduce recruitment and recommended a TAC of 100 000 tons for 1977 for Division IIIa and the Norwegian fjords in Division IVa combined. At its 1977 meeting, this recommendation was revised to 80 000 tons for both 1977 and 1978, and at the 1978 meeting the Working Group recommended a TAC of 65 000 tons for the Skagerrak and Kattegat sprat for 1979 (excluding any Norwegian fjord).

5.3 Distribution of Catches in Relation to Zones of Extended Fisheries Jurisdiction

Denmark and Norway have hitherto declared economic zones in the Skagerrak.*

Until a final arrangement is reached for the Kattegat, the area between the Danish and Swedish 12-mile zones is under joint jurisdiction of these two countries.

The fishery for sprat during the last decade has been located in the following way:

Norway: almost totally within its economic zone close to the coast or within the fjords.

Denmark: trawl fishery in the eastern Skagerrak and in the Kattegat.

Sweden: purse-seine fishery in the eastern Skagerrak, mainly close to the Swedish coast, and trawl fisheries in the Kattegat area.

6. BLUE WHITING (*Micromesistius poutassou*) - see Doc.C.M.1977/H:3-APP.

6.1 Distribution and Migration of Adults

From an age of about 2-3 years onwards, the blue whiting recruit to the spawning population which undertakes an annual migration from the spawning areas west of the British Isles to feeding areas in the Norwegian Sea (Figure 4). Although a small proportion of the population remains in the south, the majority migrate north after spawning, reaching Faroe in May, the edge of the east Icelandic current in June, and subsequently dispersing widely to

* Sweden has extended its jurisdiction to the mid-line, which in fact gives the same result as an economic zone.

the east of Iceland and in the Norwegian Sea during the summer to feed. In addition, concentrations of adult and immature blue whiting have recently been located from March-November in the area between Iceland and Greenland. The northern and eastern limits of distribution vary according to sea temperature and in some years reach 80°N west of Spitzbergen and 35°E in the Barents Sea. In addition, part of the population finds its way into the Norwegian Deep, but no spawning has yet been recorded there. By November the fish are again concentrated off eastern Iceland and north of the Faroes. The spawning migration takes place in January and February. The seaward distribution west of the British Isles and south of Iceland is poorly defined, but echo-traces characteristic of blue whiting are recorded to at least 20°W in the area south of 60°N. There are also records of small populations in the northwest Atlantic. Migrations south of 50°N are not recorded and it is not clear what relationship the population in that area bears to the more northerly ones.

During the course of their life history, the main northerly population of blue whiting thus disperses from the EEC zone into Norwegian, Faroese and Icelandic zones, and possibly the international zone. As adults, they migrate annually from the Norwegian and Icelandic zones and the open area in the Norwegian Sea, through the Faroese zone to the EEC zone to spawn.

6.2 Exploitation and Management

Blue whiting catch statistics are not yet recorded with sufficient consistency to tabulate landings with any accuracy. From data available to the ICES Statistician and additional data supplied by a number of scientists, blue whiting catches have been tabulated for the period 1966-77 in Table 5. Total recent landings, including landings from mixed industrial fisheries, as reported are as follows:

	<u>tons</u>
1970	32 900
1971	64 800
1972	34 400
1973	38 000
1974	35 600
1975	95 600
1976	152 900
1977	154 100

Revised catches for 1976 show a marked increase over the provisional figure given in the previous report. The provisional total for 1977 is not significantly higher than the revised total for 1976, but some important statistics from Spain, USSR and the German Democratic Republic are not yet available.

In 1977 there was a change in the proportion of the total catches from each area: 60% of the total came from Division Vb (Faroe) compared with only 23% in 1976. A corresponding drop occurred in Division Va.

Without detailed reporting, it is not possible to define the fishing areas with any precision. Nevertheless, an attempt has been made to do so for 1975, 1976 and 1977 in Figure 5, excluding any exploitation south of 50°N, for which no details are available.

Fishing in 1975-77 in the main spawning area was largely experimental and it cannot be assumed that a developed fishery will follow the same pattern. The main fishing occurred from March to May along the edge of the continental shelf west of Scotland and in May-June south and west of Faroe. There have for some years been important mixed industrial fisheries for Norway pout and blue whiting off the southwest coast of Norway and in Division IVa and to the south of Iceland. For a number of years, Spanish vessels have also fished to the northwest of Spain. From 1969-71, the USSR made substantial catches to the east of Iceland. New developments in 1977 were a fishery west of Iceland in mainly September-November, and a fishery near Bear Island in the period July-October.

6.3 Distribution of Catches in Relation to Zones of Extended Fisheries Jurisdiction

Despite the lack of official statistics an attempt has been made in Table 6 to allocate the reported catches in 1975, 1976 and 1977 to national zones. The main fisheries divided in this way are:

- a) the Norwegian mixed industrial fishery in the Norwegian zone (19 000 tons of blue whiting in 1977);
- b) the smaller Icelandic mixed industrial fishery to the southwest of Iceland (5 900 tons of blue whiting in 1977);
- c) the multinational fishery for spawning blue whiting west of Scotland in the EEC zone (14 600 tons in 1977);
- d) the multinational post-spawning fishery south and west of Faroe in the Faroese zone (93 000 tons of blue whiting in 1977);
- e) the summer fishery for adult blue whiting east of Iceland (4 600 tons in 1977).

In addition, in 1977 two new fisheries developed:

- f) a fishery west of Iceland in the Icelandic zone (900 tons of blue whiting in 1977);
- g) a fishery for adult blue whiting in the international zone around Bear Island and Spitzbergen in July-October (7 500 tons in 1977).

From the details of its life-history, it is clear that successful management of the blue whiting stock or stocks will ultimately depend on a high degree of international cooperation. In particular, the fact that immature fish are distributed in different zones from the adults, which themselves migrate between zones, is likely to have considerable bearing on the management of the exploitation pattern. It is clear, however, that present exploitation takes a relatively small fraction of the maximum sustainable yield.

APPENDIX Table 1. HERRING.
Total catch in '000 tons 1947-1977.
North Sea and Skagerrak.

Divisions Year	IVa west	IVa east	IVb	IVc + VIId,e	IIIa	Total North Sea & Skagerrak
1947	211.3	0.3	214.4	160.6	40.9*	627.5*
1948	169.4	1.9	168.3	162.5	54.9*	557.0*
1949	134.2	2.0	179.0	193.3	52.4*	560.9*
1950	125.1	1.6	186.7	178.3	51.3*	543.0*
1951	123.0	1.2	310.6	165.6	46.7*	647.1*
1952	168.4	6.6	253.3	236.1	61.1*	725.5*
1953	178.8	7.5	303.0	209.2	47.9*	746.4*
1954	168.0	4.3	313.7	276.9	99.1*	862.0*
1955	287.8	67.4	282.8	168.4	89.0	895.4
1956	194.5	79.1	267.6	134.0	82.0	757.2
1957	209.0	97.3	253.9	122.7	90.5	773.4
1958	164.7	98.2	315.0	92.6	131.0	801.5
1959	259.6	144.2	303.5	77.2	139.0	923.5
1960	101.1	264.0	266.2	64.9	75.8	772.0
1961	61.0	274.8	262.7	98.2	85.3	782.0
1962	37.6	291.8	243.7	54.7	104.2	732.0
1963	73.1	301.3	295.9	45.7	163.2	879.2
1964	66.1	444.0	304.5	56.6	309.8	1 181.0
1965	298.3	580.8	267.9	21.8	256.7	1 425.5
1966	278.6	424.0	181.3	11.6	144.7	1 040.2
1967	117.3	373.7	193.1	11.4	279.7	975.2
1968	286.7	256.8	164.7	9.6	280.0	997.8
1969	213.1	148.1	161.2	24.3	113.3	660.0
1970	326.9	21.4	187.7	27.1	71.1	634.2
1971	288.8	17.3	190.4	23.4	61.6	581.5
1972	235.1	22.7	216.6	23.0	67.0	564.4
1973	297.7	14.7	193.4	30.2	84.6	570.6
1974	84.2	15.4	168.2	7.4	55.5	330.7
1975	95.8	9.7	181.9	25.5	51.9	364.8
1976	105.8	2.3	49.3	18.0	14.0	189.4
1977 ¹⁾	26.4	1.0	12.7	1.1	37.6	78.8

1) Preliminary data.

*) Data include some Kattegat catches.

APPENDIX Table 2. CELTIC SEA HERRING catches, 1951-77.

	Belgium	Bulgaria	France	German Dem.Rep.	Germany Fed.Rep.	Ireland	Nether- lands	Poland	United Kingdom	USSR	Total
1951	534	-	1 001	-	-	660	-	-	888	-	3 023
1952	1 792	-	762	-	-	845	-	-	681	-	4 080
1953	502	-	1 697	-	-	693	-	-	883	-	3 775
1954	2 251	-	14	-	-	1 386	-	-	1 287	-	4 938
1955	4 230	-	21	-	-	1 619	-	-	1 789	-	7 659
1956	2 539	-	226	-	-	3 348	-	-	2 289	-	8 402
1957	1 256	-	397	-	949	6 116	4 047	-	881	-	13 646
1958	708	-	967	-	11 743	7 869	5 813	77	1 922	-	29 099
1959	98	-	1 717	-	9 243	10 132	3 720	124	770	-	25 809
1960	-	-	1 083	-	60	14 935	1 463	-	73	-	17 614
1961	128	-	3 995	-	785	5 876	3 449	96	2	-	14 331
1962	249	-	7 755	-	475	4 502	4 154	56	-	-	17 191
1963	7	-	6 081	-	251	4 405	10 018	-	340	-	21 102
1964	-	-	4 894	-	-	3 375	6 128	-	744	-	15 141
1965	-	-	1 742	-	353	3 980	7 198	-	1 054	-	14 327
1966	-	-	5 506	-	1 143	6 891	16 605	112	197	-	31 454
1967	-	-	3 825	-	910	11 133	13 184	300	398	-	29 750
1968	-	-	2 637	-	1 662	9 480	15 679	130	598	-	30 186
1969	-	-	7 038	-	5 906	18 712	16 256	252	-	-	48 164
1970	-	-	3 629	-	1 481	24 702	7 015	1 191	220	-	38 236
1971	-	-	3 393	-	974	12 602	9 672	881	65	-	27 587
1972	-	-	7 327	-	393	20 109	6 758	751	-	618	35 956
1973	-	123	5 553	7	294	13 105	5 834	1 125	-	334	26 375
1974	-	-	2 261	-	433	13 991	2 105	954	-	-	19 744
1975 ¹⁾	-	-	1 924	-	361	8 430	2 825	512	24	1 054	15 130
1976 ¹⁾	-	-	1 919	147	28	3 705	1 627	324	-	826	8 258
1977*	-	-	88	-	96	1 394	1 399	-	78	-	3 055

*) Preliminary data.

1) Revised.

APPENDIX, Table 3. N. IRISH SEA HERRING.
TACs and catches, 1975-77.

Year	TAC (tons) recommended by ICES WG	TAC set for		Total	Total catch (tons)	\hat{F} at TAC recommended by ICES WG	\hat{F} generated by catch taken	
		UK	Other countries				Manx	Mourne
1975	12 000	18 000	None set	13 200	24 503	0.4	0.81	0.94
1976	11 000	12 000	None set		21 102	0.4	0.74	0.96
1977*	12 000	11 900	1 300		17 872	0.4	0.61	0.60

*) Catch in 1977 estimated from sampling programme (see text).

APPENDIX, Table 4. N. IRISH SEA HERRING.
Total catch of herring (tons) and percentage of total catch by countries
in different periods. In 1975 and 1976 the United Kingdom catch was re-
stricted by UK conservation measures; the catch of other countries was
not restricted.

	1965-69		1970-74		1975-76		1977	
	Tons	%	Tons	%	Tons	%	Tons	%
France	nil	0	7 054	5.1	1 464	3.2	85	0.6
Ireland	2 584	7.0	19 101	13.9	7 995	17.5	3 331	21.6
Netherlands	nil	0	1 259	0.9	1 619	3.5	500	3.2
United Kingdom	34 159	93.0	109 186	79.4	34 645	75.7	11 498	74.6
USSR	nil	0	945	0.7	26	0.1	0	0
Total	36 743		137 545		45 749		15 414	
Mean annual catch	7 348		27 509		22 875		15 414	

APPENDIX Table 5. BLUE WHITING.

Landings (in thousand metric tons) by ICES fishing areas, 1966-77.

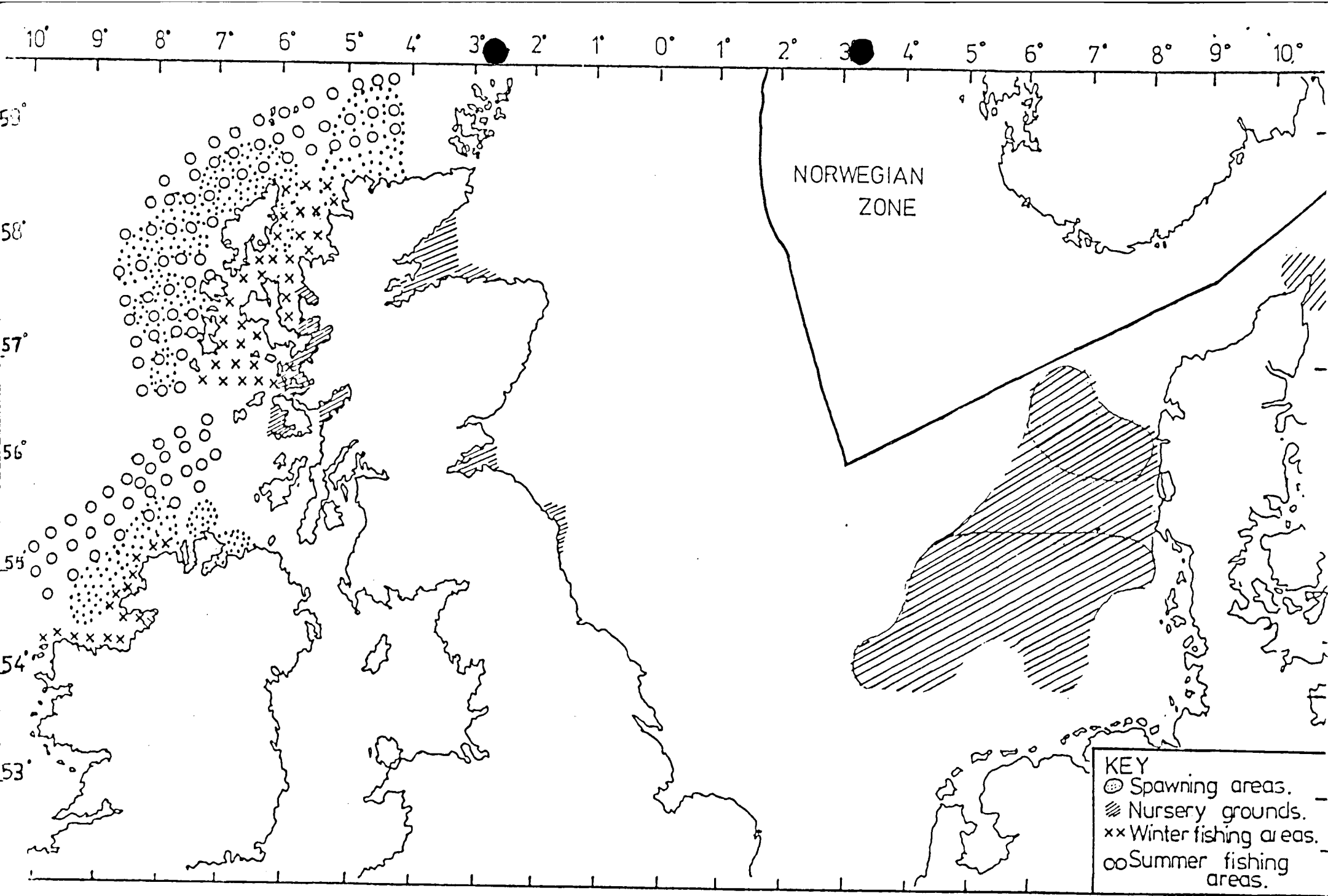
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977*
I Barents Sea	-	-	-	-	+	-	-	-	-	+	0.2	-
IIa Norwegian Sea	-	-	-	10.1	14.8	31.0	+	0.9	+	7.2	0.8	0.4
IIb Bear Island	-	-	-	-	-	0.4	-	+	+	2.5	1.6	7.5
IIIa Skagerrak	-	-	-	-	-	-	-	-	-	-	-	5.8
IVa N. North Sea	?	?	?	?	?	0.6+	0.2+	5.9+	3.1+	38.9	41.0	21.6
IVb Central North Sea	-	-	-	-	-	-	0.1	+	0.1	+	+	-
Va Iceland	-	-	0.1	+	1.0	4.9	0.6	2.9	5.2	1.5	10.3	10.5
Vb Faroe	-	-	-	-	-	-	+	2.8	0.4	2.5	35.0	92.6
VIa West of Scotland	-	-	-	-	-	6.4	11.3	11.7	14.0	26.8	42.2	13.8
VIIb Rockall	-	-	-	-	-	+	0.3	+	+	+	0.2	-
VIIb,c West of Ireland	-	-	-	4.2	0.4	12.0	3.9	0.8	0.7	1.2	3.8	0.8
VIIId,e Channel	-	1.9	-	-	-	-	+	0.1	-	+	0.8	-
VIIIg-k SW approaches	-	-	-	-	6.4	9.5	13.7	8.6	8.1	10.5	12.4	0.2
VIII Biscay	19.7	19.6	19.7	16.4	9.8	?	4.1	3.8	3.8	4.0	4.4	-
IX Portuguese waters	0.9	1.6	1.1	0.6	0.5	?	+	+	+	0.3	0.2	-
X Azores	-	-	-	-	-	-	-	0.2	-	-	-	-
XIVb Southeast Greenland	-	-	-	-	-	-	-	-	-	-	-	0.9
Total	20.6	23.0	20.9	31.3	32.9	64.8	34.4	38.0	35.6	95.6	152.9	154.1

*) Preliminary.

APPENDIX Table 6. BLUE WHITING.
Landings ('000 tons) by national
zones in 1975, 1976 and 1977.

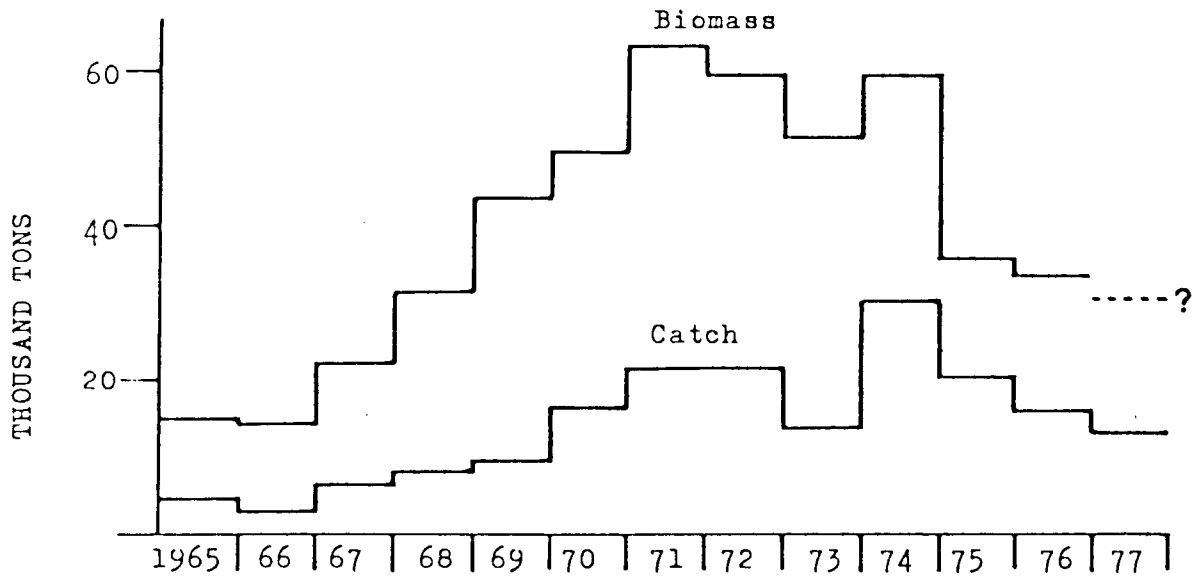
	1975	1976*	1977*
<u>Economic zone</u>			
EEC	38.5	59.4	21.0
Faroe	2.5	35.0	92.6
Iceland	1.5	10.3	11.4
Norway	48.6	41.8	21.5
Spain	4.3	4.6	
Spitzbergen/ Bear Island		1.8	7.5

* Provisional.

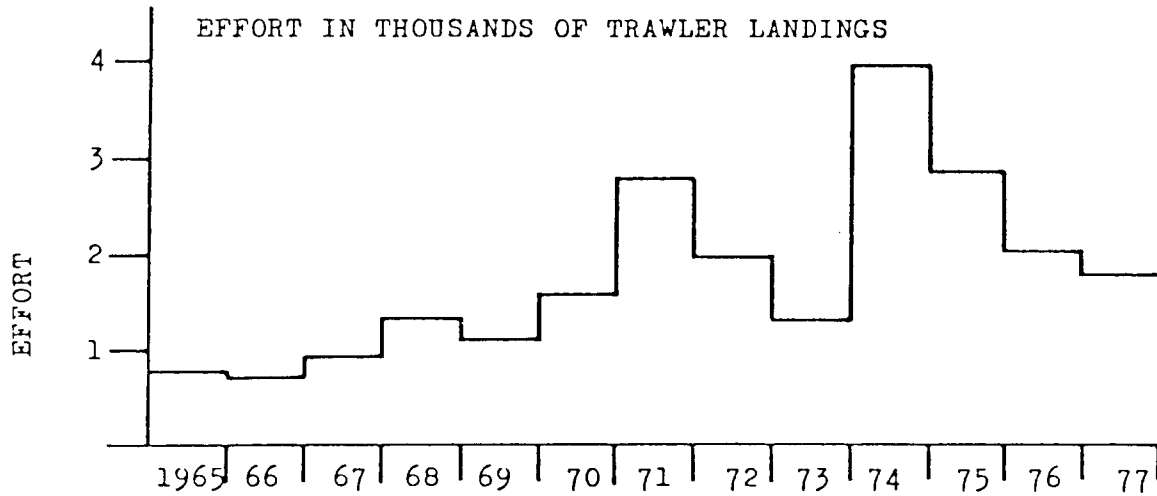


APPENDIX Figure 1. Division VIa HERRING. Spawning, nursery and fishing areas.

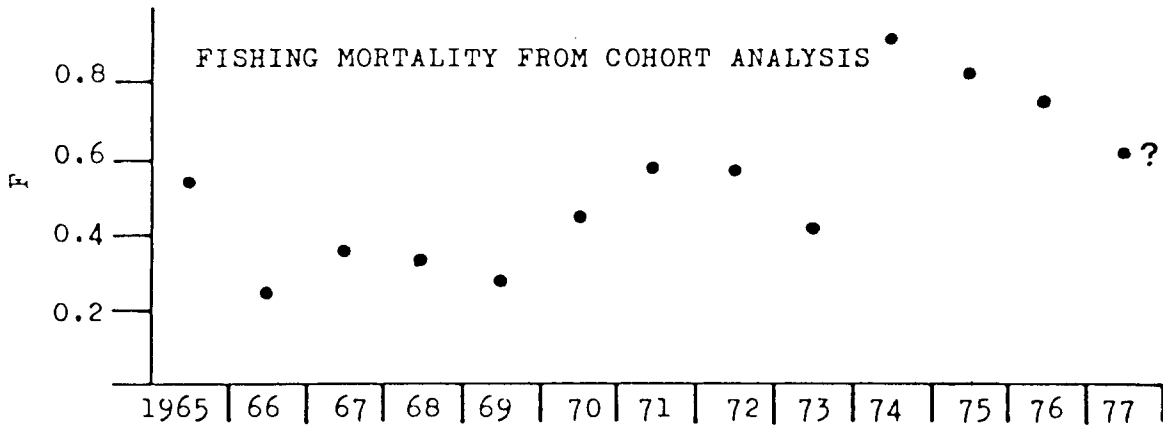
BIOMASS AND CATCH IN THOUSAND TONS



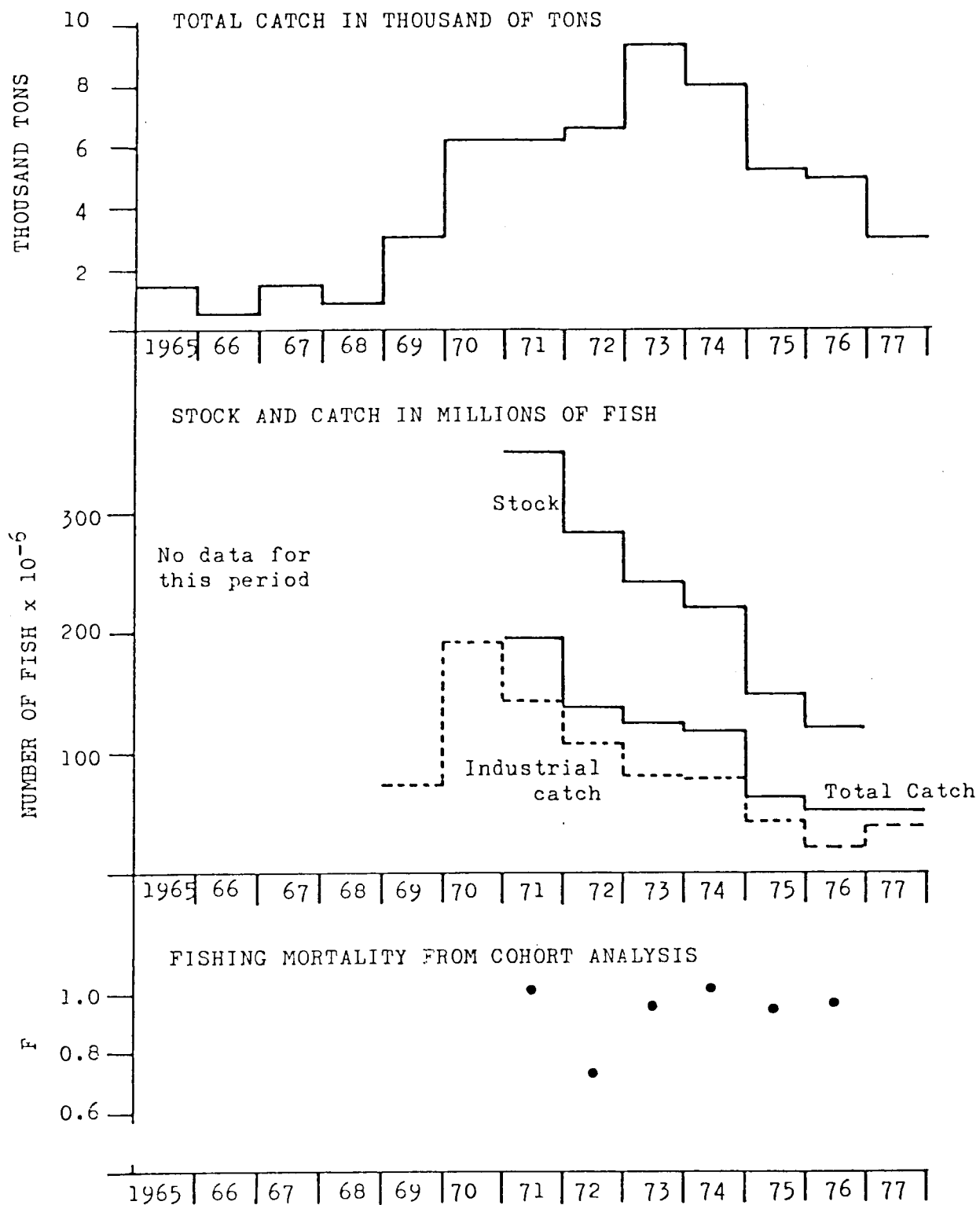
EFFORT IN THOUSANDS OF TRAWLER LANDINGS



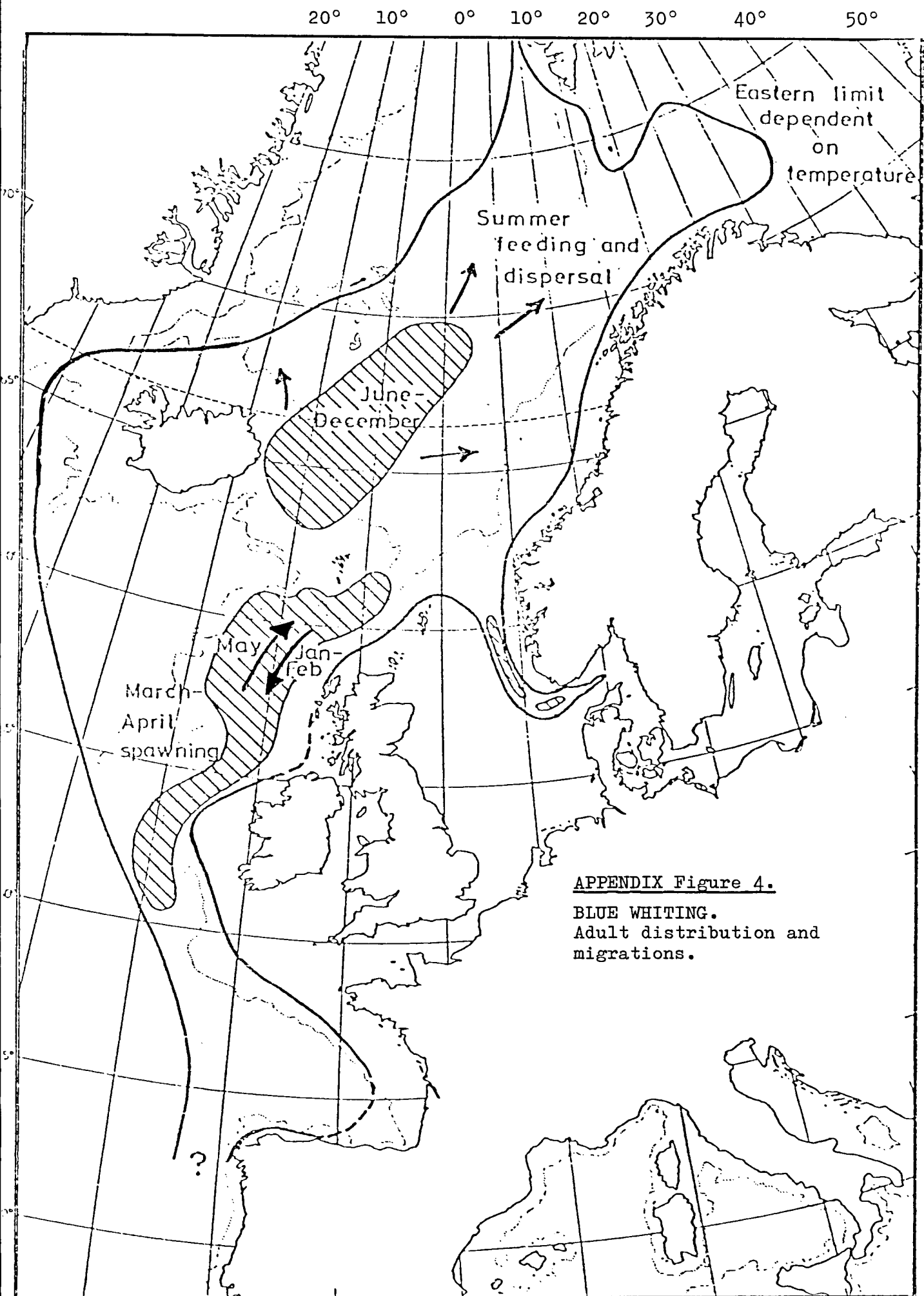
FISHING MORTALITY FROM COHORT ANALYSIS

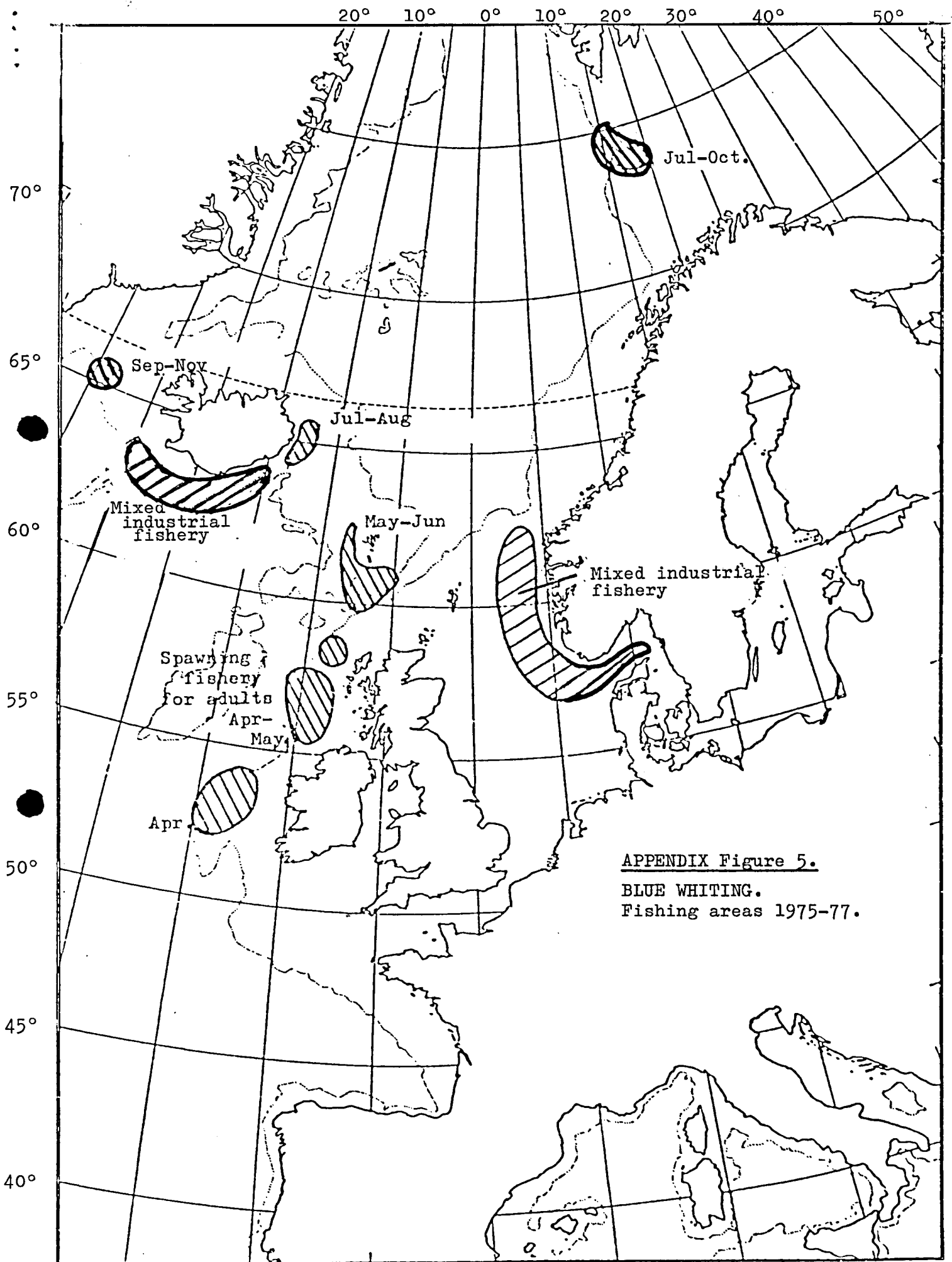


APPENDIX Figure 2. IRISH SEA HERRING. Division VIIa. Exploited Manx stock. Biomass, catch, effort and fishing mortality, 1965-77.



APPENDIX Figure 3. IRISH SEA HERRING. Division VIIa. Mourne stock. Catch by weight and number, stock size and fishing mortality 1965-77.





APPENDIX Figure 5.

BLUE WHITING.
Fishing areas 1975-77.