

This Report not to be cited without prior reference to the Council^{x)}

International Council for the
Exploration of the Sea

C.M.1979/H:8
Pelagic Fish Committee

REPORT OF THE WORKING GROUP ON ATLANTO-SCANDIAN HERRING

Bergen, 21-23 May 1979

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.

x) General Secretary,
ICES, Charlottenlund Slot,
2920 Charlottenlund,
Denmark.

1. Introduction and Participation

1.1. Terms of Reference

At its Statutory Meeting in Copenhagen 1978, the International Council for the Exploration of the Sea (ICES) decided that the Atlanto-Scandian Herring Working Group should meet at the ICES headquarters for three days during the week 21-26 May 1979 to assess the state of the Atlanto-Scandian herring (Chairman: Mr. J. Jakobsson). The Group should also evaluate all available evidence on the relation of the capelin at Jan Mayen with neighbouring stocks.

Subsequently it was decided that the Working Group should meet in Bergen 21-23 May.

1.2. Participants

A.S. Belov	USSR
J. Hamre	Norway
J. Jakobsson (Chairman)	Iceland
S.H. i Jákupsstovu	Faroes
I. Røttingen	Norway
L.I. Shepel	USSR
V.N. Shleinik	USSR

2. Norwegian Spring Spawners

2.1. Catch statistics, age composition and growth curves

A summary of the herring fisheries (not divided by nations) for the period 1950 - 1978 is given in Table 2.1. In 1976 there was a fishing ban enforced and no recorded catches.

The age distribution of the spawning stock is given in Table 2.2. The age composition of the catches in 1977 and 1978 which were taken in the wintering area, is similar to that of the spawning stock. As described later in this report, the results from the tagging project indicate that the spawning stock is divided into a northern and a southern component. Table 2.2. gives the spawning stock age composition for both components for the period 1977 - 1979.

Figure 1 gives growth curves for the 1969, 1973, 1974 and 1975 yearclasses compared with earlier periods.

2.2. Echo registration of herring 1970 - 79

In the last Working Group report, an account of the recordings of herring for the period 1970 - 77 was given. It was pointed out that in the period 1973 - 76 the registrations of herring on the spawning grounds did not indicate any significant increase in the stock. However, in winter 1977, the amount of spawning herring increased significantly. The recordings in 1978 and 1979 did not indicate any further increase in the spawning stock. In the period 1977 - 1979 the distribution pattern has been unchanged with some schools and scattering layers off Møre and Trøndelag in late February and early March.

In 1977, registrations of spent herring were located on the Træna bank in late March. This also happened in 1978, but the registrations were smaller.

Soviet investigations on herring distribution were carried out in the spring of 1976 and 1977 near the spawning grounds of the Norwegian spring spawners. In the second half of

1977 three Soviet research vessels surveyed large areas of the Norwegian Sea as well as in the Jan Mayen and the Jan Mayen - Spitsbergen region.

During these surveys no herring concentrations were located using acoustic methods but experimental fishing using both the driftnets and pelagic trawls yielded a few samples (Table 2.3.) in which the 1969 yearclass dominated.

In 1978 Soviet research vessels did not locate any herring concentrations in the Norwegian Sea and the experimental fishing only yielded one single specimen of herring.

The registrations of immature herring indicate no major change in amount or geographical distribution in the period 1977 - 1979.

2.3. Larval surveys 1977 - 1979

The previous Working Group report gives the distribution charts of the herring larvae for the period 1968 - 1976.

In the period 1973 - 1979 a modified version of the Gulf III sampler has been used for the herring larvae sampling. The distribution of the herring larvae in 1977 - 1979 is shown in Figure 2. The Figure shows no major changes in the larvae production during this period.

2.4. Acoustic abundance of 0-group herring

An acoustic 0-group survey has been carried out in coastal waters of western and northern Norway in October - December 1974 - 1978.

An abundance estimate of 0-group herring for the period

1974 - 1978 are given in Table 2.4. As described in the last Working Group report the 0-group strength for the 1974 yearclass was probably underestimated, because all areas were not surveyed that year. More than 50 % of the 1975 yearclass was recorded in the Trondheimsfjord. Biochemical investigations of the enzyme lactate dehydrogenase (LDH) of this yearclass indicate that the 0-group in the Trondheimsfjord in 1975 partly belonged to a local stock (Rabben 1978). In the autumn of 1978, more than 80 % of the herring recorded in the Trondheimsfjord belonged to the 1975 yearclass. This herring had a reduced growth rate compared with herring of the 1975 yearclass from other areas.

In 1976 - 1978 0-group herring have been recorded in the Barents Sea during the joint 0-group cruises. This component is not included in the estimate given in Table 2.4..

2.5. Tagging experiments

The herring tagging project which was described in the previous Working Group has been continued. Herring have been internally tagged and released at various localities along the Norwegian coast, and catches from an experimental fishery have been analysed for recoveries, using a tag indicator retaining internally tagged fish. Most of the catches screened for tags are taken during winter, either in the overwintering area of the mature stock or at the spawning grounds, but some few samples have also been obtained during autumn. The tagging is done in April - May.

2.6. Stock structure and migration

Figures 3 - 5 show localities of release and recapture

obtained from the winter catches in 1977 to 79. These data provide evidence to separate the herring stock in two spawning-components, a southern component spawning on the southern coast of Møre, (south of 63°N) and a northern one, spawning north of 63°N . The two components differ also in l_1 -distribution, the southern one having the larger first year growth (Table 2.5). This difference was especially large for the 1973 yearclass.

In the 1970-ies the herring have remained in the Norwegian coastal waters after spawning and have not migrated to the feeding area off Iceland as in previous years. During summer and autumn, mature herring have been observed feeding in the coastal waters between Møre and Lofoten. In late autumn the herring migrate into the fjords for overwintering where they are found in very dense concentrations from October to February. The fjords of Lofoten are the main overwintering area of the northern component, whereas the herring of the southern component seem to stay at Møre throughout the year. During February - March there is a spawning migration from the fjords to the spawning grounds off the coast.

2.7. Abundance estimates of the spawning stock

In the previous Working Group report the size of the spawning stock in 1977 was considered to be about 200 000 tons. This was derived from the tagging data obtained from the experimental fishing during the winter 1977. The experimental fishing has been continued in order to sample the stock and obtain tag returns for assessment purposes. Table 2.6 shows the number of releases and recoveries by years and localities of release. The releases recaptured north of 63°N are grouped as northern component, whereas releases recaptured to the south of that latitude are

considered to belong to the southern one. Most of the catch is obtained during the spawning season but a minor proportion is fished during autumn in the overwintering areas.

2.7.1. Northern stock component

The table below summarizes the recoveries and corresponding catch of the northern component for the winters 1977, 1978 and 1979:

Release Year	m	Recoveries			Sum
		1977	1978	1979	
1975	24959	12	14	8	34
1977	13456		10	17	27
1978	10380			13	13
Catch ($N \times 10^{-3}$):		939	705	710	2354

The table includes the releases which are dominated by the age groups older than the 1974 yearclass, with the exception of Jøkelfjord and Altafjord in 1975 and Nordøyane in 1977. These batches are considered as unsuccessful releases. The catches refer to the yearclasses 1973 and older herring exclusively.

The abundance of this stock component was calculated from these data:

$$N_{1975} = \frac{0.7 \cdot 24959 \cdot 2354 \cdot 10^3}{34} = 1210 \cdot 10^6$$

$$N_{1977} = \frac{0.7 \cdot 13456 \cdot 1415 \cdot 10^3}{27} = 494 \cdot 10^6$$

$$N_{1978} = \frac{0.7 \cdot 10380 \cdot 710 \cdot 10^3}{13} = 397 \cdot 10^6$$

The stock abundance estimates refer to the time of release of the respective years (May) and include the 1973 yearclass and older herring. The mortality due to the tagging operation is set at 30 % (Dragesund and Jakobsson 1963). The following spawning stock estimates in number by age are obtained by the use of the age composition given in Table 2.2. and the age/weight data given in Table 2.7. :

Year	Yearclass estimate ($N \times 10^{-6}$)					Σ	Total weight ₋₃ (Tonnes $\times 10^3$)
	1974	1973	1972	1969			
1977	157	361	20	113	651	180	
1978	185	300	18	79	582	180	

The stock size estimates for 1975 - 78 show an average annual total mortality, $Z = 0.37$. Using this value of total mortality rate for 1978-79 the present state of the northern component of the stock is:

Year	Yearclass estimate ($N \times 10^{-6}$)						Σ	Total weight ₋₃ (Tonnes $\times 10^3$)
	1976	1975	1974	1973	1972	1969		
1979	13	17	136	207	10	54	437	150

On this basis it is found that the size of the northern stock component has decreased by about 30 % in number and 20 % in weight during the last two years.

2.7.2. Southern stock component

The recoveries in the winter catches of 1978 and 1979 from the 1977 releases at Kvalvik and the 1978 releases at Hamnøy are used to assess the state of the southern spawning stock component:

Release Year	m	Recoveries		Sum
		1978	1979	
1977	5380	7	10	17
1978	3794		7	7
Catch ($N \times 10^{-3}$):		150	241	391

The releases, recoveries and catch refer to the age groups older than the 1975-yearclass. The abundance of this stock component was calculated from these data:

$$N_{1977} = \frac{0.7 \cdot 5380 \cdot 391 \cdot 10^3}{17} = 87 \cdot 10^6$$

$$N_{1978} = \frac{0.7 \cdot 3794 \cdot 241 \cdot 10^3}{7} = 91 \cdot 10^6$$

The release at Julsundet in 1975 (Table 2.6.) has given 9 recoveries in a catch of $139 \cdot 10^3$ individuals referring to the 1973 yearclass and older herring. This correspond to a stock size in 1975 of about $50 \cdot 10^6$ (Dragesund et al. 1978).

These estimates show that the southern stock component is far the smaller one, only 10-15% of the northern stock component. The age composition of the southern component in 1979 is given in Table 2.2.

The tagging data together with the age composition thus indicate a southern stock level in 1979 of $100 \cdot 10^6$ individuals or about 20 000 tons.

- 2.7.3. Based on tag returns the 1979 spawning stock of the Norwegian Spring Spawning herring was thus estimated as described above to be about 170 000 tons.

2.9. The prognosis for 1978-1979

The following prognosis of the spawning stock in 1978 and 1979 was made by the previous Working Group:

Year	N x 10 ⁻⁶ Age							Spawning stock in weight
	3	4	5	6	7	8	9	
1977	173	413	23	-	-	130	-	200
1978	934	295	352	20	-	-	110	432
1979	1380	1594	251	299	16	-	94	895

The development of the spawning stock has shown that this prognosis was far too optimistic.

The prognosis was made on the following basis.

- A. The spawning stock in number by age in 1977.
- B. Acoustic estimates of the 1975 and 1976 year-classes as 0-group fish (Table 2.4.).
- C. For the years 1977 - 1979 $M = 0.16$ (natural mortality used by previous Working Groups) and $F = 0$ were used for all yearclasses.
- D. Recruitment to the spawning stock was set as 50 % for the 3-year old herring and 100 % for the older.

Comments:

- A. There is a slight overestimate of the 1973-yearclass in the 1977 estimate of the spawning stock (approximately 10 %). This is of minor importance.

- B. As mentioned previously over 50 % of the 1975 yearclass was recorded in the Trondheimsfjord. Later investigations show that this component of the 1975 belong to a local stock, and will thus not recruit to the spawning stock of the Norwegian spring spawners.

A certain fraction of the 0-group estimate in other areas and years may also originate from local stocks.

- C. The natural mortality estimate of 0.16 refers to the adult stock during the 1960-ies. The total annual mortality rate in the 1970-ies obtained from the tagging experiments indicate a higher mortality due to other causes than officially reported landings. It is also possible that the mortality rate of juveniles are higher than in the adult stock. The effects of these factors will lead to an overestimate in the prognosis of the spawning stock.

In addition, the bycatch of juvenile herring in the sprat fishery may be considerable. This was not considered when the prognosis was made, and will have the same effect on the prognosis.

- D. In the prognosis it was assumed that only 50 % of the 1974 yearclass had matured in 1977. It was therefore expected that this yearclass would recruit to the spawning stock with a considerable amount in 1978. According to the age composition in 1978, the 1974 yearclass nearly fully recruited in 1977. The early recruitment was probably due

to a rapid growth (Figure 1 and Table 2-5). The 1975 (and 1976) yearclass have had a reduced growth rate compared with yearclass 1973 and 1974. The growth rate of these yearclasses is compared with the 1969 yearclass. And this yearclass did not recruit to the spawning stock before the age of 4 years. The age distribution of the spawning stock in 1978 and 1979 shows that the 1975 yearclass did neither recruit as 3 or as 4 ringers in any significant numbers.

The effect of all these factors combined has resulted in a decrease of the spawning stock instead of the expected increase of about 100 % annually.

The relation between the 0-group estimates in the fjords and the subsequent recruitment to the spawning stock is as yet uncertain. A longer time series is obviously needed before these data can be used for stock prognoses.

2.10. Management Advice

As requested by ACFM the Working Group considered the optimal range of spawning size for the Norwegian spring spawning herring. It was noted that this had in fact been estimated by Dragesund, Hamre and Ulltang (1978). They found that a recruitment was drastically reduced at spawning stock size below 2.5 million tons. The

Working Group agreed that it should be the long term aim to rebuild the stock to at least this order of abundance. It was however recognized that it may be unrealistic to use criteria based on historic data, especially because the stock at present has a coastal distribution while prior to the seventies it had an oceanic distribution during the feeding and overwintering periods.

The Working Group considered the requirements in terms of spawning stock size and trends in recruitment which must be met before a directed fishery could be recommended. It was agreed that in this case a substantial increase in the spawning stock must be registered before a directed fishery can be recommended and that such a fishery should then be only a fraction of that increase.

As described in the section of the Abundance Estimates of the spawning stock, there has not been observed any increase in the spawning stock since 1977. On the contrary the data indicate that the stock may even have declined to only 170 000 tons. In addition the recruitment from the 1977 and 1978 yearclasses is expected to be low. In the light of this serious state of the stock the Working Group can only recommend that there should be no directed herring fishery in 1979 and 1980. It is further recommended that bycatches (e.g. in the sprat fishery) should also be limited as far as possible.

3. Faroese spring spawning herring

At the Faroe island three different groups of herring have been identified, two spring spawning components and one summer spawning. The summer spawners occur at irregular intervals and are only found in the fjords.

The larger spring spawning component spawned on the banks east of the islands in March - April, the other in the fjords in April - May. Mainly based on the age composition Joensen (1966) concluded that there were two different stocks. The bank spawners arrived to the spawning grounds in late February from the overwintering areas in the Norwegian Sea, and were formerly recognized as part of the Norwegian spring spawning stock spawning at the Faroes (Jakobsson 1970). A fishery on this component took place in the late sixties and was about 16 000 t. in 1967. Since 1968 practically no bank spawning herring have been found on the Faroe plateau.

In 1978 maturing herring was reported from the spawning area on the banks in March as bycatch in the trawl fishery for cod and haddock. A small sample was dominated by the 1968 yearclass. During an echo survey in February 1979 one school of maturing herring was recorded. A sample from this also proved to be dominated by the 1968 yearclass.

Age distribution of Faroese bank spawners in 1979

Age	3	4	5	6	7	8	9	10	11	12	13	14
No.	1		12		3		1	8	66			2

On a larval survey in 1978 subsequent to the spawning time no herring larvae were found. In the Faroese 0-group surveys in 1978 however a considerable increase in 0-group herring was recorded compared to 1977.

Number of 0-group herring caught in the Faroese 0-group surveys in 1977 and 1978

Total catch	1977	1978
in number	7	262
No.of stations	93	94
Negative stations	90	79

During 1978 herring was occasionally reported as bycatch in the trawlfishery indicating that the herring stayed on the plateau throughout the year.

The results of the echosurvey in 1979 during which only one school of herring was located indicates that this stock component is at a very low level with practically no recruitment since 1968.

The Working Group recommends that directed fishery for the bank spawning herring at the Faroes should be prohibited.

4. Icelandic Spring and Summer Spawners

Traditionally, two herring stocks spawn at Iceland i.e. Icelandic Spring and Summer Spawners. Both stocks collapsed during the sixties (Coop.Res.Rep. 17 and 30 and Jakobsson 1978).

On the 1 February 1972 a ban on herring fishing with all gear other than drift nets was introduced. This ban was in force until 15 September 1975. Since then the fishery has been limited by catch quotas, seasonal closures and minimum landing size (27 cm). No recovery of the Spring spawners has so far been observed and the fishery since 1975 has been based entirely on summer spawners.

4.1. The Fishery

The landings of summer spawning herring for 1969-1978 are given in Table 4.1. During the years 1969-1971 these fluctuated between 19500-11500 tons. These catches were at a much lower level than the ones taken in the early sixties when e.g. in 1963 a peak catch of 130300 tons was taken. During 1972-1974 the catches remained at a very low level (200-1200 tons) due to the fishing ban with all gear other than driftnets. The old Icelandic driftnet fishery terminated in 1959 so at that time there was no commercial fleet equipped for this fishery. Therefore there was no need for a ban on that fishery in the early 70-ies. Since 1975 there has been a steady increase in the catches. It should be noted that the catches prior to 1972 (Table 4.1) were all taken by purse seine but in 1972-1974 only driftnets were used while in 1975-1978 the catches were taken by both gear as shown in the text table below.

Landings and TAC's in 1000 tons of Icelandic summer spawners 1975-1978 by gear are given below

	Purse seine		Driftnets	
	Landings	TAC's	Landings	TAC's
1975	9.2	7.5	3.6	
1976	10.0	10.0	7.8	
1977	15.6	15.0	13.1	10.0
1978	20.2	20.0	17.1	15.0

4.2. Stock abundance and mortality rates

The assessment of the stock and the exploitation is based on acoustic stock abundance estimates and catches by age using a VPA.

4.2.1. The catch in number and mean weights

The catch in number of the Icelandic summer spawners are given in Table 4.2. During 1975-1977 the catches were predominated by the 1971 yearclass. In 1978 this yearclass was still very important in the catch although the 1974 yearclass was caught in higher numbers. The weight at age in grams is given for each year in Table 4.3. and used for calculating biomass. It should be noted that during the last few years there is a general declining trend in mean weights.

Thus the mean weights of 3 ringers was:

	1974	1975	1976	1977	1978
Weight in g	262	241	243	217	198

This trend in declining mean weights may indicate a density dependent growth.

4.2.2. The Fishing mortality in 1978

As in previous years an echo abundance survey was carried out on the wintering grounds at south east Iceland in 1978. The integrator values per nautical mile and the area of the wintering concentration is shown in Fig. 6 . Using the estimate given by Jakobsson (1978) the echo abundance values obtained in this survey correspond to about 180 000 tons of herring. The mean weights and the age distribution obtained from sampling the wintering

concentration was then used to calculate the abundance of each age group. The fishing mortality for 1978 was then calculated from these survey results and the catch data from the previous fishing season using the formula with $M = 0.1$.

$$\frac{N_{\text{Dec 1978}}}{C_{1978}} = \frac{e^{-Z}}{(1 - e^{-Z}) \frac{F}{Z}}$$

The results are given in the text table below

Rings	Age distrib.	Mean w by age	Echo stock in millions Dec. 1978	Catch in no 1978 in millions	F_{78}
1	17	63	185	2.6	0.01
2	34	102	373	22.3	0.05
3	21	196	233	50.5	0.19
4	5	248	52	13.7	0.22
5	2	292	23	8.6	0.30
6	11	302	119	39.1	0.27
7	3	327	31	7.2	0.17
8	3	350	32	6.3	0.16
8+	-	350	20	2.8	0.15

$n = 809$ $\bar{w} = 168$ g weighted $F = 0.21$

4.2.3. The Results of the VPA

A VPA was run with the input F s obtained from the catch in number data in 1978 and the results of the Echo abundance survey, as described above using $M = 0.1$. The results are given in Tables 4.4 and 4.5.

During the most recent years 1975-1978 the adult F has increased from 0.08 to 0.21. The adult stock biomass increased sharply in 1975 and has until 1977 been about 160 000 tons. It should however be stressed that these estimates are all highly dependant on the results of the echo abundance survey.

As shown in Table 5 the 1971 yearclass is now estimated to have been about 520×10^6 herring as 1 ringers. The 1972 and the 1973 yearclasses were both weak (93 and 145 millions) while the 1974 and the 1975 yearclasses are estimated to about 400 millions as 1 ringers.

4.3. The state of the stock and advice of TAC

Based on the echo abundance estimate from December 1978 the adult stock biomass will be about 200 000 tons in 1979. This level of stock abundance is well within the range of stock-biomass during the 1954-1963 period of high and steady recruitment (Jakobsson 1978).

A TAC for 1979 has been set at 35 000 tons. This will generate an F on the adult agegroups in 1979 which is close to the $F_{0.1}$ which for this stock for the present fishing pattern is about $F = 0.2$ (Jakobsson 1973).

The Working Group recommends that for 1980 the TAC should be calculated on the bases of the results of 1979 echo abundance survey and using an F close to $F_{0.1}$.

5. The capelin at Jan Mayen

The Working Group noted that the relation of the capelin at Jan Mayen with neighbouring stocks had been considered by scientists from Faroes, Iceland and Norway during a meeting which was held in Reykjavik 27-29 March 1979. The Working Group agreed that the subject of the Jan Mayen capelin was fully dealt with in the report from the Reykjavik meeting. This capelin report is therefore appended to the Working Group report.

References

- Dragesund, O. and Jakobsson, J. 1963. Stock strengths and rates of mortality of the Norwegian spring spawners as indicated by tagging experiments in Icelandic waters. Rapp.P.-v.Reun.Cons.perm.int.Explor,Mer, 164: 15-29.
- Dragesund, O., Hamre, J. and Ulltang, Ø. 1978. Biology and population dynamics of the Norwegian spring spawning herring. ICES/Symposium on the Biological Basis of Pelagic Fish Stock Management, Aberdeen, July 1978. Contribution no. 3.: 1-80 [Mimeo].
- Jakobsson, J. 1970. The biological Position of the "Faroese Bank" Herring within the Atlanto-Scandian Herring Stocks. Coun.Meet.int.Coun.Explor.Sea, 1970 (H:12) [Mimeo].
- Jakobsson, J. 1973. Population Studies on the Icelandic Herring Stocks. Coun.Meet.int.Coun.Explor.Sea, 1973 (H:4) [Mimeo].
- Jakobsson, J. 1978. Exploitation of the Icelandic Spring and Summer Spawning Herring in Relation to Fisheries Management 1947 - 1977. ICES/Symposium on the Biological Basis of Pelagic Fish Stock Management, Aberdeen, July 1978. Contribution no. 2.: 1-43 [Mimeo].
- Joensen, J.S. 1966. Royndarfiskiskapur eftir sild vid nótt i januar - mars 1966 vid M/S "Sildrekanum". Fiskirannsóknir I. Torshavn 1966.
- Rabben, H. 1978. Intraspesifikke grupper av sild (Clupea harengus harengus L) på norskekysten frå Stad til Vesterålen. Unpublished. Thesis cand.real. University of Bergen: 1-71 [Mimeo].

Table 2.1. Catches (in thousand tons) of Norwegian spring-spawning herring during the period 1950-1978.

Year	Winter herring	Summer and autumn herring	Total adult herring	Small and fat herring	Grand total
1950	771.3	54.8	826.1	106.9	933.0
1951	889.3	104.9	994.2	284.2	1 278.4
1952	829.4	89.8	919.2	335.6	1 254.8
1953	678.6	171.3	849.9	240.7	1 090.6
1954	1 119.1	187.3	1 306.4	338.1	1 644.5
1955	1 004.4	213.1	1 217.5	142.3	1 359.8
1956	1 192.8	267.8	1 460.6	198.8	1 659.4
1957	856.5	291.8	1 148.3	171.2	1 319.5
1958	429.1	355.9	785.0	201.6	986.6
1959	510.2	372.9	883.1	228.0	1 111.1
1960	401.0	420.1	821.1	280.7	1 101.8
1961	146.3	351.6	497.9	332.2	830.1
1962	133.5	417.7	551.2	297.4	848.6
1963	132.8	538.0	670.8	313.7	984.5
1964	420.2	697.7	1 117.9	163.9	1 281.8
1965	391.2	934.6	1 325.8	221.9	1 547.7
1966	631.8	1 091.7	1 723.5	231.5	1 955.0
1967	458.8	672.7	1 131.5	545.7	1 677.2
1968	44.8	228.3	273.1	439.1	712.2
1969	20.5	3.6	24.1	43.7	67.8
1970	20.9	-	20.9	41.4	62.3
1971	6.9	-	6.9	14.2	21.1
1972	-	-	-	13.2	13.2
1973	-	-	-	6.8	6.8
1974	-	-	-	6.3 ¹⁾	6.3 ¹⁾
1975	-	-	-	3.1 ¹⁾	3.1 ¹⁾
1976	-	-	-	-	-
1977	0.4	-	-	12.4 ¹⁾	12.8
1978	0.5	-	-	8.5 ¹⁾	9.0

1) Catch consists of adult and juvenile herring caught in Norwegian inshore waters during autumn.

Table 2.2. Norwegian spring spawners. Age composition of the spawning stock in 1973 - 1979.
 (N) = Northern stock component, (S) = Southern stock component.

Age	Year									
	1973	1974	1975	1976	1977(N)	1978(N)	1979(N)	1977(S)	1978(S)	1979(S)
3	5	2	18	52	24		3	15	7	19
4	84	8	2	12	56	32	4	72	54	20
5	3	88	2		3	52	31	5	38	35
6	4	1	78	1		3	47		1	25
7	2	1		35			2			1
8	1				17			8		
≥9	1					13	13			

Table 2.3. A) Herring samples collected during Soviet experimental fishing in the Norwegian Sea in 1976 - 1977.

Year	Date	Position	Number of specimens
1976	13.03	67 ⁰ 50'N 10 ⁰ 20'E	1
	15.03	65 ⁰ 57'N 09 ⁰ 43'E	100
	16.03	65 ⁰ 59'N 09 ⁰ 08'E	25
1977	3.03	65 ⁰ 20'N 09 ⁰ 40'E	2
	9.03	63 ⁰ 20'N 05 ⁰ 10'E	4
	11.03	63 ⁰ 10'N 04 ⁰ 35'E	14
	13.03	62 ⁰ 50'N 04 ⁰ 10'E	10
	14.03	63 ⁰ 20'N 05 ⁰ 25'E	2
	16.03	63 ⁰ 50'N 06 ⁰ 20'E	21
	17.03	64 ⁰ 50'N 08 ⁰ 05'E	100
	18.03	64 ⁰ 59'N 08 ⁰ 10'E	100

Table 2.3. B) Age composition (%) of herring samples from the Soviet experimental fishing 1976 - 1977.

Year	Age											Number of species analysed
	2	3	4	5	6	7	8	9	10	11	12	
1976	-	5.2	4.3	0.9	3.5	80.8	3.5	0.9	-	-	0.9	115
1977	-	11.2	10.3	2.4	1.2	3.2	66.1	5.6	-	-	-	251

Table 2.4. Abundance ($N \times 10^{-6}$) of 0-group herring in 1974 - 78.

Year	Area			Total
	Møre, Trøndelag	Nordland	Troms, Finnmark	
1974	50	249	31	330
1975	1 933	692	55	2 680
1976	440	2 610	750	3 800
1977	72	305	37	414
1978	321	511	392	1 224

Table 2.5. l_1 (cm) for the 1973 and 1974 yearclasses from the northern and southern stock components. Age of sampling is 3 years (n = sample size).

Stock component	Yearclass	
	1973 (n)	1974 (n)
Northern	11.3 (271)	15.1 (97)
Southern	14.2 (23)	16.2 (14)

Table 2.6. Norwegian spring spawners. Tagging localities and number released during the tagging project 1975-78 and number of recoveries during the experimental fishing 1977-79.

YEAR OF RELEASE	CAT.	LOCALITIES	POSITION	NUMBER RELEASED	NUMBER RECOVERED
1975	S	Julsundet	N62 ⁰ 51' Ø06 ⁰ 58'	5000	15
	N	Kjeungskjær	N63 ⁰ 43' Ø09 ⁰ 31'	4988	7
	N	Haltefjord	N64 ⁰ 57' Ø11 ⁰ 06'	5996	8
	N	Vegafjord	N65 ⁰ 30' Ø11 ⁰ 58'	2995	4
	N	Sørfjord	N66 ⁰ 58' Ø13 ⁰ 55'	4981	14
	N	Leinesfjord	N67 ⁰ 47' Ø14 ⁰ 58'	1999	1
	N	Gavlfjord	N68 ⁰ 53' Ø15 ⁰ 19'	4000	5
	N	Jøkelfjord	N70 ⁰ 04' Ø21 ⁰ 56'	3999	0
	N	Altafjord	N70 ⁰ 02' Ø22 ⁰ 59'	3985	1
1976	S	Bud	N62 ⁰ 54' Ø06 ⁰ 55'	3198	3
	N	Fillfjord	N63 ⁰ 35' Ø09 ⁰ 01'	4797	2
	N	Lurøy	N66 ⁰ 27' Ø12 ⁰ 55'	5999	5
	N	Eidsfjord	N68 ⁰ 43' Ø15 ⁰ 07'	9947	4
	N	Nordreisa	N67 ⁰ 48' Ø20 ⁰ 56'	2950	0
1977	S	Rundø	N62 ⁰ 22' Ø05 ⁰ 48'	4048	4
	S	Kvalvik	N63 ⁰ 06' Ø07 ⁰ 54'	5997	18
	S+N	Stokksund	N64 ⁰ 05' Ø10 ⁰ 02'	5998	10
	N	Nordøyane	N64 ⁰ 50' Ø10 ⁰ 36'	9996	4
	N	Træna	N66 ⁰ 30' Ø12 ⁰ 06'	3996	11
	N	Eidsfjord	N68 ⁰ 44' Ø15 ⁰ 04'	9997	16
1978	S	Hamnøy	N62 ⁰ 31' Ø06 ⁰ 10'	5999	10
	N	Haltefjord	N64 ⁰ 57' Ø11 ⁰ 07'	5999	1
	N	Valvær	N66 ⁰ 48' Ø12 ⁰ 46'	10998	16
	N	Husvågen	N68 ⁰ 15' Ø14 ⁰ 40'	9000	7
Sum				136862	166

Table 2.7. Age-weight data for herring (Average data for herring samples from Møre in the first quarter of 1978).

Age (years)	:	2	3	4	5	6	7	8	9
Average weight (g)	:	104	167	261	297	361		402	462

Table 4.1. Landings of Icelandic Summer spawning herring 1969 - 1978
in tons x 10⁻³.

1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
19.4	15.9	11.5	0.3	0.2	1.2	12.8	17.8	28.7	37.2

Table 4.2. Catch in numbers, millions, Icelandic Summer Spawners
1969 - 1978.

AGE	1969	1970	1971	1972	1973	1974	1975
1	4.520	2.003	8.774	0.176	0.001	0.001	1.465
2	78.410	22.344	13.071	0.385	0.172	3.681	1.977
3	8.274	33.965	5.439	0.157	0.734	0.814	30.855
4	5.178	4.500	13.688	0.195	0.113	0.972	6.266
5	10.015	2.734	3.040	0.316	0.018	0.090	7.628
6	2.841	4.419	1.563	0.056	0.014	0.045	0.833
7	1.389	1.145	3.276	0.033	0.006	0.002	0.427
8	1.179	0.531	0.748	0.029	0.006	0.001	0.333
9	0.609	0.604	0.250	0.016	0.003	0.001	0.110
10	0.424	0.195	0.103	0.011	0.003	0.001	0.004
11	0.286	0.103	0.120	0.004	0.001	0.001	0.001
12	0.139	0.076	0.001	0.001	0.001	0.001	0.001
13	0.109	0.061	0.001	0.004	0.001	0.001	0.001
14	0.074	0.051	0.001	0.001	0.001	0.001	0.001
SUM 0- 2	82.930	24.347	21.845	0.561	0.173	3.682	3.442
SUM 3-14	30.517	48.384	28.230	0.823	0.901	1.930	46.460
TOTAL	113.447	72.731	50.075	1.384	1.074	5.612	49.902

AGE	1976	1977	1978
1	0.632	0.663	2.607
2	10.136	18.266	22.318
3	4.022	23.400	50.469
4	35.142	10.080	13.703
5	7.214	44.913	8.648
6	5.641	6.523	39.085
7	1.076	5.252	7.178
8	0.451	1.352	6.288
9	0.305	0.508	1.599
10	0.138	0.351	0.916
11	0.095	0.026	0.396
12	0.001	0.124	0.017
13	0.001	0.001	0.025
14	0.001	0.001	0.050
SUM 0- 2	10.768	18.949	24.925
SUM 3-14	54.087	92.533	128.374
TOTAL	64.855	111.482	153.299

Table 4.3. Weight at age, in grams, Icelandic Summer Spawners
1969 - 1978.

AGE	1969	1970	1971	1972	1973	1974	1975
1	82.0	85.0	88.0	96.0	90.0	80.0	110.0
2	164.0	174.0	166.0	177.0	199.0	189.0	179.0
3	217.0	227.0	244.0	278.0	257.0	262.0	241.0
4	280.0	278.0	277.0	332.0	278.0	297.0	291.0
5	295.0	330.0	306.0	358.0	337.0	340.0	319.0
6	319.0	347.0	327.0	379.0	381.0	332.0	339.0
7	355.0	358.0	351.0	410.0	380.0	379.0	365.0
8	395.0	410.0	371.0	419.0	397.0	356.0	364.0
9	395.0	420.0	391.0	470.0	385.0	407.0	407.0
10	395.0	425.0	412.0	500.0	450.0	410.0	389.0
11	377.0	451.0	420.0	500.0	450.0	410.0	430.0
12	423.0	464.0	435.0	500.0	450.0	423.0	416.0
13	441.0	471.0	446.0	500.0	450.0	423.0	416.0
14	481.0	459.0	420.0	500.0	450.0	423.0	416.0
AGE	1976	1977	1978				
1	103.0	84.0	73.0				
2	189.0	157.0	128.0				
3	243.0	217.0	196.0				
4	281.0	261.0	247.0				
5	305.0	285.0	295.0				
6	335.0	313.0	314.0				
7	351.0	326.0	339.0				
8	355.0	347.0	359.0				
9	395.0	364.0	360.0				
10	363.0	362.0	376.0				
11	396.0	358.0	380.0				
12	396.0	355.0	425.0				
13	396.0	400.0	425.0				
14	396.0	420.0	425.0				

Table 4.4. Calculated fishing mortality, Icelandic Summer Spawners
1969 - 1978, $M=0.10$, Initial $F=0.21$.

AGE	1969	1970	1971	1972	1973	1974	1975
1	0.09	0.05	0.08	0.00	0.00	0.00	0.01
2	0.82	0.76	0.45	0.00	0.00	0.01	0.02
3	0.63	0.93	0.36	0.01	0.01	0.01	0.08
4	0.64	0.74	1.16	0.02	0.01	0.01	0.09
5	0.72	0.74	1.69	0.04	0.00	0.01	0.12
6	0.63	0.72	1.17	0.09	0.00	0.01	0.06
7	0.92	0.65	1.89	0.05	0.01	0.00	0.03
8	0.90	1.01	3.15	0.06	0.01	0.00	0.09
9	0.86	1.71	2.28	0.77	0.01	0.00	0.31
10	1.15	0.66	1.91	0.57	0.28	0.00	0.01
11	1.22	0.87	0.99	0.29	0.08	0.12	0.00
12	1.11	1.20	0.02	0.02	0.10	0.10	0.16
13	0.80	3.56	0.03	0.07	0.02	0.12	0.12
14	0.70	1.00	1.00	0.04	0.02	0.02	0.15
AVERAGE WEIGHTED BY STOCK IN NUMBERS							
A 3-13	0.71	0.88	1.00	0.02	0.01	0.01	0.09
Ave 1-14	0.65	0.64	0.38	0.01	0.00	0.01	0.07
AGE	1976	1977	1978				
1	0.00	0.00	0.01				
2	0.09	0.06	0.06				
3	0.06	0.26	0.21				
4	0.11	0.18	0.21				
5	0.13	0.18	0.21				
6	0.11	0.14	0.21				
7	0.09	0.13	0.21				
8	0.07	0.14	0.21				
9	0.10	0.09	0.21				
10	0.69	0.14	0.21				
11	0.28	0.23	0.21				
12	0.00	0.61	0.21				
13	0.21	0.00	0.21				
14	0.15	0.30	0.21				
AVERAGE WEIGHTED BY STOCK IN NUMBERS							
Ave 3-13	0.10	0.19	0.21				
Ave 1-14	0.07	0.09	0.12				

Table 4.5. Stock in numbers, millions, Icelandic Summer Spawners
1969 - 1978, M=0.10, Initial F=0.21.

AGE	1969	1970	1971	1972	1973	1974	1975
1	53.312	43.797	113.862	105.334	520.445	93.220	145.711
2	146.361	43.944	37.726	94.690	95.142	471.268	84.313
3	18.577	58.370	18.649	21.754	85.313	85.924	422.921
4	11.451	8.983	20.774	11.718	19.534	76.496	76.974
5	20.442	5.464	3.875	5.904	10.418	17.568	68.292
6	5.266	9.030	2.360	0.654	5.042	9.409	15.810
7	2.412	2.082	3.994	0.663	0.539	4.349	8.471
8	2.075	0.871	0.803	0.544	0.569	0.482	4.114
9	1.104	0.765	0.288	0.031	0.465	0.509	0.437
10	0.646	0.424	0.125	0.027	0.013	0.413	0.460
11	0.422	0.185	0.199	0.017	0.014	0.009	0.377
12	0.216	0.113	0.071	0.067	0.011	0.011	0.007
13	0.207	0.064	0.031	0.063	0.060	0.009	0.009
14	0.104	0.064	0.002	0.027	0.053	0.053	0.008
Adult stock weight 3-14	17.730	22.494	14.255	12.914	33.465	56.637	156.586

AGE	1976	1977	1978
1	363.250	476.417	273.302
2	130.452	328.081	430.429
3	74.410	108.407	279.501
4	353.356	63.507	75.888
5	63.695	286.346	47.893
6	54.348	30.782	216.456
7	13.514	43.999	39.752
8	7.259	11.206	34.823
9	3.406	6.140	8.855
10	0.289	2.792	5.073
11	0.412	0.131	2.193
12	0.340	0.283	0.094
13	0.006	0.307	0.138
14	0.006	0.004	0.277
Adult stock weight 3-14	164.149	159.352	187.745

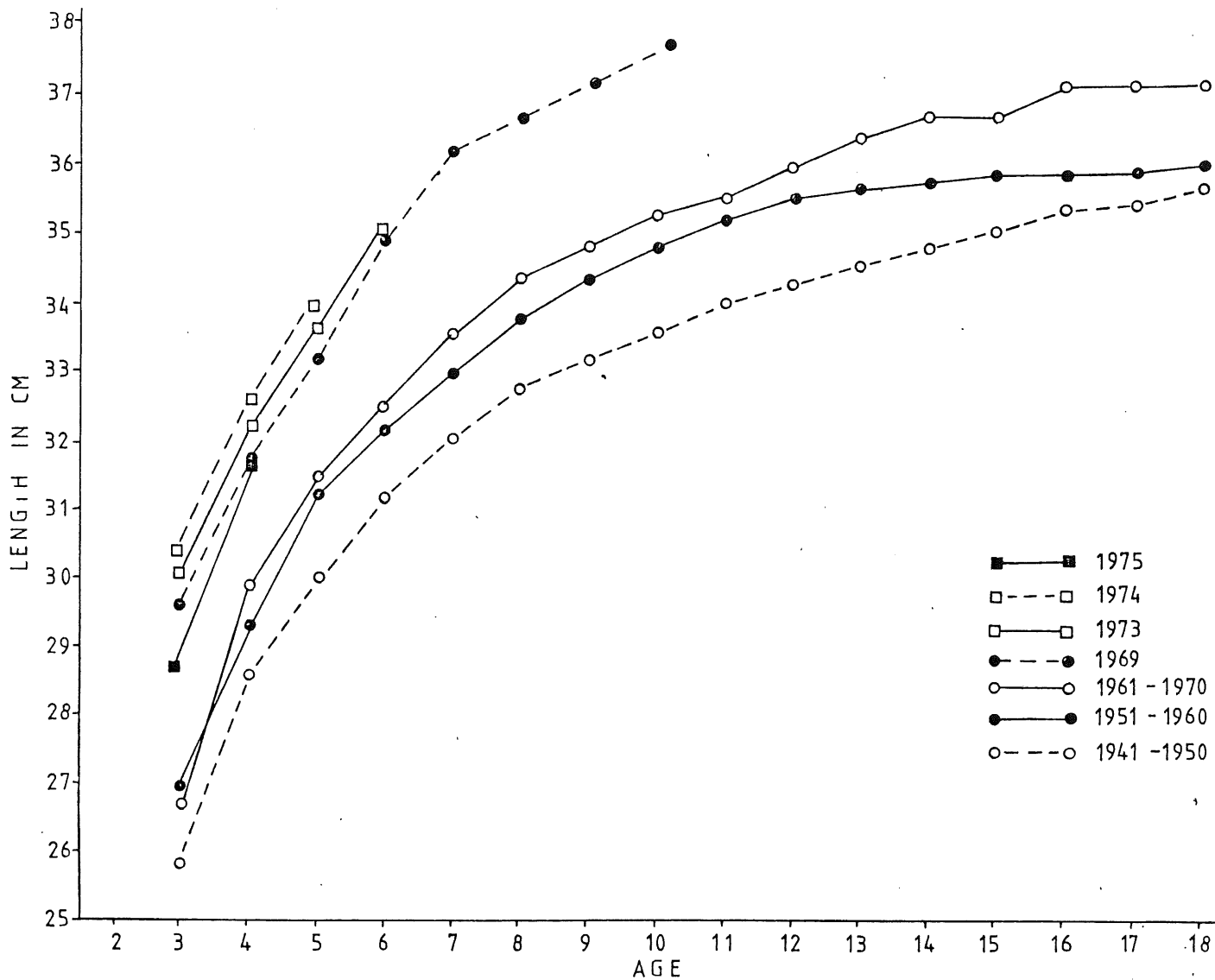


Figure 1. Growth curves for the 1969, 1973, 1974 and 1975 yearclasses compared with growth curves for earlier periods.

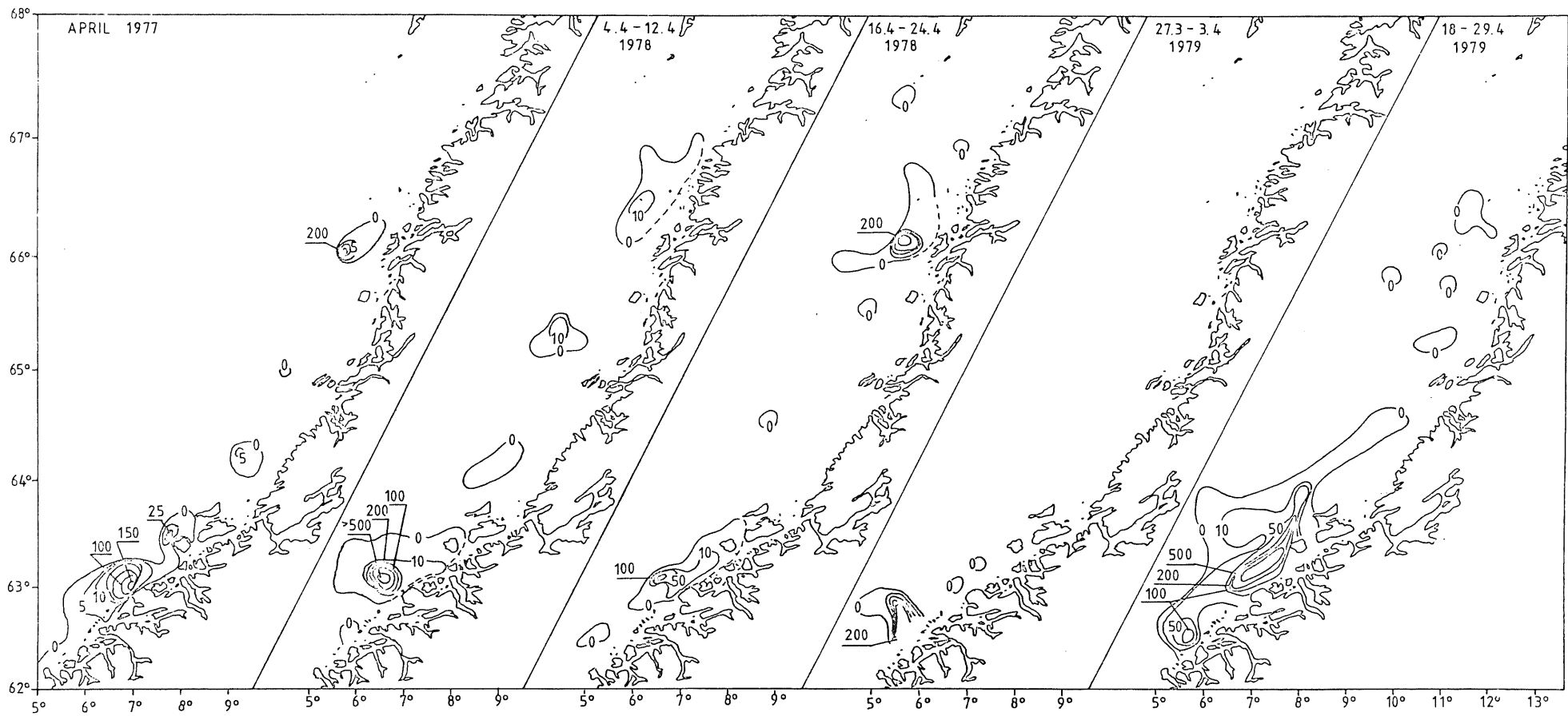


Figure 2. Norwegian spring spawners. Distribution of herring larvae 1977-1979. Number of larvae per m^2 surface.

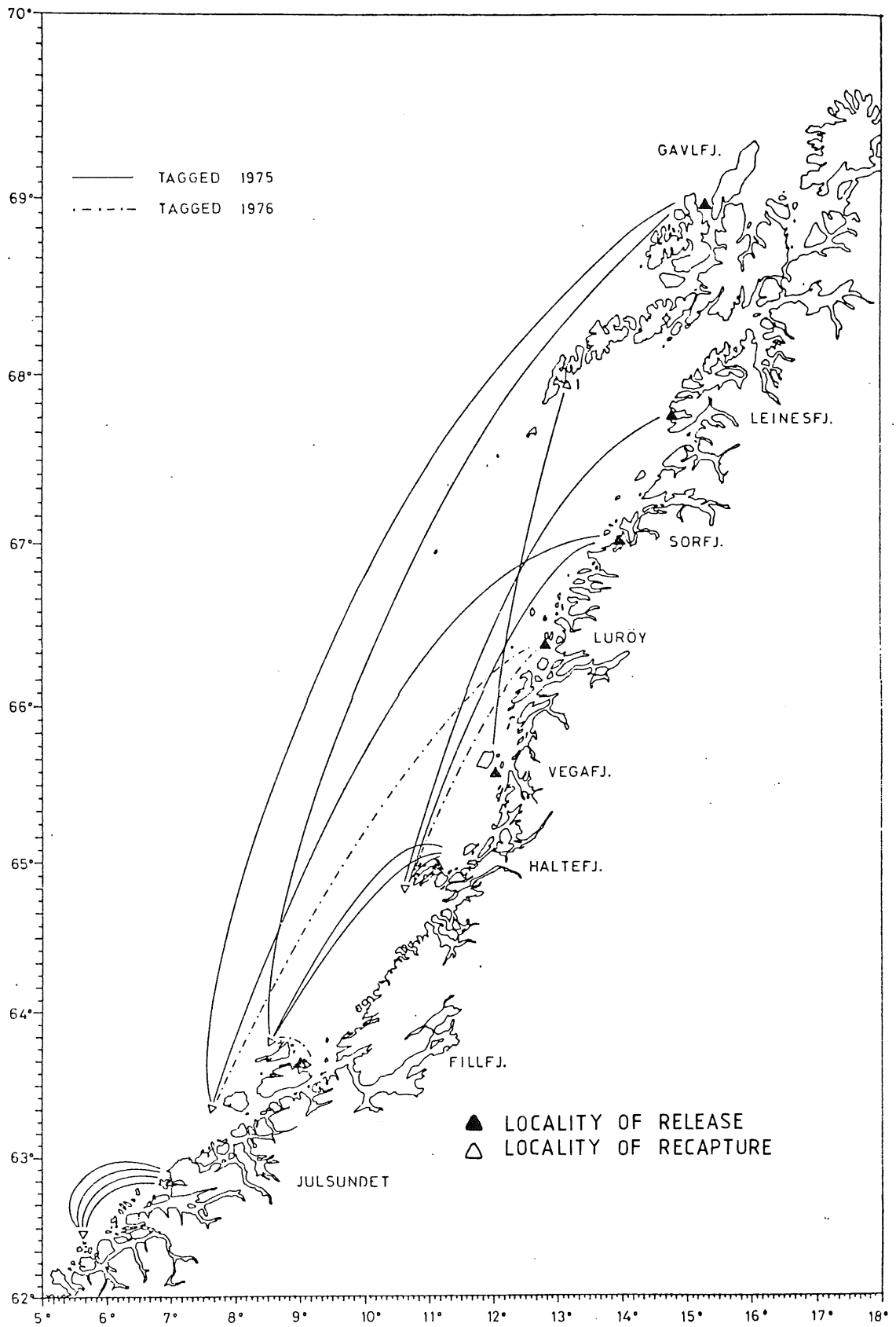


Figure 3. Distribution of tag returns from the experimental fishing in 1977.

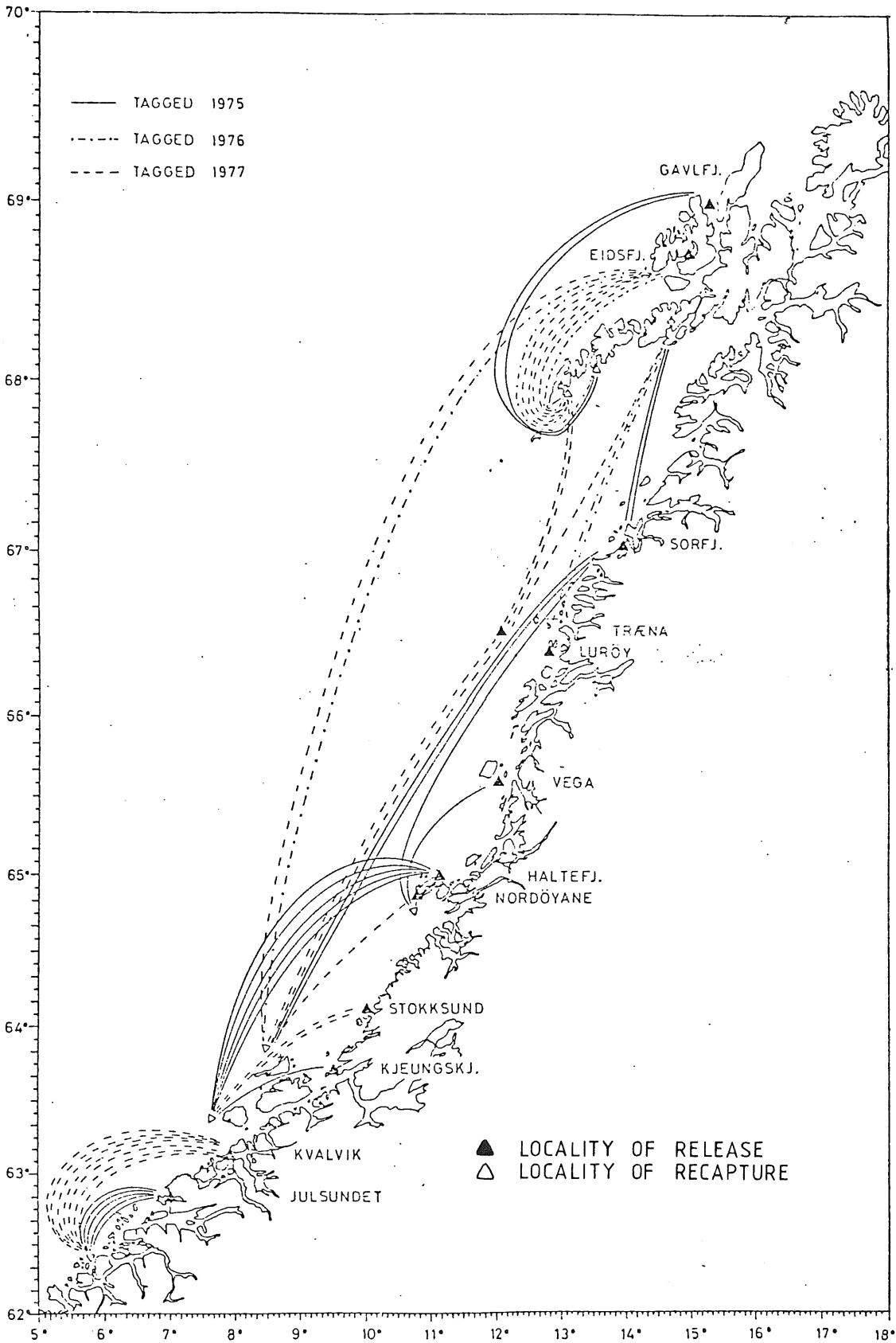


Figure 4. Distribution of tag returns from the experimental fishing in 1978.

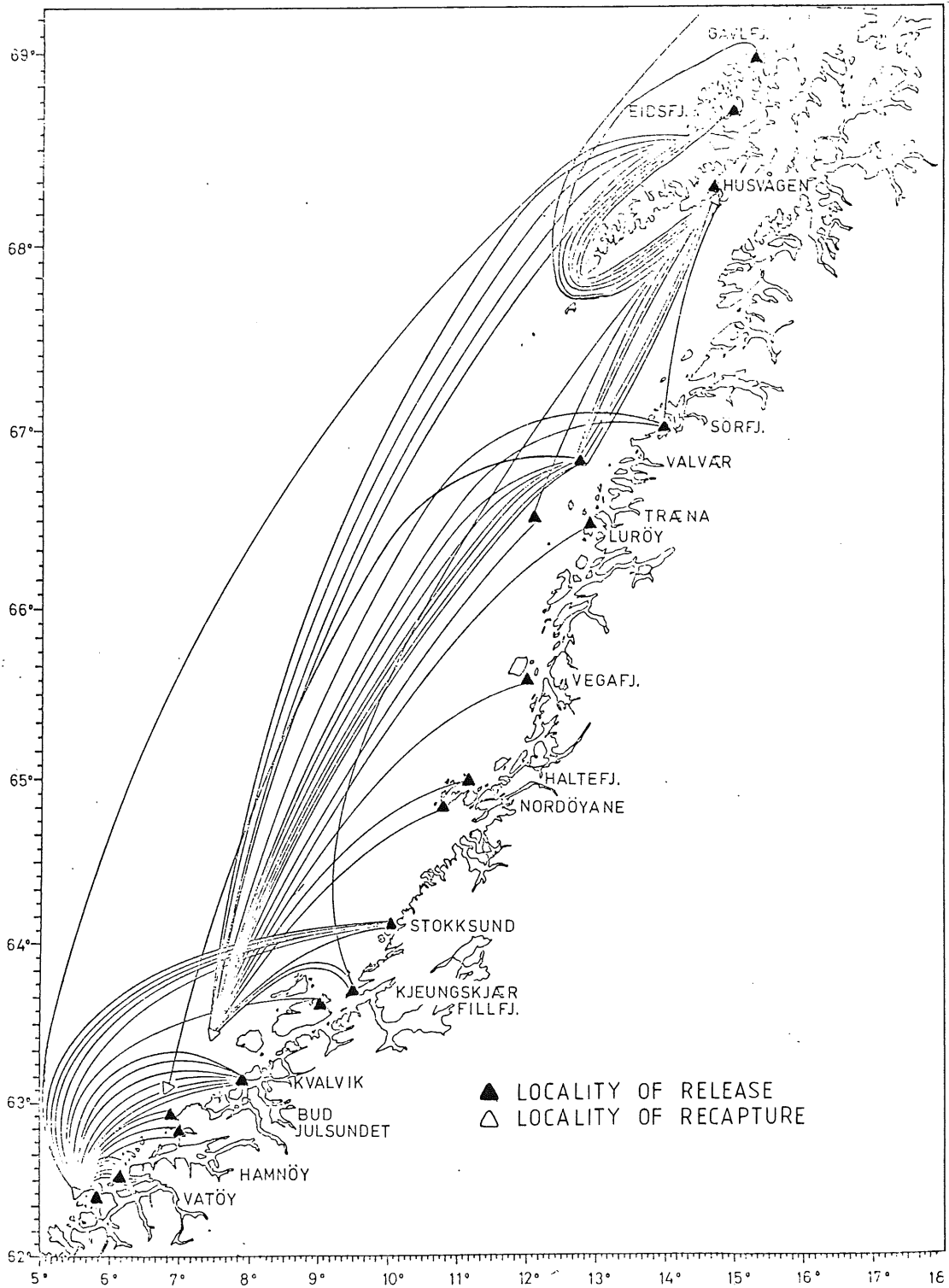


Figure 5. Distribution of tag returns from the experimental fishing in 1979.

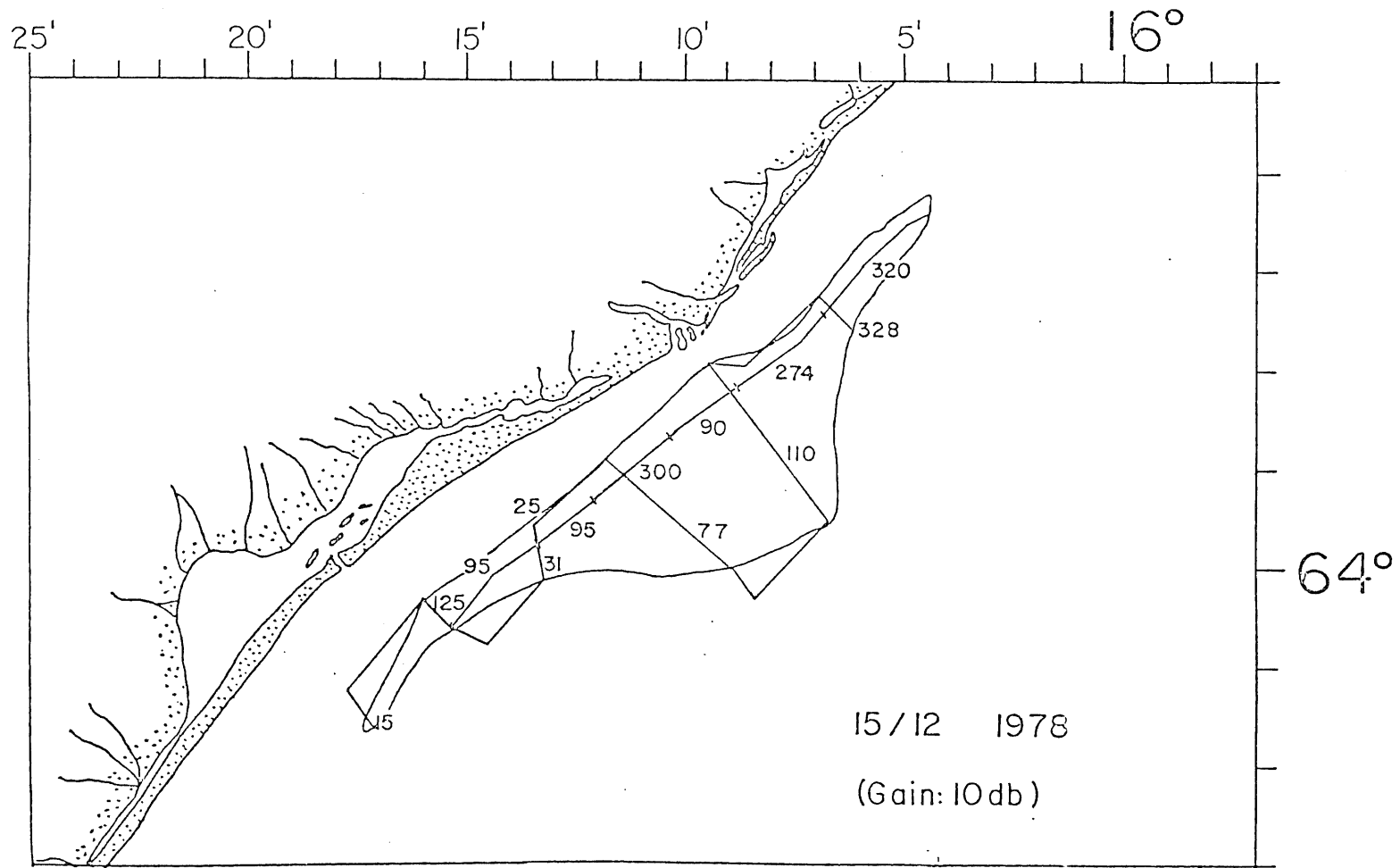


Fig. 6. Echo abundance survey carried out 15.12. 1978 on the wintering concentration of the Icelandic Summer Spawning Herring at South East Iceland. The numbers inserted along the course lines give integrator elevation in mm per sailed nautical mile.

APPENDIX

Report of the capelin meeting
held in Reykjavík 27-29 March 1979.

1. Introduction

While scouting for blue whiting a Norwegian purse seiner located dense concentrations of capelin 15-20 n.m. SW of Jan Mayen in the middle of August 1978. The first catch of about 1300 tons was taken on the 19 August. During the following weeks the fishery moved northwards and mainly took place N and NW of Jan Mayen. The Norwegian catches were taken in late August, September and early October. The Faroese and the Icelandic catches were taken in September only. The total international catches are given by countries in the text table below.

Catches in metric tons in the Jan Mayen area August-October 1978.

	August	September	October	Total
Faroe	-	3353	-	3353
Iceland	-	59937	-	59937
Norway	19776	133160	2306	154143

As a result of this new development in the Jan Mayen area Iceland invited scientists from Faroe and Norway to a meeting in Reykjavík to discuss (i) the identity of the Jan Mayen Capelin (ii) the present state of the capelin stock (iii) the TAC of capelin for the coming season.

This meeting took place during 27-29 March 1979 in Reykjavík and the participants were:

Are Dommasnes, Havforskningsinstituttet, Bergen
Johannes Hamre, " " "
Jakob Jakobsson, Hafrannsóknastofnun, Reykjavík
Hjalti í Jakupsstovu, Fiskirannsóknarstofvan, Thorshavn
Sveinn Sveinbjörnsson, Hafrannsóknastofnun, Reykjavík
Gunnar Sætersdal, Havforskningsinstituttet, Bergen
Hjálmar Vilhjálmsson, Hafrannsóknastofnun, Reykjavík.

2. The identity of the Jan Mayen Capelin.

2.1. Surveys.

The results from earlier surveys (in 1960 and onwards) were reviewed in order to study the historical occurrence of capelin in the Jan Mayen area.

During the sixties the area was surveyed regularly in spring (May-June) without positive results. In mid or late summer on the other hand the Jan Mayen area was reasonably well covered only in 1966 and 1967. In the former year dense concentrations were located north of Iceland ($68^{\circ}\text{N } 19^{\circ}\text{W}$) while in the latter year (July-August) they were located west of Jan Mayen ($71^{\circ}\text{N } 12^{\circ}\text{W}$).

In the 1970's a few scouting surveys were carried out to locate capelin in the Jan Mayen area without positive results until August 1978. The coverage of the area was however poor and therefore it is not possible to draw any conclusions on the regularity of the occurrence of capelin in the Jan Mayen area.

During July-August 1978 the Icelandic summer fishery took place off NW and N-Iceland. In September the fishery moved to Jan Mayen while in October it moved back to the area off NW Iceland. The movements of the main stock of capelin were reflected in the changes of the fishery. They are also in conformity with survey results in the same period.

Thus in September, while the fishing took place at Jan Mayen, an intensive search for capelin concentrations was carried out NW and N of Iceland on the Bjarni Sæmundsson with negative results. Similarly in October when the fishing had shifted to NW-Iceland the area NW and W of Jan Mayen was surveyed with a Norwegian scouting vessel also with negative results.

2.2. Tagging.

In July and early August 1978 11750 capelin were tagged with internal seel tags off the western N-coast of Iceland and the NW-peninsula. Four of these tags subsequently turned up in Norway from catches taken in the Jan Mayen area.

During the period 21-25 September 1978 further 5114 capelin were tagged by the same method to the W of Jan Mayen. From this experiment tags were recovered in October-December from catches taken N and NW off the NW-peninsula of Iceland. (Fig. 1).

In 1979 14 tags from the Jan Mayen tagging experiment have been recovered so far. All these tags are from that component of the 1979 spawning stock which was fished off NE-, E- and SE-Iceland in the period January-March 1979. (Fig 1).

Tag returns, therefore, clearly indicate a migration from the deep water area off N-Iceland to Jan Mayen in August as well as a return of this capelin to spawn at the Icelandic coast in the wintertime.

2.3. Age distribution.

The age distribution from the Jan Mayen fishery 1978 as well as that from Icelandic summer, autumn and winter (spawning) fishery is given in Table 1 and Fig. 2. These age distributions are very similar and indicate that the Jan Mayen fishery as well as the fishery at Iceland are based on the same capelin stock component which comes to spawn at the coast of Iceland during the next winter.

2.4. Hydrographic Conditions in 1978.

A survey of the waters off W-, N-, and E-Iceland in spring 1978 indicated more or less normal hydrographic conditions compared to recent years. The East Icelandic Current was pronounced and salinity off N-Iceland was relatively low.

As the summer advanced, however, a pronounced warming up of the upper layers was observed resulting in indistinct border areas between the various warm and cold water masses. The extension of drift ice was consequently much reduced and in autumn the E-Greenland coast was practically free of drift ice north to the 72 parallel.

The above changes in the environment may well explain the extensive migrations of the capelin to northerly regions that took place in 1978.

2.5. Conclusions.

The survey results, the age distribution data and especially the tag returns in 1978 and 1979 clearly show that the maturing

Icelandic capelin migrated from the N-Iceland area to Jan Mayen in August. During late September and October the reverse migration took place to the area off NW Iceland whence the spawning migration started at the beginning of 1979 as illustrated in Fig. 1.

Thus there exists convincing evidence that the capelin fishery which took place in the Jan Mayen area in August-September 1978 was based on the stock which has its spawning grounds at the Icelandic coast. This main conclusion does not preclude the possible existence at Jan Mayen of a local stock (or stocks) which spawns in the area. Such local stocks are known from many Arctic coasts, e.g. the Greenland fjords, but these stocks are small and generally not of commercial interest.

3. Abundance estimates state of the stock and recommendations for TAC.

Acoustic abundance estimates of the Icelandic capelin stocks were obtained for the first time in October 1978 when the capelin concentrations were located NW of Iceland. Based on preliminary target strength estimates the results indicate that the prespawning stock was in the order of 1.3 million tons. Subsequently during the spawning migration in 1979 three further echo abundance surveys were carried out. Based on the same preliminary target strength estimates the results are consistent with the October findings.

Comparable measures of 0-group abundance are available from August surveys since 1972. In the text table below the 0-group abundance index as well as the corresponding catches of the parent stock (the winter fishery and the summer and autumn fishery of the previous year) is given.

The 0-group indices and catches from the parent stock.

	Catch	0-group index
1972	277	89
1973	441	116
1974	462	134
1975	458	89
1975-76	342	60
1976-77	659	43
1977-78	770	31
1978-79	1.191	?

During the period 1972-1975 the 0-group index indicates a high level of recruitment but in later years there is a definite downward trend in the recruitment to a level in 1977 and 1978 which is about 1/3 of that observed in 1972-1975. At the same time there is a sharp increase in the fishing from about 400.000 tons in 1972-1976 to about 1.200.000 in 1978-1979.

Decrease in recruitment during a period of sharp increase of the catches is considered a danger sign as this could mean that the recruitment has been seriously reduced by the fishery since 1977. The stock may therefore have been over exploited and the need for caution in management must be stressed.

Judging by the 0-group index the recruitment to the fishable stock in 1979-1980 will be considerably reduced as compared with former years. The group therefore recommends that a precautionary TAC of 600.000 tons be set for the period summer 1979 to spring 1980 for the Icelandic economic zone, the East-Greenland waters and in the Jan Mayen area.

When the results of the summer and autumn surveys (acoustic abundance and 0-group) become available this precautionary TAC will be reconsidered and if necessary revised.

4. Management.

Until 1978 regulatory measures have mainly been precautionary in nature. Since 1973 there has been a closed season from 14 May lasting for 2-3 months. In addition, the juvenile over-wintering areas have been closed for all fishing. In 1975 a minimum landing size of 12 cm was introduced. In 1978 the autumn season was stopped on 14 December and the winter season 1979 did not start until 10 January. The winter season 1979 was closed at south Iceland on 5th March and at west Iceland on the 18th March.

5. Research cooperation in 1979.

In order to update the information on the state of the stock and obtain a better assessment of the size of the fishable component of the stock for the 1979-1980 season the following plans for a

joint survey were agreed: Two ships, G.O. Sars and Bjarni Sæmundsson, will conduct an acoustic survey of the expected area of distribution of the capelin between 66° and 72° N for a period of about two weeks starting from Iceland in late July to mid August. Expert personnel will be exchanged for the duration of the survey and special calibration runs will be arranged between the two vessels. A detailed plan will be worked out by correspondence. The observations will be processed on a current basis on board and it is hoped that a stock estimate will be available at the end of the cruise.

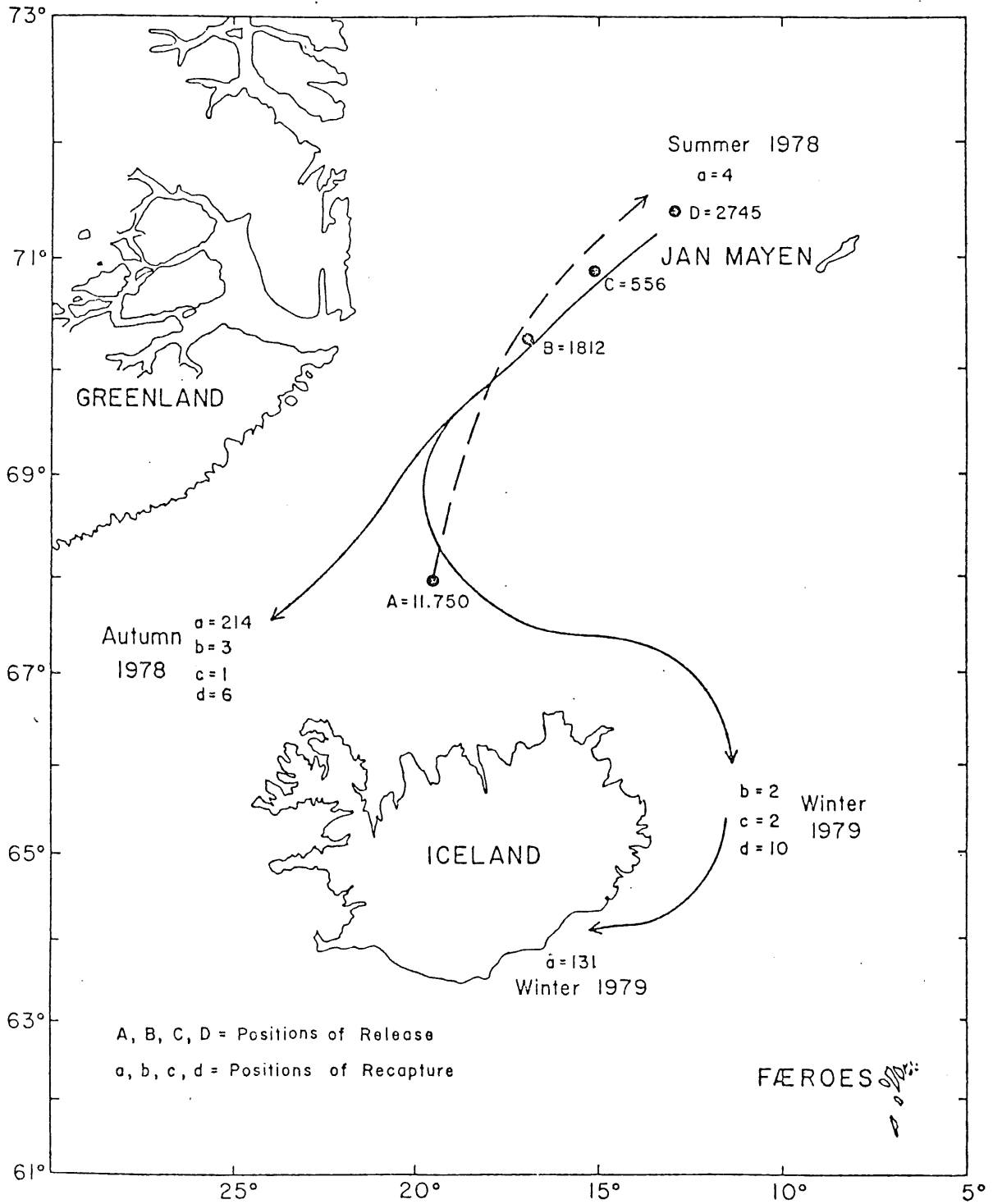
If the distribution and behaviour of the capelin during August is found to be unsuitable for acoustic abundance estimation, consideration will be given to a renewed joint effort to assess the stock abundance in another two ship survey in September when the Norwegian research vessel "Michael Sars" is scheduled for a cruise in the Jan Mayen area.

Appendix

TABLE I

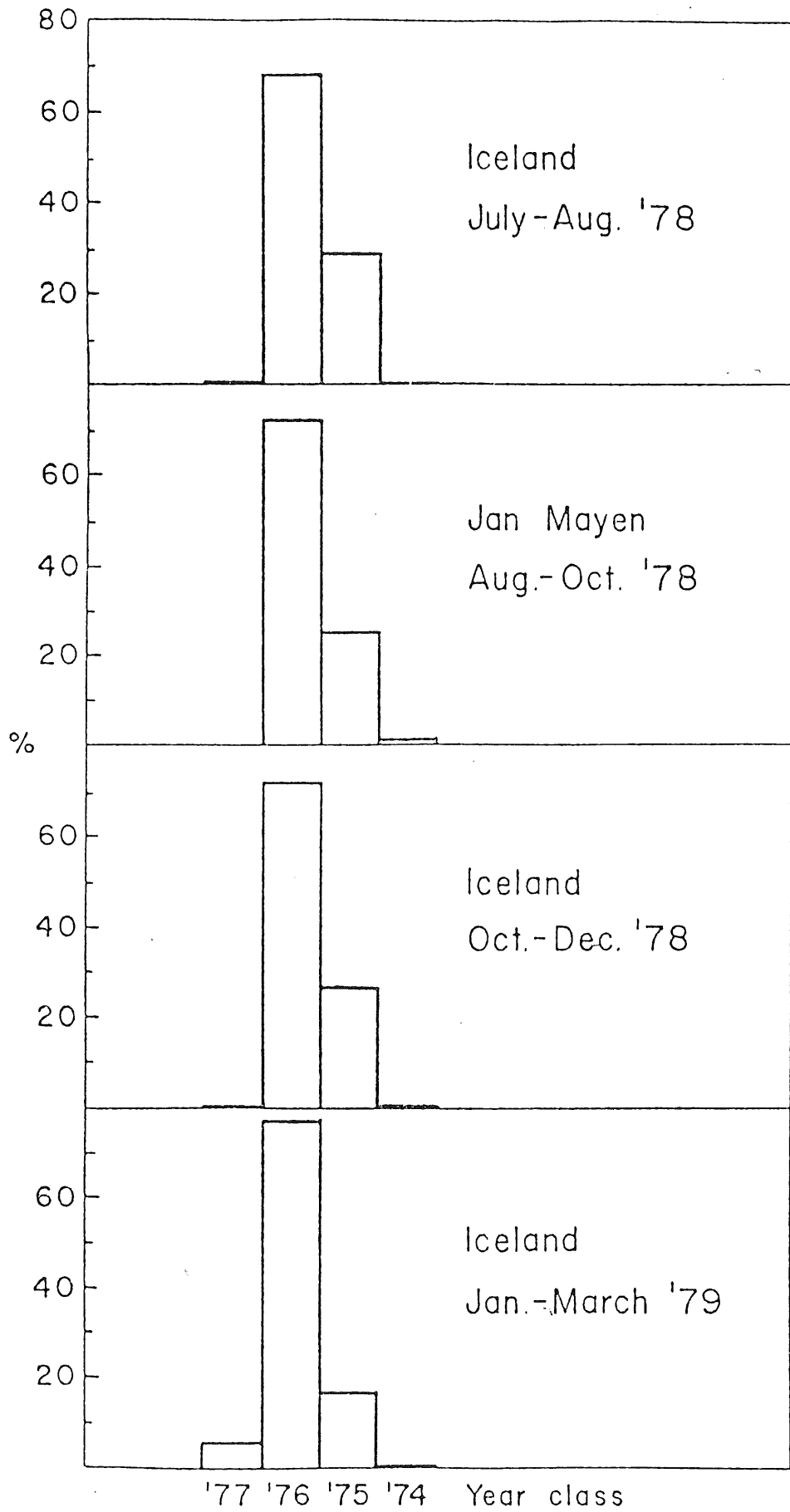
The age distribution of capelin in the
Iceland-Jan Mayen area in summer and
autumn 1978 and in september 1979.

	<u>1977</u>			<u>1976</u>			<u>1975</u>			<u>1974</u>			<u>Total</u>		
	o/oo	N	W	o/oo	N	W	o/oo	N	W	o/oo	N	W	o/oo	N	W
Iceland July-Aug. '78	11	110	493	690	7167	96041	294	3059	62107	5	54	1385	1000	10390	160026
Jan Mayen Aug.-Oct. '78	-	-	-	725	7707	148927	255	2711	62940	20	213	5562	1000	10631	217429
Iceland Oct.-Dec. '78	6	85	715	721	9583	179196	269	3571	93548	4	47	1602	1000	13256	275061
Iceland Jan.-March '79	56	1570	14762	778	21297	406772	162	4573	114337	4	110	3185	1000	28150	539056
Total	28	1765	15970	742	46354	830936	223	13914	332932	7	424	11734	1000	62457	1191572



Appendix

Figure 1. Migration routes as indicated by tag returns.
Summer 1978 - winter 1979.



Appendix

Figure 2. Age distribution of the Iceland - Jan Mayen capelin. July 1978 - March 1979.