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Norwegian investigations on young cod, haddock and redfish in the
Barents Sea and adjacent waters 1970-1972.

by

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INTRODUCTION

Abundance estimates of prerecruits are needed for estimation of expected catches in coming years. The reliability of these calculations are to some extent influenced by the bias and variance of the abundance estimates of the recruits. Great effort has therefore been put forth during the last years to get better abundance estimates of prerecruits.

The distribution and abundance of commercial important species at an age of six months have been studied every year since 1965 in August/September in the Barents Sea and adjacent waters (Benko et al. 1970, Anon. 1970, 1972 a, b) by acoustic techniques described by Dragesund and Olsen (1965) and Dragesund et al. (1970). Data from the 0-group surveys indicate that the abundance

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of cod and haddock year classes is determined at an age of six months (Hysten and Dragesund 1970). However, other data indicate that the abundance of the year classes is influenced by different natural mortality during their first winter of life (Ponomarenko 1970). This necessitates investigations on the abundance of the year classes during the whole prerecruits phase.

The Polar Institute in Murmansk has made bottom trawl surveys every year since 1946 from October to April in the Barents Sea and adjacent waters. Hauls are made during the survey at stations on standard sections (Baranenkova 1957). Great variation is observed in the abundance with age of the same year classes. Some of this variation might be overcome by designing the groundfish survey after stratified random sampling procedures. Surveys designed according to these principles have been tried with success by Canada, US and USSR in the West-Atlantic (Grosslein 1969). A feasibility study designed after the same principles has been tried at the Faroe Bank (Jones and Pope 1972).

Groundfish surveys represent much more effort than echo surveys. The Marine Research Institute, Bergen has therefore been looking for a suitable time of the year to carry out an echo survey for estimating the abundance of prerecruits of cod, haddock and redfish in the Barents Sea and adjacent waters. Some results of three cruises made in 1970-1972 are given in this report. A more extensive description of the findings in 1970 and 1971 is given in papers by Hysten et al., (1972, a, b).

MATERIAL AND METHODS

The surveys were carried out by R.V. "G.O.Sars" in November 1970, June 1971 and April-May 1972. Survey routes and grid of trawl stations and hydrographical stations are shown in Fig. 1.

The distribution of the different fish species was studied by means of acoustic recordings combined with fishing experiments

with both pelagic and bottom trawl. The pelagic trawl was a small meshed Engel trawl, and fishing depth was controlled by means of a Simrad net sonde. For bottom trawling was used a small Granton trawl with the cod-end covered inside by a nylon net with mesh size 14 mm. However, the trawl used in 1972 was a bit larger, and it had an otter board mounted above the headline. Trawling time at each bottom trawl stations was $1\frac{1}{2}$ hour in 1970 and 1 hour in 1971 and 1972. The towing time with the Engel trawl varied on the cruises between 20 minutes and 1 hour.

R.V. "G.O.Sars" was equipped with a Simrad EK 38 kHz echo sounder linked to 3 Simrad Echo Integrators (QM), each with two channels. The channels were working in intervals from 5-50, 50-100 etc. down to 300 m during the 1970 and 1971 cruises, while the deepest channel was working from 250-400 or 450 m in 1972. The transmitter of the EK sounder was set with a 10/1 power range, and the receiver amplification was 20 logR- 20 db. Amplification of the integrator was varied between 30 and 40 db, and the level was set at 3. Average integrator readings for each 5 nautical miles were plotted on charts. When more than one species were recorded on the same channel, the echo abundance was divided between the species by judging the echo record or according to the frequencies of the species composition at the nearest trawl station.

The biological material was worked out for each of the 3 subareas:

1. Norwegian coast area: South of 73°N and west of the line $73^{\circ}\text{N}27^{\circ}\text{E}$ - $70^{\circ}\text{N}30^{\circ}\text{E}$.
2. Bear Island/Spitsbergen area: North of 73°N and west of 27°E .
3. Barents Sea: East of areas 1 and 2.

Few data were collected in the Norwegian coast area in November 1970, and they were therefore excluded.

RESULTS

Hydrography

The investigated area had the same general feature of temperature

condition in 1971, 1972 (Fig. 2) and in July 1970 (Berge et al. 1970). However, the area seems to have been slightly colder in June 1971 than observed during July 1970 and April-May 1972.

Echo abundance

On the basis of data from the survey in November 1970 it was only possible to mark off the echo abundance of demersal species along the vessel's course (Fig. 3 A). However, for the other cruises echo abundance have been charted (Fig. 3 B, C). In 1972 the integrator values were all over higher than in 1971, and the distribution area was wider. The higher concentration of demersal species in the branch of the North cape current which goes northeast towards Novaya Zemlja, were according to fishing, mostly due to the 1970 year class of cod. Cod, haddock and to some extent redfish and saithe were responsible for the echo abundance in the Norwegian coast area both in 1971 and 1972. North of Bear Island and at Spitsbergen small redfish and to some extent cod and blue whiting gave some contribution to the echo abundance.

It was difficult to discriminate between the different species on the basis of echo records. Cod was recorded as single fish, in dense schools, or only as a thickening of the bottom line. Haddock was never recorded in schools, but the echo records were often similar to those of cod. Redfish was mainly recorded in a scattered layer, but dense concentrations were observed off Spitsbergen.

Cod

About 2/3 of the cod catches in November 1970 belonged to the 1970 year class. However, total catch at Spitsbergen was influenced by two hauls west of Hornsund, which were dominated by the 1963 and 1964 year classes. Beside the 1970 year class, the 1969, 1963 and 1964 were the most abundant year classes in the Bear Island area, and the 1964, 1967, and 1969 year classes made some contribution to the catches in the Barents Sea (Table 1).

Cod were caught with bottom trawl in all areas in June 1971, but it was almost exclusively represented in pelagic catches from

the Norwegian coast. Pelagic catches were dominated by the 1969 and 1968 year classes. Bottom trawl catches from all areas contained the 1964 year class (Table 1). However, it was most abundant in those from the Norwegian coast area. The year classes 1965-1968 were almost lacking at Bear Island/Spitsbergen, but they were relatively abundant at the Norwegian coast. The 1969 year class was relatively abundant at Bear Island/Spitsbergen, but its preponderance was mainly due to one haul north of Bear Island where about 800 specimens of this year class were caught. This year class was also abundant in the other areas too. Year class 1970 which was so abundant in November 1970 was almost lacking in the samples. It was only caught in any numbers in the eastern part of the Barents Sea.

Catch per hour trawling was higher in all areas in the April-May 1972 survey than for the other two. For the investigated area as a whole 603 cod were caught per hour with the bottom trawl and 94 per hour with the pelagic trawl. The highest number per hour trawling was obtained with the bottom trawl along the Norwegian coast, where 864 were caught. The corresponding figures for the Barents Sea and Bear Island/Spitsbergen area were 601 and 376 respectively. Catch per hour trawling at the Norwegian coast was, however, strongly influenced by one haul at Fruholmen, which gave about 2/3 of the cod caught in the Norwegian coast area. Likewise, does one haul made west of the Goose Bank amount to about 6/7 of the cod caught in the Barents Sea. If these hauls are excluded the catch per hour trawling for the Norwegian coast and the Barents Sea will be 165 and 149 respectively.

Both pelagic and bottom trawl catches from the Barents Sea and the Bear Island/Spitsbergen area were dominated by 3 year old and younger cod, while most of the cod taken at the Norwegian coast was more than 3 years. Only few specimens of the 1971 year class were caught in the survey area. The 1970 year class amounted in 1972 to about 40% of the number caught per hour trawling with the bottom trawl, while the 1969 and 1968 year classes amounted to about 30% each. However, it should be mentioned that the

1968 year class was mainly caught in the Norwegian coast area (Table 1). Catch per hour trawling of the mature year classes in 1972 were too low, because the spawners to some extent were outside the investigated area at that time of the year.

Haddock

The 1969 year class was the most abundant year class in November 1970 (Table 2). This and the 1970 year class were almost the only ones represented in the catches from the Bear Island/Spitsbergen area. Catches from the Barents Sea were dominated by the 1969 and 1967 year classes. Relatively few of the 1970 year class were caught, and they were all caught in the western part of the investigated area.

In June 1971 haddock was most abundant in the Barents Sea and in the Norwegian coast area where respectively 216 and 107 haddock were caught per hour trawling with bottom trawl, while 9 haddock were caught per hour at Bear Island/Spitsbergen (Table 2). Corresponding figures for the pelagic trawl were 45, 24 and 0 respectively. Haddock older than 2 years, mostly the 1967 and 1968 year classes, were almost exclusively caught at the Norwegian coast. Only 3 haddock older than 4 years were caught during the survey. The 1969 year class was the most abundant year class in the catches taken in the Norwegian coast area and at Bear Island/Spitsbergen, while the 1970 year class dominated the Barents Sea catches. However, the preponderance of the 1970 year class was due to one haul at the Goose Bank where about 1200 specimens of this year class were caught. Catches from the other trawl stations in the Barents Sea showed a preponderance of the 1969 year class.

Data from the 1972 survey indicate that haddock was most abundant in the Norwegian coast area where 312 haddock were caught per hour trawling with the bottom trawl. Corresponding figures for the Barents Sea and Bear Island/Spitsbergen were 237 and 10 respectively. The haddock concentrations were dominated by the 1969 and 1970 year classes which amounted to about 50 and 34 per cent of the total number caught respectively. Older year classes were only represented by a few specimens.

Most of the haddock taken in the Norwegian coast area and in the Barents Sea with the pelagic trawl were 3 year old fish, while the 2 year olds dominated at Bear Island/Spitsbergen. However, few haddock were caught in the Bear Island/Spitsbergen area.

Redfish

Redfish more than 14 cm were grouped in Sebastes marinus and Sebastes mentella, while fish less than 14 cm were kept together. The year classes 1970 and 1969 dominated the catches in November 1970 from the Bear Island and Spitsbergen areas. The 1969 year class was mainly found within the same area where it was found as 0-group (Anon. 1970), while the 1970 year class had drifted more than 200 nautical miles eastwards and northwards from early September to the middle of November (Anon. 1972 a). S.mentella was caught on most of the stations, and the bulk of the specimens were 14-20 cm long. S.marinus were caught in smaller numbers than S.mentella. It was most abundant in the Barents Sea, and the length groups 15-25 cm dominated the catches (Hyllen et al. 1972 a).

Relatively few of the 1969 and 1970 year classes were caught in June 1971 by both bottom and pelagic trawl (Table 3). All redfish older than 2 years were caught with bottom trawl, except 6 S.marinus and 1 S.mentella. S.marinus had the highest abundance in the Norwegian coast area and the lowest in the Barents Sea (Table 3). Length groups 15-25 cm corresponding to the year classes 1963-1968 dominated in all areas. Specimens larger than 30 cm corresponding to year classes 1962 and older were almost lacking in samples from the Barents Sea and the Bear Island/Spitsbergen area. The length groups 14-25 cm corresponding to year classes 1963-1968 dominated the catches of S.mentella from the Bear Island/Spitsbergen area and the Barents Sea, but few of these size groups were caught in the Norwegian coast area. Fishes larger than 30 cm, year classes 1962 and older were only caught in small numbers in the Barents Sea, while these dominated the catches in the Norwegian coast area. However, 99% of the numbers caught in that area were taken in one haul in the southern part of the

Bear Island channel. This haul was dominated by mature fish, and 85% of the number caught were females.

Both young and older redfish caught in April-May 1972 were grouped in S.mentella and S.marinus. However, the year classes 1969, 1970 and 1971 have been kept together in Table 3 to make it possible to compare the data from all surveys. S.mentella older than the 1968 year class were more abundant than S.marinus in all areas. Age samples of S.mentella caught by bottom trawl in the Bear Island/Spitsbergen area and the Barents Sea were dominated by the 1966, 1967 and 1969 and the 1968-1971 year classes respectively. The S.mentella concentrations in the Norwegian coast area were dominated by the same year classes as those in the Barents Sea. Year class composition of S.marinus were different from those of S.mentella. While the year classes 1971 and 1966 dominated in the Norwegian coast area, the 1967-1968 and the 1965-1966 were the most abundant year classes in the Bear Island/Spitsbergen area and the Barents Sea respectively.

Only few redfish of the 1969-1971 year classes were represented in the pelagic trawl catches from 1972. Older year classes were only represented in any numbers among the S.mentella caught in the Norwegian coast area (Table 3).

DISCUSSION

A suitable time of the year for estimating the abundance of prerecruits of cod, haddock and redfish by echo surveys, will be when all the recruits or a constant part of them are pelagic. The 0-group of these species are pelagic in August/September, and the echo survey procedure is suitable for estimating the abundance at this time of the year (Dragesund et al. 1970). However, the abundance estimates obtained up to now by this technique might be improved by introducing the echo integrator readings in estimating the number of fish present (Midttun and Nakken 1968, 1971).

The 0-group cod and redfish are in November partly pelagic and partly in close contact with the bottom. Observations at this time of the year indicate also that cod make diurnal vertical migration within the watermasses above the bottom (Hyllen et al. 1972), and that 0-group cod and redfish have a yearly variation in time for descending towards the bottom (Baranenкова 1957, Berger and Cheremisina 1972). These conditions complicate the estimation of the abundance of the 0-group fish both on the basis of echo surveys and on groundfish surveys.

The strength of the 1970 and 1971 year classes of cod were according to the 0-group fish surveys rich and average respectively (Anon. 1972 a and 1972 b). However, they were scarce as 1 year old in the bottom trawl catches from the spring surveys (Table 1). Their abundance might therefore be underestimated. It might also be difficult at this time of the year to trace the 1 year old cod on the echo records, because they might be pelagic among the capelin. However, the 2 and 3 year old cod are more congregated in spring, and both ^agroundfish survey and an echo survey might give information of the abundance of these age groups.

Both the 0-group fish survey (Anon. 1970) and the Soviet young fish survey (Baranova 1972, Anon. 1972 c), have shown that the 1969 year class of haddock is rich and richer than the 1970 year class. Nevertheless the 1970 year class was more abundant in the 1971 samples. Since few haddock were caught in this year, the material might be unreliable.

The age groups 1, 2 and 3 of haddock were represented in catches taken with bottom and pelagic trawls during the two spring surveys. However, the data indicate that the 1 and 2 group were better represented in the pelagic trawl catches from June than from April-May. This might reflect a tendency for haddock to leave the bottom in summer months. Similar observations have also been made by fishermen fishing with long line near Vardo, where 3 year old haddock are taken during July-August at a depth of 10-20 m. Beside the observed variation in seasonal vertical distribution it has also been shown that 1-3 year old haddock have

diurnal vertical migration within the watercolumn near the bottom during early autumn and late winter (Woodhead 1964). This complicate the interpretation of survey data from this part of the year.

The 0-group and 1-group redfish were represented in the November 1970 catches (Table 3), but the same year classes were scarce in the bottom trawl catches from June 1971. They were also caught with pelagic trawl during the June and April-May survey. However, their abundance was higher in summer than in spring, which indicate that the 1-3 year old redfish are more pelagic in summer than spring. Whether these age groups also undertake diurnal vertical migration in the watermasses just above the bottom either in summer or any other part of the year is unknown.

Age groups 1-3 of cod, haddock and redfish are to some extent pelagic during summer and they do not undertake extensive diurnal vertical migration at this time of the year. Summer could therefore be a suitable time for an echo survey with the aim of estimating the abundance of young fish. However, a summer survey will be very close in time to the 0-group survey, and it is worth while to study the possibility of combining the 0-group survey with an echo survey of 1-3 year old cod, haddock and redfish.

Young cod, haddock and redfish are living close to the bottom during winter both day and night (Bananenkova, personal communication). This time might therefore be a suitable time for a groundfish survey. However, the weather condition can at this time of the year be unfavourable and some part of the potential area might be covered with ice, conditions which would introduce bias in the abundance estimates.

Our present knowledge of the seasonal vertical distribution of young cod, haddock, and redfish and the weather and ice conditions in the Barents Sea and adjacent waters indicate that a groundfish survey might be carried out in late autumn, after the 0-group survey. If some observation of the 1-3 group fish might be made during the 0-group survey, a groundfish survey could be designed for late autumn in accordance with the geographical distribution of recruits obtained earlier on.

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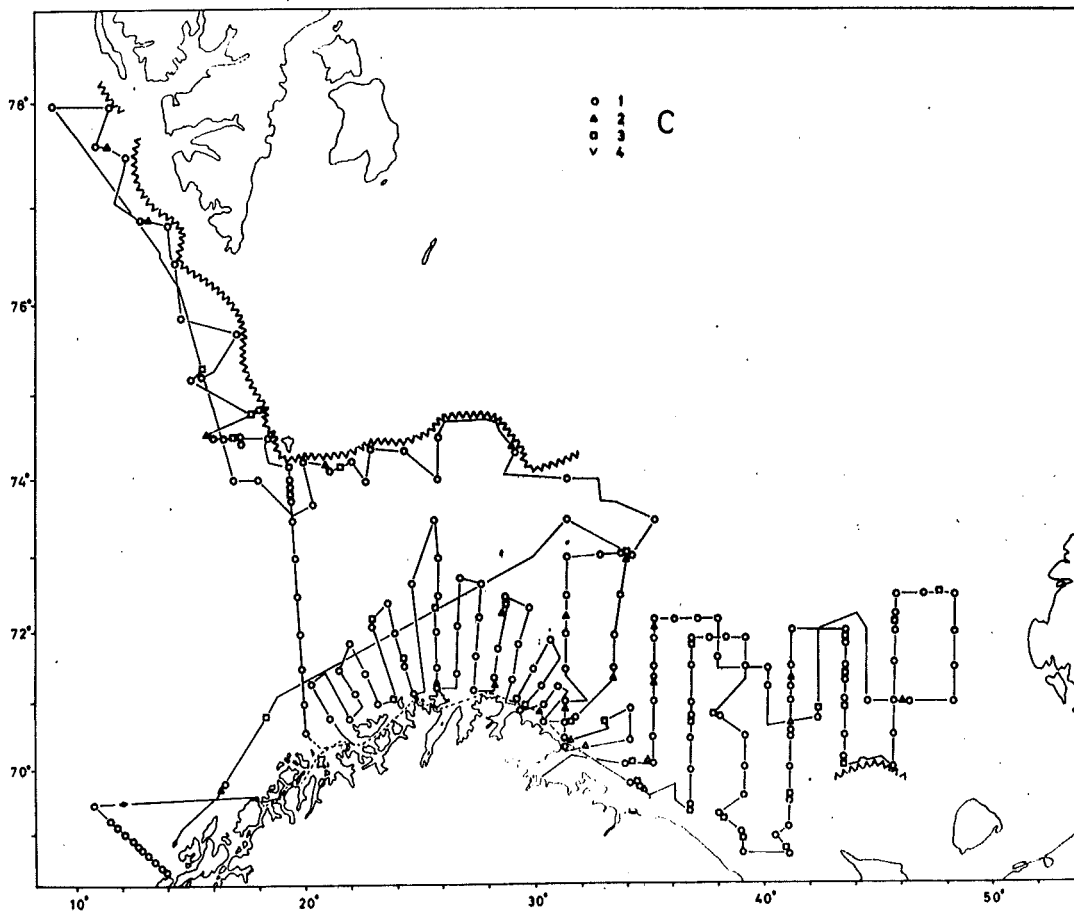
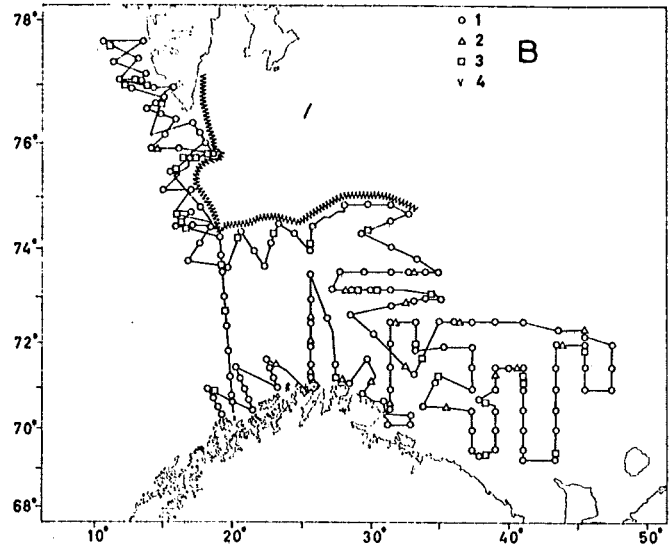
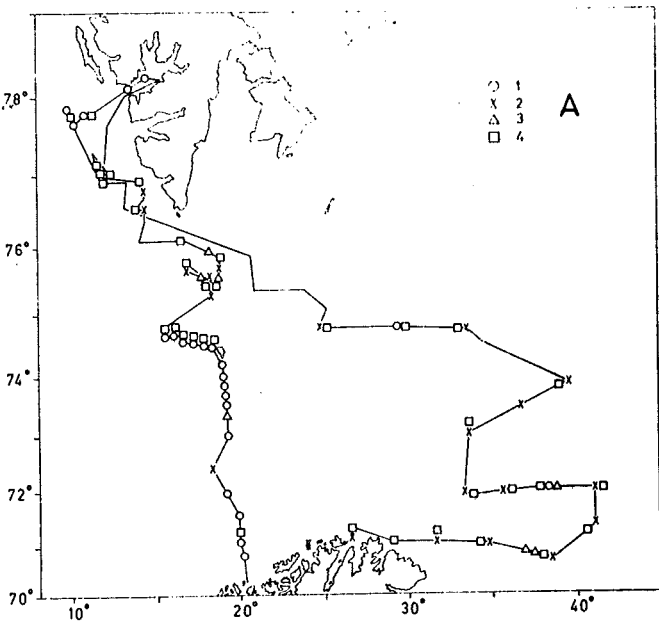


Fig. 1 Survey routes and grid of stations
A: November 1970 1) Hydrography 2) Bathythermograph
 3) Pelagic trawl 4) Bottom trawl
B: June 1971 1) Hydrography 2) Pelagic trawl
 3) Bottom trawl 4) Ice border
C: April-May 1972. Legend as in Fig. 1 B.

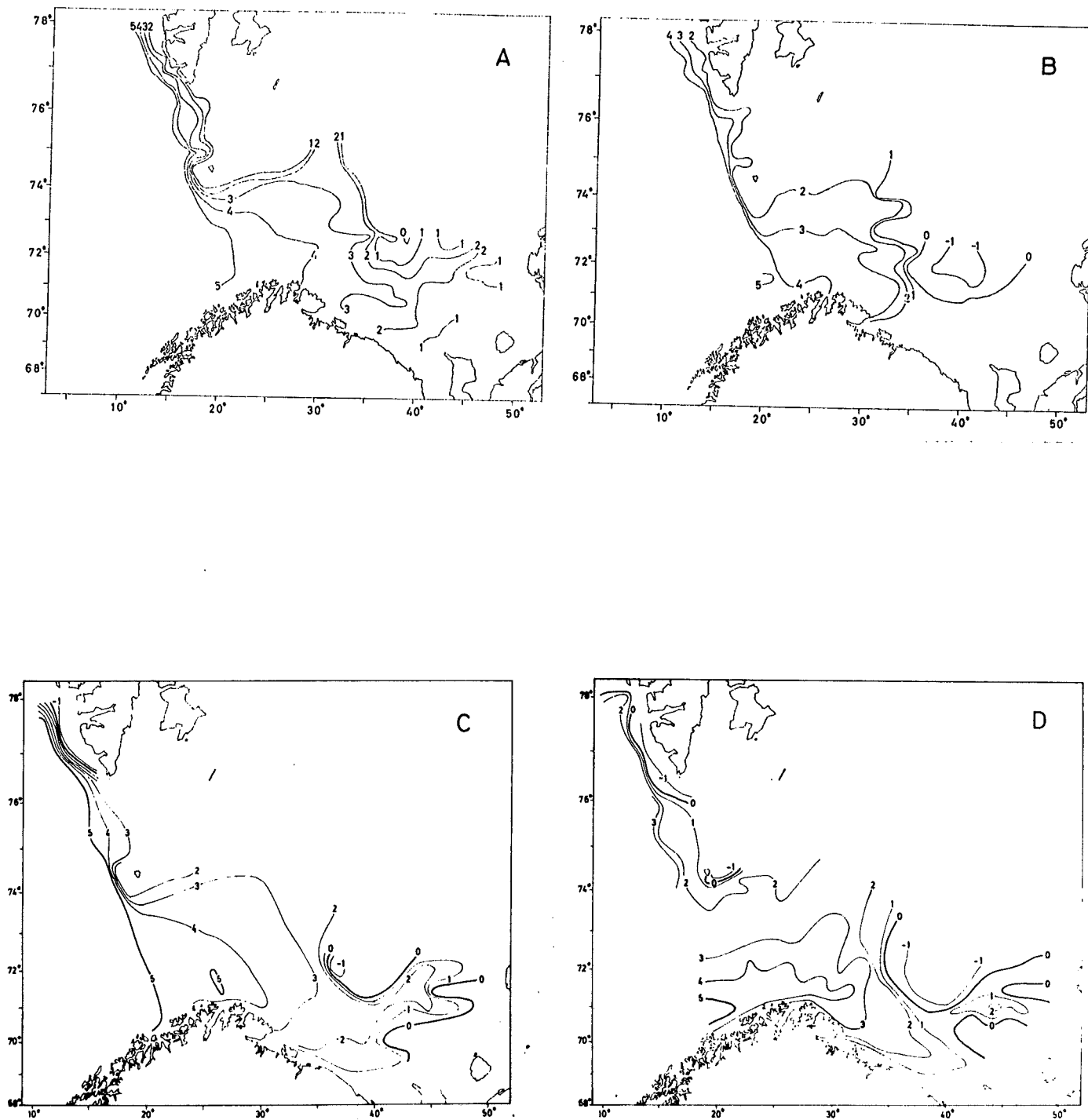


Fig. 2

Distribution of temperature

A. June 1971, 50 m

B. June 1971, 200 m

C. April-May 1972, 100 m

D. April-May 1972, 10 m above the bottom

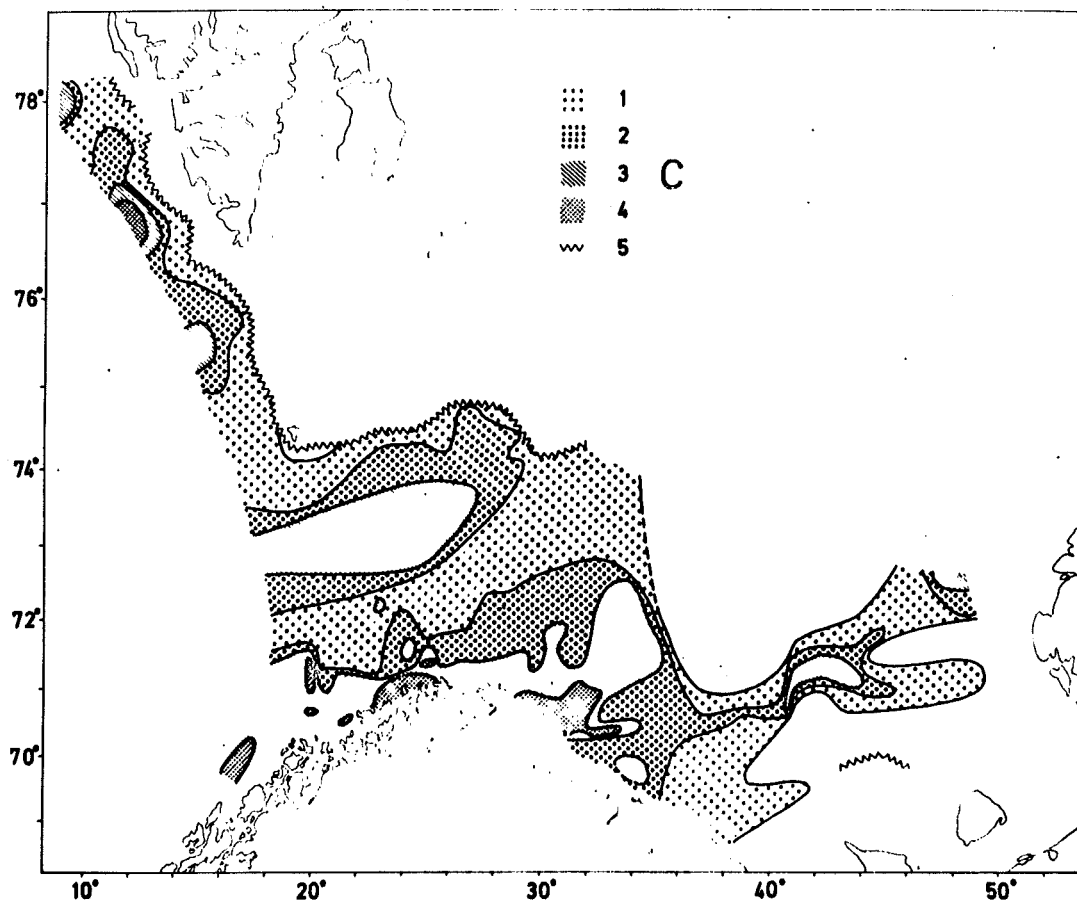
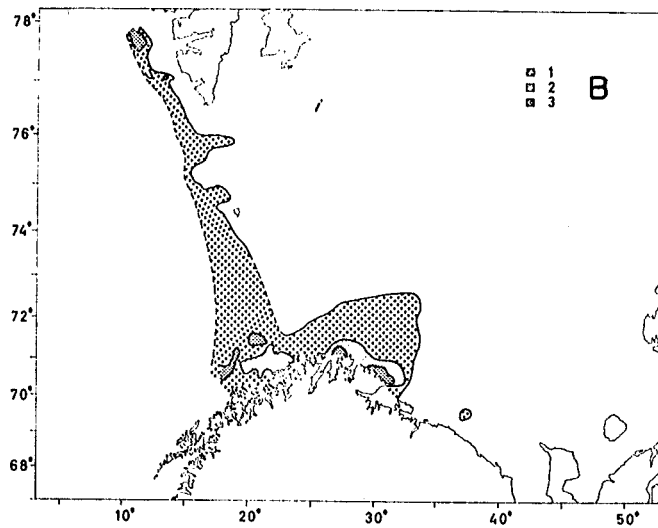
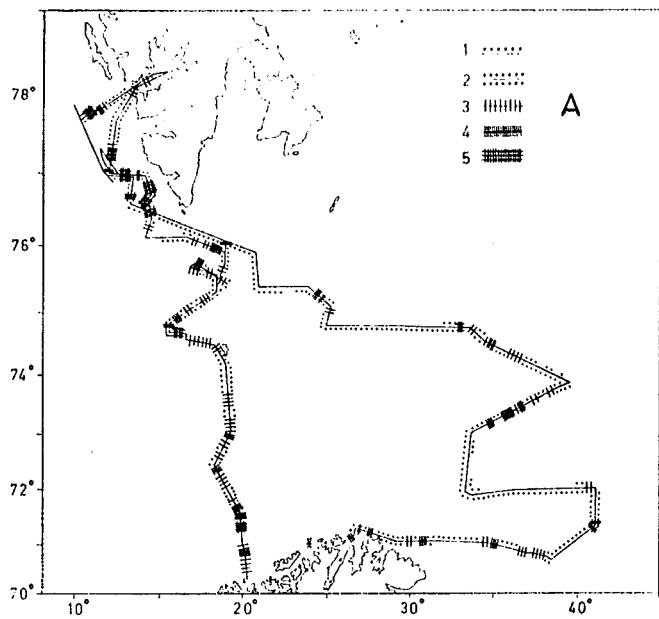


Fig. 3

Echo abundance of demersal fish species.

A. November 1970. Integrator values 1) 0-5, 2) 5-10, 3) 10-20, 4) 20-40, 5) ≥ 40

B. June 1971. Integrator values: 1) 0-5, 2) 5-10, 3) 10-20

C. April-May 1972. Integrator values: 1) 0-10, 2) 10-20, 3) 20-50, 4) ≥ 50 5) Ice border

Table 1. Number of cod caught per hour trawling.

FISHING AREAS	HOURS TRAWLING	YEAR CLASSES											Total										
		1971	1970	1969	1968	1967	1966	1965	1964	1963	1962	1962											
<u>November 1970</u>																							
Spitsbergen	7	-	26	3	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	93
Dear Island	11	-	86	30	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	142
Barents Sea	12	-	139	11	5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	177
Total	30	-	93	16	2	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	142
<u>June 1971</u>																							
Bear Island/ Spitsbergen	19	-	5	42	7	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	82
Norwegian coast	3	-	1	18	23	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	148
Barents Sea	13	-	13	11	2	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	40
Total	35	-	8	29	7	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	73
<u>April-May 1972</u>																							
Bear Island/ Spitsbergen	5	-	246	87	28	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	376
Norwegian coast () ^x	9(8)	1(1)	23(26)	49(34)	484(73)	182(30)	61(3)	61(3)	61(3)	61(3)	61(3)	61(3)	61(3)	61(3)	61(3)	61(3)	61(3)	61(3)	61(3)	61(3)	61(3)	61(3)	864 (165)
Barents Sea () ^{xx}	19(18)	10(11)	352(124)	166(16)	10(3)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	601 (149)
Total () ^{xxx}	33(31)	6(6)	246(118)	122(20)	142(23)	50(8)	17(1)	17(1)	17(1)	17(1)	17(1)	17(1)	17(1)	17(1)	17(1)	17(1)	17(1)	17(1)	17(1)	17(1)	17(1)	17(1)	603 (188)
<u>June 1971</u>																							
Bear Island/ Spitsbergen	0,5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norwegian coast	4,5	-	+	23	14	6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	53
Barents Sea	5,3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Total	10,3	-	1	10	6	3	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	25
<u>April-May 1972</u>																							
Bear Island/ Spitsbergen	4	-	210	18	81	16	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	228
Norwegian coast	8	-	4	32	3	16	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	137
Barents Sea	11	+	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15
Total	23	+	44	15	28	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	94

()^x Station 112 excluded. ()^{xx} Station 84 excluded. ()^{xxx} Station 112 and 84 excluded.

BOTTOM TRAWL

PELAGIC TRAWL

Table 2. Number of haddock caught per hour trawling

FISHING AREAS	HOURS TRAWLING	YEAR CLASSES										TOTAL		
		1971	1970	1969	1968	1967	1966	1965	1964	1963	1962			
BOTTOM TRAWL														
<u>November 1970</u>														
Spitsbergen	7	59	71	1	-	-	-	-	-	-	-	-	-	131
Bear Island	11	57	319	3	3	2	-	-	-	-	-	-	-	381
Barents Sea	12	5	50	3	3	15	-	-	+	+	-	-	-	78
Total	30	37	154	2	2	7	-	-	+	+	1	-	-	201
<u>June 1971</u>														
Bear Island/Spitsbergen	19	2	6	+	-	-	-	-	-	-	-	-	-	9
Norwegian coast	3	16	67	10	14	-	-	-	-	-	-	-	-	107
Barents Sea	13	140	75	+	+	-	-	-	-	-	-	-	-	216
Total	35	55	37	1	1	1	-	-	+	-	-	-	-	94
<u>April-May 1972</u>														
Bear Island/Spitsbergen	5	2	8	-	-	+	-	-	+	-	-	-	-	10
Norwegian coast	9	77	158	7	19	1	-	-	1	-	-	-	-	312
Barents Sea	19	94	138	2	1	1	-	-	+	-	-	-	-	237
Total	33	75	123	3	6	6	-	-	+	-	-	-	-	223
PELAGIC TRAWL														
<u>June 1971</u>														
Bear Island/Spitsbergen	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
Norwegian coast	4.5	3	18	+	+	2	-	-	+	-	-	-	-	24
Barents Sea	5.3	19	25	+	-	-	-	-	+	-	-	-	-	45
Total	10.3	11	21	+	1	1	-	-	+	-	-	-	-	35
<u>April-May 1972</u>														
Bear Island/Spitsbergen	4	7	1	-	-	-	-	-	-	-	-	-	-	8
Norwegian coast	8	5	73	2	3	-	-	-	+	-	-	-	-	84
Barents Sea	11	1	12	1	-	-	-	-	-	-	-	-	-	14
Total	23	3	9	1	1	1	-	-	+	-	-	-	-	15

Table 3. Number of redfish caught per hour trawling.

FISHING AREAS	SMALL REDFISH					SEBASTES MARINUS			SEBASTES MENTELLA			
	1971	YEAR CLASSES		Total	1968-63	1962 +	Total	YEAR CLASSES		Total		
		1970	1969					1968-63	1962 +			
<u>November 1970</u>												
Spitsbergen	-	31	35	65	10	3	10	29	29	29	29	29
Bear Island	-	15	85	100	4	49	4	40	40	40	40	40
Barents Sea	-	175	66	241	34	2	34	29	29	29	29	29
<u>Total</u>	-	80	66	148	14	7	14	34	34	34	34	34
<u>June 1971</u>												
Bear Island/Spitsbergen	-	7	10	22	38	3	41	2531	56	2587	56	2587
Norwegian coast	-	5	17	18	70	49	119	10	68	78	68	78
Barents Sea	-	12	17	29	4	2	5	67	1	68	1	68
<u>Total</u>	-	8	16	24	28	7	35	1399	37	1437	37	1437
<u>April-May 1972</u>												
Bear Island/Spitsbergen	2	78	829	912	21	+	21	624	-	624	-	624
Norwegian coast	87	19	24	132	27	8	35	32	-	32	-	32
Barents Sea	70	41	35	146	9	+	9	32	-	32	-	32
<u>Total</u>	65	41	152	258	15	2	18	125	-	125	-	125
<u>June 1971</u>												
Bear Island/Spitsbergen	-	-	-	-	-	-	-	-	-	-	-	-
Norwegian coast	-	22	8	30	3	2	6	+	+	1	+	1
Barents Sea	-	17	8	25	-	-	-	-	-	-	-	-
<u>Total</u>	-	18	8	26	1	1	2	+	+	+	+	+
<u>April-May 1972</u>												
Bear Island/Spitsbergen	-	10	4	14	-	-	-	7	-	7	-	7
Norwegian coast	8	3	5	16	5	5	10	504	-	504	-	504
Barents Sea	4	2	10	15	-	-	-	10	-	10	-	10
<u>Total</u>	23	5	7	15	2	2	3	181	-	181	-	181

BOTTOM TRAWL

PELAGIC TRAWL