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Results of stratified trawl surveys for shrimps (Pandalus borealis)
in the Barents Sea in May and in the Svalbard region in July-August
1985

by

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ABSTRACT

The results of a stratified random bottom trawl survey with R/V "Michael Sars" in May 1985 in the Barents Sea between $N71^{\circ}30'$ - $N75^{\circ}30'$ and between $E25^{\circ}30'$ - $N35^{\circ}30'$ is described in this report. It also describes the results from a survey with the same vessel in the Barents Sea between $N75^{\circ}30'$ - $N76^{\circ}35'$ and between $E25^{\circ}30'$ - $E35^{\circ}00'$, between $N73^{\circ}00'$ - $N74^{\circ}10'$ and between $E16^{\circ}30'$ - $E25^{\circ}30'$ and in the Svalbard region between $N74^{\circ}00'$ - $N80^{\circ}30'$ and between $E8^{\circ}00'$ - $E18^{\circ}00'$ in July-August 1985. On the basis of the data from 119 trawl stations, the biomass of shrimps, Pandalus borealis, in the Barents Sea survey was estimated to be about 218 000 tonnes. In the Spitsbergen area the biomass of shrimps was estimated to be about 35 000 tonnes on the basis of data from 72 trawl stations. By-catch data for fish are also given and discussed.

INTRODUCTION

A stratified random bottom trawl survey was carried out in the Barents Sea from 1 to 21 May 1985 and from 19 July to 11 August in the northern Barents Sea and in the Bear Island - Spitsbergen area. The aim of the surveys was to estimate the abundance and structure of the shrimp stocks and measure the by-catches of fish species.

MATERIALS AND METHODS

The trawl used was a "Campelen Super" 1800 meshes shrimp trawl with 12-21 inches rubber bobbins. The mesh size is decreasing from 80 mm in the front part to 35 mm in the codend, lined inside with a net of 18 mm mesh size. The sweep wire was 40 m. The trawling distance was 3 nautical miles at a speed of three knots/hour. During towing the trawl had a wingspread of 11.7 m (Teigsmark and Øynes 1982), the headline was between 4 and 5 m above the bottom, and the distance between the otterboards was 55-60 m.

All fish species taken as by-catch were counted, and commercial important species as cod, haddock, Greenland halibut, redfish etc. were measured by length (Tables 1 and 4).

Alltogether 23 strata were worked during the Barents Sea survey (Fig. 1) and 22 during the Spitsbergen survey (Fig. 3). Each stratum was divided into rectangles of 5x5 nautical miles as described by Teigsmark and Øynes (1981). Within each stratum rectangles were given consecutive numbers, and the trawl stations were randomly allocated to rectangles.

Hydrographical observations were made at each trawl station with a CTD-sonde.

The statistical treatment of the data follows Teigsmark and Øynes (1981). The horizontal opening of the trawl was calculated to be 11.7 m. On this basis the data for the total and commercial biomass of shrimps within each stratum and all strata summarized have been

recalculated for 1984 according to Teigsmark and Øynes (1982) (Tables 7 and 8). The commercial stock, i.e. that part of the stock available to the commercial fleet using 35 mm mesh size was calculated as in Teigsmark and Øynes (1981).

The total and commercial number of shrimps is also given in the different strata in the Barents Sea. As in Teigsmark and Øynes (1982) the length-weight relationship $w=4.586 \cdot 10^{-3} l^{3.12}$ was used in all the calculations.

The Barents Sea

Fig. 1 shows the area covered by the 1985 survey. Altogether 119 stations were taken (Table 1). Strata 1 to 17 were worked according to the same method as used by Høyen *et al.* (1984). Strata 18 was not covered during the May survey due to unfavourable ice conditions, and strata 19-22 due to lack of time. These strata together with stratum 24 were covered during the July-August survey, and these were included in estimating the biomass of the Barents Sea.

Due to lack of survey time altogether 8 stations had to be worked during night (st. no 190, 193, 204, 209, 217, 218, 224, 225). These hauls give an underestimate of the abundance of shrimp because a part of the shrimp leave the bottom during night.

In most of the strata the same numbers of hauls as in 1984 was allocated to each stratum. The number of hauls in strata 16 and 18 were doubled this year because of high concentrations of shrimps in strata 16 in 1984 (Table 7) and in strata 18 in 1985 (Table 2). The area north of stratum 18 (stratum 24) was included in the survey this year.

In the most important strata up to 9% of the rectangles were trawled. The trawling distance was 3.0 nautical miles, but stations 191, 192, and 227 had to be stopped after 1.5, 2.0 and 2.8 nautic miles respectively due to rough bottom.

Most of the Barents Sea south of N74⁰00 was closed for shrimp trawling in winter and spring 1985 due to large numbers of 1-, 2-, and 3-group

cod and haddock in shrimp trawl catches. Therefore, a large part of the fishing fleet was trawling in strata 15,16 and 18 during the survey in May. In the rest of the survey area there had been only minor trawling until the end of May.

Fig. 2 shows the survey tracks and trawl stations worked by R/V "Michael Sars".

The Spitsbergen area

The survey in 1985 covered 72 stations in the area from "Kveitehola" (Stratum 1) and northwards along the western slope off Spitsbergen up to $N80^{\circ}30'$ (Table 4). The sampling strata are given in Fig. 3. The number of hauls are about the same in each stratum as in 1984. Trawling frequency in the depth intervall 200-300 m, 300-400m and 400-600 m was 7-33%, 7-38% and 11-25% of the rectangles respectively. The trawling at the stations 344 and 354 was interrupted after 1.5 nautical miles due to rough bottom (Table 4). The survey tracks and trawl stations worked by R/V "Michael Sars" is showed in Fig. 4.

RESULTS AND DISCUSSION

The Hydrography in the Barents Sea and the Spitsbergen area

Fig. 5 shows the temperatures at the bottom in the Barents Sea in the survey area in May and July-August. Even though the temperatures in the northern Hopen area and south of Bear Island is observed two months later, the isotherms seem to indicate relatively stable temperature conditions during the period May-August in the whole Barents Sea. Temperatures above zero were found in the whole survey area being close to 0°C in the northern and eastern part of the Barents Sea with an increase westward and south toward the Finnmark coast.

The bottom temperatures in the Spitsbergen area (Fig. 6) is characterized by sharp gradients along the western slope of Vest-Spitsbergen. Within a few nautical miles, the temperature may change $2-3^{\circ}\text{C}$. The bottom temperatures in the survey area were above 0°C in all strata except in the northern part of strata 7. Generally,

the temperature was above 1.5°C in all the strata except in some parts of strata 3, 10 and 11 and the whole strata 14, 21 and 22.

Biological characteristics

An increase in average length of shrimp, both males, females and intersexes was observed northwards in the Barents Sea. The average length of intersexes, i.e. the yearclass spawning for the first time as females in the autumn, was about 19 mm carapax length in strata 1-6, 8-10, 20 mm in strata 7, 11, 19, 20, 21 mm in strata 12, 13, 21, 22 and 22 mm in strata 14-17.

Stock biomass in the Barents Sea

The total biomass of shrimp is estimated to 218 000 27 000 tonnes (Table 2), which indicates a decrease of about 48.5% from 1984 to 1985 in the strata investigated both years. The biomass of the commercial stock is estimated to be about 187 000 23 000 tonnes giving a decrease of 50% from 1984 (Table 3). Altogether, the total and commercial biomass in the Barents Sea is lower in 1985 than in 1981 (Tables 7 and 8).

A drastic decline was observed of total and commercial biomass in all strata except strata 5 and 18 (Tables 2 and 3). The decline was most severe in the eastern and northern part of the Barents Sea covering the most important fishing grounds as Tiddlybank (stratum 7), Thor Iversen Bank area (strata 11-13) and the southern part of the Hopen area (strata 14-17). The decline was most severe in strata 7, 11, 13, 15 and 16, with more than 20 000 tonnes in each stratum (Table 7). However, an increase of about 17 000 tonnes in stratum 18 from 1984 to 1985 and about 7 000 tonnes in stratum 24 indicate a recent settlement of recruits in the northern areas which is confirmed by the high abundance of males, the low abundance of intersexes and females this year (unpubl data). A positive temperature regime also indicates that there has been favourable conditions for larval settlement and growth in these strata.

The total stock is estimated to be $47.8 \cdot 10^9$ individuals, and the commercial biomass is estimated to be $35.9 \cdot 10^9$ individuals, corresponding to a decrease of 44.7% and 45.7% from 1984 to 1985 in

the strata investigated both years (Tables 9 and 10). This indicates that the decline in the number of shrimp is almost as severe as the decline in biomass.

If a part of the shrimp stock has moved out of the survey area, caused by change in the hydrographical conditions (temperature, currents), a reduced stock biomass would be observed in the survey area and an increased biomass outside. However, the estimated stock biomass of shrimp based on surveys by R/V "G.O. Sars" in Jan-Feb 1984 and 1985 show a decline of about 59% in the area covered both by R/V "G.O. Sars" in Jan-Feb and by R/V "Michael Sars" in May, a decline of about 38% in the area east of the May survey area, and a decline of about 52% west of the May survey area. This indicates that the observed decline from 1984 to 1985 both in number and biomass is real. Several factors may be responsible for the observed decline in stock biomass:

The main fishing grounds in 1984 were as in 1983 the eastern part of the survey area (strata 1,3,7,11,12) and south of stratum 7. A great part of the total landings of 75 000 tonnes from the Barents Sea in 1984 (Sub-area 1) was caught in these strata. Some of the decline in these strata may therefore be caused by the fishing. However, since great decline is also observed in strata with little or no fishing, others factors are also involved.

Cod is one of the main predators of shrimp. Mehl et al. (1985) report that shrimp composed 15-40% by weight of the diet of cod in the first quarter of 1984 in strata 1-4, and 2-40% in strata 6-12. Mehl (unpubl. data) reports that there was an increase in predation by cod during the second to fourth quarter of 1984. Cod less than 60 cm were the main predators of shrimp. As reported by Hylén et al. (1984), the abundance of cod taken as by-catch in strata 1-12 was high, about 50-650 cod pr 3 n.m. trawled, which is much higher than in 1983 (Teigsmark and Øynes 1983) and higher than in 1985 (Table 14). At the same time the cod stock in 1985 is at its highest level since 1977 (Hylén and Nakken 1985). The predation pressure upon the shrimp stock has therefore increased during the recent years, perhaps especially during 1984, a factor which might be responsible for the decline in

biomass of shrimps in strata 1-4 and 6-12.

It is known that the younger stages of shrimp live more pelagically than the older ones (Barr 1970), and the length distributions of shrimp in our surveys show that a reasonable index of yearclass strength cannot be given before the shrimp is two years old. The total number of males, intersexes and females for the years 1981 to 1985 is presented in Table 12. The low number of females in 1985 indicates that the 1977 yearclass, which seemed to be strong in 1983 and 1984, now practically is absent. Low number of intersexes in 1985 indicates a weak 1980 yearclass if the shrimp change sex at five year old. This seems to be the case in all the strata except those near the Finnmark coast where the shrimp change sex at four year old (strata 1-4, unpubl. data). A decrease in the number of males from 1982 to 1983 indicates a weak 1981 yearclass. A weak 1980- and 1981 yearclass contribute to the decrease in the total stock in 1985.

The fishing gear and techniques have been the same since 1980 (Tavares and Øynes (1980), but the vulnerability may have changed from year to year. Compared with 1984, a higher proportion of moulting shrimp was found in 1985, especially in strata 13-17 (unpubl. data). A general experience among fishermen is that the catches of shrimp are smaller when the shrimp is moulting. This may be caused by a vertical migration of the shrimp. However, more experiments are needed to document this statement.

In strata 13-17 the biomass of shrimp in 1984 was estimated to be about 162 000 tonnes (Table 7), and in 1985 about 79 000 tonnes. Some of this decline may be caused by emigration from strata 16 and 17 to 18 where the biomass increased by 17 000 tonnes. With low fishing activity during 1984 and a low abundance of cod in these strata both in 1984 and 1985, some of the observed decline may be the effect of a change in behaviour during the moulting period. Therefore the biomass in strata 13-17 may have been underestimated.

It is also important to make a critical analysis of the methods used in estimating the biomass of shrimp to localize sources of errors

which may influence the biomass estimate. Tavares and Øynes (1980) assumed that all shrimps of fishable size present in the area swept by the trawl were caught. However, Teigsmark and Øynes (1982) state that the shrimp may escape over and under the trawl and through the meshes. Therefore, the estimate of stock biomass should always be regarded as a minimum estimate.

Even though the 1982 and 1983 yearclasses seem to be strong, as indicated by an increasing number of males in 1984 (Table 12) and a high number of small males (carapax length <16 mm) both in 1984 and 1985 (unpubl. data), there cannot be expected any positive development in stock size until two to three years when these yearclasses become reproductively active. A low abundance of females and a high number of small shrimp in the catches will make it difficult to run a profitable fishery within the next two years.

Stock biomass in the Spitsbergen area

The total stock biomass of shrimp is estimated to be 35 000 14 000 tonnes. This gives a decrease of about 34% from 1984 in the strata surveyed both years (Table 5). The commercial biomass is estimated to be about 30 000 12 000 tonnes, giving a decrease of about 37% (Table 6).

In some of the strata between 200 and 300 m (2,4,9,11,13,15) the decline in biomass has continued from 1984. In strata 6 and 7 there has been a large increase (about 4500 and 6700 tonnes), and the biomass in these two strata constitutes about 30% of the total biomass in 1985 (Table 11). In the strata between 300 and 400 m there has been a large decrease in strata 1,3 and 8, (about 5000, 8500 and 3000 tonnes) a minor decrease in strata 5, the same biomass in strata 12 and a small increase in strata 10 and 14. The biomass in all the strata between 400 and 600 m (strata 16-22) decreased except in strata 21 where a small increase occurred. Altogether, the biomass is smaller in 1985 than in 1982 (Table 11).

The decline in biomass may have been caused by at least three factors. In 1984 the shrimp stock in the Svalbard area was heavily fished which probably has led to a decline in the stock size.

The abundance of cod in 1985 has increased in almost all strata from 1984 (Table 15, Hysten *et al.* 1984). This has probably lead to an increased natural mortality by the higher predation pressure and thereby a reduction of the biomass of shrimp.

The structure of the shrimp stock in the period 1982 to 1985 (Table 13) indicates that the decline in number of females from 1983 to 1985 is caused by a heavily reduction of the rich 1977 yearclass. The low number of intexsexes in 1984 and 1985 seem to indicate a poor 1979 and 1980 yearclass if the shrimp is changing sex at five year old. The decrease in the number of males in 1983 indicates a poor 1981 yearclass which also is stated by Teigsmark and Øynes (1983) where small concentrations of small males (< 16 mm carapax length) were observed in most strata. These three yearclasses below average may partly explain the decline in stock size. However, the increase in the number of males from 1983 to 1984 indicates that the 1982 year class is strong. The 1983 yearclass also seem to be strong because the number of males in 1985 constitutes the largest part of the stock during the period 1982-1985, and the observation of small males in 1985 was high in most strata between 200 and 400 m (unpubl. data). This indicates that there cannot be expected any considerable improvement in the stock size until these yearclasses become reproductively active in two-three years.

By-catches in the Barents Sea.

As in 1984 there was in 1985 a high number of small cod and haddock in the areas where the shrimp fishery usually takes place (strata 1-4, 7, 11-12 (Table 14). In order to limit the by-catches of the 1983 and 1984 yearclasses of cod and haddock, the most important areas worked by the shrimp fleet were closed for shrimp trawling during the winter 1984-1985 and the spring and summer 1985. As in 1983 and 1984, cod was present in all the strata investigated (Table 14). The abundance of cod in most of the strata south of N74⁰00 and east of E25⁰00 were generally at a lower level in 1985 than in 1984. The abundance of cod increased at Tiddlybanken and Thor Iversen Bank area (strata 7, 11 and 13). A small increase was observed in some of the strata north of N74⁰00. South of Bear Island higher abundance indexis were recorded in

the deeper strata (20-22), but in strata 19 a large decrease was observed. The greatest number of cod was found in strata 11 and 22.

In the years 1981 to 1983 only few cod was present in most of the survey area, and in 1983 the 1982 yearclass of cod was observed in most of the strata in small numbers. The abundance increased in 1984 and 1985 by more than ten times, mostly dominated by the 1982 and 1983 yearclasses.

Haddock was most numerous in the shallow part of Thor Iversen Bank area and west of Tiddlybanken (stratum 6 and 11) where an increase was observed in 1984 and 1985. The abundance of haddock was smaller in most of the other strata south of N74⁰00, and only a few numbers were caught in the shrimp catches southeast of Hopen (strata 13-18).

The overall abundance of redfish was at about the same level in 1985 as in 1984. The highest abundance was found in strata 15 and 16, a more northerly distribution than in 1984.

Only a few Greenland halibut were taken as by-catch in 1985, and the level was close to the by-catch in the previous years.

Compared with 1983 and 1984, capelin was more abundant in several strata. Polar cod was present only in the northern strata with the highest abundance east of Hopen (stratum 24).

The overall abundance of long rough dab in 1985 was about 30% lower than in 1984 and somewhat higher than in 1983 (Teigsmark and Øynes 1983).

By-catches in the Spitsbergen area

Cod was present in all the survey strata, and this has never been observed during the Vest-Spitsbergen shrimp survey (Table 15). The abundance of cod in 1985 was at about the same level in strata 1-4 as in 1984. In all the other strata a higher abundance was observed. The highest abundance was found in the southern part of Storfjordrenna (stratum 4). In the strata north of N79⁰00 between 200 and 400 m (strata 12-15) a marked increase in the abundance of cod was observed.

The 1982 and 1983 yearclasses were dominant in the depth intervall between 200 and 400m. A general increase was also observed in all the strata between 400 and 600 m (strata 16-22), and the cod was mostly of commercial size.

Haddock was in 1985 more numerous in some strata than in 1984, and the 1983 and 1984 yearclasses were dominant. The highest abundance was found in strata 6. Few haddock were found north of Kongsfjord (stratum 11) and deeper than 400 m. In 1983 only one specimen of haddock was found in the whole survey area (Teigsmark and Øynes 1983).

High abundance of redfish (Sebastes mentella) was observed in several strata, and the highest abundances was found north of Isfjord.

Compared with 1984 Greenland halibut showed a reduced abundance in 1985 in most of the strata. In several strata the abundance was reduced by 50% or more.

Capelin and polar cod were more abundant in 1985 than in 1984 and at about the same level as observed in 1983.

Long rough dab was less abundant in 1985 than in 1984, and only a small number were observed deeper than 400 m.

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Table 1. Trawl station data from cruise with R/V "Michael Sars" in the Barents Sea in April-May 1985

St. no.	Date	Stratum	Squ. are	Time (hour)	Dist. (n.m.)	Position		Depth (m)	Shrimp catch (kg)	By catches (number)								
						N	E			Cod	Haddock	Redfish	Greenl. halibut	Capelin	Polar cod	Long rough dab	others	
135	1.5	1	1	1735	3.0	7130	2701	351	77	59	26	1043	2	2		20	177	
164	8.5	1	36	0525	3.0	7129	2954	310	53	191	37	265	16			69	358	
131	1.5	3	3	0605	3.0	7145	2550	316	32	124	33	156				108	206	
134	1.5	3	19	1530	3.0	7134	2644	345	94	54	41	350	2			26	217	
132	1.5	3	25	0940	3.0	7157	2648	282	30	239	187	18				186	327	
133	1.5	3	27	1225	3.0	7148	2652	340	120	85	28	134				72	187	
138	2.5	3	41	0520	3.0	7135	2740	375	375	210	11	320	1			41	149	
139	2.5	3	46	0825	3.0	7148	2740	334	130	161	41	268			1	116	95	
140	2.5	3	57	1105	3.0	7145	2814	370	40	126	73	244			1	102	195	
141	2.5	4	3	1405	3.0	7146	2912	308	55	223	116	218			4	120	208	
142	2.5	4	20	1705	3.0	7140	3002	344	29	17	23	76	5			14	32	
143	2.5	4	36	2050	3.0	7155	3032	346	238	98	26	1440	41			279	8	
165	8.5	4	52	0955	3.0	7143	3121	320	32	77	27	781	5	64		145	35	
168	8.5	4	71	1914	3.0	7151	3216	310	60	159	24	466	9			247	66	
166	8.5	4	74	1310	3.0	7144	3221	310	25	82	109	551	2			107	32	
167	8.5	4	82	1540	3.0	7143	3255	303	14	112	24	95		16740		126	8	
220	21.5	5	23	1943	3.0	7223	2630	260	25	28	174	192			66	108	483	
161	8.5	5	51	0510	3.0	7219	2755	291	18	166	130	278			9	189	174	
156	4.5	5	83	1325	3.0	7230	2942	280	28	123	120	298	3	15		138	36	
155	4.5	6	20	1035	3.0	7239	3021	293	12	47	116	1146	2	45		355	15	
154	4.5	6	25	0755	3.0	7253	3033	273	12	73	537	1252	1	36		249	81	
146	3.5	6	32	0735	3.0	7221	3033	288	40	31	177	1212	2	26		513	54	
145	3.5	6	34	0445	3.0	7212	3033	315	96	73	76	453		29		409	47	
153	4.5	6	49	0445	3.0	7259	3122	250	0	260	1456	986				290	126	
148	3.5	6	67	1405	3.0	7230	3137	285	27	44	43	855		480		350	96	
147	3.5	6	80	1125	3.0	7221	3143	289	50	175	137	4416	1	40		600	112	
149	3.5	6	92	1630	3.0	7235	3158	260	20	165	53	903		1447		784	71	
150	3.5	6	94	1900	3.0	7233	3201	262	40	132	133	954	1	1890		1501	36	
178	10.5	7	18	0515	3.0	7237	3211	210	172	67	4	120	4	144		398	52	
171	9.5	7	23	0520	3.0	7213	3307	276	8	200	222	919	3			236	25	
172	9.5	7	29	0830	3.0	7227	3323	286	130	77	8	2252	6	120		534	29	
173	9.5	7	49	1120	3.0	7224	3407	274	82	20	1	248		368		683	69	
176	9.5	7	55	1932	3.0	7237	3437	275	298	380	3	1344	1			347	68	
174	9.5	7	61	1405	3.0	7224	3440	270	52	22		423	9	221		297	47	
175	9.5	7	71	1650	3.0	7231	3518	273	148	69		3225	2	800		464	42	
229	21.5	8	8	1638	3.0	7239	2600	290	40	32	584	272			8	80	9	
228	21.5	8	25	1255	3.0	7259	2649	360	98	13	34	434	29	11		86	55	
182	12.5	8	45	0820	1.5	7243	2739	307	8	13	20	69		28		44	6	
181	12.5	8	59	0537	2.0	7258	2814	293	7	18	27	74	6			71	26	
158	4.5	8	68	1940	3.0	7240	2850	325	15	38	96	153	3	9		174	30	
157	4.5	8	82	1645	3.0	7245	2922	290	15	94	174	1233	6	72		259	41	
227	21.5	9	8	0950	2.8	7309	2738	321	64	27	75	762	9	8		201	34	
224	20.5	9	11	2304	3.0	7324	2734	380	41	60	19	501	31	76		131	42	
225	21.5	9	36	0250	3.0	7327	2834	380	54	32	7	322	22	87		119	16	
226	21.5	9	40	0550	3.0	7314	2859	345	8	12	16	357	16	52		83	14	
190	11.5	10	14	2400	3.0	7309	3022	315	27	39	93	227	3	185		239	88	
193	16.5	10	25	0302	3.0	7358	3040	320	148	31	3	2002	6	73		157	95	
189	11.5	10	32	2056	3.0	7323	3041	360	88	12	8	981	12	224		256	178	
188	11.5	10	44	1750	3.0	7331	3105	370	111	7	2	1974	20			236	72	
180	10.5	11	10	1250	3.0	7316	3213	270	35	332	402	1222	14	14		1117	77	
181	10.5	11	24	1530	3.0	7326	3238	288	30	130	457	2932	41			759	33	
179	10.5	11	28	1008	3.0	7309	3236	262	13	380	577	729	6	9	1	635	138	
187	11.5	12	3	1435	3.0	7347	3133	350	23	29	3	621	4			108	428	
186	11.5	12	25	1100	3.0	7346	3229	300	150	173	102	2436	4	1209		663	463	
182	10.5	12	32	1758	3.0	7337	3257	302	229	142	118	1398	13			535	95	
185	11.5	12	35	0712	3.0	7351	3309	306	292	17		960	5	160		626	86	
183	10.5	12	43	2010	3.0	7341	3320	316	391	50	39	540	28	20		540	87	
221	20.5	13	48	1412	3.0	7358	2645	440	60	25	4	264	34	3	4	119	9	
222	20.5	13	63	1748	3.0	7345	2739	410	64	91	9	461	47			99	14	
223	20.5	13	66	2045	3.0	7333	2740	395	32	27	9	293	10	8		86	23	
197	16.5	13	98	1800	3.0	7354	2926	350	59	8	2	364	2	91	7	147	23	
220	20.5	14	5	1007	3.0	7403	2540	450	98	51	4	270	90	25		137	17	
219	20.5	14	26	0700	3.0	7419	2613	403	275	70	14	1058	16	70	14	105	126	
215	19.5	14	34	1710	3.0	7444	2637	330	175	97	9	7178	1	78		57	539	
218	20.5	14	64	0252	3.0	7409	2726	410	105	26	3	608	41	21	3	101	40	
217	19.5	14	67	2350	3.0	7424	2728	400	199	22	2	877	66	8		120	106	
216	19.5	14	70	2055	3.0	7439	2734	372	317	12		8745	57	70	20	250	374	
212	19.5	14	92	0810	3.0	7446	2810	357	360	7	5	3889	44	80	60	190	130	
211	19.5	15	1	0525	3.0	7445	2843	370	145	11	2	11057	23	14		63	188	
186	16.5	15	12	1447	3.0	7409	2900	380	91	11	4	1026	12	35		56	87	
199	17.5	15	16	0515	3.0	7427	2900	280	175	3	4	3189	130	64		17	128	
200	17.5	15	58	1008	3.0	7426	3021	345	162			7434	17	83	17	99	96	
195	16.5	15	67	1035	3.0	7418	3027	330	170	10	1	11709	11	119	7	231	49	
194	16.5	15	72	0645	3.0	7409	3040	320	192	16	1	1004	10	240	36	192	193	
201	17.5	15	79	1400	3.0	7443	3053	330	185	11		2859	6	48	12	114	177	
214	19.5	16	4	1412	3.0	7454	2720	335	148	57	4	4845	5	125	73	148	227	
213	19.5	16	28	1114	3.0	7459	2812	337	84	2		13822	16	21	216	54	156	
209	18.5	16	33	2203	3.0	7509	2824	337	128	3	2	1852	4	77	90	99	56	
207	18.5	16	36	1255	3.0	7521	2831	330	353		22	4491		605	242	385	683	
206	18.5	16	55	0940	3.0	7516	2929	350	152			8457	7	30	78	68	48	
203	17.5	17	18	2130	3.0	7511	3024	380	48									
202	17.5	17	21	1805	3.0	7459	3025	380	137	4		4728	138	40	13	48	85	
204	18.5	17	42	0047	3.0	7509	3114	360	153	6	1	1900	58	100	28	169	100	
205	18.5	17	48	0430	3.0	7521	3140	330	126	5		620	3	84	50	91	79	
208	18.5	18	31	1620	3.0	7534	2909	340	290	2	2	11845	9	169	598	338	356	

Table 1 cont. Trawl station data from cruise with R/V "Michael Sars" in the Barents Sea and in the Bjørnøya area in July-August 1985

St. no.	Date	Stratum	Squ. are
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Table 2. Estimated density (\bar{C}_k) and biomass in each stratum in the Barents Sea and estimated biomass in all strata summarized with the precision of the estimates.

Stratum	Area nm ²	Number of hauls	\bar{C}_k tons/nm ²	S_k^2	$V(\bar{C}_k)$	Coeff. of var. (S.E./ \bar{C}_k)	Biomass tons	S.E. of biomass
1	1200.	2.	3.430	0.802	0.401	0.185	4116.	759.795
3	1950.	7.	5.812	29.865	4.266	0.355	11332.	4027.803
4	2300.	7.	3.415	17.001	2.429	0.456	7853.	3584.358
5	2400.	3.	1.249	0.073	0.024	0.125	2997.	375.178
6	2700.	9.	1.741	2.273	0.253	0.289	4701.	1356.921
7	1850.	7.	6.709	24.836	3.548	0.281	12411.	3484.711
8	2400.	6.	1.447	1.409	0.235	0.335	3472.	1162.954
9	1500.	4.	2.408	1.231	0.308	0.230	3612.	832.268
10	1500.	4.	4.643	7.437	1.859	0.294	6965.	2045.310
11	1325.	3.	1.372	0.370	0.123	0.256	1818.	465.495
12	1375.	5.	13.560	22.669	4.534	0.157	18645.	2927.726
13	2700.	4.	2.836	0.598	0.150	0.136	7657.	1044.246
14	2550.	7.	11.525	29.042	4.149	0.177	29389.	5194.070
15	2025.	7.	8.487	2.861	0.409	0.075	17187.	1294.691
16	1575.	6.	9.893	27.684	4.614	0.217	15582.	3383.118
17	1525.	4.	6.015	7.118	1.779	0.222	9173.	2034.280
18	2500.	8.	9.834	43.779	5.472	0.238	24585.	5848.303
19	1325.	4.	0.554	0.383	0.096	0.559	734.	410.142
20	1525.	4.	4.261	5.923	1.481	0.206	6497.	1855.739
21	3300.	8.	2.731	11.187	1.398	0.433	9011.	3902.427
22	3125.	6.	4.423	11.214	1.869	0.309	13823.	4272.302
24	1625.	4.	4.116	9.137	2.284	0.367	6688.	2455.990
All strata:							218248.	13470.221

Table 3. Estimated commercial density (\bar{C}_k) and biomass in each stratum in the Barents Sea and estimated commercial biomass in all strata summarized with the precision of the estimates.

Stratum	Area nm ²	Number of hauls	\bar{C}_k tons/nm ²	S_k^2	$V(\bar{C}_k)$	Coeff. of var. (S.E./ \bar{C}_k)	Biomass tons	S.E. of biomass
1	1200.	2.	2.890	0.511	0.255	0.175	3468.	606.554
3	1950.	7.	5.117	24.160	3.451	0.363	9977.	3622.731
4	2300.	7.	2.884	13.192	1.885	0.476	6633.	3157.398
5	2400.	3.	0.897	0.024	0.008	0.100	2152.	215.372
6	2700.	9.	1.316	1.358	0.151	0.295	3553.	1048.890
7	1850.	7.	5.980	20.225	2.889	0.284	11063.	3144.632
8	2400.	6.	1.176	1.038	0.173	0.354	2823.	998.032
9	1500.	4.	2.124	0.977	0.244	0.233	3185.	741.359
10	1500.	4.	3.949	6.011	1.503	0.310	5924.	1838.847
11	1325.	3.	1.076	0.194	0.065	0.236	1426.	336.648
12	1375.	5.	11.952	18.986	3.797	0.163	16435.	2679.375
13	2700.	4.	2.527	0.502	0.125	0.140	6823.	956.372
14	2550.	7.	10.353	22.199	3.171	0.172	26400.	4541.109
15	2025.	7.	7.585	2.324	0.332	0.076	15359.	1166.729
16	1575.	6.	8.845	20.379	3.397	0.208	13930.	2902.669
17	1525.	4.	5.309	5.493	1.373	0.221	8096.	1787.018
18	2500.	8.	7.523	29.975	3.747	0.257	18807.	4839.216
19	1325.	4.	0.482	0.292	0.073	0.561	638.	358.078
20	1525.	4.	3.654	4.328	1.082	0.285	5572.	1586.221
21	3300.	8.	2.357	8.119	1.015	0.427	7778.	3324.390
22	3125.	6.	3.761	7.902	1.317	0.305	11752.	3586.206
24	1625.	4.	3.050	5.371	1.343	0.380	4956.	1882.958
All strata:							186750.	11608.304

Table 4. Trawl station data from cruise with R/V "Michael Sars" in the Spitsbergen area in July-August 1985

St. no.	Date	Stratum	Square	Time (hour)	Dist. (n.m.)	Position		Depth (m)	Shrimp catch (kg)	By catches (number)							
						N	E			Cod	Haddock	Redfish	Greenl. halibut	Capelin	Polar cod	Long rough dab	others
354	10.8	1	5	1305	3.0	7450	1619	343	1	8	30	675	1	1	11	264	208
355	10.8	1	7	1645	3.0	7448	1724	305	33	131	4	681	5	12	222	771	910
356	10.8	2	9	1900	1.5	7444	1740	232	0	29	10	41			3	645	95
359	11.8	2	13	0440	3.0	7434	1629	250	0	137	42	115				252	51
360	11.8	2	17	0805	3.0	7419	1627	298	0	124	10	509	1			132	51
281	27.7	3	15	1905	3.0	7548	1524	387	95	37	8	1737	116	492	52	272	48
280	27.7	3	24	1625	3.0	7541	1625	385	24	22	7	835	67	56	21	226	63
279	27.7	3	27	1310	3.0	7540	1604	372	14	42	11	6662	1388	264	11	495	144
350	9.8	3	38	2140	3.0	7533	1454	387	20	17	1		57				41
278	27.7	3	41	1012	2.0	7529	1521	380	3	1	4	288	1		3	11	181
274	26.7	4	7	1838	3.0	7555	1745	280	3	2940	160	50	10	80		460	42
277	27.7	4	14	0803	3.0	7519	1526	284	0	61	279	85		5	1	90	53
276	27.7	4	19	0440	3.0	7512	1630	266	0	361	71	11			30	173	30
289	28.7	5	1	2053	3.0	7651	1301	347	18	35	2	609	7	20	13	31	102
286	28.7	5	6	1140	3.0	7630	1423	326	8	42	6	1100		1		38	34
284	28.7	5	24	0445	3.0	7605	1620	376	134	414		5713	370	210	63	406	290
288	28.7	6	3	1810	3.0	7641	1446	238	5	315	1488	15838		105	1	210	177
287	28.7	6	6	1500	3.0	7640	1451	240	781	292	8	85		2436	3024	126	2458
285	28.7	6	9	0834	3.0	7618	1523	277	15	71	4	240		170	83	408	132
271	26.7	7	15	0757	3.0	7625	2050	231	98				46	65	3848	455	494
270	26.7	7	20	0440	3.0	7627	2210	233	24				21		1638	102	75
273	26.7	7	42	1532	3.0	7611	1742	310	215	151		32	1312	3664	1360	448	225
272	26.7	7	46	1200	3.0	7619	1903	278	8				120	495	387	88	48
295	29.7	8	4	1555	3.0	7732	1116	343	15	35	3	2441	55	11	2	172	38
294	29.7	8	6	1342	3.0	7722	1122	350	6	13	1	763	5	13	6	16	50
343	8.8	9	4	1645	3.0	7748	1025	264	10	26	7	23					1
296	29.7	9	5	1825	3.0	7743	1058	275	5	54	112	8751		30		375	210
293	29.7	9	13	0725	3.0	7659	1242	260	0	35	276	30004					12
292	29.7	9	14	0445	3.0	7707	1321	260	25	113	33	356		1		630	864
301	30.7	10	6	1130	3.0	7817	951	315	26	36	2	9654	18	121		690	243
306	31.7	10	11	0445	3.0	7814	1048	338	236	148		2637	204	102	5984	128	1043
341	7.8	10	14	1210	3.0	7903	1044	330	317	1			263		1298	176	8118
317	3.8	11	3	0910	3.0	7856	850	227	2	51	52	8073				132	57
316	3.8	11	6	0610	3.0	7858	953	236	268	61	1	55	83	2739	531	165	2782
304	30.7	11	12	1930	3.0	7851	911	203	2	180	106	365	1	24		174	64
303	30.7	11	14	1710	3.0	7841	932	245	1	386	456	5834		10	6	128	56
311	2.8	11	20	1525	3.0	7812	1226	271	225	42			93	34	51	1658	6142
300	30.7	11	24	0850	3.0	7810	1006	255	2	49	18	95630				112	450
313	2.8	11	28	2125	3.0	7811	1045	283	96	210	5	2732	33	77	187	172	1420
310	1.8	11	37	0442	3.0	7808	1254	290	88	158	1	15	77	60	240	480	8106
312	2.8	11	41	1830	3.0	7803	1155	241	114	216	7	93	116	112	80	2112	9291
307	31.7	11	44	0922	3.0	7803	1233	254	212	219	6	84	546	116	168	2048	5387
329	5.8	12	1	0445	3.0	7957	1041	350	50	192	7	1990	1	9	14	209	104
321	3.8	12	4	1945	3.0	7939	915	359	140	64		3499	22	5	85	145	264
319	3.8	12	6	1525	3.0	7934	844	375	23	48		7334	27		5	59	328
320	3.8	13	4	1730	3.0	7934	921	271	0	129		4177			7	140	347
318	3.8	13	7	1215	3.0	7916	823	270	8	42	3	1517			50	223	114
337	6.8	14	2	0445	3.0	8008	1057	360	70	300		2092	9		16	228	182
338	6.8	14	3	0720	3.0	8016	1050	390	235	11		882	140	28	193	14	704
330	5.8	15	1	0700	3.0	8001	1101	248	15	4		30515		58	7	392	253
340	6.8	15	4	1405	3.0	8026	1225	268	5	225	1	1					21
353	10.8	16	1	0940	3.0	7458	1445	471	123	49		689	5		2	1	120
357	10.8	16	4	2245	3.0	7434	1610	513	20	17		573	1			1	59
349	9.8	17	5	1820	3.0	7544	1409	519	20	9	1	383	26	6	31		63
352	10.8	17	8	0445	3.0	7520	1439	450	30	40	1	327	7	10		13	807
346	9.8	18	4	0735	3.0	7636	1345	481	75	15		220	59	166	31	3	63
347	9.8	18	7	1115	3.0	7620	1420	548	12	6		410	140			3	57
348	9.8	18	9	1435	3.0	7605	1422	415	18	19	2	320	10		3	6	102
297	29.7	19	2	2058	3.0	7747	1009	443	5	21							
344	8.8	19	6	2120	1.5	7718	1125	462	76	14		4109	7	4	11		31
299	30.7	20	12	0500	3.0	7810	918	490	45	24		4480	164	14			59
302	30.7	20	18	1455	3.0	7835	919	453	172	44		6310	120	26	347	13	71
324	4.8	21	4	0950	3.0	7954	744	615	1	5	1	25	19	24	3	3	438
325	4.8	21	8	1320	3.0	7958	837	490	205	3		168	133		70	42	266
327	4.8	21	13	1840	3.0	7953	951	471	153	1		155	157	27	27	31	247
326	4.8	21	24	1610	3.0	7951	923	462	130	5		126	133	20	8	40	140
323	4.8	21	30	0600	3.0	7939	828	531	5	2		74	88	7	12	1	115
333	5.8	22	7	1545	3.0	8009	728	550	120	3		98	135	36	24	2	199
332	5.8	22	13	1320	3.0	8006	807	530	86	2		242	135	10	26	10	178
334	5.8	22	24	1955	3.0	8010	909	545	31			21	123	13	42	2	156
331	5.8	22	26	1020	3.0	8002	926	506	47	1		188	50	26	108	12	86
339	6.8	22	39	1100	3.0	8025	1133	474	233	3		261	218	10	130		295

Table 5. Estimated density (\bar{C}_k) and biomass in each stratum at Vest-Spitsbergen and estimated biomass in all strata summarized with the precision of the estimates.

Stratum	Area nm ²	Number of hauls	\bar{C}_k tons/nm ²	S_k^2	$V(\bar{C}_k)$	Coeff. of var. (S.E./ \bar{C}_k)	Biomass tons	S.E. of biomass
1	284.	2.	0.897	1.425	0.713	0.941	255.	239.589
2	842.	3.	0.000	0.000	0.000	0.000	0.	0.000
3	1189.	5.	1.662	3.658	0.732	0.515	1976.	1016.932
4	486.	3.	0.053	0.008	0.003	1.000	26.	25.633
5	611.	3.	2.814	13.656	4.552	0.758	1719.	1303.186
6	353.	3.	14.088	551.709	183.903	0.963	4976.	4789.775
7	1530.	4.	4.551	24.789	6.197	0.547	6961.	3807.606
8	109.	2.	0.554	0.113	0.056	0.429	60.	25.833
9	539.	4.	0.528	0.325	0.081	0.540	285.	153.734
10	201.	3.	10.183	62.798	20.933	0.449	2044.	918.251
11	815.	10.	5.329	29.495	2.950	0.322	4344.	1400.044
12	155.	3.	3.746	10.448	3.483	0.498	581.	289.264
13	89.	3.	0.211	0.089	0.045	1.000	19.	18.868
14	56.	2.	8.046	37.897	18.949	0.541	455.	245.944
15	95.	2.	0.528	0.139	0.070	0.500	50.	25.142
16	200.	2.	3.773	14.768	7.384	0.720	755.	543.464
17	357.	2.	1.319	0.139	0.070	0.200	471.	94.183
18	246.	3.	1.847	3.366	1.122	0.574	454.	260.568
19	249.	2.	4.142	30.080	15.040	0.936	1031.	965.652
20	269.	2.	5.725	22.451	11.226	0.585	1540.	901.280
21	570.	5.	5.213	23.353	4.671	0.415	2971.	1231.851
22	734.	5.	5.456	17.955	3.591	0.347	4005.	1390.917
All strata							34976.	6983.701

Table 6. Estimated commercial density (\bar{C}_k) and biomass in each stratum at Vest-Spitsbergen and estimated commercial biomass in all strata summarized with the precision of the estimates.

Stratum	Area nm ²	Number of hauls	\bar{C}_k tons/nm ²	S_k^2	$V(\bar{C}_k)$	Coeff. of var. (S.E./ \bar{C}_k)	Biomass tons	S.E. of biomass
1	284.	2.	0.726	0.929	0.465	0.939	206.	193.465
2	842.	3.	0.000	0.000	0.000	0.000	0.	0.000
3	1189.	5.	1.453	2.689	0.538	0.505	1728.	871.894
4	486.	3.	0.047	0.007	0.002	1.000	23.	22.753
5	611.	3.	2.503	11.074	3.691	0.768	1529.	1173.506
6	353.	3.	11.464	360.989	120.330	0.957	4049.	3874.422
7	1530.	4.	3.780	20.093	5.023	0.592	5793.	3428.035
8	109.	2.	0.465	0.125	0.062	0.538	51.	27.190
9	539.	4.	0.500	0.329	0.082	0.574	270.	154.832
10	201.	3.	8.144	35.523	11.841	0.423	1634.	690.626
11	815.	10.	4.295	19.715	1.972	0.327	3501.	1144.627
12	155.	3.	3.623	9.717	3.239	0.497	562.	278.959
13	89.	2.	0.174	0.061	0.030	1.000	16.	15.572
14	56.	2.	7.492	30.127	15.063	0.518	423.	219.285
15	95.	2.	0.513	0.143	0.071	0.521	49.	25.455
16	200.	2.	3.335	11.724	5.862	0.726	667.	484.230
17	357.	2.	1.164	0.092	0.046	0.184	415.	76.643
18	246.	3.	1.628	2.445	0.815	0.554	401.	222.087
19	249.	2.	3.596	22.459	11.229	0.932	895.	834.404
20	269.	2.	5.182	18.382	9.191	0.585	1394.	815.518
21	570.	5.	4.906	21.221	4.244	0.420	2797.	1174.270
22	734.	5.	5.092	14.121	2.824	0.330	3738.	1233.530
All strata:							30139.	5952.139

Table 7. Estimated biomass of shrimp in each stratum in the Barents Sea in the years 1981 to 1985 in 1000 tons.

Stratum \ Year	1981	1982	1983	1984	1985
1	8.5	8.3	6.0	5.3	4.1
2	6.7	5.2	4.8	3.6	
3	11.4	7.4	14.7	13.9	11.3
4	14.0	13.9	14.8	17.5	7.9
5	3.2	5.2	8.1	1.9	3.0
6	16.7	26.0	38.9	18.8	4.7
7	11.9	7.6	18.0	32.4	12.4
8	10.9	19.2	10.6	8.4	3.5
9	12.8	15.7	13.0	20.2	3.6
10	14.9	14.9	21.4	16.5	7.0
11	12.9	11.8	16.2	23.2	1.8
12	17.3	16.8	22.9	23.9	18.6
13	19.9	13.3	20.9	29.1	7.7
14	21.0	21.1	39.4	34.6	29.4
15	21.9	22.4	31.4	40.8	17.2
16		7.2	16.0	36.8	15.6
17		9.3	16.9	21.0	9.2
18		5.9	8.0	7.5	24.6
19	3.8	1.6		5.1	0.7
20	14.8	13.0	16.0	15.4	6.5
21	10.4	14.5	8.0	16.8	9.0
22	17.7	24.4	22.2	22.0	13.8
23				4.9	
24					6.7
	250.8	284.6	368.2	419.6	218.2

Table 8. Estimated commercial biomass of shrimps in each stratum in the Barents Sea in the years 1980 to 1985 in 1000 tons.

Stratum \ Year	1980	1981	1982	1983	1984	1985
1		7.4	7.2	5.6	4.8	3.5
2		5.1	4.2	4.1	2.6	
3	4.9	9.3	6.1	13.0	12.1	10.0
4	14.7	11.5	11.5	12.7	15.2	6.6
5		2.7	4.2	6.5	1.7	2.2
6	16.6	14.2	22.0	33.7	16.5	3.6
7	3.2	9.5	6.0	15.8	28.3	11.1
8		9.4	15.5	8.8	7.4	2.8
9		10.6	13.1	11.8	18.1	3.2
10		12.2	12.6	19.4	14.9	5.9
11		10.1	29.3	14.0	21.6	1.4
12		13.9	13.7	20.7	21.3	16.4
13		16.7	11.2	19.2	25.2	6.8
14		17.6	18.8	36.2	31.1	26.4
15		18.9	19.9	30.3	37.4	15.4
16			5.8	14.5	32.9	13.9
17			7.1	14.5	17.1	8.1
18			4.4	7.1	4.6	18.8
19		3.3	7.4		4.7	0.6
20		12.6	10.9	14.1	13.8	5.6
21		9.2	12.5	7.2	15.4	7.8
22		15.3	20.2	19.5	19.6	11.8
23					4.5	
24						5.0
		209.2	237.4	328.7	371.1	186.8

Table 9. Estimated number of shrimps in each stratum in the Barents Sea in the years 1981 to 1985 (numbers in millions).

Stratum \ Year	1981	1982	1983	1984	1985
1	1830.1	1764.3	1004.8	960.5	935.9
2	1911.2	1332.1	1033.8	1185.3	
3	2859.2	1812.0	2937.3	2850.9	2274.6
4	3506.9	3314.9	3192.4	3648.7	1784.8
5	815.7	1276.0	2040.5	416.3	976.8
6	3732.1	5981.1	8266.4	3856.1	1413.9
7	3242.1	2033.9	3693.6	6713.8	2389.0
8	2319.5	4830.5	2442.0	1807.7	865.4
9	3021.1	3660.6	2319.9	3883.8	722.3
10	3662.1	3424.1	3822.1	3049.2	1550.9
11	3778.1	3260.5	3458.0	3786.5	508.4
12	4541.9	4188.9	4087.1	4650.9	3733.5
13	4544.1	3040.9	3624.6	6516.0	1483.1
14	2479.3	4070.6	6599.3	6510.5	5517.1
15	4697.6	4289.9	4128.9	6932.7	3280.3
16		1872.2	2891.3	6891.4	2918.6
17		2730.5	3607.2	5281.3	1806.3
18		1780.6	1623.2	3084.0	7019.3
19	827.4	313.5		869.8	151.6
20	3249.5	2992.6	3225.1	2975.4	1405.5
21	2021.6	3086.6	1500.7	2903.4	1916.8
22	3779.3	5833.2	4481.1	4278.3	3097.8
23				813.0	
24					2012.3
	56808.9	66889.6	69979.1	83870.3	47764.2

Table 10. Estimated commercial number of shrimps in each stratum in the Barents Sea in the years 1981 to 1985 (numbers in millions).

Stratum \ Year	1981	1982	1983	1984	1985
1	1416.7	1392.5	880.8	811.7	717.3
2	1257.5	918.1	771.0	708.8	
3	2088.8	1357.8	2394.6	2248.2	1865.0
4	2443.9	2460.3	2379.3	2797.6	1356.4
5	584.6	963.8	1511.1	316.8	589.1
6	2855.1	4485.0	6189.7	2970.1	882.6
7	2143.8	1380.3	2815.9	5232.6	1947.5
8	1866.5	3591.7	1878.0	1413.3	634.2
9	2271.7	2834.2	1896.8	3216.5	580.4
10	2574.0	2547.6	3125.1	2360.9	1161.1
11	2327.6	2058.1	2681.1	3308.3	330.6
12	3052.7	2956.1	3341.8	3638.7	2937.0
13	3480.8	2289.1	3050.2	4642.1	1202.2
14	1760.1	3294.0	5648.6	5086.9	4274.1
15	3600.0	3450.1	3788.0	5633.6	2596.6
16		1325.1	2435.2	5697.0	2355.8
17		1716.4	2733.7	3538.9	1423.6
18		1140.2	1267.5	1505.6	4625.4
19	629.8	262.3		771.2	122.8
20	2497.6	2231.6	2522.6	2413.6	1084.6
21	1711.0	2521.8	1287.4	2598.5	1542.3
22	3056.0	4408.6	3689.0	3487.9	2378.5
23				710.0	
24					1304.3
	41618.2	49584.5	56287.5	65109.0	35911.6

Table 11. Estimated biomass of shrimps in each stratum at Vest-Spitsbergen in the years 1982 to 1985 in 1000 tons.

Stratum	Year			
	1982	1983	1984	1985
1	0.1	3.2	5.3	0.3
2	1.4	0.9	0.0	0.0
3	8.2	5.0	10.6	2.0
4	4.1	14.4	0.8	0.0
5	4.4	0.2	3.4	1.7
6	10.5	0.3	0.4	5.0
7		0.6	0.2	7.0
8	1.1	2.4	3.2	0.1
9	3.4	4.8	1.1	0.3
10	4.2	1.3	1.1	2.0
11	6.4	3.8	7.7	4.3
12	2.2	2.5	0.6	0.6
13	0.8	2.0	0.1	0.0
14	2.3	0.5	0.4	0.5
15	1.5	1.7	0.5	0.1
16		1.4	2.2	0.8
17		0.3	1.9	0.5
18		0.2	0.6	0.5
19		6.0	3.8	1.0
20		1.4	1.6	1.5
21		5.5	1.7	3.0
22		0.9	5.5	4.0
23			1.2	
	40.4	58.7	54.0	35.0

Table 12. Estimated total number of and percent males, intersexes and females in the Barents Sea in the years 1981 to 1985 (numbers in millions).

Sex	Year									
	1981	%	1982	%	1983	%	1984	%	1985	%
males	45424.3	76.6	49192.4	73.5	41864.6	59.8	50694.6	60.4	31624.8	66.2
intersexes	7191.7	12.1	8890.2	13.3	7846.6	11.2	4676.0	5.6	4870.0	10.2
females	6672.1	11.3	8807.0	13.2	20267.9	29.0	28499.7	34.0	11269.4	23.6
total	59288.2	100.0	66889.6	100.0	69979.1	100.0	83870.3	100.0	47764.2	100.0

Table 13. Estimated total number of and percent males, intersexes and females in the Spitsbergen area in the years 1981 to 1985 (numbers in millions).

Sex	Year							
	1982	%	1983	%	1984	%	1985	%
males	5401.0	73.5	5260.9	59.9	7114.3	71.8	5765.2	76.6
intersexes	953.0	13.0	1057.1	12.0	368.0	3.7	535.5	7.1
females	991.3	13.5	2463.7	28.1	2432.8	24.5	1223.0	16.3
total	7345.4	100.0	8781.7	100.0	9915.1	100.0	7764.2	100.0

Table 14. Catch of shrimps and by-catch composition in the different strata in the Barents Sea in April - May and July - August 1985.

Stratum number	Number of hauls	Shrimps pr 3 n.m. (kg)	By-catch of fish in numbers pr 3 n.m. trawled							
			Cod	Haddock	Redfish	Greenl. halibut	Capelin	Polar-cod	Long rough dab	Others
1	2	65	125	33	654	9	1	0	45	218
3	7	110	157	59	214	1	0	0	93	207
4	7	65	110	50	518	9	2401	0	148	55
5	3	24	106	144	256	1	30	0	145	204
6	9	33	111	303	1353	1	444	0	561	639
7	7	127	119	34	1304	4	208	0	451	48
8	6	33	36	161	390	8	26	0	158	33
9	4	43	33	31	499	20	56	0	134	27
10	4	88	22	27	1296	10	121	0	222	108
11	3	26	281	479	1628	20	8	0	837	83
12	5	257	82	52	1191	11	278	0	494	172
13	4	54	28	6	347	23	26	3	113	30
14	7	218	41	5	3232	45	50	14	137	190
15	7	161	7	2	5468	30	86	13	126	134
16	6	188	11	5	5677	5	1210	263	162	202
17	4	164	5	0	2416	66	75	30	103	88
18	8	186	5	0	1712	4	9360	652	137	97
19	4	11	83	28	1435	6	5	13	344	58
20	4	81	35	1	4061	49	2	27	156	23
21	8	52	61	3	3528	14	2	0	187	208
22	6	84	179	84	5752	32	1	1	137	34
24	4	78	1	0	2	26	2062	4263	89	35

Table 15. Catch of shrimps and by-catch composition in the different strata in the Spitsbergen area in July and August 1985.

Stratum number	Number of hauls	Shrimps pr 3 n.m. (kg)	By-catch of fish in numbers pr 3 n.m. trawled							
			Cod	Haddock	Redfish	Greenl. halibut	Capelin	Polar-cod	Long rough dab	Others
1	2	17	70	17	678	3	7	117	518	559
2	3	0	106	24	235	0	0	2	558	97
3	5	32	24	6	1932	326	162	18	202	113
4	3	1	1121	170	49	3	28	10	241	42
5	3	53	164	3	2474	126	77	25	158	142
6	3	267	226	500	5388	0	904	1036	248	922
7	4	86	38	0	8	375	1056	1808	273	211
8	2	11	24	2	1707	30	12	4	94	44
9	4	10	57	107	9784	0	8	0	251	272
10	3	193	62	1	4097	162	74	2427	331	3135
11	10	101	157	65	11288	95	317	126	718	3376
12	3	71	101	2	4274	17	5	35	138	232
13	2	4	86	2	2847	0	0	29	182	231
14	2	153	156	0	1487	75	14	105	121	443
15	2	10	115	1	15258	0	29	4	196	137
16	2	72	33	0	631	3	0	1	1	90
17	2	25	25	1	355	17	8	16	7	435
18	3	35	13	1	317	70	56	10	4	74
19	2	79	25	0	4109	7	4	11	0	31
20	2	109	34	0	5395	142	20	174	7	66
21	5	99	3	0	110	104	16	24	23	241
22	5	103	2	0	162	133	19	66	5	183

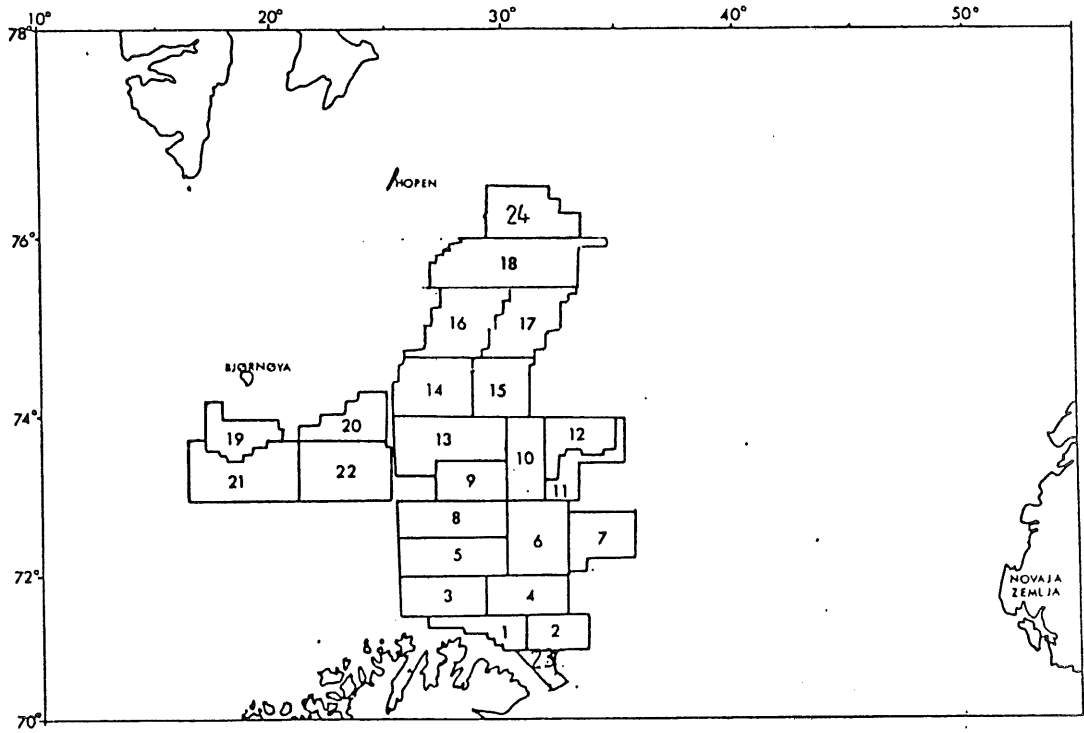


Fig. 1. Sampling strata used in May and July-August 1985 in the Barents Sea for the shrimp survey with R/V "Michael Sars".

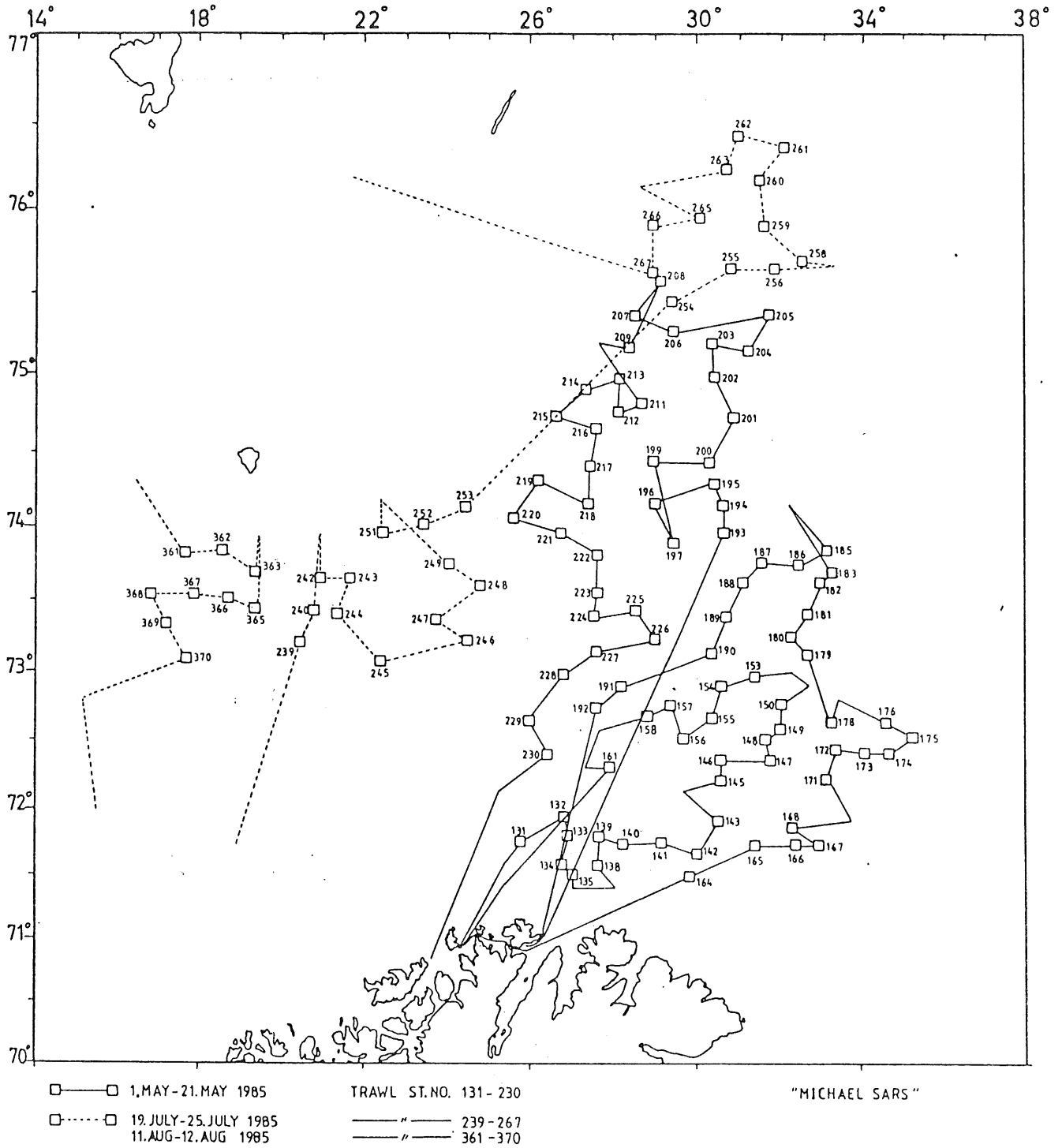


Fig. 2. Survey tracks and trawlstations taken by R/V "Michael Sars" in the Barents Sea in May and July-August 1985.

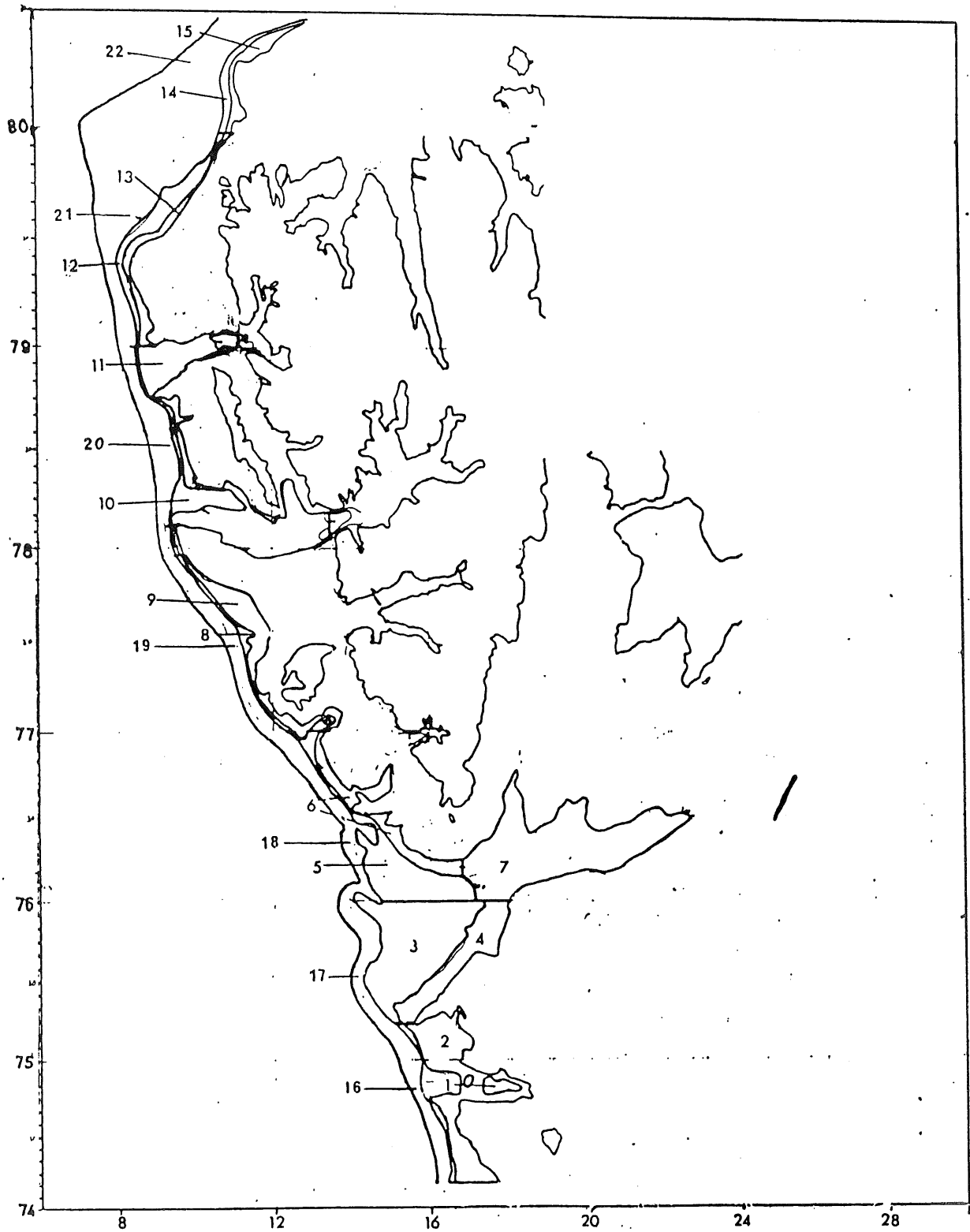


Fig. 3. Sampling strata used in July-August 1985 in the Spitsbergen area for the shrimp survey with R/V "Michael Sars".

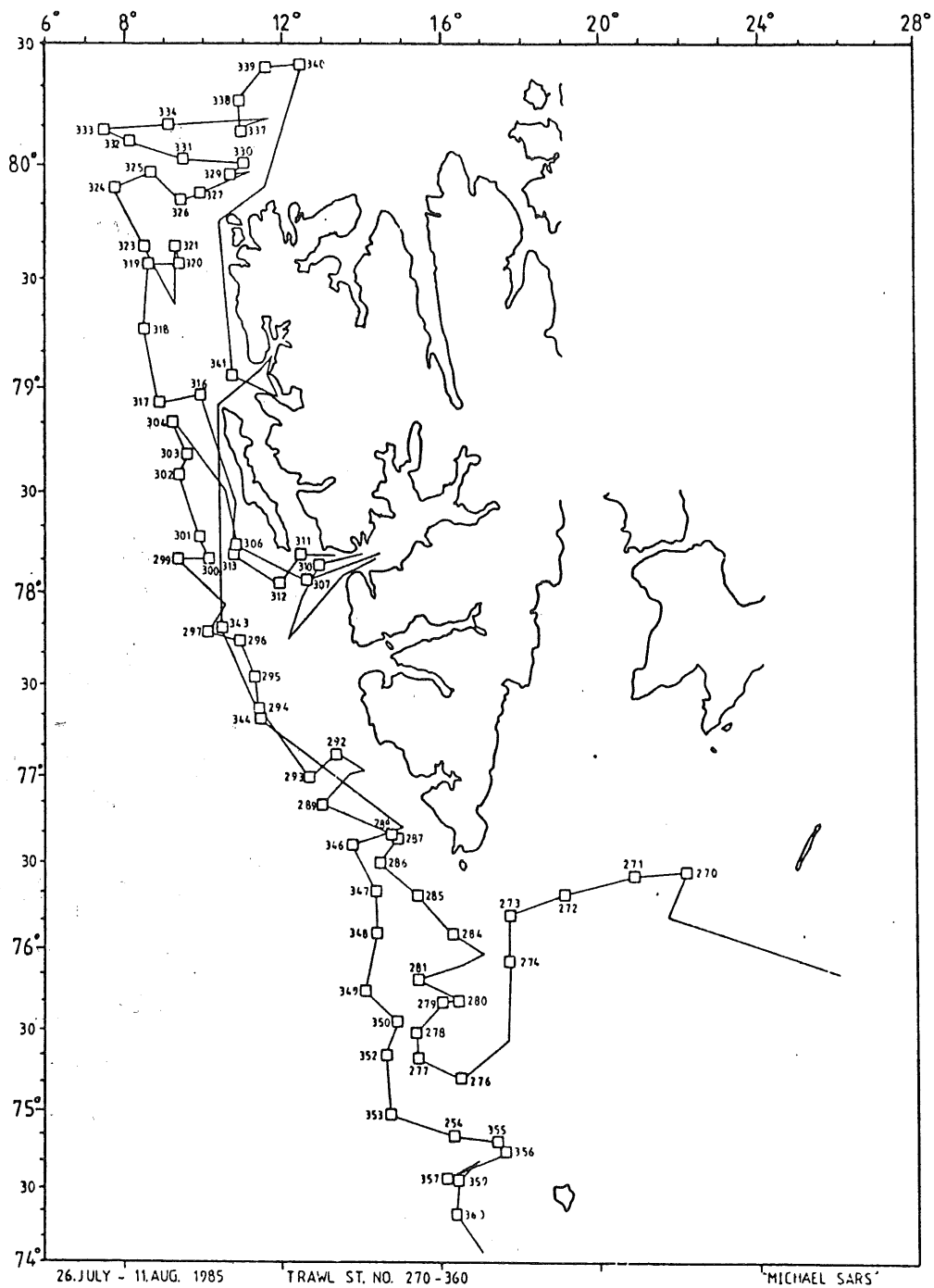


Fig. 4. Survey tracks and trawlstations taken by R/V "Michael Sars" in the Spitzbergen area in July-August 1985.

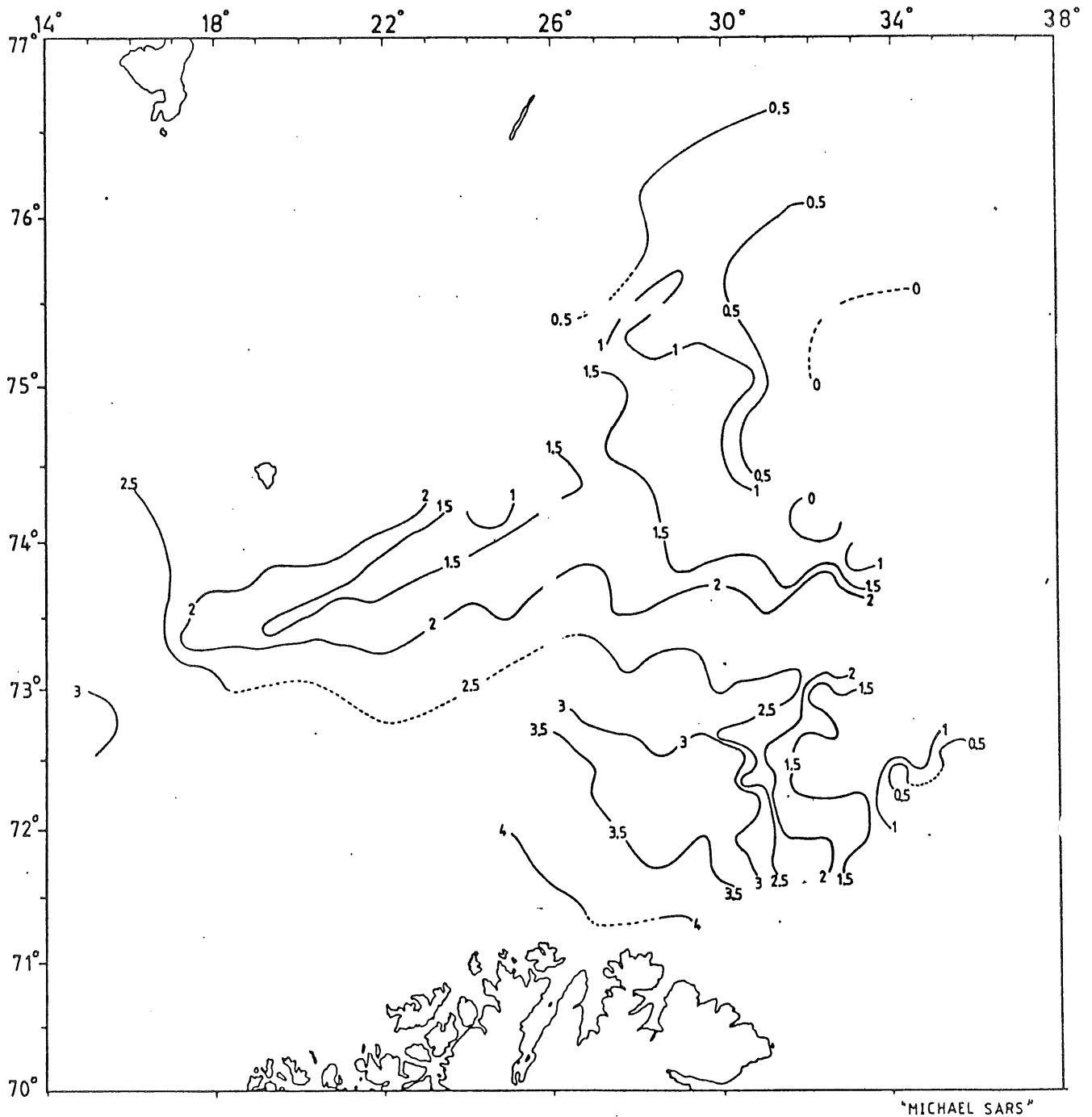


Fig. 5. Temperature distribution at the bottom in the Barents Sea in May and July-August 1985.

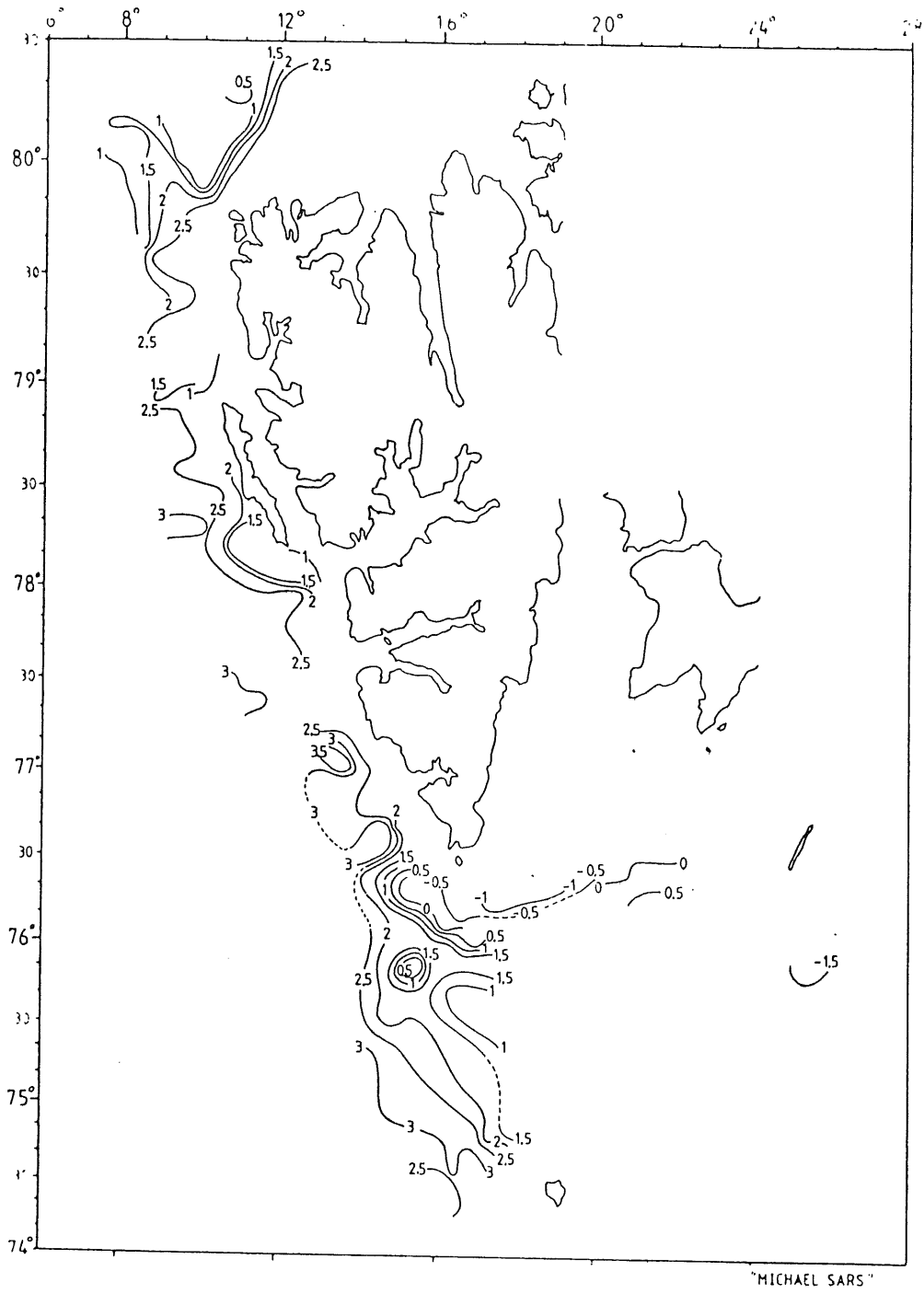


Fig. 6. Temperature distribution at the bottom in the Spitsbergen area in July-August 1985.

