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RESULTS OF STRATIFIED TRAWL SURVEYS FOR SHRIMP (Pandalus borealis) IN THE BARENTS SEA AND THE SVALBARD REGION IN 1988.

by

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ABSTRACT

Results of stratified random bottom trawl survey in the Barents Sea in April - May and the Svalbard region in July - august 1988 are described. However, the strata south of Bear Island and the northern part of the Barents Sea were surveyed in July - August 1988.

Based on data from 119 trawl stations in the Barents Sea survey, the biomass of shrimps was estimated to about 156 000 tonnes, which is an increase of 21,5% compared with 1987. Based on data from 64 trawl stations in the Svalbard region, the biomass was estimated to about 28 000 tonnes, corresponding to an increase of 18,6% compared with 1987.

INTRODUCTION

Stratified random bottom trawl surveys were carried out with R/V "Michael Sars" in the Barents Sea from 23 April to 20 May and from 19 July to 20 August in the Bear Island/Spitsbergen area. The main objectives of the surveys were to study the abundance and structure of the shrimp stocks.

MATERIAL AND METHODS

A "Campelen Super" 1800 meshes shrimp trawl with 12-21 inches rubber bobbins was used as survey gear. The mesh size decrease from 80 mm in the front part to 35 mm in the cod end, lined inside with a net of 4 m in length and 8 mm mesh size. The sweep wire was 40 m. Trawling distance on each station was 3,0 nautical miles at a speed of 3 knots. As an average, the horizontal opening of the trawl was measured to 11,7 m during towing (Teigsmark and Øynes 1982), and the headline was between 4 and 5 m above the bottom.

Barents Sea

Alltogether 23 strata were worked during the Barents Sea survey (Fig. 1). Each stratum was divided into rectangles of 5x5 nautical miles as described by Teigsmark and Øynes (1981). The number of hauls allocated to each stratum were nearly the same as last year (Table 1). In the most important strata up to 10% of the rectangles were included in the survey.

As in 1987 (Hylen et al. 1987) unfavourable ice condition prevented from doing the spring survey in stratum 17,18 and 24. These strata were surveyed during July.

Bear Island/Spitsbergen area

The same strata system as used in the bottom trawl survey for cod (Godø and Nedreaas 1986) was used in designing the shrimp survey, and

20 strata were covered (Fig. 2). The survey in 1988 covered 64 stations from "Kveithola" (Stratum 1) and northwards along the western slope off Spitsbergen to N $80^0$10'. Caused by bad ice conditions stratum 14 and 15 could not be covered.

SHRIMP STOCK BIOMASS

In the 1987 surveys the strata southeast of Hopen Island (Strata 16 - 18) and the eastern part of stratum 7 were overflown by cold bottom water below 0^0C. These strata were in 1988 covered by bottom watermasses with temperatures above zero. All strata in the Bear Island/Spitsbergen survey except parts of stratum 6 and 7 were in 1988 covered by water masses with temperatures above 0^0C. Parts of stratum 6 and 7 had a bottom layer with temperatures between 0^0C and $-0,5^0$C.

Barents Sea stock

An increase in the shrimp biomass of 52,3% was observed from 1986 to 1987 in the strata south of N 74^0 and east of 25^0 (Strata 1-13). and a further increase of 16% was observed in 1988. On the other hand a decrease in biomass of 45,5% was recorded in 1987 for the strata south-east of Hopen Island (Strata 14-16), probably caused by the cold bottom water in those areas in 1987. In 1988 the shrimp biomass increaced in stratum 14 and 15 to the same level as in 1986. Strata 16-18 and 24 were from spring 1986 and in 1987 overflown by cold bottom water with temperatures below zero, and few shrimps were observed in the area. In 1988 the bottom temperature was above zero in these strata, but the density of shrimps was still low, close to the low level in 1981.

The total biomass of shrimp is estimated to 155 700 tonnes in 1988 (Table 2), corresponding to an increase of 21,5% compared with 1987. This bring the biomass up to the same level as in 1986.

The low abundance of intersexes in 1986 was expected to give a decrease of females in 1987 (Hylen and Øynes 1986), whitch was confirmed by

the 1987 survey (Table 3). The females represent in 1987 only 8,4% of the total stock, which was the lowest abundance recorded since the investigations started in 1981. From 1986 to 1987 there was an increase in abundance of intersexes to the same level as in the years 1981 to 1983 (Hylen et al. 1987),which brought the abundance of females in 1988 up to the same level as in 1985. Abundance of males and intersexes were at the same level in 1988 as in 1985 - 1987 (Table 3).

Bear Island/Spitsbergen stock

The shrimp biomass has been declining from 1983 to 1986 in all strata off Spitsbergen, reaching a minimum in 1986 (Table 4). An increace of 7,7% was observed from 1986 to 1987 (Hylen et al 1987) and a further increase was observed in 1988 (Table 5), corresponding to 18.6%. In the strata between 200 - 400m (Strata 1-15) the biomass declined from 1986 to 1987 and leveled out in 1988.

In strata deeper than 400 m (Strata 16-22) the biomass increased from 1986 to 1987 by near 100% which brought the biomass to a higher level than in 1986. A further increase of 31% was observed in 1988.

The high numbers of intersexes in 1987 (Hylen et al. 1987) brougth the abundance of females in 1988 up to the same level as in 1985 (Table 5). The abundance of males were in 1988 at the same level as in the two preceding years, and the abundance of intersexes were in 1988 at the highest level ever observed in these area. This is caused by the rich 1983 year class, which has been changing sex.

REFERENCES

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Table 1. Estimated biomass index in each stratum in the Barents Sea and the Spitsbergen area in 1988.

Stratum	BARENTS SEA AREA			VEST-SPITSBERGEN AREA		
	Area nm^2	No of hauls	Biomass tonnes	Area nm^2	No of hauls	Biomass tonnes
1	1200	3	7788	284	2	404
2	1650	3	2002	842	2	0
3	1950	7	6923	1189	2	4328
4	2300	6	9385	486	2	2486
5	2400	4	4116	611	4	900
6	2700	8	12002	353	2	0
7	1850	6	5564	1530	5	2340
8	2400	6	8020	109	2	1208
9	1500	4	6134	539	2	1836
10	1500	5	7883	201	4	1490
11	1325	3	3123	815	9	2504
12	1375	5	6602	155	4	511
13	2700	6	18021	89	3	164
14	2550	5	10199	56	1	+
15	2025	7	12745	95	1	+
16	1575	6	1468	200	2	422
17	1525	4	4949	357	2	1987
18	2500	9	2858	246	3	917
19	1325	3	163	249	2	0
20	1525	2	1770	269	2	1434
21	3300	7	7935	570	6	1414
22	3125	5	13059	734	2	3621
24	1625	5	3018			
All strata		119	155724		64	27968

Table 2. Estimated biomass of shrimps in each stratum in Barents Sea in the years 1981 to 1988 in 1000 tonnes.

Year / Stratum	1981	1982	1983	1984	1985	1986	1987	1988
1	8.5	8.3	6.0	5.3	4.1	1.1	7.1	7.8
2	6.7	5.2	4.8	3.6		0.6	1.4	2.0
3	11.4	7.4	14.7	13.9	11.3	3.3	11.8	6.9
4	14.0	13.9	14.8	17.5	7.9	4.7	8.2	9.4
5	3.2	5.2	8.1	1.9	3.0	1.9	1.4	4.1
6	16.7	26.0	38.9	18.8	4.7	3.0	3.1	12.0
7	11.9	7.6	18.0	32.4	12.4	3.9	9.6	5.6
8	10.9	19.2	10.6	8.4	3.5	3.7	3.2	8.0
9	12.8	15.7	13.0	20.2	3.6	1.5	4.2	6.1
10	14.9	14.9	21.4	16.5	7.0	4.3	11.3	7.9
11	12.9	11.8	16.2	23.2	1.8	1.5	2.1	3.1
12	17.3	16.8	22.9	23.9	18.6	6.9	4.6	6.6
13	19.9	13.3	20.9	29.1	7.7	17.7	14.4	18.0
14	21.0	21.1	39.4	34.6	29.4	11.2	7.5	10.2
15	21.9	22.4	31.4	40.8	17.2	11.3	9.7	12.7
16		7.2	16.0	36.8	15.6	6.1	6.0	1.5
17		9.3	16.9	21.0	9.2	16.7	3.5	4.9
18		5.9	8.0	7.5	24.6	11.2	4.1	2.9
19	3.8	1.6		5.1	0.7	0.6		0.2
20	14.8	13.0	16.0	15.4	6.5	12.6		1.8
21	10.4	14.5	8.0	16.8	9.0	5.7	4.6	7.9
22	17.7	24.4	22.2	22.0	13.8	14.5	4.3	13.1
23				4.9				
24					6.7	14.7		3.0
All Strata:	250.8	284.6	368.2	419.6	218.2	158.6	122.3	155.7

Table 3. Estimated total number and percent of males, intersexes and females in the Barents Sea in the years 1982 to 1988 (numbers in millions).

Sex	Year 1982	%	1983	%	1984	%	1985	%	1986	%	1987	%	1988	%
Males	49192.4	73.5	41864.6	59.8	50694.6	60.4	31624.8	66.2	29468.4	75.5	26041.6	79.7	28385.7	65.5
intersexes	8890.2	13.3	7846.6	11.2	4676.0	5.6	4870.0	10.2	3173.5	8.1	3906.6	12.0	3070.9	7.1
females	8807.0	13.2	20267.9	29.0	28499.7	34.0	11269.4	23.6	6391.9	16.4	2739.7	8.3	11857.2	27.4
Total	66889.6	100.0	69979.1	100.0	83870.3	100.0	47764.2	100.0	39033.8	100.0	32687.9	100.0	43313.9	100.0

Table 4. Estimated biomass of shrimps in each stratum at Vest-Spitsbergen in the years 1982 to 1988 in 1000 tonnes.

Year / Stratum	1982	1983	1984	1985	1986	1987	1988
1	0.1	3.2	5.3	0.3	0.5	0.6	0.4
2	1.4	0.9	0.0	0.0	0.2		0.0
3	8.2	5.0	10.6	2.0	4.1	5.0	4.3
4	4.1	14.4	0.8	0.0	0.2	0.8	2.5
5	4.4	0.2	3.4	1.7	1.3	0.5	0.9
6	0.5	0.3	0.4	5.0	2.4	0.4	0.0
7		0.6	0.2	7.0	1.9	1.3	2.3
8	1.1	2.4	3.2	0.1	0.7	0.7	1.2
9	3.4	4.8	1.1	0.3	1.5	0.9	1.8
10	4.2	1.3	1.1	2.0	0.5	1.1	1.5
11	6.4	3.8	7.7	4.3	4.1	2.9	2.5
12	2.2	2.5	0.6	0.6	0.3	0.7	0.5
13	0.8	2.0	0.1	0.0	0.1	0.5	0.2
14	2.3	0.5	0.4	0.5	0.1	0.3	
15	1.5	1.7	0.5	0.1	0.1	0.4	
16		1.4	2.2	0.8	0.1		0.4
17		0.3	1.9	0.5	0.2	0.4	2.0
18		0.2	0.6	0.5	0.9	0.6	0.9
19		6.0	3.8	1.0	0.0	2.2	0.0
20		1.4	1.6	1.5	0.3	0.8	1.4
21		5.5	1.7	3.0	0.7	1.0	1.4
22		0.9	5.5	4.0	1.1	1.8	3.6
23			1.2		0.5		
All strata	40.4	58.7	54.0	35.0	22.0	22.8	28.0

Table 5. Estimated total number and percent of males, intersexes and females in the Spitsbergen area in the years 1982 to 1988 (numbers in millions).

Sex	Year 1982	%	1983	%	1984	%	1985	%	1986	%	1987	%	1988	%
Males	5401.0	73.5	5260.9	59.9	7114.3	71.8	5765.2	76.6	4399.7	80.2	4374.3	75.7	4005.9	57.0
intersexes	953.0	13.0	1057.1	12.0	368.0	3.7	535.5	7.1	207.5	3.8	527.0	9.1	1772.7	25.2
females	991.3	13.5	2463.7	28.1	2432.8	24.5	1223.0	16.3	881.7	16.0	879.2	15.2	1247.1	17.8
Total	7345.4	100.0	8781.7	100.0	9915.1	100.0	7764.2	100.0	5488.9	100.0	5780.5	100.0	7025.8	100.0

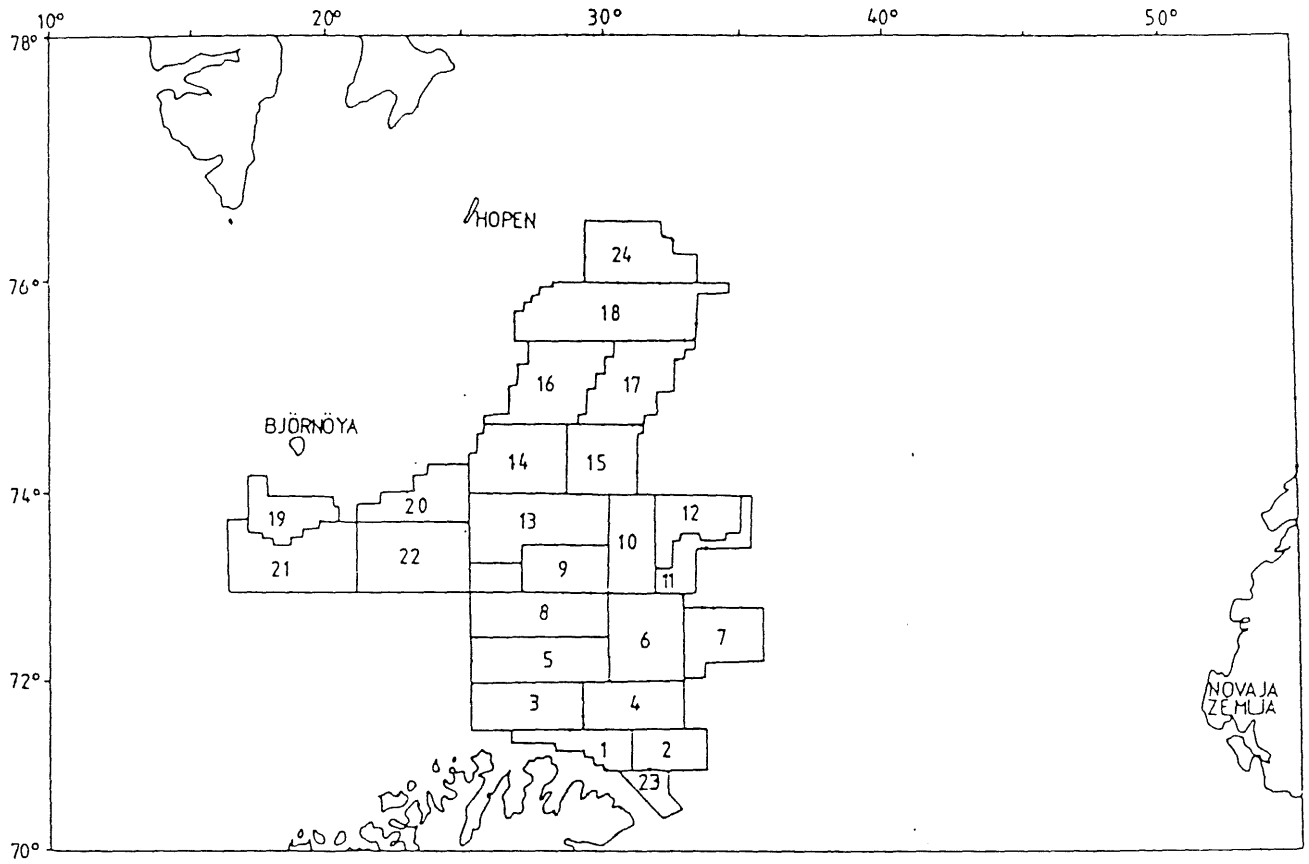

Fig. 1. Sampling strata used in April and May 1988 in the Barents Sea for the shrimp survey with R/V "M. Sars".

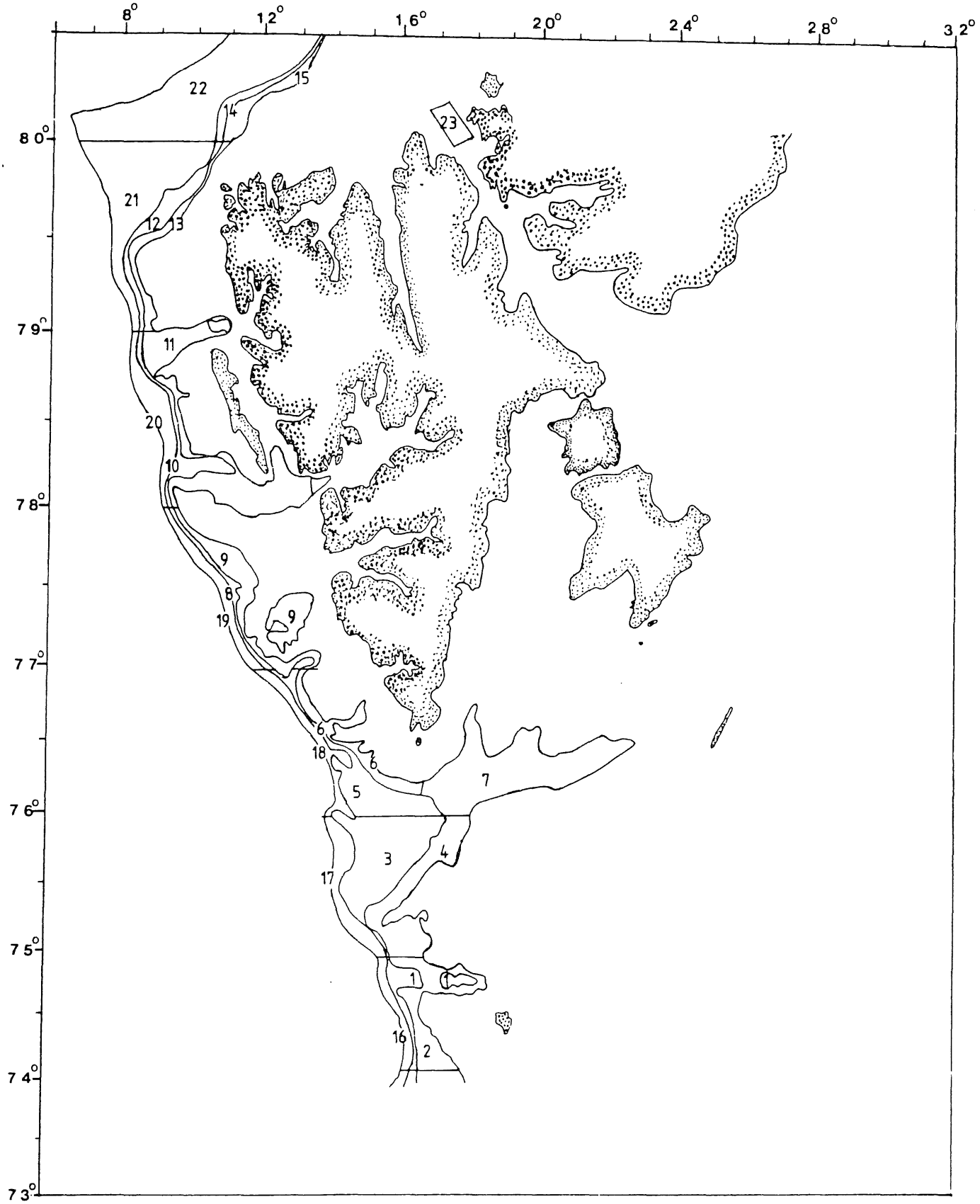

Fig. 2. Sampling strata used in July and August 1988 in the Spitsbergen area for the shrimp survey with R/V "M. Sars".