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RESULTS OF STRATIFIED TRAWL SURVEYS FOR SHRIMP (Pandalus borealis) IN THE BARENTS SEA AND THE SVALBARD REGION IN 1989

by

Arvid Hylen, Knut Sunnanå and Per Øynes
Institute of Marine Research
Bergen, Norway

ABSTRACT

Results of stratified random bottom trawl survey in the Barents Sea in April - May and the Svalbard region in July - August 1989 are described. However, the strata south of Bear Island were surveyed in July - August 1989.

Based on data from 123 trawl stations in the Barents Sea survey, the biomass of shrimps was estimated to about 173 800 tonnes, which is an increase of 11.6% compared with 1988. Based on data from 62 trawl stations in the Svalbard region, the biomass was estimated to about 44 000 tonnes, corresponding to an increase of 56.4% compared with 1988.

INTRODUCTION

Stratified random bottom trawl surveys were carried out with R/V "Michael Sars" in the Barents Sea from 17.April to 18.May, and the Spitsbergen area from 14. July to 12. August. 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 80mm in the front part to 35mm in the cod end, lined inside with a net of 4m in length and 8mm mesh size. The sweep wire was 40m. Trawling distance on each station was 3.0 nautical miles at a speed of 3 knots. As an average, the horisantal opening of the trawl was measured to 11,7m during towing (Teigsmark and Øynes 1982), and the headline was between 4 and 5m 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.

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 19 strata were covered (Fig.2). The survey in 1989 covered 62 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 could not be covered. Strata 12 and 13 could not be covered caused by rough bottom.

SHRIMP STOCK BIOMASS

In the 1987 survey the strata southeast of Hopen Island (Strata 16-18) and the easten part of stratum 7 were overflown by cold bottom water below 0^0C. In 1988 the whole investigated area in the Barents Sea were covered by watermasses with temperatures above Zero. In 1989 negative temperatures were observed only in the eastern part of stratum 17. In the Spitsbergen waters the bottom water temperatures was above zero in the investigated area.

Barents Sea stock

An increase in the shrimp biomass of 52,3% was observed from 1986 to 1987 in the strata south of $N74^0$ and east of $E25^0$ (Strata 1-13).A further increase of 18,3% was observed in 1988. In 1989,a decrease of 8.8% was observed in these area. A decrease of 59,5% in biomass was observed in the deepest part of the Barents Sea (Strata 8,9 and 13). At the important fishing area at "Thor Iversen" bank a decrease of 24.4% was observed (Strata 10-12). On the other hand, an increase in biomass of 32,2 % was observed in the strata north of Finnmark (Strata 1-4). The biomass in these areas is at present about 14% below the level in the top year 1984 . At the important fishing grounds at Tiddly bank (Strata 6 and 7) the biomass of shrimp is at the same level in 1989 as in 1988. In the area south east of Hopen (Strata 14-18 and 24) there are an increase in the southern part of the area and a decrease in the northern part. However, the biomass for the whole area are at the same level in 1989 as in 1988 (Table 2). In the strata southeast of Bear Island there is an increase of more than 100% from 1988 to 1989 (Strata 19-22).

In the survey area as a whole the shrimp biomass was estimated to 173,800 tonnes in 1989 (Table 1) corresponding to an increase of 11.6% compared with 1988. This bring the stock biomass above the 1986 level (Table 2).

The abundance of males in 1989 were at the same level as in the years 1985 to 1988, and represent 73% of the stock. The abundance of intersexes was in 1989 more than the duble abundance that in 1988, and the highest recorded after 1983, therefore a high number of females would be expected in 1990.

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 increase of 18.6% was observed from 1987 to 1988 (Hylen and Øynes 1988) and a further increase was observed in 1989, corresponding to 56,4% compared with 1988.

The high numbers of intersexes in 1987 (Hylen et al. 1987) brought the abundance of femals 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 preeceding years, and the abundance of intersexes were in 1988 at the highest level ever observed in this area, mainly caused by the rich 1983 year class. These year-class has to a great extent changed sex in 1989 and recruited the stock of females. It is probably that this year-class is the reason for the high number of females in 1989. The numbers of males are higher than the years since 1985. This means that the recruitment in the shrimp stock at Vest-Spitsbergen is good. The number of intersexes are less than the half in 1989 than the year before. The abundance of males are the highest observed in the period 1985 to 1989, wich indicate a good recruitment to the shrimp stock of Spitsbergen. The abundance of intersexes is less than half i 1989 than in 1988.

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Table 1. Estimated biomass index in each stratum in the Barents Sea and the Spitsbergen area in 1989.

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	12368	284	3	1293
2	1650	4	1915	842	2	0
3	1950	6	14782	1189	5	8983
4	2300	9	12284	486	3	2290
5	2400	3	4137	611	2	2465
6	2700	7	7184	353	2	0
7	1850	8	9944	1530	4	5677
8	2400	5	2406	109	3	463
9	1500	4	1979	539	3	5418
10	1500	4	4769	201	4	1178
11	1325	3	3729	815	9	4915
12	1375	5	4788	155	1	+
13	2700	7	8588	89	1	+
14	2550	6	14374	56	1	+
15	2025	7	13722	95	2	299
16	1575	9	1662	200	3	334
17	1525	6	1247	357	3	1752
18	2500	6	1627	246	2	610
19	1325	2	5558	249	2	2273
20	1525	5	10847	269	2	1504
21	3300	8	17255	570	2	1654
22	3125	14	17431	734	3	1782
24	1625	4	1243	-	-	-
All strata:		123	173838		62	43791

Table 2. Estimated biomass of shrimp in each stratum in Barents Sea in the years 1982 to 1989 in 1000 tonnes.

Year / Stratum	1982	1983	1984	1985	1986	1987	1988	1989
1	8.3	6.0	5.3	4.1	1.1	7.1	7.8	12.4
2	5.2	4.8	3.6		0.6	1.4	2.0	1.9
3	7.4	14.7	13.9	11.3	3.3	11.8	6.9	14.8
4	13.9	14.8	17.5	7.9	4.7	8.2	9.4	12.3
5	5.2	8.1	1.9	3.0	1.9	1.4	4.1	4.1
6	26.0	38.9	18.8	4.7	3.0	3.1	12.0	7.2
7	7.6	18.0	32.4	12.4	3.9	9.6	5.6	9.9
8	19.2	10.6	8.4	3.5	3.7	3.2	8.0	2.4
9	15.7	13.0	20.2	3.6	1.5	4.2	6.1	2.0
10	14.9	21.4	16.5	7.0	4.3	11.3	7.9	4.8
11	11.8	16.2	23.2	1.8	1.5	2.1	3.1	3.7
12	16.8	22.9	23.9	18.6	6.9	4.6	6.6	4.8
13	13.3	20.9	29.1	7.7	17.7	14.4	18.0	8.6
14	21.1	39.4	34.6	29.4	11.2	7.5	10.2	14.4
15	22.4	31.4	40.8	17.2	11.3	9.7	12.7	13.7
16	7.2	16.0	36.8	15.6	6.1	6.0	1.5	1.7
17	9.3	16.9	21.0	9.2	16.7	3.5	4.9	1.2
18	5.9	8.0	7.5	24.6	11.2	4.1	2.9	1.6
19	1.6		5.1	0.7	0.6		0.2	5.6
20	13.0	16.0	15.4	6.5	12.6		1.8	10.8
21	14.5	8.0	16.8	9.0	5.7	4.6	7.9	17.3
22	24.4	22.2	22.0	13.8	14.5	4.3	13.1	17.4
23			4.9					
24				6.7	14.7		3.0	1.2
All Strata:	284.6	368.2	419.6	218.2	158.6	122.3	155.7	173.8

Table 3. Estimated total number and percent of males, intersexes and females in the Barents Sea in the years 1983 to 1989 (numbers in millions).

Sex	Year 1983	%	1984	%	1985	%	1986	%	1987	%	1988	%	1989	%
Males	41864.6	59.8	50694.6	60.4	31624.8	66.2	29468.4	75.5	26041.6	79.7	28385.7	65.5	30692.7	73.0
Intersexes	7846.6	11.2	4676.0	5.6	4870.0	10.2	3173.5	8.1	3906.6	12.0	3070.9	7.1	6201.1	14.8
Females	20267.9	29.0	28499.7	34.0	11269.4	23.6	6391.9	16.4	2737.7	8.3	11857.2	27.4	5086.4	12.2
Total	69979.1	100.0	8387.0	100.0	47764.2	100.0	39033.8	100.0	32687.9	100.0	43313.9	100.0	41962.2	100.0

Table 4. Estimated biomass of shrimps in each stratum at Vest-Spitsbergen in the years 1982 to 1989 in 1000 tonnes.

Stratum \ Year	1982	1983	1984	1985	1986	1987	1988	1989
1	0.1	3.2	5.3	0.3	0.5	0.6	0.4	1.3
2	1.4	0.9	0.0	0.0	0.2		0.0	0.0
3	8.2	5.0	10.6	2.0	4.1	5.0	4.3	9.0
4	4.1	14.4	0.8	0.0	0.2	0.8	2.5	2.2
5	4.4	0.2	3.4	1.7	1.3	0.5	0.9	2.5
6	0.5	0.3	0.4	5.0	2.4	0.4	0.0	0.0
7		0.6	0.2	7.0	1.9	1.3	2.3	6.6
8	1.1	2.4	3.2	0.1	0.7	0.7	1.2	0.5
9	3.4	4.8	1.1	0.3	1.5	0.9	1.8	5.4
10	4.2	1.3	1.1	2.0	0.5	1.1	1.5	1.2
11	6.4	3.8	7.7	4.3	4.1	2.9	2.5	4.9
12	2.2	2.5	0.6	0.6	0.3	0.7	1.5	
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		0.3
16		1.4	2.2	0.8	0.1		0.4	0.3
17		0.3	1.9	0.5	0.2	0.4	2.0	1.7
18		0.2	0.6	0.5	0.9	0.6	0.9	0.6
19		6.0	3.8	1.0	0.0	2.2	0.0	2.3
20		1.4	1.6	1.5	0.3	0.8	1.4	1.5
21		5.5	1.7	3.0	0.7	1.0	1.4	1.7
22		0.9	5.5	4.0	1.1	1.8	3.6	1.8
23			1.2		0.5			
All strata:	40.4	58.7	54.0	35.0	22.0	22.8	28.0	43.8

Table 5. Estimated total number and percent of males, intersexes and females in the Spitsbergen area in the years 1983 to 1989 (numbers in millions).

Sex	Year 1983	%	1984	%	1985	%	1986	%	1987	%	1988	%	1989	%
Males	5260.9	59.9	7114.3	71.8	5765.2	76.6	4399.7	80.2	4374.3	75.7	4005.9	57.0	6852.2	75.6
Intersexes	1057.1	12.0	368.0	3.7	535.5	7.1	207.5	3.8	527.0	9.1	1772.7	25.2	839.2	9.3
Females	2463.7	28.1	2432.8	24.5	1223.0	16.3	881.7	16.0	879.2	15.2	1247.1	17.8	1367.7	15.1
Total	8781.7	100.0	9915.1	100.0	7764.2	100.0	5488.9	100.0	5780.5	100.0	7025.8	100.0	9059.1	100.0

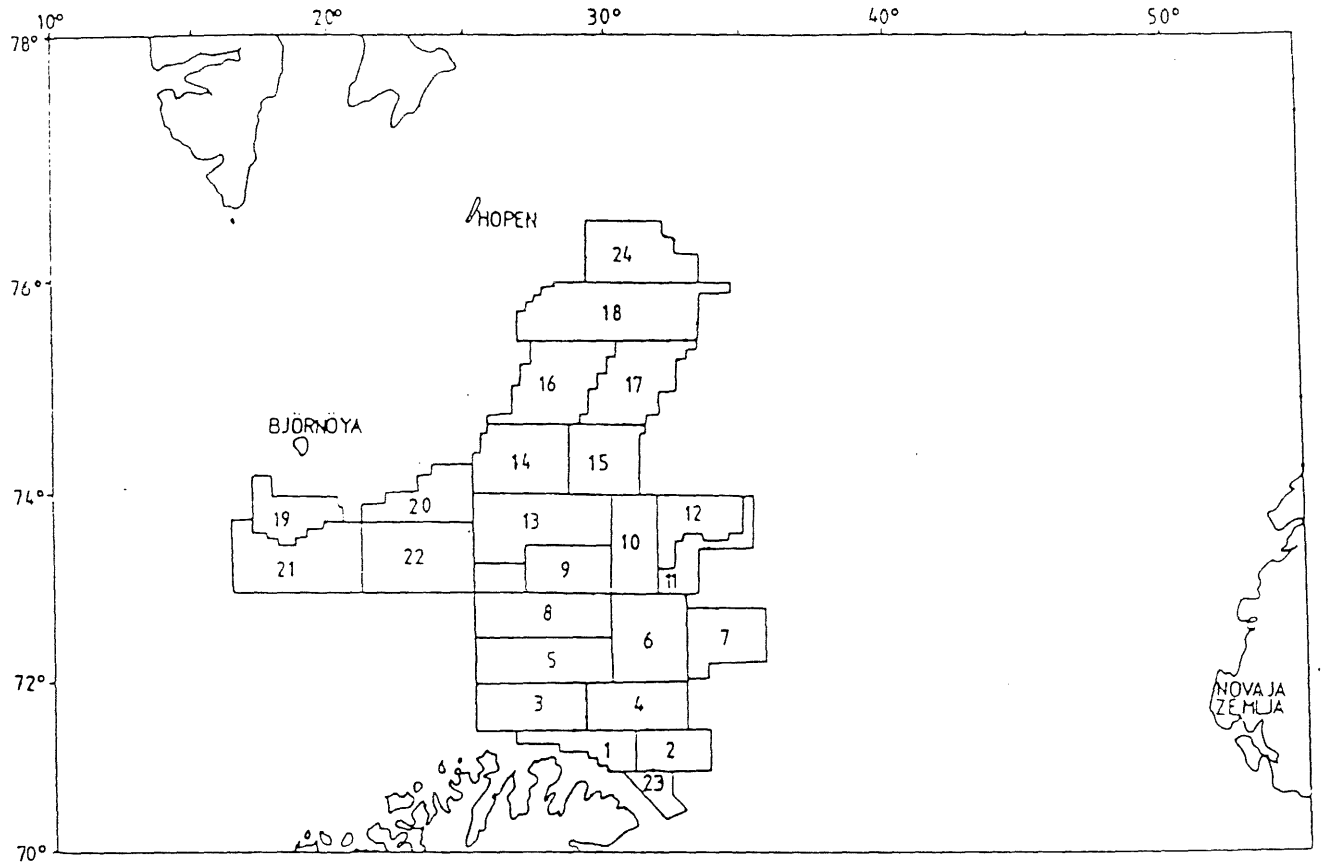

Fig. 1. Sampling strata used in April and May 1989 in the Barents Sea for the shrimp survey with R/V "M. Sars".

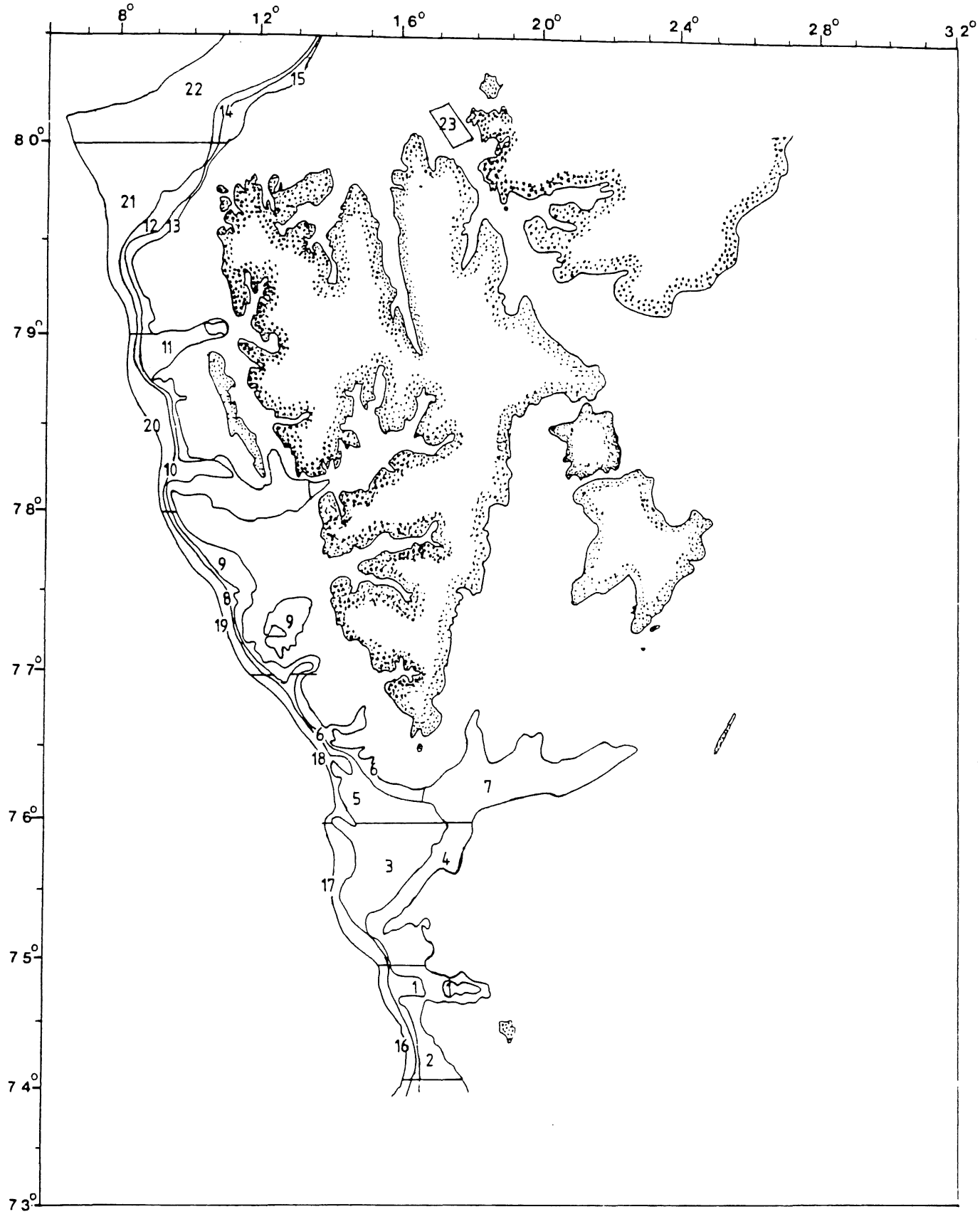

Fig. 2. Sampling strata used in July and August 1989 in the Spitsbergen area for the shrimp survey with R/V "M. Sars".