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SHRIMP INVESTIGATIONS IN THE NORWEGIAN DEEP
1984-1985

By

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ABSTRACT

Systematic investigations for assessment of the stock of Pandalus borealis in the Norwegian Deep were started in 1984. The program includes a yearly cruise with research vessel. From commercial trawlers samples and logbooks are obtained. A preliminary estimate of the stock is 16 000 tonnes. The maximum catch during the last decade was 10 000 tonnes. Considering the high percentage of male shrimps caught, it is found appropriate to continue the investigations for a proper assessment of the stock(s) and the effects of different measures for its (their) preservation.

INTRODUCTION

During the meeting of ICES Working Group on Pandalus stocks in 1984, the need for more data for stock assessment of Pandalus stocks in the North Sea - Skagerrak area was stressed. Also the Norwegian shrimp trawlers have been concerned for a long time about the development of the shrimp stock and asked for more investigations. Earlier, the philosophy was that the shrimp stocks could not be overfished because there were so many potential breeding areas where it was impossible to fish shrimps (RASMUSSEN 1958). However with the increasing gear size and the use of stone hoppers it was considered worthwhile to investigate the situation. Therefore, it was decided to improve our knowledge by research cruises and sampling of commercial catches.

This report gives some results of the first year of investigations.

MATERIAL AND METHODS

During a cruise on R/V "Micael Sars" in October 1984, 67 trawl hauls were performed in the Norwegian Deep (FIG. 1). The gear used was a "Campelen 1800" shrimp trawl with rubber bobbins and a lining net

with the mesh size 6 mm in the cod end. It was trawled for one hour at each location with the speed of 3 knots.

A slightly smaller trawl with 20 mm mesh in the cod end was used on R/V "Haakon Mosby" in March 1985. From this cruise organized for other purposes by the University of Bergen, Institute of Fisheries Biology, we received 19 shrimp samples (FIG.1)

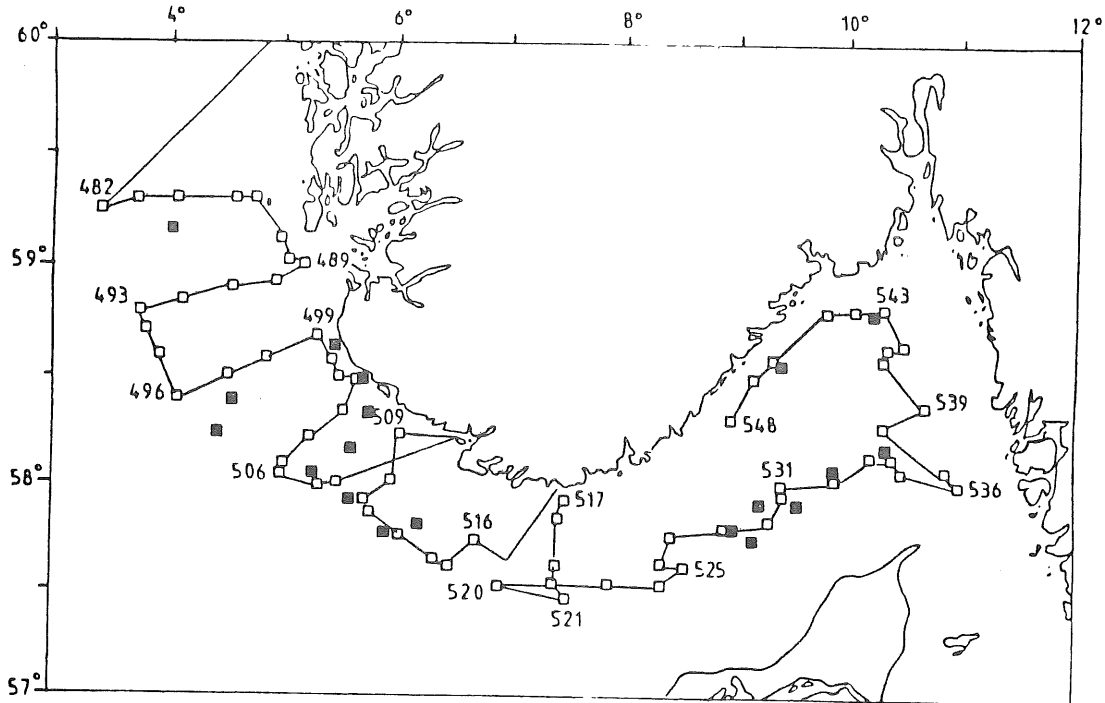


FIG.1 Course track and bottom trawl stations taken during the "M.SARS" October 1984 cruise (open squares), and origin of samples obtained from the "H.MOSBY" cruise in March 1985 (filled squares)

Six shrimp trawlers were asked to take monthly samples on board before any sorting into commercial categories had taken place. In this report 10 of these samples are considered.

The shrimp is grouped into sex stages according to Rasmussen (1953) and aged by eye. The area was divided into twelve strata. The trawl opening (11.7 m) used for the swept area method are taken directly from TEIGSMARK and ØYNES (1983), since the trawl and vessel used were identical. The biomass is calculated simply by applying the average catch per square nautical mile for each strata, without any adjustments for selection.

RESULTS AND DISCUSSION

The vertical migrations of shrimps, a phenomenon already utilised by the fishermen, is demonstrated in TABLE 1. In October the 1982 and 1981 yearclasses were relatively more abundant in the deeper layers. In March the opposite seemed to be the case. For stratified sampling it is therefore important to take the depth into consideration. It is also seen that the Danish side of the Norwegian Deep in Skagerrak (X-XII) was the only area where the 1984 yearclass was abundant. During the October cruise the 1982 yearclass was totally converted to females east of Lindesnes, while in the western areas considerable proportions still were male or intersexes. FURNES, HECKETT and SÆTRE (1985) indicated a hydrographic border in the Lindesnes area based both on physical and biological parameters. Therefore, for the present report the area investigated has been divided into 12 strata (FIG 2.) based on the depth and differences already discovered in the collected material. This may be refined when more knowledge is gained through repeated investigations.

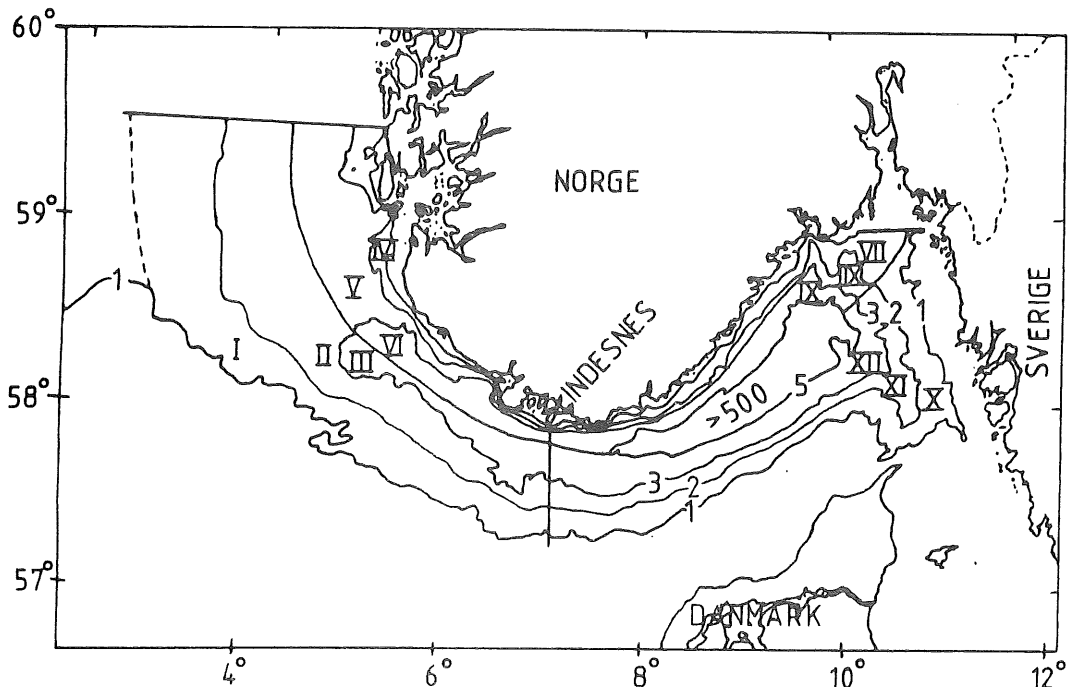


FIG. 2. The strata used (I to XII) separated by 100 m depth contours.

From one year of investigations it is only possible to compare the abundance of three yearclasses. The availability of the shrimp vary through the year (TAB. 2). However, if the May figures for 1984 and 1985 are compared, the 1984 yearclass seemed to be approximately at the same level as the 1983 yearclass. The 1982 yearclass was less abundant than both the 1983 and 1981 yearclass. This corresponds to poor shrimp catches during the spring 1984 when the 1982 yearclass should have been the most important in the catches.

TABLE 1. Percentage by number of shrimps (*P. borealis*) in each sex and age group for each stratum in October 1984 and March 1985. (Strata as in FIG.2).

N: the number of shrimps sampled from each stratum.

Stra.	Month	1984		1983		1982			1981	N
		Male	female	inter	female	male	inter	female	female	
I	Oct.	0	50	1	34			15	0	412
II	Oct.	0	52	2	8	1	2	14	20	1562
III	Oct.	0	50	0	5	11	5	17	12	463
II	March	1	15	10	22	1	7	21	23	865
III	March	1	30	6	6	1	18	18	22	141
V	Oct.	+	34	3	13	7	4	21	18	1174
VI	Oct.	0	4	0	0	7	3	21	66	105
V	March	0	32	12	8	0	0	13	35	233
VII	Oct.	1	57	4	28	0	0	8	2	115
IX	Oct.	1	63	2	18	0	0	15	0	337
IIX	March	8	16	37	28	0	0	5	4	201
IX	March	0	29	33	32	0	0	4	1	198
X	Oct.	20	49	3	25	0	0	3	0	978
XI	Oct.	25	55	3	12	0	0	5	1	1620
XII	Oct.	0	47	3	8	0	0	29	12	173
X	March	3	1	6	50	0	0	23	16	494
XI	March	27	4	24	34	0	0	8	2	299

Table 2. Number of shrimps (*P. borealis*) per trawling hour for the different yearclasses and their average carapace length in mm. Sampled from a commercial trawler in inner Skagerrak

Date	YEARCLASSES							
	1984		1983		1982		1981	
	N	L	N	L	N	L	N	L
1984 05 04	0		1968	14.7	896	20.3	304	24.9
05 18	0		1470	14.5	868	19.6	196	23.7
08 06	0		8896	16.8	512	22.6	0	
09 10	0		10266	16.3	1218	21.2	232	25.3
11 13	21	9.0	3472	15.6	70	22.3	0	
12 04	2106	10.3	6903	15.8	65	21.2	0	
1985 02 05	6675	11.8	9475	16.9	225	21.8	0	
03 11	7176	12.0	3874	17.3	182	23.9	0	
04 11	1781	12.8	3341	18.0	429	22.8	0	
05 09	1560	13.3	2408	18.7	168	24.0	0	

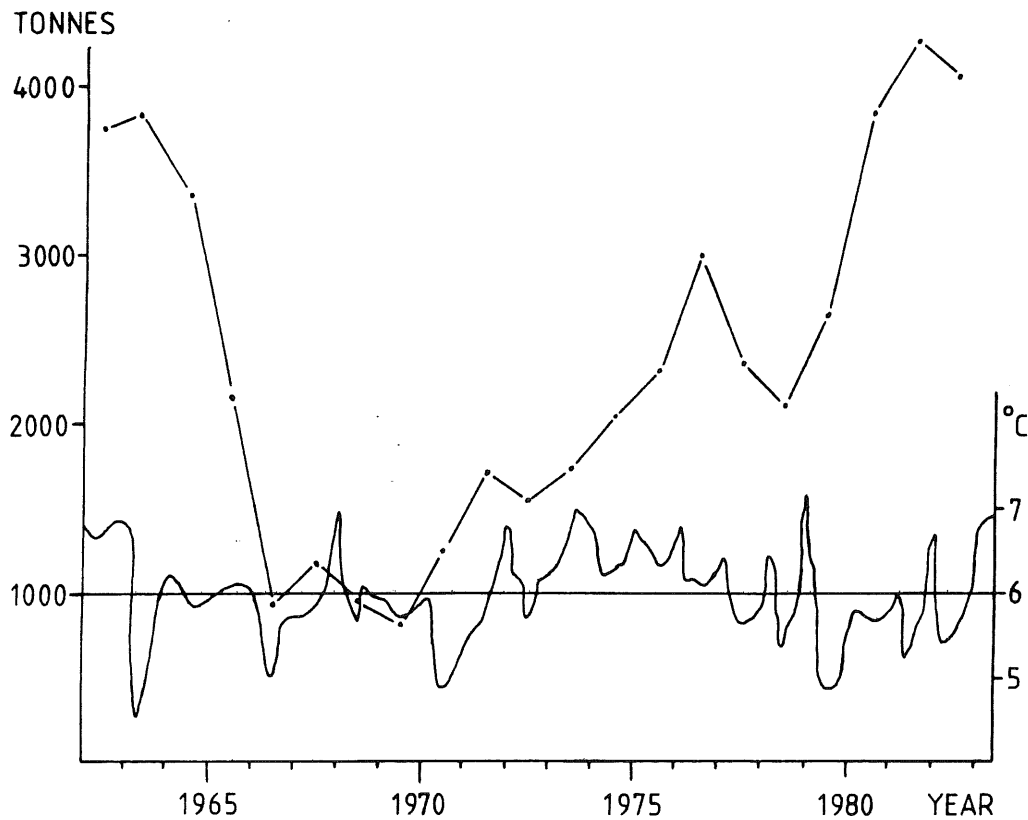


FIG. 3. Tonnes shrimp (*P. borealis*) landed from the Skagerrak. Temperature measured in 300 m depth on a section across the Norwegian Deep from Arendal to Hirtshals.

TABLE 3. Estimates of shrimp (*P. borealis*) biomass in twelve strata in the Norwegian Deep. Strata numbered as in Fig.1

Stratum	Depth	2 NM	hauls	2 kg/nm	biomass tonnes
I	100-200	2574	4	1903	4898
II	201-300	2190	14	1646	3605
III	301-500	593	3	1543	915
IV	100-200	380	0		(293)
V	201-300	1270	12	977	1240
VI	301-500	355	1	566	200
VII	100-200	459	1	772	354
VIII	201-300	267	0		(206)
IX	301-500	494	3	1389	686
X	100-200	1515	9	772	1170
XI	201-300	767	11	1543	1183
XII	301-500	977	2	1698	1659
SUM		11841	60		15912 (16412)

Some of the strata were poorly sampled, however the more extensively

sampled strata are at the same time the most important fishing areas. The estimate of the total stock in the Norwegian Deep was about 16 000 tonnes. (TAB.3) In 1981 it was landed 10 000 tonnes. In the early sixties there was a sudden decrease in the shrimp catches. Rasmussen (1967) related this to the influx of cold water from the North Sea. However, prior to this decrease, the catches of shrimps in the Norwegian Deep were higher than ever, both before and after, and in 1970 comparable low temperatures were recorded in the middle of a period of increasing shrimp catches (FIG.3). The possibility of a combined detrimental effect of poor recruitment conditions and high exploitation rate must be considered.

It is premature to evaluate the statistical variability of these data. However, if the estimate of the total stock in the Norwegian Deep is approximately correct, the exploitation seems too high, especially considering the high percentage of male shrimps. Under otherwise unfavorable conditions one might expect the female stock to produce too few larvae for a sufficient recruitment.

Repeated investigations will give more data for mortality estimates etc., which hopefully will enable us to furnish the management with sensible advice.

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