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Preliminary Report of a Cruise With M/T "HÅKØY-II" to East Greenland Waters in September 1988

by

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1. INTRODUCTION

In the last years a total of about 10 000 tons of shrimp have been fished in Denmark Strait. Except for sampling of the commercial catches, little is known about the stock in this area. Therefore, Norway has since 1983 conducted scientific cruises in East Greenland waters (Smedstad, 1984, 1985, 1986, 1987 and 1988). In 1983 the cruise was carried out with R/V "Eldjarn" in november, but the investigations were very hampered by ice. In 1984 we therefore carried out the investigations earlier in the autumn. A freshfish trawler were hired for the period 7 - 28 September. The experiences from this cruise were so good that the same period and also the same ship were chosen for 1985, 1986, and 1987. In 1988 we had to hire another vessel of the same size. The cruise in 1988 was carried out in the period 30. August - 23. September. This report gives some results from that cruise.

2. MATERIAL AND METHODS

The investigated area lies between 65^0N and 68^0N (Fig. 1). We had no problems with ice.

M/T "Håkøy-II" T 50 T is a commercial freshfish trawler 46.5 m long with a main engine of 1500 Hp. The bottom trawl equipment was as follows:

Trawldoors: Steinshavn nr 8 (about 8 m^2).
Bridles : 40 m.
Gear : Six 21" steelbobbins on each side, and six 24" steelbobbins in the middle.
Trawl : "Campelen Super 1800 mesh" shrimp trawl with 35 mm meshes in the codend. 50 extra floats along the sides and about 20 extra floats along the fishline.

Towing speed was 2.5 knots and standard towing distance was 1 nautical mile. In the western area, the bottom conditions were so bad that we had to decrease towing distance to 0.5 nautical mile. 58 trawlstations were taken. The positions are seen in Fig. 1.

For calculations of "swept area" we used 11.7 m as the width of the trawl. This is the same width as used in the Barents Sea for the same trawl (Teigsmark and Øynes, 1982).

In lack of good depth data over the area, the different strata were defined as statistical squares (Fig. 2). Because of few trawlhauls, some strata were combined. The combined strata are: 8, 9 and 10, 12 and 19, 25 and 26.

The statistical treatment of the catch data was done as described in Randa and Smedstad (1982). For biomass calculations the following length/weight relations were used (Smedstad 1986):
Ovigerous females:

$$w = 0.003498\ L^{2.51}$$

Individuals without eggs:

$$w = 0.00148\ L^{2.71}.$$

The carapace length was measured to nearest mm below.

The determination of sex was based on the form of the endopodite of the first pleopod as described by Rasmussen (1953). Females and transitionals were classified by use of the following scheme:

1. (BR - E): Ovigerous females, eyes not visible on the eggs.
2. (BR + E): Ovigerous females, eyes visible on the eggs.
3. (JH) : Females with setae on the pleopods.
4. (HR) : Females or transitionals with head roe.
5. (WR) : Females or transitionals without roe.

Stages found on this cruise were males, females without roe, females with head roe and ovigerous females with no eyes on the eggs.

On this cruise we had no possibility to take hydrographical samples.

3. RESULTS

The shrimp catches are seen in Fig 3. The biggest catches of shrimp were taken in the area close to the boarder between Greenland and Iceland (strata 16) and in strata 19 and 20 in the western area.

3.1 Horizontal distribution

The horizontal distribution of the sexes shows the same pattern as found in earlier years. Fig. 4 shows that males were found in greatest numbers in the western and northern areas. Looking at the relative abundance of males in different strata we find the same pattern (Fig. 5). Males were found in smallest numbers around Dohrn Bank (strata 21, 22, and 29). For the total investigated area 58.5 % of the shrimp in numbers were males.

Females were found in greatest numbers in west (strata 12, 20 and 25) and northeast of Dohrn Bank (strata 15, 16, and 23) (Fig. 6 and 8). Most of the females were ovigerous (BR - E), very few had head roe (HR), and 25 % of the females were without roe (WR). The highest frequencies of females without roe were found in the north and the lowest frequencies around Dohrn Bank (Fig. 7).

3.2 Length distribution

Fig. 10 shows length distributions of shrimp from selected stratas. The stratas represent a line from north to south (Fig. 2).It is clearly seen from these samples that the shrimps increase in length southwards. The smallest males are mainly found in the north, and the proportions of females increase southwards. Fig. 11 shows the length distribution of the estimated stock for the investigated area.

By going through the length distributions for the different years it should be possible to separate different age groups. This analysis is not finnished but a preliminary examination of the data indicates that there is 5-6 lengthgroups of males. The smallest males that can be separated in our material has a carapax length of about 18 mm. The next peaks in the length distributions seems to be at 20 mm, 23 mm, 25 mm and 28 mm. The length distributions of females have only one peak at about 30 mm. If the different peaks of males represent agegroups the material indicates that the shrimps at East-Greenland are about 6 years old when they shift to females.

3.3 Biomass

Table 1 and Fig. 9 show the calculated biomasses for each strata. The stock in the investigated area was estimated to 49 600 tons with a Standard Error of 8289 tons. This is almost the double of last years estimate, but at the same level as the estimate in 1986.

4. DISCUSSION

The present results agree well with the results from earlier years, and support the theory of the Dohrn Bank area as a breeding area, the nothern and western areas being nursery areas and with an activ migration of ovigerous females towards the breeding area in winter and early spring.

The large increase in the stock estimate from 1987 to 1988 is not real. Table 3 and 4 show some of the results separated on a western and an eastern area. The western area has very difficult bottom for trawling. The estimates in this area are based on very few and very short trawl hauls. The variations between hauls and between years are therefore larger in this area. The large increase in the estimate in this area from 1987 to 1988 can, to a great extent, be explained by differences in the weather conditions. In 1987 the weather was very windy, while we had almost no wind in 1988.

The results from the eastern area gives a better picture of the stock. However, also in this area there are factors that complicate the comparision of the results from year to year. In 1985 we had no hauls in the Islandic zone. In 1985 and 1986 we were trawling both day and night, while in 1987 most of the hauls were taken during daytime, and in 1988 all hauls were taken during daytime. The wind conditions were much better in 1988 than in 1987. Some of the observed increase in the biomass may therefore be due to improvement of the investigation. Anyhow, the present results indicate that the shrimp stock in Denmark Strait has been relatively stable the last few years.

The proportion of males has increased the last two years (Table 5). This may be due to increased exploitation of female shrimp, but it may also be due to stronger yearclassses recruiting the stock. The length distributions indicate an increase in smaller males. The investigation in 1989 will perhaps give an answer to this problem.

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Table 1. Estimated abundance of shrimp in each stratum at East Greenland.

Stratum	Numb.of hauls	Area nm	Mean catch numb./hour	S.E. of catch	Number in mill.	Mean catch kg/ hour	S.E. of catch	Biomass tonnes
1	2	681	9306.0	9270.0	334	65.7	65.4	2360
8	6	2088	1366.0	464.2	150	17.6	5.9	1940
12	3	1434	10208.0	4032.3	772	137.5	54.3	10400
13	3	710	1712.0	1021.9	64	25.5	15.5	955
14	3	710	687.0	385.7	26	9.5	5.9	355
15	5	710	11614.2	3726.4	435	156.1	49.7	5850
16	6	710	9997.8	1070.4	375	141.5	16.1	5300
17	3	710	1939.0	577.7	73	33.7	10.4	1260
20	2	724	28233.0	14229.0	1080	342.2	153.1	13100
21	4	724	385.5	118.0	15	5.5	1.6	209
22	4	724	979.5	649.4	37	16.1	10.7	614
23	5	724	5908.0	1757.9	226	90.7	24.2	3470
25	2	1478	3636.0	2424.0	284	48.2	31.0	3760
29	2	739	49.5	49.5	19	.8	.8	31
West	19	6519	6515.1	1897.5	22400	83.7	22.0	28800
East	31	6347	4868.0	1118.3	16300	62.1	9.9	20800
Total	50	12866	5702.6	1108.5	38700	73.0	12.2	49600

Table 2. Total biomass (1000 tonnes) and corresponding Standard Error of shrimp east and west of 31^{0}W in different years.

	West of 31^{0}W		East of 31^{0}W		TOTAL	
	Biomass	SE in %	Biomass	SE in %	Biomass	SE in %
1985	19.2	35.2	12.0	20.9	31.3	23.2
1986	14.8	24.9	29.3	16.6	44.2	13.9
1987	6.5	25.0	18.7	21.5	25.2	17.1
1988	28.8	26.3	20.8	15.9	49.6	16.7

Table 3. Number of males (millions) and corresponding Standard Error east and west of 31^{0}W in different years.

	West of 31^{0}W		East of 31^{0}W		TOTAL	
	Numbers	SE in %	Numbers	SE in %	Numbers	SE in %
1985	742	46.7	285	22.8	1030	34.4
1986	370	44.4	919	16.5	1290	17.4
1987	238	35.2	818	29.8	1060	24.5
1988	1370	32.4	887	36.9	2260	24.4

Table 4. Males in per cent of total number east and west of 31^{0}W in different years.

	West of 31^{0}W	East of 31^{0}W	TOTAL
	Males in %	Males in %	Males in %
1985	50.1	32.8	43.8
1986	36.3	44.0	41.4
1987	47.3	55.3	53.5
1988	61.2	54.8	58.5

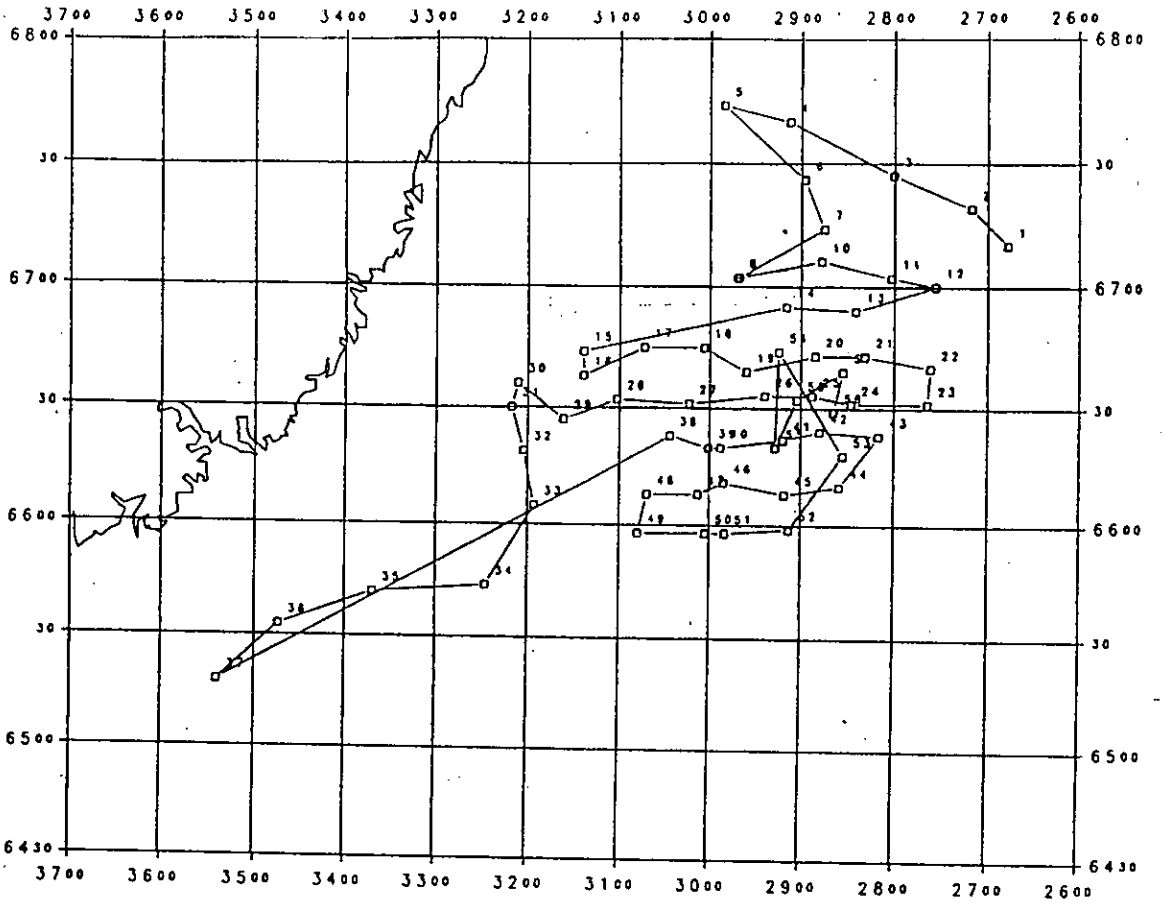

Fig. 1. Survey tracks and trawl stations by M/T "Håkøy - II" in September 1988.

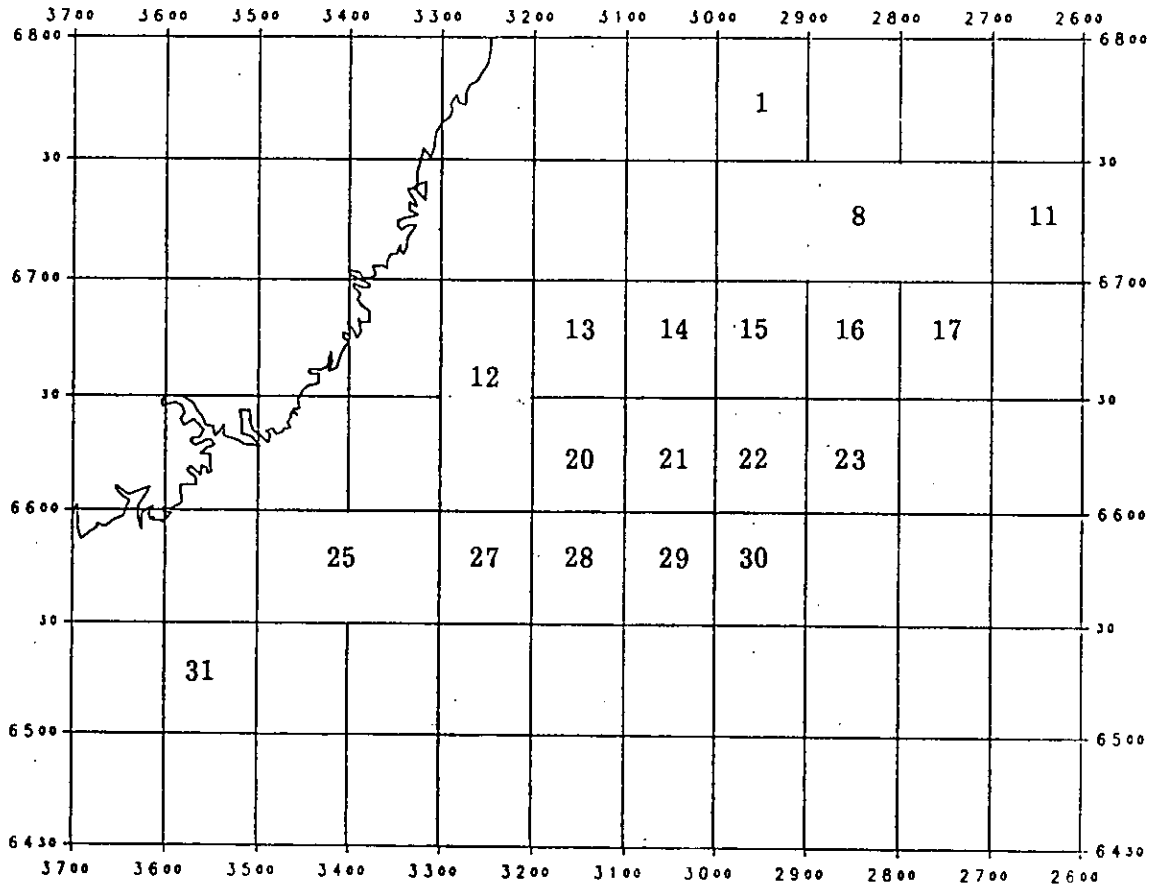

Fig. 2. Stratum numbers.

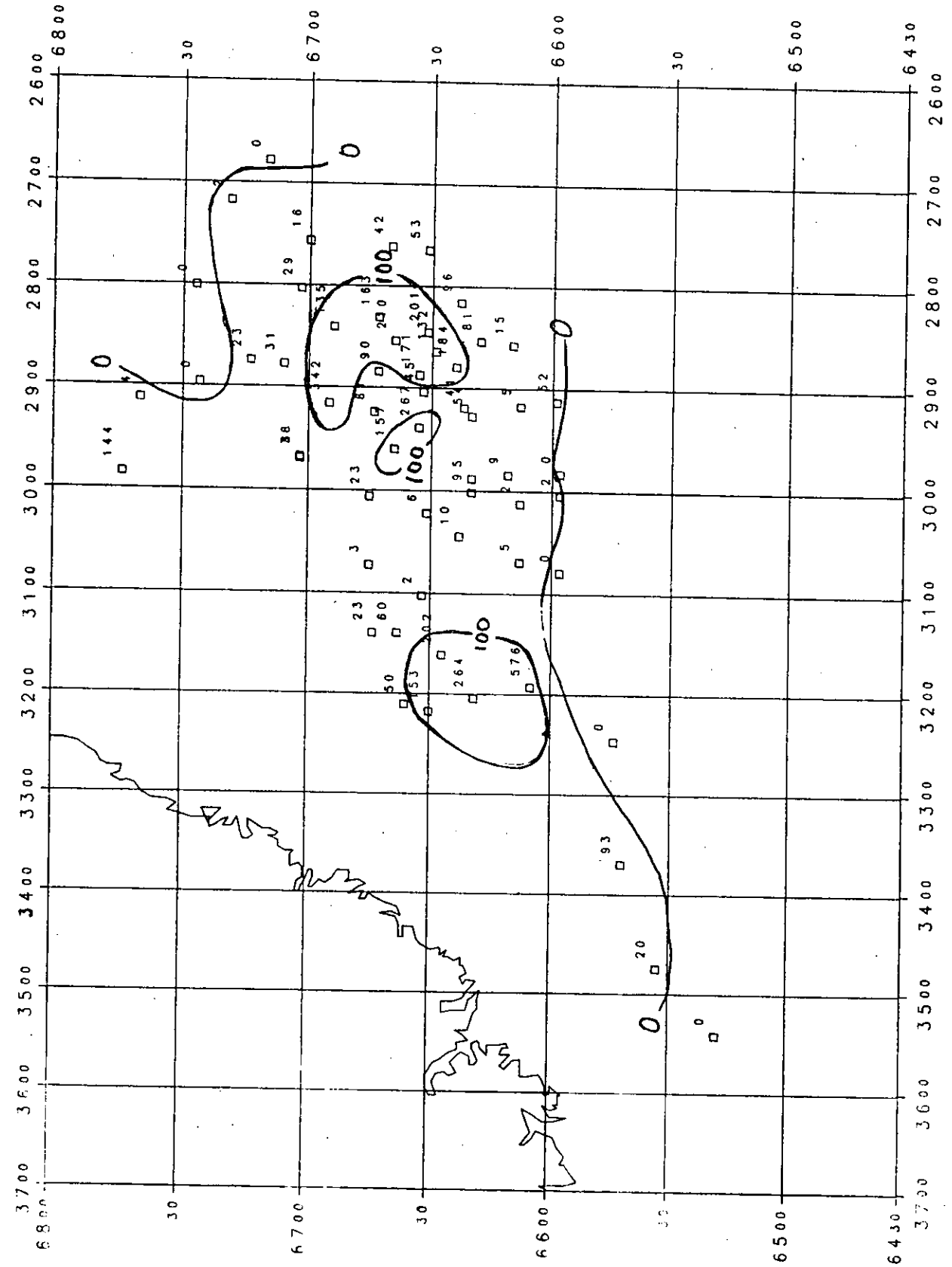

Fig.3. Catches of shrimps in kg per 3 nautical miles towed.

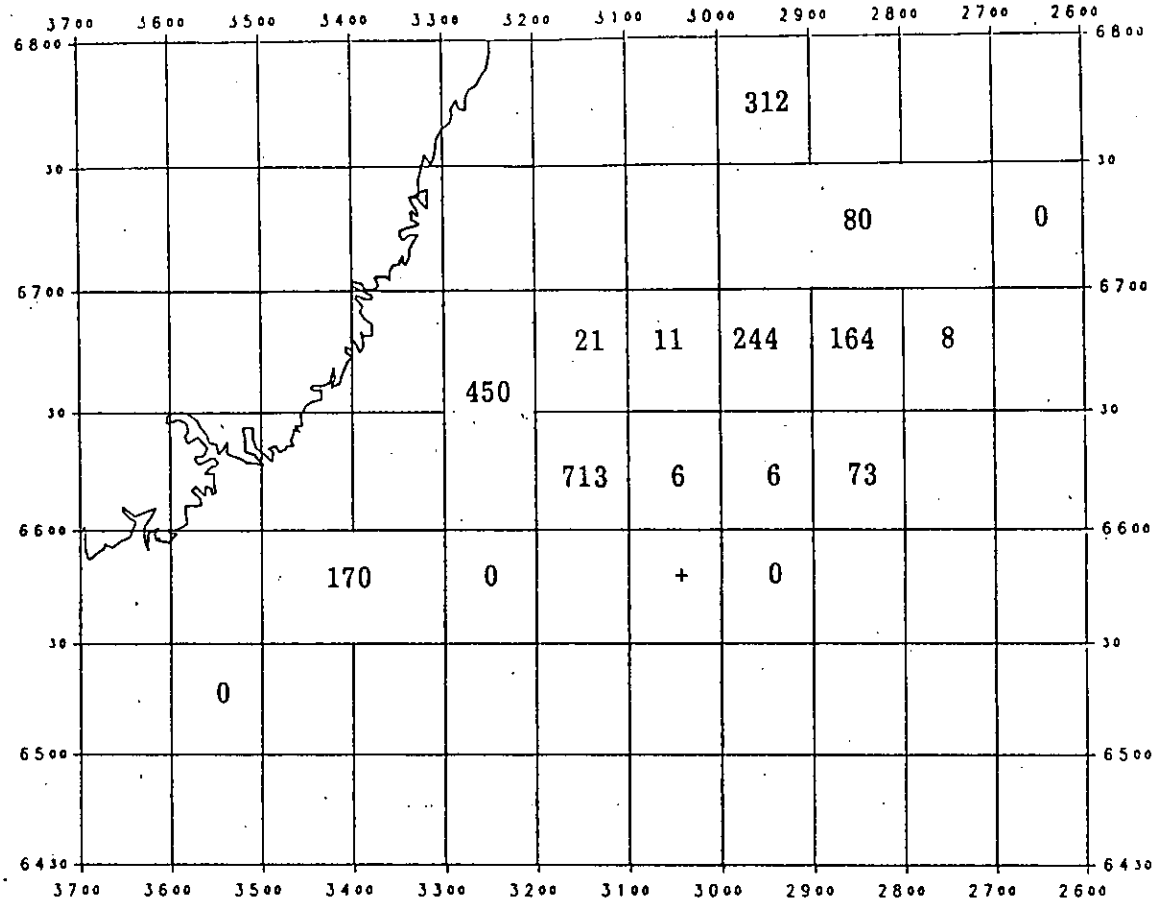

Fig.4. Calculated numbers of males (in millions).

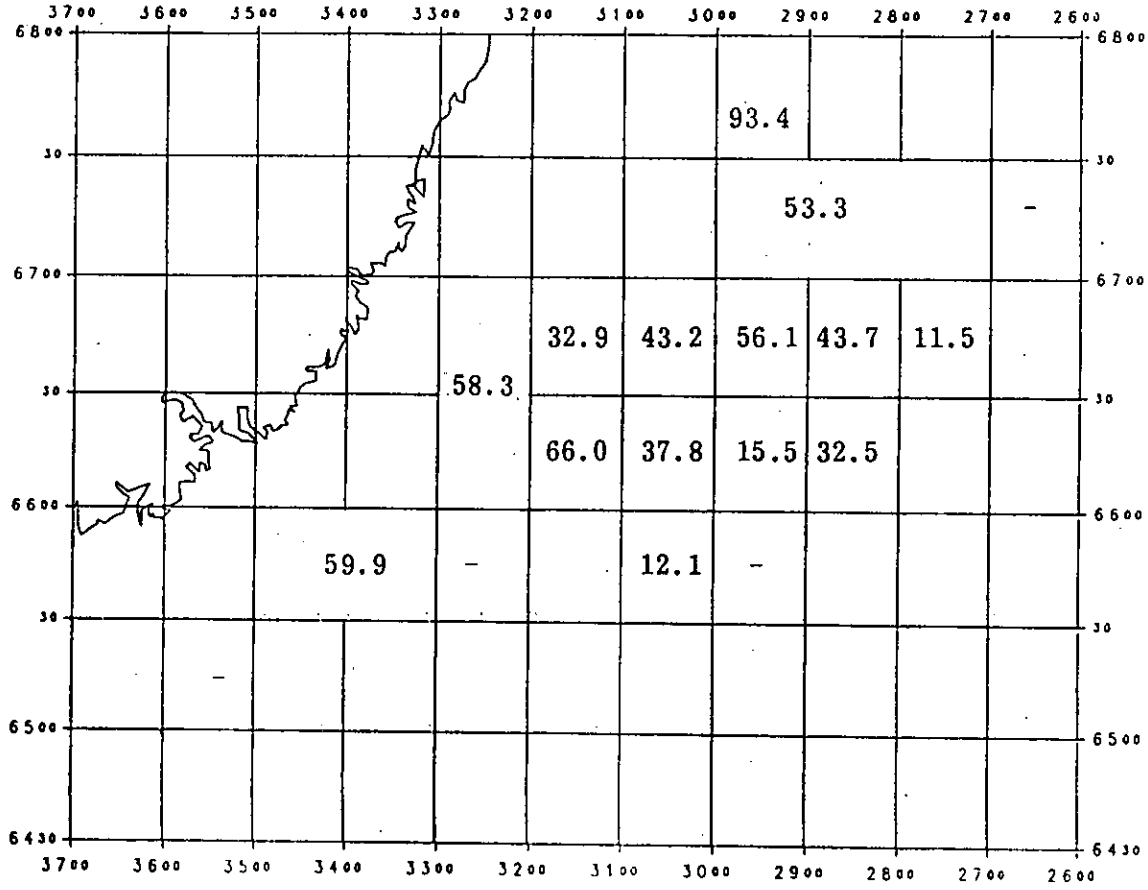

Fig.5. Males in per cent of total number.

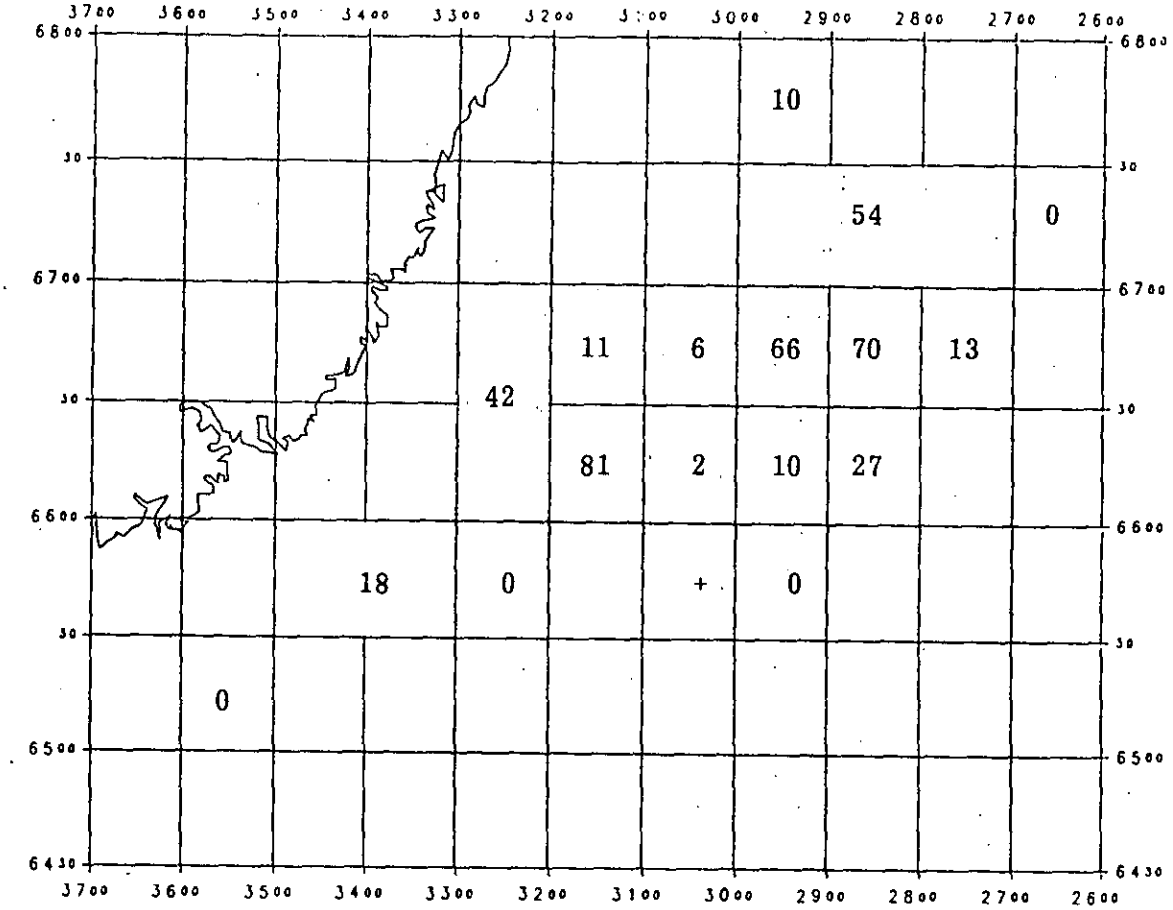

Fig.6. Calculated numbers of females without roe (in millions).

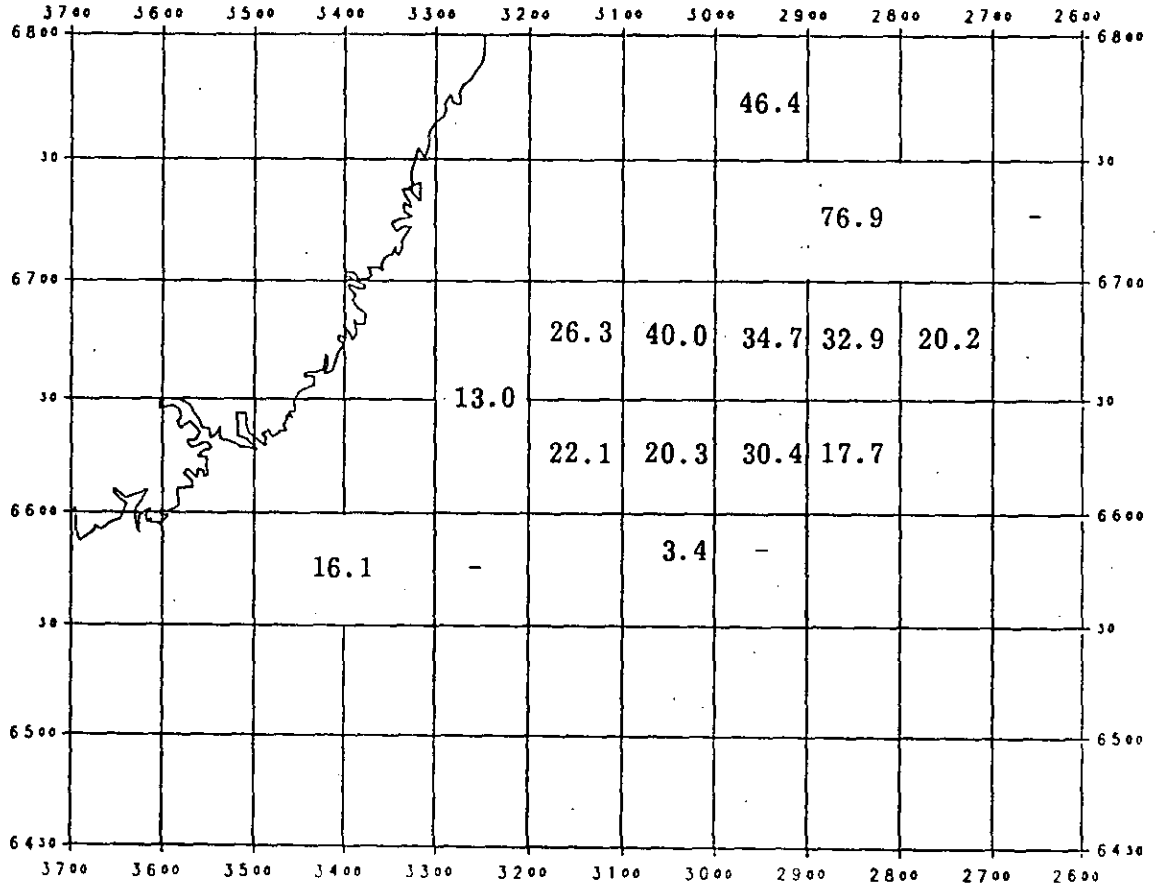

Fig. 7. Female shrimps without roe in per cent of total females.

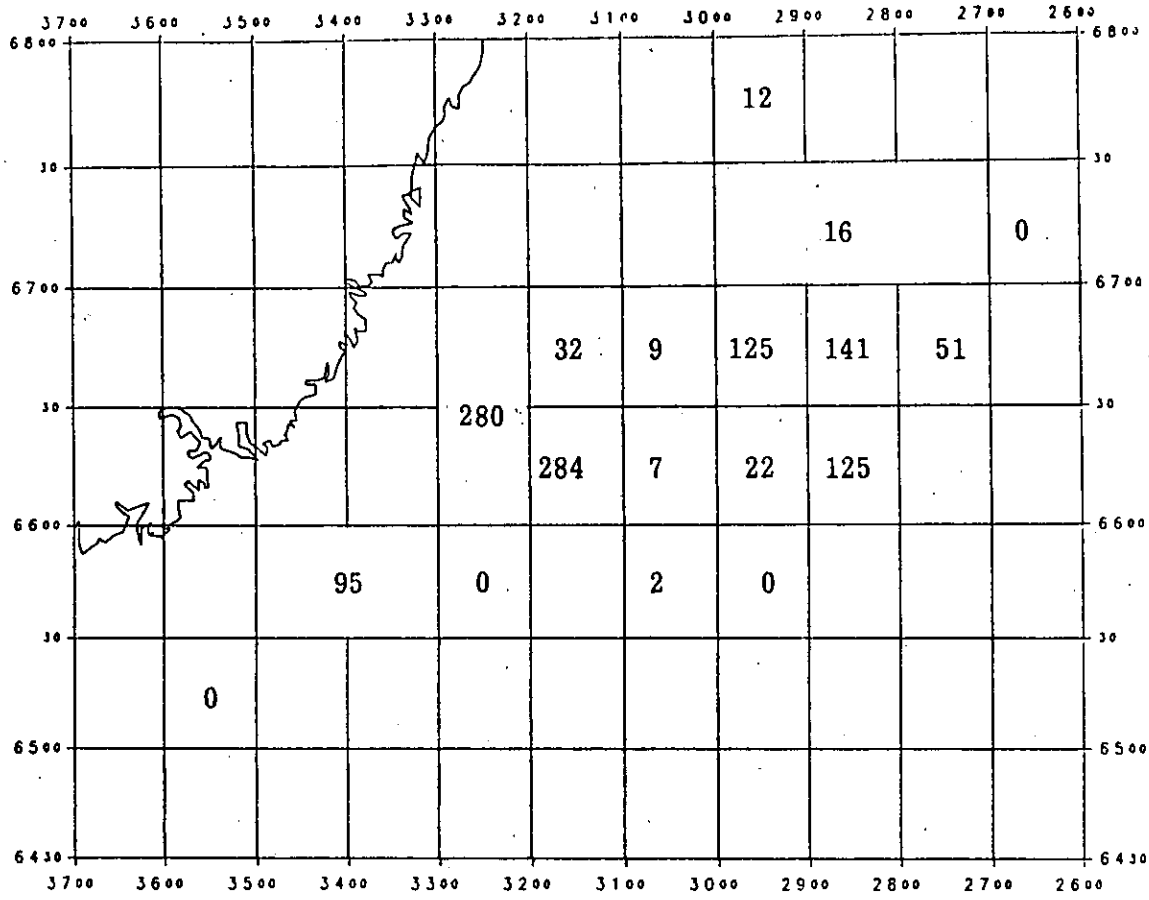

Fig. 8. Calculated numbers of female shrimps with roe (in millions).

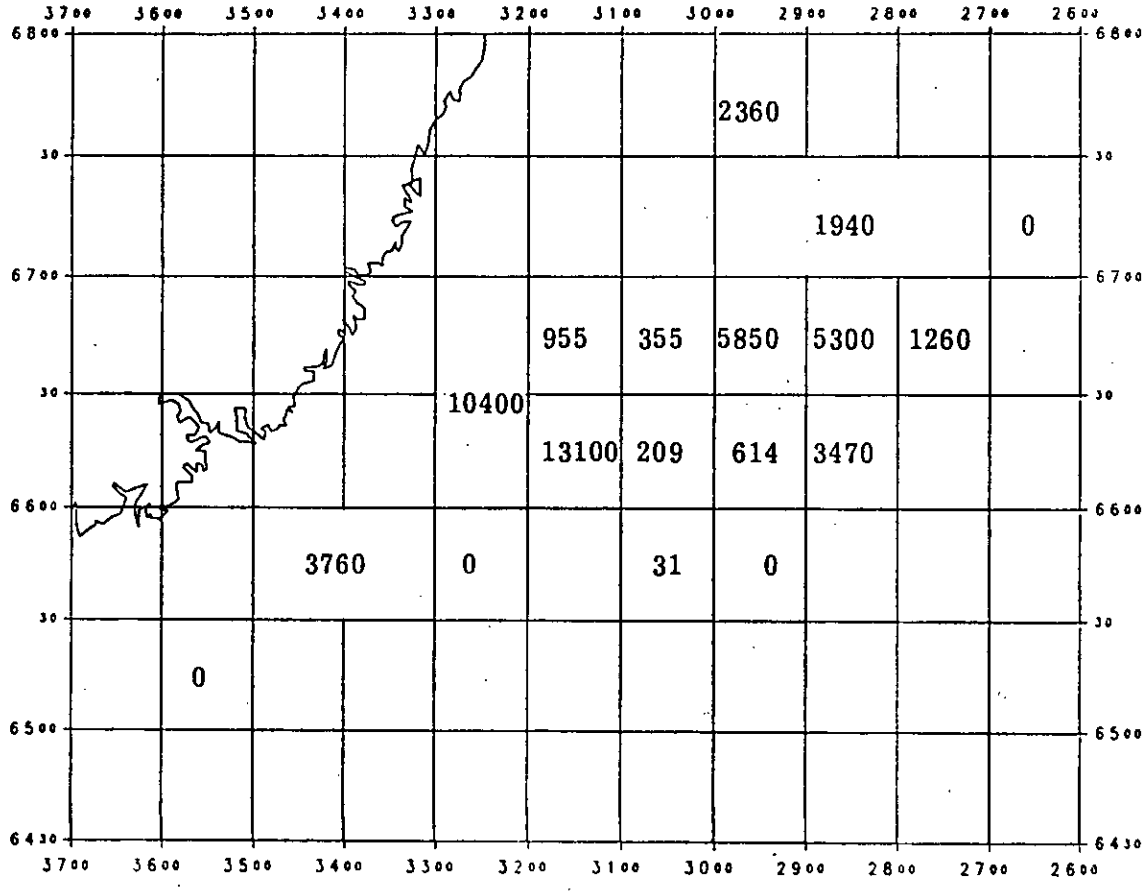

Fig. 9. Calculated total biomass of shrimps in tonnes.

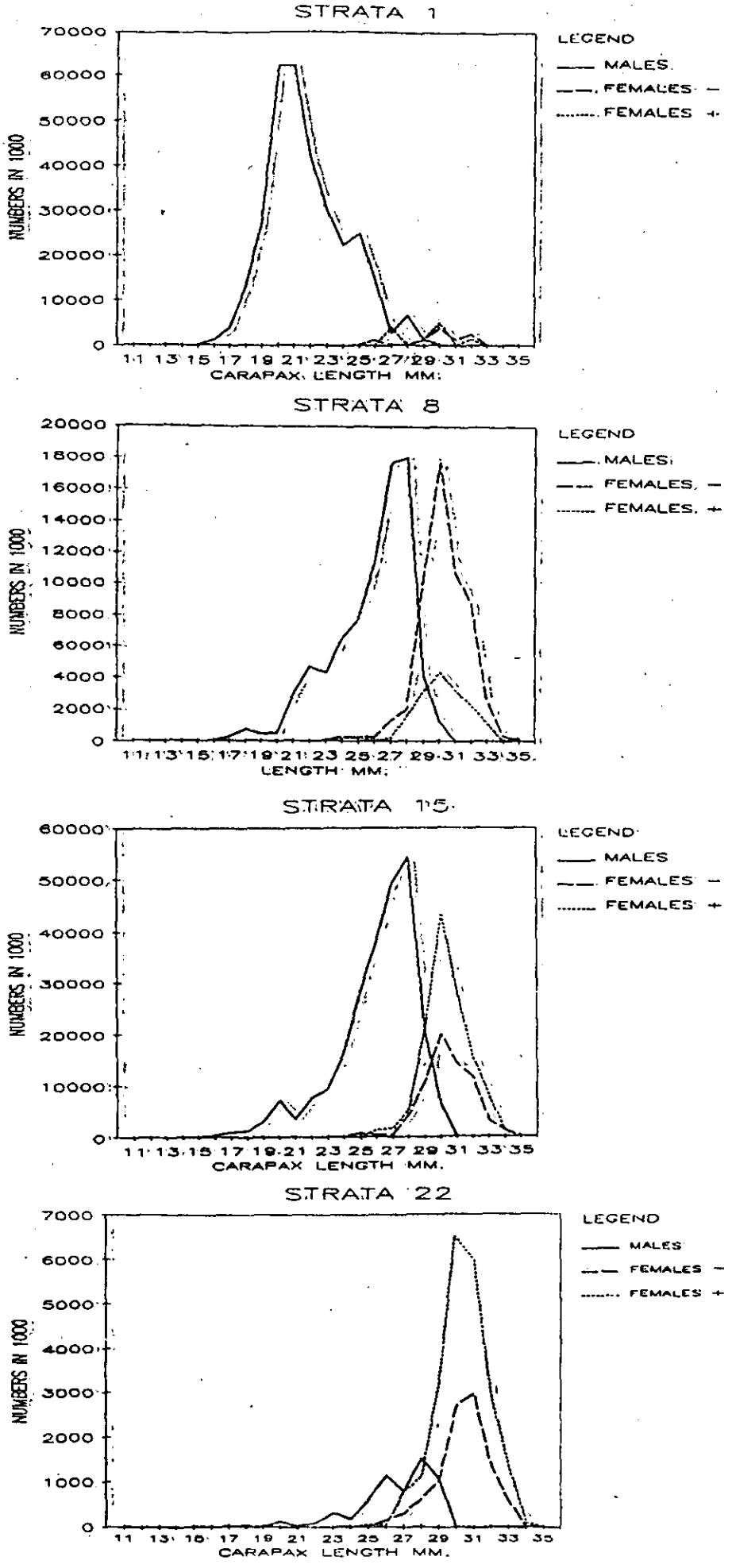

Fig. 10. Length distributions of shrimp from selected strata from north (strata 1) to south (strata 22).

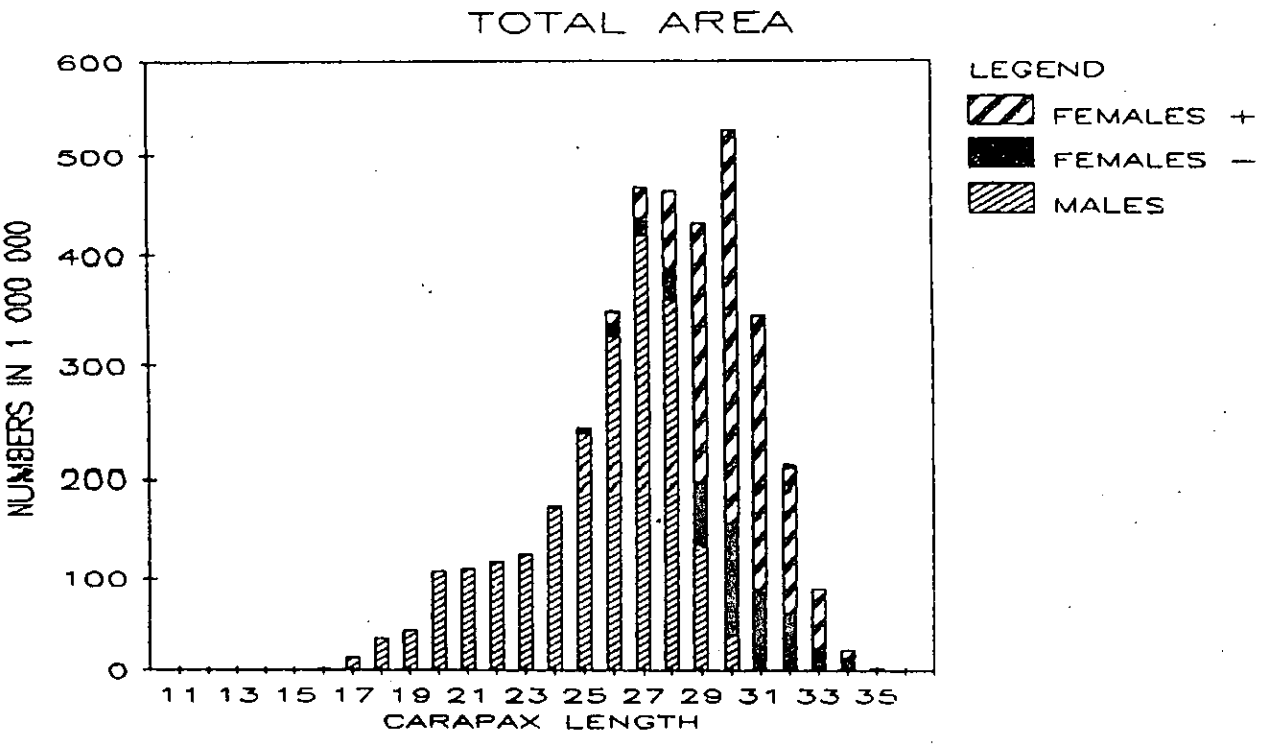

Fig. 11. Length distribution of the shrimp stock in the investigated area.