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The Canadian Fishery for Northern Shrimp (*Pandalus borealis*) in Division 0A, 1987

by

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INTRODUCTION

Quota reports (preliminary to April 27, 1988) show that 6140 t of shrimp were taken in Div. 0A in 1987, exceeding the quota of 6120 t by 20 t. This represents a doubling of the catches taken in both 1986 and 1985 (about 3000 t). A total of 15 vessels participated in the 1987 fishery in this area, compared to only 8 in 1986. The fishery began in the third week of June and continued until October 31 when it was estimated that the quota had been taken and the area was closed.

Fishing logs from both foreign and domestic vessels were available for 1987, providing data on fleet performance. These were supplemented by observer data, primarily for the foreign vessels. The 1986 data are now complete and have been updated in this paper for comparison with the available 1987 information. Data are presented on catch and effort in 1986 and 1987, size distributions of shrimp taken in the 1987 commercial catches, as well as bycatches and discards.

MATERIALS AND METHODS

Monthly catch and effort data were compiled from observer reports and vessel logs for the period 1979 to 1987. Fishing effort and CPUE for each month were plotted by Danish statistical square for 1986 (vessel logs updated) and 1987 (observer reports and available vessel logs). Size composition of catches sampled by observers were summarized by month and 100 m depth intervals. Data on bycatches were compiled as percentages of the total observed catch in each month and catch rates for the major bycatch species were compared for the period 1980 to 1987. Estimates of the proportions of discarded shrimp also were derived from the data sources.

RESULTS

CPUE AND EFFORT

The monthly catch rates (kg per hr) observed in each year of the time series show a characteristic decline over the season (Fig. 1, Table 1). For most years, the decline leveled off later in the season (September to November) but in 1985 and 1986 there was a noticeable recovery of catch rates in the latter months. The 1987 pattern is similar to that of the years prior to 1985 when a recovery was not so obvious.

Weighted catch rates for the July to September period based on observers' reports were 315, 344, 409, 330, 338, 319, 353 and 690 kg per hr from 1980 to 1987, respectively. The increase in catch rate between 1986 and 1987 was 95%. Data from vessel logs for the same period showed catch rates of 338, 374, 304, 294, 290, 394 and 511 kg per hr from 1981 to 1987, respectively. The increase between the 1986 and 1987 rates from these data was 30%. It is noted that, despite the discrepancy in the magnitude of increase, both sources show that the 1987 catch rates were, by far, the highest in the series.

The distribution of fishing effort in 1986 as determined from vessel logs (updated from Parsons et al. 1987) showed that the fishery was concentrated in the area between 58° and 59°W, similar to previous years (Fig. 2). Most fishing occurred between 67°30′ and 68°N in all months. Catch rates in June were high throughout the area fished compared to July when rates

were higher in the south. In later months, catch rates south of 68°N remained relatively high, confining most of the effort to that area. It appears that in 1986, less effort was expended in the northwestern areas compared to previous years.

Observers' reports and vessel logs for 1987 showed that for June and July, effort was distributed close to the international boundary between 67°30′ and 68°N (Fig. 3 and 4). Catch rates were high throughout the area fished in both months. By August, effort increased slightly in western areas and, in September, in the northwest. In October, effort was spread over a wider area extending from 67° to 68°15′N. Catch rates were similar throughout, except in the southernmost grounds where they were generally higher. Fishing activity in 1987 appeared to be more similar to the pattern observed prior to 1986, with more of the grounds being utilized.

LENGTH DISTRIBUTIONS

Length frequencies for the sampled catches by month and depth interval (Fig. 5) show a prominent mode about 25 mm CL. This size group consists primarily of female shrimp as evidenced in the October samples when they are observed as ovigerous. Several modes of smaller, male shrimp are also present in the samples but, in most cases, overlapping is severe and it is difficult to visually separate the components. The largest male size group appears fairly clearly at 22-23 mm with indications of other components at 20-21 mm and 18 - 19 mm. Smaller components are not well-represented in the commercial catch data. Catch rates were approximately equal in the different depths for July, August and October but increased in the deeper water in June and September. Increases in mean size with depth were observed in September and October.

As in 1986, male shrimp contributed substantially to the catches in all months but, unlike 1986, several size groups of males were present. Smaller males had not been apparent in the sampling data in either 1985 or 1986 which contrasted the findings of previous years (Parsons et al. 1987).

SHRIMP DISCARDS

The percentages of shrimp discards as estimated by observers in 1987 (Table 2) show that levels were similar to those observed in the previous year, averaging just over 2%. In the years prior to 1986, discard rates were higher, ranging from 3 to more than 5%.

Length frequencies of shrimp discards were available for most months of the fishery (Fig. 6) but were obtained from only a few vessels. The data provide evidence of selective discarding of the smaller sizes in that the smaller male size groups are more prominent. Particularly evident are modes about 17 and 19 mm which are not as clear in samples from the total catch. Note also the mode around 12 mm in the August deep water sample. The data also show discarding of larger animals, likely due to damage. This contrasts the situation observed in 1985 when length distributions of discarded shrimp were similar to those from the catches before discarding (Parsons and Veitch 1986).

BYCATCHES

Observer data on catch composition for each month of the 1987 fishery (Table 3) show that percentage bycatch by weight increased from about 11% in June to 15% in July and August and to about 20 % in September and October. The increase from June to July is due mainly to an increase in redfish (Sebastes spp.) catches whereas subsequent increases are more related to the decrease in the catch rates of shrimp. Incidence of Greenland sharks increased in October but catch rates were low compared to some months in previous years and the bycatch for the species amounted to only 2 % of the total observed catch.

Redfish was the most abundant finfish species in the catches, ranging from 8 to 16 % of the total weight of all species. Greenland halibut amounted to less than 3 % of the total observed catch in all months. Catch rates from 1980 to 1987 show a decline for redfish during the first four years, followed by a substantial increase to the highest level observed in 1987. Catch rates for Greenland halibut have remained low over the same period but show a gradually increasing trend.

	Catch per hour (kg)							
	1980	1981	1982	1983	1984	1985	1986	1987
Redfish	63	32	20	9	16	20	90	107
Greenland halibut	2	3	4	5	6	4	8	11

DISCUSSION AND CONCLUSIONS

Catch rates from the Canadian shrimp fishery in Div. 0A for the July to September period have shown an increase from 1980 to 1982 followed by apparent stability from 1983 to 1985. A further increase was observed from 1985 to 1987, by 116 % from observer data and 77 % from vessel logs. The first increase from 1985 to 1986 was considered in relation to improvements in trawl design and changes in market acceptability of small shrimp in 1986 (Parsons et al. 1987), implying that the increase might not reflect an increase in overall stock abundance. Market conditions in 1987 were similar to those in 1986 in that smaller sized shrimp were acceptable. Also the fishing power of vessels employed in 1987 was probably not much greater than that of the previous year and the increases observed might reflect a real increase in abundance in the area. Two vessels which fished at similar times in both years showed substantially higher catch rates in 1987 than in 1986 while another obtained higher catch rates in the fall of 1987 than in the summer of 1986. It is noted, however, that the catch in Div. 0A accounts for only a small portion of the total offshore catch and trends noted in the former might not apply to the whole stock area.

Distribution of fishing effort in 1987 was similar to that observed in past years in that most occurred between 58° and 59°W, 67° and 68°N. Slight differences have been observed years which appear to be related to optimization of catch rates within the general area. No distinct patterns of shrimp migration have been noted either within or between years. Seasonal changes in the distribution of the fleet likely relate more to the presence or absence of ice on the grounds rather than changes in shrimp distribution.

The high catch rates obtained in 1987 were associated with relatively high proportions of smaller male shrimp occurring in the catches. These smaller/younger shrimp were not apparent in the sampling data of the previous two years and their presence in 1987 might indicate some increase in abundance and/or availability. The data, however, are not quantitative and it is not possible to speculate on year class strength. The fact that shrimp of these sizes were being retained by the commercial fleet, indicates the continued acceptance of small shrimp in the market place. Although discards of shrimp remained low in 1987 (about 2 % of the total shrimp catch), there was some indication of selective discarding of the smaller sizes under these conditions. In previous years, the relatively large size of discards indicated that most discarding was due to damage.

Bycatches posed little or no problem to the fishery in 1987. Even the incidence of Greenland shark appeared to be reduced over previous years but this might be more related to the early closure as virtually no fishing occurred after October 31. Catch rates for redfish, however, have continued to increase since 1983 and, if the trend continues, could cause some difficulties for the shrimp fishery, if not the redfish resource.

REFERENCES

Parsons, D. G., and P. J. Veitch. 1986. The northern shrimp (Pandalus borealis) fishery in Div. 0A, 1985. NAFO SCR Doc. 86/4, Ser. No. N1102. 16 p.

Parsons, D. G., P. J. Veitch, and V. L. Mercer. 1987. Research and commercial fishing for shrimp (Pandalus borealis) in Div. 0A, 1986. NAFO SCR Doc. 87/1, Ser. No. N1269. 18 p.

Table 1. Catch[1] (t) and CPUE (kg/hr) by month for Div. 0A, 1980-87 from A) observer reports and B) vessel logs.

	1980		1981		1982		1983		1984		1985		1986		1987	
Month	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
A. Obs.																
May	1	496														
Jun	26	481	364	487			17	518			332	555	287	682	147	859
Jul	13	410	862	413	588	561	547	391	430	451	698	456	558	433	745	1168
Aug	177	328	795	322	653	384	503	330	203	314	459	267	441	335	835	615
Sep	48	261	728	306	398	317	397	272	399	275	339	235	367	290	756	544
Oct			784	256	471	287	452	274	419	257	452	328	479	388	923	529
Nov	22	671	798	248	421	318	181	261	117	277	262	380	841	532	1	378
Dec	74	343	75	161												
TOTAL	361	341	4406	305	2531	363	2097	310	1568	307	2542	347	2973	418	3407	642
B. Logs:																
Jun			347	465			9	405			290	487	309	656	144	869
Jul	54	445	756	419	373	603	752	389	379	448	924	369	603	450	505	973
Aug			665	307	650	354	1241	303	354	260	604	251	363	365	1168	495
Sep			585	297	458	305	798	253	398	243	414	232	241	331	1181	436
Oct			833	258	335	268	992	248	324	237	582	323	242	419	2249	462
Nov			743	249	249	261	257	239	40	311	255	308	604	507	2	570
Dec	62	306	72	149												
TOTAL	116	358	4001	299	2065	335	4049	284	1495	280	3069	309	2362	445	5249	494

[1] Catch is total (including discards) recorded in available vessel logs or estimated by observers, and does not represent the total catch taken in each year.

Table 2. Shrimp discards (% of total shrimp catch) in Div. 0A, 1980-87, estimated by observers.

Month	1980	1981	1982	1983	1984	1985	1986	1987
May	18.0							
Jun	15.5	2.7		0.6		4.0	2.2	1.6
Jul	15.7	2.6	2.4	1.6	6.5	2.9	2.3	1.7
Aug	6.0	4.4	3.3	3.0	4.9	3.4	2.4	3.4
Sep	2.5	5.6	3.4	3.3	5.8	2.9	2.2	1.5
Oct		5.7	3.4	4.6	2.8	3.8	1.7	1.8
Nov	0.0	3.3	2.9	5.3	6.0	6.6	2.0	2.0
Dec	1.3	4.2						
Average[1]	5.26	4.13	3.06	3.22	5.09	3.68	2.12	2.10

[1] Weighted by observed catch in each month.

Table 3. Observed bycatch in Division 0A, 1987.

	June		July		August		September		October		November	
	Wt.(t)	%	Wt.(t)	%	Wt.(t)	%	Wt.(t)	%	Wt.(t)	%	Wt.(t)	%
Shark (NS)	1.75	1.06	2.20	.25	1.75	.18	4.24	.45	22.07	1.94		
Skate (NS)	.35	.21	1.27	.15	.54	.06	2.41	.26	3.30	.29	.01	.87
Cod	.02	.01	.09	.01	.23	.02	.21	.02	.07	.01		
Arctic cod	.07	.05	.33	.04	.50	.05	.76	.08	.44	.04		
Wolffish (NS)	.08	.05	.84	.10	.61	.06	.51	.05	.15	.01		
Eelpouts/blennies	.12	.07	.61	.07	.26	.03	.49	.05	.29	.03		
Redfish (NS)	13.68	8.31	118.18	13.49	127.25	13.04	154.50	16.34	152.35	13.37	.10	8.70
American plaice	.26	.16	.80	.09	.76	.08	1.70	.18	.49	.04	.01	.87
Greenland halibut	1.09	.66	5.12	.58	3.80	.39	20.05	2.12	29.95	2.63		
Shrimp (P.b.)	146.65	89.12	745.00	85.02	835.26	85.60	755.61	79.94	922.54	80.98	1.02	88.69
Other	.49	.30	1.77	.20	4.85	.50	4.78	.51	7.49	.66	.01	.87
Bycatch total	17.91	10.88	131.21	14.98	140.55	14.40	189.65	20.06	216.60	19.02	.13	11.31
Grand totals	164.56	100.00	876.21	100.00	975.81	100.00	945.26	100.00	1139.14	100.00	1.15	100.00

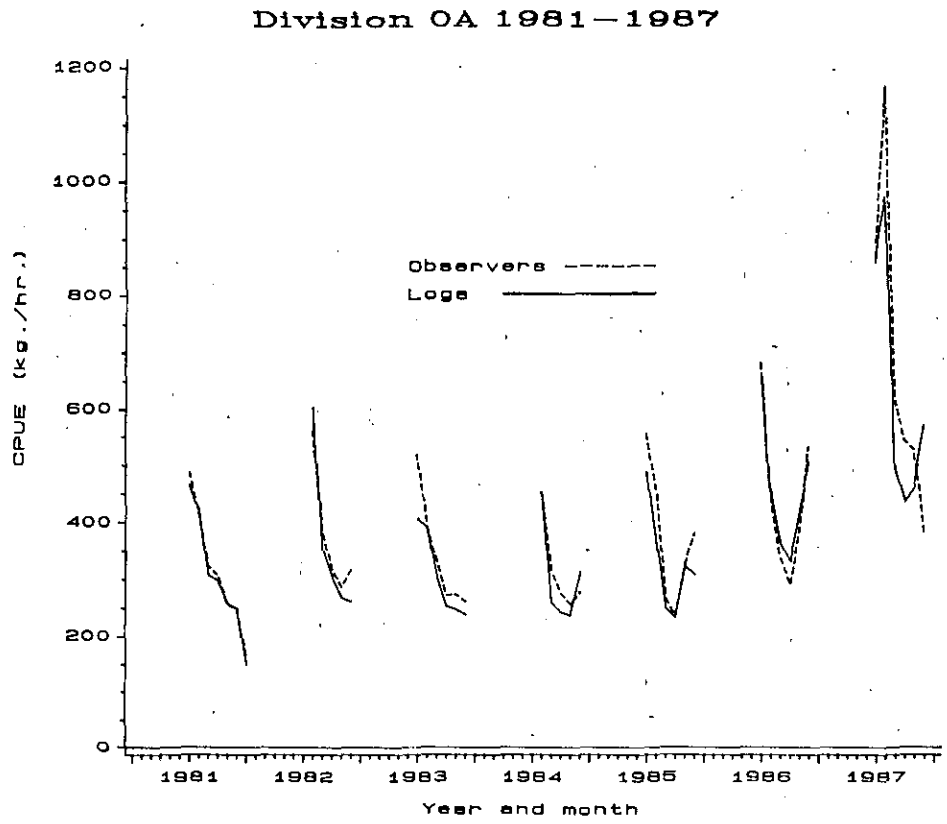

Fig.1. Monthly CPUE (kg/hr) for shrimp vessels of tonnage classes 4, 5 and 6, Div. 0A, 1981 - 1987.

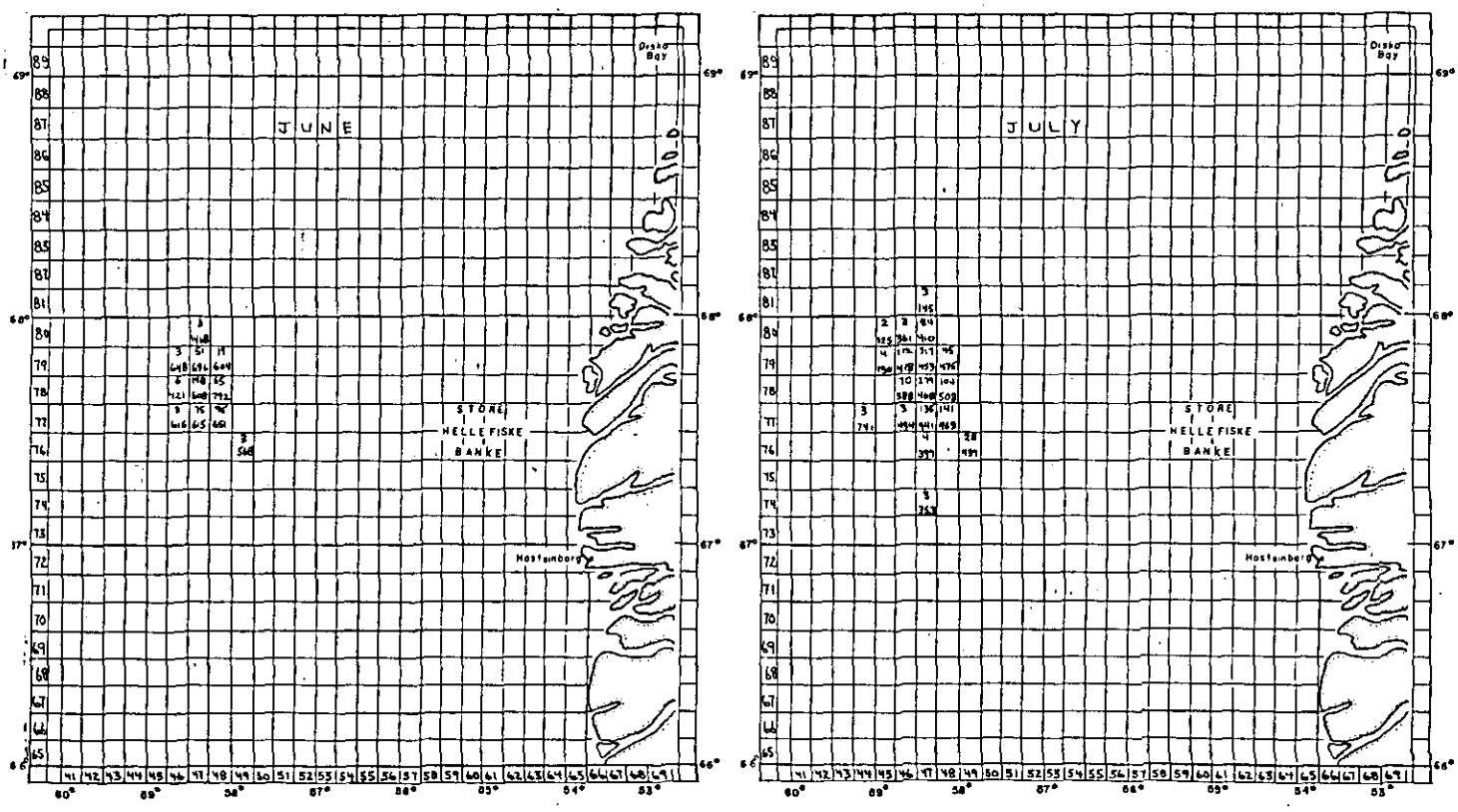

Fig.2. Hours fished (upper) and kg/hr (lover) by statistical square from 1986 vessel logs.

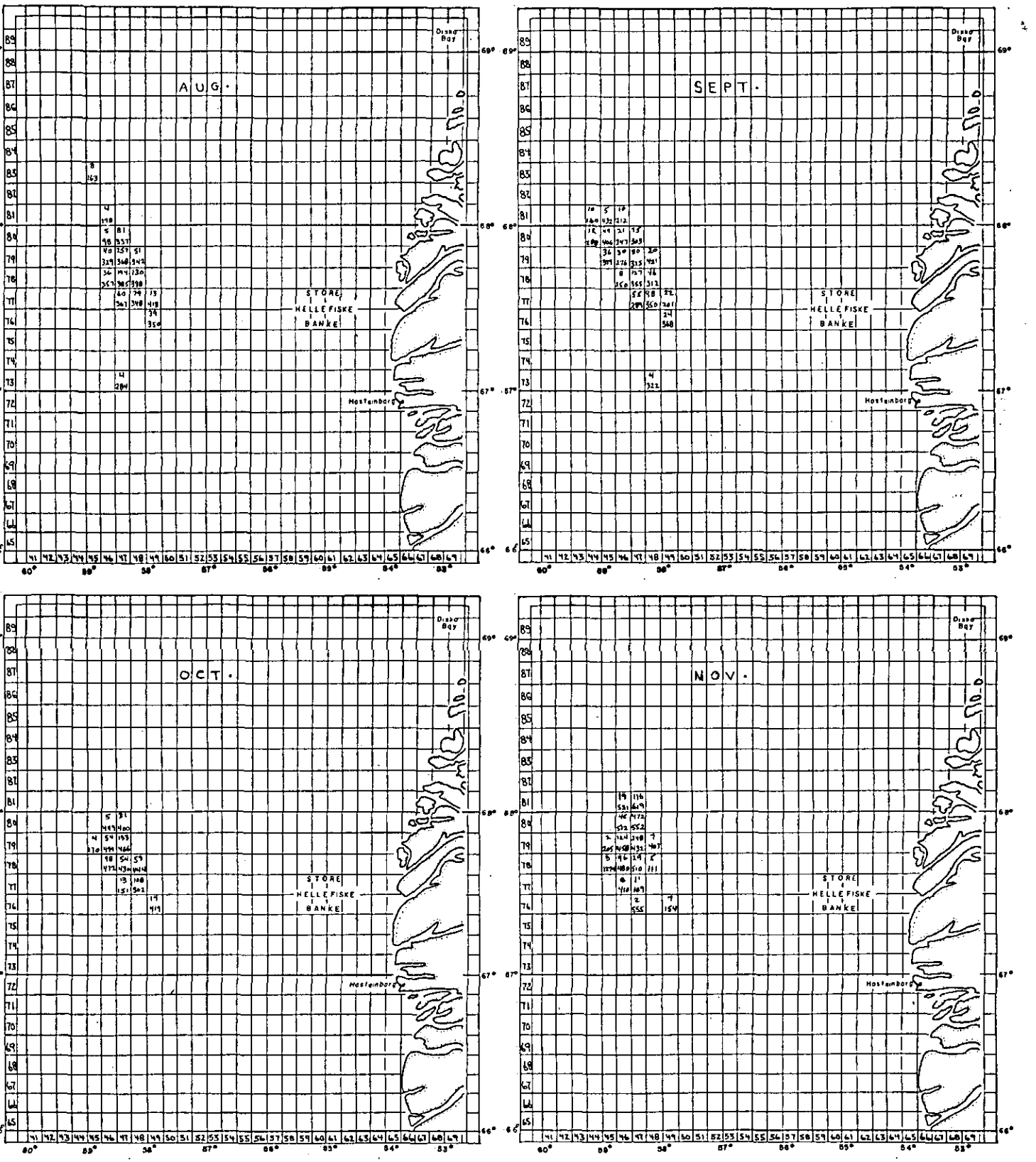

Fig.2. Continued.

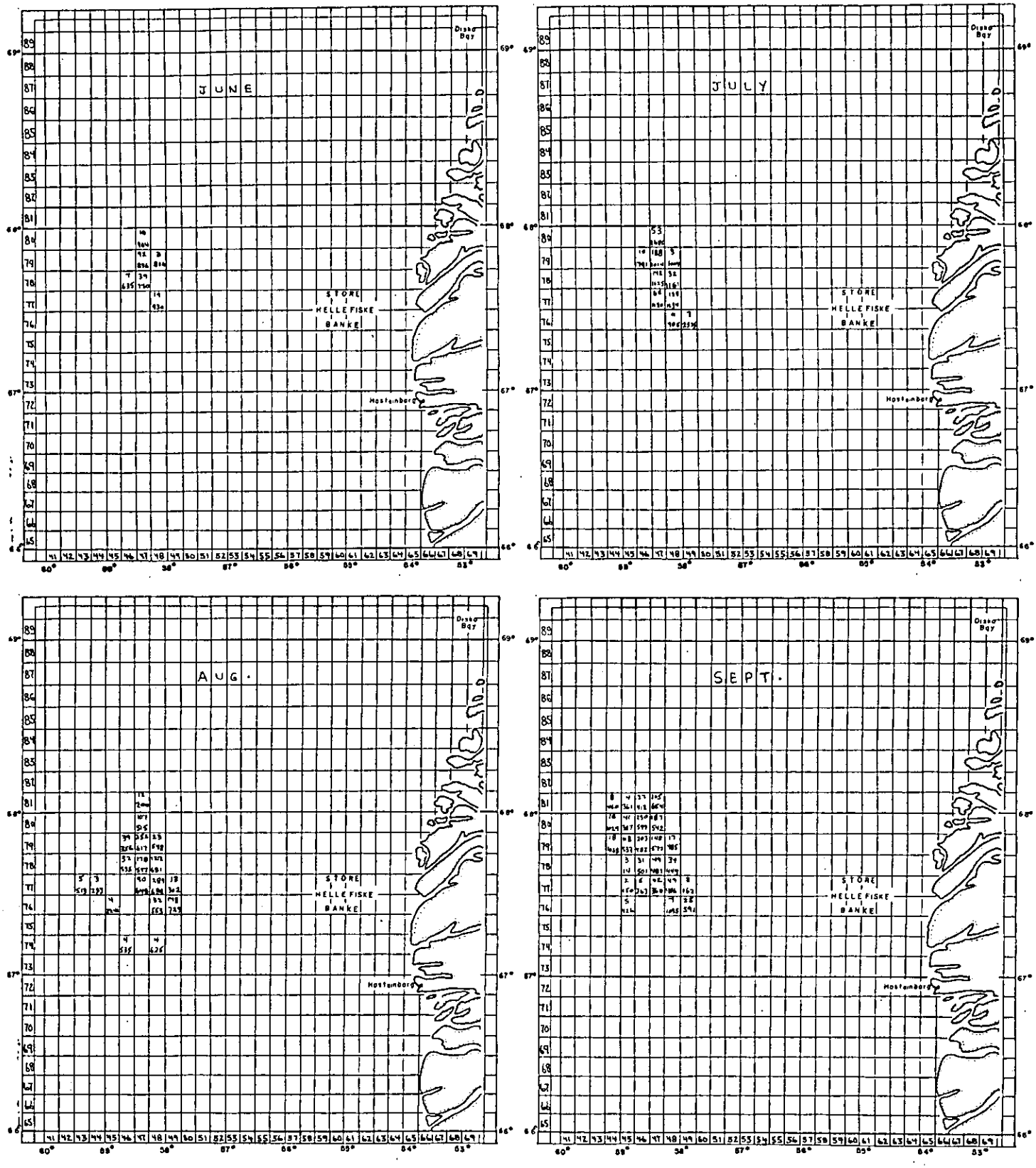

Fig.3. Hours fished (upper) and kg/hr (lower) by statistical square from 1987 observer reports.

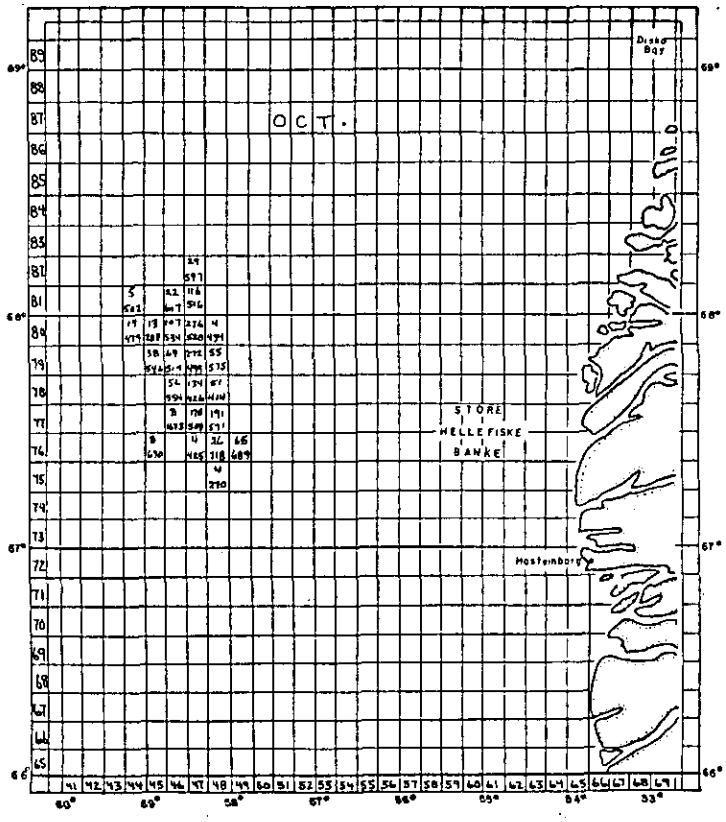

Fig.3. Continued.

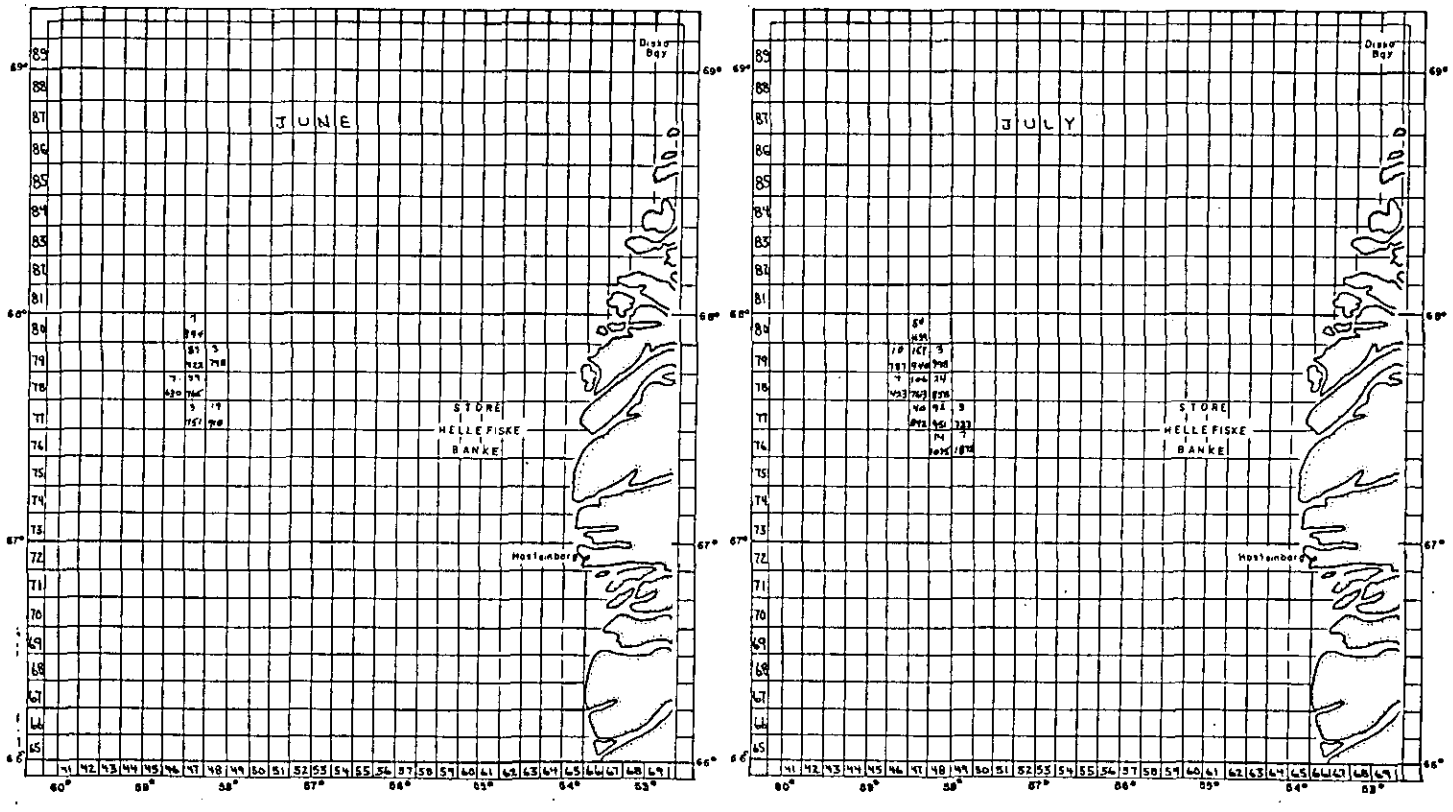

Fig.4. Hours fished (upper) and kg/hr (lower) by statistical square from 1987 vessel logs.

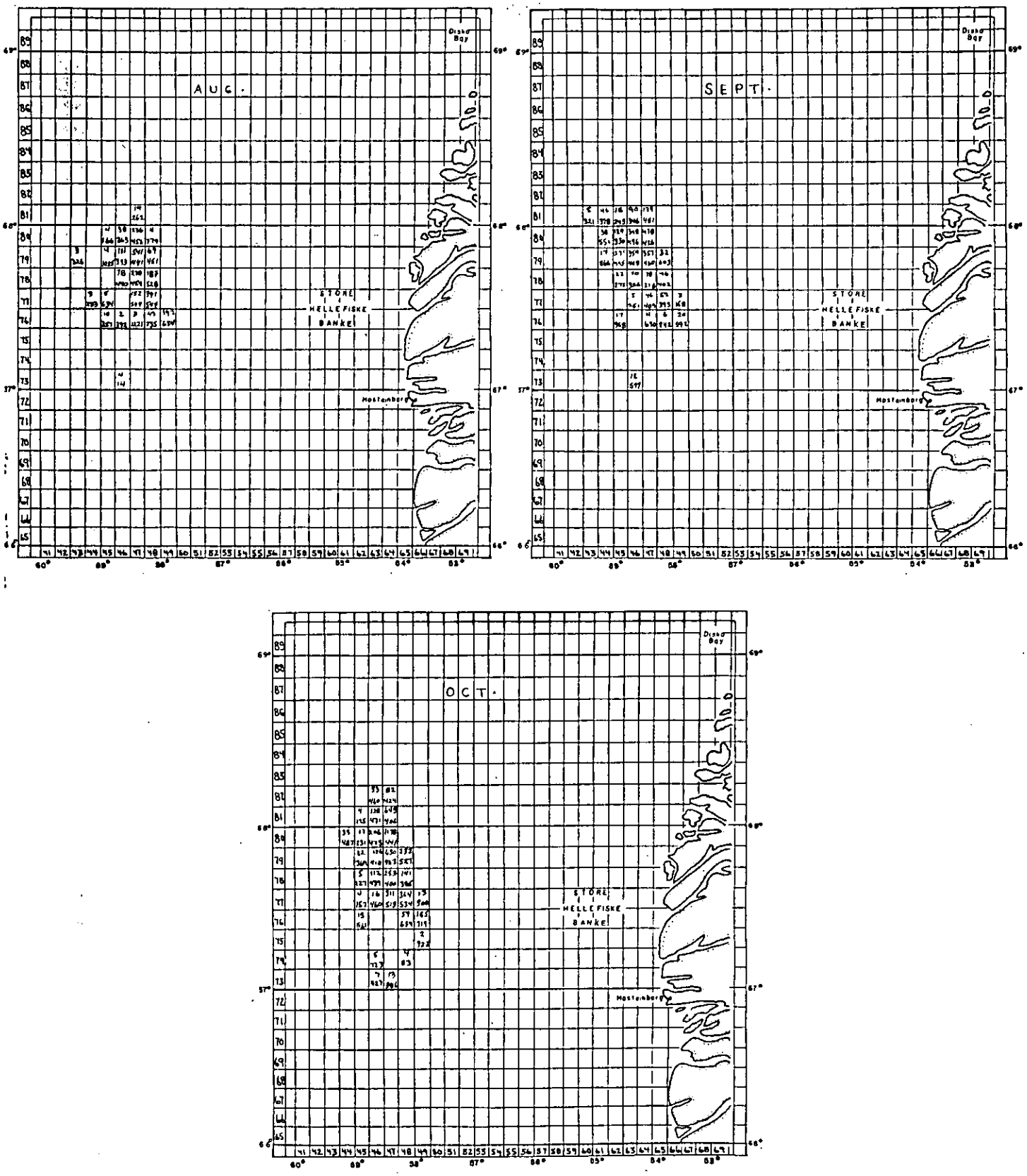

Fig.4. Continued.

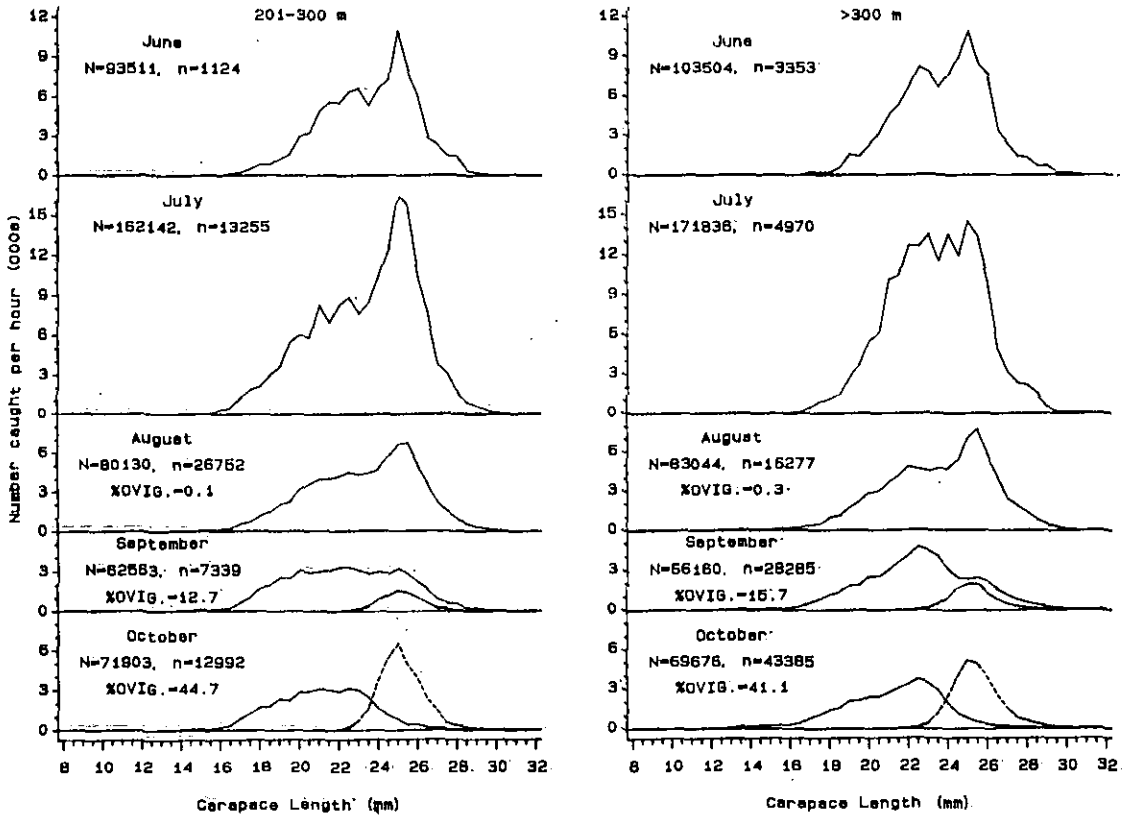

Fig.5. Commercial length frequencies by month and depth interval, Div. 0A, 1987. (Broken line = ovigerous, N = number per hour, n = number measured.)

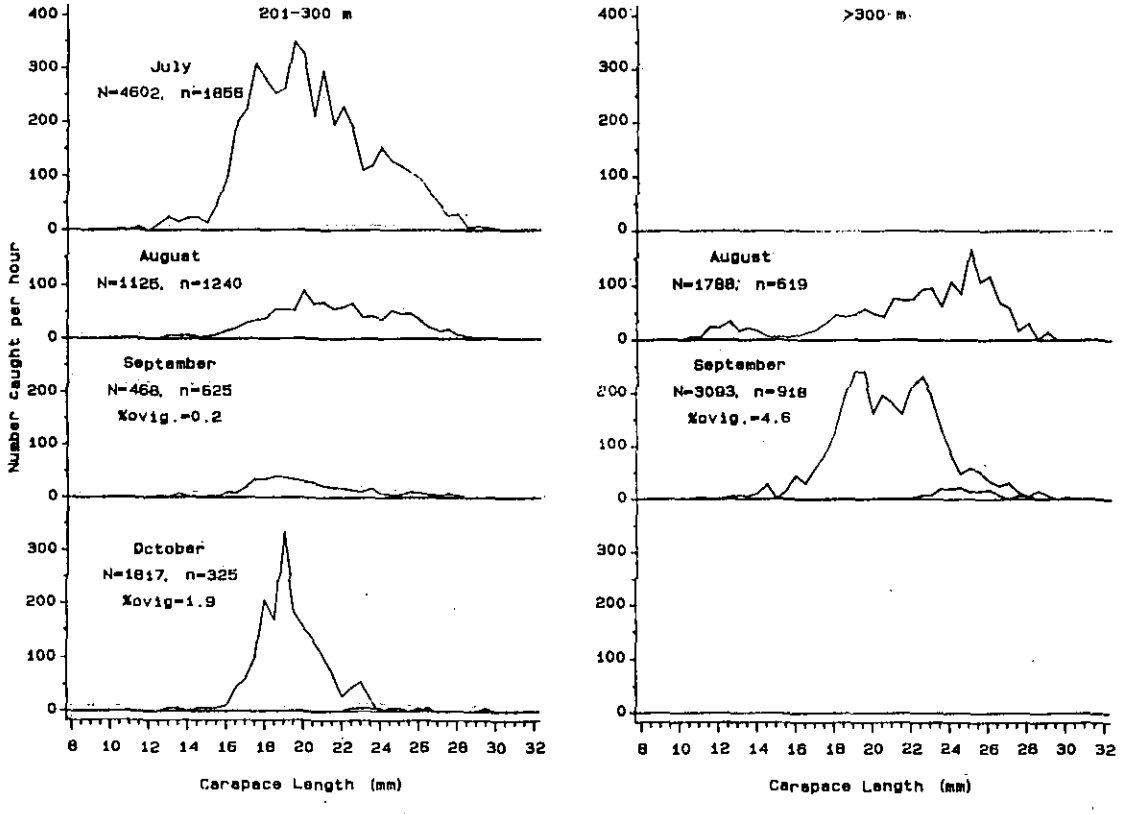

Fig.6. Length frequencies for discarded shrimp by month and depth interval, Div. 0A, 1987. (Broken line = ovigerous, N = number per hour, n = number measured.)