

# Northwest Atlantic



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Details of Catch, Effort and CPUE from the Canadian Fishery for  
Shrimp (Pandalus borealis) in Division OA, 1983

by

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## Introduction

Shrimp catches from Canadian licensed vessels in Div. OA in 1983 (preliminary to December 31) totalled 4,014 tons or 80% of the 5,000 t allocation. This is considerably higher than the 2,655 t (53%) taken in the previous year and comparable to the 4,300 t (86%) in 1981. A total of nine (9) vessels participated in this fishery which took place from late June to November. Heavy ice and lower catch rates off Labrador (Div. 2H) early in the season encouraged an early departure for the Davis Strait.

Observer coverage for the shrimp fleet was considerably reduced in 1983 and data collections were obtained only from foreign-owned vessels fishing for Canada in Div. OA. Vessel logs, on the other hand, were available for most trips of domestic vessels while those for foreign-owned vessels generally were not available. Therefore, in this report, it was necessary to consider in detail both data sources to obtain representation from each component of the fleet. The information contained includes distribution of catch and effort, monthly length frequencies for the observed catch and details of the observed by-catches and discarding practices. Catch rates from 1982 vessel logs have been updated from the previous report (Parsons et al. 1983).

## Materials and Methods

Catch and catch per unit effort (CPUE) were compiled on a monthly basis from observers' records and from vessel logs for 1979-83. Distribution of effort and the associated CPUE from both sources for 1983 were plotted by Danish statistical square. Observers obtained shrimp measurements (0.5 mm carapace length) from the catch and from discards and these were summarized by month for 100 m depth intervals. Data on by-catches were represented as a percentage of the total observed catch weight for each month. Estimates of the percent weight of shrimp discarded also were obtained from observers' reports and vessel logs.

## Results and Discussion

### Catch and CPUE

In previous reports, CPUE from the two data sources have been interpreted as reasonable indices of abundance and, since either vessel logs or observers' reports may have been lacking in a given year, data from both have been considered. In 1983, the problem is compounded in that different components of the fleet are represented by each source. No standardization of effort has been achieved for the fleet and the usefulness of CPUE as an indicator of abundance in 1983 is diminished. These results only should be used to corroborate observations made from more extensive (and reliable) data sources.

Seasonal trends in catch (kg) per hour fished for the years 1979-83 are given in Fig. 1 and Table 1. The weighted catch rates for the period July-September from observers' reports were 315, 344, 409 and 330 kg from 1980 to 1983, respectively. The rates for the same months from vessels logs were 338, 374 and 306 kg from 1981 to 1983, respectively. Both sources show an increase in catch rates from 1981 to 1982 (19 and 11%) followed by a decrease in 1983 (19 and 18%). In 1981, good recruitment was predicted by STACFIS for 1982 and 1983 (NAFO

1981). If the pattern indicated above is evident from other components of the fishery, it is possible that most of this recruitment occurred in 1982 and the uncertainty of 1983 recruitment levels expressed at the Jan. 1983 meeting (NAFO 1983) was justified.

The distribution of fishing effort based on observer reports (Fig. 2) showed that, as in previous years, most fishing in Div. OA occurred between 58° and 59°W. In June-July and October-November effort was concentrated between 67° and 68°N but in August and September comparatively more fishing took place north of 68°N. This activity is more likely due to ice conditions rather than displacement of the shrimp concentrations. The pattern observed in 1983 more closely resembles that of 1982 when most fishing occurred south of 68°N. In 1981, more effort was expended north of 68°N in most months (Parsons et al. 1983).

Vessel log data (Fig. 3) essentially were similar to the observer reports in that most fishing occurred between 58° and 59°W and between 67° and 68°N. A considerable amount of effort for these vessels just north of 68°N extended into October.

#### Length Composition

Length distributions by month for 1983 (Fig. 4) show only slight differences in size and relative shrimp abundance between the 200-300 and 300-400 m depth intervals. In July, abundance appeared to be greater in the shallower stratum and in October and November more ovigerous females were found in deeper water. Large numbers of ovigerous females appeared in September but a few had laid eggs as early as July.

Two obvious modes were evident in most samples at 22-23 mm and 26 mm. Bimodality is apparent in the smaller (male) group at approximately 20 mm. A similar bimodal situation was observed in the 1982 data. It was thought that a delay in transition (due to colder temperatures) might have been an explanation but it also was pointed out that mixing of different components of the stock (with different growth rates) could produce the same effect (NAFO 1983). A third explanation could be the presence of another age group, evidence of which was found in samples dating back to 1979 (see Parsons and Tucker, this meeting). If the latter is true, then a logical modal progression can be followed between years.

A final observation is the virtual absence of shrimp less than 19 mm in the commercial data. Although these sizes generally are discarded in commercial operations, some evidence of their existence usually is apparent. The absence of small shrimp in the 1983 length frequencies adds credence to the concerns of STACFIS that recruitment may be reduced in 1984 and 1985 (NAFO 1983).

#### Shrimp Discards

Estimates of the discards of shrimp from observers' reports (Table 2) showed an increase from 0.6% in May to 5.3% in November. Since the commercial length frequencies do not show increasing proportions of small shrimp over the season, these changing rates only reflect discarding practices of different vessels. The 1983 estimates are comparable to those observed in the previous two years.

Vessel log records (Table 2) indicate discards of 1% and less, in most cases lower than those reported for 1981 and 1982. These rates must be considered 'optimistic' and those from observers' reports are more likely representative.

Measurements of discards were obtained from one vessel for each month from July to October (Fig. 5). The distributions were unimodal at 20-23 mm, and the differences in size between July-August and September-October possibly represent different discarding practices in response to declining catch rates.

One notable difference from data collected in previous years is the low numbers of shrimp less than 19 mm. In other years, evidence of smaller/younger shrimp was apparent in the discard frequencies (Parsons et al. 1983). The scarcity of smaller shrimp in the 1983 data supports the observation made above from the length composition of the catch and emphasizes the concerns for reduced recruitment in 1984 and 1985.

#### By-catches

With declining catch rates of shrimp, by-catches increased from 1.55% of the total observed catch weight in June to 17.54% in November (Table 3). Again, redfish was the most important by-catch species but never exceeded 4% of the total catch weight in any month. A cursory examination of redfish catch rates indicated a general decrease in abundance since

1980. Greenland halibut accounted for only 2% of the total observed catch in November and less in other months. Other species, except for sharks, generally represented less than 1% of the catch weight. The 9% 'other' by-catch in November likely represents unspecified sharks.

### Conclusions

Catch rates from commercial shrimp trawlers fishing in Div. OA in 1983 were substantially lower than those obtained in 1982. Although the suitability of these catch rates as an index of abundance is questionable, it is possible that a decrease in abundance and/or a change in distribution has occurred between the two years. This observation will require support from the other, more extensive components of the fishery.

Distribution of fishing effort and associated catch rates indicate that most fishing activity in 1983 (and 1982) occurred south of 68°N. This supports an observation by Kanneworff (1983) that a southward displacement of shrimp abundance has been indicated, possibly related to a decrease in bottom temperatures in 1982.

Length frequencies from the commercial catch indicated two dominant size groups in all months, 22-23 mm males and 26 mm females. Bimodality in the former might be interpreted as separate age groups. The data also showed a scarcity of smaller/younger animals in the catch. Samples of discards were similar in that shrimp less than 19 mm were lacking compared to other years. If samples from other areas confirm these observations, recruitment in the next two to three years might be considerably reduced. Predictions of recruitment from such data, however, must be made cautiously.

The discarding of small shrimp in 1983 was observed to be similar to levels estimated for the previous two years (<5% in most months). If abundance of small shrimp remains low in 1984, discard rates are not likely to increase.

Redfish continues to be the major by-catch species, followed by Greenland halibut. In Div. OA, by-catches do not appear to be a problem except for incidental catches of Greenland sharks.

### References

- Kanneworff, P. 1983. Biomass of shrimp (*Pandalus borealis*) in NAFO Subarea 1 in 1977-1983, estimated by means of bottom photography. NAFO SCR Doc. 83/1/1, Ser. No. N639, 22 p.
- NAFO. 1981. Report of Scientific Council, November 1981. NAFO Sci. Coun. Rep. 1981: 109-122.
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- Parsons, D. G., P. J. Veitch, G. E. Tucker. 1983. The Canadian fishery for shrimp (*Pandalus borealis*) in Division OA, 1982. NAFO SCR Doc. 81/1/2, Ser. No. N640, 21 p.
- Parsons, D. G., and G. E. Tucker. 1984. Observations on some biological characteristics of shrimp (*Pandalus borealis*) from the Davis Strait, 1978-81. (This meeting).

Table 1. Catch and CPUE (MT per hour fished) by month for Division OA, 1979-83.

Month	1979		1980		1981		1982		1983	
	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
A. Observer Reports										
May			1	0.496						
June			26	0.481	364	0.487			17	0.518
July			13	0.410	362	0.413	588	0.561	547	0.391
Aug.	48	0.346	177	0.328	795	0.322	653	0.384	503	0.330
Sept.	-	-	48	0.261	728	0.306	398	0.317	397	0.272
Oct.	5	0.121	-	-	784	0.256	471	0.287	453	0.274
Nov.			22	0.671	798	0.248	421	0.318	180	0.261
Dec.			74	0.343	75	0.161				
	53	0.296	360	0.340	4,406	0.305	2,531	0.363	2,097	0.310
B. Vessel Logs										
June					347	0.465				
July			54	0.445	756	0.419	373	0.603	378	0.450
Aug.					665	0.307	650	0.354	983	0.305
Sept.	42	0.512			585	0.297	458	0.305	523	0.250
Oct.	64	0.220			833	0.258	335	0.268	578	0.238
Nov.	248	0.231			743	0.249	249	0.261	37	0.151
Dec.	16	0.140	62	0.306	72	0.149				
	370	0.237	116	0.358	4,001	0.299	2,064	0.335	2,499	0.283

Table 2. Shrimp discards in Division OA, 1980-83.

Month	1980		1981		1982		1983	
	Observed catch (tons)	% Discards	Observed catch (tons)	% Discards	Observed catch (tons)	% Discards	Observed catch (tons)	% Discards
A. Observer Reports								
May	1.4	18.0						
June	25.6	15.5	363.9	2.7			16.8	0.6
July	12.6	15.7	862.4	2.6	587.8	2.4	547.0	1.6
Aug.	176.5	6.0	795.1	4.4	653.3	3.3	502.6	3.0
Sept.	48.5	2.5	727.9	5.6	398.3	3.4	396.5	3.3
Oct.			784.4	5.7	471.0	3.4	452.5	4.6
Nov.	21.6	0.0	797.7	3.3	420.7	2.9	180.1	5.3
Dec.	74.2	1.3	74.8	4.2				
B. Vessel Logs								
June			347.4	2.3				
July	53.9	0.2	755.8	1.5	372.6	0.4	377.7	0.6
Aug.			664.9	1.4	650.3	0.5	982.6	0.5
Sept.			585.2	3.0	457.7	1.7	523.5	0.5
Oct.			833.0	5.1	334.6	2.3	578.1	1.0
Nov.			742.8	3.7	248.7	1.0	37.3	0.5
Dec.	62.0	0.0	71.9	4.1				

Table 3. Observed by-catch, Division OA, 1983.

Species name	June		July		August		September		October		November	
	Weight (MT)	%	Weight (MT)	%	Weight (MT)	%	Weight (MT)	%	Weight (MT)	%	Weight (MT)	%
Shrimp ( <i>Pandalus</i> )	16.039	98.45	477.622	96.84	462.900	95.14	350.736	93.97	387.114	92.32	152.123	82.45
Redfish (unspecified)	0.096	0.59	8.474	1.72	9.797	2.01	8.192	2.19	9.485	2.26	6.740	3.65
Redfish ( <i>Mentella</i> )							2.295	0.61	2.595	0.62	0.625	0.34
Greenland halibut	0.127	0.78	5.299	1.07	3.924	0.81	6.076	1.63	7.550	1.80	3.740	2.03
American plaice	0.001	0.01	0.165	0.03	0.435	0.09	0.849	0.23	1.268	0.30	0.964	0.52
Skate (unspecified)			1.020	0.21	0.353	0.07	0.828	0.22	1.744	0.42	1.550	0.84
Skate (Thorny)							0.118	0.03	0.154	0.04	0.183	0.10
Eelpouts/Blennies	0.020	0.12	0.646	0.13	0.339	0.07	0.442	0.12	0.791	0.19	0.367	0.20
Cod			0.002	0.00	0.024	0.00	0.357	0.10	0.432	0.10	0.102	0.06
Arctic cod	0.014	0.09	0.098	0.02	0.002	0.00	0.022	0.01	0.108	0.03	0.071	0.04
Halibut	0.005	0.03	0.064	0.01	0.022	0.00	0.424	0.11	0.571	0.14	0.104	0.06
Wolffish (Broadhead)					0.015	0.00	0.048	0.01	0.085	0.02	0.040	0.02
Wolffish (Striped)			0.009	0.00	0.007	0.00	0.351	0.09	0.336	0.08	0.737	0.40
Wolffish (Spotted)			0.046	0.01	0.144	0.03	0.174	0.05	0.308	0.07	0.225	0.12
Witch							0.010	0.00				
Yellowtail					0.002	0.00						
Long-horn Sculpin							0.470	0.13	0.475	0.11	0.145	0.08
Greenland shark					6.900	1.42						
Other			0.060	0.01	1.936	0.40	1.961	0.53	6.421	1.53	16.810	9.11
By-catch totals	0.253	1.55	15.592	3.16	23.662	4.86	22.496	6.02	32.196	7.67	32.376	17.54
Grand totals	16.292	100.00	493.212	100.00	486.560	100.00	373.231	100.00	419.304	100.00	184.500	100.00

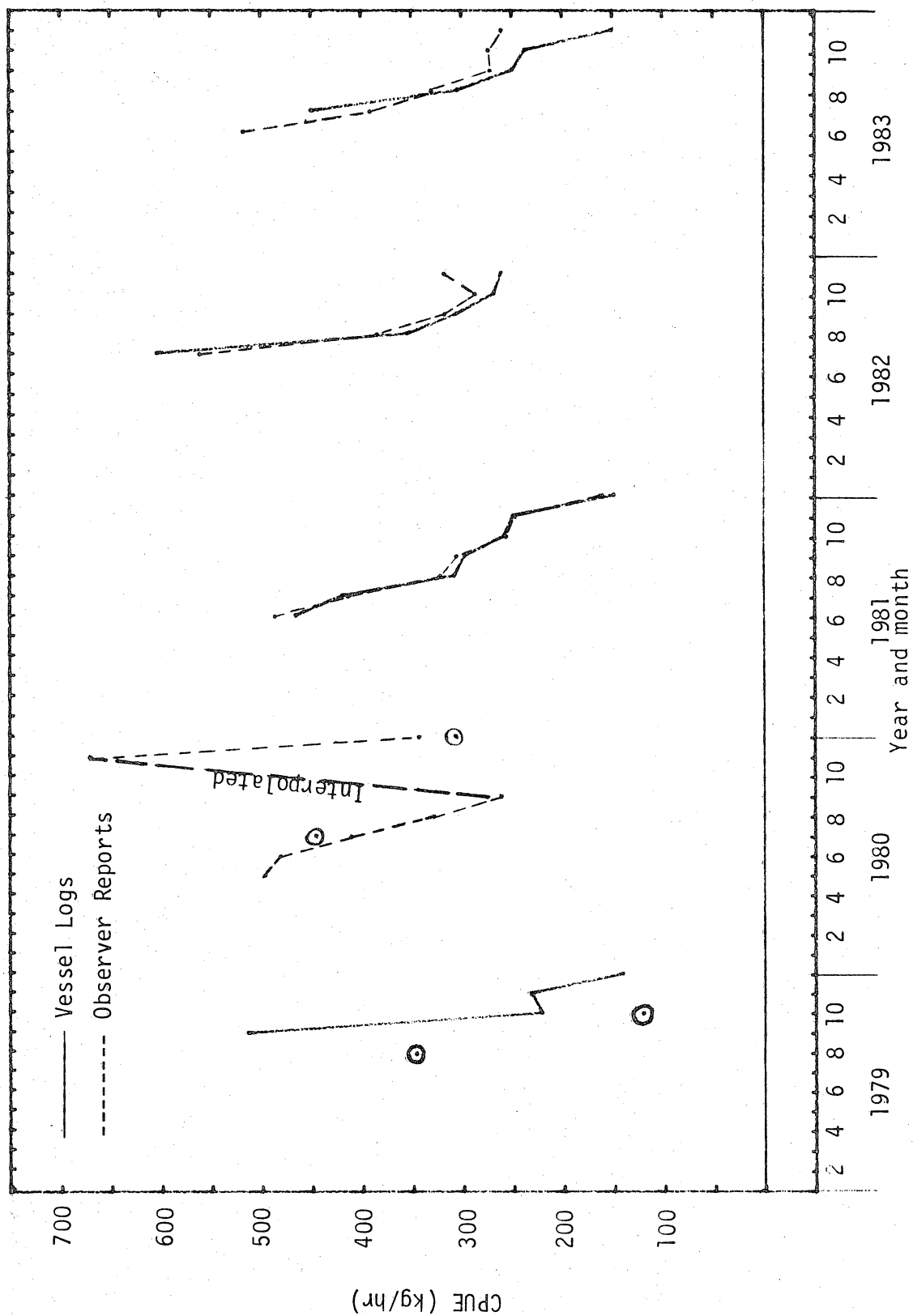


Fig.1. Monthly catch (kg) per hour fished for vessels of tonnage classes 4,5, and 6 in Division OA, 1979-1983.

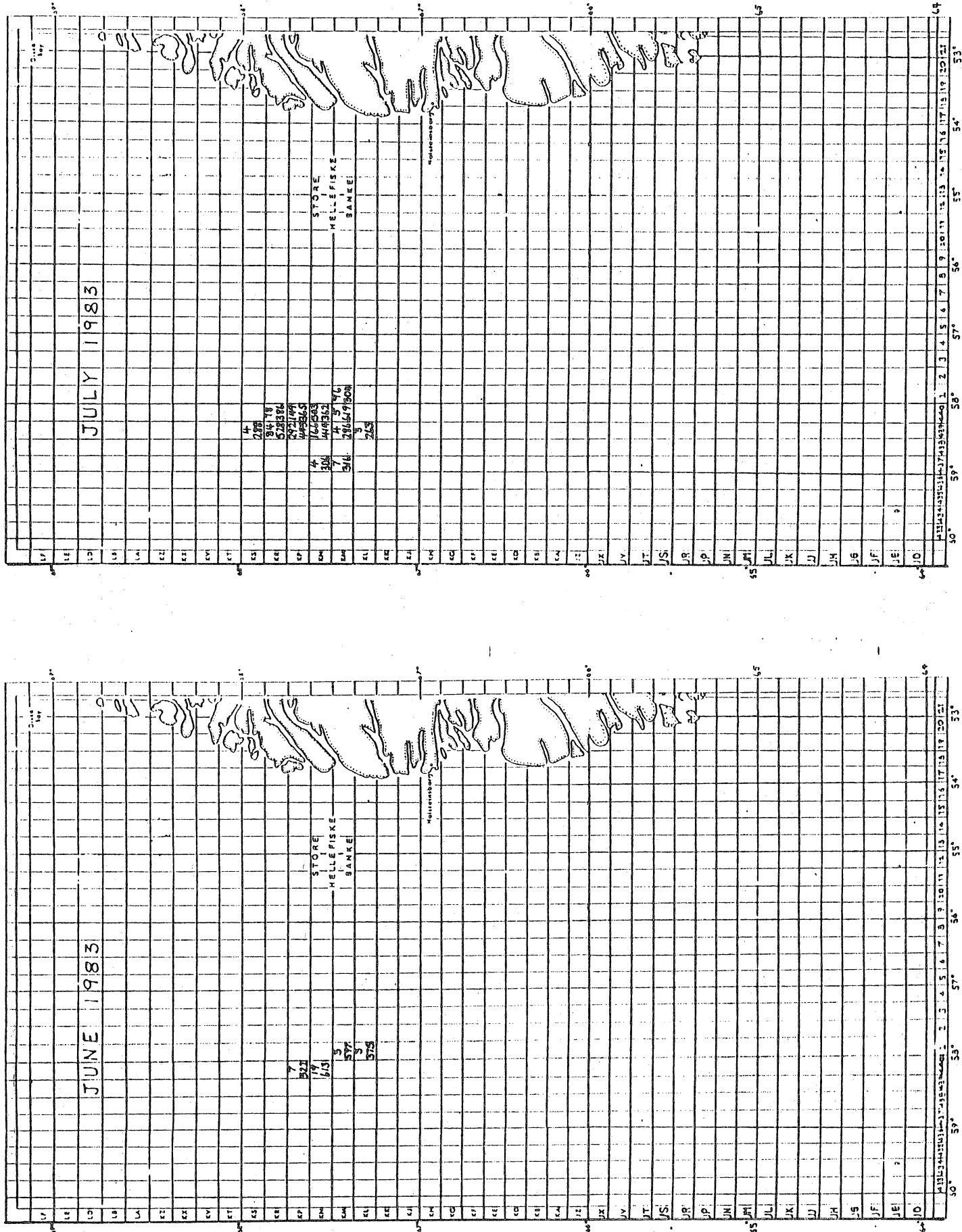


Fig.2. Hours fished (upper) and kg/hr (lower) by statistical square, 1983, from observer reports.

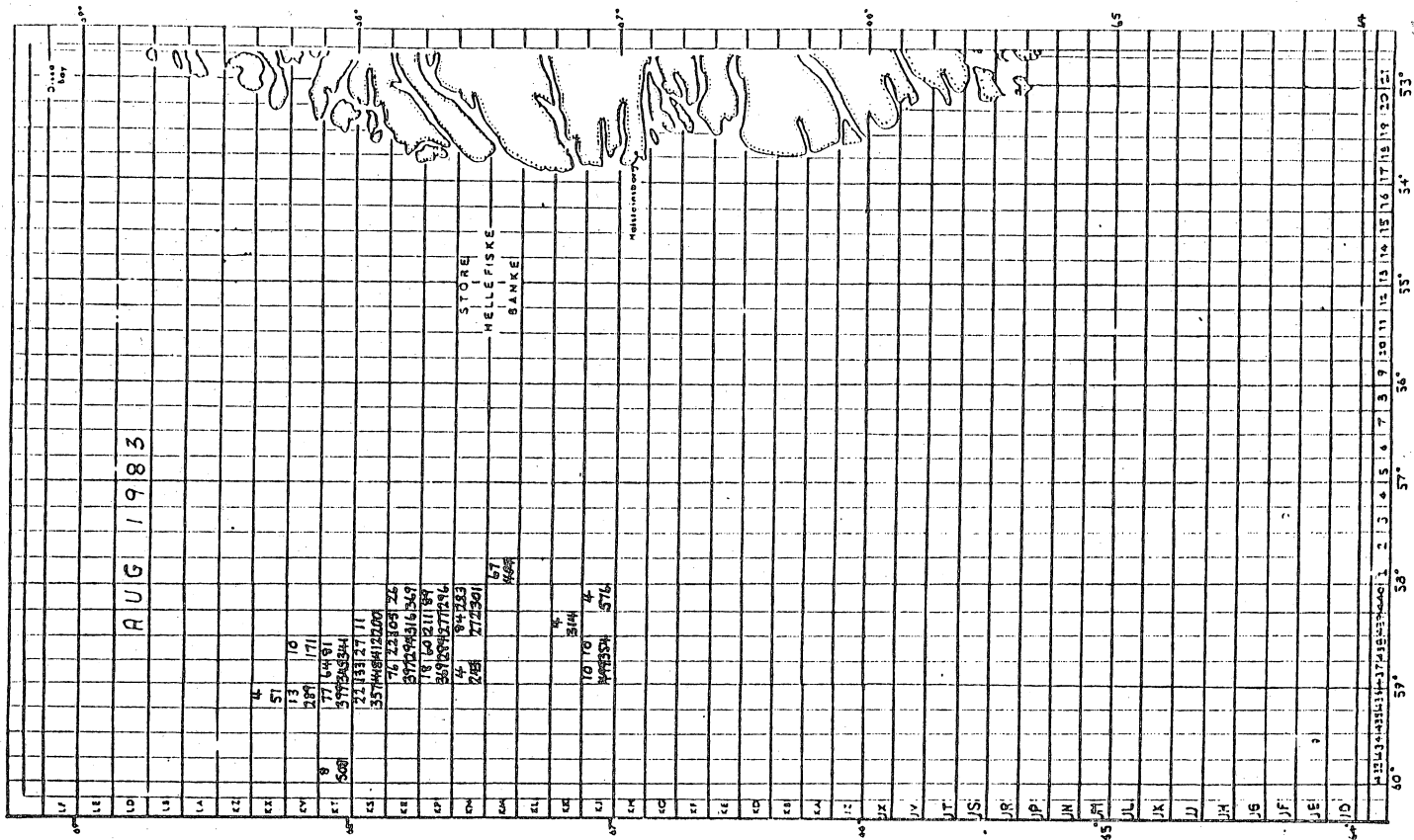
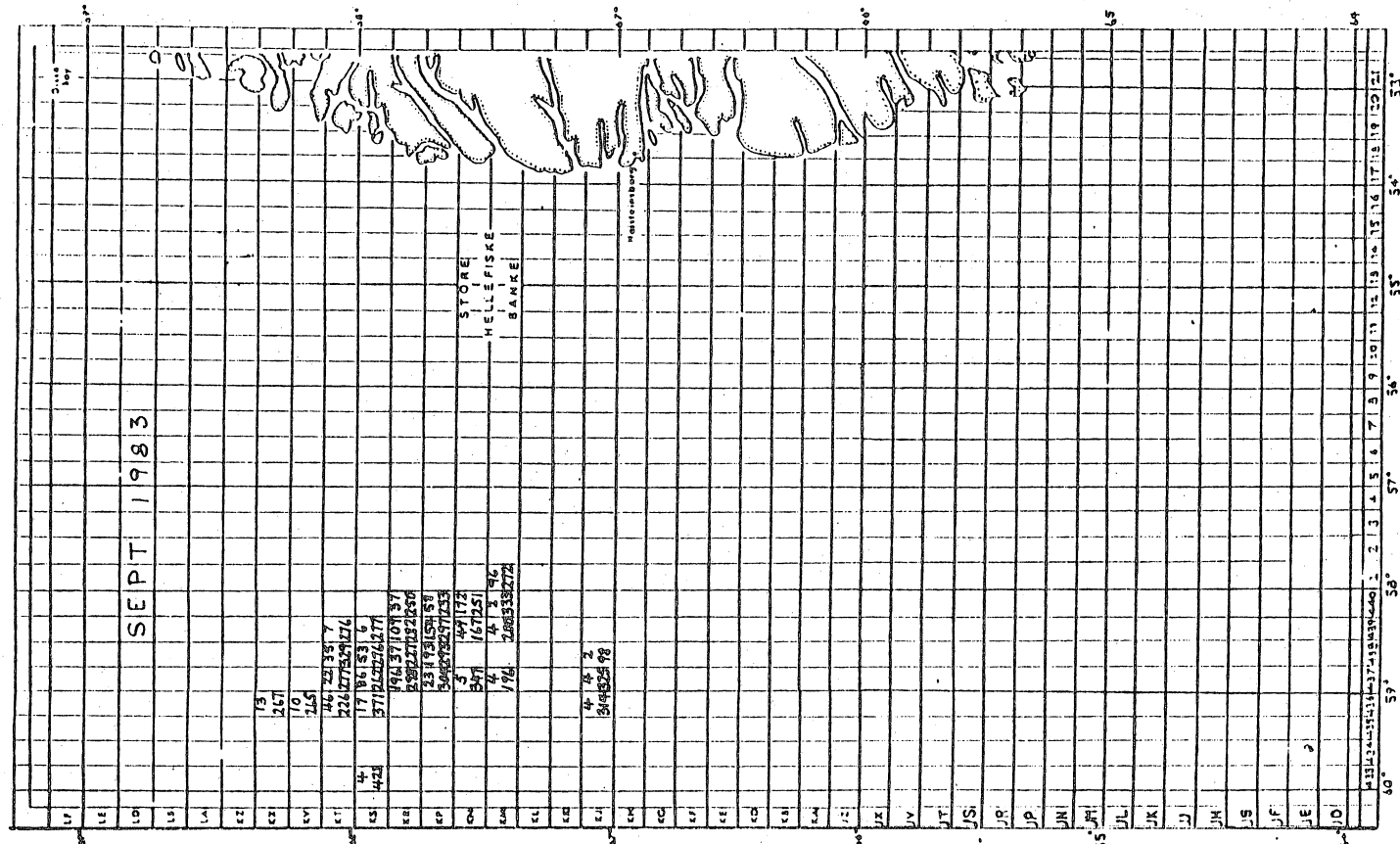


Fig.2. Continued.



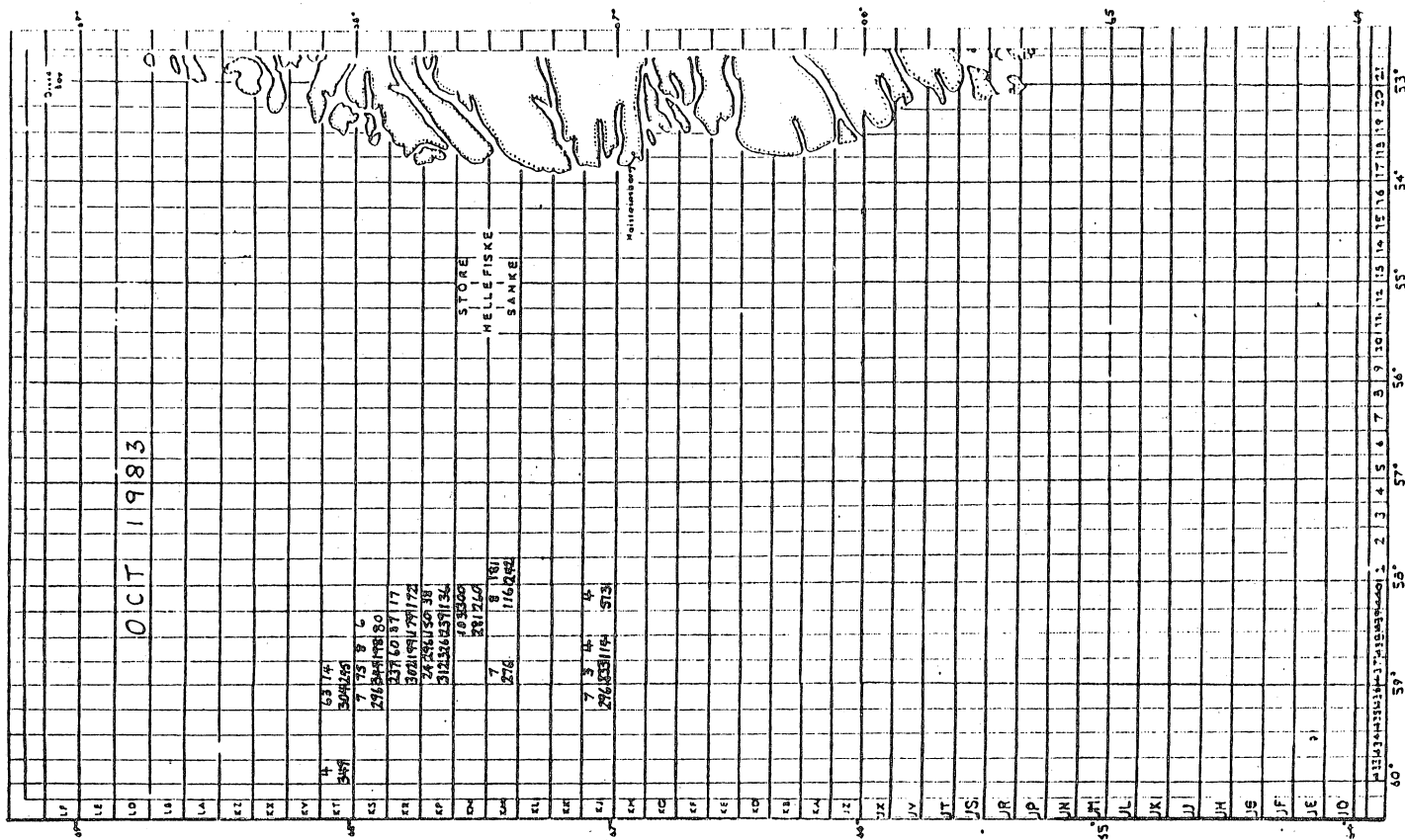
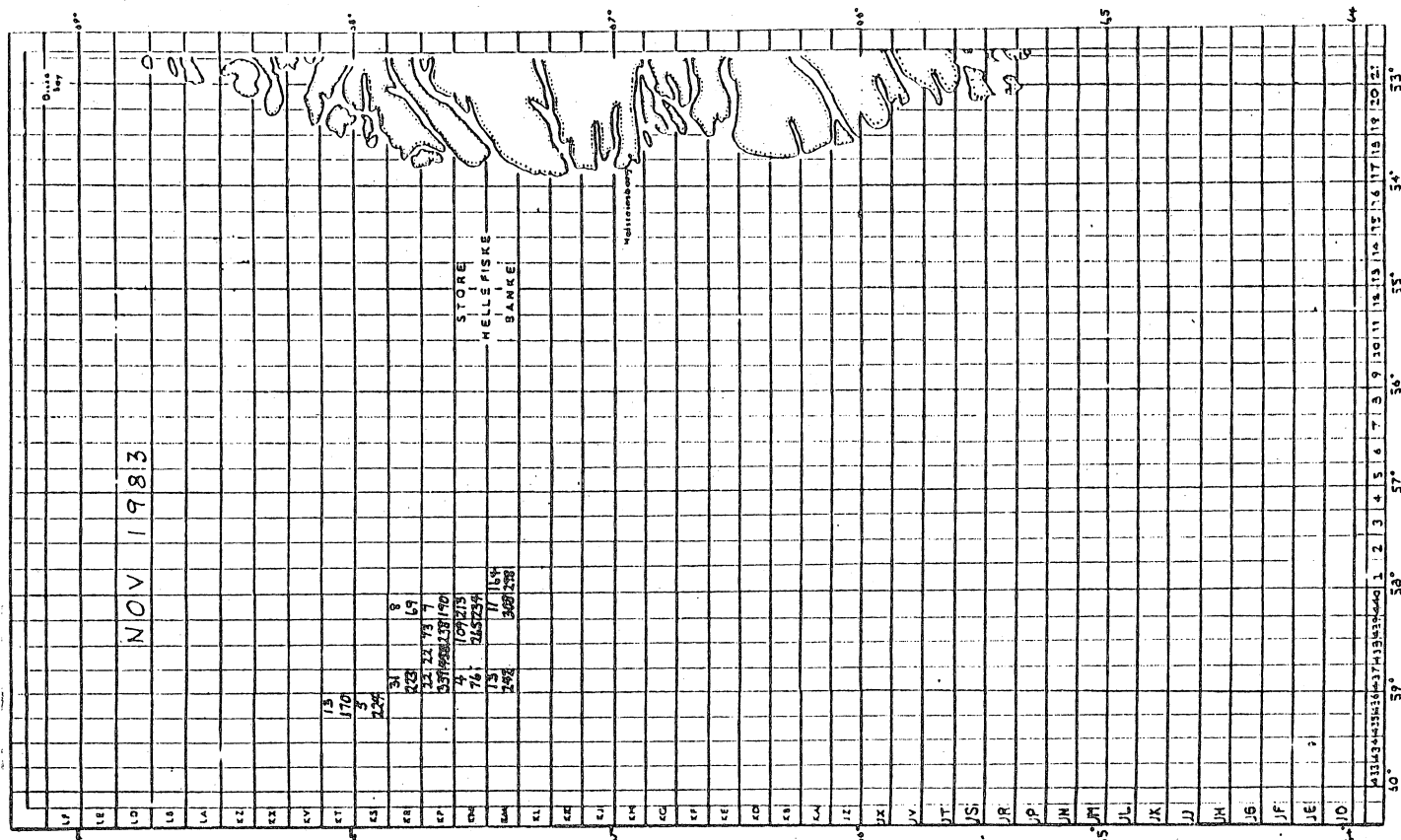


Fig. 2. Continued.

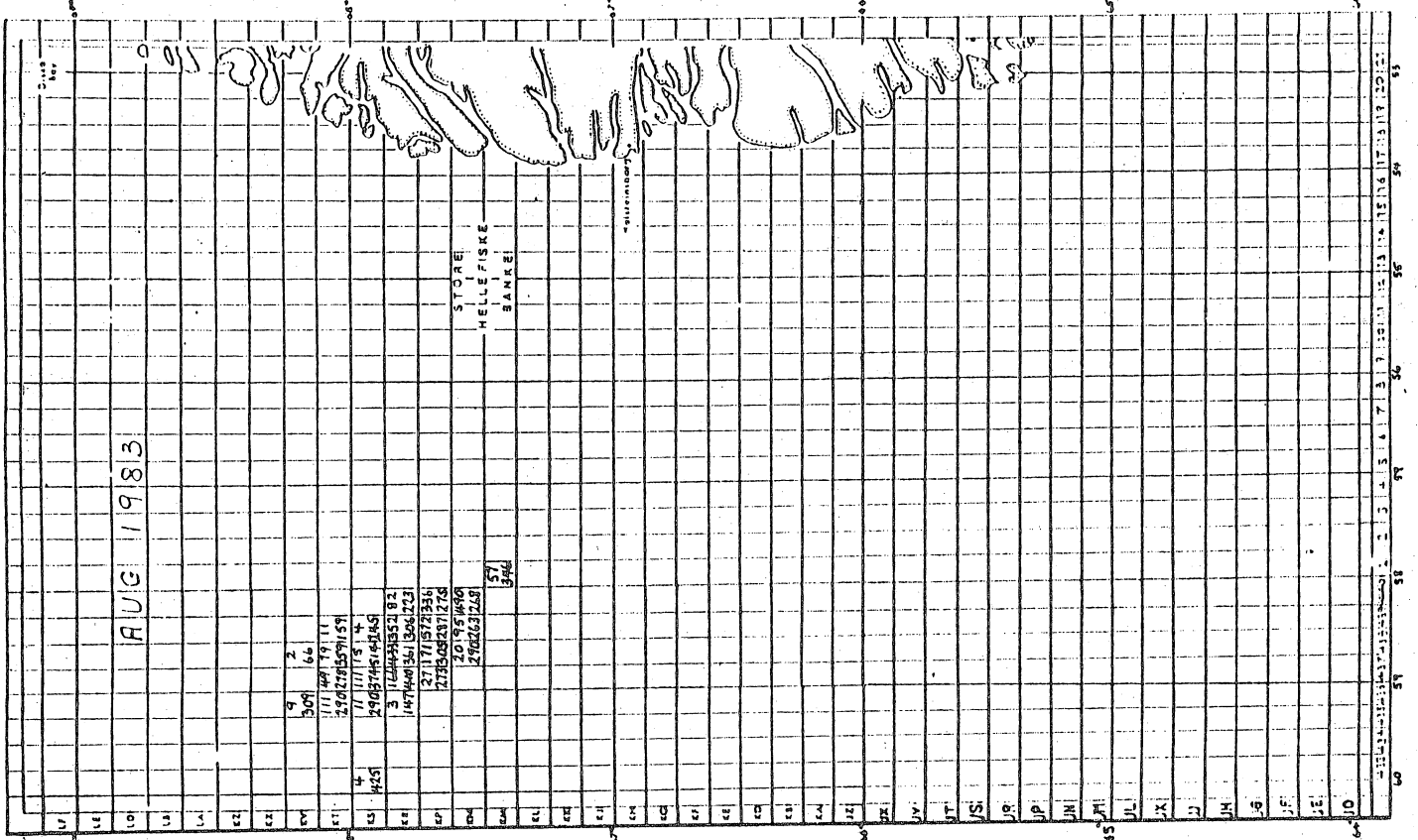
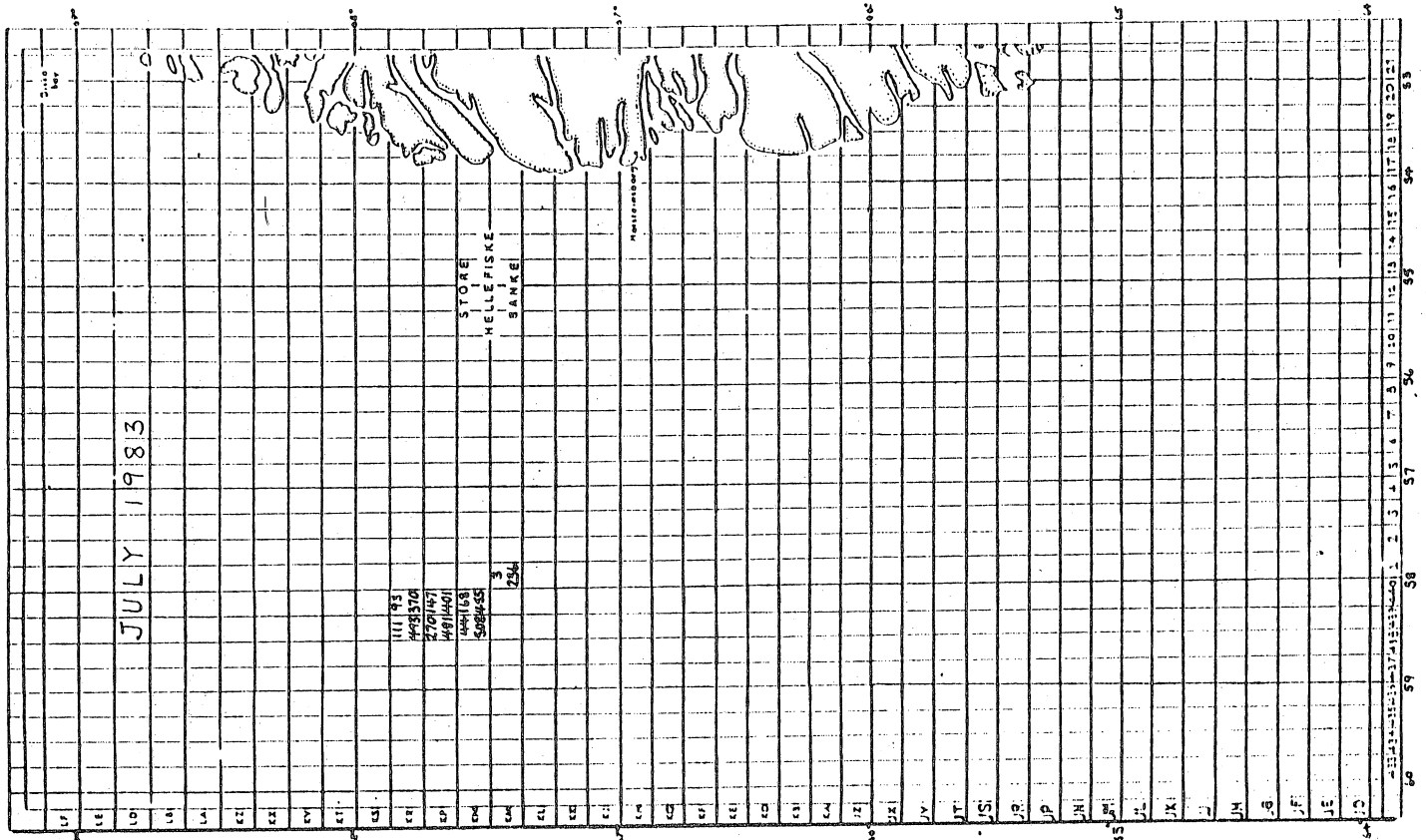


Fig.3. Hours fished (upper) and kg/hr (lower) by statistical square 1983, from vessel logs.

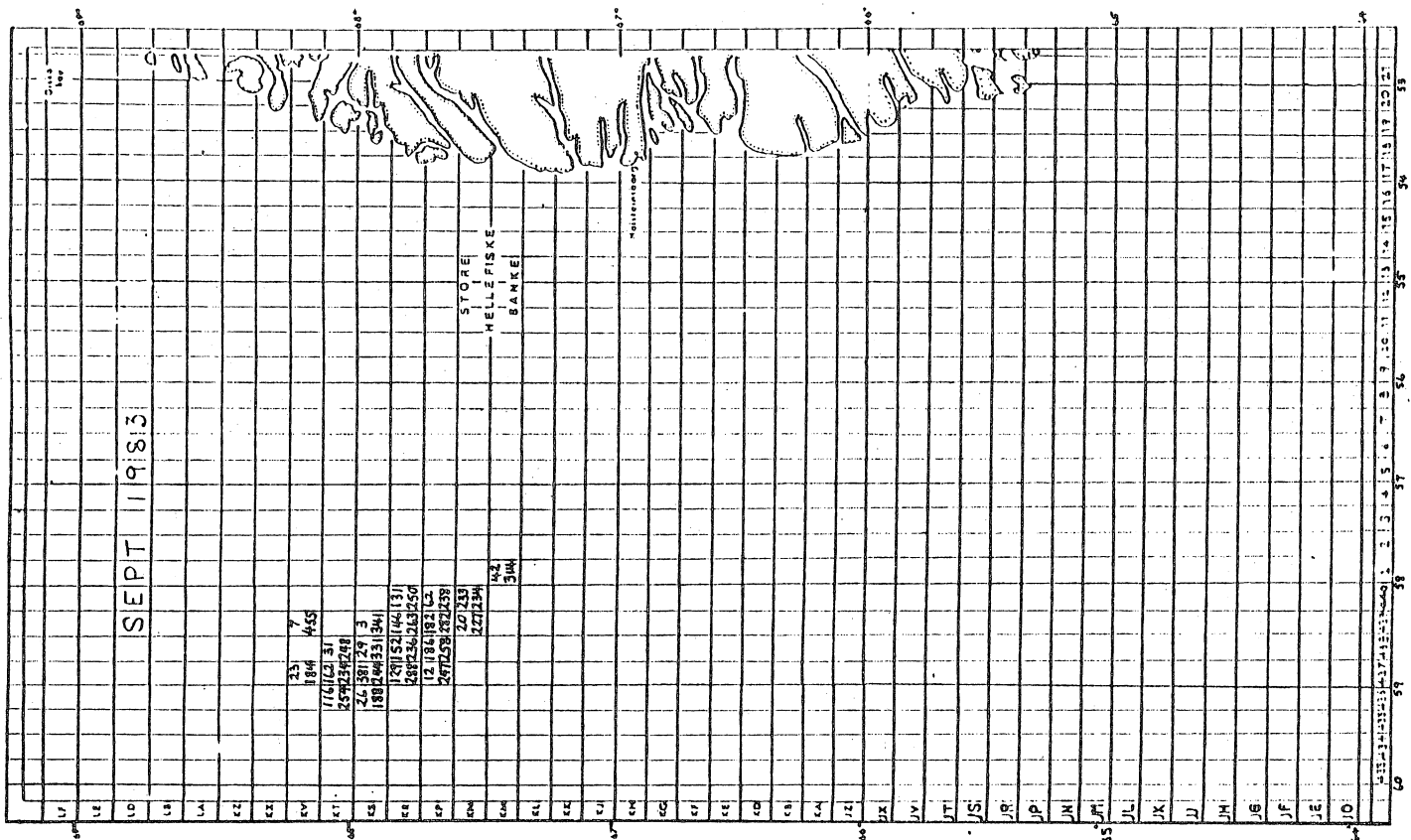
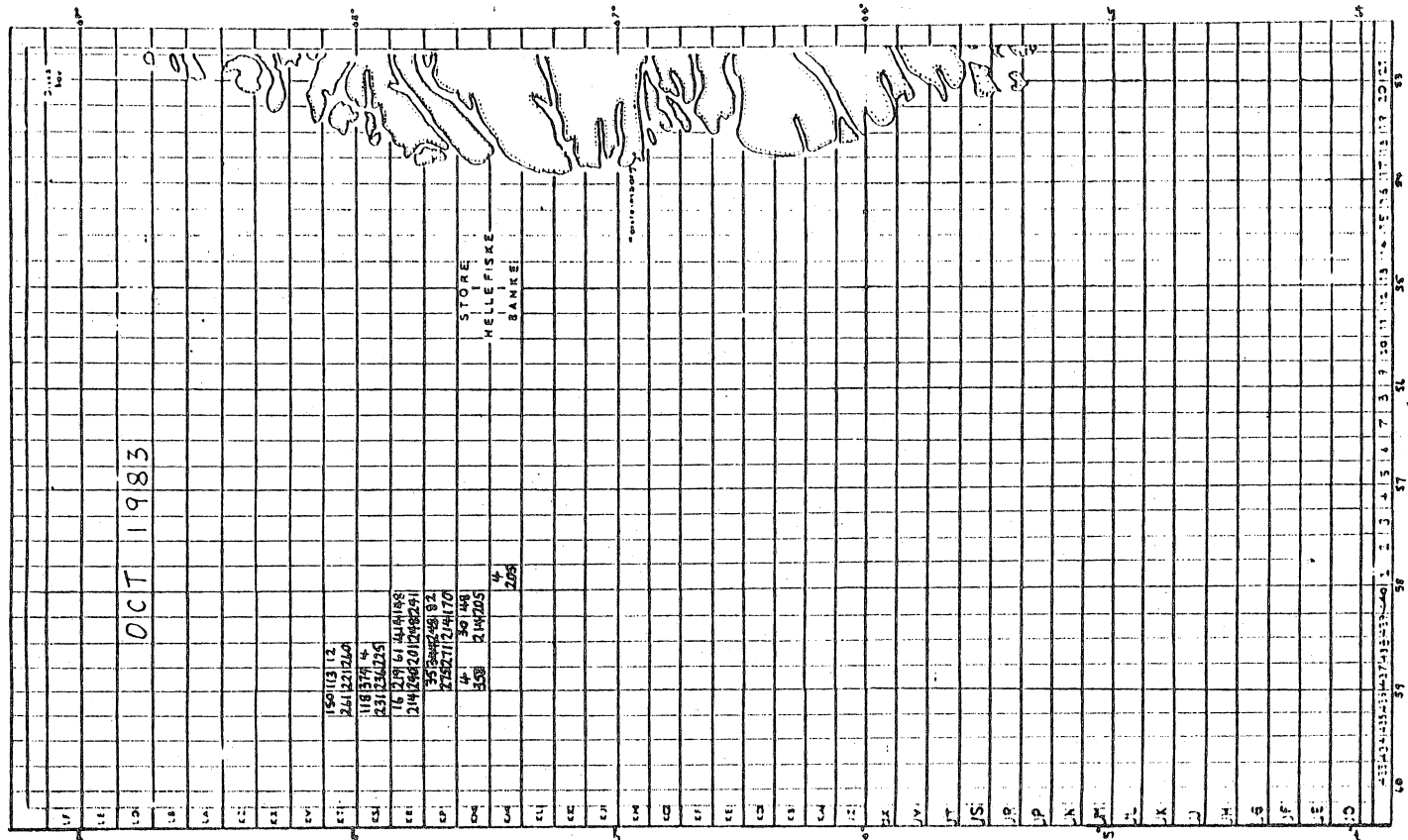


Fig.3. Continued.

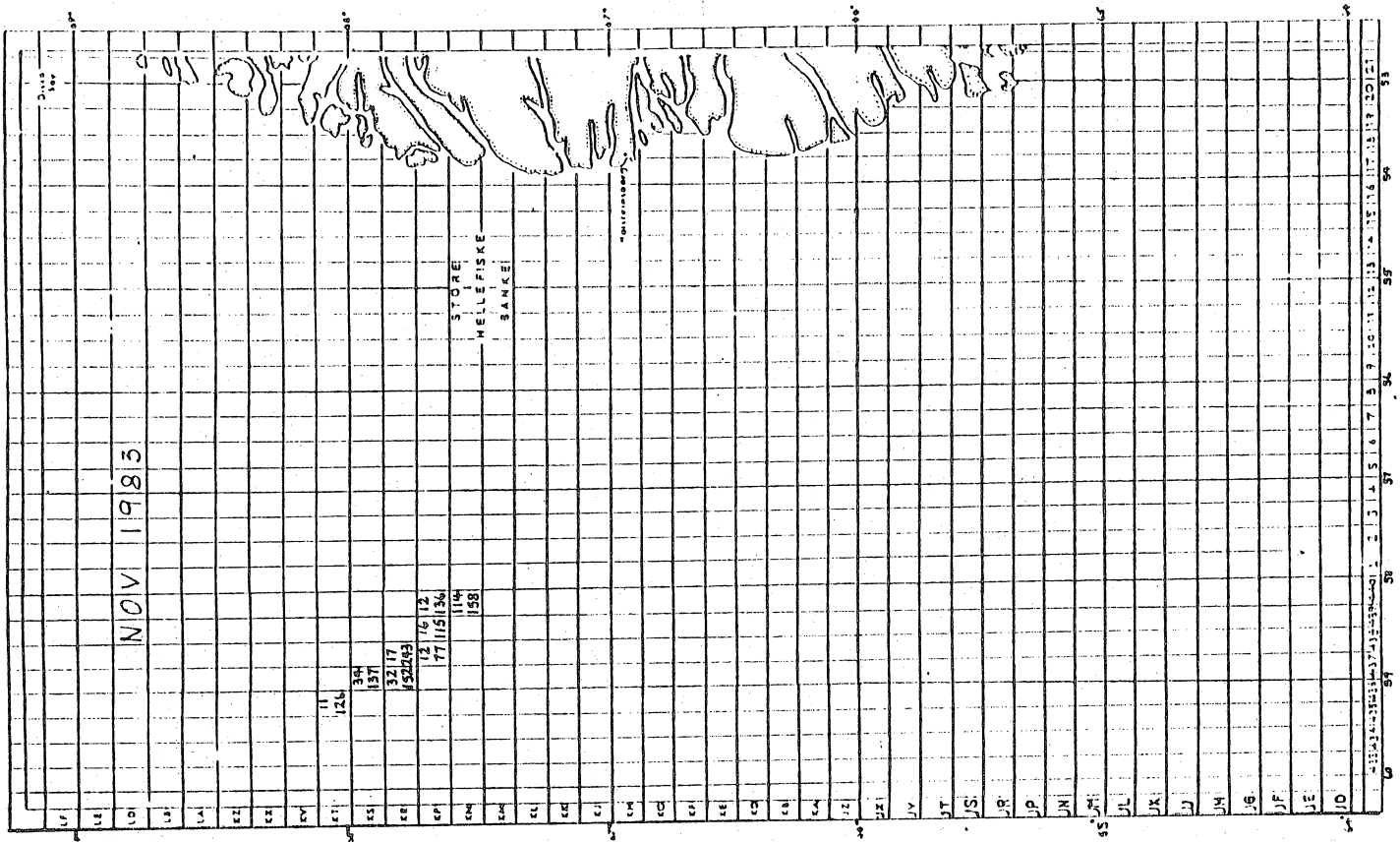


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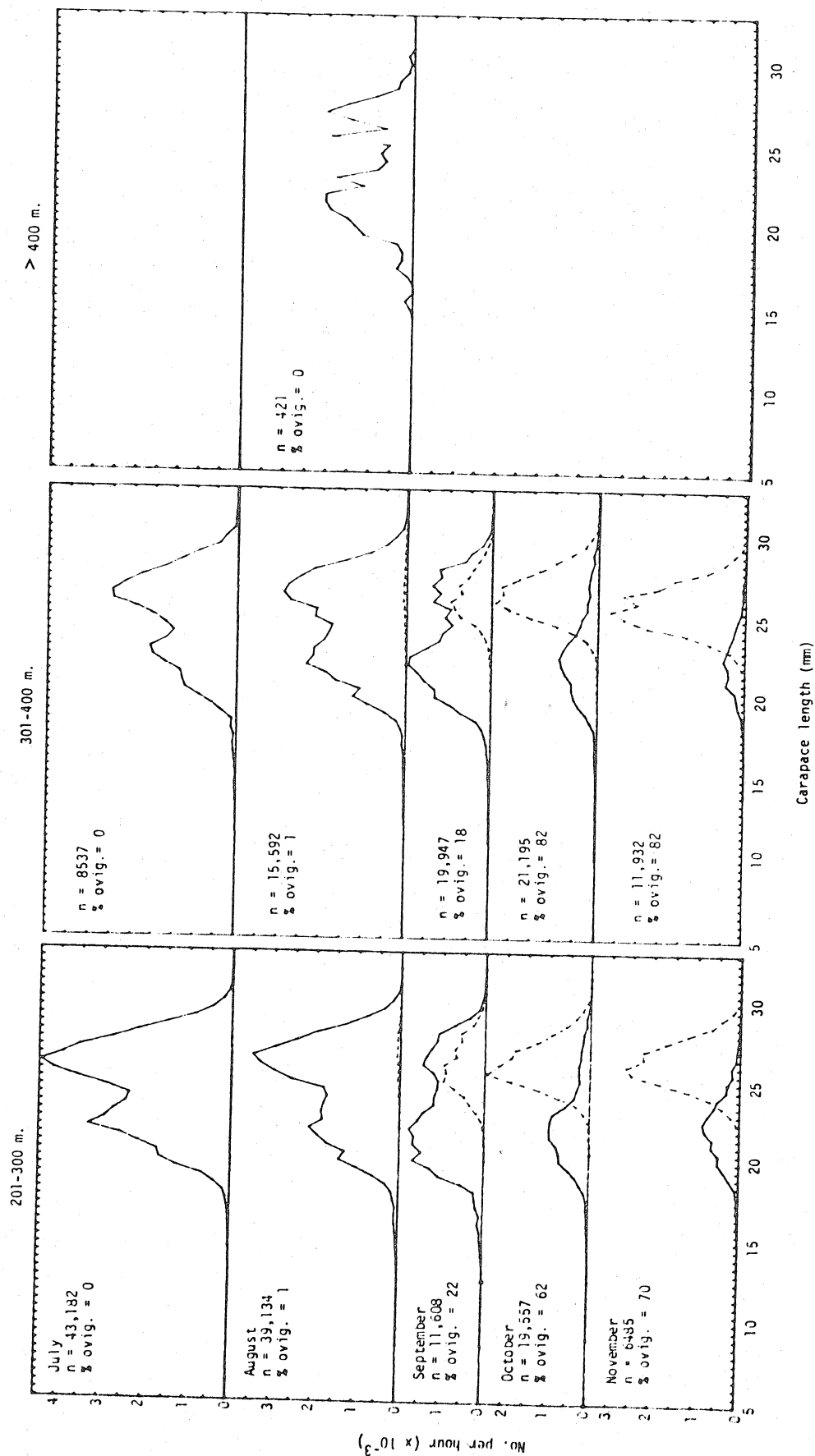


Fig.4. Commercial length frequencies, Division OA, 1983.  
( Ovigerous represented by broken line.)

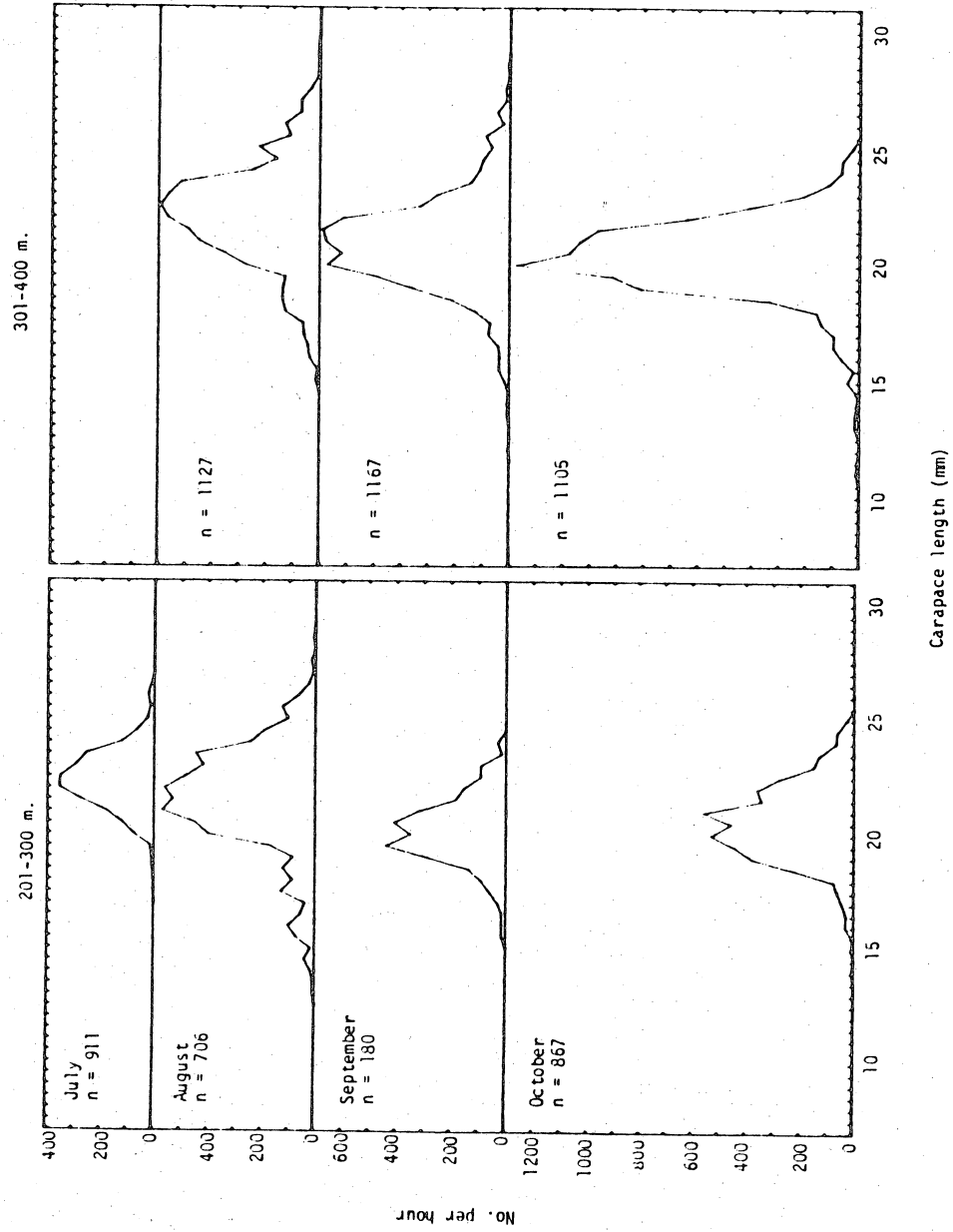


Fig.5. Length frequencies for discarded shrimp, Division 0A, 1983.