



SPECIAL MEETING OF STACRES - NOVEMBER 1978

Norwegian Investigations on the Deep Sea Shrimp, *Pandalus borealis*,  
in West Greenland waters 1977 and 1978

by

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1. Introduction

The Institute of Marine Research, Bergen, Norway, started investigations on the shrimp fishing grounds off West Greenland in 1976, and the results of the 1976 investigations are given in Ulltang and Øynes (1978). In this paper are given the results of the investigations which were carried out in 1977 and 1978.

Due to quota regulations, only 20 Norwegian vessels participated in the shrimp fishery in West Greenland waters in 1977. In 1978 the Norwegian quota increased from 7000 to 10 300 metric tons and 25 Norwegian vessels took part in the fishery. In both years the main fishing area was the continental slope off Store Hellefiskebank. The fishing gear and technique were the same as in previous years, and are described by Ulltang and Øynes (1978).

2. Material and Methods

From 25 June to 12 July 1977 one of the authors made observations on board the Norwegian shrimp trawler M/V "Kap Farvel", a 135 foot stern trawler of 454 tons, where a 1800-mesh Sputnik trawl, with a 51 m ground rope and 43 mm mesh size, was used.

From 20 July to 4 August 1978 E. Moksnes from Department of Fisheries Biology, University of Bergen, made observations on board the trawler M/V "Pero". This ship had also an observer on board in 1976 (Ulltang and Øynes 1978). "Pero" fished with a 2200-mesh Wing trawl with a ground rope of 62 m, and a 1800-mesh Sputnik trawl with a groundrope of 51 m. The mesh size used in both trawls was 41-43 mm.

Sorting machines which sorted the shrimp into "large" "small" and discards were used on board both trawlers. For a further description of the working routine, see Ulltang and Øynes (1978).

Tables 1-2 give data for the trawl hauls which were examined by the observers in 1977 and 1978.

### 3. Size composition of shrimp

Length compositions of shrimp in samples of total catch and discards collected by the observers on board "Kap Farvel" in 1977 and "Pero" in 1978 are shown in Tables 3-4. In Table 5 and Fig. 2 are shown weighted mean length compositions (catch as weighting factor) for the years 1976-1978. In 1976 and 1978 all samples are from the slope of Store Hellefiskebank, while in 1977 samples are also available from Disco field and Sukkertoppen Dyb. The samples from Store Hellefiskebank in 1978 are from the north-western slope (Fig. 1).

During the years 1976-1978 catches were sampled from only one trawler during a period of less than a month. Comparisons between the three years can only be made for one area (Store Hellefiskebank). In 1976, the catches from Store Hellefiskebank consisted of two main size groups, one group around 21-22 mm carapace length and the other around 26 mm (Fig. 2). The latter group was dominant. In 1977 the main

bulk of the shrimp from this area was around 22 mm carapace length, and the length composition from Sukkertoppen Dyb was very similar. The shrimp caught at Store Hellefiskebank in 1978 had a length composition intermediate those of 1976 and 1977.

The rather peculiar mean length composition from the Disco Field in 1977 reflects rather large variation between samples.

The material from 1976 and 1977 was analysed for possible depth differences in length compositions, but no depth effects could be demonstrated.

Because of the limited sampling, no firm conclusions can be drawn about changes in size composition of the shrimp over the period 1976-1978, but the material indicates that no drastic changes have occurred.

Size compositions of discards for 1977 and 1978 are shown in Fig. 3. In 1977 the observer on board "Kap Farvel" found a discard rate of 21.7% and 13.1% at Store Hellefiskebank and Sukkertoppen Dyb respectively. In 1976 and 1978 the observer on board "Pero" found a discard rate at Store Hellefiskebank of 8.4% and 10.0% respectively.

The observations were made a little earlier in summer in 1977 than in 1976 and 1978, and this probably explains the differences in discard rates and in length composition of discards between 1977 and 1978. In 1977 a significant part of the shrimp was still soft shelled at the time of the observations and therefore significant quantities of larger shrimp were discarded by the sorting machines.

#### 4. Bycatches

Tables 1-2 show the bycatches in some trawl hauls of M/V "Kap Farvel" in June/July 1977 and of M/V "Pero" in July/August 1978. The fish are given as numbers of individuals. In some cases the number of red fish are estimated in thousands. No fish were kept except those eaten on board. These bycatches are from a total catch of 32 759 kg shrimp in 1977 and 65 511 kg shrimp in 1978 (discards not included).

Bycatches continued to be small both in 1977 and 1978. As in 1976 redfish were most numerous. Except at Sukkertoppen Dyb in 1977 all the redfish were small (Fig. 4-5). Only 124 cod were found in the catches of M/V "Kap Farvel" in 1977. On the northern stations (Tow No. 1-4) the cod in Table 1 is Gadus ogac. During the sampling period on board M/V "Pero" in 1978 only 20 cod were found. Of these were 8 Gadus ogac.

Greenland halibut was less numerous in 1977 and 1978 than in 1976. No Greenland halibut fry were found in 1977.

A seal (Pusa hispida) was caught 30 June 1977 in position N 67°41' W 57°25'.

#### 5. Catch and Catch per Unit of Effort

Table 6 shows catch and catch per hour trawling (CPUE) for 1977 and 1978 by month and division. The 1978 data are not complete, as some logbooks had not been returned, and some fishing still was going on, at the time of this analysis. A mean CPUE, calculated as total catch divided by total effort, is given for each division and year. Annual mean CPUE values for the period 1975-1976 are based on the monthly data given by Ulltang and Øynes (1978). It should be noted that Ulltang

and Øynes (1978) calculated the mean CPUE by weighting the monthly CPUE by the monthly catches, which gave slightly higher values than those in table 7. As discussed by Ulltang and Øynes (1978), a better weighting factor would be the monthly fishing effort, and using that factor is equivalent to divide annual catch by annual effort. The largest difference between the two sets of mean values occurs in Div. 1B in 1976, and this gives some decrease in CPUE from 1975 to 1976 according to Table 7, while Ulltang and Øynes (1978) found a slight increase.

The mean CPUE in Div. 1C and 1D was rather stable during the period 1975-1977, apart from a temporary increase in Div. 1C in 1976. In both divisions CPUE decreased in 1978. In Div. 1B there is a decreasing trend since 1975 with the largest drop from 1977 to 1978.

It is difficult to draw any firm conclusions from annual mean CPUE values, as the mean will depend on both fluctuations in abundance and the seasonal distribution of the fishing effort. In Fig. 6 are plotted monthly CPUE in Div. 1B for the years 1975-1978. It is seen that the main difference between 1978 and the previous years occurs during the period Jan.-May. In 1975-1977 CPUE was very high during parts of this period, while the 1978 values remain at a constant low level of 0.2 - 0.3 during all months for which data are available.

## 6. Discussion

It is difficult to draw any firm conclusions from the significant drop in commercial CPUE from 1977 to 1978 (Table 6, Fig. 4) without having additional information on shrimp distribution from research vessel surveys. It is known that the fishery during the first half of the year was severely

hampered by ice on the traditional main fishing areas. The effect of this on CPUE would depend on the distribution of the shrimp in relation to ice distribution and on the effect of ice on the size of the area swept per trawling hour. Very little information exists to throw further light on these problems. Generally one would expect that ice difficulties would result in some decrease in CPUE, but it is not possible to quantify it.

Although no firm conclusions can be drawn about the reasons for the drop in CPUE from 1977 to 1978, the size of this decrease, especially in Division 1B during the first half of the year gives rise to serious concern. Before having more exact information the conservative approach would be to assume that at least a part of the decline in CPUE is caused by declining stock abundance.

In Ulltang and Øynes (1978) stock size estimates for 1975-1976 are given, based on the swept area method. Because of the problems connected with the interpretation of the 1978 CPUE discussed above, no new stock size estimates are given in this paper. Stock size estimates may however, easily be calculated from the old ones if assumptions are made about how much of the decrease in CPUE is caused by declining stock.

Length compositions show no significant changes from 1976-1977 to 1978. Length compositions are, however, not available from the months and areas where the largest decrease in CPUE was observed.

#### Reference

ULLTANG, Ø and P. ØYNES. 1978. Norwegian Investigations on the Deep Sea Shrimp, Pandalus borealis, in West Greenland Waters. ICNAF Sel. Pap. No. 4.

Table 1. Total catch of shrimps and bycatch of fish from some trawl hauls made by M/S "Kap Farvel" at West Greenland in June/July 1977

Tow no.	Date	Time	Position		Towing time(hr)	Shrimp catch (kg.)				Bycatches (numbers)			
			N.lat.	W.long.		Large	Small	Total	Dis-card	Cod	Greenl. hal.	Red fish	Other fish
1	26 Jun	0820	68°13'	55°06'	2.00	308	66	374			75	145	34
2	26 Jun	1110	68°13'	55°06'	2.00	264	66	330		16	70	240	20
3	26 Jun	1350	68°15'	54°40'	1.00	132	22	154		4	21	114	7
4	26 Jun	1620	68°09'	55°33'	1.00	132	22	154		5	18	114	40
5	27 Jun	0655	67°42'	57°04'	2.42	780	240	1020	122		220	4000	120
6	27 Jun	0944	67°42'	57°04'	2.58	530	240	770	100	Not counted			
7	27 Jun	1335	67°42'	57°04'	2.50	300	130	430	200		107	2500	A few
8	27 Jun	1645	67°42'	57°04'	2.50	600	290	890	400	Not counted			
9	28 Jun	0510	67°13'	57°21'	2.33	950	220	1170		3	159	3500	50
10	28 Jun	1020	67°13'	57°21'	2.17	750	250	1000		Not counted			
11	28 Jun	1300	67°13'	57°21'	2.25			800			92	5500	20
12	29 Jun	0635	67°13'	57°21'	2.25	970	230	1200	300	3	378	5500	131
13	29 Jun	0935	67°13'	57°21'	2.25	950	250	1200		Not counted			
14	29 Jun	1220	67°13'	57°21'	2.17	770	220	990		2	135	6500	63
15	29 Jun	1510	67°13'	57°21'	2.17	750	250	1000		Not counted			
16	30 Jun	0845	67°41'	57°25'	1.67	220	175	395	180		36	261	1
17	30 Jun	1050	67°41'	57°25'	2.17	640	810	1450			112	344	1 seal
18	30 Jun	1325	67°41'	57°25'	2.08	615	725	1340			109	361	7
19	30 Jun	1840	67°41'	57°25'	2.00	640	660	1300		Not counted			
20	2 Jul	0755	64°15'	53°17'	3.17	900	460	1360	220	2	118	178	1
21	2 Jul	1200	64°15'	53°17'	3.00	925	310	1235		3	98	361	46
22	2 Jul	1545	64°15'	53°17'	3.33	840	290	1130		1	77	127	3
23	4 Jul	0745	64°15'	53°17'	3.17	530	150	680		2	32	66	13
24	4 Jul	1140	64°10'	53°15'	3.33	725	240	965		5	31	173	19
25	4 Jul	1535	64°10'	53°25'	3.50	330	90	420		1	14	38	0
26	5 Jul	0645	64°05'	53°10'	3.25	750	250	1000	150	6	34	155	53
27	5 Jul	1030	64°05'	53°10'	3.17	640	220	860		4	23	161	17
28	5 Jul	1420	64°05'	53°10'	3.50	680	220	900		3	19	231	27
29	6 Jul	0545	64°25'	53°10'	1.50	1200		1200		6	17	321	10
30	6 Jul	0855	64°25'	53°10'	1.92	350	110	460		1	7	410	17
31	6 Jul	1125	64°25'	53°10'	2.00	750	220	970		Not counted			
32	6 Jul	1410	64°25'	53°10'	2.00	440	130	570			9	1500	2
33	7 Jul	0815	64°15'	53°10'	2.17	530	150	680	100	4	18	231	A few
34	7 Jul	1105	64°21'	53°15'	2.33	1060	370	1430	200	2	77	200	4
35	7 Jul	1410	64°21'	53°15'	2.50	500	200	700	150	Not counted			
36	8 Jul	0345	64°21'	53°15'	3.67	810	200	1010	200	7	18	300	32
37	8 Jul	0750	64°21'	53°15'	3.17	660	220	880	150		8	150	27
38	8 Jul	1135	64°21'	53°15'	2.67	620	220	840			9	110	5
39	8 Jul	1450	64°21'	53°15'	3.42	620	310	930	150		9	123	A few
40	9 Jul	0615	64°20'	53°15'	3.00	920	180	1100	200	2	22	5000	49
41	9 Jul	0950	64°20'	53°15'	3.17	840	220	1060		7	79	4900	164
42	9 Jul	1335	64°20'	53°15'	3.33	730	260	990		Not counted			
43	10 Jul	0330	64°19'	53°17'	3.00	900	220	1120		Not counted			
44	10 Jul	0705	64°19'	53°17'	3.00	620	150	770		20	34	2000	138
45	10 Jul	1030	64°19'	53°17'	3.17	480	90	570		Not counted			
46	10 Jul	1415	64°19'	53°17'	3.00	620	180	800		8	11	1000	116
47	11 Jul	0515	64°20'	55°19'	2.50	726	286	1012		3	22	800	60
48	11 Jul	0845	64°20'	55°19'	3.00	1320	245	1565	250	Not counted			
49	11 Jul	1235	64°20'	55°19'	3.00	840	310	1150	150	2	54	2000	104
50	12 Jul	0720	64°20'	55°19'	3.00	480	110	590		2	29	2000	41
51	12 Jul	1055	64°20'	55°19'	3.00	680	220	900		Not counted			

\* Split trawl

Table 2. Total catch of shrimps and bycatch of fish from some trawl hauls made by M/S "Pero" at West Greenland in July/August 1978

Tow no.	Date	Time	Position		Towing time (hr)	Shrimp catch (kg.)				Bycatches (numbers)			
			N.lat.	W.long.		Large	Small	Total	Dis-card	Cod	Greenl. hal.	Red fish	Other fish
1	22 Jul	0755	67°31'	57°02'	3.08	630	270	900	90		155	75	99
2	22 Jul	1310	67°32'	56°43'	3.00	350	150	500		4	70	110	-44 *
3	22 Jul	1650	67°34'	56°58'	3.00	800	300	1100			45	10	44
4	23 Jul	0445	67°30'	56°42'	3.00	760	360	1120	187		110	600	55
5	23 Jul	0840	67°37'	56°56'	3.33								x
6	23 Jul	1255	67°30'	56°39'	2.33								x
7	23 Jul	1830	67°36'	56°56'	3.00	572	308	880	136		76	110	60
8	24 Jul	0355	67°57'	56°58'	3.00	308	154	462	50		185	500	50
9	24 Jul	0830	68°09'	56°59'	2.83	1970	730	2700	330	1	23	3000	2
10	24 Jul	1310	68°06'	57°01'	2.00	800	560	1360	115		12	2300	3
11	24 Jul	1600	68°11'	56°54'	2.25	800	560	1360	97		15	43	5
12	24 Jul	1920	68°13'	56°47'	2.50	980	420	1400	116		12	240	
13	25 Jul	0330	68°08'	57°02'	3.00	1002	418	1420	200		15	300	1
14	25 Jul	0720	68°12'	56°46'	3.00	1277	548	1825	166		26	95	2
15	25 Jul	1100	68°08'	57°01'	2.83	1150	700	1850	263		80	670	3
16	25 Jul	1450	68°12'	56°40'	3.00	990	660	1650	165		45	385	
17	25 Jul	1850	67°56'	56°57'	1.58	616	352	968	97		15	300	
18	26 Jul	0550	68°14'	56°36'	3.00	740	316	1056	132		32	105	
19	26 Jul	1055	68°11'	56°56'	2.50	814	484	1298	130		30	150	4
20	26 Jul	1305	68°12'	56°40'	3.17	814	440	1254	156		151	1200	10
21	26 Jul	1705	68°08'	57°02'	3.00	900	480	1380	153		85	1500	13
22	26 Jul	2050	68°13'	56°44'	3.50	480	220	700	70		150	150	50
23	27 Jul	0515	68°14'	56°39'	2.75	520	540	1060	155		35	140	5
24	27 Jul	0840	68°15'	56°20'	3.00	1276	528	1804	164		55	650	19
25	27 Jul	1400	68°12'	56°43'	2.50								x
26	27 Jul	1745	68°14'	56°13'	3.00	1056	1282	1338	300		40	350	10
27	27 Jul	2120	68°13'	56°34'	2.83	915	385	1300	130		85	1500	15
28	28 Jul	0530	68°13'	56°35'	3.00	924	555	1479	145		160	1100	30
29	28 Jul	0920	68°14'	56°14'	3.17	902	660	1562	223		68	1000	11
30	28 Jul	1330	68°14'	56°29'	3.00	840	735	1575	225		125	1000	16
31	28 Jul	1740	68°15'	56°11'	3.00	660	462	1122	110		90	1000	21
32	28 Jul	2210	68°13'	56°29'	3.00	946	572	1518	213		110	4000	18
33	29 Jul	0615	68°13'	56°31'	2.75	750	500	1250	170	1	65	400	14
34	29 Jul	0945	68°13'	56°12'	3.00	1240	460	1700	178	1	100	1400	58
35	29 Jul	1345	68°13'	56°14'	2.17	682	352	1034	148	3	42	1000	63
36	29 Jul	1710	68°14'	56°09'	3.00	726	352	1078	100		32	6000	18
37	29 Jul	2215	68°12'	56°31'	3.00	610	290	900					
38	30 Jul	0710	68°13'	56°28'	3.00	594	374	968	100		Not counted		
39	30 Jul	1115	68°15'	56°03'	3.08	660	440	1100	138		57	107	29
40	30 Jul	1500	68°13'	56°24'	2.83	570	260	830	80	1	35	750	26
41	30 Jul	1920	68°15'	56°02'	1.00	70	30	100			6	95	17
42	31 Jul	0810	68°02'	57°10'	3.00	594	242	836	70		38	800	10
43	31 Jul	1230	67°57'	56°53'	3.00	1232	330	1562			105	1000	38
44	31 Jul	1700	68°03'	56°58'	3.00	616	176	792	72		93	5000	25
45	31 Jul	2110	67°56'	57°01'	2.00	330	110	440			21	400	11
46	1 Aug	0645	68°01'	56°53'	3.00	770	198	968	80		43	150	13
47	1 Aug	1130	67°59'	56°56'	3.00	616	132	748	62	4	115	73	38
48	1 Aug	1445	68°01'	57°04'	3.00	760	176	936	76		104	3000	18
49	1 Aug	1850	67°53'	56°56'	3.00	1000	325	1325	100		132	1000	36
50	2 Aug	0220	67°57'	56°56'	2.75	1174	396	1570	170	3	42	425	26
51	2 Aug	0915	67°53'	56°51'	3.00	2134	792	2926			49	560	8
52	2 Aug	1310	67°46'	57°05'	3.00	1276	352	1628	100		31	100	17
53	2 Aug	1705	67°51'	56°59'	3.00	1298	396	1694	130		35	1000	13
54	2 Aug	2050	67°46'	57°06'	2.67	680	320	1000	70		135	1000	36
55	3 Aug	0525	67°46'	57°06'	3.00	781	231	1012	100		64	450	32
56	3 Aug	0855	67°52'	56°56'	3.00	1100	308	1408	110	2	47	210	16
57	3 Aug	1240	67°46'	57°10'	3.00	410	175	585	52		64	600	41
58	3 Aug	1620	67°41'	57°22'	1.00	150	50	200			3	105	11

\* Split trawl



Table 3. Length composition of shrimp caught by M/V "Kap Farvel" in June/July 1977.  
Random samples of the catch and of discarded shrimp.

Tow	Length (mm carapace)																														
	Depth	No. 10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Tot.							
Disco field	270-276	1			1	1			3	3	13	14	12	10	5	9	11	9	7	4					102						
	307-288	2				2	3	5	14	11	20	8	11	4	7	6	2	2	2	4	1				100						
	417-390	3				1	1	1	1	4	14	8	16	13	8	3	7	16	5	4					102						
	194-184	4						1	1	3	4	7	2	6	6	2	13	9	17	8	5			83							
Total			1	1	1	3	4	10	21	32	55	30	43	28	26	33	27	42	21	10				387							
W.slope of Store	214-227	5			2	6	7	10	12	11	5	8	5	8	6	6	6	4	3	5	2				100						
	214-220	7	1	3	5	14	14	7	4	6	9	7	2	5	6	13	5	5	1	1				111							
	226-224	12	1	2	4	2	4	2	5	3	5	5	7	6	5	18	19	13	7	4			1	115							
Helle-fiskebanke	288-290	16			1	1	1	2	7	11	14	29	15	5	4	3	4	3	1	1				101							
	291-293	17			1	1	2	2	8	8	13	32	12	7	5	6	4	4	7	5	2			101							
	284-290	19	3	2	2	2	2	5	2	3	9	10	18	18	8	4	4	4	7	5	2			104							
Total			3	2	7	5	11	26	28	26	27	38	47	57	93	64	37	50	41	36	21	10	2	1	632						
Sukker-toppen	385-360	20				1	1	1	1	3	1	9	17	12	14	5	9	6	5	1					85						
	349-346	26			1	1	1	2	2	3	5	7	16	19	10	9	7	12	6	1	2			104							
	315-303	33			1	1	2	2	7	12	12	9	8	14	6	3	4	6	5	2	1		1	96							
	414-336	38	2	1		3	2	3	4	5	9	18	6	18	11	6	3	2	5	3	3			104							
	294-277	45				1	9	9	7	8	9	5	10	5	2	12	7	7	3	4				98							
Total			2	2	1	4	7	15	23	27	35	42	35	75	53	35	33	31	35	19	10	2	1	487							
Dis-cards	5			1	2	12	6	5	13	15	18	12	9	4	1	1	1	1	1					100							
	12	1	8	4	4	7	6	7	10	16	12	13	4	5	1	1	1	1	1	1		1		102							
	20		1			1	3	2	1	9	12	27	26	7	4	1	1	1	1					95							
	26				2	6	3	6	13	21	25	15	2	1	2									96							
	33		1		2	5	5	11	9	16	20	18	8	6										101							
	38		1	1	1	3	8	5	16	21	19	14	3	1	1	2	1	1	1	1				98							
	45	1			1	1	4	6	5	11	20	21	14	4	1	4	3							96							
Total			2	1	11	5	9	28	31	43	50	88	121	120	91	50	12	13	8	2	1		2	688							



Table 5. Weighted mean length compositions (%) of shrimp caught by M/V "Pero" in July-August 1976 and 1978 and by M/V "Kap Farvel" in June-July 1977.

Year	Area	Carapace length (mm)																							
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
1976	Slope of Store Hellefiskebank	0.1	-	-	0.1	0.2	0.3	0.7	1.9	3.3	5.0	9.2	9.3	5.1	7.2	15.8	19.9	14.2	6.3	1.1	0.1				
1977	Disco field																								
	Slope of Store Hellefiskebank	0.7	0.3	1.0	0.5	1.4	3.1	3.4	4.1	4.4	6.0	7.0	9.1	16.1	10.7	6.1	7.6	7.0	6.0	3.5	1.6	0.3	0.2		
	Sukkertoppen Dyb	0.4	0.3	0.2	0.7	1.4	2.3	3.7	4.4	6.2	7.3	7.8	16.4	12.1	9.1	6.6	7.0	7.4	4.4	1.8	0.4	0.1			
1978	N.W. Slope of Store Hellefiskebank	0.2	0.1	0.1	0.5	0.4	2.1	4.0	3.2	6.1	5.4	5.7	7.4	8.1	7.5	8.6	13.0	11.3	8.8	5.3	1.9	0.3	0.1		

Table 6. Catch (metric tons) and catch per hour trawling (CPUE) by month and division, 1977 and 1978 (1978 data are preliminary; CPUE is calculated as total catch / total effort).

Year	Month	0A		1A		1B		1C		1D		1E		Total Catch Subarea 1
		Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	
1977	Jan	-	-	-	-	471	0.746	8	2.67	5	0.313	10	0.323	494
	Feb	-	-	-	-	805	0.752	-	-	-	-	-	-	805
	Mar	-	-	-	-	230	1.036	-	-	18	0.353	-	-	248
	Apr	-	-	-	-	296	0.441	10	0.250	32	0.274	-	-	338
	May	-	-	-	-	1799	0.488	2	0.167	-	-	-	-	1801
	Jun	-	-	-	-	446	0.263	4	0.250	149	0.320	-	-	599
	Jul	-	-	-	-	651	0.396	84	0.225	364	0.256	-	-	1099
	Aug	-	-	-	-	736	0.348	-	-	13	0.333	-	-	749
	Sep	50	0.212	6	0.200	520	0.265	-	-	-	-	-	-	526
	Oct	99	0.220	11	0.244	250	0.190	-	-	-	-	-	-	261
	Nov	1	0.125	-	-	410	0.330	-	-	-	-	-	-	410
	Dec	-	-	-	-	21	0.212	2	0.054	-	-	-	-	23
	Total	150	0.216	17	0.227	5635	0.409	110	0.229	581	0.275	10	0.323	7353
1978	Jan	-	-	-	-	5	0.111	68	0.167	336	0.211	-	-	409
	Feb	-	-	-	-	742	0.206	69	0.158	186	0.146	-	-	997
	Mar	-	-	-	-	317	0.207	113	0.148	56	0.095	-	-	486
	Apr	-	-	-	-	454	0.269	11	0.090	29	0.111	-	-	494
	May	-	-	-	-	794	0.250	-	-	1	0.083	-	-	801
	Jun	14	0.269	5	0.218	337	0.226	72	0.220	193	0.163	-	-	607
	Jul	-	-	-	-	659	0.248	8	0.131	11	0.092	-	-	723
	Aug	-	-	-	-	871	0.280	-	-	14	0.70	-	-	990
	Sep	-	-	-	-	91	0.281	2	0.111	37	0.41	-	-	130
	Total	14	0.269	161	0.374	4270	0.242	343	0.164	863	0.168	-	-	5637

Table 7. Mean catch per hour trawling by ICNAF Division and year (including only values based on more than 100 tons of catch).

Year	ICNAF Division			
	0 A	1 A	1 B	1 C
1975			0.510	0.225
1976			0.452	0.323
1977	0.216		0.409	0.229
1978		0.374	0.242	0.164

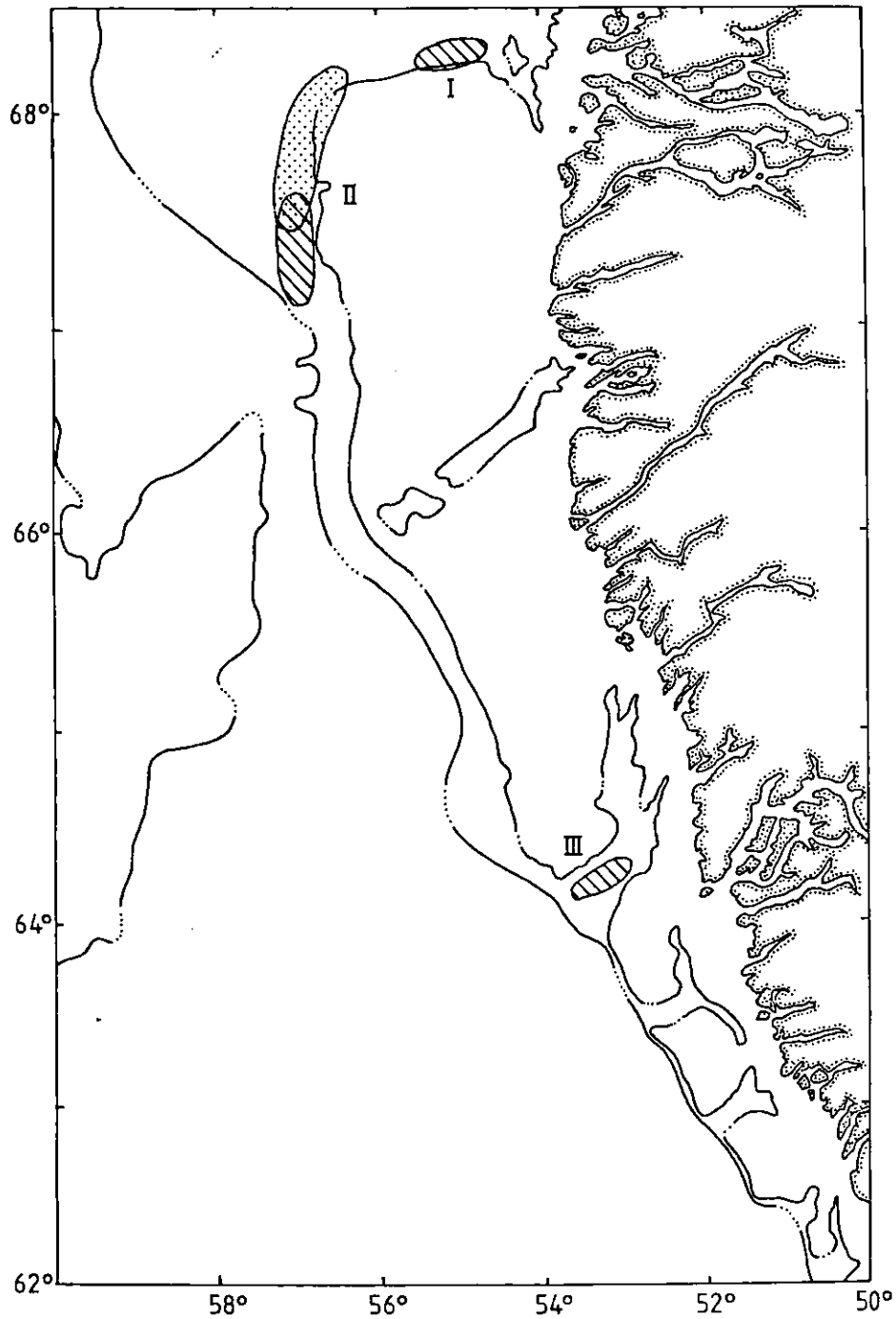


Figure 1. Fishing areas during the stay of the observer in 1977 and 1978: southeast of Disco Bugt (I), slope of Store Hellefiskebank (II), and Sukkertoppen Dyb (III).

— 1977  
... 1978

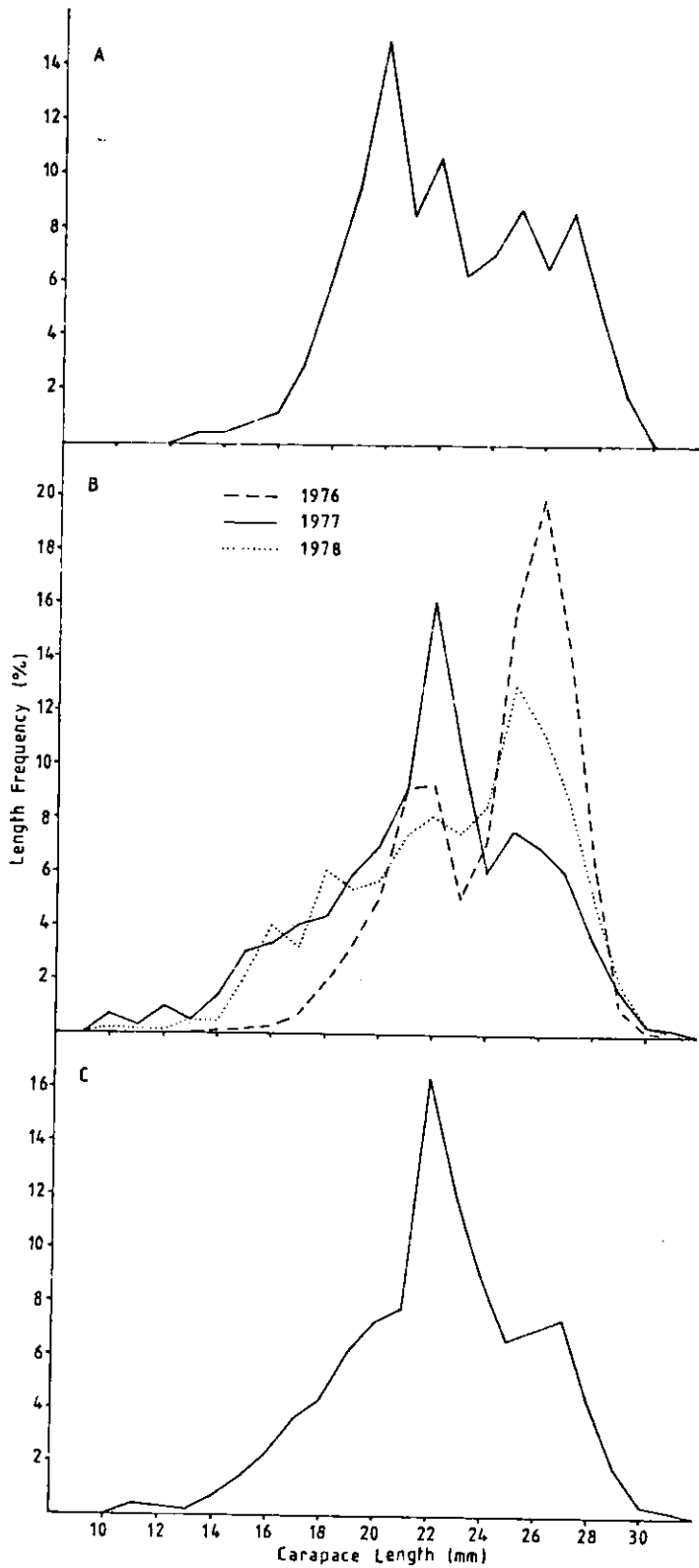


Figure 2. Weighted mean length compositions of shrimp caught at Disco field June/July 1977 (A), Store Hellefiskebank July/August 1976, June/July 1977 and July/August 1978 (B), and Sukkertoppen Dyb June/July 1977 (C).

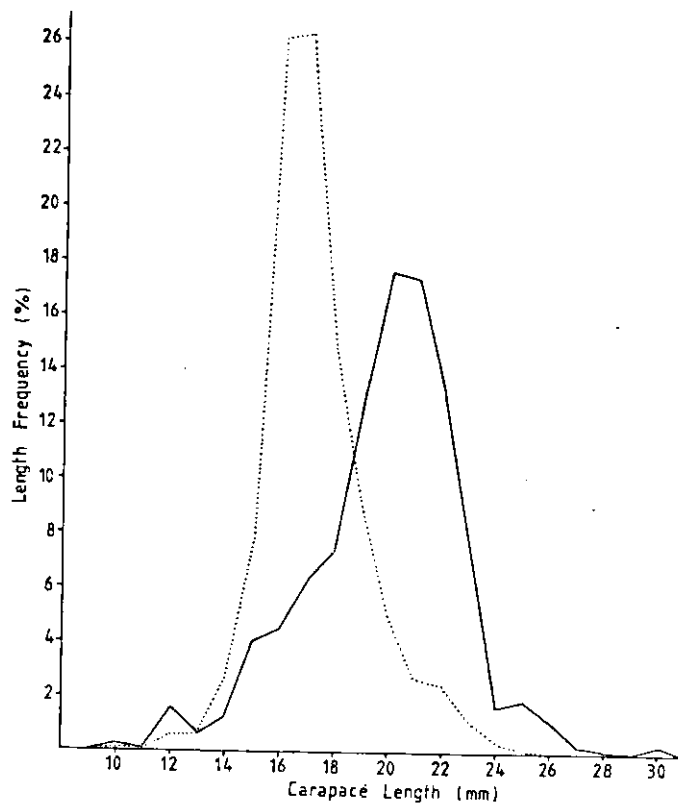


Figure 3. Mean length compositions of discarded shrimp June/July 1977 (solid line) and July/August 1978 (dotted line).

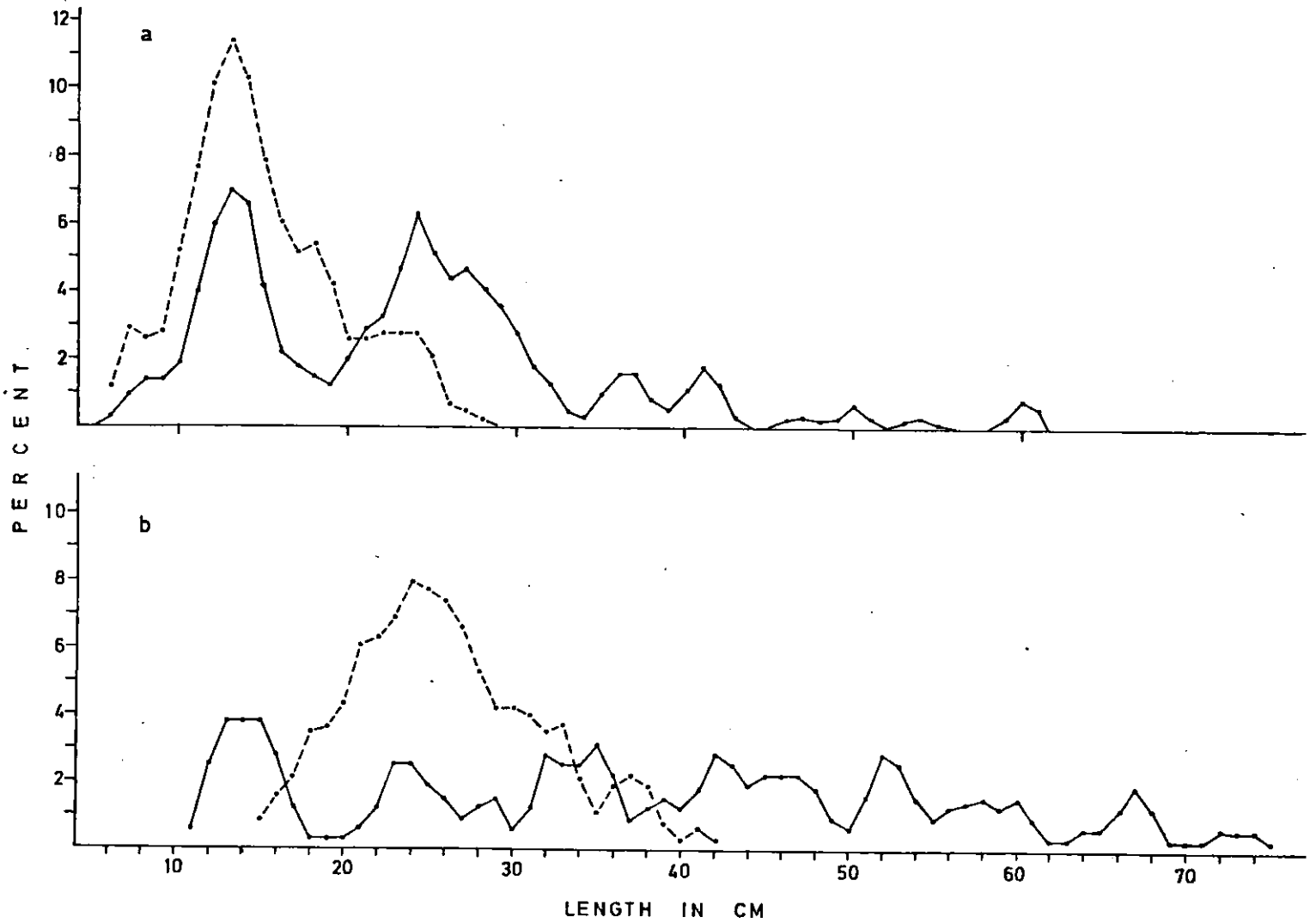


Figure 4. Length compositions of bycatches of redfish (a) and Greenland halibut (b) caught by M/V "Kap Farvel" June/July 1977 at Sukkertoppen Dyb (solid line) and Store Hellefiskebank (broken line).



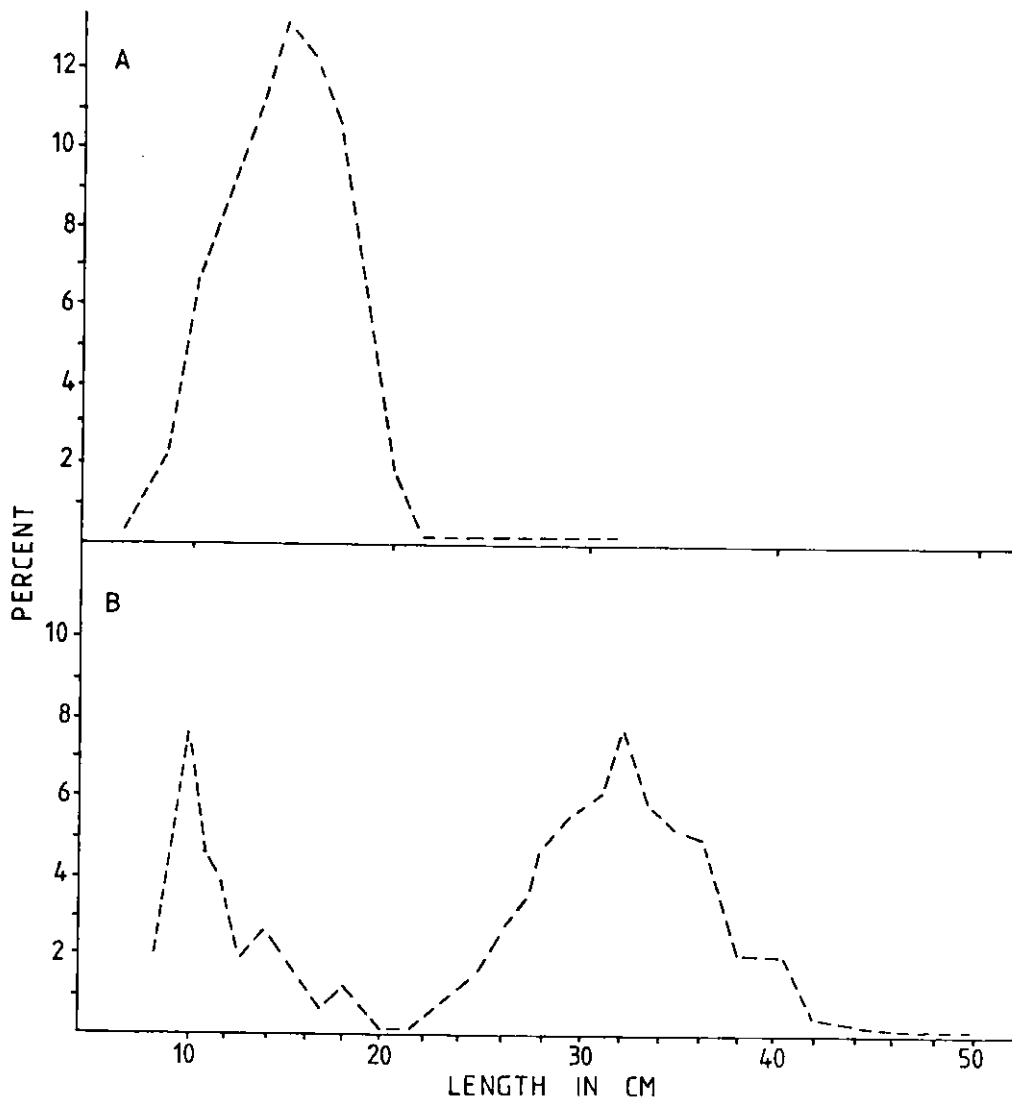


Figure 5. Length compositions of bycatches of reef fish (a) and Greenland halibut (b) caught by M/V "Pero" July/August 1978.

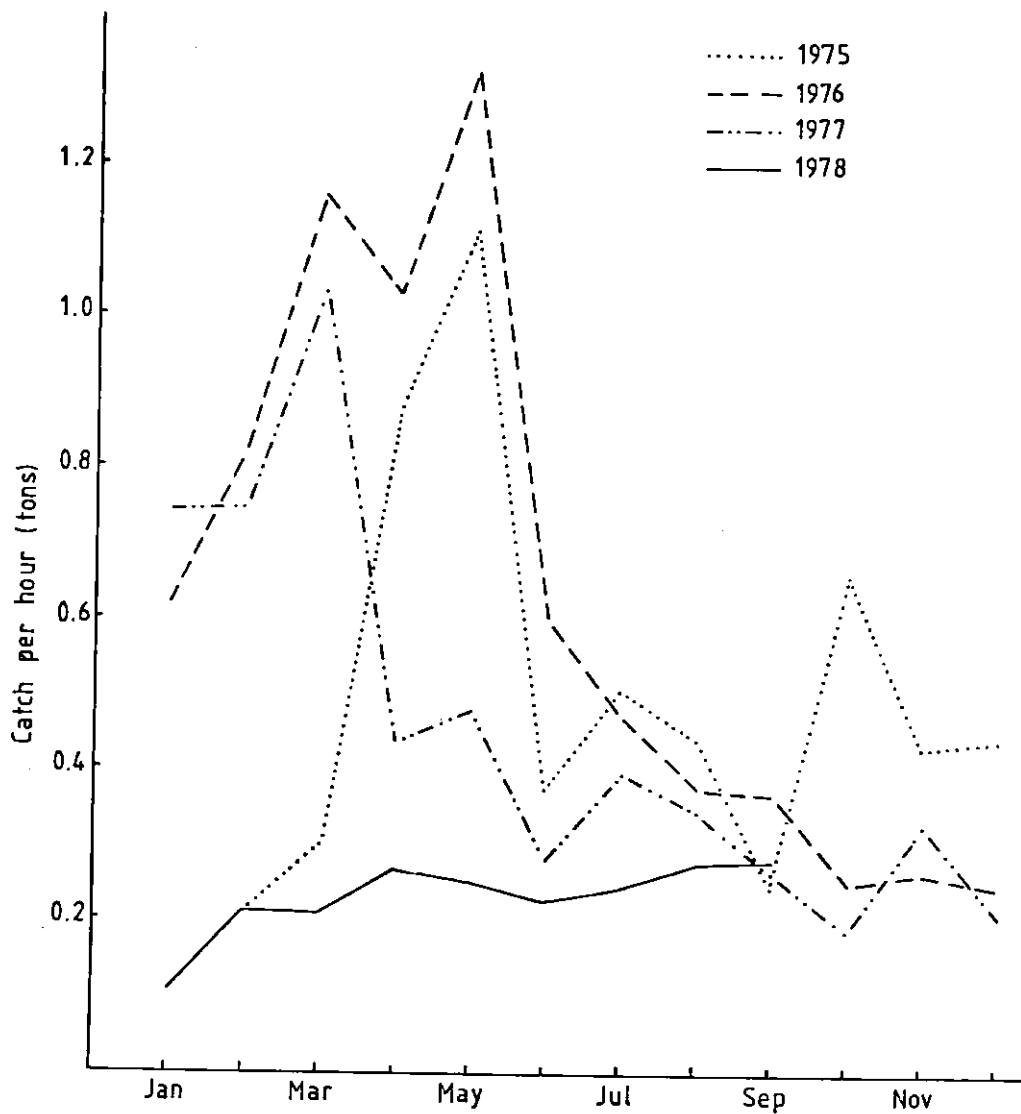


Figure 6. Mean catch per hour trawling of Norwegian shrimp trawlers in Div. 1B plotted against month for 1975, 1976, 1977 and 1978.