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The Greenland Fishery for Northern Shrimp (*Pandalus borealis*) in Davis Strait in 1994 and January-October 1995

by

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Introduction

In November 1993 Scientific Council recommended that shrimp in Div. 0A and Subarea 1 both north and south of 71°N and in inshore areas be assessed as a single stock. At its meeting in November 1994 it was concluded that due to lack of catch rate and catch composition data in the inshore areas, it was most appropriate to review data from each of the three areas separately. Hence STACFIS adviced a TAC of shrimp in all of NAFO Div. 0A and Subarea 1 to be set at 60,000 tons for the year 1995.

Two fleet components, named the offshore- and the small-vessel fleet exploit the stock. The separation is based on vessel size. Vessels above 75 GRT belong, by definition, to the offshore fleet and are restricted to offshore areas and by quotas. An exception from the "offshore-only" rule applies to eight 79 GRT vessels, which have a small quota in inshore areas. Vessels below 75 GRT belong to the "small-vessel fleet" which are unrestricted by areas and quotas.
Since 1986 logbooks have been mandatory for all vessels above 50 GRT fishing in Greenland waters. Catch from vessels below 50 GRT can only be estimated from sales slips. Logbooks from the small-vessel fleet component between 50- and 75 GRT are considered incomplete until 1990.

Trawlers above 75 GRT in 1994 reported a total catch in Subarea 1 of 44,448 tons including 1,712 tons taken in the inshore areas. Catches of smaller vessels in 1994 are estimated to 27,359 tons, of which about 16,400 tons were taken in the inshore area. This brought the total catch by Greenland vessels in 1994 up to 71,800 tons.
The reported catches by the offshore fleet in 1995 until October totalled 36,766 tons, of which 1,419 tons was taken inshore. Catches by the small-vessel fleet amounted to 16,090 tons, of which 8,224 tons was taken inshore. This sums to a preliminary total catch in 1995 of 51.707 tons which is at the same level as the 1994-catch in the same time period.

The present paper updates information on reported catch and effort of the two fleet components and the allocation of the inshore/offshore catch for the years 1990-1995. Geographical distribution, standardized and unstandardized catch rates and size composition of the commercial catches are also compared and presented.

Materials and methods

Based on compulsory weekly reporting to Greenland authorities by vessels above 75 GRT, total catch and number of vessels in the shrimp fishery in NAFO Subarea 1 in 1994 and the first three quarters of 1995 were compiled by nation and month.

Logbook data were analysed to show the spatial distribution of the fishery and the overall distribution of catches by year, and of catch, effort and catch rates by month.

Total landings from vessels below 75 GRT was allocated to inshore/offshore areas, based on information from logbooks and sales slips.
From 1990 and onward vessels with logbook was split out from the "landings"-database (containing sales slips data) and analysed separately. Information from vessel logs on catch, effort and catch rates from the small-vessel fleet were compiled in an inshore/offshore component. From the remaining part of the small-vessel fleet the catches in inshore/offshore areas were estimated from the "landings"-database.

Logbook data from 33 Greenland trawlers from the offshore fleet were used in a multiplicative model (Carlsson & Lassen, 1991) to calculate standardized annual catch rate indices for the years 1987-1995 in Div. 1B and Div. 1CD. Indices were calculated for total catch, and - to avoid the influence of unreported discard of smaller shrimp - for shrimp larger than 8.5 g (Carlsson & Lassen, 1991).
Catch and effort were aggregated by vessel, month, year and area (areas have been selected based on the distribution of the commercial fishery (Siegstad *et al.*, 1994). The analysis was carried out for Div. 1B and Div. 1CD separately due to differences in seasonality.
All cells in the matrix with less than 10 hours of effort or with 10% or more of the catch not being sorted by shrimp size were excluded to avoid the influence of cells with few hauls and non-sorted catch..
Significant interactions between year-month, year-vessel, and vessel-month exist in the data but their contribution to the variation is small in relation to that explained by the main effects (vessel, month, year). The final analysis were therefore run with main effects only.

Size composition of shrimp catches by year were generated from samples from the commercial fishery (offshore fleet). Samples taken by observers before processing were sorted by sexual characteristics (McCrary, 1971) and measured to the nearest 0.1 mm carapace length. The data were then pooled in 0.5 mm length groups and adjusted by ratio of weight to the number caught in the set. Numbers from all sets for the month were totalled and adjusted by weight to the monthly catch reported in vessel logs. The numbers from all months were totalled and adjusted by weight to the total catch of the year.
Annual length frequency distributions of total catches in Subarea 1 were analysed by modal analysis (Macdonald & Pitcher, 1979) to isolate year classes and determine their proportions. The number of age components in the catch and initial estimates of their mean lengths were based on the findings of Sarvard *et al.* (1994). The iterations were run with all coefficients of variations held fixed at an value at 0.048 (Parsons & Veitch, 1991). An catch-at-age table was produces by multiplying proportions and total number caught. Age specific indices of abundance were then produced by dividing the numbers caught at age by the effort.

Results and Discussion

Catches and fishery of the Small-vessel fleet from 1990 to October 1995.
Table 1 shows the total landings of shrimp from the small-vessel fleet (<75 GRT) by year from 1990 to 1995 as calculated from sales slips. The landing of shrimp has increased steadily from about 20,000 tons in 1990 to 27,000 tons in 1994. Data from 1995 covers only the period January to August, but is at the same level as January-August landings in 1994.

In relation to fishing pattern logbook data is considered to be more accurate than sales slips, for which reason vessel with logbook is split out from the "landings"-database. From 1990 to 1995 almost half of the landings of shrimp from smaller vessels is covered by logbooks information. An inshore/offshore allocation of catches is estimated for vessels with and without logbooks (Table 1).

Figure 1 and table 1 show how catches are distributed between inshore and offshore areas and the proportion of unidentified catch for the two vessels components. From 1990 onward data from vessels with logbooks show that 50 to 55% of the catches is from the inshore areas. For vessels with no logbook, data from sales slips identified a large proportion of inshore catch - except from 1993 and 1994 where the inshore/offshore proportions were almost equal. However, the proportion of unidentified sales slips has also increased to 60% of the catches in the same two years.

The catches in inshore areas were relatively stable during 1990-1995 and showed no shift in effort to offshore areas as previously suggested in Anon. (1994) and by Andersen (1994). Table 2 shows the nominal catch by Greenland in Subarea 1, with distribution between inshore and offshore catches for 1990 to 1995.

Table 3 show the catch and effort as reported in logbook from smaller vessels in inshore and offshore areas. A seasonality is clearly evident as very little effort is spent in the inshore areas in February-April. At that time of the year the main effort is allocated to the offshore areas. An opposite shift from the offshore to the inshore area is seen in late autumn.
Table 3 and figure 2 show the unstandardized catch rates by month for vessels < 75 GRT in the inshore and offshore areas from 1990 to 1995. The catch rates fluctuated during the seasons in both offshore and inshore fishery. High catch rates is seen every year in May in the inshore fishery, probably a reflection of that the areas has been inaccessible because of ice for a period. The overall catch rates seem stable in both the inshore and offshore areas.

Reported Catches from the offshore fleet *1994 - October 1995*

Table 4-5 show catches and the number of reporting vessels in NAFO Subarea 1 by month and division in 1994 and 1995 as reported to Greenland authorities.
Total reported catch in 1994 was 44,448 tons, an increase from the 43,163 tons reported in 1993. The preliminary catch figures for 1995 is at the same level as at the corresponding figures in 1994, i.e. 36,766 tons. A total of 32 vessels participated in the fishery in 1994 (table 5) and until October 1995 also 32 vessels have been registered. More than 80% of the catches were confined to Div. 1B,C and D.

Geographical Distribution of the Greenland Fishery

Figure 3 and 4 show the geographical distribution of the Greenland catches in 1994 and 1995 respectively as recorded in vessel logs. As in previous years the fishery in 1994-95 were widespread over the fishing grounds along the coast. Most catch was taken in the middle area i.e. Div. 1B, C and D (>80%). The preliminary catch figures for 1995 do not suggest any significant changes in the distribution of the fishery from 1994 to 1995 except indications of a continuation of earlier years movement of the fishery southwards (fig. 3-4).
Figure 5 shows the monthly distribution of catch rates in 1994 and 1995 by statistical unit of 7.5' latitude and 15' longitude. As in previous years ice prevented access to the northern fishing areas in the beginning of the year. The fishing grounds north of 67°N were as in 1994 accessed in April - a month earlier than in 1993.

Catch, Effort and Unstandardized CPUE from Vessel Logs

Annual catch, effort and mean catch rates based on logbooks from vessels above 50 GRT are given in table 6 and graphically in figure 6.
In the nineties the annual fishing effort spent in SA 1 have been relative stable fluctuating around 165,000 hours. The 1995-level will be of the same order of magnitude but perhaps a little smaller as the preliminary figures of 1995 are about 12,000 hours short of the corresponding figures in 1994 (Siegstad & Carlsson, 1994). Catches have shown a slowly increasing trend from about 45,000 tons in 1989 to almost 57,000 tons in 1994. The catches in 1995 have until October reached the same level as at the same time in 1994, i.e. about 38,000 tons. As this was done with use of less effort catch rate went up in 1995 compared to three previous years of stability, to the highest level since 1989. The introduction of

twin trawling in 1995 contributed to this development as fishing with two trawls at a time almost doubles catch rate (Siegstad & Hvingel, 1995). However twin trawling in 1995 still only account for a small part of the total fishery and if we eliminate their effect from the calculated catch rate to make it comparable to previous years, it only drops about 5kg/hr. With or without twin trawlers unstandardized CPUE are showing an upgoing trend in 1995.

Standardized CPUE from Greenland Vessel Logs

Results of the multiple regression analysis to standardize catch rates of both large shrimp (>8.5 g) and total catch (table 8-11 and figure 8-11) show that all main effects are highly significant ($p<0.0001$) and their combined effects explain 44-48% of the variation in CPUE in Div. 1B and 1CD. All first-order interactions between the effects of year, month and vessel are also highly significant, suggesting that the effects of year on CPUE differs from month to month and from vessel to vessel. The contribution of these interactions to the variability within the data set however are small compared to that of the main effects thus the basic model without interactions were considered a good description of the data.

The annual catch rate indices of large shrimp and total catch as calculated from the regression analysis are presented i figure 12. In Div. 1B the two almost parallel curves are showing a declining trend from a relatively high level in 1987. From 1989 and on a more stable period starts only interrupted by a minor peak in 1993 which however was not significantly different from the 1995 index ($p>0.05$). Stability remained between 1994 and 1995 ($p>0.48$ for both the large-shrimp index and the all-shrimp index).

In Div. 1CD The large-shrimp index after an increase from 1987 to 1988 shows a slow but steadily decreasing trend over the years. From 1994 to 1995 however the CPUE-index increases significantly at the 5% level ($p=0,012$). The index for all shrimp confirmed this trend by also showing a significant increase from 1994 to 1995 ($p=0.0001$).

Length Distributions

Table 7 shows the number of samples taken and the number of individuals measured which form the basis of the analysis of length frequency distributions in the commercial fishery 1991 to 1995.

In figure 13 the 1995 monthly length frequencies by Division is shown. Any seasonal or spatial trends are difficult to worm out as the samples are not equally distributed along these variables. In Marts however an adequate number of samples were available to cover most of the fishing grounds along the Greenland west coast (left pile of length frequency distributions in figure 13).

In *Marts* 1995 Div. 1B apparently hosted the smallest catchable shrimps with a mean carapace length of 20.7mm. Males dominated making up 74% of the catches.

Further south in Div. 1C the male component of the catches is reduced to 51% and the female peak also noticeable in Div. 1B here consist of larger shrimps. Thus mean size is also larger than in the more northerly Div. 1B i.e. 22.6mm.

In Div. 1D catches looked a little more like in Div. 1B with a big male component around 20mm but here females comprise only 24% of the catches making the female peak almost absent in the overall length frequency distribution. Mean size caught was calculated to 21.2mm.

In the southernmost Division adequately sampled, Div. 1E, the largest mean shrimp size of 23.1mm was achieved. This was primarily caused by absence of the smallest males in the catches making males peak at 21.5mm compared to around 20mm or less in the other Divisions in Marts. Males and females comprise exactly equal proportions of the length distributions.

Modal analysis were applied to the annual length frequency distributions from 1991 to 1995 of the catches in SA 1 (figure 14). Estimated mean lengths (table 12) proved consistency over the years and agreed well with the findings in the previous ageing study by Savard *et al.* (1994).

In the years 1991 to 1995 mean shrimp size caught in Subarea 1 declined 1.7mm from 23.4mm to 21.7mm (figure 14). This was primarily caused by the left hand side of the length distributions below 20mm becoming larger as time went by. This observation was confirmed in the calculated proportions of age 1 to 4 which in concert increased constantly from 6.5% in 1991 to 16.2% of the total catches in 1995 (table 12). In the same time period the calculated mean age of the shrimp in the catches dropped from 6.2 to 5.9 years.

Catch rates for male shrimp have after a decrease from 1991 to 1993 increased to a maximum in 1995 while the female catch rates showed more or less the opposite trend (figure 7)

The estimated proportions caught at age (table 12) shows that the relative contribution of females in 1995 is the lowest recorded in the last five years probably saying that the 1985 year class now definitely has left the fishery. At the same time year class 4 account for the largest proportion of the total catches measured (12.3%) indicating a very good 1991 year class. The age specific catch rates (table 12) suggest that the 1991 year class is 50% better than the 1990 year class which also seems to be a year class above average, and about 2 to 3 times larger than the 1987-1989 year classes. It is also possible however that at change in the fishing pattern targeting smaller shrimp might produce the same effect but no signals about this were left within our data on geographical distribution of the fishery.
Thus the before mentioned decline in shrimp size may be caused by a combination of the large 1985 year class exiting the fishery and incoming of a good 1991 year class.

The conclusions or suggestions above should be viewed in the context that the annual length frequency distributions, although based on a huge amount of measured individuals, do not represent a complete coverage of the fishery in time and space.

Conclusion

In broad outline the geographical distribution of the fishery in Subarea 1 in 1994 was maintained in 1995. A continuation of earlier years movement southwards of the fishery is however indicated.
Landings of shrimp by the small-vessel fleet (<75 GRT) were estimated to about 27,000 tons in 1994 and is expected to reach the same level in 1995. Stability in size of catches by the offshore fleet from 1994 to 1995 is also suggested i.e. about 44,000 tons. This sums to a total catch by Greenland vessels of around 71,000 tons in 1994 and an expectation of total catches at the same level in 1995.
In the nineties the annual fishing effort spent in Subarea 1 have been relative stable around 165,000 hours. The 1995-level will be of the same order of magnitude or perhaps a little smaller as the preliminary figures of 1995 are about 12,000 hours short of the corresponding figures in 1994.
The catches of the small-vessel fleet in inshore areas were relatively stable during 1990-1995 and show no shift in effort to offshore areas as previously suggested (NAFO, 1994; Andersen, 1994).

The overall unstandardized catch rates of the small-vessel fleet seems stable in both the inshore and offshore areas from 1990 to 1995. The introduction of twin trawling in 1995 biased the overall unstandardized CPUE for the vessels above 50 GRT upwards, but even without these sets in the calculation the unstandardized CPUE went up from 1994 to 1995 to the highest level since 1989.
The decline in the standardized large-shrimp CPUE's from 1993 to 1994 may be explained by the 1985 year class contributing considerably less to the fishery and comparatively lesser strength of the 1986, 1987 and 1988 year classes as also noted by Parsons & Veitch (1994).
From 1994 to 1995 the standardized CPUE's of Div. 1B show stability while those of Div. 1CD increases. This increase was also shown in the unstandardised CPUE of all of Subarea 1. Increase in male shrimp abundance seems to be the main cause of the improved catch rates. Especially age 4 shrimp is strongly represented in the catches compared to previous years which may indicate incoming of a strong 1991 year class. Also the 1990 year class strength seems above average. With the 1985 year class practically out of the fishery the 1996 shrimp catches will depend on the strengths of the 1988-1991 year classes (this years age 4 to 7). Except for age 7 these age groups all showed increase in catch rate from 1994 to 1995.

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Table 1. Total catches (tons) by the small-vessel fleet (<75 GRT) by vessels with mandatory logbooks and vessels <50 GRT without (+log/-log; figure in brackets equals the number of vessels with logbooks). Allocation to the inshore/offshore areas are shown as calculated from the logbooks and weighted up to total catch (1995 incomplete).

Year	Landings (total)	+log/-log	Off-shore	In-shore	Unidenti-fied	Landings	Offshore (Weighted)	Inshore (weighted)	Offshore (weighted) total	Inshore (weighted) total
1990	20426	+log (16)	3151	3518	1021	7690	3633	4057	6639	13787
		-log	1282	7463	3991	12736	3006	9730		
1991	23943	+log (15)	3521	4852	1795	10168	4276	5892	7266	16677
		-log	1177	6317	6281	13775	2990	10785		
1992	25789	+log (16)	3676	5952	1209	10837	4138	6699	7239	18550
		-log	1357	6277	7305	14952	3101	11851		
1993	26651	+log (19)	5278	6290	1170	12738	5812	6926	10887	15764
		-log	2693	2565	8655	13913	5075	8838		
1994	27359	+log (17)	5215	6750	688	12653	5515	7138	10953	16406
		-log	2672	3149	8885	14706	5438	9268		
1995	16090	+log (15)	3487	3544	513	7544	3741	3803	7866	8224
		-log	1483	2620	4443	8546	4125	4421		

Table 2. Nominal catches by Greenland in Subarea 1, 1990 to September 1995. The distribution off catches in an inshore/offshore component as well as for vessels >75 GRT and vessels < 75 GRT is shown. (Due to weighting to the nominal catches (lower table) minor discrepancies to absolute nominal catches might occur). *preliminary figures.

	1990	1991	1992	1993	1994*	1995*
SA1 Offshore	49478	52652	58676	52493	53693	43212
SA1 Inshore	13630	16258	20594	17843	18118	9643
Nominal catches	63108	68910	79270	70336	71811	52855

Vessel > 75 GRT						
Offshore	42915	45568	51425	41393	42740	35347
Inshore	0	0	2012	1770	1712	1419
Vessel < 75 GRT						
Offsore	6639	7266	7239	10887	10953	7866
Inshore	13787	16677	18550	15764	16406	8224

Table 3. Catch (tons), effort (hr) and unstandardized CPUE (kg/hr) from the small-vessel fleet by year and month as allocated to the inshore/offshore area (1995 incomplete).

Catch(t) by month/year from smaller vessel logbooks inshore/offshore

	Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
1990	Inshore	230	121	140	208	236	535	409	201	448	476	317	199	3520
	Offshore	183	137	225	276	423	487	430	515	200	68	119	90	3153
1991	Inshore	227	89	76	55	382	459	460	580	630	706	721	467	4852
	Offshore	154	306	361	509	445	452	622	235	80	44	184	130	3522
1992	Inshore	474	5	28	136	552	861	434	670	675	919	389	360	5503
	Offshore	161	260	565	517	389	394	535	167	153	142	133	271	3687
1993	Inshore	117	86	10	25	514	896	654	598	942	1038	924	488	6292
	Offshore	332	413	343	739	891	625	832	420	151	178	125	233	5282
1994	Inshore	386	167	126	558	617	649	701	786	849	904	613	396	6752
	Offshore	424	468	417	515	588	480	673	350	485	366	311	138	5215
1995	Inshore	292	171	153	566	740	574	477	363	209				3545
	Offshore	281	401	609	431	222	424	475	555	91				3489

Effort(hrs) by month/year from smaller vessel logbooks inshore/offshore

	Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
1990	Inshore	713	569	623	677	659	1609	1582	751	1471	1674	1376	623	12327
	Offshore	615	509	734	837	1331	1725	1477	1750	730	308	466	274	10756
1991	Inshore	914	438	425	202	852	1693	1924	2208	2462	2739	2801	1599	18257
	Offshore	757	1394	1624	1845	1731	1429	2144	1070	382	192	595	423	13586
1992	Inshore	1588	33	142	311	1671	2486	1722	2425	2418	3489	3052	1308	20645
	Offshore	654	1535	1898	1698	1260	1228	1905	752	655	477	495	993	13550
1993	Inshore	262	276	58	150	1408	2617	1822	2165	3068	3724	3345	1860	20755
	Offshore	1597	1473	1061	2031	3152	1964	2569	1350	553	628	419	912	17709
1994	Inshore	1611	768	567	1187	1845	2461	2434	2659	2751	3426	2922	1951	24582
	Offshore	1706	1980	1870	1520	2094	1622	2173	1011	1807	1491	1167	627	19068
1995	Inshore	1411	891	874	1010	2693	2361	1655	1277	889				13061
	Offshore	1212	1518	1686	1061	783	1217	1486	1380	438				10781

CPUE (kg/hrs) by month/year from smaller vessel logbooks inshore/offshore

	Month	1	2	3	4	5	6	7	8	9	10	11	12
1990	Inshore	323	213	225	307	358	332	258	268	305	284	230	319
	Offshore	296	268	307	330	318	282	291	295	275	220	256	327
1991	Inshore	248	202	179	271	449	271	239	263	256	258	257	292
	Offshore	204	219	222	276	257	316	290	219	210	226	310	307
1992	Inshore	299	153	199	438	330	346	252	276	279	263	275	275
	Offshore	246	170	298	304	308	321	281	222	233	297	268	273
1993	Inshore	445	312	176	168	365	245	359	276	307	279	276	262
	Offshore	208	280	323	364	283	318	324	311	272	284	298	255
1994	Inshore	239	218	222	470	334	264	288	295	309	264	210	203
	Offshore	249	237	223	339	281	296	310	346	268	246	266	220
1995	Inshore	207	192	175	561	275	243	288	284	235			
	Offshore	232	264	361	406	283	348	320	402	206			

Table 4. Catches of shrimp (tons) by division and month in NAFO Subarea 1 in 1994 and 1995 until October, as reported to the Greenland authorities by vessels above 75 GRT. Only Greenland vessels participated in the fishery.

Year 1994

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1AN	0	0	0	0	0	0	11	0	361	460	5	0	837
1AS	0	0	0	0	0	30	5	174	329	390	188	32	1148
1B	510	107	529	707	828	1125	1393	1795	3232	3101	1801	516	15644
1C	519	671	2005	1308	1067	1214	1083	405	69	30	389	516	9276
1D	799	599	975	1207	1498	898	1120	996	380	452	1302	987	11213
1E	86	322	497	387	568	53	451	691	231	369	361	372	4388
1F	120	107	156	312	173	32	237	89	280	87	194	155	1942
Total	2034	1806	4162	3921	4134	3352	4300	4150	4882	4889	4240	2578	44448

Year 1995

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1AN	0	0	0	0	1	0	0	200	36	32	-	-	269
1AS	0	0	0	0	0	0	3	79	105	183	-	-	370
1B	393	460	634	1681	730	1091	752	2377	1235	756	-	-	10109
1C	428	717	1182	1763	1319	590	1183	531	485	129	-	-	8327
1D	972	1229	1054	1442	1742	1387	1299	671	1247	529	-	-	11572
1E	102	452	775	497	798	261	553	398	558	303	-	-	4697
1F	227	122	236	18	122	1	83	414	164	35	-	-	1422
Total	2122	2980	3881	5401	4712	3330	3873	4670	3830	1967	-	-	36766

Table 5. Number of vessels in the shrimp fishery by division and month in NAFO Subarea 1 in 1994 and 1995 until October, as reported to the Greenland authorities by vessels above 75 GRT. Only Greenland vessels participated in the fishery.

Year 1994

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1AN	0	0	0	0	0	0	1	0	7	6	2	0	9
1AS	0	0	0	0	0	1	2	5	8	7	7	1	16
1B	9	9	18	16	20	18	18	24	24	22	25	17	31
1C	18	13	25	23	21	16	20	17	8	6	15	17	31
1D	17	14	23	21	23	15	21	15	6	4	15	18	30
1E	4	7	13	11	11	1	9	7	3	4	6	7	22
1F	4	3	4	7	6	1	3	6	4	3	4	7	15
													32

Year 1995

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1AN	0	0	0	0	1	0	1	3	2	1	-	-	5
1AS	0	0	0	0	0	0	2	5	3	4	-	-	10
1B	10	12	15	29	21	19	11	19	20	13	-	-	33
1C	13	18	21	24	22	16	19	10	15	6	-	-	32
1D	15	18	24	23	22	18	16	9	19	14	-	-	31
1E	4	13	13	13	11	8	8	7	7	4	-	-	24
1F	6	5	8	2	3	1	2	10	6	3	-	-	15
													33

Table 6. Annual catch, effort and unstandardized catch rate based on information from Greenland vessel logs in the years 1989 to October 1995.

Catch

	1989		1990		1991		1992		1993		1994		1995	
Area	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%
1A	10298	22.6	7838	15.7	7871	14.9	9471	16.6	4889	8.9	4712	8.3	1750	4.6
1B	21053	46.3	19369	38.9	20485	38.8	19090	33.6	23382	42.4	21705	38.1	11156	29.3
1C	7954	17.5	14570	29.2	11723	22.2	11618	20.4	10184	18.5	10293	18.1	8205	21.5
1D	5888	12.9	7765	15.6	12175	23.1	13493	23.7	11727	21.3	12881	22.6	10928	28.7
1E	0	0.0	0	0.0	380	0.7	2859	5.0	2905	5.3	4702	8.3	3828	10.0
1F	302	0.7	298	0.6	150	0.3	365	0.6	2078	3.8	2679	4.7	2224	5.8
Total	45495	100.0	49840	100.0	52784	100.0	56896	100.0	55165	100.0	56972	100.0	38091	100.0

Effort

	1989		1990		1991		1992		1993		1994		1995	
Area	Hours	%	Hours	%	Hours	%	Hours	%	Hours	%	Hours	%	Hours	%
1A	37530	27.3	33472	20.6	28248	16.2	35410	21.2	17998	11.1	18458	11.1	6321	6.4
1B	60502	44.0	61383	37.7	68514	39.4	54619	32.7	64386	39.8	66202	39.9	35989	36.5
1C	23153	16.8	42939	26.4	39385	22.7	34391	20.6	32347	20.0	32268	19.5	21637	22.0
1D	12928	9.4	22762	14.0	36170	20.8	36526	21.8	34787	21.5	33708	20.3	24005	24.4
1E	2	0.0	0	0.0	564	0.3	5344	3.2	6360	3.9	7869	4.7	6492	6.6
1F	3363	2.4	2223	1.4	962	0.6	924	0.6	5958	3.7	7304	4.4	4116	4.2
Total	137478	100.0	162779	100.0	173843	100.0	167214	100.0	161836	100.0	165809	100.0	98560	100.0

CPUE

	1989		1990		1991		1992		1993		1994		1995	
Area	kg/hr	%	kg/hr	%	kg/hr	%	kg/hr	%	kg/hr	%	kg/hr	%	kg/hr	%
1A	274.39	82.9	234.17	76.5	278.64	91.8	267.47	78.6	271.64	79.7	255.28	74.3	276.85	71.6
1B	347.97	105.2	315.54	103.1	298.99	98.5	349.51	102.7	363.15	106.5	327.86	95.4	309.98	80.2
1C	343.54	103.8	339.32	110.8	297.65	98.0	337.82	99.3	314.84	92.4	318.98	92.8	379.21	98.1
1D	455.45	137.6	341.14	111.4	336.6	110.9	369.41	108.6	337.11	98.9	382.13	111.2	455.24	117.8
1E	0	0.0	0	0.0	673.76	221.9	534.99	157.2	456.76	134.0	597.53	173.9	589.65	152.6
1F	89.801	27.1	134.05	43.8	155.93	51.4	395.02	116.1	348.77	102.3	366.79	106.7	540.33	139.8
Total	330.93		306.18		303.63		340.26		340.87		343.6		386.48	

Table 7. Number of biological samples (s) taken in the commercial shrimp fishery and actual number of individuals measured (n) to examine size composition of the catches.

Year/	1991		1992		1993		1994		1995	
Month	n	s	n	s	n	s	n	s	n	s
1	0		448	1	0	0	12473	19	3781	8
2	0		0	0	16938	45	10078	17	0	0
3	0		0	0	22948	40	6387	12	77198	146
4	0		0	0	0	0	12853	29	2898	5
5	0		19139	45	0	0	11063	29	0	0
6	12181	24	0	0	0	0	20495	49	11628	19
7	0		0	0	0	0	14156	28	4625	8
8	0		21992	55	4175	12	0	0	-	-
9	75178	93	0	0	16251	30	14191	23	-	-
10		0	0	0	7776	16	5121	10	-	-
11	3631	9	13799	44	0	0	0	0	-	-
12	9986	34	0	0	0	0	13806	26	-	-
Total	100976	160	55378	145	68088	143	120623	242	100130	186

Table 8. Standardization of CPUE for total shrimp catches in Div. 1B: ANOVA table and parameter estimates (output from the GLM procedure of the SAS-application).

Dependent Variable: LNCPUE

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	55	290.00095426	5.27274462	33.22	0.0001
Error	1966	312.00783781	0.15870185		
Corrected Total	2021	602.00879206			

R-Square	C.V.	Root MSE	LNCPUE Mean
0.481722	6.912733	0.3983740	5.7629019

Source	DF	Type I SS	Mean Square	F Value	Pr > F
VESS	33	201.61633216	6.10958582	38.50	0.0001
YR	8	60.17918622	7.52239828	47.40	0.0001
MO	11	18.74406183	1.70400562	10.74	0.0001
AREA	3	9.46137405	3.15379135	19.87	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
VESS	33	196.94927711	5.96815991	37.61	0.0001
YR	8	56.01365477	7.00170685	44.12	0.0001
MO	11	18.77047817	1.70640711	10.75	0.0001
AREA	3	9.46137405	3.15379135	19.87	0.0001

Parameter		Estimate		T for H0: Parameter=0	Pr > |T|	Std Error of Estimate
INTERCEPT		5.274155245	B	68.16	0.0001	0.07737653
VESS	OUIN	0.494122214	B	6.47	0.0001	0.07637348
	OUIQ	0.792311183	B	10.29	0.0001	0.07702081
	OUKV	1.286196666	B	14.04	0.0001	0.09163450
	OUON	0.556236374	B	7.47	0.0001	0.07445315
	OUOQ	0.199776754	B	2.55	0.0110	0.07846568
	OUPJ	0.564295457	B	7.26	0.0001	0.07773606
	OUTM	0.461466043	B	6.34	0.0001	0.07281634
	OUWH	0.328793642	B	4.28	0.0001	0.07681995
	OUYM	0.448535870	B	6.46	0.0001	0.06942355
	OVUG	-0.298000290	B	-2.93	0.0034	0.10158802
	OWDV	0.340303477	B	5.05	0.0001	0.06733029
	OWGG	1.072325537	B	12.06	0.0001	0.08891168
	OWLQ	0.093607325	B	1.08	0.2805	0.08670749
	OWPQ	0.002652706	B	0.03	0.9727	0.07760387
	OWQU	1.100138910	B	14.73	0.0001	0.07466731
	OWSH	0.233111906	B	2.26	0.0237	0.10301108
	OWUD	0.395617730	B	5.71	0.0001	0.06927460
	OWUJ	0.314203886	B	4.43	0.0001	0.07092792
	OWVM	0.181211601	B	2.10	0.0355	0.08612230
	OWWP	0.905802779	B	12.88	0.0001	0.07034463
	OXSY	-0.119666315	B	-1.48	0.1390	0.08084574
	OYAQ	-0.152006118	B	-1.99	0.0472	0.07653511
	OYBZ	0.615992147	B	7.12	0.0001	0.08653503
	OYCK	0.362709002	B	4.73	0.0001	0.07662990
	OYFF	0.888605482	B	10.62	0.0001	0.08363881
	OYKK	0.454861690	B	6.09	0.0001	0.07470368
	OYNR	0.246524096	B	3.63	0.0003	0.06797171
	OYNS	0.482421200	B	6.20	0.0001	0.07785947
	OYRK	0.678294876	B	10.46	0.0001	0.06485172
	OYRT	0.556700480	B	6.99	0.0001	0.07968717
	OYXT	0.696207990	B	8.88	0.0001	0.07844343
	OZKQ	0.989757875	B	12.63	0.0001	0.07834290
	OZSI	0.111797470	B	1.41	0.1597	0.07948819
	ZZZZ	0.000000000	B	.	.	.
YR	87	0.559882468	B	10.64	0.0001	0.05263979
	88	0.106922259	B	2.36	0.0186	0.04540209
	89	-0.104258777	B	-2.23	0.0255	0.04665289
	90	-0.192420202	B	-4.14	0.0001	0.04644994
	91	-0.012167344	B	-0.27	0.7893	0.04553138
	92	-0.001631553	B	-0.03	0.9726	0.04741990
	93	-0.011794340	B	-0.22	0.8229	0.05270278
	94	-0.031080209	B	-0.69	0.4875	0.04475216
	95	0.000000000	B	.	.	.
MO	1	0.145124435	B	1.92	0.0552	0.07564283
	2	-0.035204103	B	-0.38	0.7014	0.09180358
	3	0.203057012	B	3.39	0.0007	0.05993556
	4	0.201221447	B	4.28	0.0001	0.04697695
	5	-0.122273758	B	-2.82	0.0048	0.04334714
	6	-0.006909276	B	-0.16	0.8722	0.04294350
	7	-0.001398916	B	-0.03	0.9745	0.04372272
	8	-0.127053941	B	-2.91	0.0037	0.04372680
	9	-0.111956762	B	-2.47	0.0135	0.04529616
	10	-0.097605383	B	-2.09	0.0366	0.04665730
	11	-0.079406401	B	-1.78	0.0752	0.04461108
	12	0.000000000	B	.	.	.
AREA	3	0.284319917	B	6.62	0.0001	0.04298002
	4	0.006212433	B	0.25	0.8036	0.02497771
	5	0.092971406	B	3.79	0.0002	0.02451663
	6	0.000000000	B	.	.	

Table 9. Standardization of CPUE for large shrimp (>8.5g) in Div. 1B: ANOVA table and parameter estimates (output from the GLM procedure of the SAS-application).

Dependent Variable: LNCPUE

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	54	349.27951977	6.46813926	28.07	0.0001
Error	1887	434.80320684	0.23042035		
Corrected Total	1941	784.08272661			

R-Square	C.V.	Root MSE	LNCPUE Mean
0.445463	9.269587	0.4800212	5.1784531

Source	DF	Type I SS	Mean Square	F Value	Pr > F
VESS	32	181.33212578	5.66662893	24.59	0.0001
YR	8	104.27964671	13.03495584	56.57	0.0001
MO	11	52.60609414	4.78237219	20.75	0.0001
AREA	3	11.06165314	3.68721771	16.00	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
VESS	32	178.10539732	5.56579367	24.15	0.0001
YR	8	105.09312216	13.13664027	57.01	0.0001
MO	11	54.04447790	4.91313435	21.32	0.0001
AREA	3	11.06165314	3.68721771	16.00	0.0001

Parameter		Estimate		T for H0: Parameter=0	Pr > |T|	Std Error of Estimate
INTERCEPT		4.822681134	B	50.80	0.0001	0.09492735
VESS	OUIN	0.318060867	B	3.41	0.0007	0.09327517
	OUIQ	0.265407577	B	2.83	0.0047	0.09378929
	OUKV	1.022436447	B	9.12	0.0001	0.11211206
	OUOQ	0.113334393	B	1.19	0.2330	0.09499027
	OUPJ	0.484468226	B	5.12	0.0001	0.09460987
	OUTM	-0.401142942	B	4.52	0.0001	0.08873265
	OUWH	0.297012828	B	3.18	0.0015	0.09348425
	OUYM	0.070475823	B	0.83	0.4064	0.08486987
	OVUG	-0.556625389	B	-4.45	0.0001	0.12517727
	OWDV	0.185410878	B	2.26	0.0240	0.08205781
	OWGG	0.793212492	B	7.35	0.0001	0.10797007
	OWLQ	0.206465413	B	1.94	0.0523	0.10632135
	OWPQ	-0.133391509	B	-1.41	0.1583	0.09450303
	OWQU	0.853616611	B	9.39	0.0001	0.09094356
	OWSH	0.270315583	B	2.13	0.0335	0.12703706
	OWUD	0.084369242	B	1.00	0.3183	0.08452086
	OWUJ	-0.078032640	B	-0.89	0.3711	0.08721746
	OWVM	0.151146630	B	1.43	0.1524	0.10557177
	OWWP	0.553298105	B	6.45	0.0001	0.08576581
	OXSY	-0.431049172	B	-4.30	0.0001	0.10022311
	OYAQ	-0.152397471	B	-1.64	0.1006	0.09278032
	OYBZ	0.619666519	B	5.94	0.0001	0.10424679
	OYCK	0.122037783	B	1.30	0.1930	0.09370734
	OYFF	0.563985757	B	5.55	0.0001	0.10168655
	OYKK	0.427566031	B	4.68	0.0001	0.09133105
	OYNR	0.228468664	B	2.75	0.0059	0.08293161
	OYNS	0.314045500	B	3.31	0.0009	0.09477859
	OYRK	0.323197630	B	4.07	0.0001	0.07933953
	OYRT	0.599246628	B	6.18	0.0001	0.09694714
	OYXT	0.610386839	B	6.40	0.0001	0.09541391
	OZKQ	0.715896647	B	7.51	0.0001	0.09528414
	OZSI	-0.526823619	B	-5.48	0.0001	0.09619624
	ZZZZ	0.000000000	B	.	.	.
YR	87	0.807589311	B	12.61	0.0001	0.06406319
	88	0.549373828	B	9.90	0.0001	0.05547444
	89	0.083119165	B	1.46	0.1433	0.05677289
	90	0.085065951	B	1.50	0.1340	0.05673706
	91	0.041129640	B	0.74	0.4621	0.05592292
	92	-0.025635419	B	-0.44	0.6573	0.05778287
	93	0.136717864	B	2.11	0.0346	0.06465474
	94	-0.030599441	B	-0.56	0.5752	0.05459883
	95	0.000000000	B	.	.	.
MO	1	0.149900172	B	1.58	0.1142	0.09486688
	2	-0.076765244	B	-0.65	0.5146	0.11778252
	3	0.092324656	B	1.26	0.2086	0.07340474
	4	0.274426834	B	4.68	0.0001	0.05861986
	5	-0.251560979	B	-4.69	0.0001	0.05368063
	6	-0.313498506	B	-5.89	0.0001	0.05319551
	7	-0.175061404	B	-3.24	0.0012	0.05408901
	8	-0.230053249	B	-4.25	0.0001	0.05413455
	9	-0.303569438	B	-5.44	0.0001	0.05577900
	10	-0.031323916	B	-0.54	0.5888	0.05794185
	11	-0.030922080	B	-0.56	0.5746	0.05508592
	12	0.000000000	B	.	.	.
AREA	3	0.164769309	B	2.98	0.0029	0.05526287
	4	-0.010338457	B	-0.34	0.7358	0.03063914
	5	0.158624652	B	5.26	0.0001	0.03016076
	6	0.000000000	B	.	.	.

Table 10. Standardization of CPUE for total shrimp catches in Div. 1CD: ANOVA table and parameter estimates (output from the GLM procedure of the SAS-application).

Dependent Variable: LNCPUE

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	54	289.98183575	5.37003400	35.33	0.0001
Error	2398	364.53534470	0.15201641		
Corrected Total	2452	654.51718045			

R-Square	C.V.	Root MSE	LNCPUE Mean
0.443047	6.754993	0.3898928	5.7719205

Source	DF	Type I SS	Mean Square	F Value	Pr > F
VESS	33	238.64914489	7.23179227	47.57	0.0001
YR	8	12.23987998	1.52998500	10.06	0.0001
MO	11	37.81415804	3.43765073	22.61	0.0001
AREA	2	1.27865285	0.63932642	4.21	0.0150

Source	DF	Type III SS	Mean Square	F Value	Pr > F
VESS	33	217.90229481	6.60309984	43.44	0.0001
YR	8	11.72847014	1.46605877	9.64	0.0001
MO	11	38.14890963	3.46808269	22.81	0.0001
AREA	2	1.27865285	0.63932642	4.21	0.0150

Parameter		Estimate		T for H0: Parameter=0	Pr > |T|	Std Error of Estimate
INTERCEPT		5.558199586	B	72.23	0.0001	0.07694793
VESS	OUIN	0.226309845	B	3.06	0.0023	0.07407004
	OUIQ	0.367033337	B	4.33	0.0001	0.08475662
	OUKV	0.944630115	B	11.70	0.0001	0.08073826
	OUON	0.318980545	B	4.18	0.0001	0.07623102
	OUOQ	-0.017435719	B	-0.21	0.8326	0.08250405
	OUPJ	0.192777708	B	2.46	0.0138	0.07821206
	OUTM	0.250071533	B	3.40	0.0007	0.07353743
	OUWH	0.186806696	B	2.49	0.0130	0.07512251
	OUYM	0.126582750	B	1.68	0.0929	0.07529999
	OVUG	-0.269970468	B	-1.92	0.0544	0.14024663
	OWDV	0.074268157	B	1.02	0.3094	0.07304221
	OWGG	0.882666403	B	11.16	0.0001	0.07910745
	OWLQ	-0.191498946	B	-2.13	0.0334	0.08996692
	OWPQ	-0.211708250	B	-2.57	0.0104	0.08252384
	OWQU	0.907190188	B	12.19	0.0001	0.07444149
	OWSH	0.213243781	B	2.35	0.0190	0.09087817
	OWUD	0.118657988	B	1.57	0.1169	0.07566096
	OWUJ	0.100935292	B	1.27	0.2025	0.07917844
	OWVM	-0.114507541	B	-1.23	0.2202	0.09338095
	OWWP	0.634198451	B	8.63	0.0001	0.07344729
	OXSY	-0.226927713	B	-2.71	0.0067	0.08361788
	OYAQ	-0.386840236	B	-4.68	0.0001	0.08269082
	OYBZ	0.538942657	B	6.95	0.0001	0.07749204
	OYCK	0.126551740	B	1.63	0.1023	0.07741849
	OYFF	0.507301373	B	4.16	0.0001	0.12198152
	OYKK	0.347947749	B	4.51	0.0001	0.07707139
	OYNR	0.105137170	B	1.41	0.1591	0.07463835
	OYNS	0.279102692	B	3.77	0.0002	0.07394995
	OYRK	0.370620891	B	5.12	0.0001	0.07241401
	OYRT	0.256333394	B	3.41	0.0007	0.07527961
	OYXT	0.601483546	B	7.50	0.0001	0.08021383
	OZKQ	0.926675865	B	12.22	0.0001	0.07585746
	OZSI	0.164089694	B	1.81	0.0711	0.09087496
	ZZZZ	0.000000000	B	.	.	.
YR	87	-0.119888298	B	-1.42	0.1569	0.08466036
	88	0.081447233	B	1.43	0.1520	0.05683502
	89	-0.000058801	B	-0.00	0.9988	0.03905019
	90	-0.063614929	B	-1.88	0.0603	0.03384854
	91	-0.179333937	B	-5.69	0.0001	0.03152728
	92	-0.140420095	B	-4.54	0.0001	0.03092811
	93	-0.156179452	B	-4.71	0.0001	0.03315455
	94	-0.155622219	B	-5.05	0.0001	0.03079009
	95	0.000000000	B	.	.	.
MO	1	0.025129335	B	0.56	0.5774	0.04509197
	2	0.079617080	B	1.72	0.0855	0.04628435
	3	0.191796839	B	4.64	0.0001	0.04132000
	4	0.118776624	B	3.05	0.0023	0.03898751
	5	-0.134927922	B	-3.45	0.0006	0.03911095
	6	0.198929111	B	4.79	0.0001	0.04155483
	7	0.189363479	B	4.66	0.0001	0.04060113
	8	-0.043622881	B	-1.00	0.3159	0.04348772
	9	-0.195154201	B	-3.96	0.0001	0.04930693
	10	0.090495674	B	1.55	0.1202	0.05821887
	11	0.115541359	B	2.47	0.0135	0.04675522
	12	0.000000000	B	.	.	.
AREA	7	-0.036144221	B	-1.69	0.0905	0.02134497
	8	-0.058178936	B	-2.90	0.0038	0.02006059
	9	0.000000000	B	.	.	.

Table 11. Standardization of CPUE for large shrimp (>8.5g) in Div. 1CD: ANOVA table and parameter estimates (output from the GLM procedure of the SAS-application).

Dependent Variable: LNCPUE

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	53	314.96077860	5.94265620	34.70	0.0001
Error	2295	393.00939265	0.17124592		
Corrected Total	2348	707.97017125			

R-Square	C.V.	Root MSE	LNCPUE Mean
0.444879	7.905231	0.4138187	5.2347455

Source	DF	Type I SS	Mean Square	F Value	Pr > F
VESS	32	201.16116475	6.28628640	36.71	0.0001
YR	8	32.21214332	4.02651791	23.51	0.0001
MO	11	71.27676397	6.47970582	37.84	0.0001
AREA	2	10.31070657	5.15535328	30.10	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
VESS	32	220.74583917	6.89830747	40.28	0.0001
YR	8	29.40620410	3.67577551	21.46	0.0001
MO	11	71.27011942	6.47910177	37.84	0.0001
AREA	2	10.31070657	5.15535328	30.10	0.0001

Parameter		Estimate		T for H0: Parameter=0	Pr > |T|	Std Error of Estimate
INTERCEPT		4.822594556	B	58.70	0.0001	0.08216289
VESS	OUIN	0.215259268	B	2.72	0.0065	0.07902035
	OUIQ	0.132550745	B	1.47	0.1409	0.08998161
	OUKV	0.823385969	B	9.60	0.0001	0.08575914
	OUOQ	0.037107043	B	0.42	0.6756	0.08865233
	OUPJ	0.176993341	B	2.13	0.0332	0.08305742
	OUTM	0.265341778	B	3.39	0.0007	0.07815947
	OUWH	0.185135875	B	2.33	0.0202	0.07962328
	OUYM	-0.044787695	B	-0.56	0.5749	0.07983998
	OVUG	-0.527476439	B	-3.54	0.0004	0.14902479
	OWDV	0.016526340	B	0.21	0.8313	0.07756266
	OWGG	0.679251453	B	8.06	0.0001	0.08422686
	OWLQ	-0.007357930	B	-0.08	0.9390	0.09618212
	OWPQ	-0.201441417	B	-2.30	0.0216	0.08764611
	OWQU	0.712730019	B	9.01	0.0001	0.07913864
	OWSH	0.271516212	B	2.81	0.0049	0.09648731
	OWUD	-0.027874172	B	-0.35	0.7292	0.08050106
	OWUJ	-0.330341567	B	-3.92	0.0001	0.08432233
	OWVM	-0.138178336	B	-1.41	0.1599	0.09828583
	OWWP	0.431500233	B	5.53	0.0001	0.07806782
	OXSY	-0.445301805	B	-4.95	0.0001	0.08996828
	OYAQ	-0.265143869	B	-3.02	0.0026	0.08779400
	OYBZ	0.670632060	B	8.13	0.0001	0.08245662
	OYCK	0.048867866	B	0.59	0.5533	0.08241039
	OYFF	0.473764889	B	3.65	0.0003	0.12974718
	OYKK	0.241440513	B	2.95	0.0032	0.08185151
	OYNR	0.100893667	B	1.28	0.2024	0.07913192
	OYNS	0.200327046	B	2.54	0.0110	0.07873761
	OYRK	0.232814462	B	3.02	0.0025	0.07702651
	OYRT	0.399939610	B	5.00	0.0001	0.07994070
	OYXT	0.559087286	B	6.55	0.0001	0.08541110
	OZKQ	0.696059302	B	8.66	0.0001	0.08034579
	OZSI	-0.926548908	B	-9.61	0.0001	0.09645210
	ZZZZ	0.000000000	B	.	.	.
YR	87	0.046395890	B	0.53	0.5991	0.08824478
	88	0.381063091	B	6.14	0.0001	0.06205801
	89	0.251872184	B	5.92	0.0001	0.04256739
	90	0.262736898	B	7.22	0.0001	0.03639596
	91	0.065641025	B	1.94	0.0525	0.03383349
	92	0.135670512	B	4.10	0.0001	0.03306621
	93	0.170047153	B	4.74	0.0001	0.03589404
	94	-0.083278050	B	-2.52	0.0117	0.03302097
	95	0.000000000	B	.	.	.
MO	1	0.168234484	B	3.38	0.0007	0.04977997
	2	0.184401884	B	3.60	0.0003	0.05116350
	3	0.357707811	B	7.94	0.0001	0.04506273
	4	0.334149281	B	7.86	0.0001	0.04253390
	5	-0.088918880	B	-2.09	0.0365	0.04248343
	6	0.000159515	B	0.00	0.9972	0.04501335
	7	0.165611101	B	3.75	0.0002	0.04411530
	8	-0.010049875	B	-0.21	0.8315	0.04723004
	9	-0.305271858	B	-5.74	0.0001	0.05318311
	10	0.066312237	B	1.04	0.2973	0.06360979
	11	0.149528148	B	2.94	0.0033	0.05089734
	12	0.000000000	B	.	.	.
AREA	7	0.082062070	B	3.54	0.0004	0.02316617
	8	-0.076086345	B	-3.49	0.0005	0.02178433
	9	0.000000000	B	.	.	.

Table 12. Mean length at age, catch at age in proportions and absolute numbers and unstandardized catch rates at age as determined from commercial length frequency distributions in NAFO SA 1.

Mean Cpl. length (mm)

Year/Year class	1991	1992	1993	1994	1995
1	-	-	9.8	10.3	9.4
2	13.4	12.3	13.2	12.5	12.6
3	16.2	15.4	15.0	14.3	15.3
4	18.1	18.0	17.5	17.1	17.3
5	20.9	20.5	19.5	19.3	19.3
6	22.5	22.8	21.6	21.6	21.2
7	24.7	25.4	24.9	24.8	24.2
8+	27.2	27.9	27.3	26.6	26.4

Proportion of total catch

Year/Year class	1991	1992	1993	1994	1995
1	-	-	0.002	0.002	0.002
2	0.004	0.003	0.012	0.023	0.006
3	0.012	0.018	0.031	0.024	0.031
4	0.049	0.078	0.066	0.096	0.123
5	0.197	0.211	0.123	0.156	0.217
6	0.303	0.228	0.201	0.259	0.252
7	0.295	0.414	0.497	0.319	0.222
8+	0.141	0.049	0.067	0.121	0.146

Number caught (millions)

Year/Year class	1991	1992	1993	1994	1995
1	-	-	13	14	10
2	31	20	78	166	30
3	93	120	201	174	155
4	381	518	428	695	617
5	1533	1402	798	1129	1088
6	2358	1515	1304	1874	1264
7	2296	2752	3225	2308	1114
8+	1097	326	435	876	732
Total	7783	6647	6488	7237	5016

Number caught per hour (unstandardized)

Year/Year class	1991	1992	1993	1994	1995
1	-	-	80	87	102
2	179	119	481	1004	305
3	537	715	1243	1047	1578
4	2194	3100	2646	4190	6260
5	8820	8387	4931	6808	11044
6	13566	9063	8058	11304	12825
7	13208	16456	19925	13922	11298
8+	6313	1948	2686	5281	7430
Total	44772	39748	40091	43644	50892

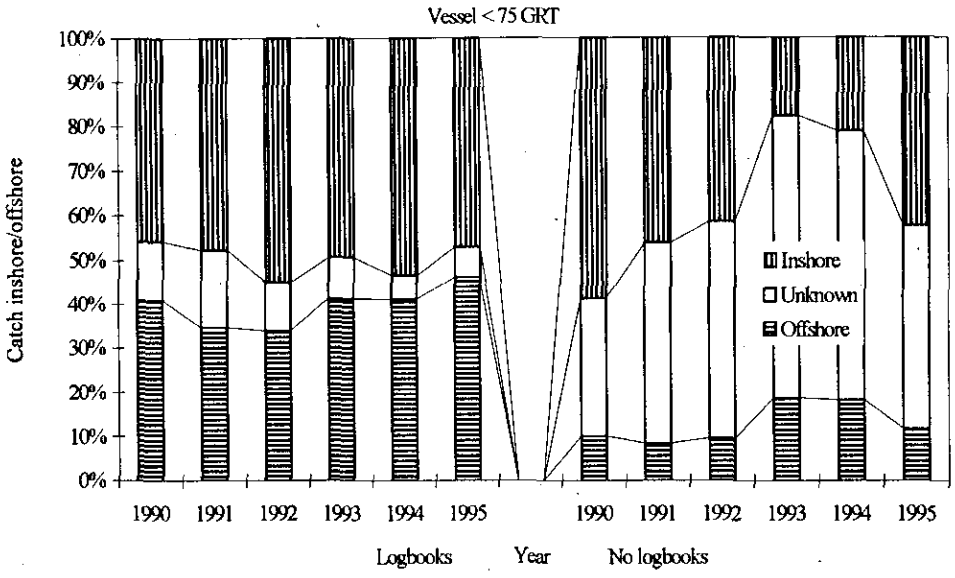


Fig. 1. The allocation of total catches by smaller vessels (<75 GRT) with and without logbooks* to the inshore/offshore area in the years 1990 to October 1995. *The proportions of catches in the two areas by vessels without logbooks was calculated from information on sales slips

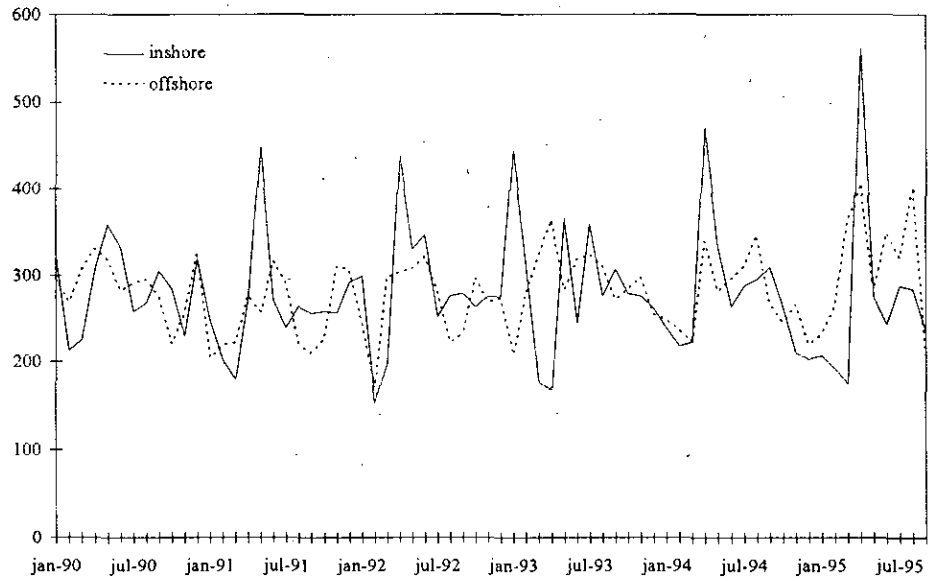


Fig. 2. Unstandardized catch rates (kg/hr) of smaller vessels (<75 GRT) by month in the inshore and offshore areas from 1990 to October 1995.

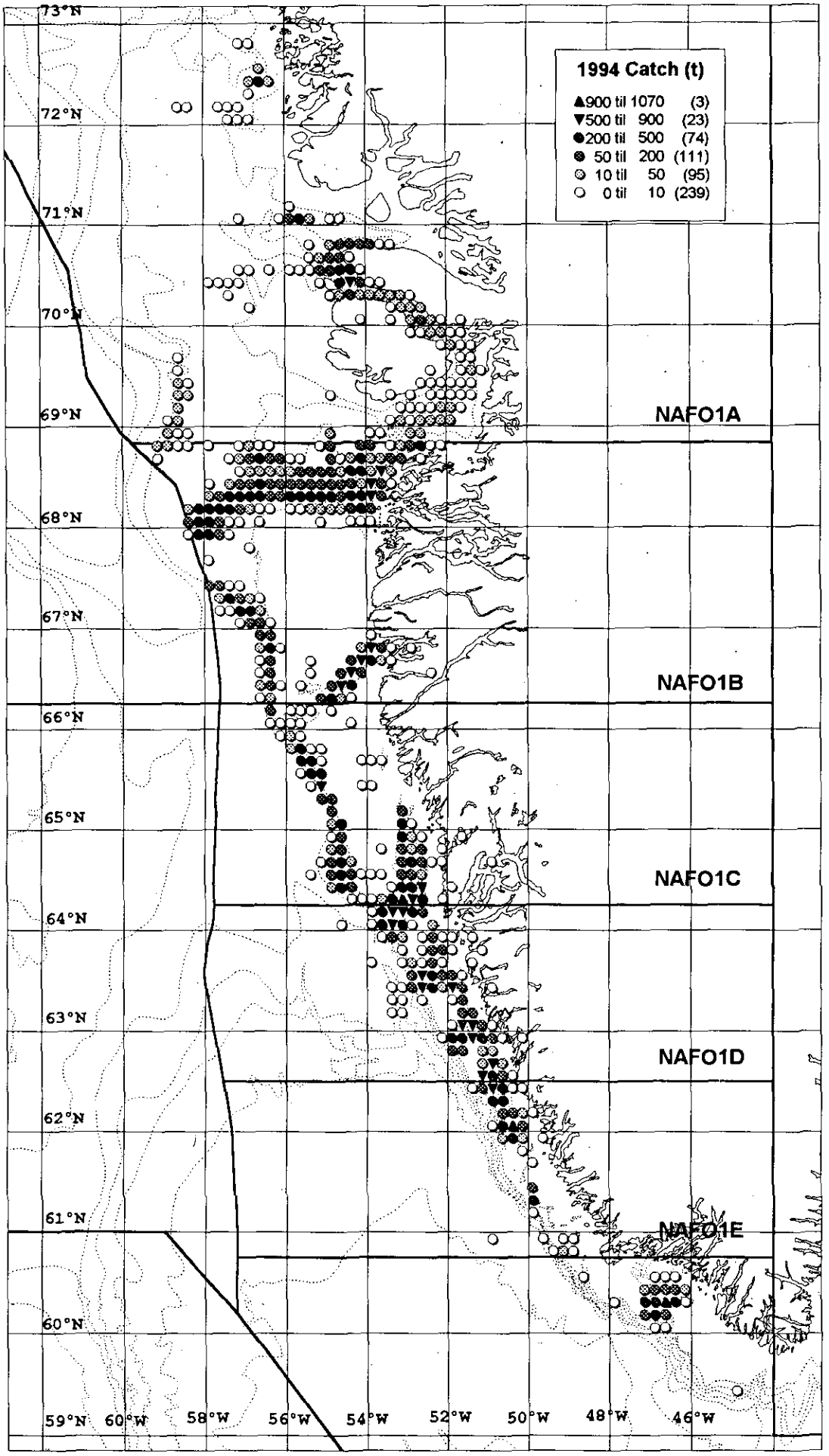


Fig. 3. The geographical distribution of the Greenland catches in 1994 as recorded in vessel logs.

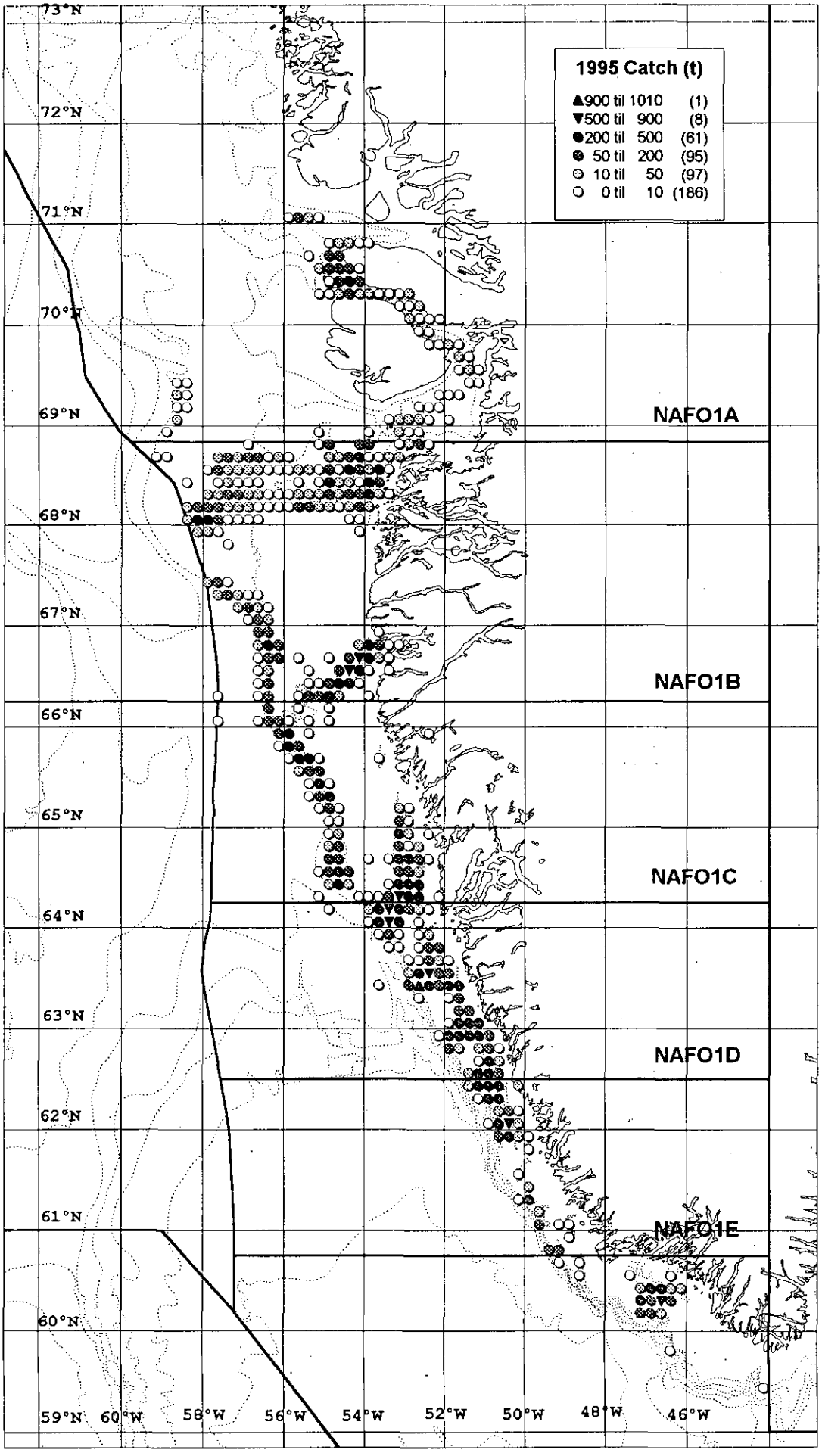
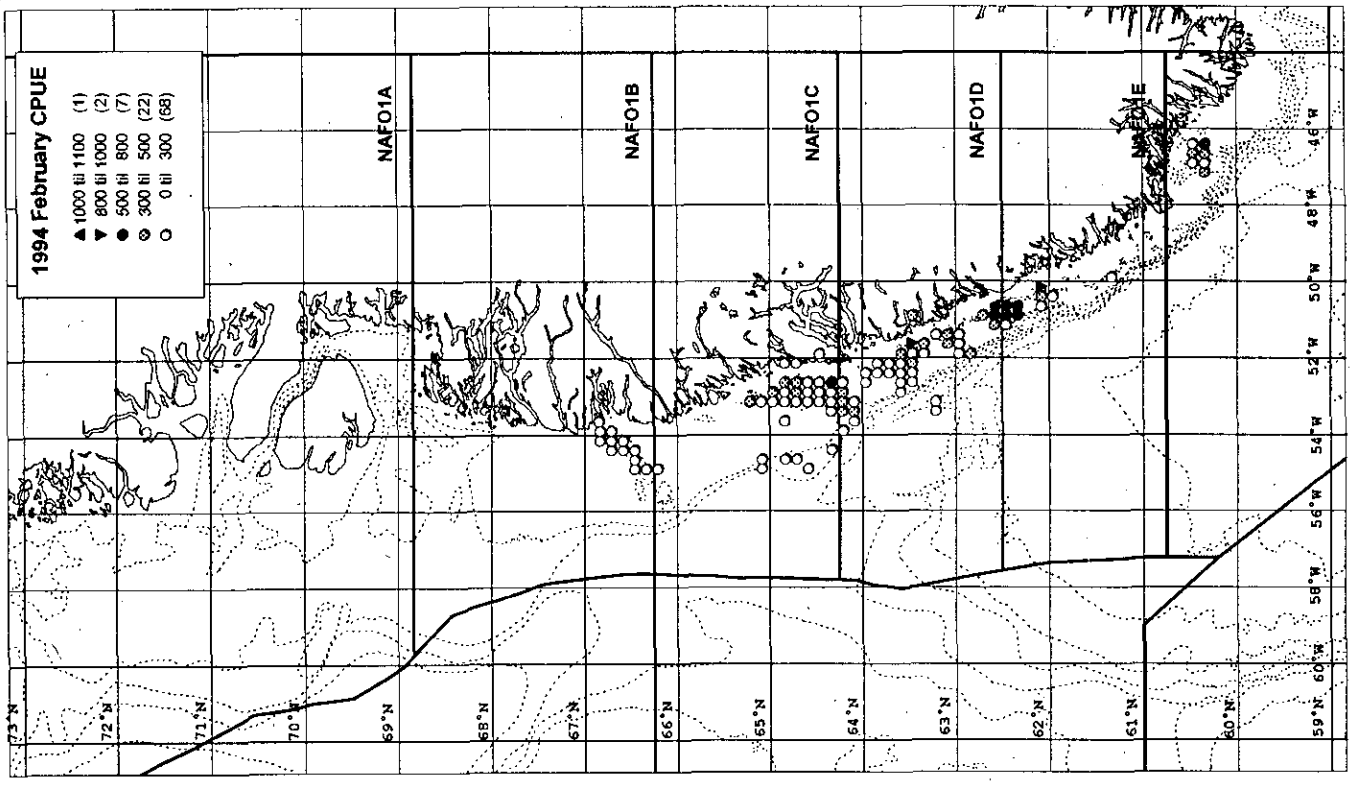


Fig. 4. The geographical distribution of the Greenland catches in 1995 as recorded in vessel logs.



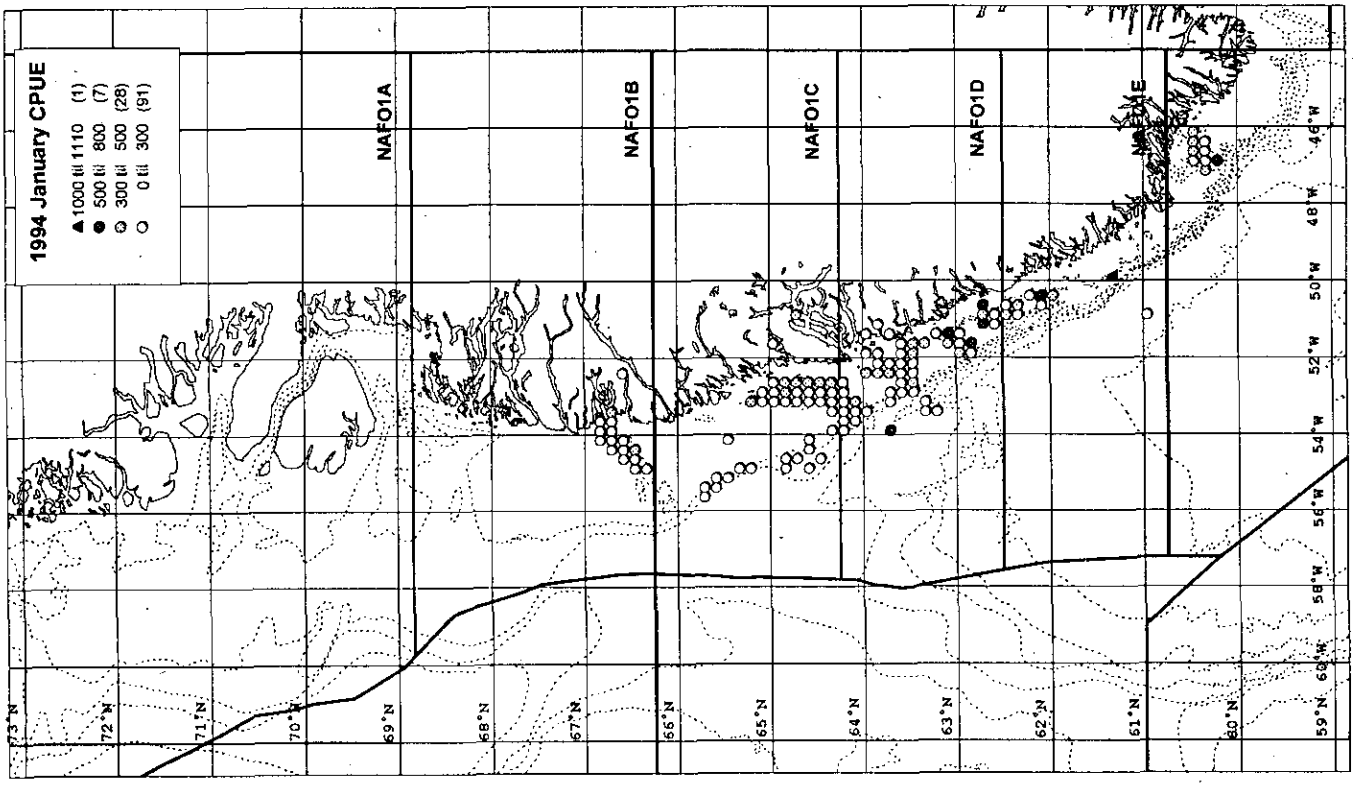
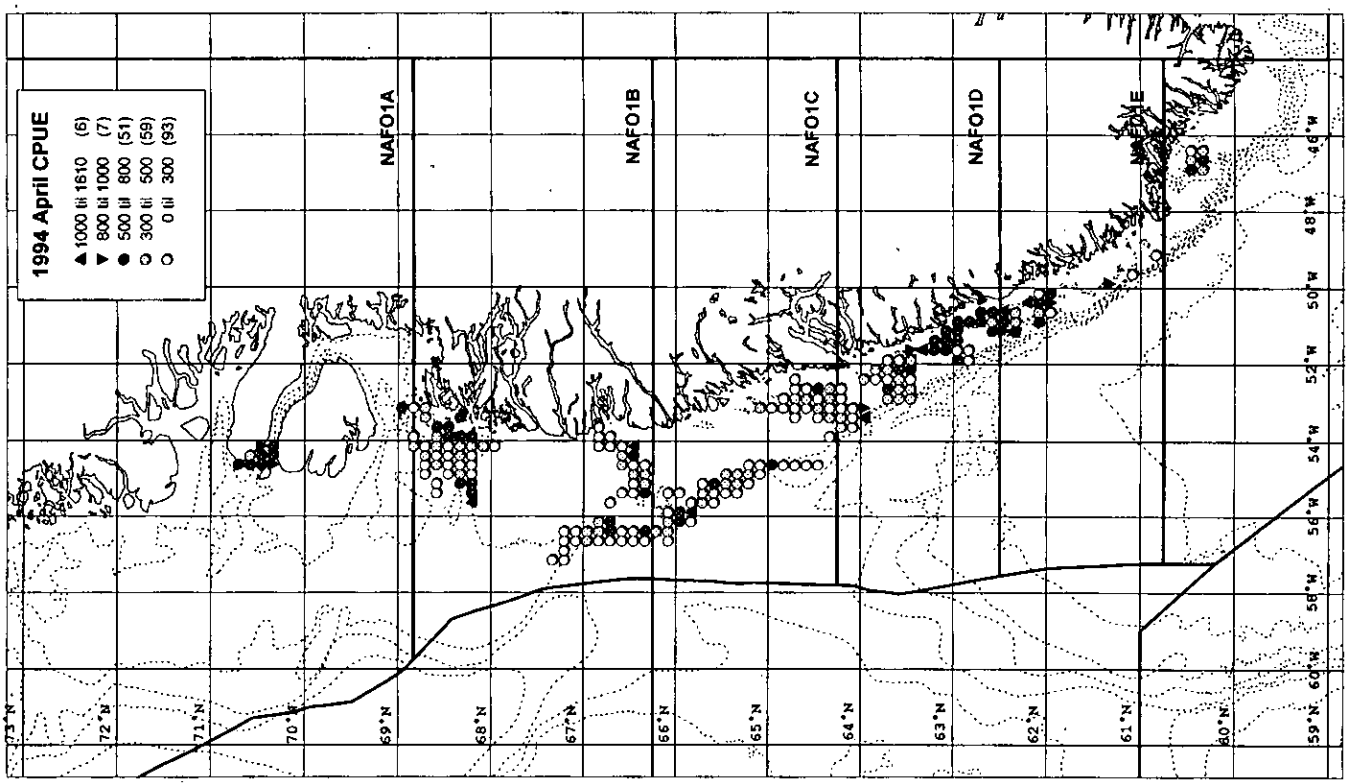


Fig. 5. The geographical distribution of unstandardized catch rates accomplished by Greenland offshore vessels (logbook data) by month from January 1994 to September 1995. Note the figure continues on the following pages.



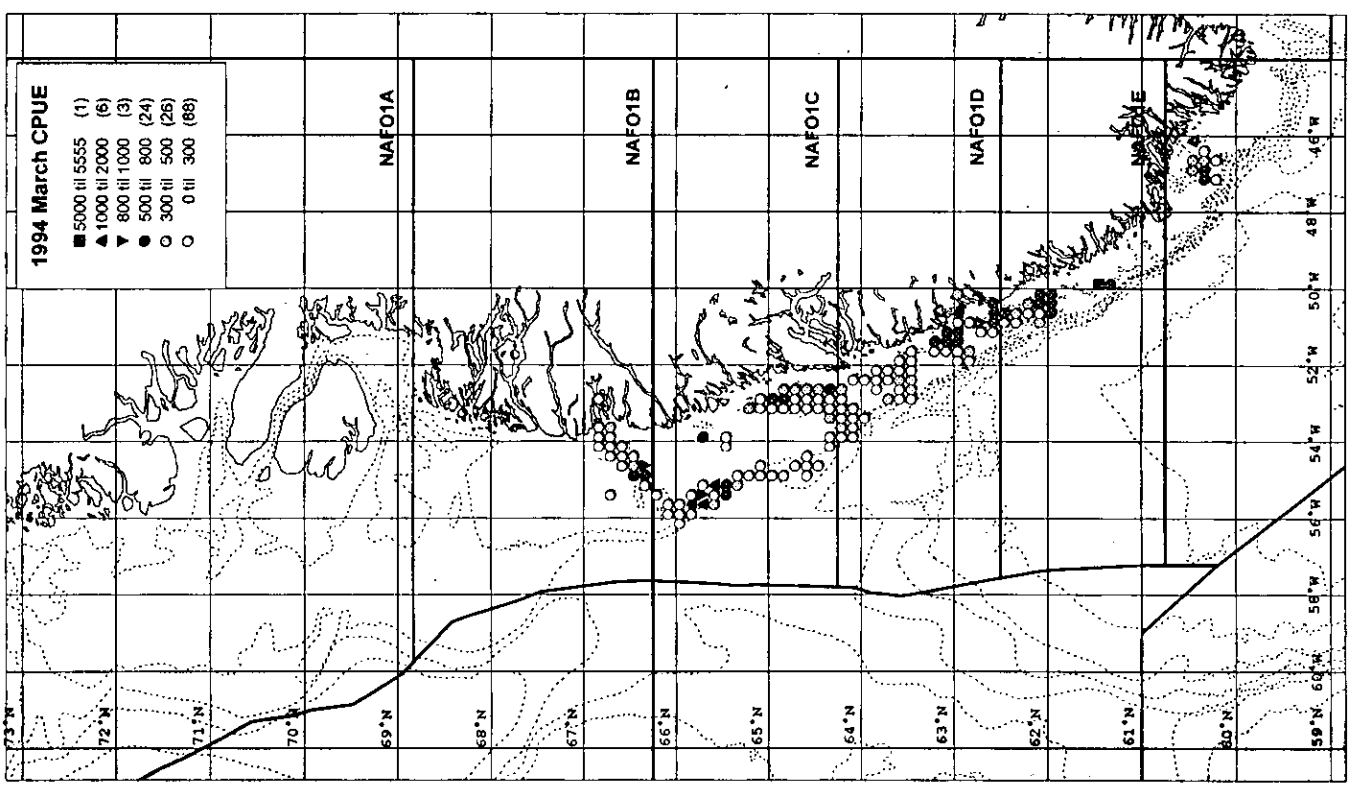
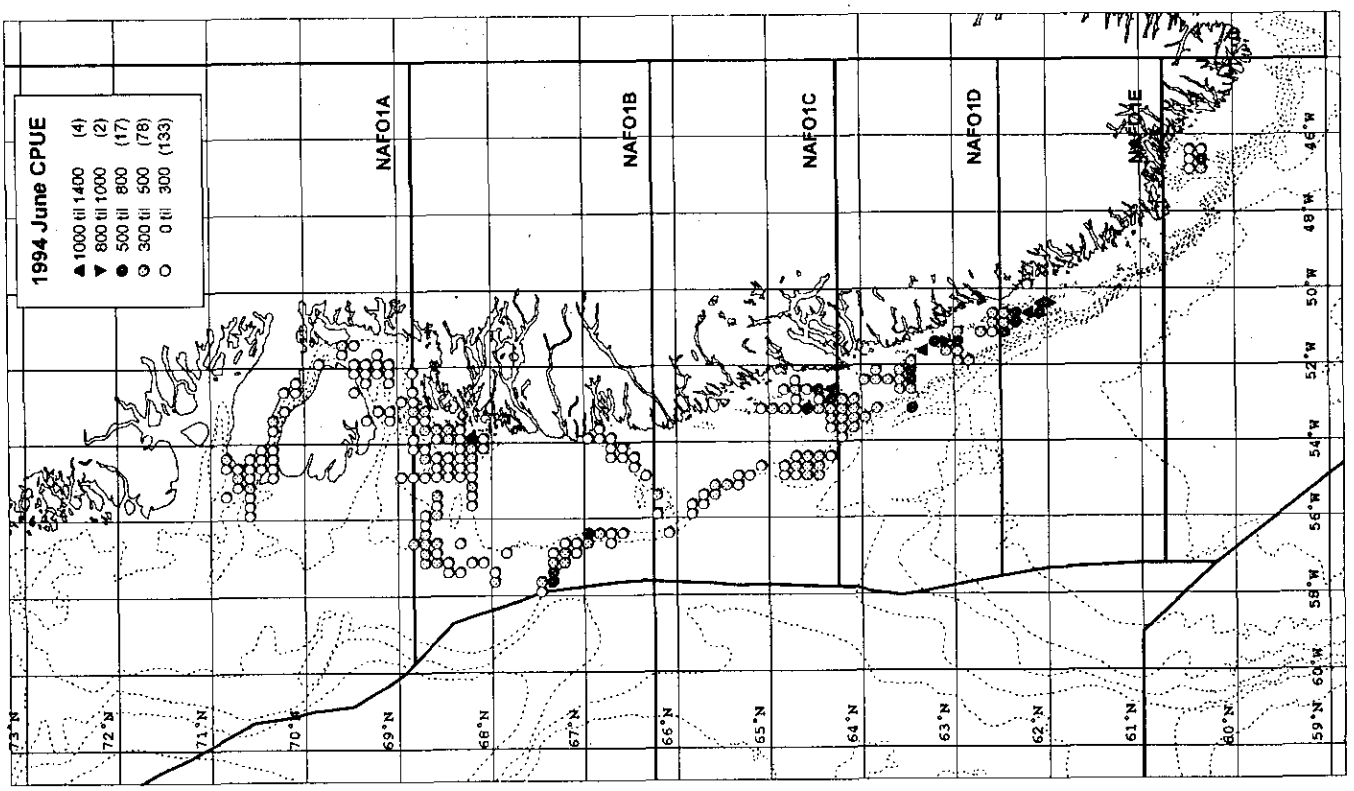


Fig. 5. Continued...



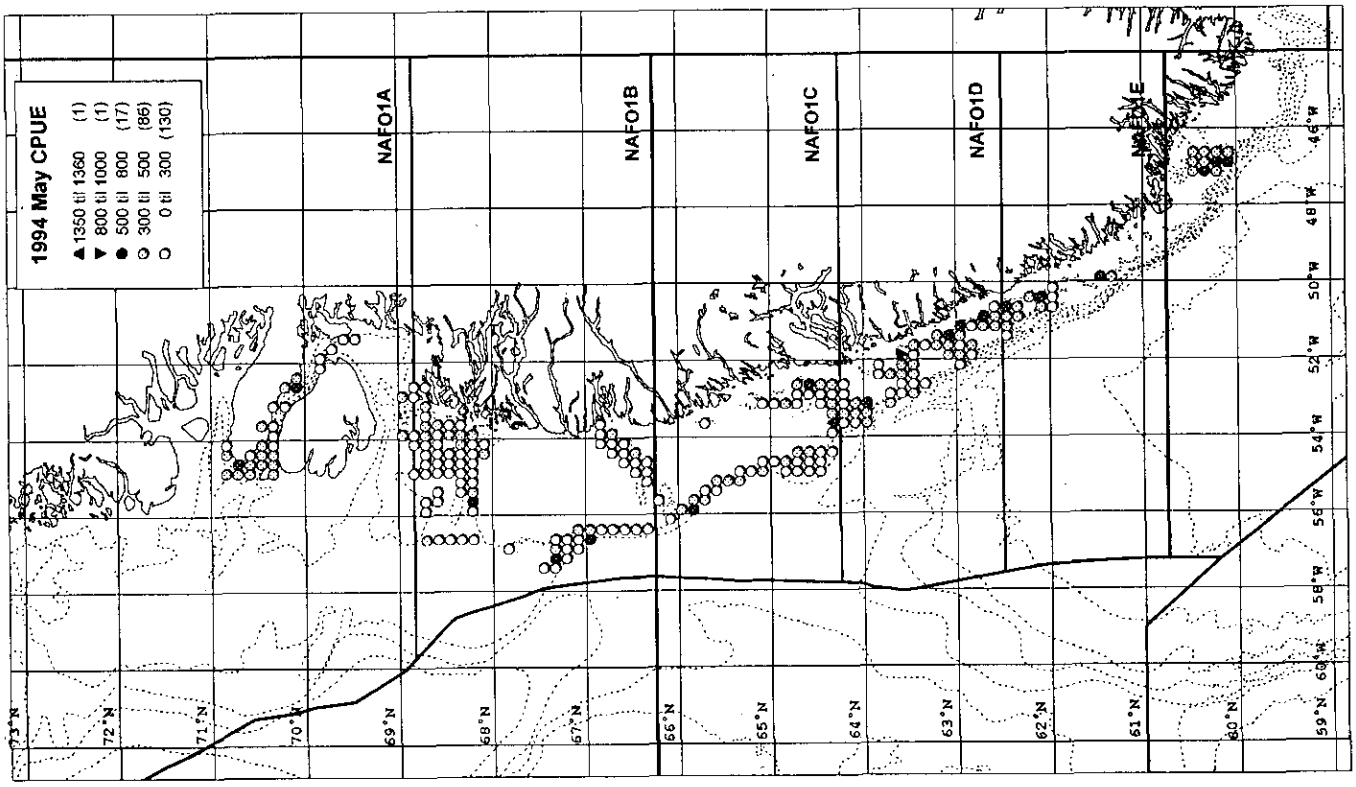
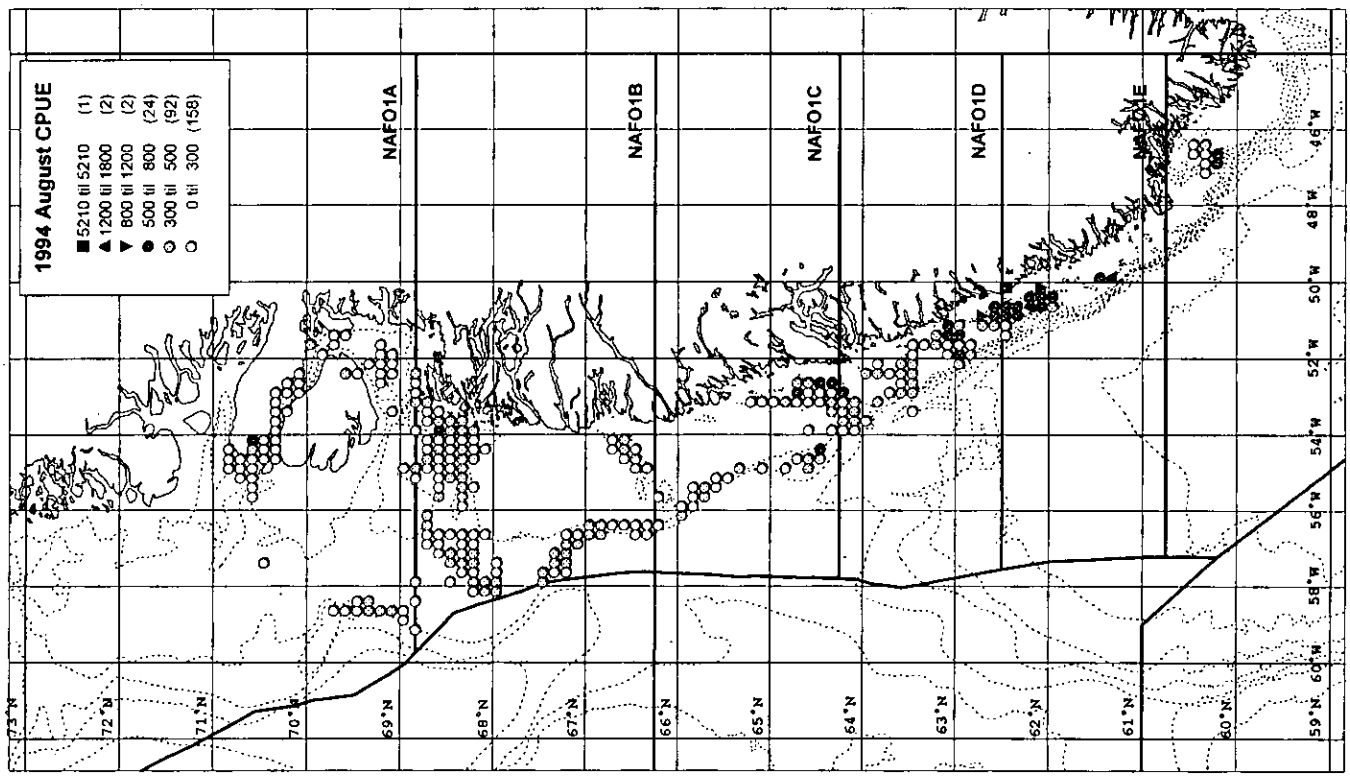


Fig. 5. Continued...



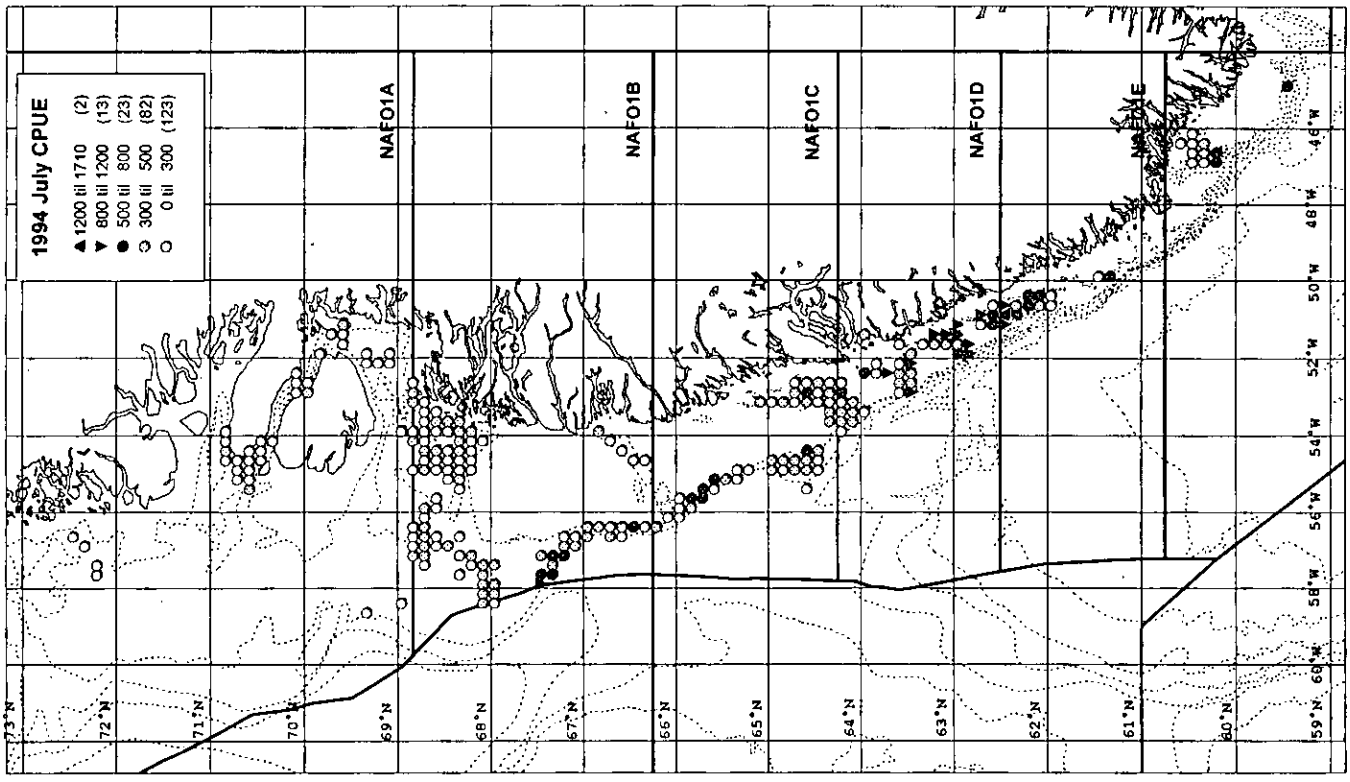
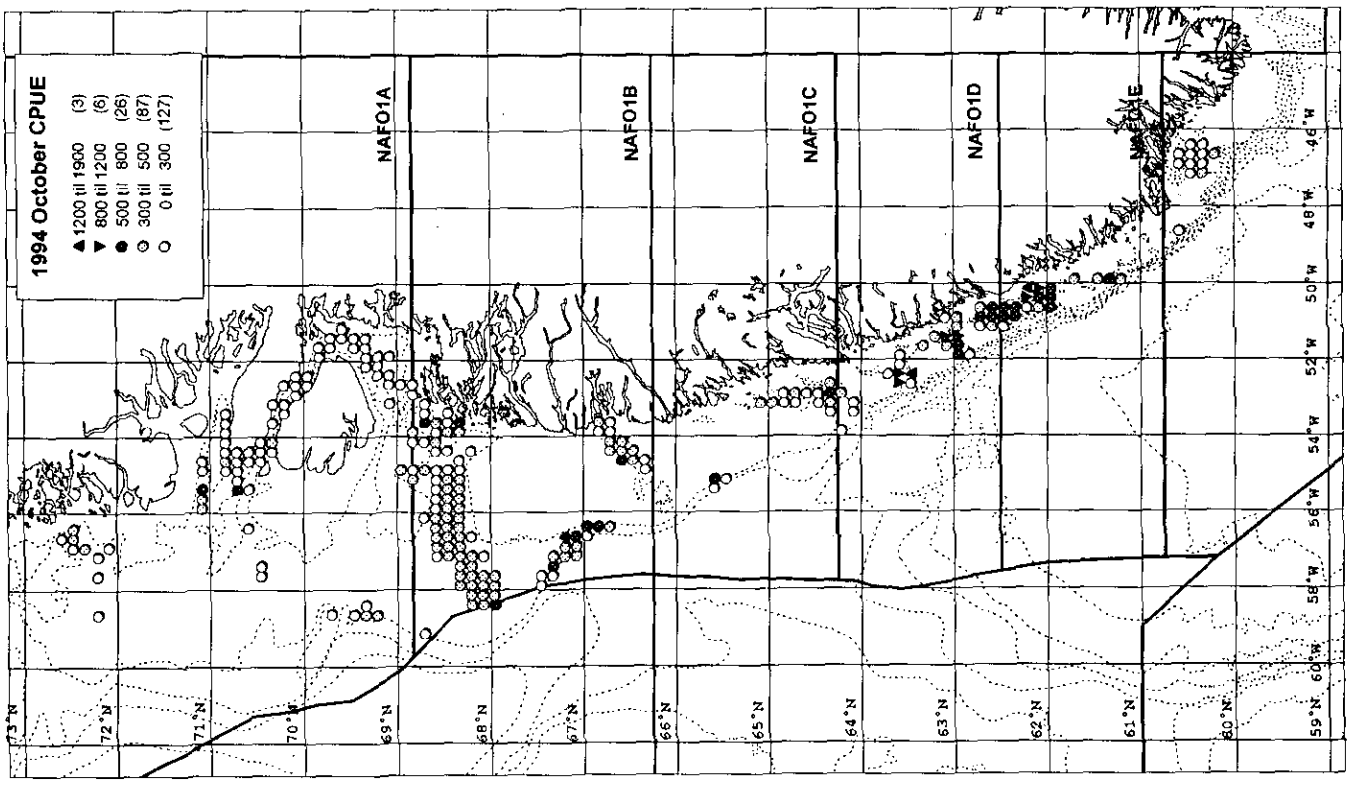


Fig. 5. Continued...



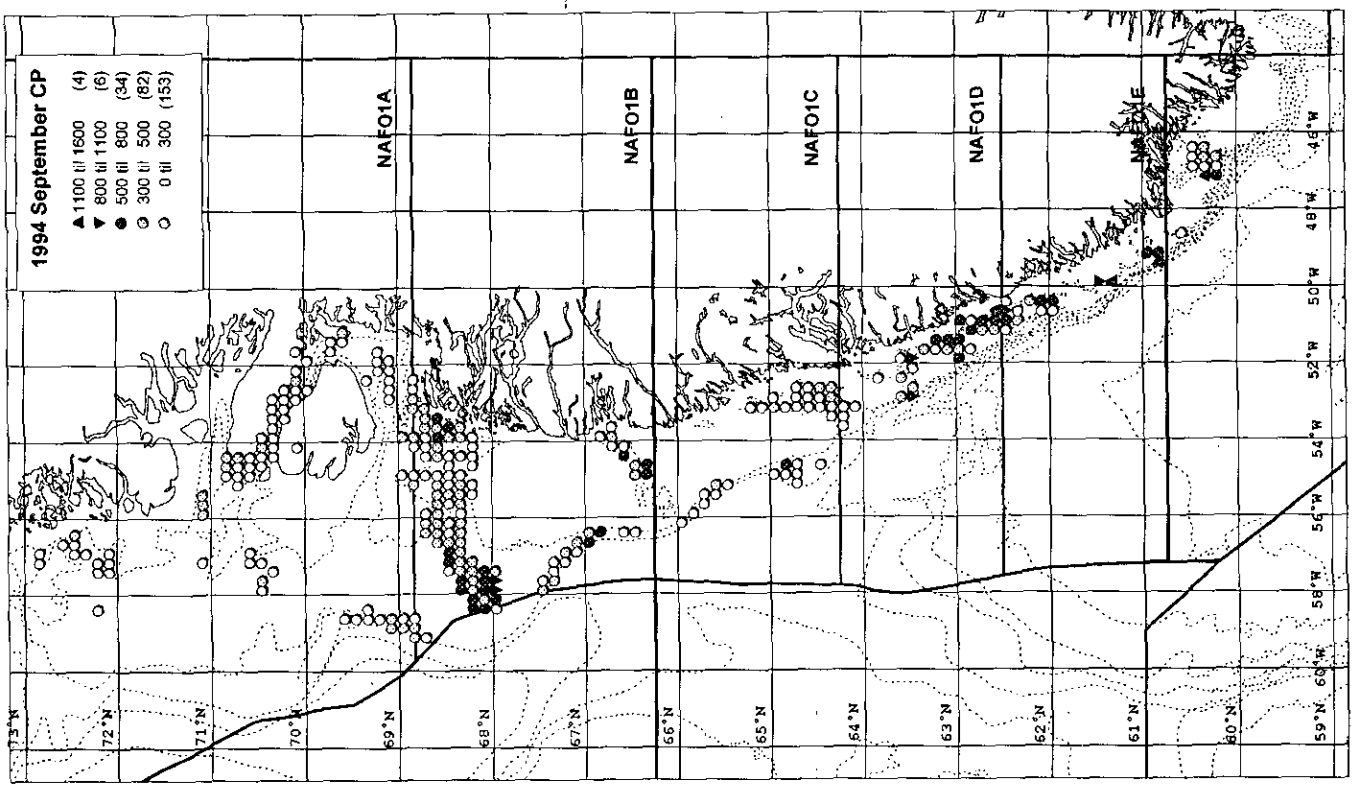
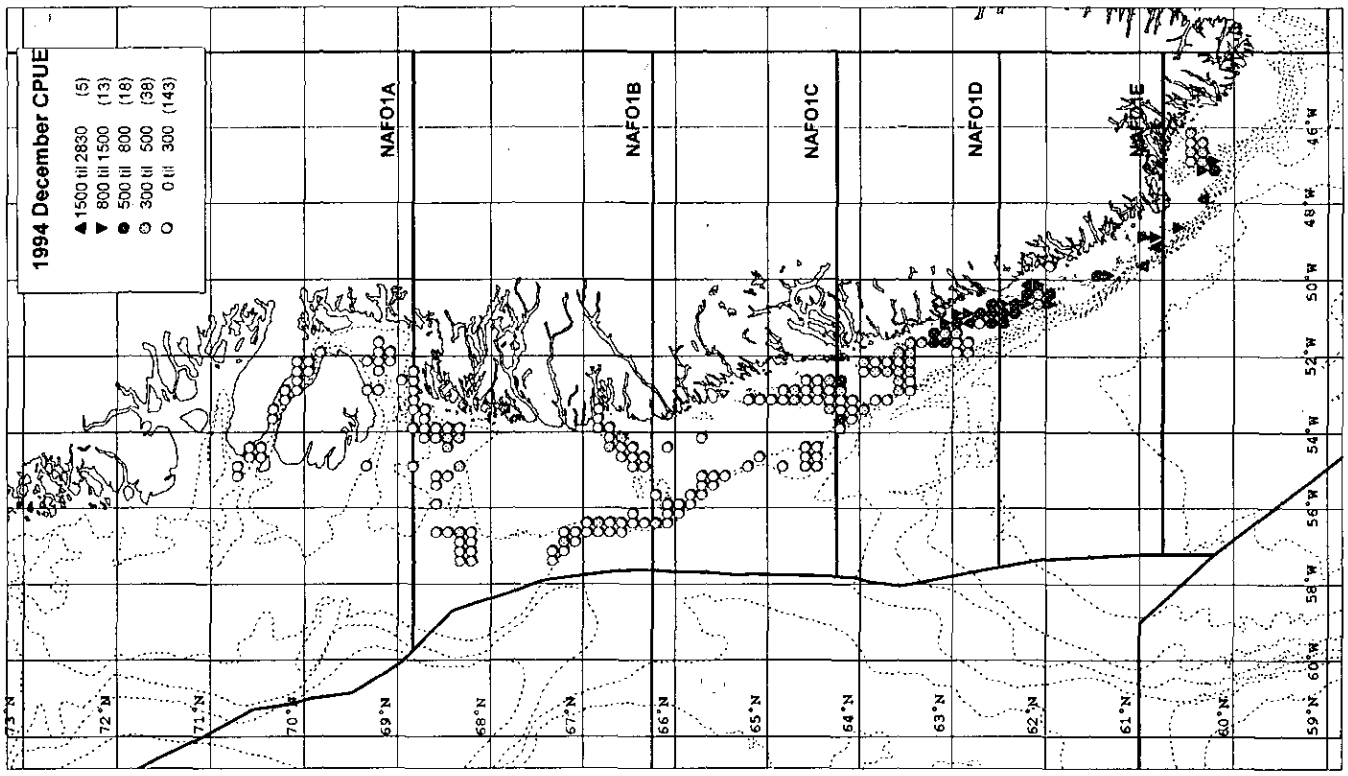


Fig. 5. Continued...



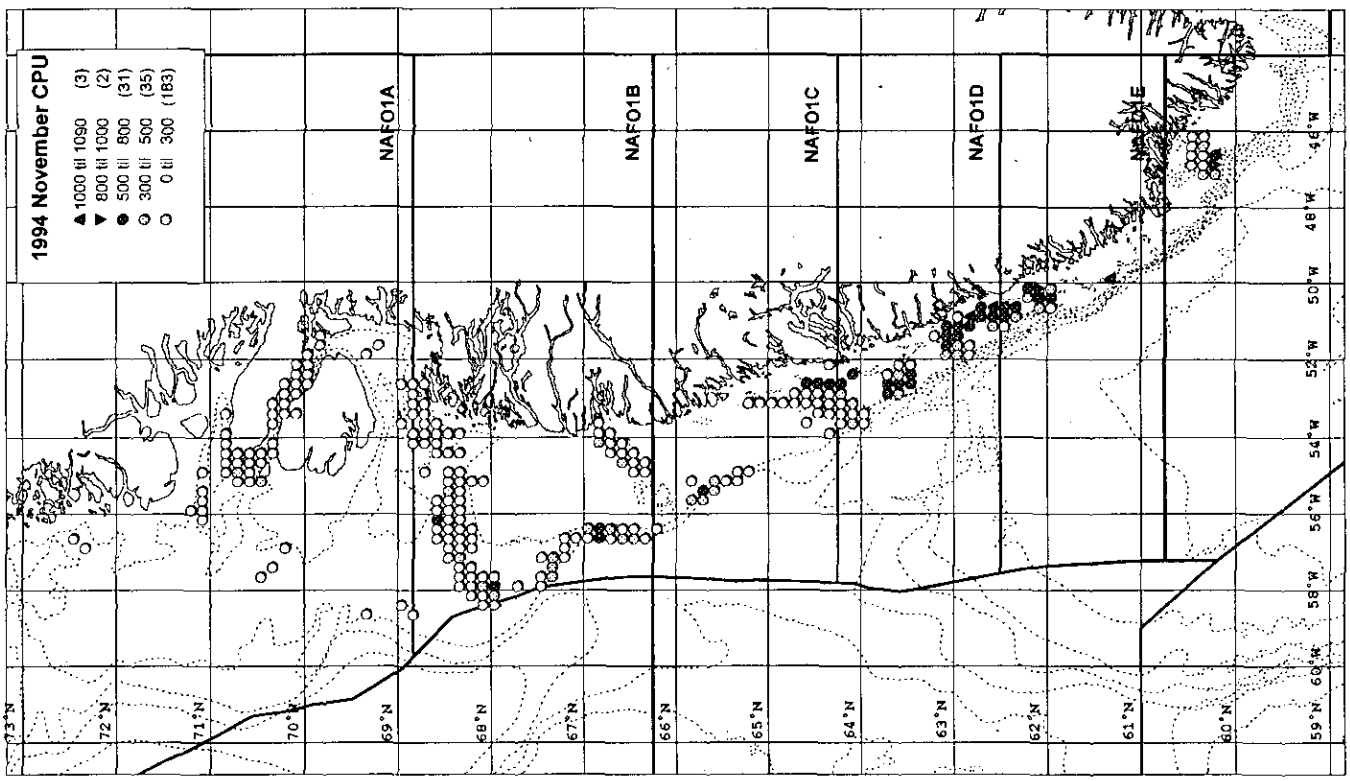
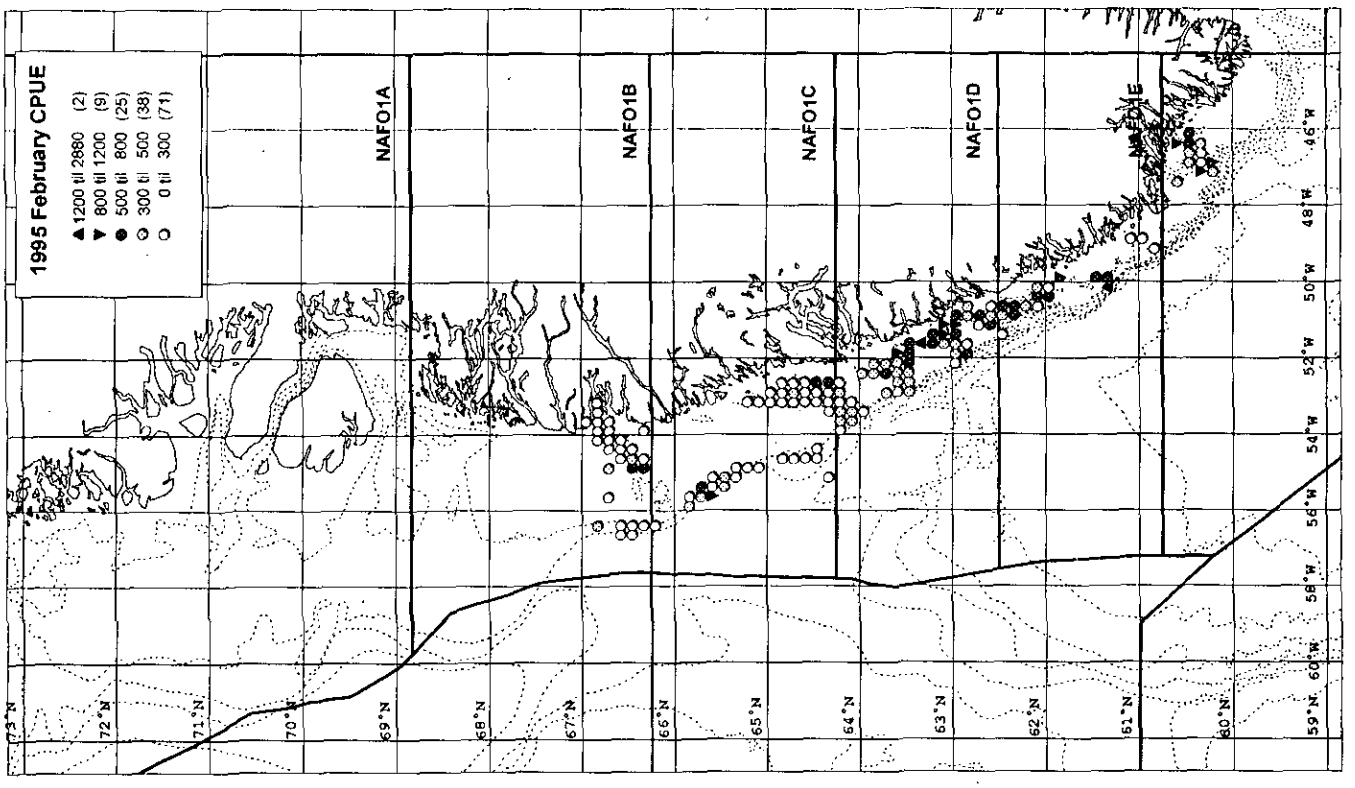


Fig. 5. Continued...



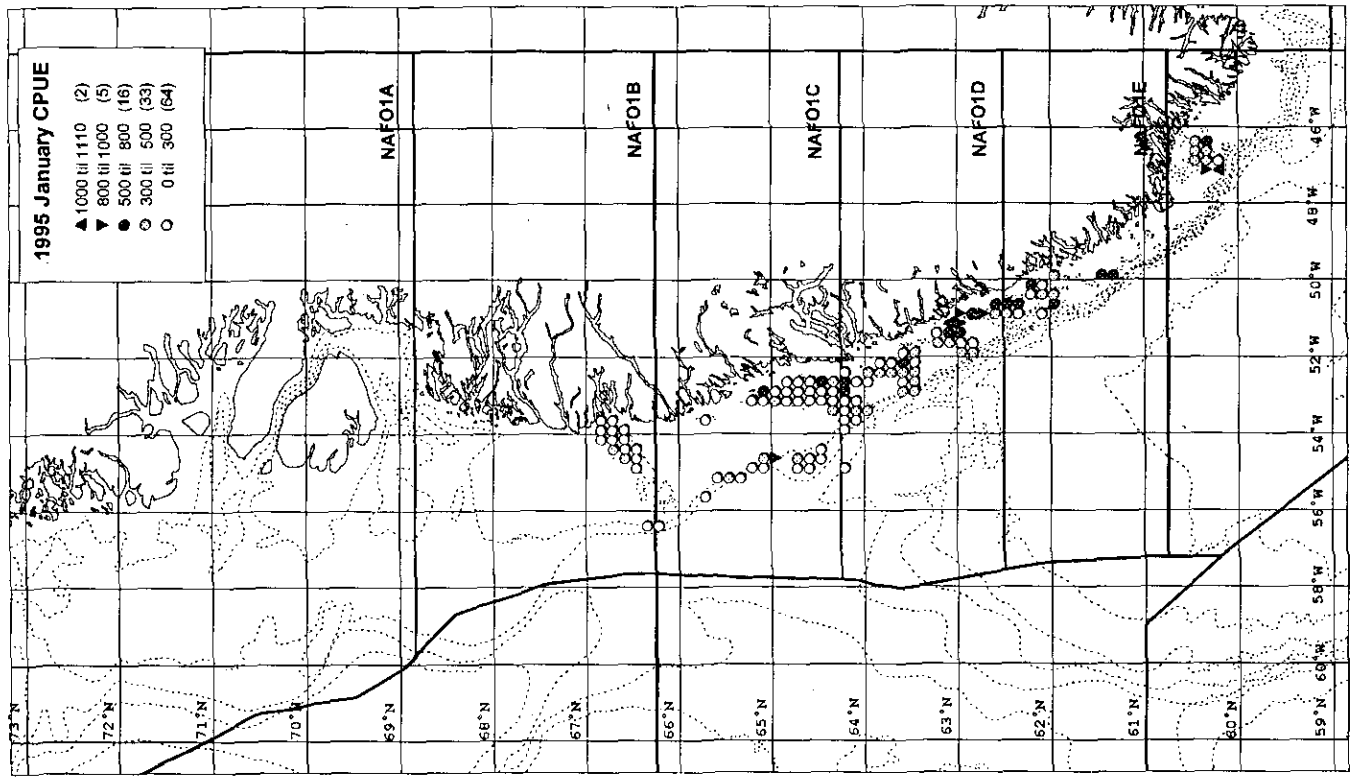
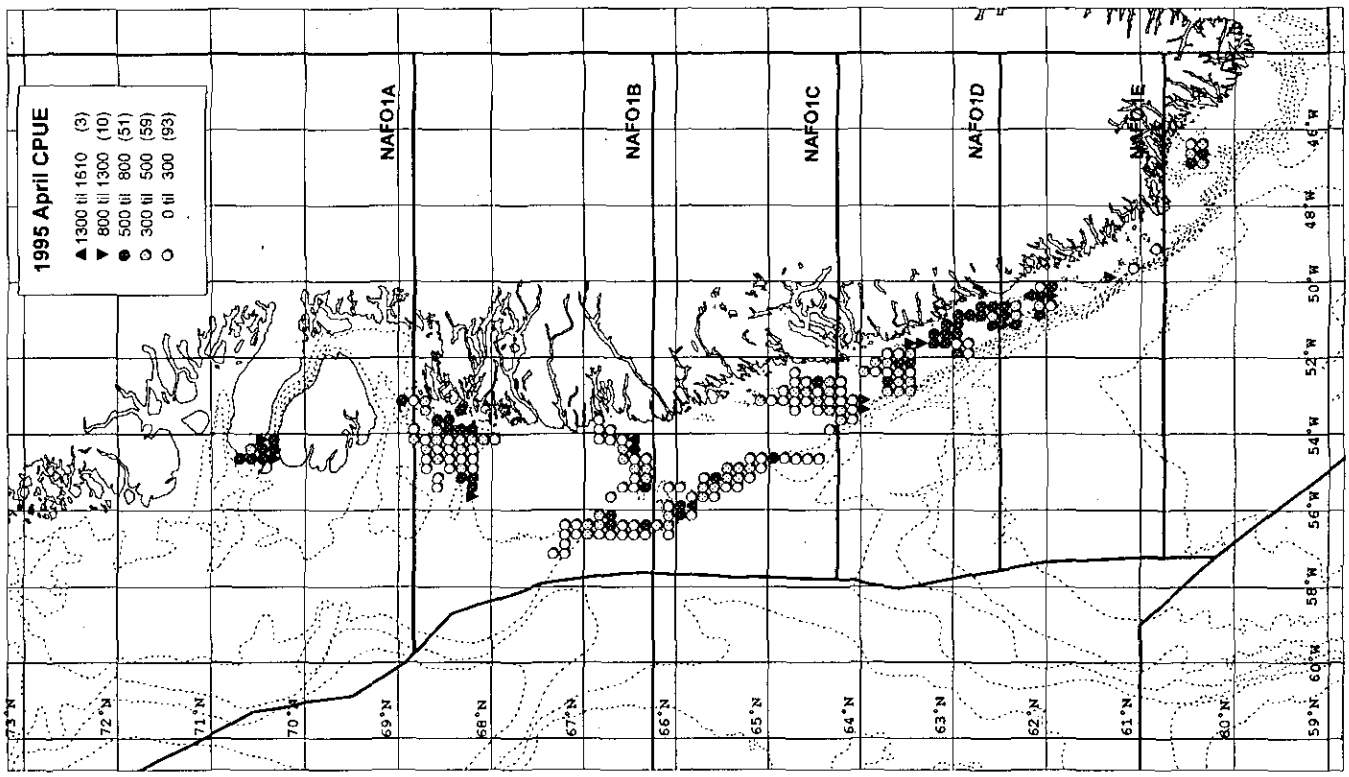


Fig. 5. Continued...



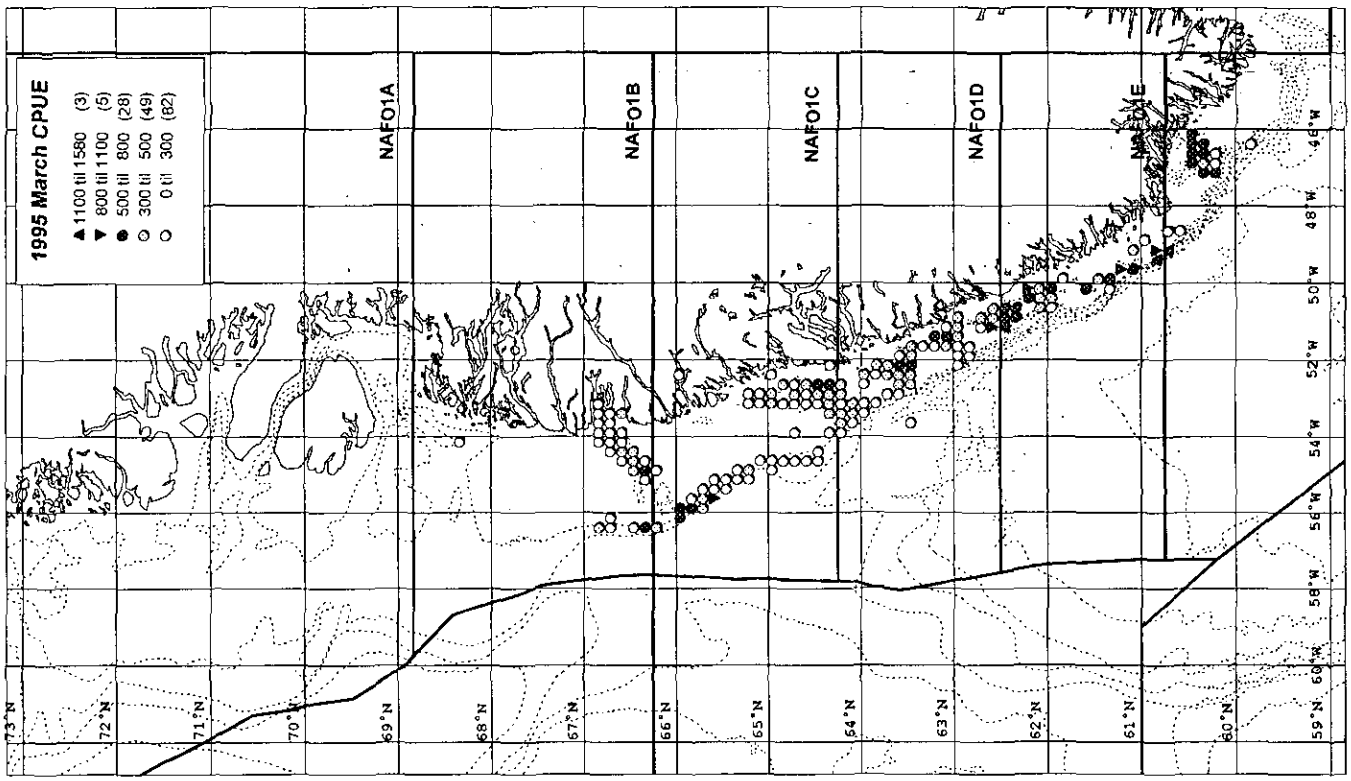
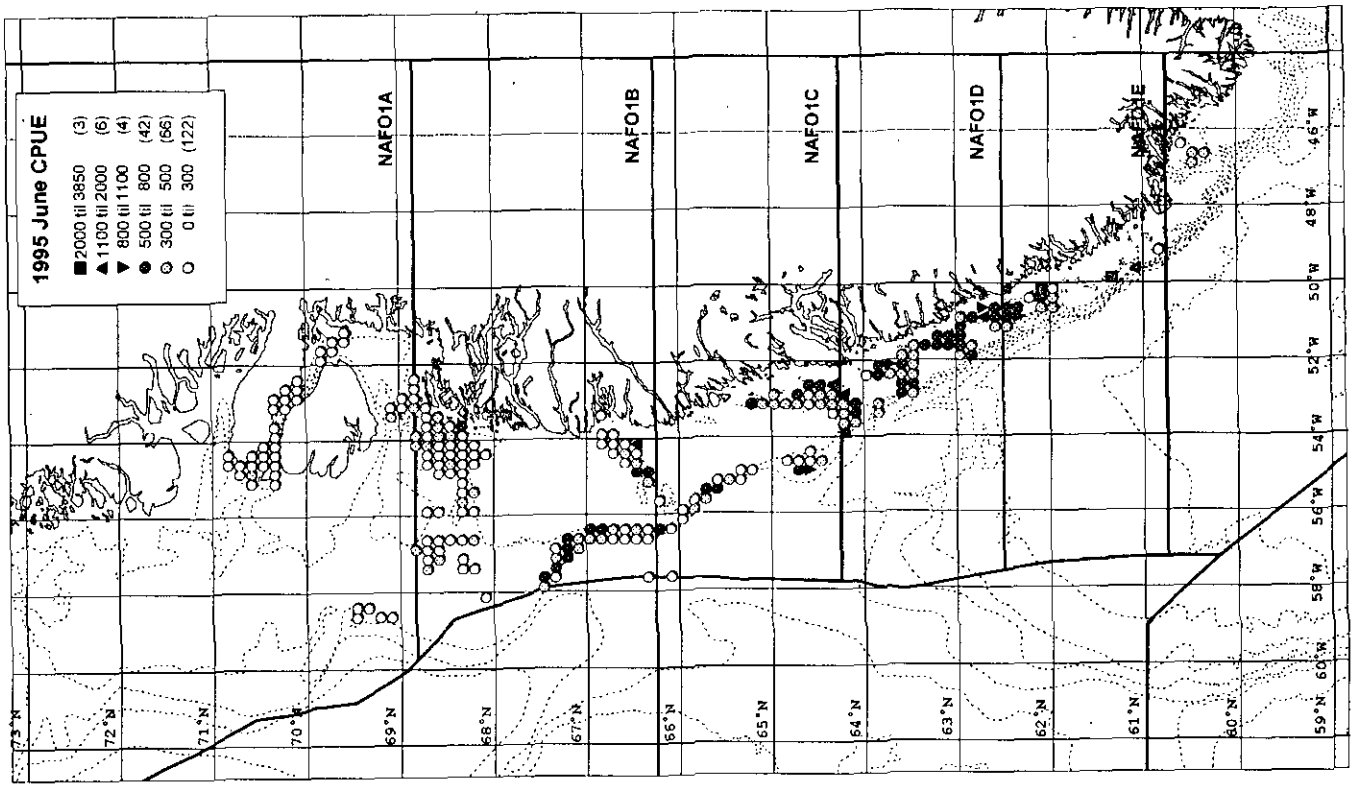


Fig. 5. *Continued...*



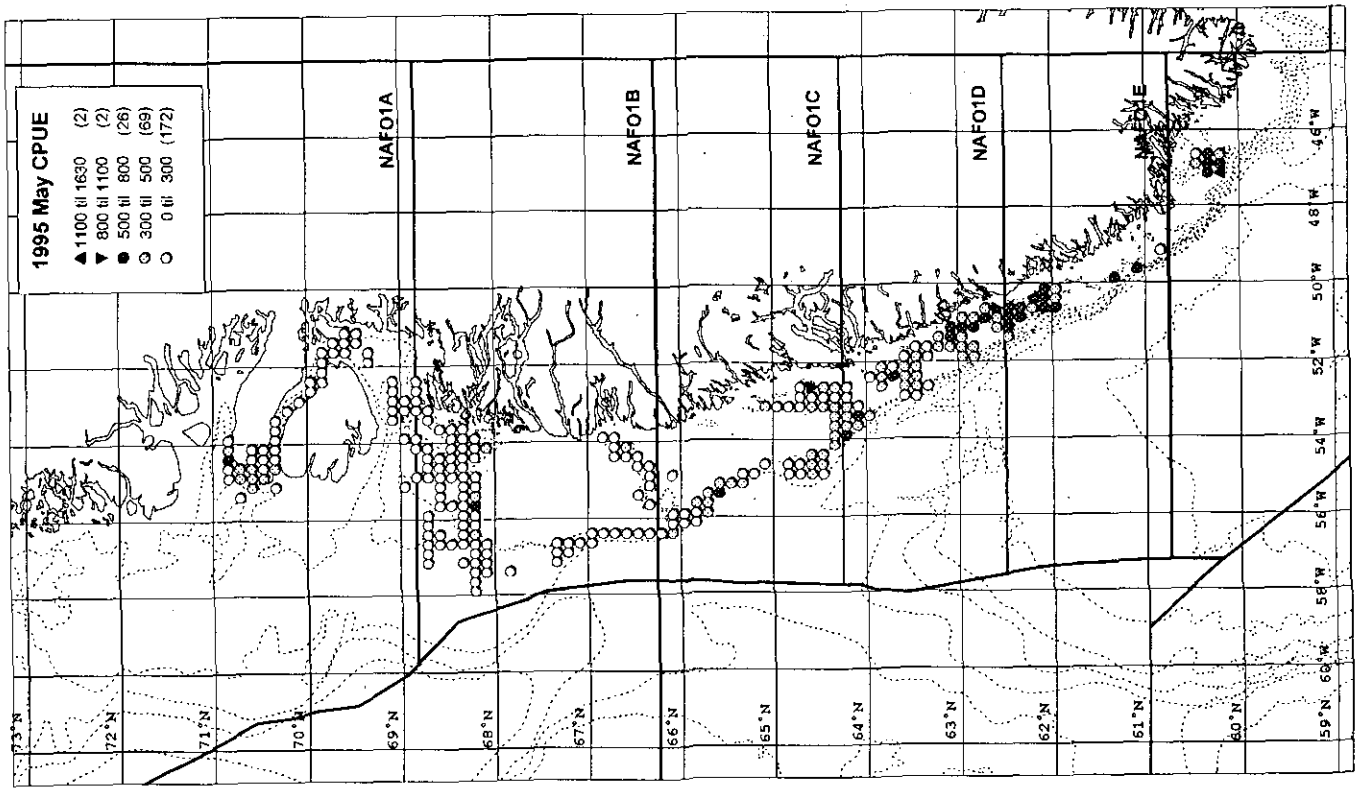
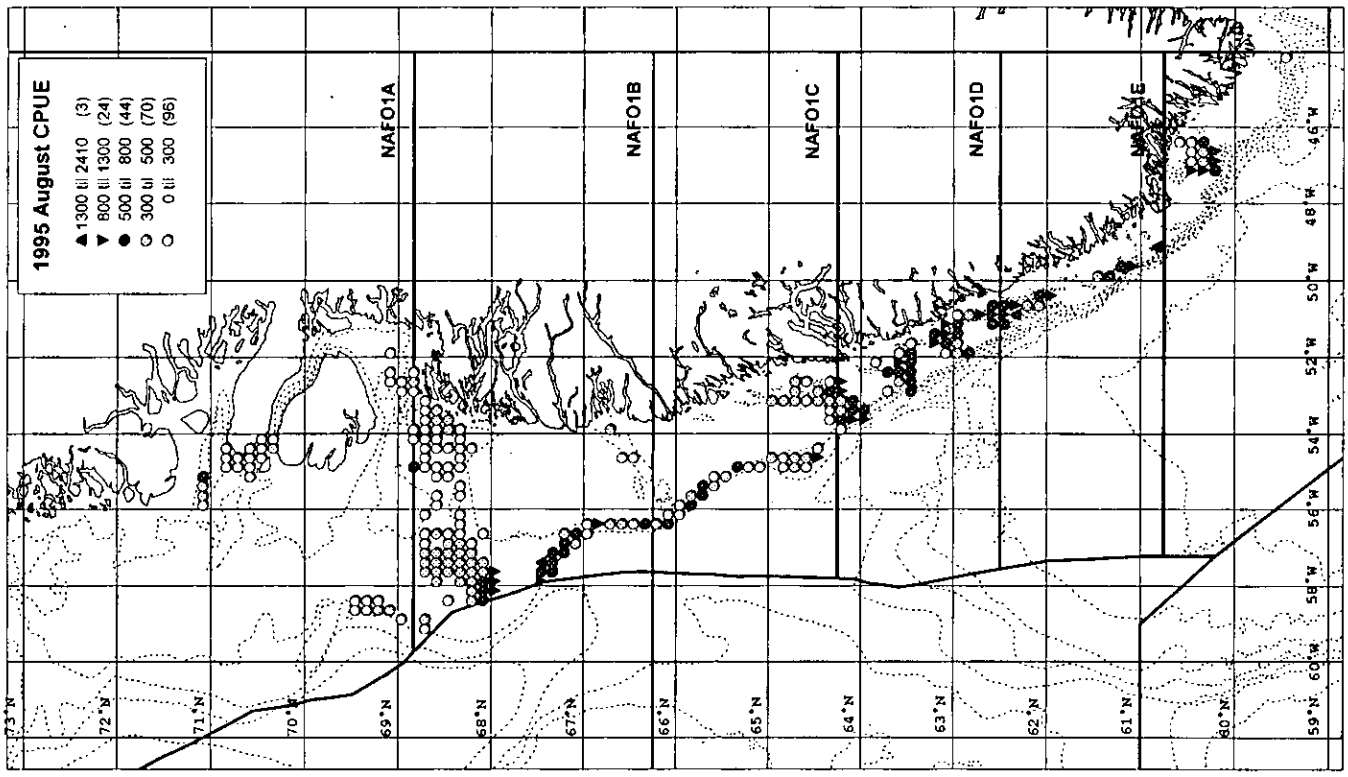


Fig. 5. Continued...



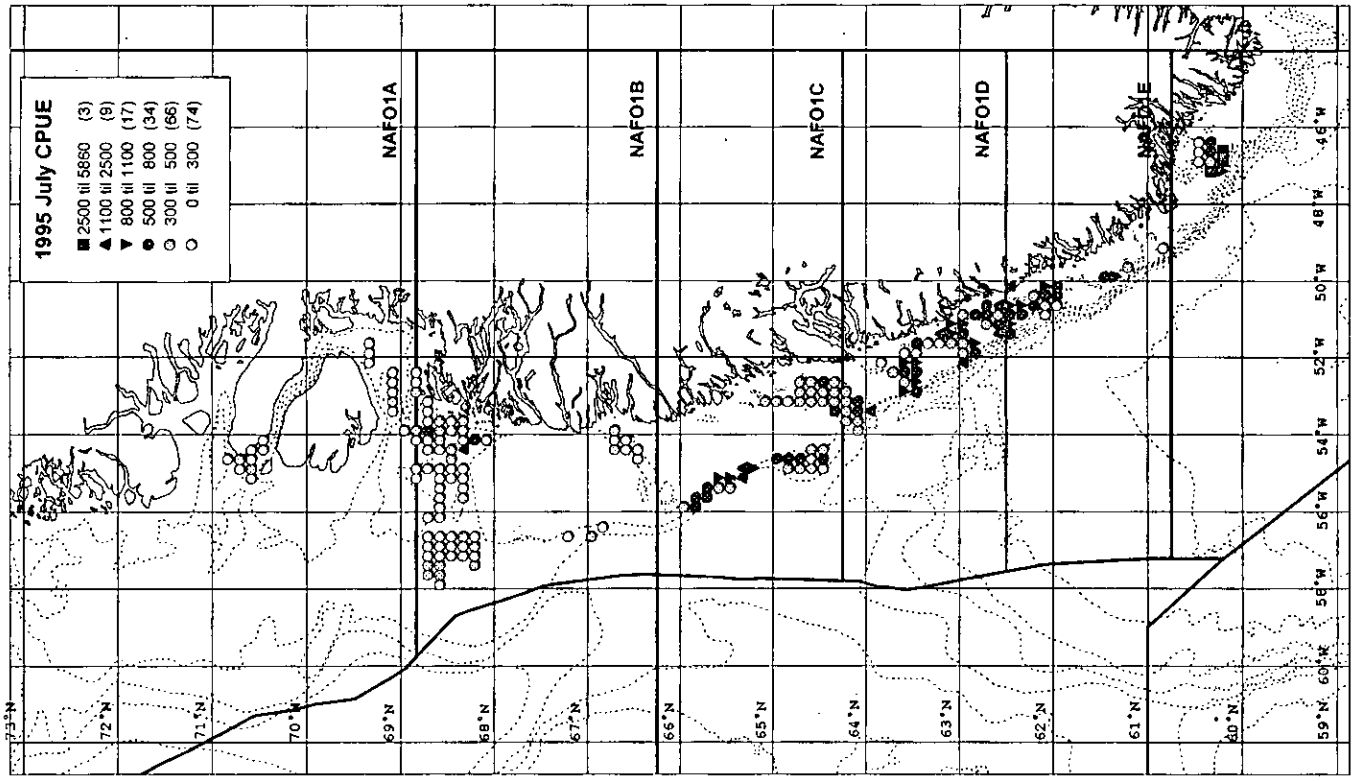
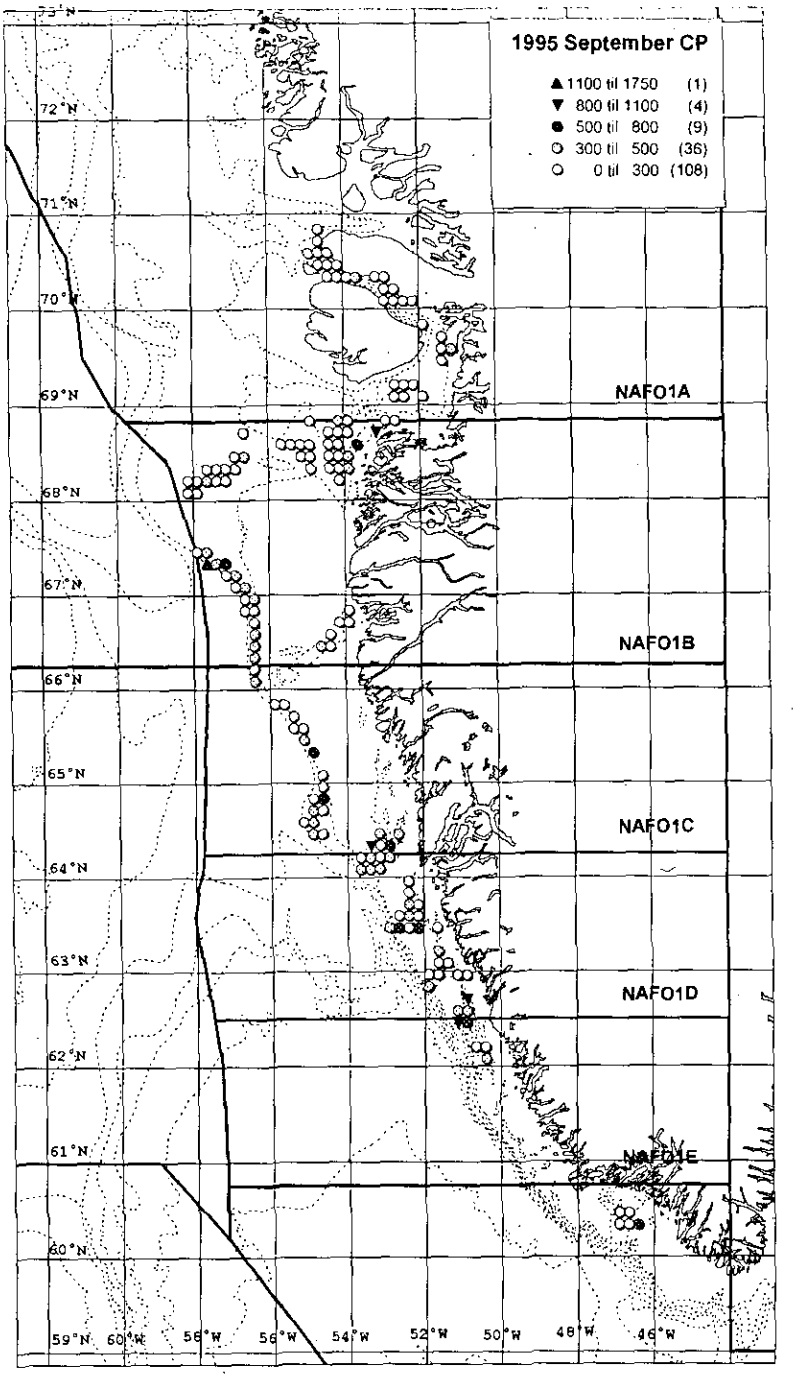


Fig. 5. Continued...



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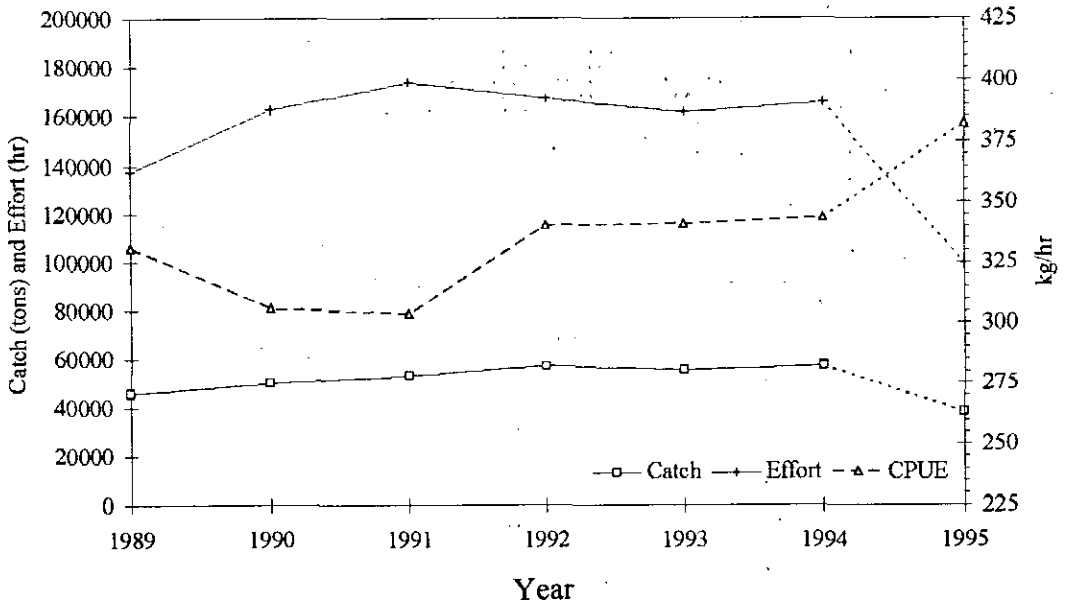

Fig. 6. Catch, effort and unstandardized CPUE by year in Subarea 1, based on logbooks from the offshore Greenland fleet (>75 GRT).

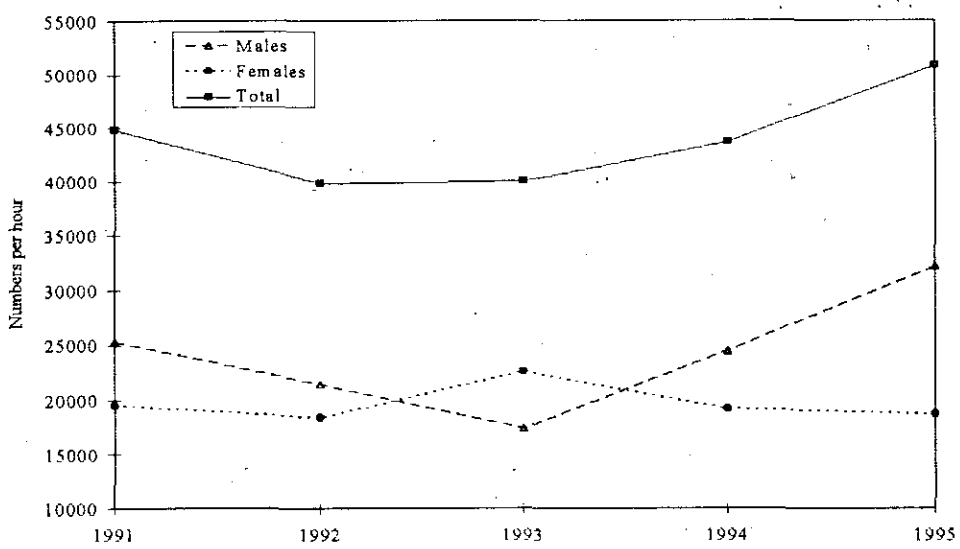

Fig. 7. Unstandardized catch rates (numbers/hr) of male shrimp (age 1 to 6), female shrimp (age 7 and 8+) and total catch based on the proportions calculated in the modal analysis (see table 12).

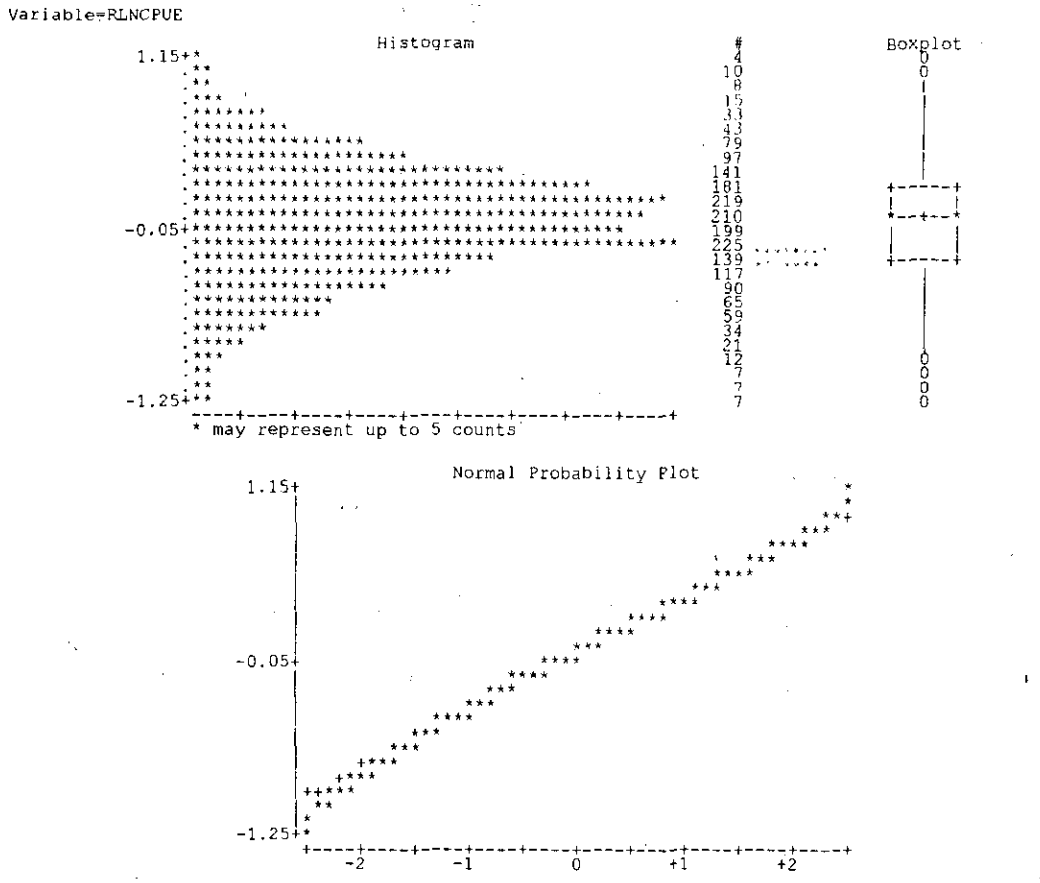

Fig. 8. Histogram box and probit plot of the residuals from the multiplicative analysis in table 8.

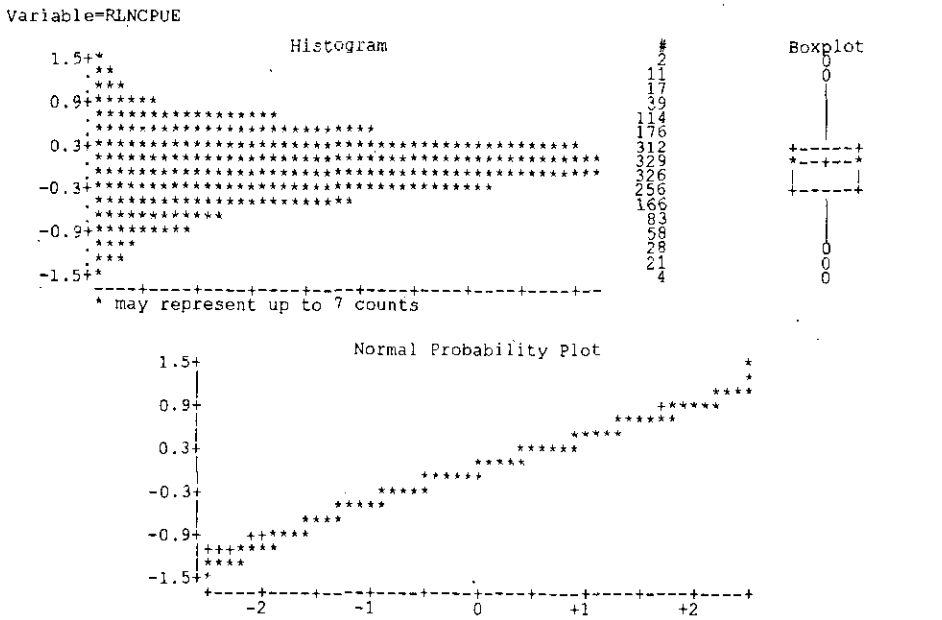

Fig. 9. Histogram box and probit plot of the residuals from the multiplicative analysis in table 9.

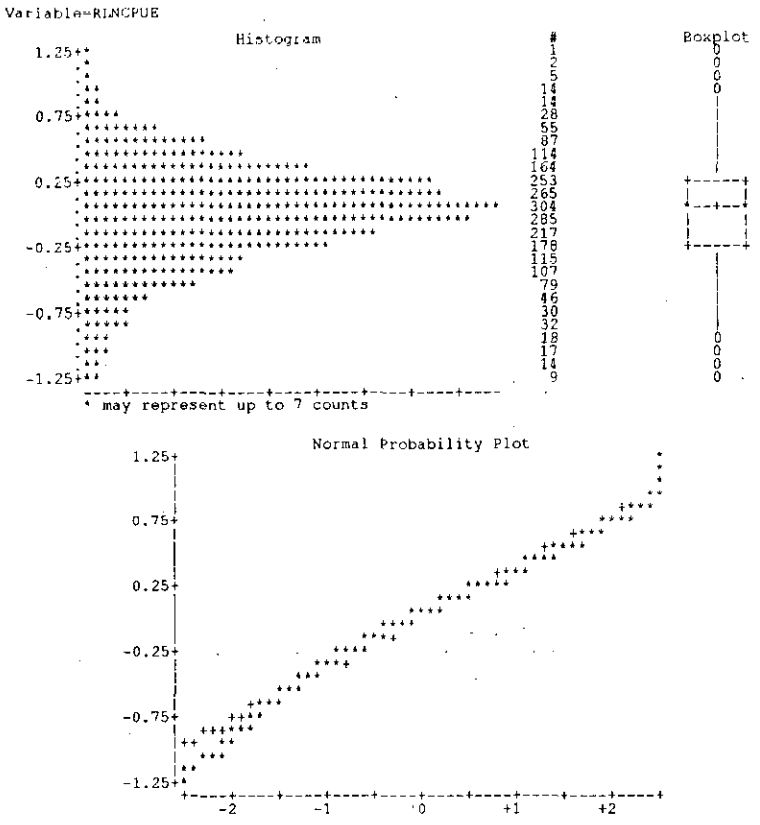

Fig. 10. Histogram box and probit plot of the residuals from the multiplicative analysis in table 10.

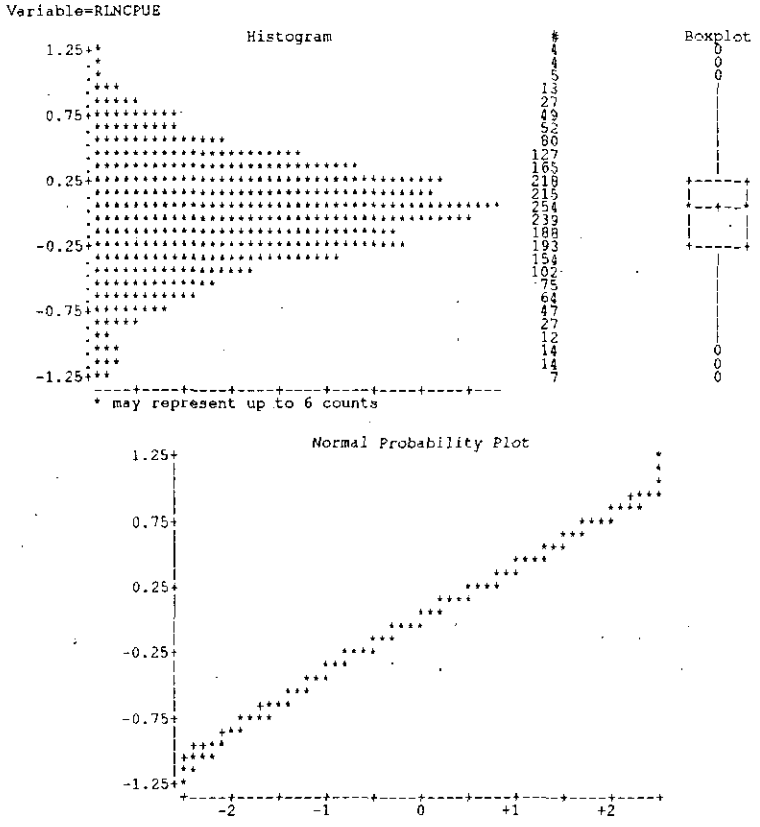

Fig. 11. Histogram box and probit plot of the residuals from the multiplicative analysis in table 11.

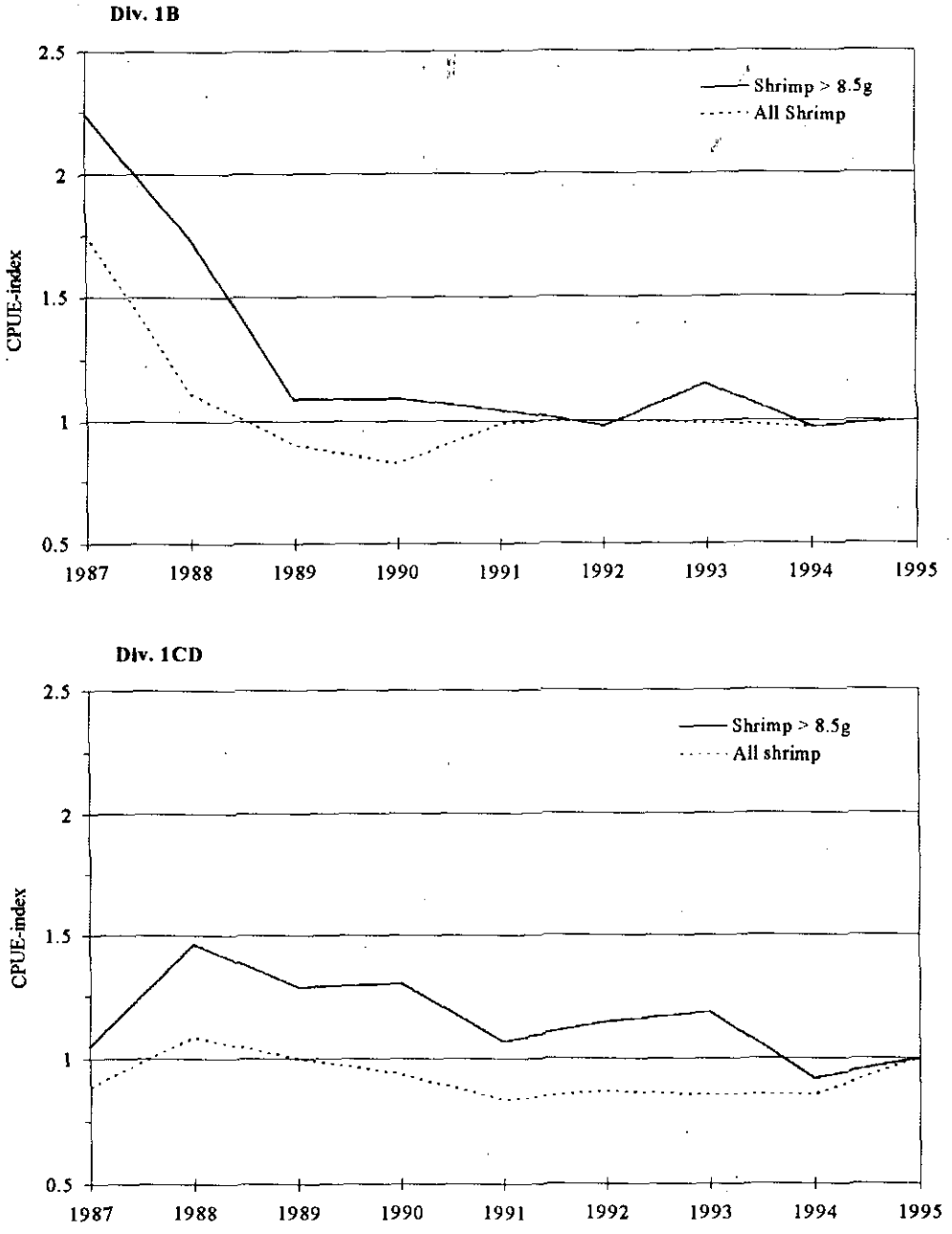

Fig. 12 Annual CPUE-indices calculated for shrimp >8.5g and for all shrimp by 33 Greenland trawlers i Div. 1B (upper diagram) and Div. 1CD (lower diagram) from 1987 to October 1995.

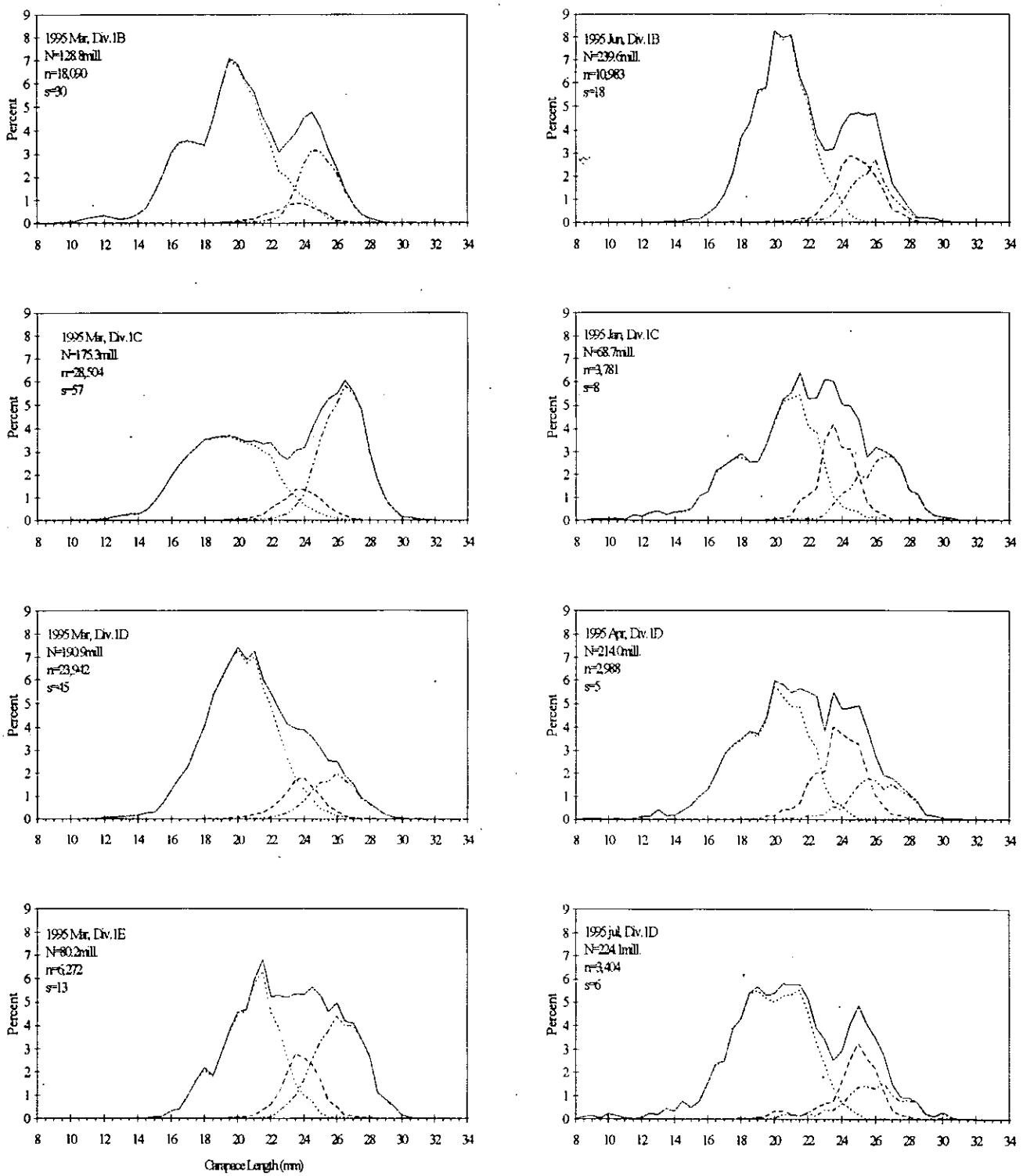

Fig. 13 Length frequencies of shrimp from the commercial fishery at west Greenland by month and Division. Only months with at least 5 samples are shown. (N=total number caught; n=number measured; s=number of samples.

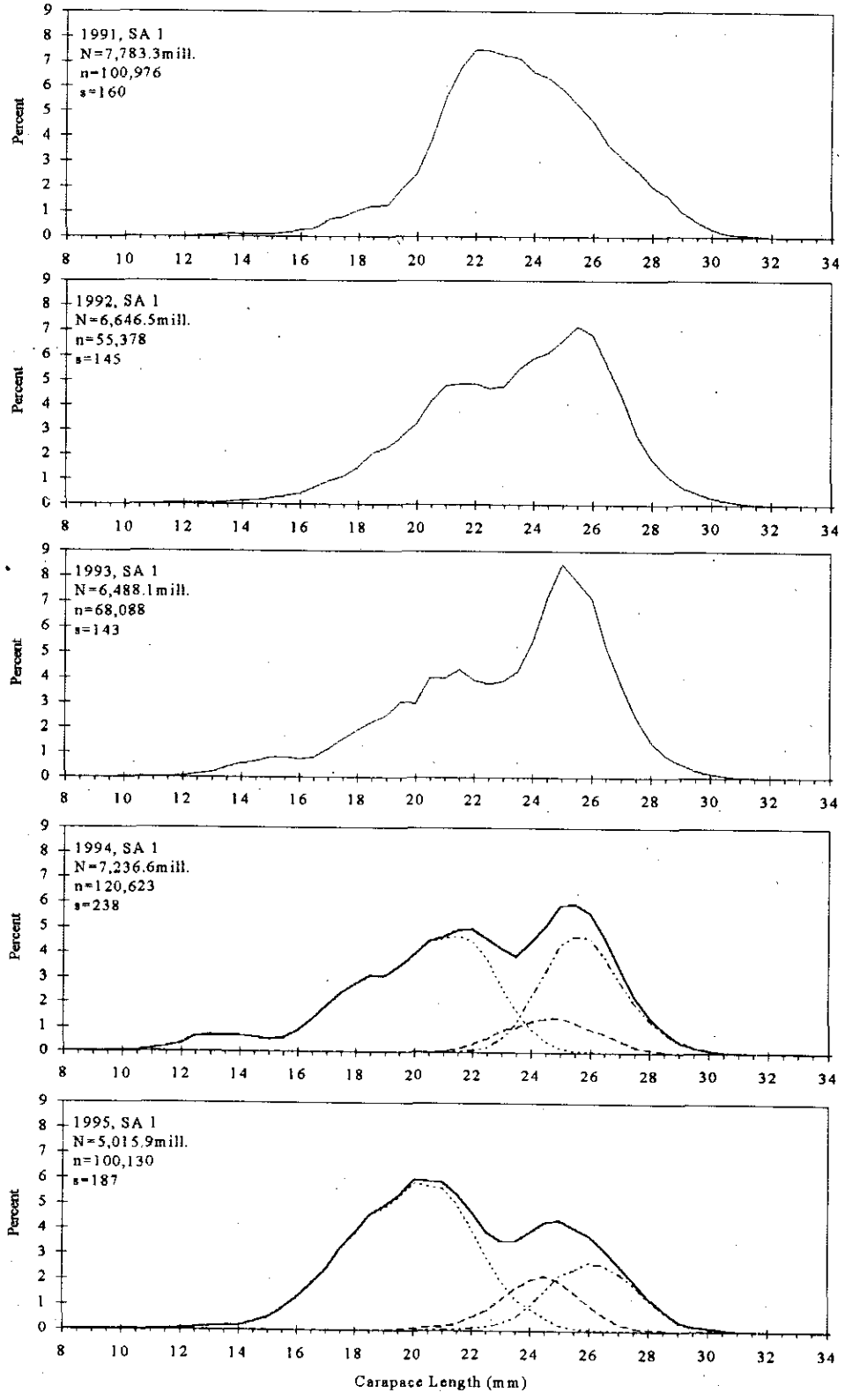

Fig. 14. Length frequencies of shrimp from the commercial fishery at west Greenland by year. (N=total number caught; n=number measured; s=number of samples. Mean lengths caught were 23.4; 23.4; 23.0; 22.3; and 21.7mm in the years 1991 to 1995 respectively.