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Preliminary Assessment of Shrimp (*Pandalus boeralis*) in Davis Strait, 1996 (Subareas 0+1)

by

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1. INTRODUCTION

In November 1993 the 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. In accordance with the recommendation of the Scientific Council advised that the total allowable catch for the entire stock area be set to 60,000 tons in 1996.

The fishery for northern shrimp in Davis Strait occurs in two main areas: the offshore area and the inshore area (primarily Disko Bay). Two fleets are exploiting the stock. The fishing grounds for the Canadian fleet are restricted to the eastern part of Div.0A, whereas the Greenland fleet exploit the stock in Subarea 1 (Division 1A to 1F) inshore as well as offshore. In Subarea 1 two fleet components, named the offshore- and small-vessel fleet exploit the stock. The separation is based on vessel size. The offshore fleet are restricted to the offshore areas and by quotas. An exceptation from the "offshore-only" rule applies to eights 79 GRT vessels, whish have a minor quota (i.e. 2.000 tons) in inshore areas. Vessels below 75 GRT or the small-vessel fleet have until now been unrestricted by areas and quotas.The small-vessel fleet will be restricted by quotas from the first of January 1997.

The introduction of twin trawl in 1995 and an increase in trawling speeed for few new vessel in 1996 is an improvement of vessel fishing power. In 1995 and 1996 the Greenland shrimptrawler has been active in a minor directed fishery for *Pandalus montagui* in Subarea 1. This fishery amount to 374 tons in 1995 and to 432 tons in 1996 so far.

The following presents the preliminary assessment of the shrimp resource in Davis Strait by summarizing and interpreting data from the Greenland and the Canadian fishery and reseach vessel surveys.

2. COMMERCIAL FISHERY (SCR Doc. 96/106, 96/109, 96/110, 96/111)

2.1 History of the Fishery

Overall catches in the entire stock area increased until 1986, were stable from 1986 to 1988, then increased until 1992 and thereafter decreased until 1995 (Table 1, Figure 2). The preliminary statistics for 1996 suggest landings a little below the 1995 level.Until 1987 standardized effort has been fluctuating around 90,000 hr's showing a slowly increasing trend. In the subsequent five years effort increased to about 241,000 hr's. In 1995 effort decreased from this new high level to about 200,000 hr's and a futher decrease can be expected in 1996.

Catches from the Canadian fleet fluctuated during the late 70's and early 80's, increased from about 2,100 tons in 1984 to 7,500 tons in 1992 and declined thereafter (Table 1., Figure 2). Catches from the Greeenland offshore fleet showed the

same trend as total catches in Subarea 1 + 0. The Westgreenland small vessel fishery was relatively stable from 1972 to 1986 with estimated catches of 7,500 tons annually (except for 10,000 tons in 1974). Overall catches for small vessels in recent years have increased to over 27,500 tons in 1994. The catches in 1995 decreased and in 1996 the level is expected to be at the same level as 1995. Allocation of catches in inshore/offshore areas has been relatively stable since 1990, with a inshore catch of around 17,000 tons on an avarage.

Over the last 16 years, the Canadian fishery has been restricted to Div. 0A, between the international boundary to the east and the 500 m depth contour to the west.The Canadian fishery usually takes place from July to November, whereas the Greenland fishery in Subarea 1 occurs in all months. The location of fishing activity in the latter area is affected in the early part of the year by the presence of ice, confining the fleet to the southern grounds in Div. 1C, 1D, 1E and 1F. Apart from others years areas north of 67°N could still be accessed in January in 1996 due to a mild winter.In the spring the fishing grounds north of 67°N were accessed in April in 1995 and 1996. The northwestern corner of Div. 1B and Div. 0A have recieved much less attention in 1996 than in previous years.

More than 75% of the total catches in Subarea 1 in 1995 were taken in Div. 1B, C and D.The catch from Div. 1E and 1F increased from less than 1,000 tons in 1988-91 to about 8,500 tons in 1995. Traditionally, the fishing grounds in Div. 1B and the Div. 1A have been most important, but since 1987 catches have increased in Div. 1C and 1D, and from 1990 these catches exceeded those from 1B. A geographical change in form of a southwards movement of the fishery has been indicated in the catch statistics and data on the annual distribution of effort allocation is displayed in Figure 4. In general the areas north of 70°N gets less importent to the overall fishery over the ten years examined. The fishery starts expanding southward in 1989 and the expantion continues southward in the following years.

2.2 Trends in Catch Rates

Five time series of standardized CPUE indices are available, including both the inshore and different offshore areas, as well as the offshore and the small vessel component. A single index was calculated by combining the five separate indices, wighted by the proprotion of the total fishing grounds each represented (Figure 3). The five indices were analyzed by multiple regression to test their inherent biological assumptions.The combined index cover data from 1977 to 1996. The basic model for all indices linked catch rate to vessel fishing power, temporal and spatial availability of shrimp and overall annual abundance. The five indices standardized to the KGH index (1977-1990) by the mean ratio of the ovelapping years, show an agreement in development supporting the assumption that they are measuring the same thing.

The series showed that, during the 1976-1988 period, stock biomass fluctuated at a level substantially higher than the 1989-1995 periode. Futher a declining trend was evident within the latter periode. During the last ten years the Greenlandic indicies (1B, 1CD and Small vessel) showed a decrease from 1987 to 1991, fluctuated thereafter with a decreasing trend. The 1994 value was the lowest in the timeseries. The indices increased from 1994 to 1995 and again in 1996 with about 7%-11%. The Canadian series showed two periods of stable catch rates at similar levels: 1983 to 1986 and 1989 to 1993. These periods were separated by significantly higher catch in both 1987 and 1988. The standardized series indicated relative stability up to 1993. However, the value predicted for recent years (1994-1996) were the lowest in the sixteen year period.

Unstandardized catch rates from the smaller vessel in the inshore/offshore areas area available from 1990 - 1996. Seasonality of the fishery is evident in the monthly CPUE(Figure 5.).The unstandardized CPUE of the small vessel show stability in both inshore and offshore areas. The unstandardized CPUE for the Canadian fleet were fairly stable up to 1985, increased to a substantially higher level in 1986-1988. The catch rates from 1994 to 1996 returned to the level observed in early 1980's (Figure 6).

2.3 Biological Data

Length frequency distributions obtained by observers were available from the commercial fishery in Div. 0A during the 1981-1996 period, and in Subarea 1 from 1991 to 1996.

Data from Div. 0A indicate that relatively strong year classes appear to be produced about every five years. Although

recruitment of a few such year classes raised CPUE's in the early and late 1980's over the "base level" observed from 1983 to 1986, the strong 1985 year classes only maintained catch rates in the early 1990's. The 1995 data suggest that the 1990 year class is strong. (Figure 7, Tabel 3).Data from the 1996 fishery in Div 0A suggest that the 1993 year classes is strong

Length frequency distributions obtained from the commercial fishery in Subarea 1 in 1991- 1996 are showed in Figure 9 and Tabel 4. Increase in male shrimp abundance seems to be the main cause of the improved catch rates in both 1995 og 1996, partly due to the increased abundant of the 1990 and 1991year classes. Also the 1993 and 1994 year classes look promising in the 1996 data.

RESEARCH SURVEY DATA (SCR Doc 96/112, 96/114)

3.1 Biomass Estimates

In July-August 1996, a stratified random trawl survey was carried out in the main area of shrimp distribution in Divisions 1A-1F and the adjacent part of Subarea 0 (Figure 9).

The estimate of biomass for the area surveyed south of 69°30'N was about 176,000 tons compared to 130,000 tons in 1995. The increase in biomass is mainly due to an increase in the southernmost strata (W6 and W7). Biomass in the area north of 69°30'N decreased from 19,000 tons in 1992 to show relatively stable level of 9,000 tons in 1993-1996. In Canadian water the estimated biomass has fluctuated between 3,000 to 17,000 tons over the previous years. The estimate for 0A in 1996 is the lowest in the timeseries.(Table 2).

In August 1996 a stratified-random trawl survey was conducted in the inshore areas in Disko Bay and Vaigat. Biomass has increased conccurrent from about 32,000 tons in 1993 to 54,743 tons in 1996.

Demographic Structure

Total number of shrimp increased from 1995 to 1996 in accordance with the increase in biomass estimate. The increase is based on a significant increase in numbers of males. In 1996 three modes of males dominate at 14, 18 and 21 mm carapace length (CL). The mode at 21 mm CL is probaly representing the 1990 year class, the mode at 18 mm CL may be interprented as the 1992 and 1991 year class. The significant mode at 14 mm CL is probaly representing the 1993 year class (age 3). (Figure x).

Overall length distribution indicate a relative strong 1990 year class and recruitment of several year classes of smaller shrimp, of which the1993 year class is more abundant than ever observed in the timeserie. The 1993 yearclass is supposed mainly to be offspring of the very abundant 1985 yearclass, and its abundance in 1996 may indicate that a new very strong year class will recruit to the fishery in few years.

The overall size composition of shrimp from the inshore survey in 1996 was similar to that for the offshore in relation to the occurrence of modes. Males are most abundant in southwestern and central Disko Bay. Females are most abundance in cantral Disko Bay and northern Vaigat.... .....

OTHER INFORMATION (SCR Doc 96/xxx)

During the Westgreenland trawl survey for P. borealis minor quantities of P.montagui is reported. A biomass estimate on P.montagui in the periode 1988-1996 is reported. The biomass estimates and numbers of stations where they are found indicate an increase in population size between 1988 and 1996. The rapid increase indicate environmental changes, however the impact on P.borealis is unknown..

SUMMARY OF ALL INDICES

<u>overall variations in catches:</u>
- overall increase from 1981 to 1992, thereafter decreased from 1992 to 1995 (futher decrease in 1996 is anticipated)

local variation in catches:
- catches in the inshore area increased till 1992, decreased thereafter
- catches offshore increased since 1988-1992, decrease thereafter
- catches in division 0A have ranged between 6,000 and 7,500 tons from 1987 to 1992, from 1993 catches has decreased

variations in effort:
- overall increase in effort from 1987 to 1992,
- effort increased in Div. 0A till 1992, decreased in therafter
- in Div. 1E and Div. 1F increasing effort since 1991
-no shift in effort allocation in inshore/offshore

a shift in the fishery:
- since 1987 a movement southward of the Greenland fishery has taken place.

trends in recent catch rates:
variations in division 0A:
- catch rates have decline since 1987 and for the 1994-1996 periode are at a lower level the observed from 1989 to 1993.
- the decline was associated with a gradual reduction in the catch rates of female shrimp
variations in division 1B:
- decrease from 1987 to 1989 followed by stability from 1989 to 1996,
variations in 1CD:
- decreased from 1988 to 1991, stable since then
varitaion in small vessel:
- same trend as in 1B and 1CD.
variation in Combined Index:

composition of catches:
from division 0A:
- in general, years of high catch rates are associated with a dominance of females in the catches
- catch rates for females reflected the same trend as the overall commercial CPUE index while those for males varied without trend
- data suggest that the 1993 yearclasses is strong
throughout West Greenland offshore area:
- increase in male shrimp abundance is the main cause of the improved catch rates in both 1995 and 1996.
-some indication of a strong 1993 yaer class

discarding:
- level of discarding in 0Adeclined in recent years from a high of 6.5% in 1991 to 1% in 1996.
- no information from Div. 1

biomass estimates from research surveys:
- biomass in the area North of 69°30'N decreased from 1992 (19,000 tons) to show relatively stable level of 9,000 tons in 1993-1996.
- biomass South of 69°30'N was about 176,000 tons compared to 130,000 tons in 1995. The increase in biomass is mainly due to an increase in the southernmost area.
- total offshore biomass fluctuated around 190,000 tons from 1988 to 1996 (except for the low 1991 value of 125,000 tons).
- estimates of biomass of about 55,000 tons for 1996 in the inshore area is the higest in the timeserie
- in Div.0A the estimated biomass has fluctuated between 3,000 to 17,000 tons over the previous years. The estimate for 0A in 1996 is the lowest in the timeseries

demographic structure:
- males: estimated number of males was highest in 1993 and 1996

- females: estimated number of females was higest in 1993
-overall length distribution show a relative strong 1990 year class and recruitment of several year classes of smaller shrimp, of which the 1993 year class is more abundant than observed before
- the 85 year class changed sex and took part in spawing for the first time at age 7 in 1992. The 1993 year class should thus mainly be offspring of the 1985 yearclass.
- the size at age composition of shrimp from the inshore survey is similar in the occurrence of modes to the offshore
- same modes of males occur in inshore and offshore areas

STATUS OF THE RESOURCE

Indices from the commercial fishery show that the abundance of shrimp in 1989-96 was stable but lower than the high 1976-88 level. The high level can be explained by the recruitment to the female component of at least two strong year classes. The decrease from the 1976-88 level can be explained by mortality (fishing and natural) of these year classes. The stability from 1989-1993 was maintained by the strong 1985 year class. The low level of stock abundance in 1994 can be explained by the the disapearing of this year class. Increase in male abundance seems to be the main cause of improved catch rates in both 1995 and 1996.

The research survey index from 1988 to 1996 in the offshore areas showed relative stability around a mean of approximately 180,000 tons. The declining trend from 1993 to 1995 has stopped in 1996. The increase in biomasse is found in the southern part of the area. The inshore biomass index showed an increase from 1993 to 1996.

Since 1987 an ongoing movement of the Greenlandic fishery has take place.The southward displacement of the fishery may be due to the fleet tracking the southward shift in the distribution of the stock.

Overall length distribution from the surveys indicate a relatively strong 1990 year class and recruit-ment of several year classes of smaller shrimp, of which the 1993 year class is more abundance than observed before for threee years old males.

A strong 1990 year class is also indicated in the fishery, and will most probaly maintain the catchrates in 1997, as it recruits to the female stock in 1997. The 1993 year class is expected to enter the fishery as five year old. Depending on the actually strenght it may, when it enter the fishery in 1998, cause changes in the discard procedure.

The combined inputs to the assessment indicate a stable stock that, in 1997, will be able to sustain a fishery similar to that of the latest years. The fishery in 1997 will depend on the 1990 relatively strong year class and as it recruit to the female component it will maintain til catch rate. The presence of several year classes, recruiting to the fishable stock in comming years, further suggest that the stock will stay at a level not lower than the present for a number of years, depending on exploitation levels and environmental changes. The stability of shrimp biomass from surveys also indicate a stable stock.

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Tabel 1. Catch, effort and TAC for *P.borealis* in NAFO Subarea 0+1 from 1974-96.

Total catch and effort of *P.borealis* i NAFO Subarea 0+1 from 1974-96

Year	Catch Inshore Greenland	Catch Offshore Greenland	Catch Greenland In+offshore	Catch Canada	Catch Offshore Grl+Can	Total catch Subarea 0+1	Total effort Subarea 0+1	TAC (Adviced)	TAC(effective) Offshore-Grl	TAC(effective) Small vessel Grl	TAC(effective) Canada
1974	10.064	11.945	22.009	0	11.945	22.009					
1975	8.700	29.190	37.890	0	29.190	37.890					
1976	7.300	42.374	49.674	392	42.766	50.066	71.966				
1977	7.800	33.843	41.643	457	34.300	42.100	64.535	36.000			
1978	7.600	26.747	34.347	122	26.869	34.469	69.499	40.000			
1979	7.500	25.958	33.458	1.732	27.690	35.190	78.704	29.500			2.000
1980	7.500	35.778	43.278	2.726	38.504	46.004	85.737	29.500			2.500
1981	7.500	32.016	39.516	5.284	37.300	44.800	94.620	29.500			5.000
1982	7.500	35.015	42.515	2.064	37.079	44.579	73.183	29.500	34.800		5.000
1983	7.500	33.854	41.354	5.413	39.267	46.767	96.433	29.500	34.625		5.000
1984	7.500	33.741	41.241	2.142	35.883	43.383	88.386	29.500	34.925		5.000
1985	7.500	43.896	51.396	3.069	46.965	54.465	108.631	36.000	42.120		6.120
1986	7.500	52.634	60.134	2.995	55.629	63.129	118.462	36.000	42.120		6.120
1987	6.921	50.720	57.641	6.095	56.815	63.736	92.247	36.000	40.120		6.120
1988	10.233	44.159	54.392	5.881	50.040	60.273	111.806	36.000	40.120		6.120
1989	13.224	45.198	58.422	7.235	52.433	65.657	164.423	44.000	45.245		7.520
1990	13.630	49.554	63.184	6.177	55.731	69.361	175.254	50.000	45.245		7.520
1991	16.258	52.834	69.092	6.788	59.622	75.880	221.889	50.000	46.225		8.500
1992	20.594	58.664	79.258	7.493	66.157	86.751	240.868	50.000	44.200		8.500
1993	17.843	52.280	70.123	5.491	57.771	75.614	195.210	50.000	40.600		8.500
1994	18.118	53.693	71.811	4.766	58.459	76.577	240.077	50.000	42.300		8.500
1995	16.429	51.900	68.329	1.998	53.898	70.327	201.142	60.000	39.500		8.500
** 1996	10.533	42.466	52.999	2.100	44.566	55.099	146.243	60.000	37.890	26032*	8.500
1997											

* The small vessel's kvota was introduced in 1996 but not effective.

** Premiliary

Table 2. Shrimp biomass estimates (thousand tons) obtained from stratified-random surveys in Davis Strait, 1988-96 (south not included in total).

	Biomass in Year								
Area	1988	1989	1990	1991	1992	1993	1994	1995	1996
West	152928	189729	188323	115214	155980	210463	162213	130169	175651
Canada	9305	3870	11398	4776	16763	3609	7036	5138	1740
North	19613	13269	11955	5324	18826	8480	8473	9788	9108
South	-	-	-	-	483	19872	22053	1783	3805
Total	181846	206868	211676	125314	191569	222552	177722	145095	186499

Table 3. Number of shrimp caught from Canadian commercial samples, 1981-95.

Table Number (x10-3) of shrimp caught at age by year in Div. 0A, 1981 - 1995

Year/Age	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
3	0	0	0	0	0	0	0	14842	0	0	0	0	19832	9968	5354
4	10185	5727	5227	29642	7042	12095	29070	68271	54333	37565	27551	29309	79328	71107	15394
5	25193	31393	65626	67170	47888	87594	107865	117991	153631	280921	83542	177805	205186	108986	121479
6	67540	31605	137640	48678	67607	87227	219554	164742	187355	149443	366162	296017	130434	213321	54214
7+	433111	143390	372267	126453	229581	179586	408509	376235	541457	348701	411488	473822	327993	261169	138212
TOTAL	536029	212115	580760	271943	352118	366502	764998	742081	936776	816630	888743	976953	762774	664551	334654

Table Number of shrimp caught per hour (unstandardized) at age in Div. 0A, 1981 - 1995.

Year/Age	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
3	0	0	0	0	0	0	0	1181	0	0	0	0	1459	611	746
4	576	930	274	3875	709	1797	2342	5433	2936	2463	1339	1662	5836	4357	2145
5	1426	5095	3443	8780	4822	13015	8690	9390	8303	18419	4061	10085	15096	6677	16929
6	3822	5130	7221	6363	6807	12961	17687	13110	10125	9798	17801	16790	9596	13070	7555
7+	24508	23274	19531	16530	23115	26684	32910	29941	29262	22863	20004	26874	24131	16001	19260
TOTAL	30332	34429	30470	35548	35453	54458	61629	59055	50626	53542	43206	55411	56119	40715	46635
Effort (hrs)	17672	6161	19060	7650	9932	6730	12413	12566	18504	15252	20570	17631	13592	16322	7176

Table Number of shrimp caught per hour (standardized) at age in Div. 0A, 1981 - 1995

Year/Age	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
3	0	0	0	0	0	0	0	813	0	0	0	0	925	406	485
4	594	996	264	3612	525	1038	1703	3738	1907	1642	990	1017	3698	2894	1395
5	1468	5461	3310	8184	3573	7516	6318	6460	5394	12279	3003	6170	9566	4436	11011
6	3937	5497	6942	5931	5045	7485	12860	9020	6578	6532	13162	10272	6081	8683	4914
7+	25245	24942	18775	15408	17130	15410	23927	20600	19009	15242	14791	16441	15292	10631	12527
TOTAL	31244	36896	29290	33135	26274	31449	44807	40631	32888	35695	31946	33900	35562	27051	30332
Effort (hrs)	17156	5749	19828	8207	13402	11654	17073	18264	28484	22878	27820	28819	21449	24567	11033

Table 4. Mean lenght at age in proportions and absolute number and standardized catch rates at age as determined from commercial length frequency distributions in NAFO Subarea 1.

Mean Cpl. length (mm)

Year/Year class	1991	1992	1993	1994	1995	1996
1	-	-	9.8	10.2	9.3	11.2
2	13.4	12.1	13.2	12.4	12.6	13.5
3	16.2	15.3	15.0	14.3	15.3	15.4
4	18.1	17.9	17.5	17.1	17.3	17.5
5	20.9	20.5	19.5	19.3	19.3	19.8
6	22.5	22.8	21.6	21.6	21.2	21.6
7	24.7	25.4	24.9	24.8	24.2	24.9
8+	27.2	27.9	27.3	26.6	26.4	26.9

Proportion of total catch

Year/Year class	1991	1992	1993	1994	1995	1996
1	0.000	0.000	0.002	0.002	0.002	0.005
2	0.004	0.003	0.012	0.023	0.006	0.018
3	0.012	0.017	0.032	0.024	0.030	0.040
4	0.049	0.077	0.066	0.095	0.122	0.077
5	0.197	0.209	0.123	0.156	0.218	0.212
6	0.303	0.229	0.201	0.259	0.253	0.248
7	0.295	0.415	0.497	0.318	0.222	0.307
8+	0.141	0.050	0.067	0.122	0.146	0.092

Number caught (millions)

Year/Year class	1991	1992	1993	1994	1995	1996
1	0	0	17	18	18	39
2	33	28	99	210	54	139
3	98	157	265	219	270	308
4	401	713	546	867	1098	593
5	1610	1935	1017	1423	1962	1633
6	2477	2121	1663	2362	2277	1910
7	2412	3843	4111	2901	1998	2364
8+	1153	463	554	1113	1314	708
Total	8175	9260	8272	9121	9001	7701

Number caught per hour (standardized)

Year/Year class	1991	1992	1993	1994	1995	1996
1	-	-	95	85	94	281
2	169	131	571	977	281	1010
3	506	744	1523	1020	1407	2244
4	2068	3368	3142	4036	5721	4321
5	8313	9142	5856	6627	10223	11895
6	12786	10016	9569	11002	11865	13915
7	12449	18152	23661	13508	10411	17226
8+	5950	2187	3190	5182	6847	5162
Total	42199	43740	47607	42479	46895	56110

Table 5. length and percents-at-age of males, and abundance-at-age of all shrimp based on modal analysis of total length frequency distributions from the survey area, 1988-1996.

Males, lengths-at-age										
Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
1						9,3	8,5	8,5	8,5	8,7
2	12,3	12,6	12,0	12,7	13,2	11,9	11,9	10,9	11,6	12,1
3	14,7	15,4	14,0	15,8	15,1	14,1	14,3	13,7	13,8	14,5
4	17,4	17,3	16,8	17,3	17,2	16,9	16,8	17,1	16,8	17,1
5	19,9	19,5	19,2	19,8	19,3	19,3	19,5	19,7	19,2	19,5
6	22,3	22,1	21,2	21,5	22,0	21,8	22,0	22,3	21,4	21,8

Males, percents-at-age										
Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
1						1,6	1,0	2,9	2,2	1,9
2	2,3	1,4	3,8	1,3	3,4	6,8	5,3	2,7	5,8	3,6
3	4,7	14,5	4,8	5,2	11,8	10,7	9,6	6,3	24,2	10,2
4	19,0	50,1	14,4	14,1	15,1	22,5	26,4	20,0	21,3	22,5
5	39,2	21,9	53,4	18,1	27,1	32,1	27,9	42,1	18,2	31,1
6	34,8	12,1	23,6	61,3	42,7	26,3	29,8	26,0	28,3	31,7
Total	100	100	100	100	100	100	100	100	100	101

Abundance-at-age, all shrimp (billions)										
Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
1						0,5	0,3	0,5	0,7	0,5
2	0,4	0,4	0,8	0,2	0,7	2,2	1,3	0,5	1,9	0,9
3	0,9	4,6	1,1	0,6	2,5	3,4	2,4	1,1	8,0	2,7
4	3,4	16,0	3,2	1,7	3,2	7,2	6,6	3,6	7,0	5,8
5	7,1	7,0	11,7	2,2	5,7	10,2	7,0	7,6	6,0	7,2
6	6,3	3,9	5,2	7,5	8,9	8,4	7,5	4,7	9,3	6,8
7+	7,7	6,0	8,0	4,4	5,5	7,9	6,4	5,1	5,6	6,3
Total	25,8	37,9	29,9	16,6	26,4	39;7	31,4	23,1	38,5	23,9

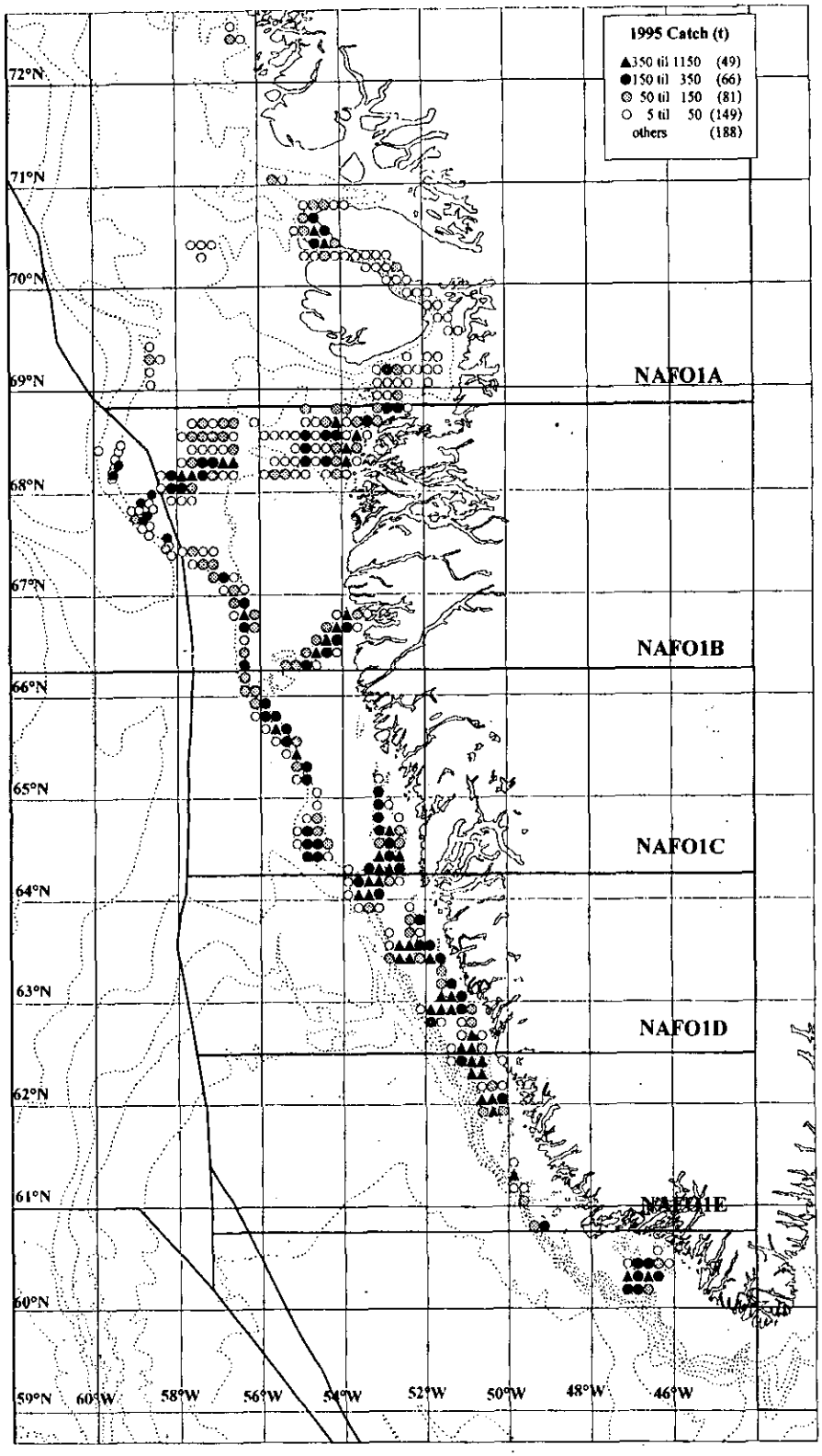

Figure 1. The geographical distribution of the catches in Subarea 1 and Div. A0.

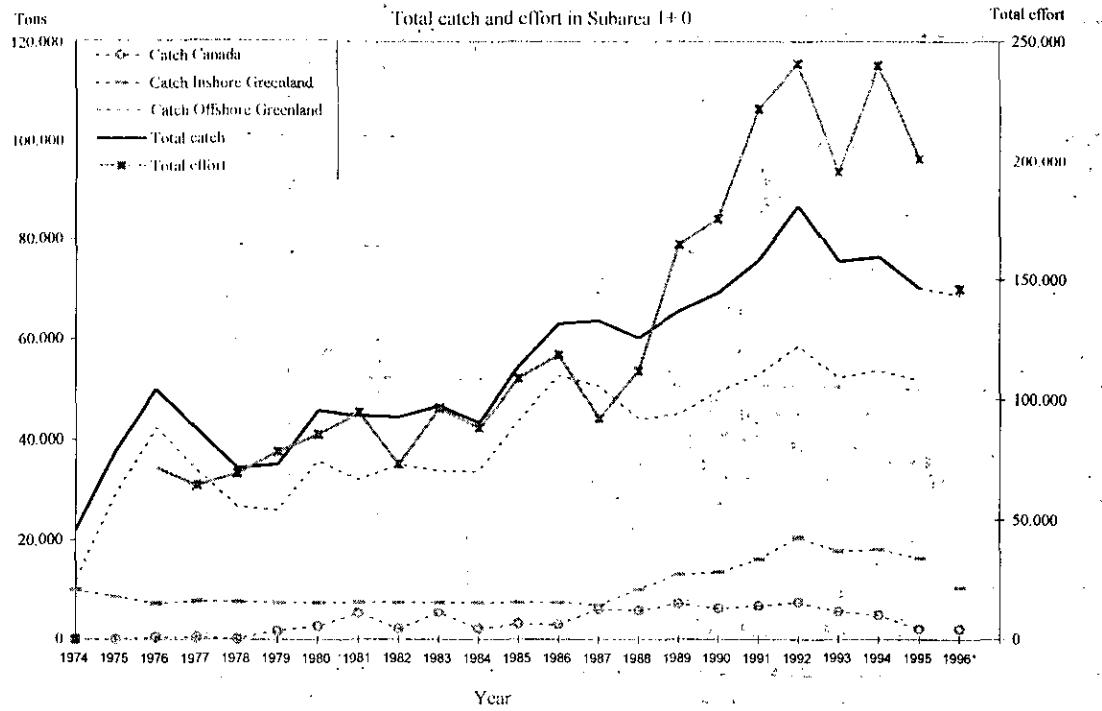

Fig. 2. Total catch and effort in Subarea 1+0 from 1974 to 1996.

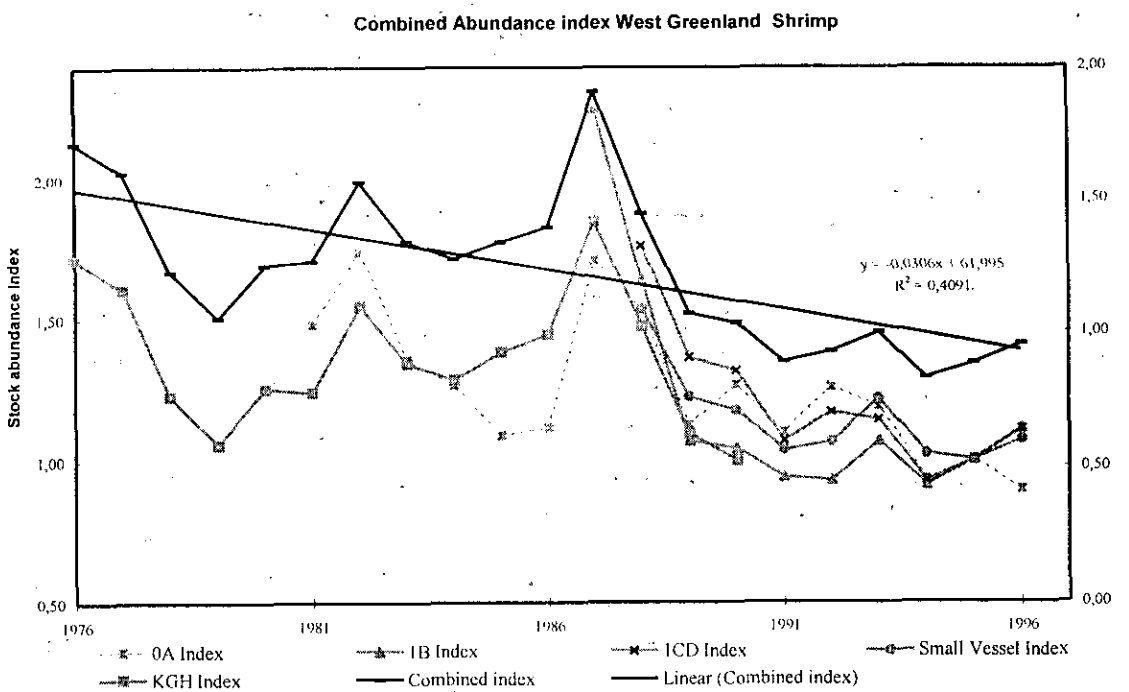

Fig. 3. Time series of the five standarized CPUE indices and the combined CPUE index from 1994 to 1996.

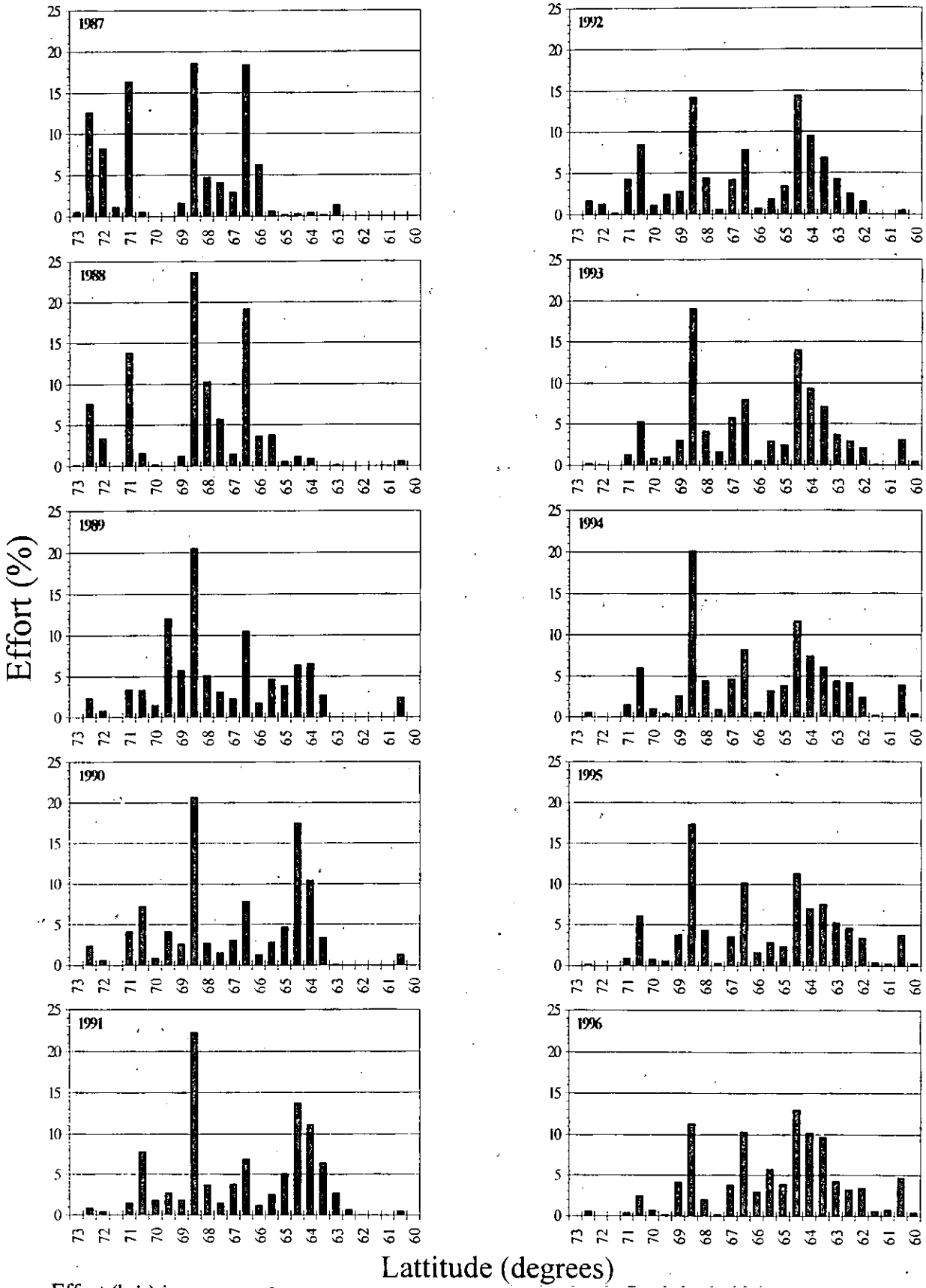

Fig. 4. Effort (hr's) in percent of years total spent in the Davis Strait by half degrees of latitude (Greenland vessels only).

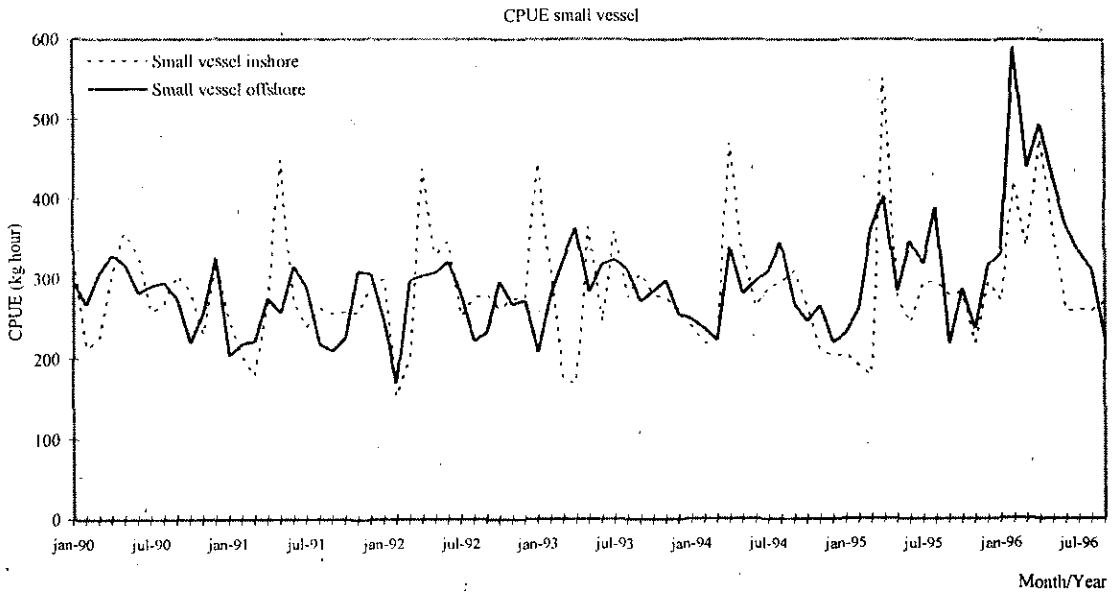

Figure 5. Unstandardized CPUE for small vessel from 1990-1996.

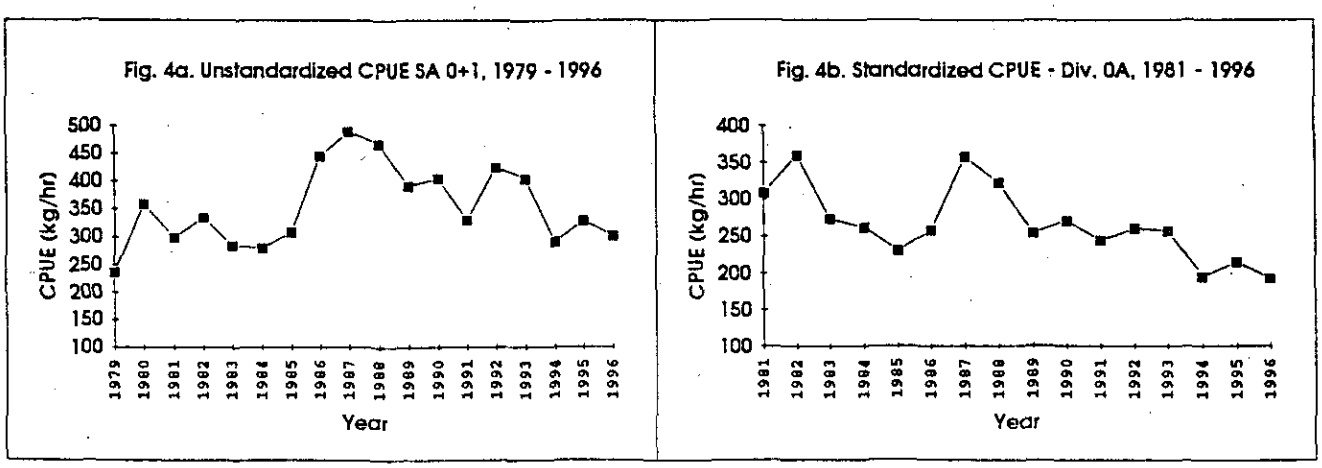

Figure 6. Unstandardized CPUE in Div. 0A 1979-1996

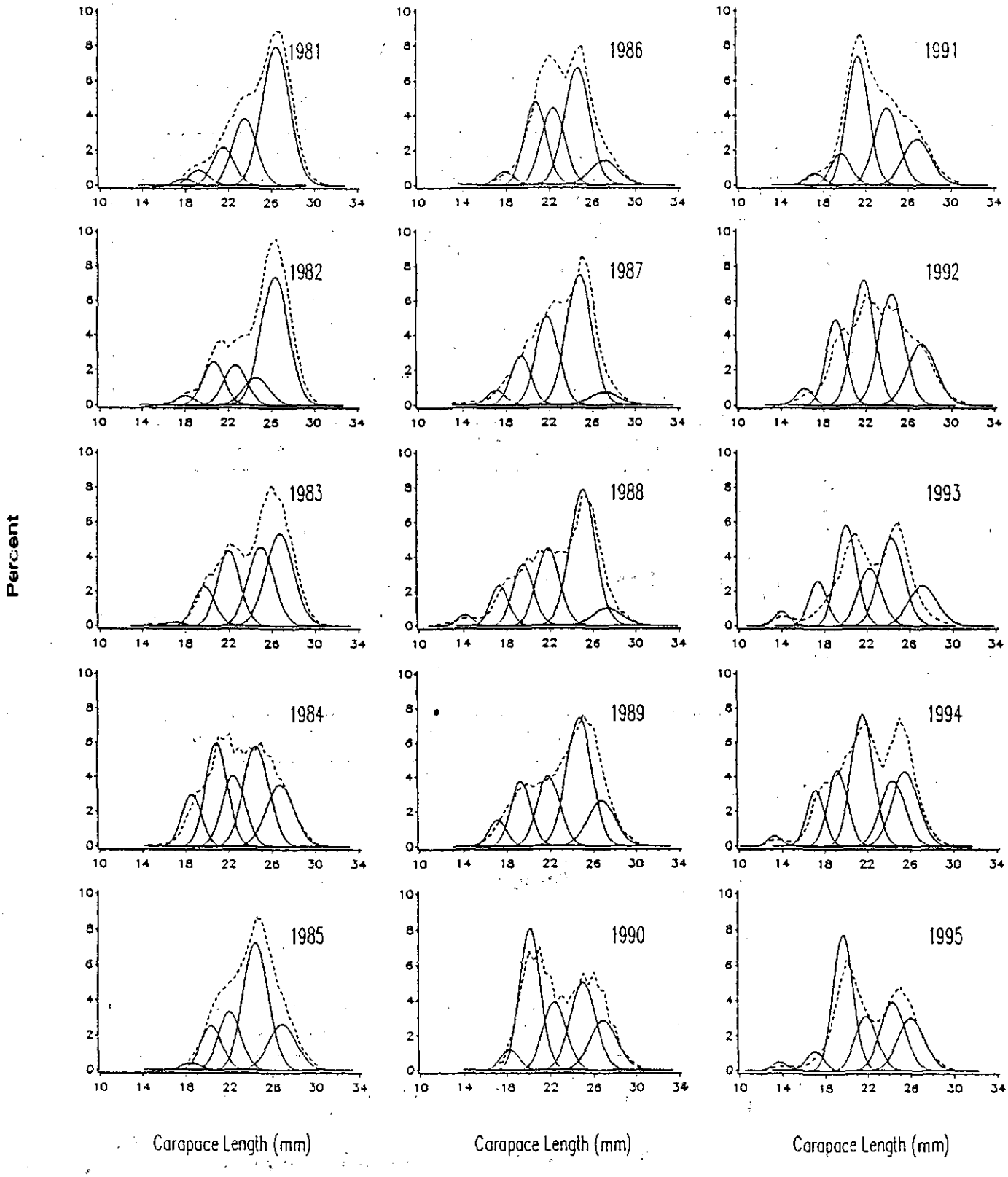

Fig. 7. Separation of ages from commercial length frequency data (broken line = commercial frequency), NAFO Div. 0A, 1981-1996.

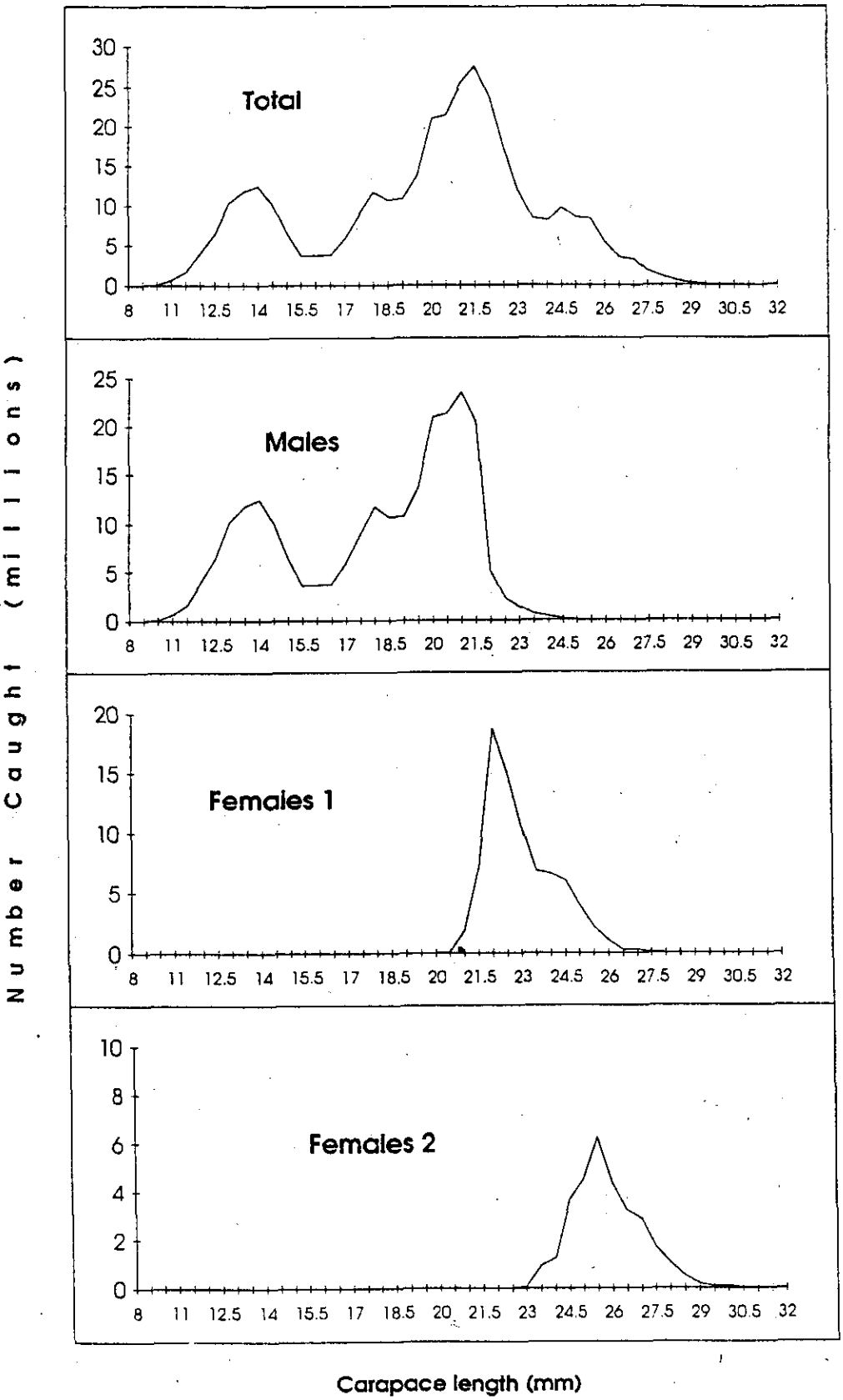

Fig. 7a. Commercial length frequency from Div. 0A, 1996.

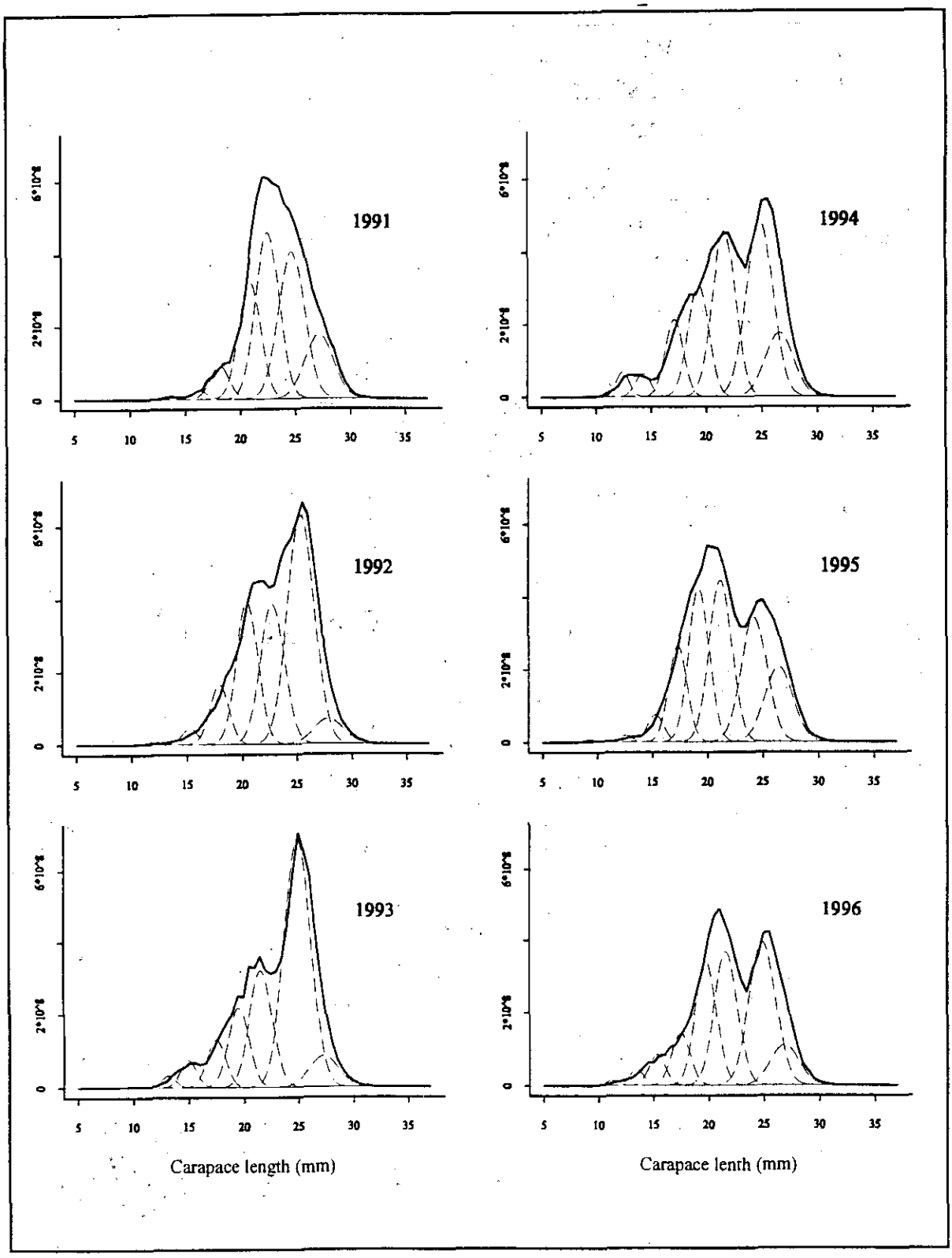

Fig. 8. Separation of ages from commerciel length frequency data NAFO Subarea 1 1991-1996.

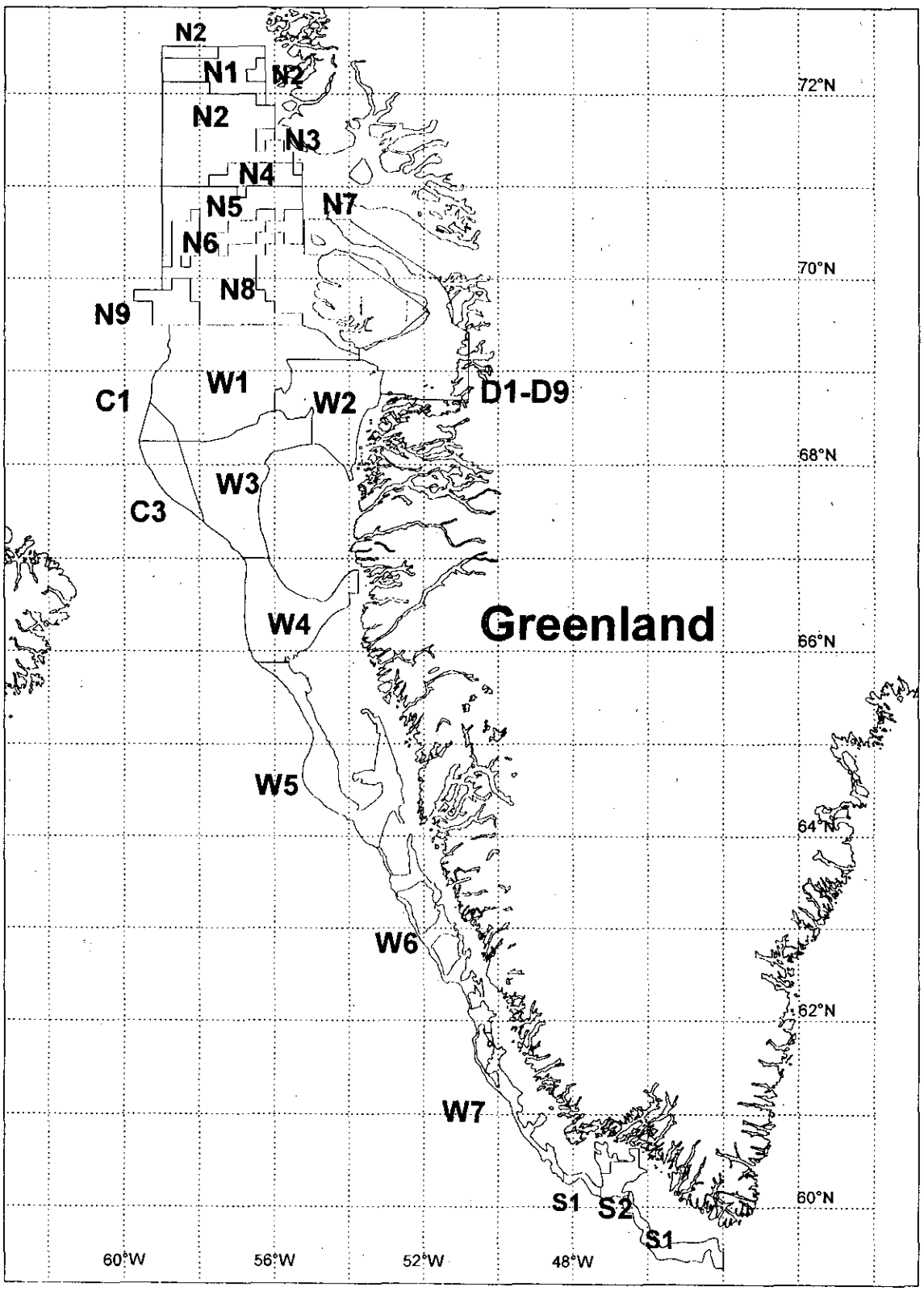

Fig. 9. Stratification scheme for West Greenland shrimp survey showing stratum labels as used in text.

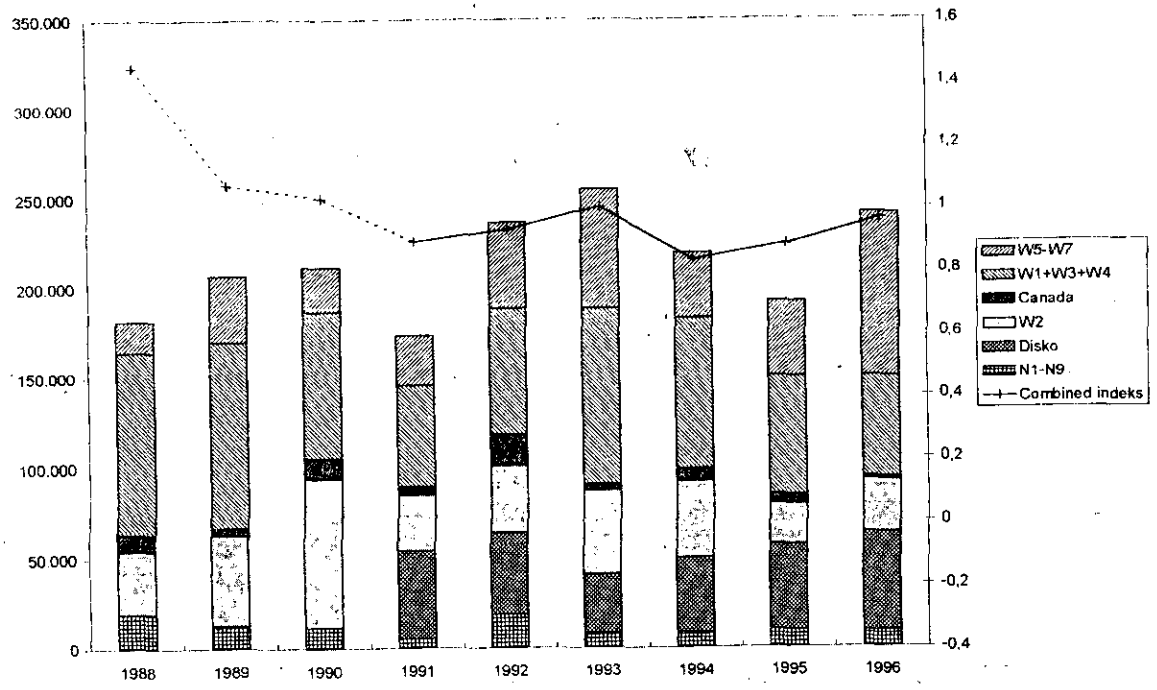

Fig. 10. Shrimp biomass estimates in SA 1+0 and the combined indexs on standardized CPUE.

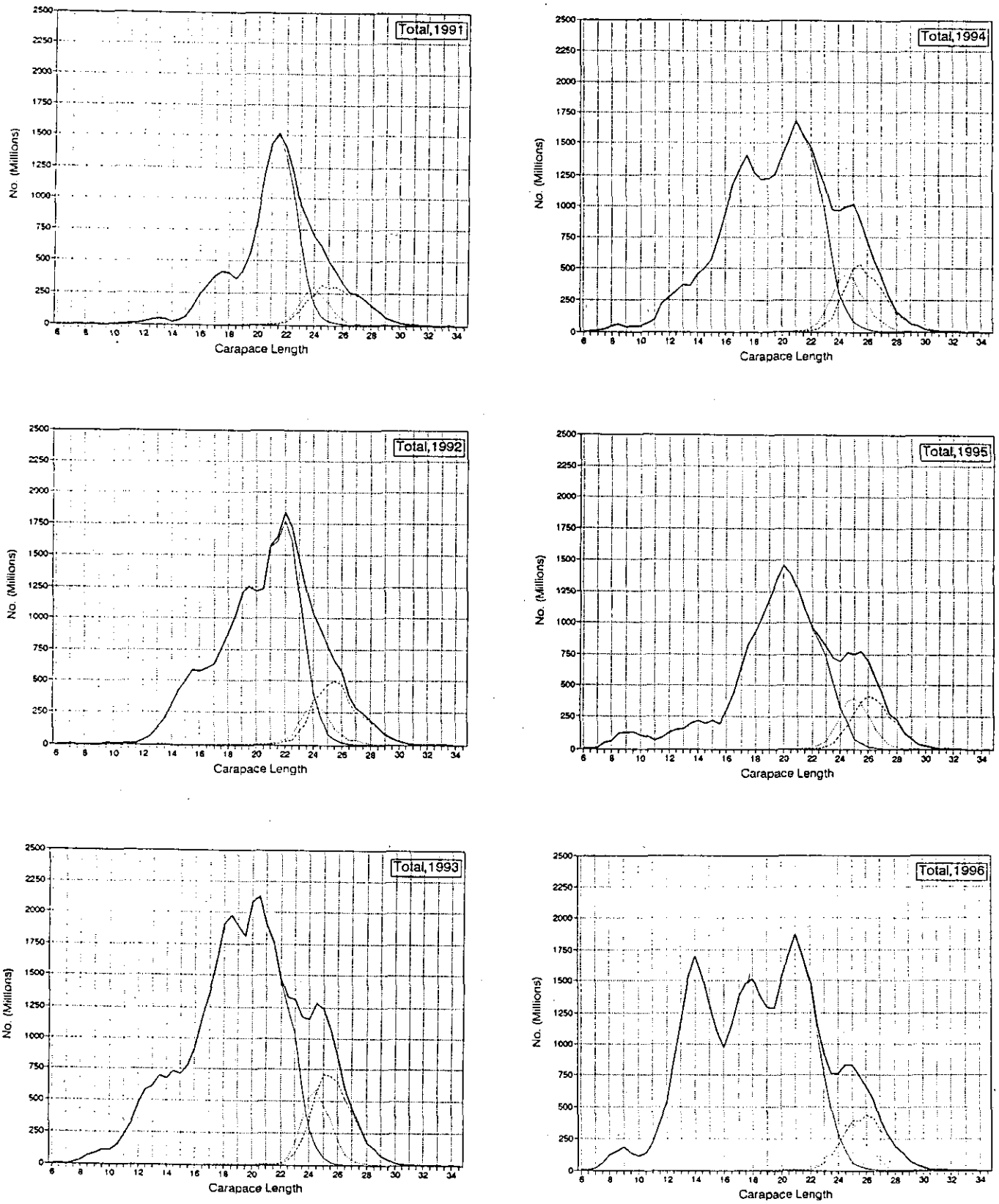

Fig. 11. Numbers of shrimp by length group (CL) in total survey area (excluding area S) in 1991-96.