Northwest Atlantic Fisheries Organization

Serial No. N2748 NAFO SCR Doc. 96/73

SCIENTIFIC COUNCIL MEETING - JUNE 1996

The Status of the Greenland Halibut Resource in the Management Area of NAFO Subarea 2 and Divisions 3KLMNO

by

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Catch History and TACs

The fishery began for Greenland halibut in this management area in the early 1960s using synthetic gillnets in the deepwater bays of eastern Newfoundland particularly Trinity Bay. As catches declined here, the effort moved northward to Bonavista Bay, then Notre Dame Bay and finally White Bay on Newfoundland's northeast coast. Subsequently, vessels moved more offshore to the deep channels running between the shallow fishing banks. Catches increased from fairly low levels in the early 1960s to over 36,000 tons by 1969 and ranged from 24,000 tons to 39,000 tons over the next 15 years (Fig. 1). From 1986 to 1989, catches exceeded 20,000 tons only in 1987 (Table 1; Fig. 1). In 1990, a high effort fishery for Greenland halibut developed in the deepwater area of the NAFO Regulatory area near the boundary of Div. 3L and Div. 3M in areas known as the Sackville Spur and the Flemish Pass. The development of this fishery quickly resulted in increased catches to about 47,000 tons in 1990. It was estimated that the catch in 1991 was at least as high as 55,000 tons (Table 1; Fig. 1 and 2) although some estimates put the catch at nearer 75,000 tons. Catches during 1992 and 1993 remained high and were estimated to be about 63,000 and 62,000 tons, respectively. Best estimates of catch suggested a decline to about 48,000 tons during 1994 although some estimates ranged as high as 56,000 tons. As a result of new management measures introduced by the NAFO Fisheries Commission in 1995 i.e. catch quota restrictions and 100% observer coverage in the NAFO Regulatory Area, catches were greatly reduced. In 1995, the catch was estimated to be about 15,000 tons, a reduction of about 75% compared to the average annual catch of the previous 5 years.

The major participants in this fishery in the NAFO Regulatory Area have been EU/Spain and EU/Portugal, as well as a variety of non NAFO-member countries such as Panama although by 1994, more than 80% of the catch is estimated to have been caught by EU (Spain) alone. Catches listed as "Subarea 3 Outside" in Table 1 include all non-Canadian catches during recent years and are illustrated in Fig. 2 for comparison with traditional fishing areas of Subarea 2 and 3 inside the Canadian zone.

Up until 1990, Canada, USSR, GDR, and Poland were usually the main participants in the fishery, although Portugal and Japan had become increasingly involved in the fishery since 1984.

Canadian catches have been taken mostly by gillnet with a significant proportion taken by otter trawlers. With the exception of 1987, catches have been declining steadily inside the Canadian zone since the early 1980's from a high of 30,000 tons to less than 3,000 tons by 1994 and 1995. This declining trend was mainly a result of low catch rates and reduced effort with multi-licensed vessels fishing other species such as snow crab that offered a better return on costs.

The traditional gillnet fishery has been conducted by relatively small vessels (<20 m) fishing in the deepwater channels near the Newfoundland and Labrador coast as well as the Newfoundland east coast deepwater bays using an average mesh size of 150 mm. However, this component of the fishery has declined rapidly in recent years and has now virtually collapsed due to very low abundance of fishable stock in traditional areas. The Canadian gillnet catches taken during recent years are from a newly developed fishery along the deep edge of the continental slope in Subarea 2 and Divisions 3KL (Table 1). Some exploratory fishing by Canadian gillnetters is now taking place along the southwest slope of the Grand Bank in Division 3O although catches have been relatively low. In an attempt to reduce the catch of young Greenland halibut in the new deepwater gillnet fishery, it is illegal to use a gillnet mesh size of less than 190 mm while fishing Greenland halibut in the Canadian zone in depths > 400 fath. (732 m).

Canadian otter trawl catches peaked at about 8,000 tons in 1982, declined to less than 1,000 tons in 1988, then increased to about 7,400 tons in 1991 which is the highest level since 1982. In 1992 , otter trawl catches were less than half that of 1991 due to low catch rates. The catch in 1993 was just over 1,500 tons and was less than 600 tons annually in both 1994 and 1995. Catch rates were very poor due to the low abundance of fish larger than 45 cm.

The TAC for this resource in Subarea 2 and Div. 3KL only, increased from 35,000 tons in 1980 to 55,000 tons in 1981-84, 75,000 tons in 1985, and 100,000 tons in 1986-89 (Fig. 1). These increases in TACs were the result of research vessel survey estimates of stock biomass (in excess of 400,000 tons) which indicated both high levels of fishable biomass as well as prospects of several better than average recruiting year-classes. After observing an estimated reduction in stock biomass from the late 1970s to the late 1980s in Subarea 2 and Div. 3KL of about 50%, the TAC was reduced to 50,000 tons in 1990 and this level was maintained to 1993 despite the substantive declines in stock size throughout the normal range of observed historical stock distribution. Although the Scientific Council, in its deliberations during June 1993, could not advise an appropriate catch level for 1994 the TAC was reduced to 25,000 tons by Canada in Subarea 2 and Divisions 3KL in consideration of low levels of stock size estimated for the area. It was intended that this catch should include all catches in the area of Subarea 2 and 3 for conservation purposes. Nevertheless, catches in the NAFO Regulatory area continued unregulated.

In 1994, management of Greenland halibut in Subarea 2 and Div. 3KLMNO became the responsibility of the NAFO Fisheries Commission which imposed a TAC of 27,000 tons for 1995. This level was maintained for 1996 and was proportioned throughout the management area in an attempt to reduce high concentrations of effort in localized areas.

Commercial fishery data

I) Catch-at-age and mean weights-at age

Sampling data from the catches of Canada in 1995 were not processed in time to be available for this meeting. However, the 1994 data analyses were completed and are included here. These data were not available in the previous assessment.

Due to uncertainty regarding catch information on fisheries in the Regulatory Area, catch-at-age for Canadian catch only were calculated for 1988-94 for the purpose of this document. Catch numbers-at-age and catch weights-at-age (kg) for these data are presented in Tables 2 and 3. The data prior to 1989 represent the entire annual fishery which took place mainly in the Canadian zone (Tables 4 and 5).

Ages 6-8 dominated the catch in most years up to 1991 (Table 2 and 4), which is typical of the traditional Canadian catch. Although the Canadian catch was much lower in 1992 to 1994 than in previous years, there were relatively higher proportions of older fish (ages 9+) (Table 2) in the catch. This is due to a considerable change in the fishing pattern with exploitation of Greenland halibut now mainly in the deepwater along the continental slope by gillnetters using a 200 mm mesh size in depths greater than 1000 m compared to a 130-190 mm mesh size at depths of less than 500 m in the traditional gillnet fishery. Although data were not available for the Canadian fishery in 1995, the fishery was conducted in a similar manner as that in 1992-94 although in 1995 there was proportionately more catch taken in Division 2J and less in Division 2G than in 1994 (Table 1).

ii) Catch and effort

Catch and effort data from the directed fishery for the period 1975 to 1992 were obtained from ICNAF/NAFO Statistical Bulletins and were combined with provisional 1993-1994 NAFO data and preliminary Canadian data for 1995.

The catch/effort data were analysed with a multiplicative model to derive a standardized catch rate index for hours fished. Factors included in the model were a combination country-gear-tonnage class category type (CGT), month, NAFO division and year. Except for the year category type, individual observations of catch or effort data less than 10 units were eliminated prior to analysis as were categories where there were less than five occurrences in the database.

The regression was significant ($p < 0.05$), explaining 64% of the variation in catch rates (Table 6). The standardized catch rate index (Table 7, Fig. 3) shows high within year variability, especially in the late 1970s to mid 1980s. There was an increasing trend from the mid 1970s that peaked in 1982 and subsequently declined to the lowest level observed over the period in 1986. Except for a higher value in 1987, the standardized catch rate showed stability to 1990. The rate declined to the lowest value in the time series in 1992 and remained at about that level to 1994. The

apparent increase in 1995 is based on only two data points with high variability and is not considered especially reliable. In this updated analysis the data suggest, relative to the whole time period, catch rates were generally higher in winter and generally higher in Subarea 2, as reflected in the coefficients (Table 6). A more detailed analysis of these data were conducted in 1995 (Myers et al., 1995) which suggested that the overall decline in CPUE were seen in the data from several countries.

Research vessel surveys

i) Geographic distribution

The spacial distribution of Greenland halibut in Divisions 2J and 3KL from standard fall surveys is examined by depicting standardized survey catches as circles and subsequently plotting these circles on a geographic map of the survey area according to the position of each catch. Circle diameters were chosen to represent proportionately increasing size groups of catch weight (kg) established arbitrarily from a cursory examination of the entire database. All catches within the bounds of a particular size grouping are represented by the same circle diameter. Tows where Greenland halibut did not occur are depicted with a plus (+) symbol. From 1978-94 for Div. 2J and 3K and Div. 3L in 1978, the surveys were conducted by the research vessel ***Gadus Atlantica*** using an Engel 145' bottom trawl. In Div. 3L from 1981-83 surveys were conducted by the ***A.T. Cameron*** using a Yankee 41.5 bottom trawl and in 1984-94 by either the ***A. Needler*** or the ***W. Templeman*** (sister ships) using an Engel bottom trawl. The results from these surveys are shown by year in Fig. 4. In 1995, the survey in Div. 2J, 3K and 3L was conducted by the research vessels ***Teleost*** and ***W. Templeman*** using a Campelen 1800 shrimp trawl with rockhopper ground gear. The results from this survey are shown in Fig. 5. Considering that the Campellen trawl is much more effective at catching small Greenland halibut than the Engel trawl (see Warren 1996, this meeting), the data for 1995 are also shown separately for fish above and below 35 cm in length in Fig. 6.

During the earlier surveys, Greenland halibut were relatively abundant in the deep channels running between the shallow fishing banks especially in Division 2J and 3K (Fig. 4). They were also plentiful along the slope of the continental shelf. This distribution pattern remained fairly consistent through to about 1986-87 and any variation associated with total abundance among years was more likely to be a result of differences in year-class strengths of certain age groups as well as natural variability in survey estimates. By 1988, for Greenland halibut in Div. 2J, a decreasing trend in abundance was clearly apparent. This was followed by a similar trend in Div. 3K by 1990. By 1993, catches in Div. 2J and 3K were extremely low; the highest catch in the area was taken in the very southeast end of Div. 3K near the edge of the continental slope (Fig. 4). In 1993 higher catches again occurred in the deeper channels as in previous years but to a much lesser degree. In 1994 catches in these areas were small and more similar to 1992. In 1995, the survey results using the Campellen trawl showed a distribution more like that of 1993, however, with relatively large catches in the deep slope area in the southeastern portion of Div. 3K (Fig. 5). A few sets here were conducted in the 1251-1500 m strata unlike previous years. When catches in 1995 were split into size groups (> and < 35 cm) it was clear that the larger catches in the distribution patterns were dominated by small fish (Fig. 6).

Throughout the survey period , there were very few large catches experienced in Div. 3L (Fig. 4, 5 and 6) and any relatively high catches were taken near the continental slope in the area known as the "nose" of the Grand Bank or the Sackville Spur.

ii) Biomass and abundance indices (unconverted from Engel to Campellen equivalents)

Biomass estimates from Canadian stratified-random groundfish surveys in autumn in Div. 2J for 1977-92 are presented in Table 8. Due to a revision of the stratification scheme in 1993, strata are not directly comparable, therefore, the results for Div. 2J in 1993-94 are presented separately in Table 9. Although the results of the 1995/96 fall-winter survey was not directly comparable to previous years the actual estimates are shown also for Div. 2J in Table 9 for information. Similarly, the biomass estimates for Div. 3K during 1978-92 and 1993-95 are shown in Tables 10 and 11, respectively. Biomass indices from autumn surveys in Div. 3L during 1981-94 and the 1995/96 survey using the Campellen trawl are detailed in Table 12. In all cases the total annual biomass estimates are accompanied by 95% confidence limits. Annual biomass estimates are also illustrated by division separately in Fig. 7 and cumulatively for Div. 2J, 3K and 3L in Fig. 8.

It should be noted that in Div. 2J and 3K, the strata from 1001-1500 m were rarely surveyed and thus were rarely included in the indices. In Div. 3L, the deepest strata are only 732 m, and these areas were not surveyed in all years. No Canadian survey data are available in Div. 2GH since those presented in Brodie and Baird (1992).

Biomass indices of Greenland halibut have been declining in Div. 2J since 1982 from a level of over 100,000 tons to less than 9,000 tons by 1992 (Table 8; Fig. 7 and 8). There was a

slight increase in 1993 to near that of 1991 (Table 9) but still at a very low level and remained at a similar level in 1994. While the 1995/96 estimate in nearly 4 times that of 1993 and 1994 it must be emphasized that it is not dirctly comparable (Table 9). The biomass index in Div. 3K peaked at 112,000 tons in 1984 but by 1987, biomass in this division also began a steep decline similar to Div. 2J and reached a low of just over 20,000 tons in 1992 (Table 10; Fig. 7 and 8). In 1993, there was a similar proportional increase in biomass as in Div. 2J to a level slighter lower than that of 1991. The 1994 survey, however, estimated the biomass to be at the same level as indicated for 1992 which is the lowest in the time series (Table 11). As with Div. 2J, the 1995/96 estimate is nearly 4 times higher than the 1994 estimate but must not be directly compared (Table 11). Estimates for Div. 3L to a depth of 366 meters were relatively stable from 1981 to 1990 at an average of about 15,000 tons (Table 12; Fig. 7 and 8). Between 1990 and 1991, the biomass index fell from nearly 16,000 tons to 7,300 tons and further to 6,700 tons in 1992 despite the fact that survey coverage in 1991-92 was complete to depths of more than 720 meters. Unlike the divisions to the north the biomass estimate in Div. 3L in 1993 declined from that of 1992 to a level near half the 1991 and 1992 estimates and is the lowest during the period. The 1994 estimate continued to be low and is within a 10% variation of the 1993 estimate (Table 12). As with Div. 2J and 3K the 1995 estimate must not be compared directly with previous estimates (Table 12) but is nevertheless about 3 times higher than the 1994 estimate.

The cumulative biomass index for all three divisions (Fig. 8) has steadily declined from a high of over 200,000 tons in 1984 to 37,000 tons in 1992 by far the lowest in the time series. Although the overall index increased to nearly 50,000 tons in 1993, the 1994 estimate returned to the 1992 level of 37,000 tons (Fig. 8). The 1995 estimates are shown in Fig. 7 for illustration only since they aren't comparable.

Declines in abundance are less apparent than indicated by the biomass indices due to the fact that the declines are not consistent across all age classes (Table 13; Fig. 9). An examination of the age structure shows that the ages 6-9 abundance has been declining possibly since the mid 1980's but very dramatically since 1990 and by 1993 and again in 1994 the age 6-9 abundance is far below anything ever observed. It is now at a level of about one third of that estimated in 1992 and less than 10% of the 1982-90 average. Age 10+ has been declining since the early 1980's and in 1993 and 1994 had virtually disappeared from the survey catches. On the other hand, ages 3-5 were slowly increasing from the early 1980's to about 1989. From 1989 to 1992, however, these age groups also declined to a relatively low level at less than half the 1988 estimate. The index for these ages increased sharply in 1993 to the second highest in the time series and was maintained at a relatively high level in the 1994 survey. The 1995/96 survey results indicate that the Campelen trawl is especially effective at catching young Greenland halibut with very high estimates compared to previous years, however, the estimates were not directly comparable in the current form (see next section for comparability).

iii) <u>Biomass and abundance indices</u> (converted from Engel to Campellen equivalents)

Results of the data analysis (Warren 1996) from the comparative fishing exercises carried out between the ***Gadus Atlantica*** using the traditional Engel 145' bottom trawl and the ***Teleost*** using a Campelen 1800 shrimp trawl with rockhopper footgear (Brodie 1996) were evaluated at this meeting. The conversion equation based on length presented for Greenland halibut was agreed to best represent the relationship between catches from the two gears with catch conversions for fish below 10 cm being set equal to that of 10 cm. Similarly, fish greater than 53 cm in length the catch conversion was set equal to 53 cm. All length frequency data on Greenland halibut collected during the fall surveys of the Gadus Atlantica using the Engel 145' bottom trawl from 1977-94 in Div. 2J and 3K were converted to Campelen trawl catch equivalents to allow for direct comparison of the old data series with the results of the 1995/96 survey and future surveys with the new survey trawl for these divisions.

Biomass indices from the 1978-94 fall surveys in Div. 2J and 3K converted to Campelen catch equivalents are presented in Fig. 10 with the 1995/96 estimate being an empirical estimate from an actual Campelen trawl survey. Conversions for Div. 3L data are not yet available. The overall trends in biomass (Fig. 10) are not greatly different from the unconverted estimates (Fig. 8) although the absolute values can differ considerably. The major differences in the trends are related to the more recent years where the converted estimates do not express the dramatic declines during the 1990's quite as strongly as before. The reason for this is that the cohorts of the 1990's appear more abundant than those previous and these young age groups have the highest conversion factors. The 1995 empirical estimate is more similar to the those of the late 1980's than in the unconverted data which expressed a much greater reduction in the 1990's.

The converted age compositions by year from 1978-95 are shown in Table 14 and Fig. 11. The age compositions here show more clearly the dominence of younger ages in the abundance indices in the 1990's as indicated earlier. The unconverted data described above are available in Fig. 9 for comparison. The converted abundance indices for various age groupings are presented in Fig.

12 separately and in Fig. 13 together. What is especially interesting in these data plots is the general increase in the abundance index from cohorts at ages 3-5. The overall trend has been increasing from the early 1980's with a low point in the 1990-92 period (Fig. 12). On the other hand, the cohorts at ages 6-9 have been declining rapidly since the mid 1980's and ages 10+ have been declining at least since the mid 1980's and maybe as early as the beginning of the survey series in 1978. These observations are consistent with previous conclusions that Greenland halibut migrate from the survey area when they reach about age 5 most especially since about 1990.

iv) Recruitment indices and year-class strengths (based on converted estimates)

In order to better examine strengths of recruiting year-classes the trends in the abundance indices for individual ages 1-5, inclusive from fall surveys in Div. 2J and 3K combined are presented in Fig. 14 with 95% confidence limits. In addition, trends in abundance of individual year-classes at for ages 2-4 individually as well as combined to smooth out the variability are shown in Fig. 15.

Age 1 shows little in the way of trends except for recent years when it shows a slight increasing trend. Age 2 on the other hand, shows a very sharp increasing trend since about 1990 with the 1995 estimate being very much higher than the average and the highest in the series (Fig. 14 and 15). This represents the 1993 year-class (Fig. 15)

At age 3 the estimates for most years are much more stable although the recent estimates also show an increasing trend as with age 2 but not quite as dramatic (Fig. 14 and 15).

At age 4, there is little in the way of trends although the recent estimates are slightly higher than previous years (Fig. 14 and 15).

At age 5 the trend is similar to age 4 up about the 1990 survey year beyond which all estimates at this age declined considerably to the point that the most recent estimates are below anything that has been observed in previous years (Fig. 15).

In general terms, the data indicate that estimates of recruiting year-classes at ages 2-4 exhibited an increasing trend since the early 1980's except for the 1987 and 1988 year-classes. The 1990 and particurlarly the 1991 year-classes appear to be at least better than average (Fig. 15). Early indications also suggest that the 1992 and 1993 year-classes may also be better than average. However, these year-class estimates at such young ages can be very much influenced by the sensitivity of the conversion factors between the survey gear types at small sizes. More confidence in the size of these year-classes should be developed over the next couple of years' surveys.

Maturity at Length

Samples were collected from the Canadian commercial deepwater gillnet fishery in Div. 0B, 2G and 3K. Samples were collected in August and September 1995. A total of 2354 females were sampled, 625 from Div. 0B, 1057 from Div. 2G and 672 from Div. 3K. The sampled catch in Div 0B and 2G was taken at depths of 1200 to 1300 m while the samples from Div. 3K came from depths of 900 to 1000 m.

The length distribution of immature and mature fish in the samples is given in Fig. 16 for each division. Most of the sampled fish were mature in Div. 0B and 2G while in Div. 3K a large portion of the sampled catch was immature. This corresponds to a larger percentage of smaller fish sampled from Div. 3K. This division also had a smaller percentage of females in the sampled catch, 50.6% as compared to 88.0% in Div. 2G and 92.3% in Div. 0B, which is also consistent with a higher percentage of smaller fish.

Maturity ogives were constructed for each of the 3 divisions (Fig. 17) The ogives were calculated using probit analyses assuming a normal distribution. The length at 50% maturity decreased south to north. The L_{50} in Div. 3K was 56.8 cm, in Div 2G, 53.4 cm and in Div. 0B, 49.2 cm. Maturities have been sampled from this fishery since 1993. In all years samples were taken from Div. 2G and 3K. The estimated proportions mature at length for these divisions in each year are shown in Fig . 18 . There is considerable variability between years with an increasing percentage mature at length from 1993 to 1995 in both divisions. The biological significance of this trend is not known as there appears to be substantial spatial and temporal variability in the maturity schedule of Greenland halibut throughout the northwest Atlantic (Junquera and Saborido-Rey, 1995; Morgan and Bowering, 1995).

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Table 1. Catches of Greenland halibut in the Northwest Atlantic by division and selected areas from 1977-95.

Year	Div. 2G	Div. 2H	Div. 2J	Div. 3K	Div. 3L	Div. 3N	Div. 3O	Total	Subarea 3	Overall
					Inside	Inside	Inside	Inside	Outside	Total
1977	1778	1524	8237	13446	6956	2	3	31946	-	31946
1978	1899	1207	3723	24107	7596	5	4	38541	-	38541
1979	577	1623	3415	19843	8610	17	4	34089	-	34089
1980	36	444	1466	17923	12773	43	3	32688	-	32688
1981	1799	2141	1358	16472	8912	49	6	30737	-	30737
1982	369	8985	5931	6794	4135	55	6	26275	-	26275
1983	111	5671	6028	11374	4655	12	2	27853	-	27853
1984	214	4663	6368	8432	5120	12	2	24811	1900	26711
1985	193	2358	6724	5775	3061	35	1	18147	2200	20347
1986	455	1564	6823	4237	2794	2	1	15876	2100	17976
1987	2700	2631	12464	6860	4786	1	-	29442	3000	32442
1988	2068	2463	1971	6389	2019	12	2	14924	3500	18424
1989	837	1821	2952	7840	2860	7	3	16320	2600	18920
1990	905	1158	2911	4952	2020	4	4	11954	35500	47454
1991	1556	2591	3034	2019	1590	11	7	10808	54200	65008
1992	1264	107	382	3489	1694	10	22	6968	56225	63193
1993	557	403	213	2398	880	19	435	4905	57550	62455
1994	1045	210	203	1032	258	1	204	2953	44570	47523
1995	320	303	777	556	296	6	57	2315	12384	14699

Note: Catches in Subarea 2 and Div. 3KLNO inside are Canadian only.
Catches in Subarea 3 outside include estimates of non-reported catches.

Table 2. Catch at age (000) of Greenland halibut from the Canadian fishery only in SA 2+3 from 1988 - 1994.

Age	1988	1989	1990	1991	1992	1993	1994
5	41	166	148	159	18	33	8
6	2124	1878	2979	1684	255	281	45
7	5429	7076	6706	4348	1319	847	154
8	1659	3568	1813	2121	840	411	196
9	404	597	300	900	359	190	153
10	130	90	78	295	316	169	139
11	25	19	34	89	268	173	185
12	10	4	21	80	234	192	107
13	2	2	11	21	119	107	101
14	2	1	13	21	70	54	57
15	1	1	9	4	36	31	15
16	1	1	2	1	8	12	4
17	0	1	1	1	4	2	0
Ages 5+	9828	13404	12115	9724	3846	2502	1164
Ages 6-9	9616	13119	11798	9053	2773	1729	548

Table 3. Weight at age (kg) of Greenland halibut from the Canadian fishery in SA 2+3 from 1988 - 1994.

Age	1988	1989	1990	1991	1992	1993	1994
5	0.397	0.403	0.416	0.410	0.386	0.398	0.372
6	0.583	0.561	0.587	0.596	0.560	0.580	0.572
7	0.801	0.765	0.754	0.808	0.797	0.814	0.866
8	1.157	1.065	1.052	1.179	1.252	1.196	1.227
9	1.640	1.619	1.542	1.736	1.937	1.815	1.835
10	2.240	2.201	2.116	2.404	2.544	2.445	2.368
11	2.837	2.980	2.850	3.078	3.169	3.064	3.023
12	3.593	3.981	3.632	3.821	3.942	3.984	3.765
13	4.456	4.455	4.524	5.294	5.111	5.120	4.928
14	5.512	5.623	5.567	5.940	6.220	6.091	6.005
15	6.821	6.962	6.906	6.674	7.194	7.125	7.649
16	7.782	7.547	8.546	9.001	8.290	8.462	7.830
17	0.000	9.659	9.601	9.659	10.623	9.763	-

Table 4. Commercial Greenland halibut catch at age matrix for Subarea 2 and Div. 3KL, 1975-88 (all countries).

AGE	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
5	322	19	464	3016	2182	204	810	236	766	858	1662	245	128	269
6	2719	680	4351	8511	7980	2032	4242	2020	3889	2211	4449	1958	1779	2900
7	5547	3600	9374	9072	11726	8913	9209	5552	10714	5560	4955	5604	10293	7405
8	4781	6030	6377	7662	5611	9429	10753	5064	8215	7308	2933	4450	8358	3986
9	3821	4199	2546	2898	1069	5258	4045	3112	2509	3888	1156	1284	2652	1172
10	1628	2457	879	1454	440	3729	836	1480	756	1198	429	412	798	423
11	677	923	191	731	262	987	240	524	229	387	133	213	359	183
12	130	290	113	371	136	125	133	225	83	136	83	122	263	96
13	269	113	101	225	131	52	40	143	116	101	73	61	210	97
14	131	36	26	110	84	14	27	70	93	55	40	49	157	56
15	63	21	18	58	76	9	20	55	74	73	18	32	99	48
16	41	1	22	54	56	2	13	29	10	28	12	20	53	11
17	43	1	7	39	44	1	5	14	14	18	2	1	17	2
5+	20172	18370	24469	34201	29797	30755	30373	18524	27468	21821	15945	14451	25166	16648

Table 5. Commercial Greenland halibut mean weights at age (kg) for Subarea 2 and Div. 3KL, 1975-88.

Age	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
5	0.609	0.609	0.609	0.609	0.609	0.514	0.392	0.525	0.412	0.377	0.568	0.350	0.364	0.363
6	0.760	0.760	0.760	0.760	0.760	0.659	0.598	0.684	0.629	0.583	0.749	0.584	0.589	0.569
7	0.955	0.955	0.955	0.955	0.955	0.869	0.789	0.891	0.861	0.826	0.941	0.811	0.836	0.805
8	1.190	1.190	1.190	1.190	1.190	1.050	0.985	1.130	1.180	1.100	1.240	1.100	1.160	1.163
9	1.580	1.580	1.580	1.580	1.580	1.150	1.240	1.400	1.650	1.460	1.690	1.580	1.590	1.661
10	2.210	2.210	2.210	2.210	2.210	1.260	1.700	1.790	2.230	1.940	2.240	2.120	2.130	2.216
11	2.700	2.700	2.700	2.700	2.700	1.570	2.460	2.380	3.010	2.630	2.950	2.890	2.820	3.007
12	3.370	3.370	3.370	3.370	3.370	2.710	3.510	3.470	3.960	3.490	3.710	3.890	3.600	3.925
13	3.880	3.880	3.880	3.880	3.880	3.120	4.790	4.510	5.060	4.490	4.850	4.950	4.630	5.091
14	4.560	4.560	4.560	4.560	4.560	4.420	5.940	5.850	6.060	5.730	6.130	6.090	5.480	6.203
15	5.920	5.920	5.920	5.920	5.920	5.040	8.060	7.530	7.310	6.850	7.160	7.640	6.670	7.644
16	7.140	7.140	7.140	7.140	7.140	7.020	8.710	8.680	8.600	8.330	8.920	9.810	7.850	9.187
17	7.890	7.890	7.890	7.890	7.890	10.100	9.580	11.500	11.300	9.570	11.800	10.100	9.840	11.444

TABLE 6. ANOVA results and regression coefficients from a multiplicative model utilized to derive a standardized catch rate index for Greenland Halibut in SA2 + Div. 3KLMNO (1993-1995 based on preliminary data).

REGRESSION OF MULTIPLICATIVE MODEL
MULTIPLE R..... 0.801
MULTIPLE R SQUARED..... 0.642

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	5.849E2	5.849E2	
REGRESSION	55	1.903E2	3.460E0	18.491
Country¦Gear¦TC	17	3.481E1	2.047E0	10.943
Month	11	1.031E1	9.372E-1	5.009
Division	7	9.178E0	1.311E0	7.008
Year	20	2.636E1	1.318E0	7.045
RESIDUALS	568	1.063E2	1.871E-1	
TOTAL	624	8.814E2		

REGRESSION COEFFICIENTS

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
Country¦Gear¦TC	3125	INTERCEPT	-0.837	0.216	624
Month	9				
Division	22				
Bycatch PCT	75				
(1)	3126	1	0.038	0.169	8
	10127	2	1.088	0.188	8
	11125	3	0.260	0.136	16
	11126	4	-0.111	0.206	6
	11127	5	0.404	0.127	17
	14124	6	0.645	0.093	44
	14126	7	0.794	0.116	23
	14127	8	0.619	0.167	9
	15126	9	0.455	0.204	6
	16127	10	0.287	0.091	51
	19124	11	-0.253	0.106	102
	19125	12	0.036	0.116	75
	19126	13	0.342	0.125	28
	20125	14	0.434	0.190	7
	20126	15	0.005	0.146	12
	20127	16	0.060	0.099	37
	27125	17	0.223	0.106	24
(2)	1	18	0.242	0.105	25
	2	19	0.110	0.100	29
	3	20	-0.059	0.093	36
	4	21	0.010	0.089	41
	5	22	0.198	0.092	37
	6	23	0.203	0.089	39
	7	24	-0.001	0.077	58
	8	25	0.111	0.070	75
	10	26	-0.295	0.075	66
	11	27	-0.053	0.072	74
(2)	12	28	0.076	0.079	58
(3)	21	29	0.000	0.085	51
	23	30	0.016	0.066	99
	31	31	-0.295	0.082	93
	32	32	-0.046	0.097	115
	33	33	-0.443	0.122	61
	34	34	-0.130	0.122	58
	35	35	-0.154	0.150	21
(4)	76	36	-0.037	0.226	11
	77	37	0.137	0.218	19
	78	38	0.346	0.236	18
	79	39	0.151	0.232	10
	80	40	0.386	0.239	12
	81	41	0.185	0.227	15
	82	42	0.440	0.220	19
	83	43	0.412	0.214	24
	84	44	0.312	0.216	23
	85	45	0.127	0.217	21
	86	46	-0.187	0.216	24
	87	47	0.113	0.208	33
	88	48	-0.265	0.217	22
	89	49	-0.123	0.222	22
	90	50	-0.054	0.220	26
	91	51	-0.406	0.215	49
	92	52	-0.540	0.216	95
	93	53	-0.343	0.219	84
	94	54	-0.511	0.224	89
	95	55	-0.199	0.370	2

LEGEND FOR AVOVA RESULTS:

CGT CODES:	3125 = Can(NFLD)	TC 5	15126 = Norway		TC 6
	3126 = "	TC 6	16127 = Poland		TC 7
	10127 = Former FRG	TC 7	19124 = Spain		TC 4
	11125 = Former DDR	TC 5	19125 = "		TC 5
	11126 = "	TC 6	19126 = "		TC 6
	11127 = "	TC 7	20125 = Former USSR		TC 5
	14124 = Japan	TC 4	20126 = "		TC 6
	14126 = "	TC 6	20127 = "		TC 7
	14127 = "	TC 7	27125 = Can(M)		TC 5

All of the above CGT are Stern Trawlers

DIVISION CODES: 21 = 2G, 22 = 2H, 23 = 2J, 31 = 3K, 32 = 3L
33 = 3M, 34 = 3N, 35 = 3O

TABLE 7 . Standardized catch rate index for Greenland Halibut in SA2 + Div. 3KLMNO derived from a multiplicative model utilizing hours fished as a measure of effort.

PREDICTED CATCH RATE

	LN TRANSFORM		RETRANSFORMED			
YEAR	MEAN	S.E.	MEAN	S.E.	CATCH	EFFORT
1975	-0.8369	0.0465	0.465	0.099	28681	61726
1976	-0.8736	0.0248	0.453	0.071	24598	54326
1977	-0.7002	0.0199	0.540	0.076	31946	59177
1978	-0.4913	0.0225	0.664	0.099	38541	58010
1979	-0.6861	0.0306	0.545	0.095	34089	62598
1980	-0.4512	0.0230	0.691	0.104	32688	47278
1981	-0.6520	0.0201	0.566	0.080	30737	54259
1982	-0.3966	0.0155	0.733	0.091	26275	35847
1983	-0.4251	0.0138	0.713	0.083	27853	39065
1984	-0.5245	0.0129	0.646	0.073	26711	41361
1985	-0.7099	0.0151	0.536	0.066	20347	37966
1986	-1.0243	0.0140	0.392	0.046	17976	45910
1987	-0.7243	0.0140	0.529	0.062	32442	61380
1988	-1.1018	0.0153	0.362	0.045	18424	50878
1989	-0.9596	0.0149	0.418	0.051	18920	45310
1990	-0.8904	0.0124	0.448	0.050	47454	105916
1991	-1.2432	0.0118	0.315	0.034	65008	206424
1992	-1.3765	0.0124	0.276	0.031	63193	229335
1993	-1.1796	0.0135	0.335	0.039	62455	186245
1994	-1.3482	0.0155	0.283	0.035	47523	167923
1995	-1.0360	0.1016	0.370	0.115	18965	51202

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.141

Table 8. Biomass (tons) of Greenland halibut per stratum from fall surveys in Division 2J from 1977-92.

Stratum	Depth (m)	Area	Units	Year 1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
206	101-200	2582	194	4031	1508	1572	1959	7206	3628	1686	2105	861	781	79	345	126	182	23	37
207		2246	169	13112	4306	1752	1163	3072	1742	1290	1055	368	204	44	8	7	0	0	0
201		1427	107	778	146	48	303	289	1036	398	517	44	105	20	9	86	57	6	0
205		1823	137	2870	900	1397	513	2044	3297	1950	954	197	152	48	144	53	41	48	8
Total				20790	6860	4769	3939	12612	9702	5324	4631	1469	1242	192	506	272	280	78	45
215	201-300	1270	95	3592	2100	678	1764	1173	3649	1378	4004	1545	1415	1132	859	514	671	324	251
234		508	38	1870	3757	2487	3012	1983	3737	1781	3459	699	486	197	772	388	187	111	70
228		1428	107	700	235	899	1972	858	992	1107	1769	682	1116	566	279	565	914	228	159
214		1171	88	3425	4235	1935	1354	5283	7411	3923	5252	5874	779	1208	1941	525	447	68	105
202		440	33	705	541	727	958	1139	1503	1016	3063	332	281	587	-	16	111	70	43
210		774	58	1128	512	554	627	290	1213	2411	1562	302	213	232	458	393	687	138	137
213		1725	129	2131	1704	1242	2970	3798	4427	3011	2654	4639	2546	1142	757	304	293	32	79
209		1608	121	7876	2657	10675	12644	6720	15648	6370	4517	4161	1650	1032	1354	1241	990	304	223
Total				21427	15741	19196	25302	21243	38580	20997	26280	18234	8485	6095	6420	3945	4301	1276	1067
208	301-400	448	34	6260	4909	3051	5032	8096	11725	3699	16686	13658	6377	3462	2825	6785	5749	1240	697
229		567	43	1661	613	1014	1091	1298	915	1553	468	553	624	252	137	131	96	301	389
203		480	36	1137	1444	2354	761	1874	2318	8173	6459	901	3889	1003	1225	3242	877	1109	201
222		441	33	3817	2136	2539	2992	1846	6223	4353	916	1126	74	1092	1374	265	471	32	71
211		330	25	866	2113	1164	1804	886	1381	3338	1381	4062	2550	1102	2019	578	3749	440	145
216		384	29	2964	4202	5228	5369	1823	6205	2959	4987	2356	998	1474	101	362	228	89	90
Total				16705	15417	15348	17048	15822	28767	24076	30896	22657	14514	8384	7681	11362	11169	3211	1593
227	401-500	686	51	5938	4473	1415	3798	2240	2827	1983	1888	1912	1064	1891	1648	2697	2103	658	1014
217		268	20	2856	3385	1753	3138	825	1172	1298	-	2917	2187	834	880	121	645	87	69
223		180	14	3398	1146	864	1838	1280	1189	834	1537	1084	1715	284	858	213	317	41	45
204		354	27	4669	12879	6918	-	4531	7547	6665	6909	438	7104	3893	4411	15073	3326	1490	988
235		420	32	3707	3375	2648	4035	1230	2827	7961	2585	2680	5762	3742	2215	4579	5862	404	285
Total				20568	25258	13599	12809	10105	15562	18740	12919	9032	17832	10644	10012	22683	12252	2681	2402
230	501-750	237	18	4328	1436	-	3014	1072	548	1654	382	467	1819	1209	787	770	827	551	1032
212		664	50	9451	7517	11575	5159	7364	7182	2230	3530	5470	19079	18665	3751	2131	3988	1062	1336
218		420	32	6870	7508	-	4083	4934	1261	1230	-	954	2592	1544	1844	567	1329	668	94
224		270	20	3519	1595	2482	664	2331	740	1024	760	567	4949	1286	1277	53	250	134	107
Total				24168	18057	14058	12920	15701	9731	6138	4673	7458	28439	22704	7659	3520	6394	2414	2569
236	751-1000	122	9	898	-	-	-	410	611	925	485	781	2050	860	119	-	1014	1014	360
231		182	14	878	1893	-	2548	-	1281	700	1349	1636	386	526	2329	-	1704	374	465
219		213	16	-	-	-	-	767	-	1647	-	1339	4574	1342	723	560	1502	200	130
Total				1776	1893	0	2548	1177	1892	3272	1834	3756	7011	2728	3172	560	4220	1588	954
-225	1001-1250	177	13	531	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-232		236	18	869	482	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-220		324	24	-	1384	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total				1399	1866	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-233	1251-1500	180	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-221		268	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-226		180	14	-	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total				0	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biomass (t)			106834	85135	66969	74565	76660	104234	78547	81234	62605	77522	50747	35450	42342	38617	11248	8630
	95% Lower			90708	62722	53867	54260	49579	82993	63918	55160	47364	47571	25957	26531	-74245	29215	8574	5267
	95% Upper			122960	107550	80071	94867	103742	125473	93175	107308	77842	107539	75586	44364	158923	48018	13925	11993

Table 9. Estimated biomass (tons) per stratum of G. halibut from the autumn survey of the GADUS ATLANTICA in Div. 2J during 1993-94 and TELEOST in fall-winter, 1995/96. Based on the new stratification system.

Depth Range (m)	Stratum	Area (sq. nm)	Trawlable Units (00	1993	1994	1995/96
101-200	201	633	48	1	10	-
	205	1594	120	1	5	-
	206	1870	140	11	32	399
	207	2264	170	0	10	1
	237	733	55	0	0	0
	238	778	58	-	-	-
Total				14	58	400
201-300	202	621	47	1	107	95
	209	680	51	166	33	360
	210	1035	78	253	50	2708
	213	1583	119	62	156	236
	214	1341	101	241	171	327
	215	1302	98	502	321	1370
	228	2196	165	345	943	2219
	234	530	40	407	59	-
Total				1977	1840	7315
301-400	203	487	37	863	547	387
	208	588	44	433	1908	4799
	211	251	19	573	336	1400
	216	360	27	166	171	64
	222	450	34	78	199	122
	229	536	40	119	410	1799
Total				2231	3570	8571
401-500	204	288	22	975	1366	1437
	217	241	18	143	123	131
	223	158	12	77	76	162
	227	598	45	843	913	909
	235	414	31	340	439	3895
	240	133	10	43	58	631
Total				2421	2975	7165
501-750	212	557	42	2732	814	5499
	218	362	27	137	76	693
	224	228	17	54	165	214
	230	185	14	79	191	652
	239	120	9	556	615	1675
Total				3559	1862	8733
751-1000	219	283	21	429	1105	2021
	231	186	14	406	393	376
	236	193	14	558	136	1007
Total				1394	1634	3404
1001-1250	220	303	23	-	-	-
	225	195	15	-	-	-
	232	228	17	-	-	-
Total				-	-	-
1251-1500	221	330	25	-	-	-
	226	201	15	-	-	-
	233	237	18	-	-	-
Total				-	-	-
Biomass (t)				11595	11939	35591
95% Lower				9598	16064	28260
95% Upper				13589	7816	42922

Table 10. Biomass (tons) per stratum of Greenland halibut from fall surveys in Division 3K from1978-92.

Stratum	Depth (m)	Area	Units	Year 1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
618	101-200	1455	109	-	-	-	-	-	-	164	484	22	8	3	36	0	0	0
619		1588	119	-	-	-	-	-	-	226	68	26	7	1	32	0	0	0
Total				0	0	0	0	0	0	390	552	48	15	4	68	0	0	0
637	201-300	1132	85	334	353	510	701	825	1258	422	1147	930	772	336	286	461	169	86
632		447	34	107	95	392	210	252	115	0	288	75	67	27	53	242	55	104
635		1274	96	640	585	1841	1148	1635	749	974	403	1054	1060	434	668	164	25	44
636		1455	109	609	510	1288	1393	2386	442	808	474	371	186	434	384	222	135	100
621		2859	215	27144	24549	10387	7033	3150	6840	3932	6552	1075	1751	1453	1792	210	524	685
624		668	50	469	532	257	188	263	119	251	249	181	291	115	165	181	159	135
634		1618	121	766	1147	642	657	1711	802	720	568	452	1099	419	327	386	288	109
620		2709	203	13570	5976	5757	5230	4541	3914	2660	2985	2591	1212	1936	323	230	415	51
Total				43640	33747	21074	16559	14764	14239	9767	12666	6729	6437	5154	4000	2094	1770	1314
639	301-400	1463	110	563	860	723	810	2092	1286	265	515	805	395	355	303	502	460	517
638		2059	155	2342	2046	1717	3294	3151	2790	1940	5335	3933	2887	1700	1776	4261	1312	1266
625		850	64	1120	909	925	2010	558	4232	2740	3548	2488	3358	1951	449	2210	997	185
628		1085	81	3517	2912	5555	1330	1052	2939	2216	6675	4918	3458	3282	2435	1422	516	263
623		1027	77	12297	2585	6412	6424	11271	16742	20815	5204	13847	10546	10461	6326	2758	2433	844
626		919	69	4190	2910	9651	4015	8306	7019	15021	8602	10693	4574	6560	6824	1620	1749	1595
633		2179	164	1325	1480	2633	1632	1297	2025	1971	2365	3222	3208	2166	3654	1961	1966	1495
630		544	41	1112	440	873	4788	-	2767	316	1354	1256	2307	2300	1607	1145	1166	434
629		495	37	764	497	970	1164	2545	2440	1157	817	2006	2960	3734	2462	578	230	505
Total				27230	14639	29459	25467	30273	42239	46440	34415	43169	33693	32510	25837	16457	10829	7104
645	401-500	204	15	285	-	184	333	271	50	831	641	-	390	175	49	312	59	123
627		1194	90	6424	3740	6139	17007	11152	19792	26938	12580	23626	12265	13009	21830	10390	5664	1371
631		1202	90	4098	2102	3113	6190	3429	6018	9501	6394	6098	9812	6904	10089	3153	10139	1787
622		632	47	6789	5666	2076	6286	5732	10627	6820	2864	26745	9826	10500	7034	18287	2916	1397
640		198	15	489	-	881	535	320	-	204	275	152	301	93	134	245	178	74
Total				18085	11509	12392	30350	20903	36487	44294	22754	56621	32595	30681	39136	32387	18957	4751
646	501-750	333	25	1481	2224	1287	1581	387	2281	2512	1662	-	750	-	-	260	692	232
641		584	44	239	1174	1392	956	1074	2689	2740	995	-	1135	-	-	1750	364	286
Total				1720	3397	2679	2537	1461	4969	5252	2657	0	1885	0	0	2010	1056	518
642	751-1000	931	70	1302	-	2324	652	2329	-	5685	2341	-	1936	-	-	3159	2659	6580
647		409	31	4919	1478	2740	2533	1213	-	-	3522	-	-	-	-	2938	763	432
Total				6221	1478	5064	3185	3542	0	5685	5863	0	1936	0	0	6097	3422	7013
-643	1001-125	1266	95	712	1230	-	-	-	-	-	-	-	-	-	-	-	-	-
-648		232	17	269	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total				981	1230	0	0	0	0	0	0	0	0	0	0	0	0	0
-644	1251-150	954	72	1090	357	-	-	-	-	-	-	-	-	-	-	-	-	-
-649		263	20	215	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total				1305	357	0	0	0	0	0	0	0	0	0	0	0	0	0
Biomass (t)				99182	66356	70668	78098	70944	97934	111829	78907	106567	76561	68350	69041	59045	36034	20700
95% Lower				68648	49413	55888	64299	55559	76916	86170	63917	76206	57939	51398	53665	40175	28656	16511
95% Upper				129622	83247	85358	91633	86182	118664	137055	93691	136567	95025	85143	84090	80368	43318	24917

Table 11. Biomass (tons) per stratum of G. halibut from the autumn survey of the GADUS ATLANTICA in Div. 3K during 1993-94 and TELEOST and W. TEMPLEMAN during fall-winter 1995/96. Based on the new stratification system.

Depth Range(m)	Stratum	Area (sq. nm.)	Trawl units ('000)	1993	1994	1995/96
101-200	618	1347	101	0	3	**286**
	619	1753	132	0	0	**18**
Total				0	3	**304**
201-300	620	2545	191	34	470	**790**
	621	2736	205	407	483	**1067**
	624	1105	83	286	212	**507**
	634	1555	117	391	505	**727**
	635	1274	96	51	29	**128**
	636	1455	109	395	181	**1393**
	637	1132	85	201	30	**179**
Total				1765	1909	**4791**
301-400	617	593	45	1957	871	**3844**
	623	494	37	496	668	**307**
	625	888	67	1005	677	**1437**
	626	1113	84	1178	1564	**1962**
	628	1085	81	544	642	**529**
	629	495	37	582	612	**2682**
	630	332	25	430	559	**858**
	633	2067	155	1516	1145	**4649**
	638	2059	155	1253	748	**1750**
	639	1463	110	700	310	**1520**
Total				9660	7796	**19538**
401-500	622	691	52	2788	1205	**2638**
	627	1255	94	10455	2425	**18946**
	631	1321	99	3580	3188	**10094**
	640	69	5	40	52	**179**
	645	216	16	56	72	**357**
	650	134	10	95	148	**252**
Total				17014	7090	**32466**
501-750	641	230	17	228	58	**227**
	646	325	24	58	257	**327**
	651	359	27	387	468	**1222**
Total				673	783	**1776**
751-1000	642	418	31	1014	1423	**1741**
	647	360	27	1618	1148	**1087**
	652	516	39	1521	906	**2365**
Total				4154	3476	**5193**
1001-1250	643	733	55	-	-	**1487**
	648	228	17	-	-	**-**
	653	531	40	1180	0	**1583**
Total				1180	0	**3070**
1251-1500	644	474	36	-	-	**688**
	649	212	16	-	-	**-**
	654	479	36	-	-	**1375**
Total				-	-	**2063**
Biomass (t)				34445	21057	**69206**
95% Lower				29067	17763	**55864**
95% Upper				39821	24352	**82547**

Table 12. Biomass (tons) per stratum of Greenland halibut from fall surveys in Division 3L during 1981-94 and during fall-winter 1995/96.

Stratum	Depth (f)	Area	Units	1981	1982	1983	1984	1985	Year 1986	1987	1988	1989	1990	1991	1992	1993	1994	1995/96
371	31-50	1121	84	1	0	0	0	0	3	0	0	0	0	1	0	0	0	0
363		1780	134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
372		2460	185	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
350		2071	155	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
384		1120	84	-	0	0	0	0	7	0	0	0	0	0	0	0	0	1
Total				1	0	0	0	0	12	0	0	0	0	1	0	0	0	2
348	51-100	2120	159	67	331	48	18	97	140	68	70	46	41	0	0	0	8	0
343		525	39	35	-	21	0	3	1	0	0	11	4	0	0	0	0	0
328		1519	114	-	-	-	23	10	59	29	7	11	1	0	0	0	0	0
341		1574	118	59	22	95	59	31	5	73	37	31	21	0	35	0	0	0
342		585	44	58	124	38	0	32	9	0	10	7	25	0	0	0	0	0
349		2114	159	14	5	68	16	11	14	38	0	6	10	0	0	0	0	4
370		1320	99	0	50	44	39	151	228	25	1	4	72	0	0	0	0	1
385		2356	177	46	387	566	88	219	826	432	0	30	127	0	108	0	48	73
390		1481	111	0	389	8	0	302	402	118	0	63	58	241	36	13	23	43
364		2817	211	104	53	184	0	11	30	112	57	74	44	2	6	0	0	1
365		1041	78	225	215	102	23	9	84	248	23	70	24	1	5	0	0	17
Total				608	1576	1172	266	877	1798	1143	205	354	428	245	191	13	79	139
391	101-150	282	21	0	58	455	397	630	175	87	51	275	128	365	87	163	119	177
344		1494	112	778	112	487	20	276	519	323	359	773	127	38	0	25	0	16
389		821	62	-	486	-	1186	1652	604	693	547	632	387	283	525	128	221	71
347		983	74	135	223	190	13	56	217	10	1498	1114	291	1	0	5	6	2
369		961	72	956	938	1010	374	962	459	667	263	294	894	343	83	10	54	72
386		983	74	2730	1605	-	936	2767	615	452	359	804	854	421	710	27	86	126
366		1394	105	523	1002	628	652	1893	1141	849	2160	1203	713	29	129	9	16	204
Total				5123	4424	2770	3579	8235	3730	3081	5236	5096	3393	1481	1533	368	500	668
368	151-200	334	25	539	721	-	445	727	167	226	545	683	4629	246	185	82	227	385
392		145	11	0	152	166	288	272	196	90	144	131	117	241	73	56	32	69
346		865	65	584	755	1136	1775	2325	1692	1461	1039	1672	2119	827	378	243	104	2237
345		1432	107	2230	932	994	4257	3935	673	1935	2480	1336	2646	223	274	828	45	937
387		718	54	3638	2354	-	2641	2277	431	1419	687	826	647	1322	748	635	520	1546
388		361	27	-	63	-	650	671	-	467	515	420	113	345	814	274	88	310
Total				6992	4977	2297	10056	10207	3159	5598	5410	5068	10271	3203	2471	2119	1017	5484
731	201-300	216	16	-	-	-	677	243	-	-	-	-	295	116	232	84	134	242
735		272	20	-	674	-	858	597	970	-	-	-	-	294	380	220	538	526
729		186	14	-	-	-	988	426	250	-	-	-	316	357	269	149	389	215
733		468	35	-	-	-	448	1259	-	-	-	-	503	928	969	416	646	501
Total				0	674	0	2970	2525	1220	0	0	0	1114	1695	1851	868	1707	1484
734	301-400	228	17	-	-	-	302	633	-	-	-	-	315	226	133	147	186	280
736		175	13	-	394	-	-	920	690	-	-	-	252	208	147	231	449	271
730		170	13	-	-	-	156	86	-	-	-	-	-	195	141	109	208	140
732		231	17	-	-	-	219	364	-	-	-	-	282	71	269	21	133	83
Total				0	394	0	678	2003	690	0	0	0	849	699	691	507	977	774
737	401-500	227	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1244
741		223	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
745		348	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
748		159	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total				-	-	-	-	-	-	-	-	-	-	-	-	-	-	1244
738	501-600	221	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1490
742		206	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
746		392	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
749		126	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total				-	-	-	-	-	-	-	-	-	-	-	-	-	-	1490
Biomass (tons)				12723	12045	6239	17548	23846	10609	9822	10851	10518	16054	7323	6737	3875	4280	11282
95% Lower				5692	9130	5010	12286	19726	6743	6996	8443	8133	-44558	4584	4875	3106	3345	8012
95% Upper				19752	14168	8258	22810	27970	14477	12646	13259	12903	76667	10067	8596	4646	5219	14552

Table 13. Abundance (000s) of Greenland halibut at age from Canadian research vessel surveys in Div. 2J3KL combined during fall 1978-94 and fall-winter 1995/96. Estimates have not been converted to Campellen equivalents for 1978-94.

Age (yrs)	Year 1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	**1995/96**
1	2538	2805	2994	7563	2137	1004	1452	7460	13005	1491	4025	3407	547	5814	1684	7510	3581	**132224**
2	25686	22523	8911	22486	5991	5905	7148	18147	22185	8685	12436	10414	5347	6726	14858	62818	23464	**488804**
3	54708	28846	15315	30875	23971	19036	21435	20024	32997	47694	28404	35816	14506	11369	26664	97955	58363	**292016**
4	55914	25799	22680	21226	31204	31465	36094	36224	55685	35752	50345	69334	68019	37832	34313	46098	60582	**124464**
5	57650	35886	35995	34277	31061	40182	72180	44886	45213	35854	58938	77935	65410	38273	23316	18385	21864	**62743**
6	45141	38805	42154	38654	29062	34742	38931	37715	57886	33486	39603	56524	48199	27416	17109	6912	4685	**20255**
7	28923	18843	27942	26647	32070	38908	30683	22359	45327	33956	29733	32108	28837	9020	8406	2520	2084	**4080**
8	13379	7378	9511	11458	32617	31538	21712	12761	12676	20722	9257	9627	6828	2155	962	739	561	**971**
9	6983	3316	4207	5281	13535	11559	10222	6293	3306	7621	2525	2884	1839	475	95	63	53	**269**
10	5112	3179	3229	2824	5375	3040	4132	3498	1430	2156	809	675	718	231	48	0	32	**104**
11	4237	2102	3601	2255	2801	2049	1869	1592	960	1065	542	558	488	104	13	0	11	**50**
12	2541	1843	2393	1030	1790	1497	1216	1218	961	642	309	161	267	61	0	13	5	**0**
13	1611	1520	1551	579	1276	1089	964	517	441	504	267	56	160	14	0	0	0	**0**
14	476	762	858	276	1306	713	804	636	411	200	210	73	115	5	0	0	0	**0**
15	335	493	326	155	835	306	427	330	213	151	151	77	49	0	0	0	0	**0**
16	243	426	182	19	325	81	294	210	62	100	81	23	27	2	0	0	0	**0**
17	130	153	53	0	51	0	140	161	0	10	38	0	0	0	0	0	0	**0**
Ages 1+	305607	194679	181902	205605	215407	223114	249703	214031	292758	230089	237673	299672	241356	139497	127468	243013	175285	**1125980**
Ages 3-5	168272	90531	73990	86378	86236	90683	129709	101134	133895	119300	137687	183085	147935	87474	84293	162438	140809	**479223**
Ages 6-9	94426	68342	83814	82040	107284	116747	101548	79128	119195	95785	81118	101143	85703	39066	26572	10234	7383	**25575**
Ages 10+	14685	10478	12193	7138	13759	8775	9846	8162	4478	4828	2407	1623	1824	417	61	13	48	**154**

Table 14. Abundance at age (000's) of Greenland halibut estimated from research vessel surveys in Divisions 2J and 3K combined. Estimates are converted into "Campelen" equivalents.

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	36633	42087	26161	73375	18285	6298	17904	102708	68169	20721	43287	28023	5561	57153	26059	33143	73075	124344
2	172112	70326	25231	91124	19676	16911	28537	60788	55253	46089	41541	49518	21759	23162	98529	182248	143909	460178
3	132830	52433	23941	59874	49282	40141	38349	36115	65835	121040	59264	94207	41247	25163	84508	262438	133795	279812
4	80174	27837	21530	23351	41680	43313	41204	28474	57874	50040	67101	99656	96979	55177	56259	79188	104134	115567
5	49576	29066	27318	25559	31198	39726	61534	39395	37606	39549	58699	68717	63698	37451	20042	22503	29519	53519
6	37391	27909	28939	27162	22254	28357	30883	36802	43852	28333	30804	39280	38193	22386	12908	7256	5640	15873
7	22327	13370	17781	19857	23040	28067	21067	23944	36890	25730	21753	20776	19555	5124	5162	2916	2509	3514
8	10466	5465	6173	8940	23806	21382	13961	9343	12493	13150	6401	5349	3403	1023	489	841	743	920
9	5431	2613	2739	4028	10252	8387	6807	4268	3955	5166	1695	1571	907	326	83	136	96	266
10	4026	2507	2139	2362	3939	2479	2973	3101	1354	1501	608	422	411	207	48	18	36	104
11	3536	1647	2451	2060	2295	1780	1392	1259	1033	770	409	324	368	75	7	0	10	50
12	2248	1448	1590	930	1483	1255	975	1112	921	796	240	78	222	45	0	60	9	0
13	1465	1207	1044	511	1056	917	791	511	482	416	194	9	140	14	0	13	5	0
14	541	593	594	273	1086	615	725	552	292	328	174	53	91	5	8	13	0	0
15	306	383	225	155	692	276	357	337	301	199	129	56	49	0	0	0	0	0
16	199	340	127	3	327	78	252	169	171	122	81	17	11	2	0	0	0	0
17	116	128	40	0	53	0	123	168	61	82	38	0	0	0	0	0	0	0
18	0	70	0	0	23	44	0	58	0	8	9	0	0	0	0	0	0	0
19	0	36	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0
20	13	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0
Unk	2022	613	2295	20978	1545	0	0	4087	4190	0	899	2589	0	0	1355	4311	0	28
Ages 1+	561411	280075	190316	360544	251975	240029	267833	353200	390731	354041	333342	410646	292597	227312	305459	595087	493481	1054176
Ages 1-2	208745	112413	51392	164499	37961	23209	46441	163496	123422	66810	84828	77541	27320	80315	124588	215391	216984	584522
Ages 3-5	262580	109336	72789	108784	122160	123180	141087	103984	161315	210629	185064	262580	201924	117791	160809	364129	267448	448898
Ages 6-9	75615	49357	55632	59987	79352	86193	72718	74357	97190	72379	60653	66976	62058	28859	18642	11149	8988	20573
Ages 10+	14472	8972	10505	27272	12499	7444	7588	11364	8805	4222	2797	3548	1292	348	1418	4415	60	182

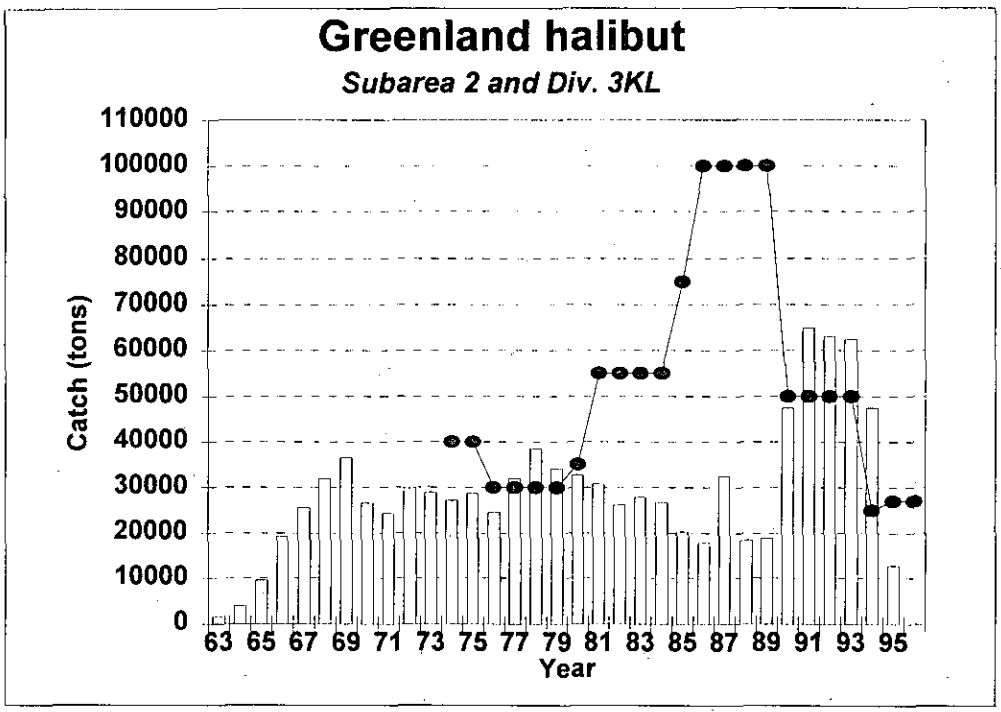

Fig 1. Nominal catches of G. halibut in Subarea 2 and Div. 3KL from 1963-95. Recent years include Div. 3MNO.

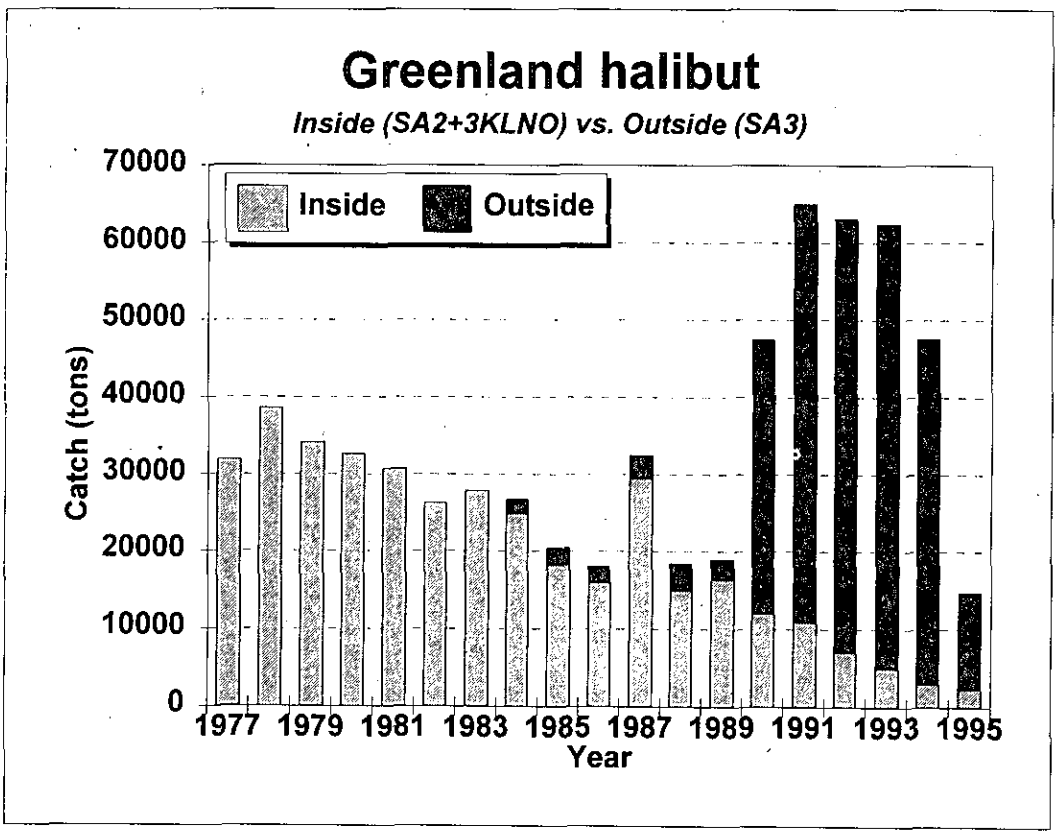

Fig 2. Catch of G. halibut inside 200 miles for Subarea 2+ Div. 3KLNO compared to the catch outside 200 miles (Subarea 3) from 1977-95.

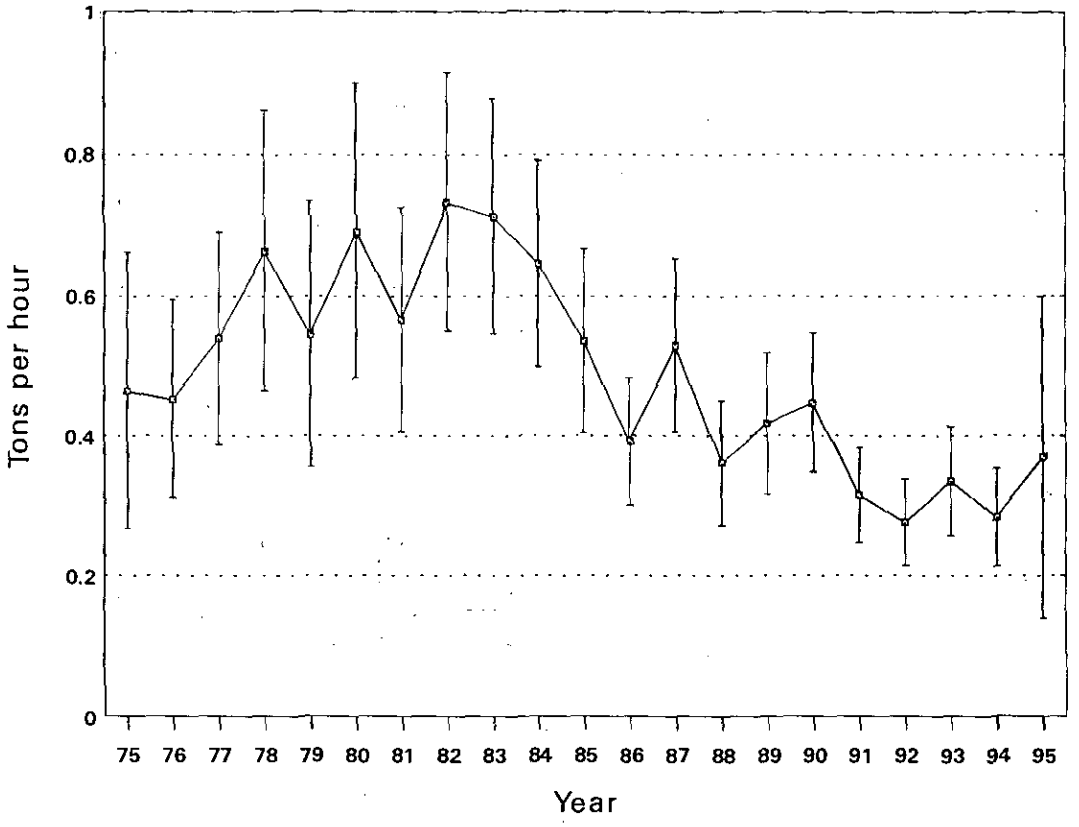

Fig. 3 Standardized CPUE with approximate 95% confidence intervals for Greenland Halibut in SA2 + Div. 3KLMNO from 1975-1995.

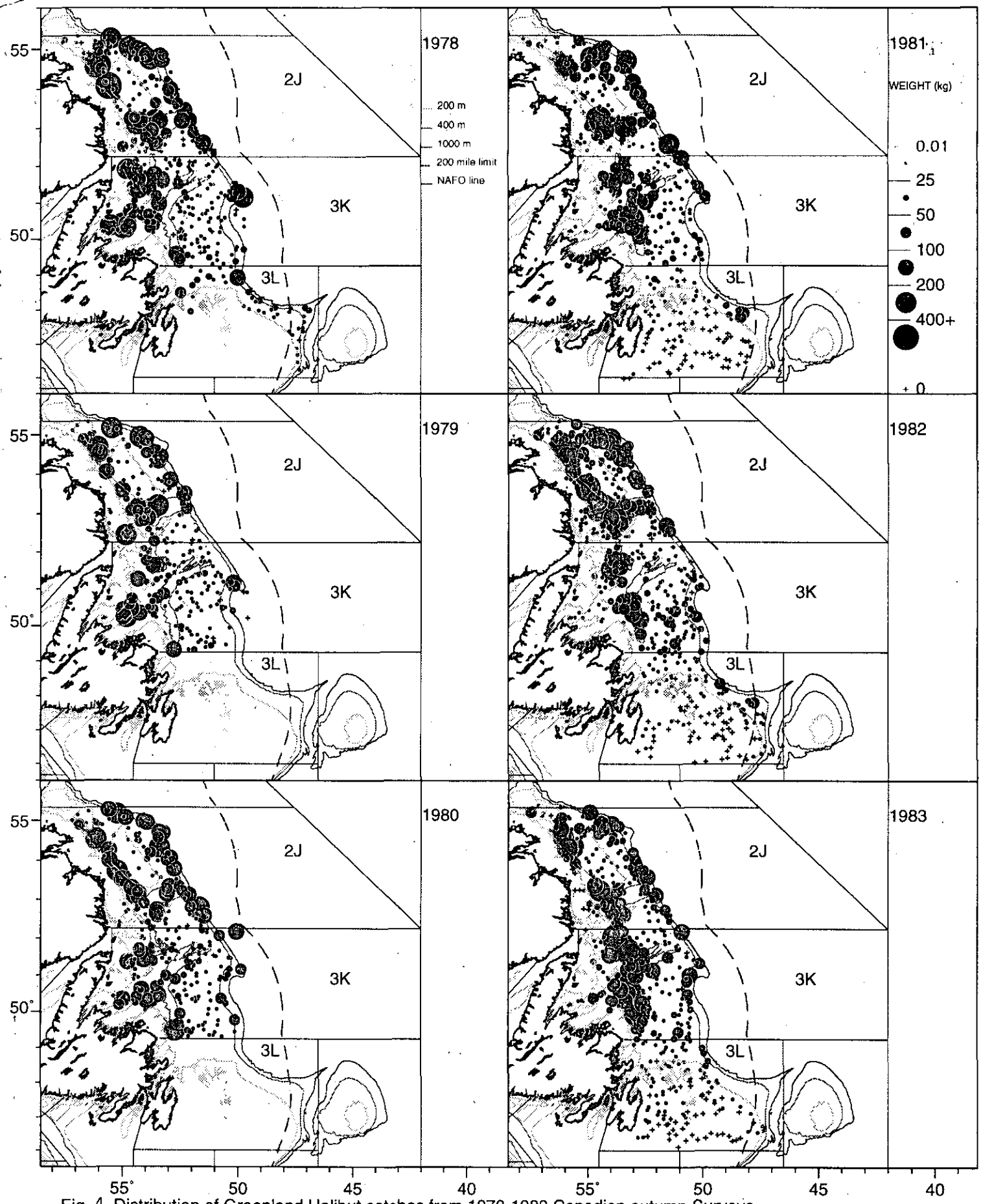

Fig. 4 Distribution of Greenland Halibut catches from 1978-1983 Canadian autumn Surveys to NAFO Divisions 2J3KL by the Canadian research vessels A.T. Cameron and Gadus Atlantica. (weights standardized to 30 min. (1.8 nm.) tows)

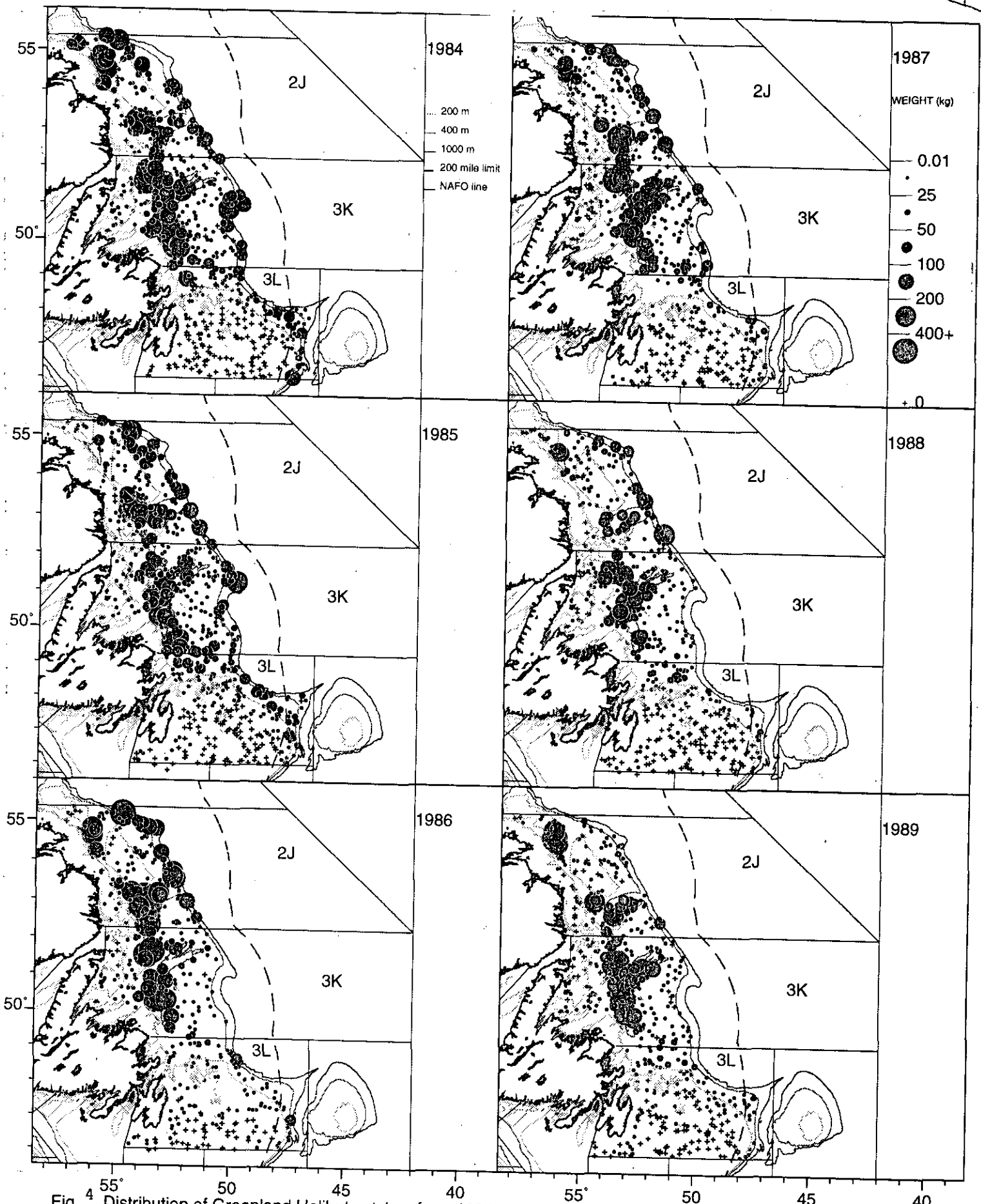

Fig. 4 Distribution of Greenland Halibut catches from 1984 - 1989 Canadian autumn Surveys to NAFO Divisions 2J3KL by the Canadian research vessels Alfred Needler, Gadus Atlantica and Wilfred Templeman (weights standardized to 30 min. (1.8 nm.) tows).

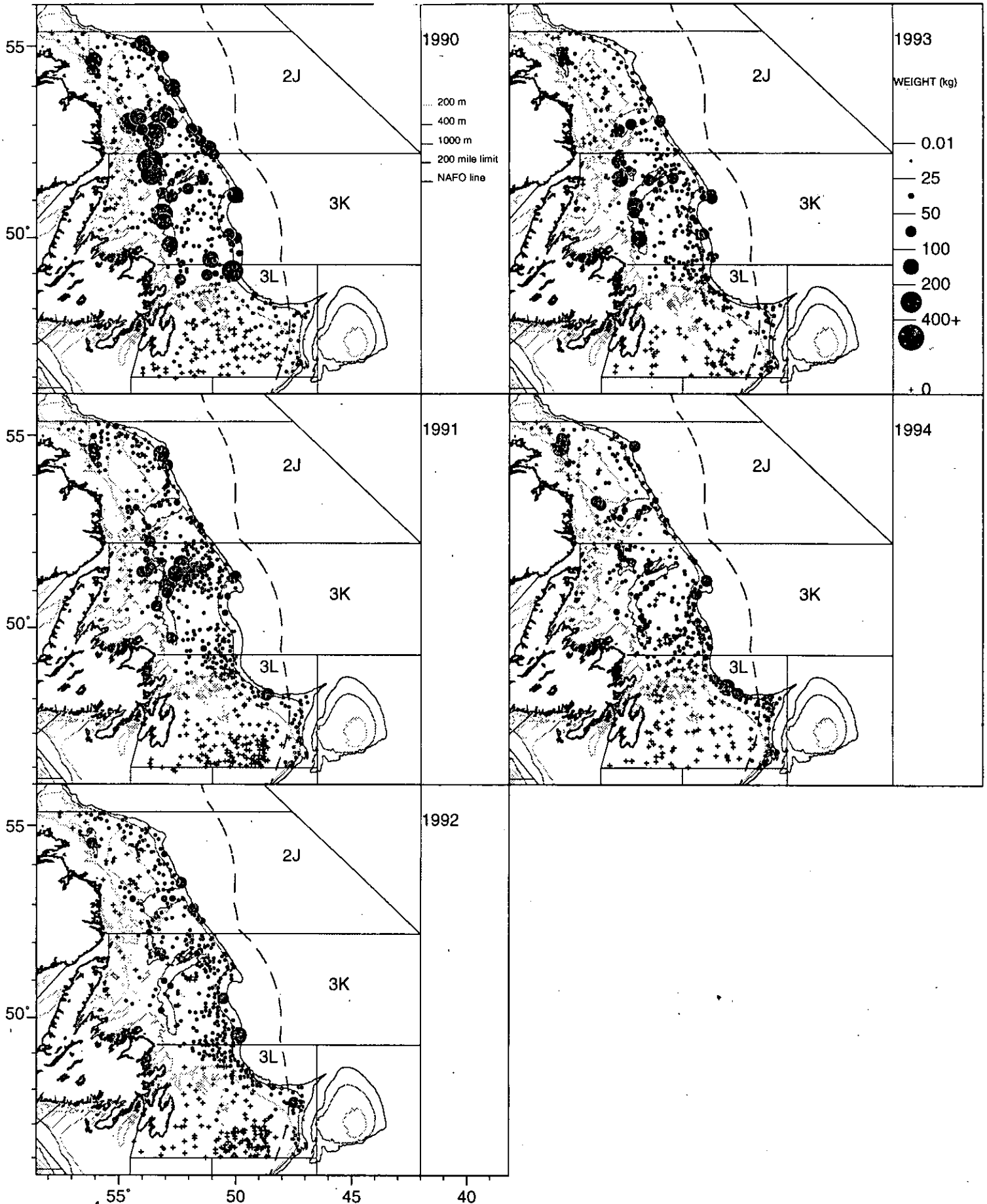

Fig. [4] Distribution of Greenland Halibut catches from 1990-1994 Canadian autumn Surveys to NAFO Divisions 2J3KL by the Canadian research vessels Gadus Atlantica and Wilfred Templeman (weights standardized to 30 min. (1.8 nm.) tows).

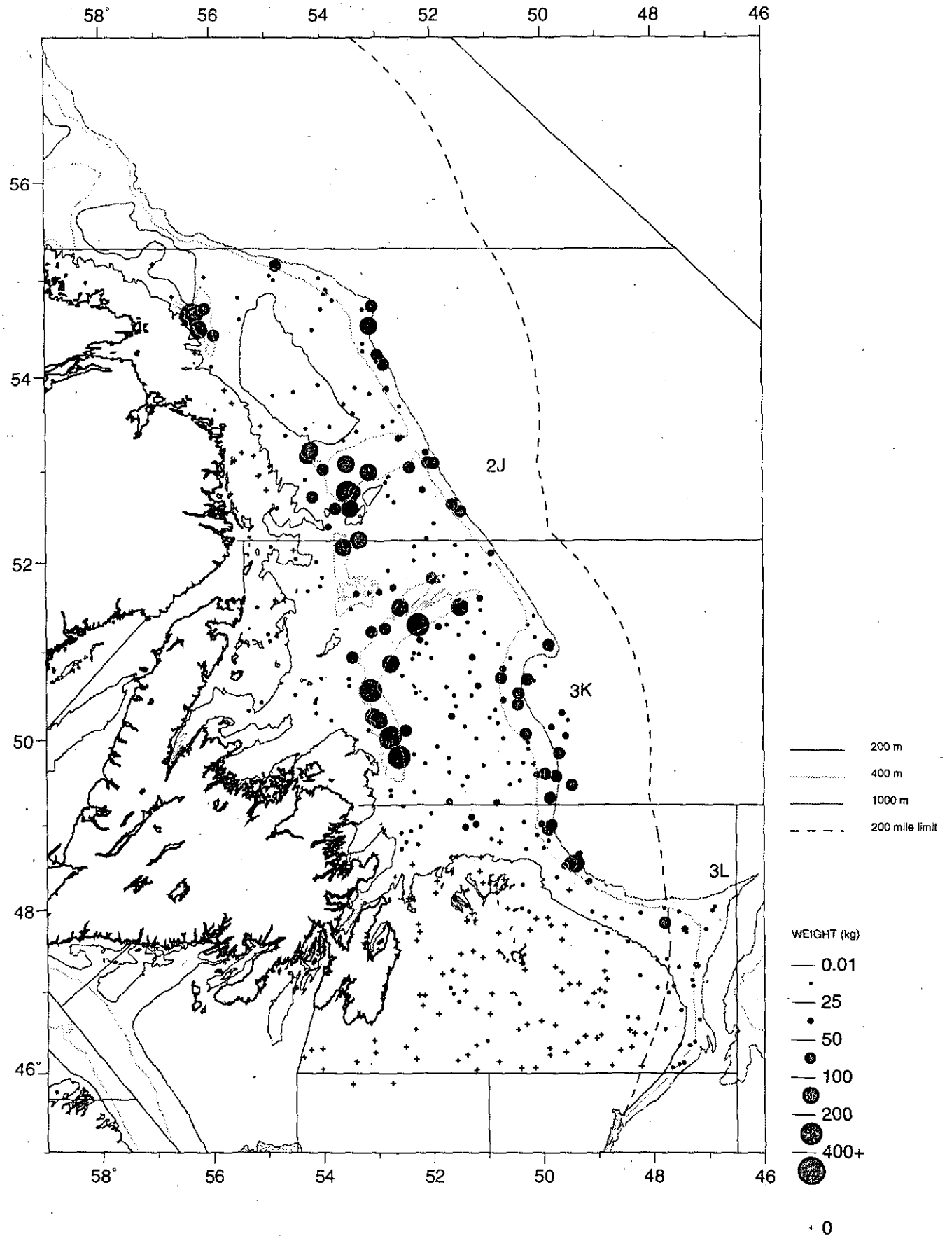

Fig. 5 Distribution of Greenland Halibut catches from 1995 Canadian fall surveys to NAFO Divisions 2J3KL by the Canadian research vessels Wilfred Templeman (trips 176 - 181) and Teleost (20 - 23)
(all sets standardized to 30 min. (1.8 nm.) tows).

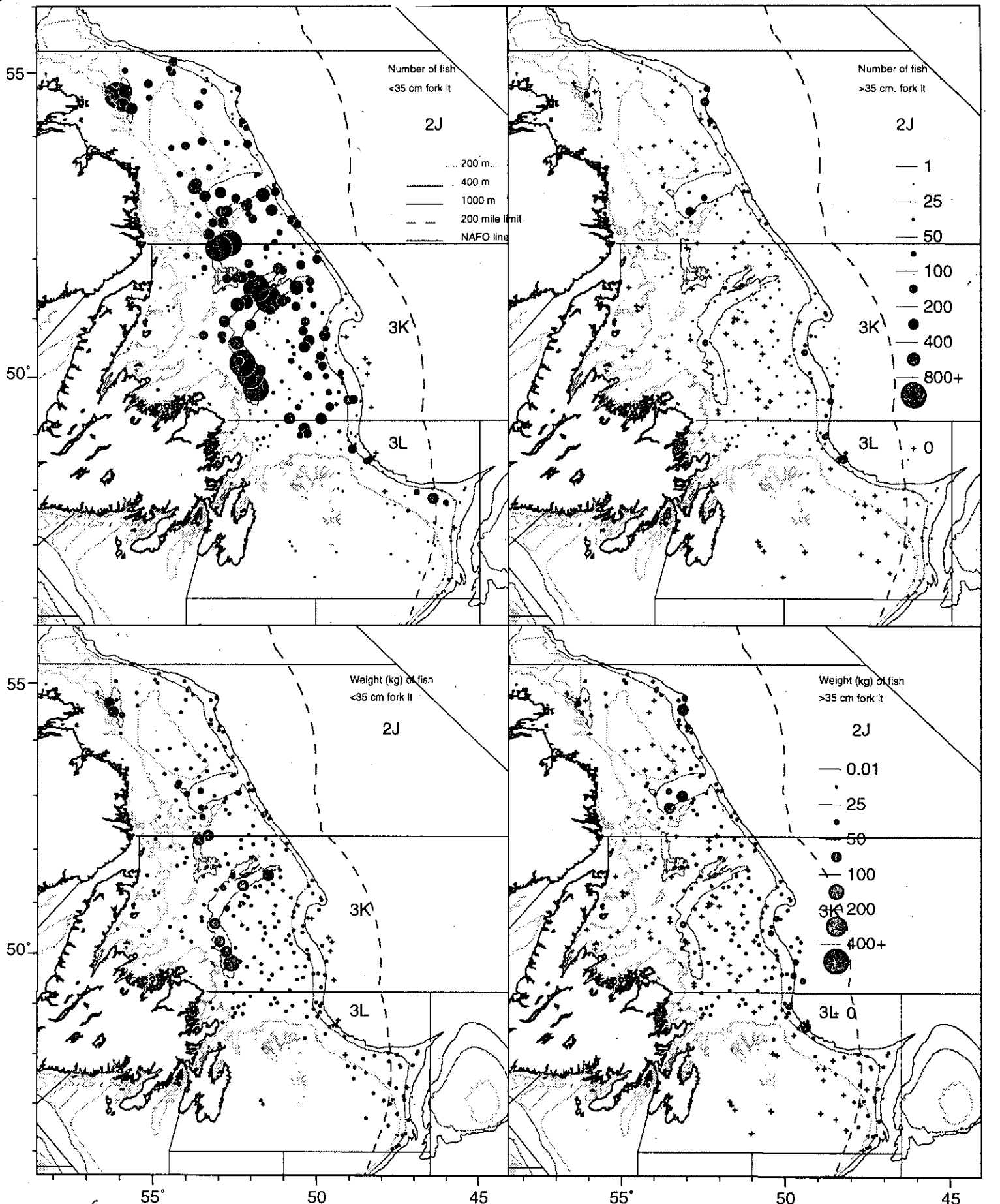

Fig. 6 Distribution of Greenland Halibut catches during the 1995 Canadian autumn surveys to NAFO Divisions 2J3KL by the Canadian research vessels Teleost (20-23) and Wilfred Templeman (176-181) (standardized to 1.8 nm. tows).

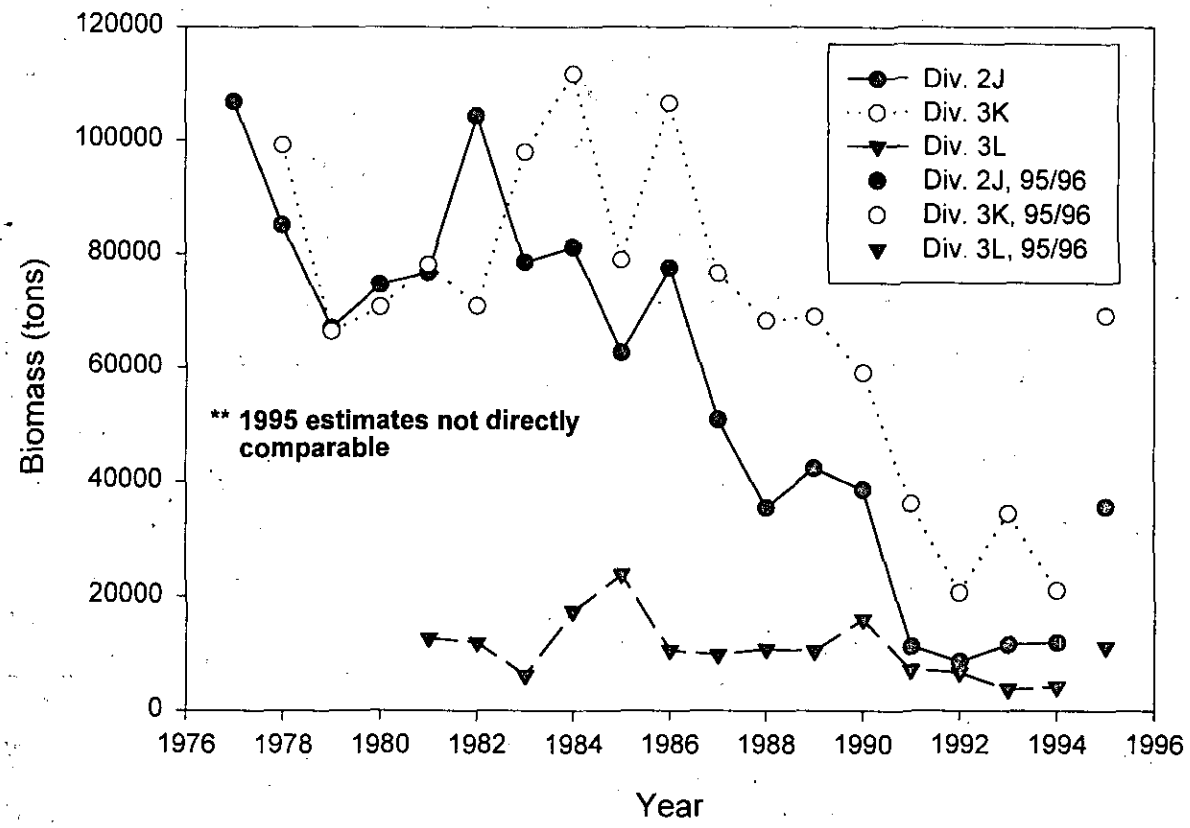

Fig 7. Biomass estimates of Greenland halibut by division since 1977, 1978 and 1981in Divisions 2J, 3K and 3L respectively from fall Canadian surveys. The 1995/96 estimate is not directly comparable to previous years due to a change in vessels and survey trawls.

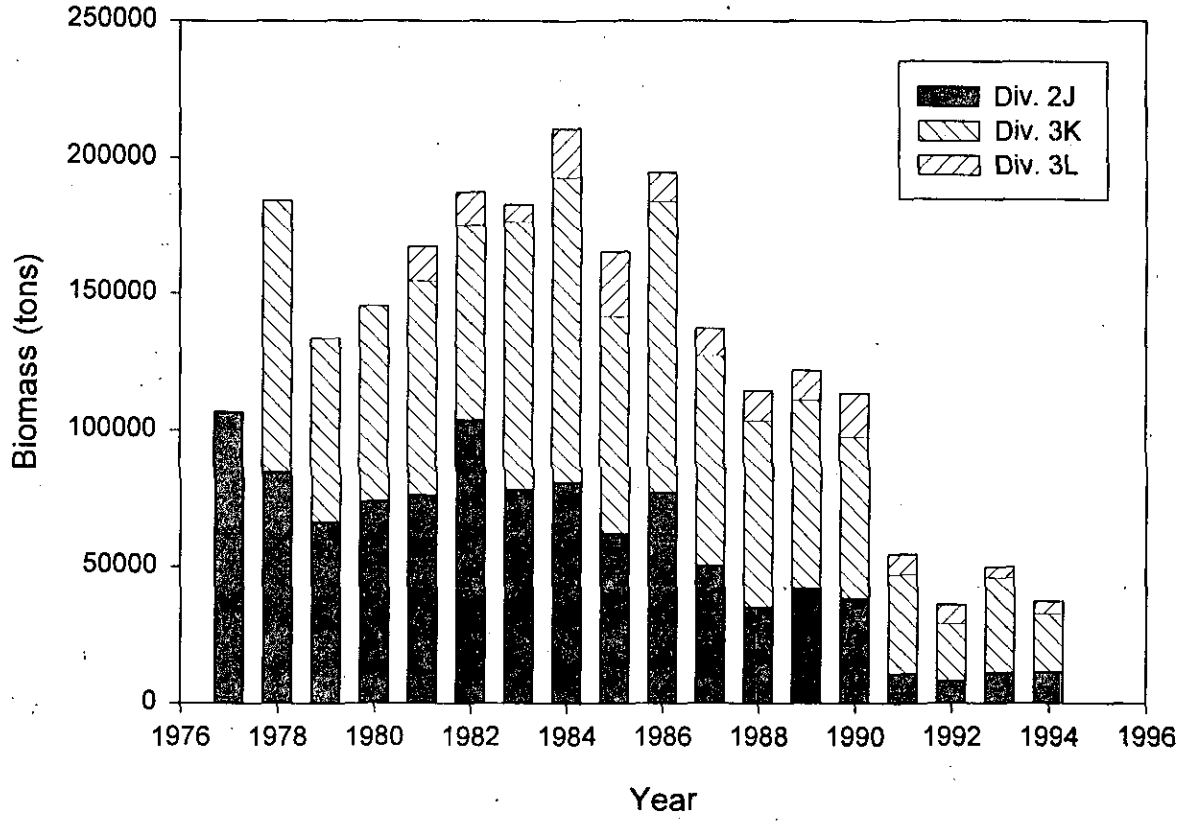

Fig 8. Cumulative biomass estimates of Greenland halibut since 1977, 1978 and 1981in Divisions 2J, 3K and 3L respectively from fall Canadian surveys. The 1995/96 estimate is not directly comparable to previous years due to a change in vessels and survey trawls and is not included.

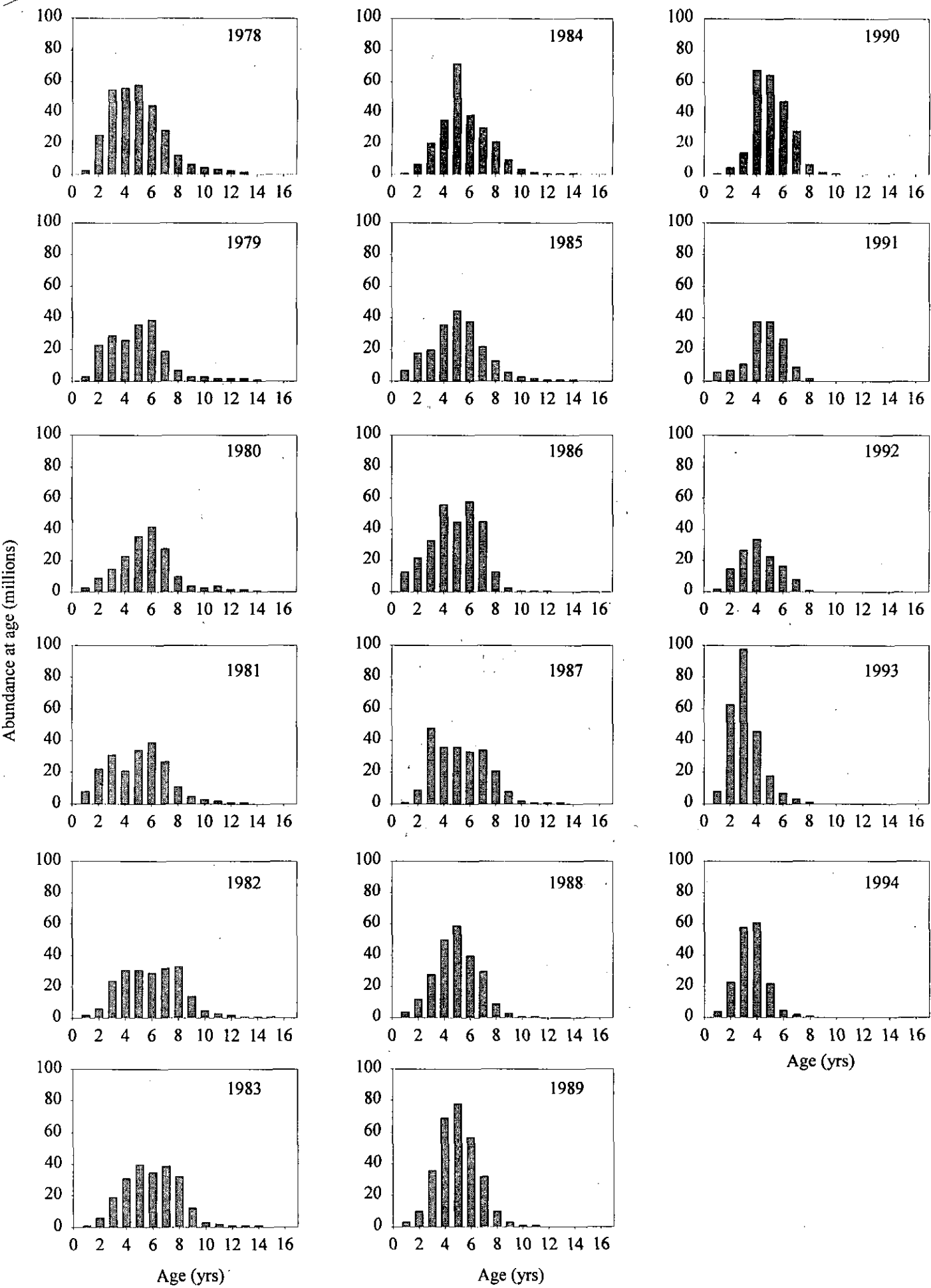

Fig 9. Abundance estimates of Greenland halibut in Div. 2J and 3KL combined from surveys in 1978-94. Estimates **have not been** converted and are shown in Engel trawl catch units.

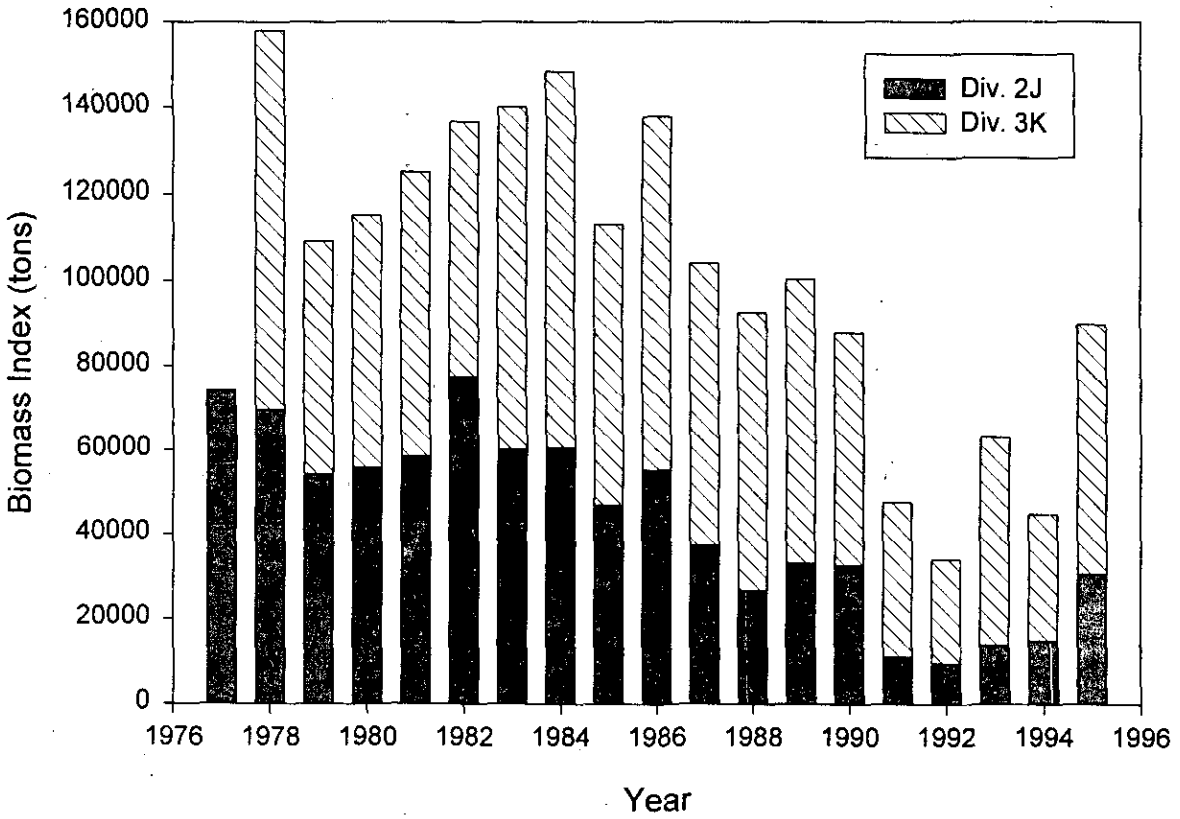

Fig 10. Biomass indices from fall surveys in Div. 2J and 3K combined in Campelen trawl catch equivalents.

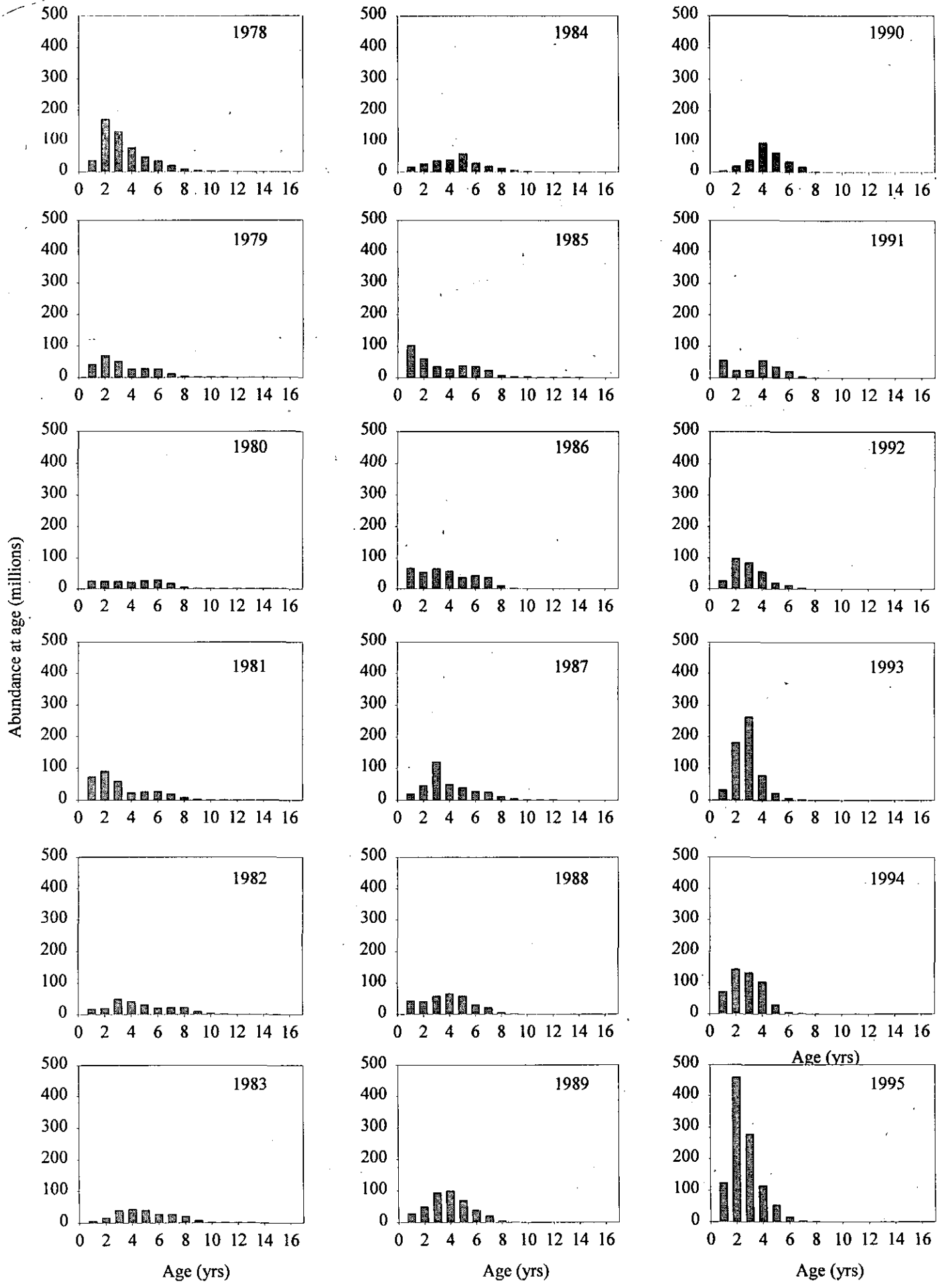

Fig 11. Abundance estimates at age of Greenland halibut in Div. 2J and 3K combined from surveys in 1978-95. Estimates are shown in Campellen trawl catch equivalents.

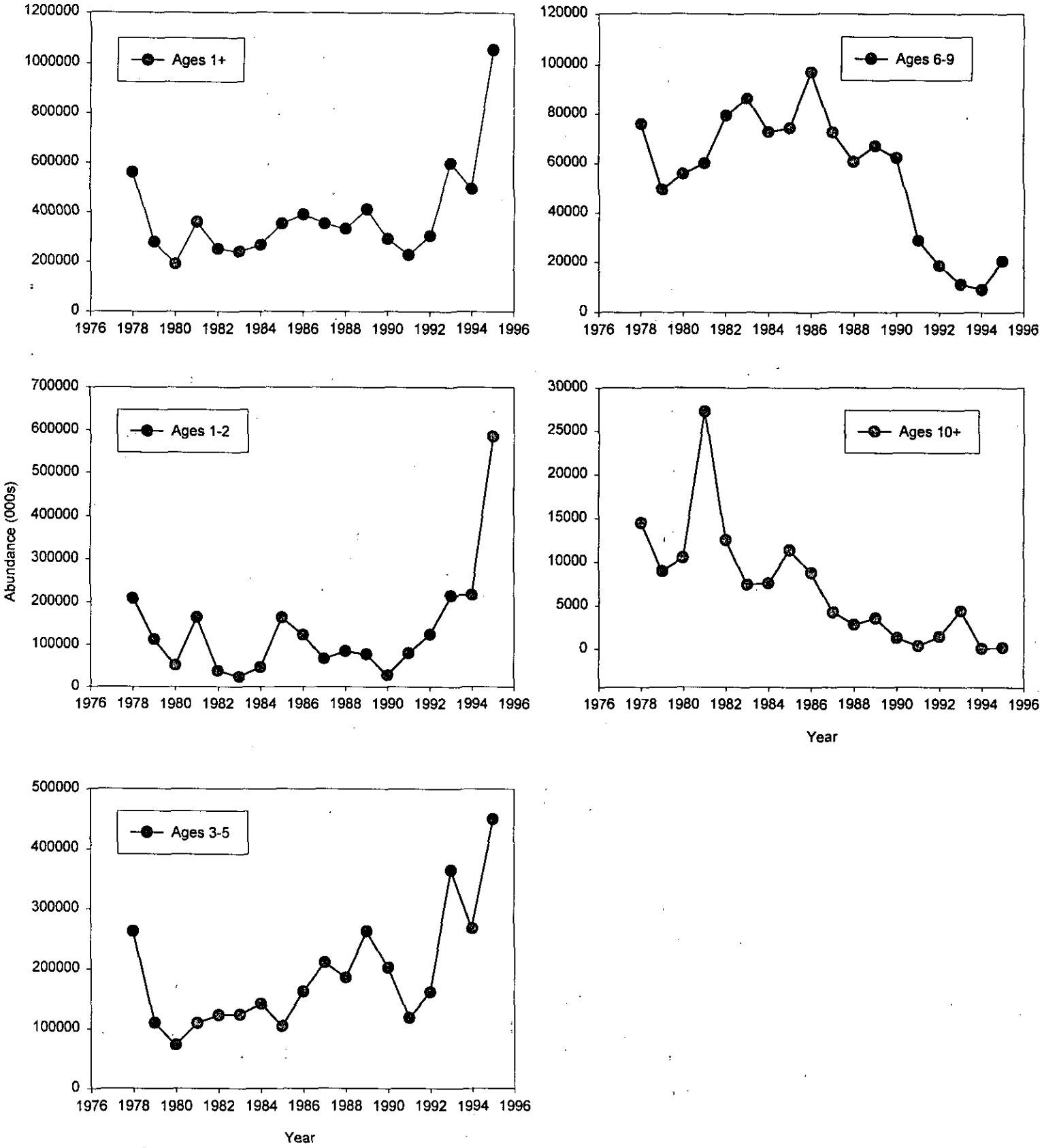

Fig 12. Abundance estimates for various age groupings of Greenland halibut from surveys in Div. 2J and 3K combined. Estimates are in Campellen trawl catch equivalents.

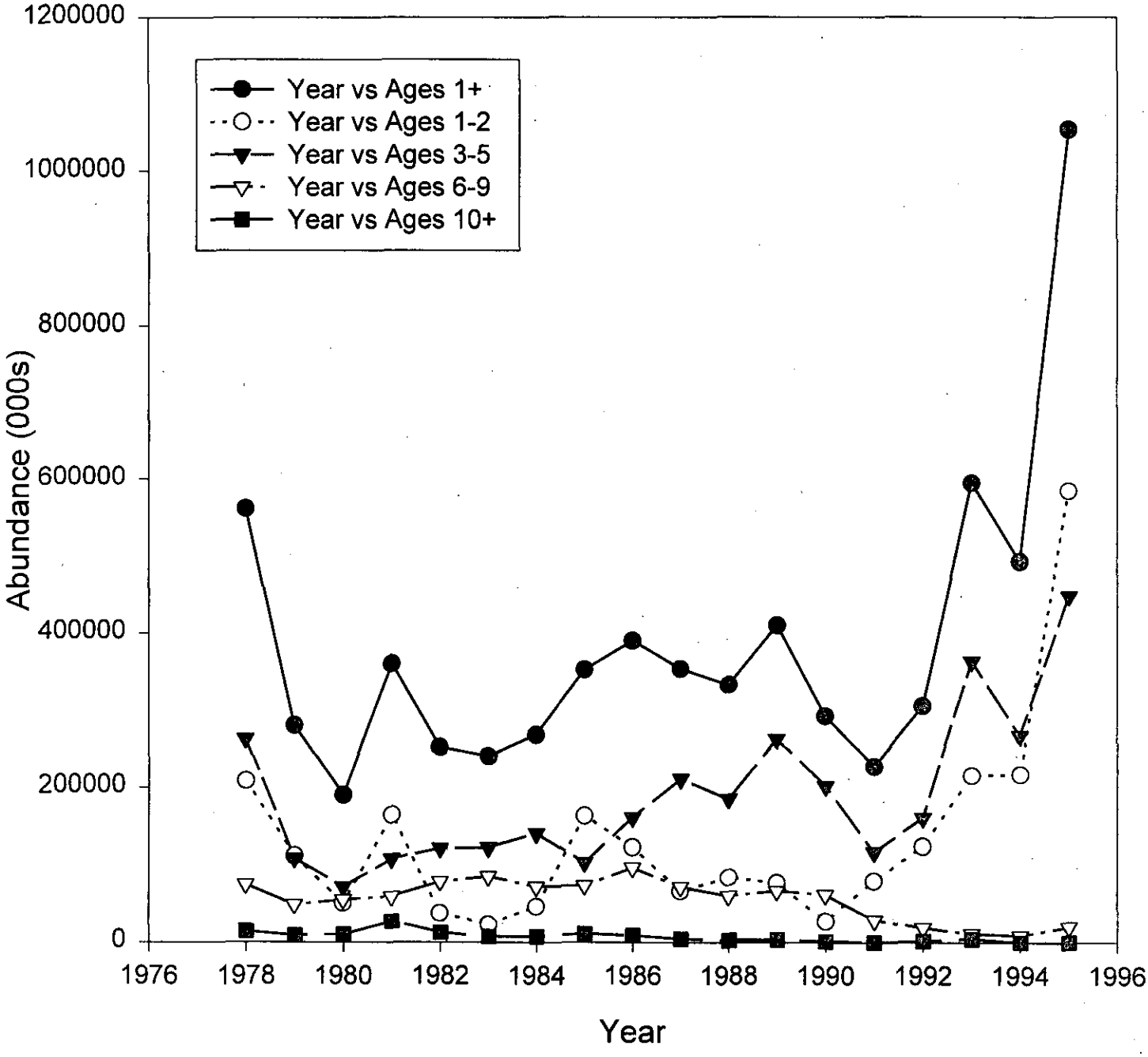

Fig. 13 Abundance indices of Greenland halibut from Canadian research vessel surveys in Div. 2J and 3K combined from 1978-95. Estimates have been converted to Campelen trawl catch equivalents.

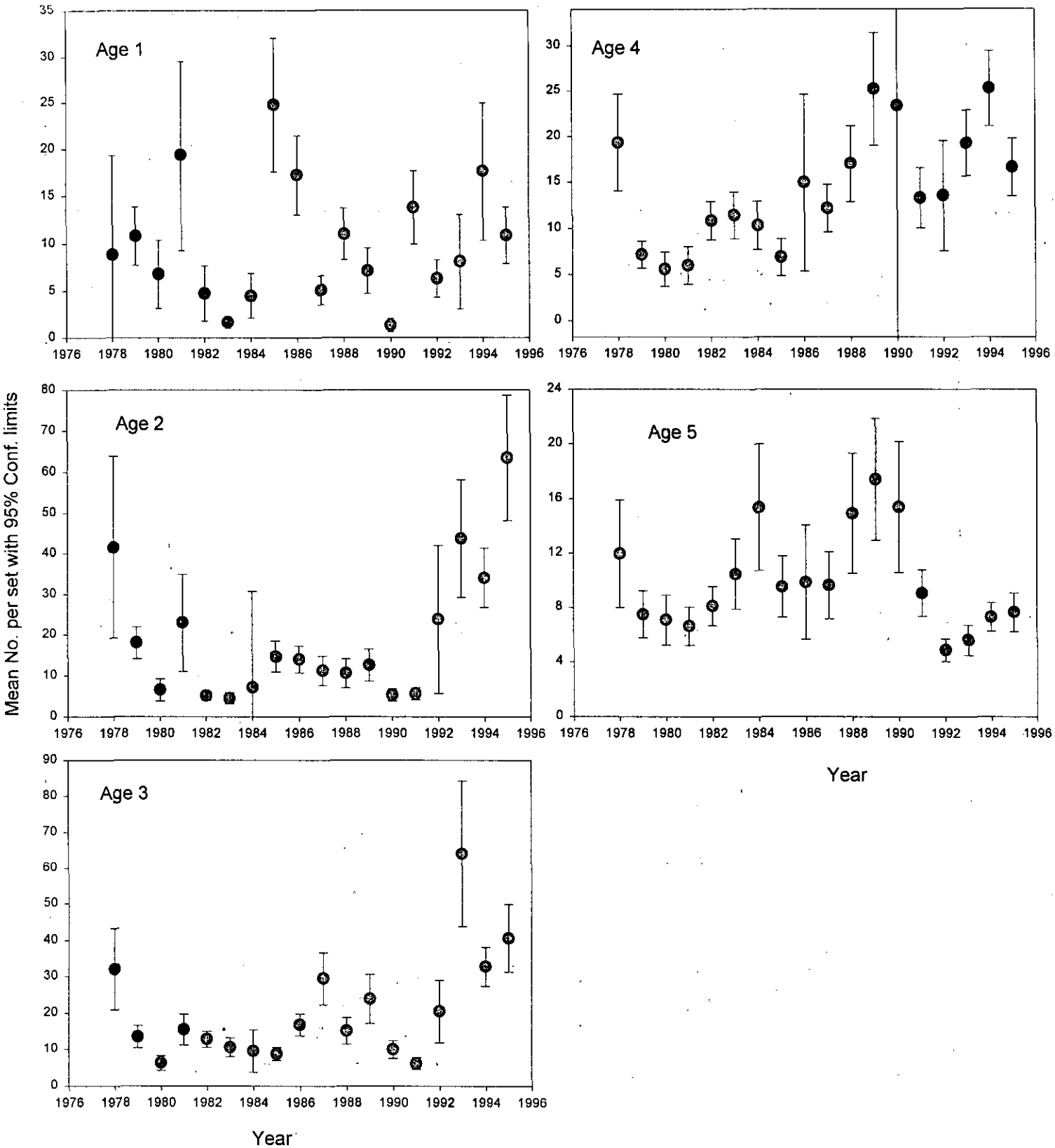

Fig 14. Mean no. per set of Greenland halibut at age with 95% confidence limits from Canadian surveys in Div. 2J and 3K combined. Estimates are in Campellen trawl catch equivalents.

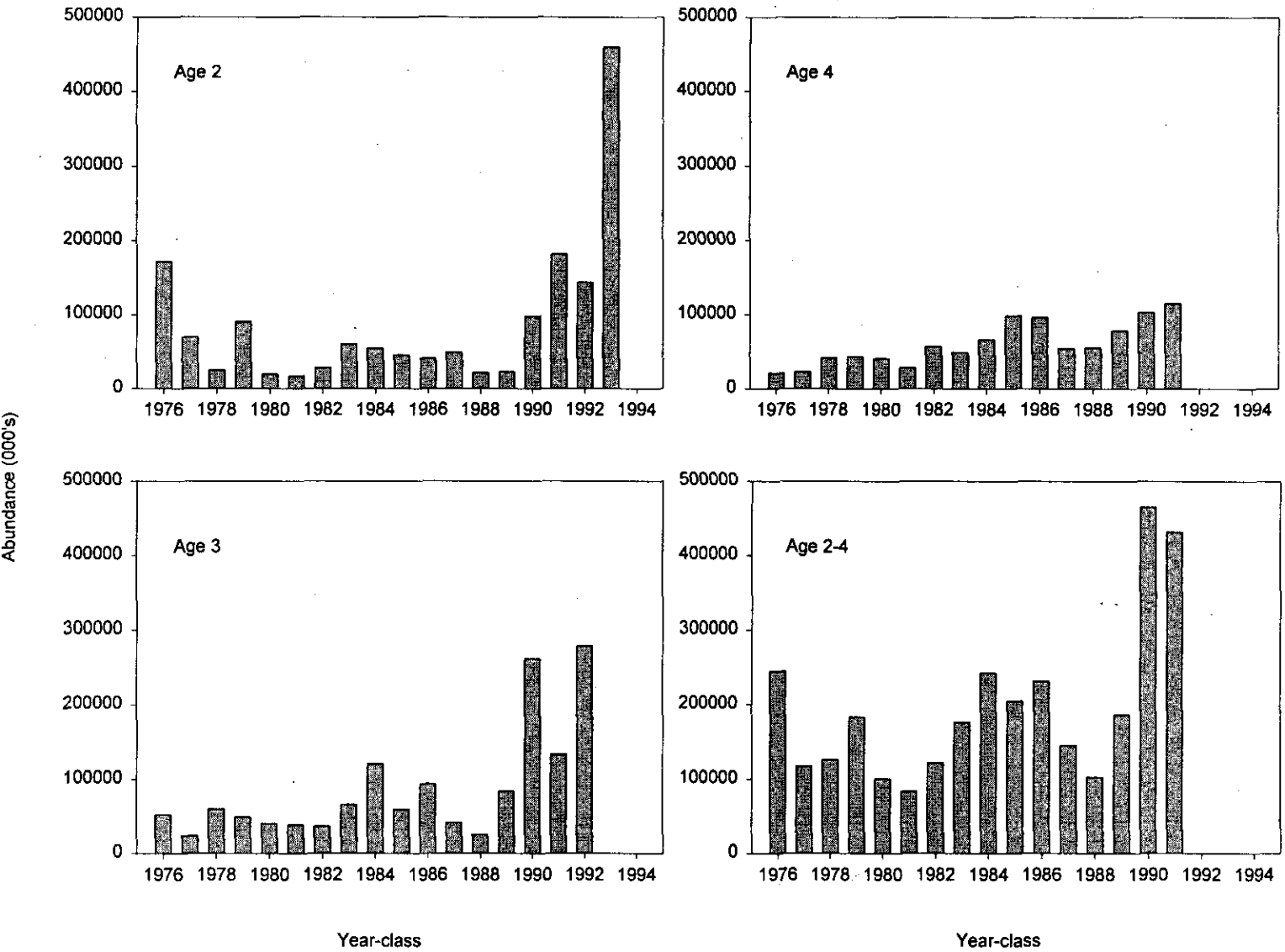

Fig 15. Abundance estimates of pre-recruit year-classes at ages 2, 3, 4 and 2-4 combined from surveys in Div. 2J and 3K during fall 1978-94 and fall-winter of 1995/96. Estimates are presented in Campellen trawl catch equivalents.

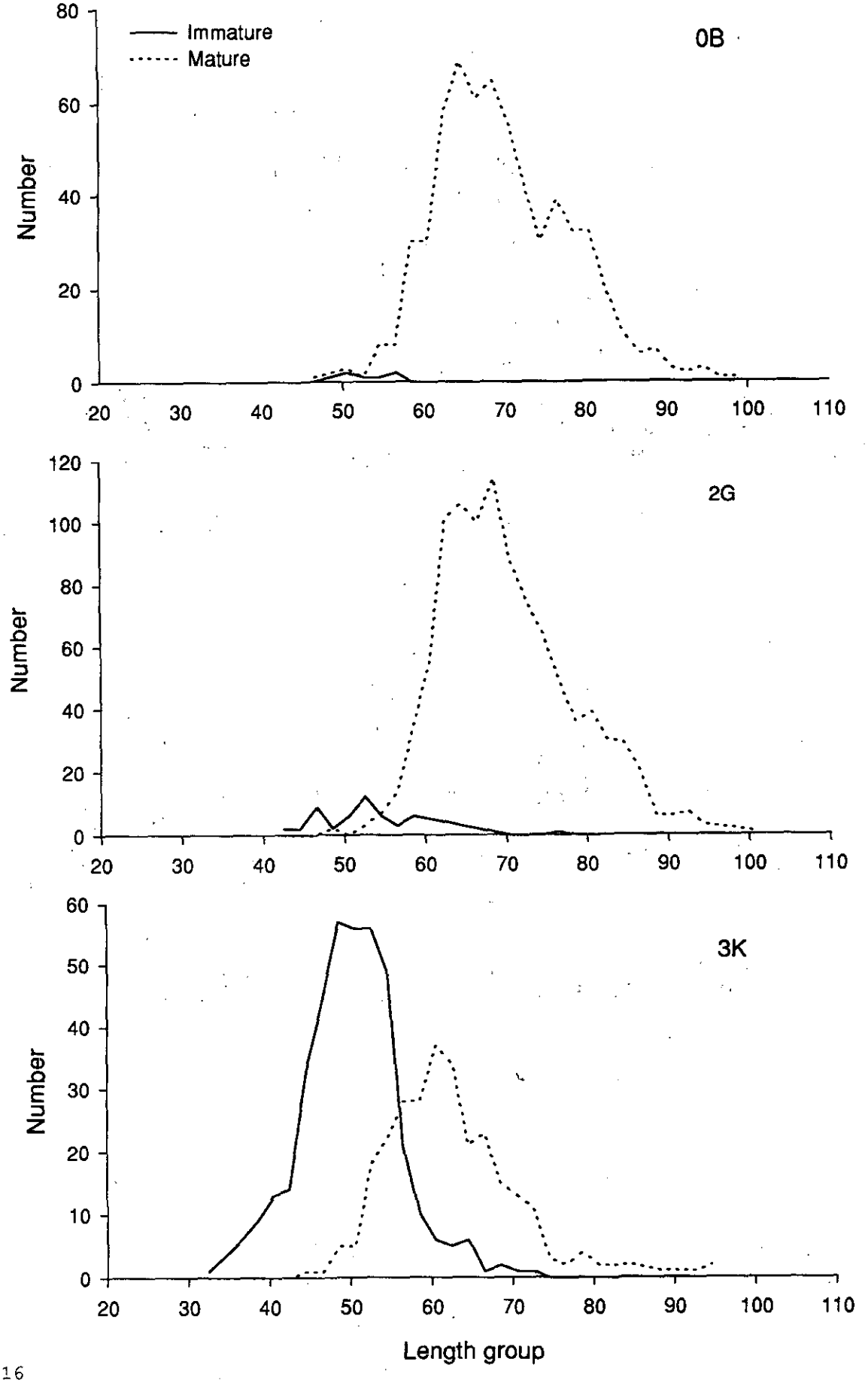

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Figure . Frequency at length of immature and mature Greenland halibut from the commercial fishery in Div. 0B, 2G, and 3K in 1995.

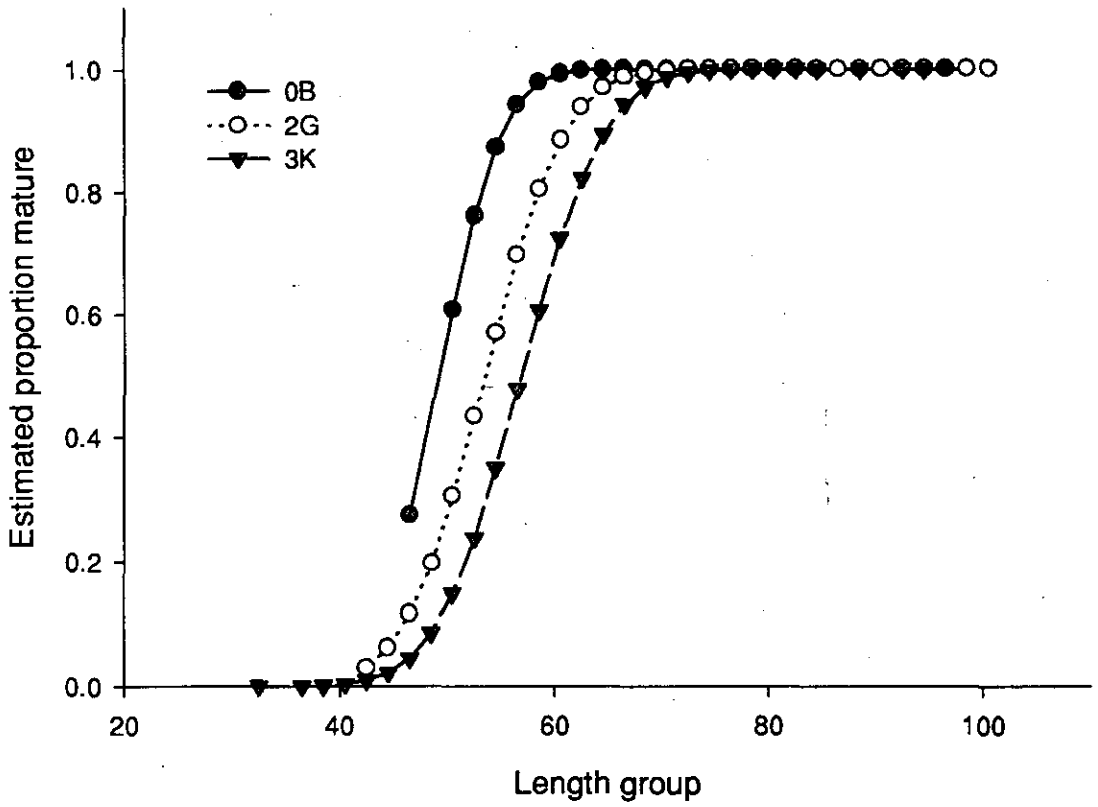

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Figure . Estimated proportion mature at length of female Greenland halibut sampled from the commercial fishery in Div. 0B, 2G and 3K.

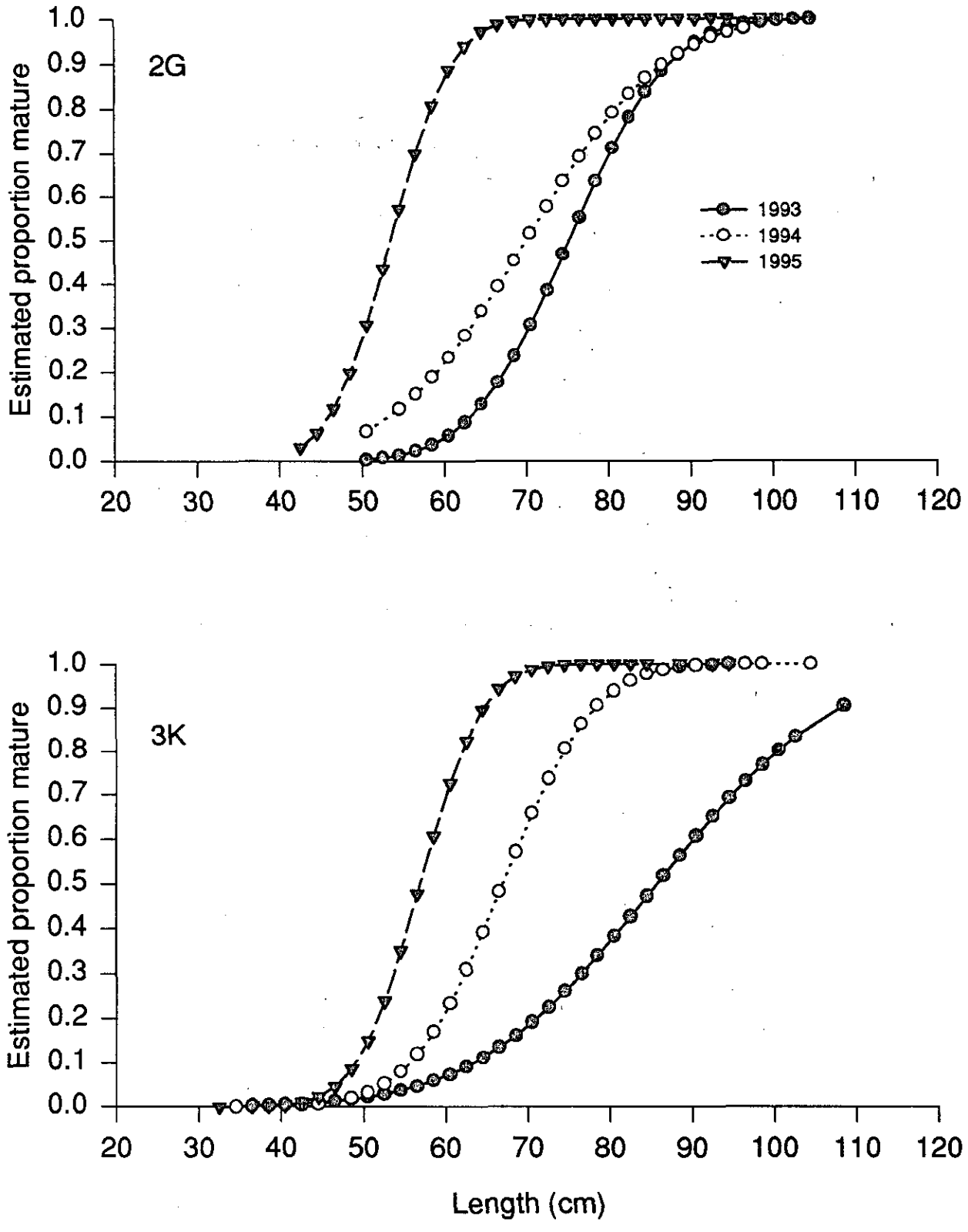

Figure 18. Estimated proportion mature for female Greenland halibut sampled from the Canadian deep water gillnet fishery at the continental slope in NAFO Div. 2G and 3K in 1993,1994 and 1995.