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Northwest Atlantic



Fisheries Organization

Serial No. N3038

NAFO SCR Doc. 98/47

SCIENTIFIC COUNCIL MEETING - JUNE 1998

An Assessment of Greenland Halibut in NAFO Subarea 2 and Divisions 3KLMNO

by

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Catch History and TACs

The fishery for Greenland halibut in this management area began in the early 1960s, using synthetic gillnets in the deepwater bays of eastern Newfoundland, particularly Trinity Bay. As catches declined here, the effort moved progressively northward in the other bays along the east and northeast coast of Newfoundland. Subsequently, vessels moved further 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. With the exception of 1987, catches in the late 1980's were around 18,000 to 20,000 tons (Table 1A; Fig. 1).

In 1990, an intense fishery for Greenland halibut developed in the NAFO Regulatory Area (NRA) of Div 3L and 3M, in the deepwater areas known as Sackville Spur and Flemish Pass. The development of this fishery resulted in a rapid escalation of catches to about 47,000 tons in 1990. Catches in the NRA in 1991 to 1993 were estimated to be around 55,000 tons in each year although some estimates were nearer 75,000 tons in at least one of these years. Overall, catches from the stock during 1991 to 1993 were estimated to be between 62,000 and 65,000 tons annually. Best estimates of catch suggested a decline to about 51,000 tons in 1994, although some estimates ranged as high as 56,000 tons. As a result of management measures introduced by the NAFO Fisheries Commission in 1995 (extensive quota restrictions and 100% observer coverage in the NRA), catches were greatly reduced. In 1995, the catch was estimated to be about 15,000 tons, increasing to almost 19,000 in 1996, and to about 20,000 tons in 1997. Catches from the stock in 1995-97 represent a reduction of about two-thirds compared to the average annual catch of the previous 5 years (Table 1B).

The major participants in this fishery in the NRA 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 was estimated to have been caught by EU (Spain) alone. Prior to 1990, Canada, USSR, GDR, and Poland were usually the main participants in the fishery, although Portugal and Japan became increasingly involved in the fishery after 1984 (Table 2). Canadian catches have been taken mostly by gillnet, although a significant proportion is taken by otter trawlers. With the exception of 1987, catches declined steadily inside the Canadian zone since the late 1970's from a high of over 30,000 tons to less than 3,000 tons in 1994 and 1995. This declining trend was mainly a result of low catch rates and reduced effort, as multi-licensed vessels fished other species such as snow crab. This fishery improved in 1996 and 1997, and catches increased to around 6,000 tons in each year (Table 3). The majority of Canadian catch in the last 2 years has come from Div. 3K, and the seasonal patterns are similar in both years. The breakdown of catches in 1997, by country and Division, is given in Table 4.

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 in recent years. The Canadian gillnet catches taken during recent years are mainly from a fishery along the deep edge of the continental slope in Subarea 2 and Divisions 3KL, although some fishing still occurs nearshore, mainly with 140 mm gillnets. Some 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. Since then, catches by this fleet have been less than 1600 tons annually. Almost all the Canadian otter trawl catch in 1996-97 occurred in Divs. 2J and 3K.

The TAC for this resource (Subarea 2 and Div. 3KL only), increased from 35,000 tons in 1980 to 55,000 tons in 1981-84, and 100,000 tons in 1986-89 (Table 1B, Fig. 1). These increases in TAC were the result of research vessel survey estimates of stock biomass which indicated high levels of fishable biomass (in excess of 400,000 tons) as well as prospects of several better than average recruiting year-classes. Despite the large TAC's, catches in the 1985 to 1989 period were lower than in the preceding years. 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 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 Subarea 2 and 3 for conservation purposes. In 1994, management of *G. 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 to 1998 inclusive, 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 1997 (6224 t) were used to calculate catch at age and mean weights at age from this component of the fishery. Table 5 shows the difference in age compositions in the gillnet and otter trawl catches in 1997. The gillnet catch contained relatively greater proportions of fish older than age 8, with fish older than 10 being found almost exclusively in this sector. In 1997, similar to the catch in 1996, the gillnet catch at age was bimodal (Table 5), with peaks at ages 7 and 11, reflecting catches by the different mesh sizes used. Otter trawl catches in 1997 consisted mainly of age 6-9 fish, with a peak at age 7. Overall, the catch at age had the same bimodal pattern observed in the gillnet catches, with peaks at ages 7 and 10. Mean weights at age were similar in both years. A sum-of-products discrepancy of -5% relative to the 1997 catch was noted. The French catch of 229 tons from otter trawl in Div. 2J had a very similar age composition compared to the Canadian otter trawl catch (Tables 5B and 5D).

Due to the uncertainty regarding catch information on fisheries in the NRA since 1989, as well as the lack of adequate sampling data for some fleets in some years, catch-at-age for Canadian catches only were available from 1988-97. Catch numbers-at-age and mean weights-at-age for this period are presented in Tables 6 and 7. Prior to 1989, data are available from the entire annual fisheries which took place mainly in the Canadian zone, and have been presented in the last few assessments of this stock (see Bowering et al. 1996). Ages 6-8 dominated the catch in most years up to 1991. Although the Canadian catch was lower in 1992 to 1997 than in previous years, there were relatively higher proportions of older fish (ages 9+) in the catch (Table 6). This is due to the change in the fishing pattern noted above, with recent exploitation of Greenland halibut occurring mainly in depths greater than 1000 m along the continental slope by gillnetters using a 200 mm mesh size, compared to a 130-190 mm mesh size at depths of less than 500 m in the traditional gillnet fishery. Mean weights at age in recent years are similar (Table 7), and no trends are seen in the mean weights over the period 1988-97.

ii) Catch and effort

Catch and effort data from the directed fishery for *G. halibut* during the period 1975 to 1993 were obtained from ICNAF/NAFO Statistical Bulletins and were combined with provisional 1994-1997 NAFO data. The catch/effort data were analysed with a multiplicative model (Gavaris 1980) to derive a standardized catch rate index for hours fished, as has been done in the last few assessments of this stock. 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 62% of the variation in catch rates (Table 8). The standardized catch rate index (Table 9, Fig. 2) shows high between-year variability, especially in the late 1970s to mid 1980s. There was an increasing trend from the mid 1970s that peaked in 1982 and CPUE subsequently declined to the lowest levels observed in the 1990's. The substantial increase from 1996 to 1997 is not statistically significant, given the high variability around the mean CPUE, particularly in 1997 (Fig. 2). In this updated analysis the data suggest, relative to the whole time period, that catch rates were generally higher in winter and higher in Subarea 2, based on the coefficients in Table 8.

Research vessel surveys

From 1977-94 in Div. 2J and 1978-94 in Div. 3K, Canadian surveys were conducted during autumn 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 145 bottom trawl, which differed somewhat from the trawl used on the *Gadus Atlantica*. In 1995-97, the surveys in Div. 2J, 3K and 3L were conducted by the research vessels *Teleost* and *W. Templeman* using a Campelen 1800 shrimp trawl with rockhopper footgear (for details on the trawls used in these surveys, see McCallum and Walsh, 1996). Warren (1996) outlined the conversion factors for *G. halibut* catches, required for comparison of results from 1995 and onward with those prior to 1995. The last assessment of this stock contained several tables and figures outlining these comparisons for *G. halibut* (Brodie et al. 1997).

Table 10 gives an outline of the Canadian survey coverage, by division and depth, for the 1996 and 1997 Canadian surveys in SA 2 + 3KLMNO. Coverage in the deep water of Divs. 3NO has not been as extensive as in other areas in the fall surveys. Also, in 1997, only the strata deeper than 730 m on the west and north sides of Flemish Cap (in the Flemish Pass and Sackville Spur areas of Div. 3M) were surveyed, compared to a complete survey of Div. 3M in 1996. Coverage in other areas was very similar between the 2 years, and was somewhat better in Div. 2G in 1997. The survey coverage was extended into new inshore strata in Divs. 3K and 3L in 1996, and this was repeated in 1997.

i) Geographic distribution

The spatial distribution of Greenland halibut in Divisions 2J and 3KL from standard fall surveys was examined by depicting standardized survey catches as circles and subsequently plotting these circles on a map of the survey area according to the position of each catch (Black 1993). Circle diameters were chosen to represent proportionally increasing size groups of catch weight (kg) established 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.

Data from all fall surveys prior to 1995 (Engel trawl) were presented in Bowering et al. (1996). 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. They were also plentiful along the slope of the continental shelf. This distribution pattern remained fairly consistent to about 1987, but after 1987, a decreasing trend in abundance was clearly apparent, detected first in Div. 2J. This was followed by a similar trend in Div. 3K by 1990. By 1993, catches in Div. 2J and 3K were extremely low and the highest catches in the area were taken in the central part of Div. 3K. In 1995-97 the survey results using the Campelen trawl showed an increasing trend in the area of distribution of larger catches (Fig. 3a, 3b). Throughout the survey period, there were very few large catches experienced in Div. 3L 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. Some catches of *G. halibut* were also recorded along the deepwater slopes of the Grand Bank in Div. 3NO, although survey coverage in these areas was not as extensive, as noted previously.

To look for differences in distribution of *G. halibut* by size, data from the 1997 survey were split into length categories above and below 35 cm. The smaller fish tend to be distributed more in the channels between the fishing banks, and less toward the continental shelf (Fig. 4a). The larger fish overlapped the distribution of smaller fish throughout the survey area, but were also found in deepwater areas along the slope where the younger fish were often absent (Fig. 4b). This depth stratification is well known for this species. There were no large catches of fish of either size group found in the inshore strata.

ii) Biomass and abundance indices (converted from Engel to Campelen equivalents prior to 1995, and Campelen surveys in 1995 - 1997)

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 (McCallum and Walsh 1996) were evaluated in 1996. The length-based conversion equation 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, for fish greater than 53 cm in length, the catch conversion was set equal to the conversion at 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 surveys from 1995 onwards (Bowering et al. 1996). The conversion for the Engels trawl used in the 3L surveys has not yet been evaluated.

Tables 11-15 give detailed results of the 1997 survey for Divs. 2GHJ and 3KLM. In Divs. 2GH, biomass levels in 1997 were similar to 1996 (Tables 11a, b). In Div. 2J, strata 208 and 212 accounted for about 28% of the biomass, and 32% of the abundance (Table 12), resulting in wide confidence limits around the mean values (Table 19). Similar percentages were found for the two strata with most fish in Div. 3K (Table 13), although the confidence limits around the mean values were much tighter than in Div. 2J (Table 19). In Div. 3L, biomass and abundance tended to be more evenly distributed, with no single stratum containing more than 8% of the total biomass in 1997 (Table 14). About 35% of the biomass in Div. 3L was found in strata deeper than about 1100 meters (Table 18). In Div. 3M, catches tended to be somewhat lower than in strata of the same depth in adjacent areas of Div. 3L (Table 15).

Biomass has increased from 1995 to 1996, and again to 1997 in all 3 Divisions (2J3KL), as seen in Tables 16-18, although the 1995 estimate is biased downward by the omission of many deep strata throughout the area. As well, the confidence limits around the biomass estimates in 2J and 3L in 1997 are very wide (Table 19). Overall, the trawlable biomass estimate for Divs. 2J3KL was 261 thousand tons in 1997, and 331 thousand tons in the surveyed areas of SA 2 + Div. 3KLMNO (Tables 19 and 20).

To allow comparison of the biomass estimates in Div. 2J and 3K from the two time periods (pre-1995 and 1995-97), the converted abundance at length was transformed to biomass at length using a length-weight relationship. The converted biomass from 1978-94, and the length-weight converted Campelen values for 1995-1997, are shown in Fig. 5. As was noted in the last assessment of this stock, the length-weight converted biomass estimates in 1996 and 1997 are about 10% lower than the actual biomass derived from catch weights, suggesting a problem with the length-weight equation used in the calculation. However, if it can be assumed that this affects all biomass estimates equally, then the trends can still be evaluated. After a steady decline from the mid-1980's to 1992, the biomass has since increased, with the values in 1996 and 1997 being equal to the level seen in the late 1980's (Fig. 5).

A closer look at the trends in the biomass of fish above and below 35 cm. continues to reveal some interesting patterns (Fig. 5). In the years prior to 1988, the trawlable biomass estimates in Divs. 2J and 3K were comprised mainly of fish larger than 35 cm. As the stock size declined in these areas, the biomass became dominated by smaller fish (the actual change-over occurred from 1991 to 1992). It is thought that much of the biomass of older fish in these areas probably migrated to the deepwater areas of the NRA in Divs. 3LMN, resulting in the sharp increases in catch in the early 1990's. While the biomass of the larger fish has remained fairly low throughout the 1990's, increasing somewhat in 1996-97, the biomass of G. halibut smaller than 35 cm. has increased sharply, to levels in 1996-97 which are substantially higher than the values seen prior to 1993. Although these comparisons must be done with the Engels - Campelen conversion in mind, it should be noted that the 1993 and 1994 unconverted values for biomass less than 35 cm. are also higher than the earlier values, ie. the increased recruitment was apparent before the switch in trawl gears occurred.

Fig. 6 shows the split, by Division, of trawlable biomass from the 1997 Canadian survey (based on the length-weight calculations). Similar to 1996, about 65% of the biomass was found in Divs. 2J3K, with no more than 15% being found in any other Division. In making this comparison, it must be noted again that deepwater coverage was not complete in all areas, mainly Divs. 3N, and 3O. Nonetheless, it is a reasonably comparable biomass estimate with that from the 1996 survey, in that both cover the majority of the stock area down to 1500 meters. Fig. 6 also indicates the components of the biomass above and below 35 cm, by Division. Larger fish made up more than 50% of the biomass in Divs. 2G, and 3L, but were a much smaller percentage in Divs. 2J and 3K, as was the case in 1996. Interestingly, the

larger-fish biomass in Div. 3L was almost as large as that of Div. 3K, despite the substantial difference in overall biomass between the 2 divisions.

The age compositions from the 1996 and 1997 surveys, by Division, are shown Table 21. In both years, the 1995 year class is dominant, followed by the 1994. The majority of these cohorts were located in Divs. 2J and 3K in both 1996 and 1997. Fish older than 10 comprised only a small fraction of the total abundance in both years. A disproportionate share of the fish older than age 8 were found in Div. 3L in 1996 and 1997. Overall, there was a decrease of about 12% in total abundance, explained by the difference in size of the 1995 and 1996 yearclasses at age 1. Apart from the 1996 cohort, the only yearclass to show an increase in abundance between the 2 surveys was the 1992, which was estimated to be about 4% higher in 1997.

To allow comparisons over the longest possible period (1978-97), data from Divs. 2J and 3K combined are used as an index of abundance. The unconverted (Engel trawl) age compositions are contained in Table 22, and include data from Div. 3L. The age compositions show clearly the dominance of younger ages in the abundance indices in the 1990's, as described earlier. The converted data (2J3K only) are shown in Table 23. The data for 1995 at ages less than 6 have been corrected in this table to account for the re-ageing described in the 1997 assessment.

The converted abundance indices for various age groupings are presented in Fig. 7. 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, although there was a drop in 1990-91 (Fig. 7). This figure also shows that the high points were in 1993, 1996, and 1997. On the other hand, the cohorts at ages 6-9 declined rapidly in the late 1980's and early 1990's, and ages 10+ declined since the early 1980's. Both these series have stabilized at very low levels in the mid 1990's, with a slight increase in the age 6-9 group in 1996 and 1997. These observations are consistent with previous conclusions that Greenland halibut migrate from the survey area in Div. 2J3K when they reach about age 5, particularly since about 1990. The reason for the increase in recruitment is not known, as it is generally believed that the stock had declined to lower levels in the 1990's, which is when the increase in young fish was indicated by the survey. Little can be said about SSB for this stock, as it is clear that few fish of spawning age, say 9+, are found in the surveys in many recent years. Thus it is not possible to determine a stock-recruit relationship for this stock.

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

Although the converted data allow comparisons of year-class strengths throughout the time series, it should be noted that there is considerable uncertainty about the conversion factors at each end of the size range. Thus a cautious approach is warranted when comparing numbers at the youngest ages. Nonetheless, it is clear that the recent data show an increase in recruitment, and a decrease in the number of older fish in the survey area (2J3K). The 1995 year class was clearly a strong one, as it was in West Greenland also. In the 3 Campelen surveys (1995-97), this year class was the highest in the series of age 0, 1, and 2 (comparing across the 3 years).

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 particularly the 1991 year-classes appeared to be at least better than average in Divs. 2J3K, but only at younger ages (Table 23). Early indications also suggested that the 1992 and 1993 year-classes were above average, but the values for the 1992 year-class in the 1996 and 1997 surveys were average at best. The observations on the declining strength of the 1990-92 year-classes over time support the hypothesis that G.halibut migrate out of the area as they grow older.

More confidence in the size of these recent year-classes should be developed over the next couple of years' surveys. G.halibut generally recruit to otter trawl fisheries around age 5, and usually dominate catches in this fishery at ages 6-9. If the year-classes of the early 1990's were indeed above average, then the increased catch rates in 1997 may be due to their abundance. However, CPUE in most fisheries in 1997 was still below long term average values (eg. Fig. 2).

iv) Some observations on mortality and reference points

Fig. 8 compares the total mortality estimates (Z -values) from 2J3K survey data at ages 7+/6+ against the trends in catch from the entire stock area (SA 2 + Div. 3KLMNO). The sharp increase in Z in Divs. 2J3K in the early 1990's mirrors the increase in catch from the stock area, most of which came from the NRA in Divs. 3LMN. Z -values decreased substantially after 1995, following reductions in the catch from the stock. Again, how much of the Z -value is

actually migration out of the 2J3K area (and likely into the NRA) is impossible to say. Nonetheless, Z-values for this part of the population were above 1.0 in each year from 1990 to 1995, which is substantially higher than the values calculated for the 1980's. Values calculated from the 1995-97 surveys are similar at around 0.3 to 0.6 to those observed in the mid 1980's, when catches were in the range of 18,000 to 28,000 tons.

For another analysis, a yield per recruit curve was taken from the 1987 assessment of this stock, based on mean weights at age and PR values averaged over the early 1980's. The PR vector is dome-shaped, with full recruitment at ages 8 and 9. F_{0.1} is 0.29, indicating an exploitation rate of about 23%, assuming m=0.2. Applying this to the trawlable biomass >35 cm in SA 2+3 in 1996 and 1997, as was done in the 1997 assessment, suggests a catch at F_{0.1} of around 23,000 to 27,000 tons, which is higher than recent catches, and approximates the current TAC of 27,000 tons.

An analysis by de Cardenas et al. (1998) showed that the stock size could increase substantially in 1998-99 if current levels of exploitation are maintained. This analysis was based on survival rates at age between the 1996 and 1997 surveys in Div. 2J3K, and employed a bootstrapping technique.

vi) Conclusions on stock status

The fishable biomass in this stock is still at a relatively low level, but appears to be increasing as a result of improved recruitment. Most indices of abundance showed some improvement in 1996 and again in 1997. Given the reduction in catches in 1995-97 (and anticipated in 1998), combined with higher recruitment estimates, this stock should continue to show signs of recovery over the next few years. A catch of 30,000 tons in 1999 should not be detrimental to the continued recovery of the stock.

REFERENCES

- Black, G.A. 1993. ACON data visualization software : user manual - version 7.14. Unpublished manuscript. 179 p. (G. Black, Dept. of Fisheries and Oceans, P.O.Box 550, Halifax, N.S., Canada B3J 2S7).
- Bowering, W.R., W.B.Brodie, M.J.Morgan, D.Power, and D.Orr. 1996. The status of the Greenland halibut resource in the management area of NAFO Subarea 2 and Divisions 3KLMNO. NAFO SCR Doc. 96/73, Ser. No. N2748.
- Brodie, W.B., W.R.Bowering, D.Power, and D.Orr. 1997. An assessment of the Greenland halibut in NAFO Subarea 2 and Divisions 3KLMNO. NAFO SCR Doc. 97/52, Ser. No. N2886.
- de Cardenas, E., L.Motos, and S.Junquera. 1998. Expected trends on the 2J3KLMNO Greenland halibut in *status quo* conditions. NAFO SCR Doc. 98/63, Ser. No. N3055.
- Gavaris, S. 1980. Use of a multiplicative model to estimate catch rate and effort from commercial data. Can. J. Fish. Aquat. Sci. 37:2272-2275.
- McCallum, B.R. and S.J. Walsh. 1996. Groundfish survey trawls used at the Northwest Atlantic Fisheries Centre, 1971 to present. NAFO SCR Doc. 96/50, Ser. No. N2726.
- Warren, W.G. 1996. Report on the comparative fishing trial between the *Gadus Atlantica* and *Teleost*. NAFO SCR Doc. 96/28, Serial No. N2701.

Table 1A. Catches of Greenland halibut in the Northwest Atlantic by Division, 1977-97.

Year	Div. 2G	Div. 2H	Div. 2J	Div. 3K	Div. 3L	2+3KL	Footnote c	Div. 3M	Div. 3N	Div. 3O	Total reported	Total estimated b
1977	1778	1524	8237	13446	6956	31941			42	3	62	32048
1978	1899	1207	3723	24107	7596	38532		528	6	4	39070	
1979	577	1623	3415	19843	8610	34068	34069	12	18	6	34104	
1980	36	444	1466	17923	12773	32642		141	75	9	32867	
1981	1799	2141	1358	16472	8912	30682		3	49	20	30754	
1982	370	8984	5931	6794	4135	26214		2	56	6	26278	
1983	111	5671	6028	11374	4655	27839		7	12	3	27861	
1984	214	4663	6368	8432	5132	24809		43	12	9	24873	26711
1985	193	2358	6724	5775	3560	18610		184	35	1	18830	20347
1986	456	1564	6823	4237	2799	15878		49	8	4	15939	17976
1987	2700	2631	12464	6860	6283	30938		307	173	0	31418	32442
1988	2068	2463	1971	6389	6195	19086		48	75	6	19215	19215
1989	837	1821	2952	7840	6046	19496	20092	491	38	9	20034	
1990	2809	1225	2845	4579	10779	22237		3040	1287	17	26581	47454
1991	3715	2252	3045	2229	15627	26868	26780	3426	4192	37	34523	65008
1992	1373	235	476	3883	29193	35160		14902	7132	425	57619	63193
1993	963	405	214	2398	25092	29072		8282	14693	644	52691	62455
1994 ^a	1045	210	203	1032	18257	20747		12741	14138	3403	51029	51029
1995 ^a	1109	412	375	641	5843	8380		3454	2948	490	15272	15272
1996 ^a	598	621	1063	2544	4487	9313		783	934	367	11397	18840
1997 ^a	365	619	1734	2658	9227	14603		1965	2958	332	19858	19858

1977-93 from NAFO Statistical Bulletins.
1994-97 are best estimates of NAFO Scientific Council.

a provisional

b In some years, estimates range above and below reported catch. Estimates from SCR 97/52.

c Slight discrepancies between totals by country in the 1960-90 summary Bulletin and the totals by Div. in the annual Bulletins.

Table 1B. Catches and TAC's of Greenland halibut in SA 2 + Div. 3KLMNO, 1960-98.
Includes estimated catches for years 1984 and later.
TAC's from 1995 onward set by NAFO Fisheries Commission.

Year	Catch(2+3KL)	2+3KLMNO	TAC
60	938	995	
61	741	786	
62	588	624	
63	1602	1621	
64	3928	4252	
65	9501	10069	
66	19244	19276	
67	25644	26525	
68	31986	32392	
69	36520	37241	
70	36402	36839	
71	24654	24834	
72	29822	30038	
73	28944	29291	
74	27123	27588	40000
75	28681	28814	40000
76	24599	24611	30000
77	31941	32048	30000
78	38532	39070	30000
79	34069	34104	30000
80	32642	32867	35000
81	30682	30754	55000
82	26214	26278	55000
83	27839	27861	55000
84	24809	26711	55000
85	18610	20347	75000
86	15878	17976	100000
87	30938	32442	100000
88	19086	19215	100000
89	19496	20034	100000
90	22237	47454	50000
91	26868	65008	50000
92	35160	63193	50000
93	29070	62455	50000
94		51029	25000
95		15272	27000
96		18840	27000
97		19858	27000
98			27000

Table 2. Greenland halibut landings (tons) by year and country for Subarea 2 and Divisions 3KL only, from 1960-93.
Does not include catches from Div. 3MNO. Data from 1960-90 from Stat Bull summary 1960-90 (1995), 1991-93 from annual Stat Bull.

Country	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Canada	660	741	586	776	1257	8092	16209	16604	13322	11553	10706	9408	8352	6840	5745	7807	9306	17967
FRG	278	-	10	35	-	355	-	42	4	202	13	-	86	707	515	622	927	755
Poland	-	-	691	1834	939	1114	-	3296	5806	5406	8266	5234	6386	9060	7105	8447	5942	5988
Iceland	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-
Norway	-	-	-	-	1	-	-	-	36	647	-	1389	501	117	-	-	-	-
USSR(Russia)	-	-	125	302	479	242	4287	8732	9268	7384	9094	10183	8652	9650	9439	6799	4308	-
Romania	-	-	-	-	-	-	-	40	228	7	120	80	-	-	-	-	-	-
GDR	-	-	-	-	-	1324	1415	4122	10014	9158	909	402	1681	2701	2025	1512	1953	-
Denmark-F	-	-	-	-	-	-	-	-	-	-	970	950	4	-	-	1	350	-
Spain	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	1	-	-
UK	-	-	2	-	-	-	-	-	-	-	731	201	1112	62	-	-	476	-
Denmark-G	-	-	-	-	-	-	-	-	-	-	-	-	65	2	-	-	-	-
Portugal	-	-	-	-	-	-	-	-	-	-	-	-	207	161	231	73	119	-
France(M)	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-
France(SPM)	-	-	-	-	-	-	-	-	-	-	-	-	-	6	48	32	-	-
Japan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	938	741	588	1602	3928	9501	19244	25644	31986	36520	36402	24654	29822	28944	27123	28681	24599	31941

Country	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Canada	27692	29940	31774	24125	19248	19031	17283	12277	8213	13450	8451	11976	9121	6418	6967	4452
FRG/Deu	1022	15	55	-	57	2	9	482	15	1	43	5	-	8	45	-
Poland	5215	1813	203	1806	1111	5258	943	460	177	1001	904	360	-	-	-	-
Iceland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	3	8	1	-	-	15	18	1	-	-	-	8	933	1531	-	-
USSR(Russia)	5632	1961	238	3325	1471	937	440	149	770	6716	1063	1053	1313	2753	22	-
Romania	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GDR	1636	178	316	1350	2487	2587	2498	1850	1868	3268	2246	1727	12	-	-	-
Denmark-F	268	-	-	-	-	-	-	193	451	2877	740	703	508	608	255	14
Spain	-	4	-	-	-	-	-	-	-	107	15	13	492	4787	23264	22682
UK	53	110	22	-	1	-	3	-	-	-	-	-	-	4	9	-
Denmark-G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Portugal	-	38	21	16	1818	-	2612	2940	3107	1390	4118	3188	8250	8768	2129	346
France(M)	-	-	-	-	-	-	-	-	-	-	-	596	-	-	-	-
France(SPM)	5	1	-	-	7	-	-	-	-	-	-	-	-	-	-	-
Japan	3	-	12	60	14	-	1003	258	1277	2128	1506	478	1608	1903	2469	1576
Other	-	1	-	-	-	9	-	-	-	-	-	-	-	-	2	-
Total	38532	34069	32542	30632	26214	27839	24809	18610	15878	30938	19086	20092	22237	26780	35160	29072

Table 3. Canadian catches of G.halibut in SA 2+3 in 1997.

	Gillnet+Longline						Otter Trawl				Total
	2G	2H	2J	3K	3L	3O	2J	3K	3L	3O	
Jan											
Feb						1					1
Mar					18						18
Apr					51						51
May			263	160	17		55				495
Jun	71	16	187	537	237	29	105	211	1		1394
Jul	40	172	518	625	169	40		185			1749
Aug	173	240	388	238	126	16	1	101	1		1284
Sep	61	88	163	102	130	1	2	192	1		740
Oct	20	60	43	86	109	2	8	109			437
Nov		11		2	1	5		33	2	1	55
Dec											
Total	365	587	1299	1853	932	180	171	831	2	4	6224

1997	Div. Totals						Gear Totals		
	2G	2H	2J	3K	3L	3O	GN	OT	LL
	365	587	1470	2684	934	184	5156	1008	60

Total = 6266 reported in WP 98/27

Table 4. Catches of G.halibut in SA 2+3 in 1997 by country and Division (from WP 98/27)

	2G	2H	2J	3K	3L	3M	3N	3O	Total	
Can (M)									4	4
Can (N)	365	586	1417	2658	935				180	6141
Can (Q)		33	88							121
Canada (Total)	365	619	1505	2658	935			184	6266	
Japan					1847	11	13	2	1873	
Portugal					2019	628	644	53	3344	
Spain					4266	1283	2301	93	7943	
France			229		160	43			432	
Total	365	619	1734	2658	9227	1965	2958	332	19858	

Table 5. Catch at age, mean weights at age, and related statistics for Catch of Greenland halibut by Canada in 1997 in SA 2 + Div. 3KLMNO. Table A is Total, Table B is otter trawl, and Table C is gillnet.

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A AGE	AVERAGE		CATCH		
	WEIGHT	LENGTH	MEAN	STD. ERR.	C. V.
* 4	0.228	31.604	6	0.87	0.14
* 5	0.383	36.902	50	3.61	0.07
6	0.581	41.720	212	11.64	0.05
7	0.909	47.665	1056	37.77	0.04
8	1.264	52.604	780	37.96	0.05
9	1.850	58.969	370	20.37	0.06
*10	2.427	63.960	337	23.03	0.07
*11	3.104	68.794	284	22.46	0.08
*12	3.996	74.153	164	15.48	0.09
*13	5.141	79.923	94	10.04	0.11
*14	5.934	83.401	37	6.51	0.18
*15	6.658	86.331	12	3.06	0.25
*16	8.376	92.462	2	0.62	0.32

B AGE	AVERAGE		CATCH		
	WEIGHT	LENGTH	MEAN	STD. ERR.	C. V.
* 4	0.223	31.447	6	0.87	0.14
5	0.380	36.804	46	3.56	0.08
6	0.541	40.896	142	6.27	0.04
7	0.858	46.851	403	9.70	0.02
8	1.250	52.456	344	9.18	0.04
9	1.757	58.088	98	5.50	0.06
*10	2.297	62.941	21	2.51	0.12
*11	2.958	67.818	7	1.33	0.20
*12	3.815	73.138	2	0.74	0.32
*13	5.859	83.000	1	0.42	0.31
14	5.699	82.500		0.21	1.17
*15	7.782	90.500		0.01	

C AGE	AVERAGE		CATCH		
	WEIGHT	LENGTH	MEAN	STD. ERR.	C. V.
* 4	0.366	36.500			0.01
* 5	0.432	38.268	3	0.55	0.17
6	0.662	43.376	71	9.81	0.14
7	0.940	48.166	653	36.50	0.06
8	1.270	52.672	536	36.83	0.07
9	1.884	59.289	272	19.62	0.07
10	2.435	64.026	316	22.90	0.07
*11	3.108	68.818	278	22.42	0.08
*12	3.999	74.167	161	15.46	0.10
*13	5.131	79.878	92	10.03	0.11
*14	5.935	83.406	37	6.51	0.18
15	6.645	86.283	12	3.06	0.25
*16	8.376	92.462	2	0.62	0.32

Table 5d. Catch at age and mean weights at age for France (M) catch of G.halibut in Div. 2J in 1997.

Age Catch (000) Weight (kg)

3	<1	0.096
4	2	0.238
5	7	0.344
6	34	0.528
7	92	0.849
8	46	1.274
9	17	1.858
10	9	2.43
11	3	3.099
12	3	4.145
13	<1	5.724
14	<1	5.232
15	<1	6.683
16	<1	9.001

Table 6. Catch at age (000) of Greenland halibut from the Canadian fishery only
in SA 2+3 from 1988 - 1997.

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
5	41	166	148	159	18	33	8	8	33	50
6	2124	1878	2979	1684	255	281	45	31	215	212
7	5429	7076	6706	4348	1319	847	154	137	632	1056
8	1659	3568	1813	2121	840	411	196	191	330	780
9	404	597	300	900	359	190	153	156	294	370
10	130	90	78	295	316	169	139	142	301	337
11	25	19	34	89	268	173	185	120	310	284
12	10	4	21	80	234	192	107	88	161	164
13	2	2	11	21	119	107	101	69	84	94
14	2	1	13	21	70	54	57	17	30	37
15	1	1	9	4	36	31	15	9	12	12
16	1	1	2	1	8	12	4	5	4	2
17	0	1	1	1	4	2	0	2	2	0
Ages 5+	9828	13404	12115	9724	3846	2502	1164	975	2408	3398
Ages 6-9	9616	13119	11798	9053	2773	1729	548	515	1471	2418

Table 7. Weight at age (kg) of Greenland halibut from the Canadian fishery
in SA 2+3 from 1988 - 1997.

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
5	0.397	0.403	0.416	0.410	0.386	0.398	0.372	0.399	0.393	0.383
6	0.583	0.561	0.587	0.596	0.560	0.580	0.572	0.572	0.566	0.581
7	0.801	0.765	0.754	0.808	0.797	0.814	0.866	0.910	0.880	0.909
8	1.157	1.065	1.052	1.179	1.252	1.196	1.227	1.273	1.304	1.264
9	1.640	1.619	1.542	1.736	1.937	1.815	1.835	1.886	1.856	1.850
10	2.240	2.201	2.116	2.404	2.544	2.445	2.368	2.505	2.523	2.427
11	2.837	2.980	2.850	3.078	3.169	3.064	3.023	3.156	3.188	3.104
12	3.593	3.981	3.632	3.821	3.942	3.984	3.765	3.828	3.866	3.996
13	4.456	4.455	4.524	5.294	5.111	5.120	4.928	4.820	5.009	5.141
14	5.512	5.623	5.567	5.940	6.220	6.091	6.005	5.961	5.871	5.934
15	6.821	6.962	6.906	6.674	7.194	7.125	7.649	6.953	6.838	6.658
16	7.782	7.547	8.546	9.001	8.290	8.462	7.830	7.490	7.973	8.376
17	-	9.659	9.601	9.659	10.623	9.763	-	9.533	8.376	-

TABLE 8 . ANOVA results and regression coefficients from a multiplicative model utilized to derive a standardized catch rate index for Greenland halibut in SA2 + Div. 3KLMNO. Effort is measured in hours fished (1994-1997 data preliminary).

REGRESSION OF MULTIPLICATIVE MODEL						(3)	21	29	0.006	0.084	51
MULTIPLE R.....							23	30	0.016	0.065	102
MULTIPLE R SQUARED....							31	31	0.263	0.080	100
							32	32	0.060	0.091	143
							33	33	0.423	0.110	77
ANALYSIS OF VARIANCE							34	34	0.130	0.115	58
SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE			35	35	0.162	0.145	21
INTERCEPT	1	6.359E2	6.359E2			(4)	76	36	0.054	0.225	11
REGRESSION	57	1.908E2	3.348E0	18.118			77	37	0.122	0.216	19
Country/Gear/TC	17	4.082E1	2.401E0	12.995			78	38	0.329	0.234	18
Month	11	1.082E1	9.833E-1	5.321			79	39	0.128	0.230	10
Division	7	8.957E0	1.280E0	6.924			80	40	0.366	0.237	12
Year	22	2.846E1	1.293E0	7.000			81	41	0.177	0.225	15
RESIDUALS	621	1.148E2	1.848E-1				82	42	0.422	0.219	19
TOTAL	679	9.415E2					83	43	0.385	0.212	24
REGRESSION COEFFICIENTS							84	44	0.296	0.214	23
CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.		85	45	0.100	0.215	21
Country/Gear/TC	3125	INTERCEPT	-0.811	0.214	679		86	46	0.295	0.214	24
Month	9						87	47	0.092	0.206	33
Division	22						88	48	0.276	0.215	22
Year	75						89	49	0.119	0.219	22
(1)	3126	1	-0.002	0.167	8		90	50	0.057	0.218	26
	10127	2	1.067	0.186	8		91	51	0.417	0.213	49
	11125	3	0.257	0.134	16		92	52	0.539	0.213	95
	11126	4	-0.117	0.204	6		93	53	0.335	0.216	84
	11127	5	0.402	0.125	17		94	54	0.489	0.218	100
	14124	6	0.625	0.083	76		95	55	0.411	0.234	21
	14126	7	0.783	0.114	23		96	56	0.607	0.228	21
	14127	8	0.486	0.121	22		97	57	0.065	0.295	4
	15126	9	0.439	0.202	6						
	16127	10	0.286	0.090	51						
	19124	11	-0.276	0.098	102						
	19125	12	0.008	0.107	75						
	19126	13	0.326	0.122	28						
	20125	14	0.425	0.189	7						
	20126	15	-0.008	0.145	12						
	20127	16	0.049	0.097	37						
	27125	17	0.220	0.105	24						
(2)	1	18	0.246	0.097	29						
	2	19	0.115	0.093	33						
	3	20	-0.065	0.087	42						
	4	21	-0.042	0.084	48						
	5	22	0.161	0.087	40						
	6	23	0.154	0.085	43						
	7	24	-0.008	0.075	61						
	8	25	0.112	0.068	79						
	10	26	0.299	0.072	70						
	11	27	-0.056	0.070	80						
	12	28	0.072	0.075	64						

LEGEND FOR ANOVA 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 9'. Standardized catch rate index for Greenland halibut in SA2 + Div. 3KLMNO from a multiplicative model utilizing hours fished as a measure of effort (1994-1997 based on preliminary data)

PREDICTED CATCH RATE

YEAR	LN TRANSFORM MEAN	S.E.	RETRANSFORMED MEAN	S.E.	CATCH	EFFORT
1975	-0.8112	0.0458	0.476	0.101	28814	60490
1976	-0.8656	0.0243	0.456	0.071	24611	53972
1977	-0.6888	0.0194	0.546	0.076	32048	58746
1978	-0.4823	0.0219	0.670	0.099	39070	58328
1979	-0.6833	0.0299	0.546	0.094	34104	62500
1980	-0.4456	0.0224	0.695	0.103	32867	47308
1981	-0.6345	0.0195	0.576	0.080	30754	53399
1982	-0.3893	0.0152	0.738	0.091	26278	35629
1983	-0.4261	0.0134	0.712	0.082	27861	39157
1984	-0.5155	0.0126	0.651	0.073	26711	41030
1985	-0.7111	0.0148	0.535	0.065	20347	38052
1986	-1.0163	0.0136	0.394	0.046	17976	45586
1987	-0.7196	0.0137	0.531	0.062	32442	61153
1988	-1.0870	0.0149	0.367	0.045	19215	52331
1989	-0.9304	0.0141	0.430	0.051	20034	46635
1990	-0.8679	0.0118	0.458	0.050	47454	103657
1991	-1.2285	0.0114	0.319	0.034	65008	203610
1992	-1.3504	0.0113	0.283	0.030	63193	223561
1993	-1.1460	0.0124	0.347	0.038	62455	180201
1994	-1.3005	0.0135	0.297	0.034	51029	171926
1995	-1.2218	0.0217	0.320	0.047	15272	47757
1996	-1.4186	0.0183	0.263	0.035	18840	71609
1997	-0.8761	0.0543	0.445	0.102	19858	44674

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.136

Table 10. Summary of sets in fall survey in SA 2+3 in 1996 and 1997.

Depth range is in meters, number of sets in parentheses.

Division	Teleost	Ship	
		<i>W.Templeman</i>	<i>A.Needler</i>
1996	2G 127 - 1436 (47)		
	2H 122 - 1415 (77)		
	2J 126 - 1410 (117)		
	3K 111 - 1368 (115)	126 - 472 (60)	
	3L 805 - 1433 (31)	51 - 671 (180)	
	3M 784 - 1400 (18)	127 - 707 (68)	
	3N 390 - 1147 (13)		37 - 309 (69)
	3O 68 - 690 (26)	65 - 139 (19)	63 - 304 (16)
1997	2G 201-1209 (69)		
	2H 220-1382 (71)		
	2J 123-1488 (117)		
	3K 143-1431 (155)	117-421 (20)	
	3L 161-1436 (71)	35-714 (134)	
	3M 799-1379 (26)		
		41-769 (100)	
		62-611 (81)	

Table 11a. *G. halibut* biomass from Canadian surveys in Div. 2G during 1996 and 1997. Upper and lower in the summary tables refer to approximate 95% confidence intervals.

NAFO Div. 2G

	Summary					
	Kg./Tow			Biomass ('000t)		
	Mean	Upper	Lower	Total	Upper	Lower
1996	11.8	23.4	0.1	22.3	44.4	0.2
1997	13.7	17.2	10.3	15.5	19.4	11.6

Table 11b. G. halibut biomass from Canadian surveys in Div. 2H during 1996 and 1997.
Upper and lower in the summary tables refer to approximate 95% confidence intervals.

NAFO Div. 2H

Stratum	Depth (m)	Units	Av. kg/set	1996		1997	
				Sets	Biomass (t)	Av. kg/set	Sets
930	<200	141413	1.08	4	152	-	-
954		133572	0.68	4	91	-	-
956		144578	0.08	3	12	-	-
957		188596	0.08	5	15	-	-
subtotal					270		
931	201 - 300	37967	4.74	2	180	1.87	2
943		48697	6.95	2	338	4.34	2
950		35903	7.88	2	283	39.04	2
953		40030	4.48	2	179	16.47	2
955		53511	27.57	2	1475	6.79	3
958		40443	4.40	2	178	9.67	2
subtotal					2633		3098
932	301 - 400	7566	17.28	2	131	21.98	2
944		118303	4.22	3	499	50.02	6
949		28338	140.64	2	3985	29.59	2
952		24348	13.83	2	337	50.40	2
959		24486	6.18	2	151	27.93	2
subtotal					5104		8834
933	401 - 500	6878	15.23	2	105	45.00	2
942		7566	8.03	2	61	17.83	2
945		63416	20.53	2	1302	31.83	3
948		33840	95.56	2	3234	106.52	2
951		32189	50.60	2	1629	79.86	2
960		14719	6.60	2	97	22.55	2
subtotal					6427		8970
934	501 - 750	10730	28.25	2	303	17.80	2
941		12243	6.58	2	80	41.45	2
946		99182	47.18	3	4680	71.03	5
947		31226	64.10	2	2002	88.70	2
961		29025	9.83	2	285	7.67	2
subtotal					7350		10736
935	751 - 1000	13206	-	-	-	36.16	2
940		13343	20.05	2	268	49.30	2
962		33290	26.55	2	884	27.69	2
subtotal					1151		2057
936	1001 - 1250	10730	-	-	-	45.30	2
939		17883	46.50	2	832	33.70	2
963		36454	56.15	2	1023	52.36	2
subtotal					1855		1909
937	1251 - 1500	12931	-	-	-	30.10	2
938		26274	17.00	2	447	27.84	2
964		47046	17.57	2	826	17.33	2
subtotal					1273		1936
Total				74	26062		71
							38628

Summary

	Kg./Tow			Biomass ('000t)		
	Mean	Upper	Lower	Total	Upper	Lower
1996	16.5	19.6	13.3	26.1	31.1	21.1
1997	38.2	49.0	27.4	38.6	49.6	27.7

Table 12. Summary of survey results for G.halibut, fall 1997, Div. 2J

Depth	Stratum	Units	No. Sets	Ave./Set	Number		Weight		
					Total No.	Variance	Ave./set	Total Wgt.	Variance
101 - 200	201	87076	2	2.5	217,690	13	0.30	26,123	0
101 - 200	205	219272	6	3.5	767,453	12	0.16	35,084	0
101 - 200	206	257239	7	19.7	5,071,288	178	1.57	403,498	2
101 - 200	207	311438	9	1.7	519,064	2	0.16	50,522	0
101 - 200	237	100832	3	0.3	33,611	0.3	0.04	3,697	0
101 - 200	238	107023	3	0.0	0	0	0.00	0	0
201 - 300	202	85425	2	32.4	2,771,581	1110	1.83	156,613	1
201 - 300	209	93542	3	44.0	4,115,828	1993	4.53	424,055	20
201 - 300	210	142376	4	36.8	5,232,308	3273	6.28	893,408	121
201 - 300	213	217759	6	81.3	17,703,016	2862	5.26	1,145,454	9
201 - 300	214	184469	5	75.6	13,945,888	429	6.82	1,258,081	9
201 - 300	215	179105	5	124.9	22,364,186	16145	8.08	1,447,563	67
201 - 300	228	302084	8	132.8	40,114,257	2736	12.14	3,666,127	37
201 - 300	234	72907	2	71.4	5,208,827	2237	10.33	752,971	55
301 - 400	203	66992	2	285.0	19,092,791	32768	33.33	2,232,517	377
301 - 400	208	80886	2	1511.7	122,272,547	1896054	155.69	12,593,263	16943
301 - 400	211	34528	2	477.0	16,469,776	161312	54.30	1,874,861	1290
301 - 400	216	49522	2	85.0	4,209,369	5202	22.00	1,089,484	348
301 - 400	222	61902	2	82.0	5,076,004	7200	15.03	930,085	287
301 - 400	229	73733	2	93.4	6,889,915	24	26.32	1,940,400	6
401 - 500	204	39618	2	1566.9	62,076,366	77706	200.45	7,941,280	209
401 - 500	217	33152	2	68.0	2,254,351	1152	20.40	676,305	52
401 - 500	223	21735	2	48.0	1,043,263	98	19.55	424,912	15
401 - 500	227	82262	2	425.5	35,002,281	18241	112.38	9,244,139	1900
401 - 500	235	56950	2	727.5	41,431,336	1201	146.88	8,364,574	282
401 - 500	240	18296	2	73.0	1,335,581	1458	27.38	500,843	239
501 - 750	212	76622	2	580.0	44,440,484	7688	140.11	10,735,059	256
501 - 750	218	49797	2	64.4	3,204,800	14	24.23	1,206,513	49
501 - 750	224	31364	2	41.0	1,285,921	98	19.93	624,926	27
501 - 750	230	25449	2	154.5	3,931,840	16021	62.43	1,588,641	1576
501 - 750	239	16507	2	1328.9	21,936,408	661506	165.10	2,725,397	3152
751 - 1000	219	38930	2	56.0	2,180,068	800	44.35	1,726,536	481
751 - 1000	231	25586	2	45.0	1,151,386	288	25.43	650,533	56
751 - 1000	236	26549	2	19.0	504,437	0	14.35	380,982	8
1001 - 1250	220	41681	2	15.5	646,056	41	12.08	503,298	12
1001 - 1250	225	26824	2	21.0	563,313	200	25.85	693,411	278
1001 - 1250	232	31364	2	23.5	737,052	0.5	29.81	934,802	2
1251 - 1500	221	45395	2	20.5	930,601	113	27.45	1,246,097	541
1251 - 1500	226	27650	2	8.0	221,198	98	14.73	407,143	380
1251 - 1500	233	32602	2	10.5	342,321	13	18.28	595,801	27
		117			517,294,461			82,095,000	

Table 13. Summary of survey results for G. halibut, fall 1997, Div. 3K

Depth	Stratum	Units	No. Sets	Ave./Set	Number		Weight		
					Total No.	Variance	Ave./set	Total Wgt.	Variance
101-200	608	109774	3	2.7	292,730	21	0.40	43,910	0.48
101-200	612	61215	2	14.0	857,006	0	2.20	134,672	0
101-200	616	34390	2	1.0	34,390	2	0.13	4,299	0.03
101-200	618	185295	6	0.5	92,647	1	0.06	10,500	0.01
101-200	619	241145	7	1.9	447,840	2	0.24	56,841	0.03
201-300	609	47046	2	32.0	1,505,469	200	8.20	385,776	23
201-300	611	78823	3	17.0	1,339,983	769	3.37	265,369	32
201-300	615	34528	2	12.5	431,598	313	1.95	67,329	8
201-300	620	350093	11	30.5	10,661,922	650	3.64	1,274,657	8
201-300	621	348992	11	40.6	14,181,785	1443	3.78	1,319,509	10
201-300	624	152005	5	104.8	15,930,124	1916	10.59	1,609,733	18
201-300	634	213907	7	87.1	18,640,510	421	10.02	2,143,659	14
201-300	635	175253	5	99.8	17,490,232	11129	8.82	1,544,951	105
201-300	636	200151	6	48.0	9,607,266	45	5.85	1,170,886	1
201-300	637	155719	5	39.6	6,166,478	268	5.58	868,913	13
301-400	610	35216	2	129.5	4,560,425	925	17.90	630,360	29
301-400	614	36179	2	83.5	3,020,910	113	11.03	398,869	2
301-400	617	81574	3	488.0	39,807,977	30411	60.57	4,940,649	754
301-400	623	67955	2	345.0	23,444,536	130050	28.53	1,938,421	843
301-400	625	122154	4	231.5	28,278,708	33745	25.18	3,075,233	306
301-400	626	153105	5	865.8	132,558,732	534053	67.16	10,282,565	2455
301-400	628	149254	5	176.6	26,358,217	64523	17.99	2,685,075	376
301-400	629	68093	2	276.0	18,793,596	52488	32.00	2,178,968	990
301-400	630	45670	2	709.0	32,380,229	16562	71.40	3,260,858	512
301-400	633	284339	9	165.3	47,010,676	23707	23.70	6,738,829	374
301-400	638	283238	9	164.8	46,671,374	16429	24.82	7,030,603	251
301-400	639	201252	6	45.8	9,224,044	271	7.73	1,556,348	10
401-500	613	4127	2	382.0	1,576,450	12168	46.45	191,691	227
401-500	622	95055	3	1100.0	104,560,181	256656	125.20	11,900,850	3933
401-500	627	172639	5	1195.4	206,365,182	524161	128.45	22,175,961	3804
401-500	631	181718	6	531.1	96,509,187	86720	79.79	14,500,102	1634
401-500	640	9492	2	15.0	142,376	2	6.25	59,323	1
401-500	645	29713	2	13.2	392,874	154	5.46	162,102	25
401-500	650	18433	2	37.5	691,244	85	13.13	241,936	1
501-750	641	31639	2	11.0	348,030	0	6.23	196,953	0.15
501-750	646	44707	2	52.5	2,347,136	5101	26.40	1,180,274	1285
501-750	651	49384	2	52.8	2,609,144	383	27.57	1,361,364	58
751-1000	642	57501	2	55.3	3,178,958	700	35.41	2,035,930	292
751-1000	647	49522	2	69.0	3,417,017	1922	40.90	2,025,449	696
751-1000	652	70982	2	70.0	4,968,706	450	36.28	2,574,855	154
1001-1250	643	100832	3	90.3	9,108,516	1780	67.73	6,829,706	579
1001-1250	648	31364	2	49.6	1,554,755	0.4	35.63	1,117,564	15
1001-1250	653	73045	2	29.2	2,130,477	0.1	22.49	1,642,902	1
1251-1500	644	65204	2	29.0	1,890,915	50	31.23	2,035,993	74
1251-1500	649	29163	2	37.5	1,093,611	1861	37.15	1,083,404	1746
1251-1500	654	65892	2	63.1	4,158,502	836	54.82	3,612,333	732

Table 14. Summary of survey results for G.halibut, fall 1997, Div. 3L.

Depth	Stratum	Units	No. Sets	Number			Weight		
				Ave./Set	Total No.	Variance	Ave./set	Total Wgt.	Variance
30 - 56	784	36866	2	0.0	0	0	0.00	0	0
57 - 92	350	284889	7	0.0	0	0	0.00	0	0
57 - 92	363	244859	6	0.0	0	0	0.00	0	0
57 - 92	371	154206	4	0.0	0	0	0.00	0	0
57 - 92	372	338400	8	0.1	42,300	0.13	0.00	423	0.00
57 - 92	384	154068	4	0.0	0	0	0.00	0	0
57 - 92	785	63966	2	0.0	0	0	0.00	0	0
93 - 183	328	208955	5	0.2	41,791	0.20	0.03	5,851	0.00
93 - 183	341	216521	4	2.8	595,433	4	1.15	248,999	1
93 - 183	342	80473	2	2.5	201,183	1	1.05	84,497	0.13
93 - 183	343	72220	2	1.3	96,293	4	0.47	33,702	0.44
93 - 183	348	291630	7	1.6	458,275	4	0.44	129,150	0.41
93 - 183	349	290804	7	0.7	207,717	1	0.21	60,238	0.09
93 - 183	364	387510	9	1.3	516,679	5	0.27	102,905	0.19
93 - 183	365	143201	3	4.7	668,272	6	1.18	169,455	1
93 - 183	370	181581	4	1.3	226,976	4	0.26	47,665	0.13
93 - 183	385	324094	8	9.6	3,110,401	132	1.55	502,436	4
93 - 183	390	203728	5	4.0	814,912	7	0.98	199,653	0.49
93 - 183	786	11555	2	1.1	12,381	0.01	0.14	1,642	0.04
93 - 183	787	84325	2	3.5	295,137	5	1.03	86,433	0.03
93 - 183	788	35903	2	5.0	179,517	50	1.25	44,879	3
93 - 183	790	12243	2	0.5	6,121	1	0.48	5,815	0.45
93 - 183	793	9904	2	0.5	4,952	1	0.40	3,962	0.32
93 - 183	794	29713	2	1.3	39,618	4	0.49	14,526	0.48
93 - 183	797	13481	2	1.0	13,481	2	0.26	3,438	0.13
93 - 183	799	9904	2	0.0	0	0	0.00	0	0.00
184 - 274	344	217622	5	3.2	696,389	8	0.44	95,754	0.07
184 - 274	347	135223	3	1.3	180,297	0.33	0.27	36,510	0.07
184 - 274	366	191760	5	34.8	6,673,253	1319	4.58	878,262	23
184 - 274	369	132196	3	33.7	4,450,606	444	6.72	887,918	13
184 - 274	386	135223	3	55.0	7,437,240	4627	7.47	1,009,662	66
184 - 274	389	112938	3	68.0	7,679,760	3661	7.75	875,267	13
184 - 274	391	38792	2	166.5	6,458,906	1741	23.00	892,221	1
184 - 274	789	9904	2	5.0	49,522	32	1.43	14,114	2
184 - 274	791	31226	2	15.6	487,478	87	6.17	192,736	2
184 - 274	795	22560	2	4.6	104,027	5	1.57	35,407	1
184 - 274	798	13756	2	20.4	281,018	368	7.84	107,887	53
275 - 366	345	196987	5	64.5	12,712,258	2165	9.01	1,774,638	27
275 - 366	346	118990	3	135.0	16,063,696	6156	19.98	2,377,824	105
275 - 366	368	45945	2	39.5	1,814,843	145	7.35	337,699	1
275 - 366	387	98769	2	83.2	8,214,277	207	16.34	1,613,499	13
275 - 366	388	49660	2	133.0	6,604,720	17298	16.39	813,727	86
275 - 366	392	19946	2	208.0	4,148,842	2312	30.98	617,838	81
275 - 366	796	24073	2	44.5	1,071,257	25	14.73	354,611	15
275 - 366	800	11142	2	165.0	1,838,504	26450	28.08	312,824	476
367 - 549	729	25586	2	48.5	1,240,939	5	19.38	495,736	8
367 - 549	731	29713	2	78.5	2,332,486	1	24.00	713,117	8
367 - 549	733	64379	2	47.5	3,057,983	1625	11.68	751,620	51
367 - 549	735	37417	2	96.0	3,591,995	242	25.07	937,847	2
367 - 549	792	6878	2	219.5	1,509,733	1013	50.73	348,889	34
550 - 731	730	23385	2	21.5	502,786	13	14.10	329,734	11
550 - 731	732	31777	2	44.5	1,414,059	13	18.58	590,251	13
550 - 731	734	31364	2	57.8	1,812,138	2048	19.27	604,278	187
550 - 731	736	24073	2	112.0	2,696,197	5000	39.53	951,493	834
732 - 914	737	31226	2	135.0	4,215,559	4418	63.45	1,981,313	749
732 - 914	741	30676	2	263.5	8,083,158	8321	105.10	3,224,060	493
732 - 914	745	47871	2	64.0	3,063,761	72	35.98	1,722,169	0
732 - 914	748	21872	2	32.5	710,847	685	13.10	286,526	119
915 - 1097	738	30401	2	65.9	2,003,426	343	47.35	1,439,335	131
915 - 1097	742	28338	2	95.5	2,706,239	11401	31.80	901,135	816
915 - 1097	746	53924	2	34.2	1,845,397	1195	18.40	992,201	200
915 - 1097	749	17333	2	48.5	840,636	4513	21.75	376,899	908
1098 - 1280	739	34941	2	89.5	3,127,176	2113	64.33	2,247,549	661
1098 - 1280	743	29025	2	77.4	2,245,321	2094	97.15	2,819,713	307
1098 - 1280	747	99594	2	10.3	1,029,140	0	14.52	1,446,053	15
1098 - 1280	750	76484	2	55.5	4,244,860	6161	51.60	3,946,573	5325
1281 - 1463	740	36316	2	82.0	2,977,922	1058	71.70	2,603,866	1447
1281 - 1463	744	38517	2	31.5	1,213,289	1	28.59	1,101,311	23
1281 - 1463	751	31501	2	94.9	2,990,891	4989	89.21	2,810,195	2081

Table 15. Summary of survey results for G.halibut, fall 1997, Div. 3M

Depth	Stratum	Units	No. Sets	Number			Weight		
				Ave./Set	Total No.	Variance	Ave./set	Total Wgt.	Variance
732 - 914	528	72907	3	27.1	1,976,600	311	21.67	1,580,200	169
732 - 914	533	13481	2	26.0	350,506	2	20.03	269,957	0.15
915 -1097	529	67130	3	3.3	223,766	12	3.25	218,172	12
915 -1097	532	32740	2	17.0	556,572	242	14.23	465,720	56
915 -1097	534	66855	3	40.0	2,674,188	1092	30.30	2,025,697	853
1098 -1280	530	155994	7	9.8	1,524,287	180	10.18	1,587,353	162
1098 -1280	535	12656	2	19.5	246,785	5	17.23	217,993	5
1281 -1463	531	27925	2	2.6	72,605	1	7.74	216,139	6
1281 -1463	536	15407	2	14.0	215,696	72	25.00	385,171	221
			26		7,841,003			6,966,401	

Table 16. Estimated biomass (tons) per stratum of *G. halibut* from the autumn survey of Teleost in fall-winter, 1995/96, fall 1996, and fall 1997 in Div. 2J.
All surveys done with Campelen trawl. Based on the latest stratification update.

Depth Range (m)	Stratum	Area (sq. nm)	Trawlable Units (000)	1995/96	1996	1997
101-200	201	633	87.1		82	26
	205	1594	219.3		514	35
	206	1870	257.2	399	1120	403
	207	2264	311.4	1	56	51
	237	733	100.8	0	1	4
	238	778	107.0		15	0
	Total			400	1788	519
201-300	202	621	85.4	95	89	157
	209	680	93.5	360	1059	424
	210	1035	142.4	2708	3904	893
	213	1583	217.8	236	1338	1145
	214	1341	184.5	327	4056	1258
	215	1302	179.1	1370	1247	1448
	228	2196	302.1	2219	5478	3666
	234	530	72.9		163	753
	Total			7315	17334	9744
301-400	203	487	67.0	387	946	2233
	208	588	80.9	4799	3707	12593
	211	251	34.5	1400	1343	1875
	216	360	49.5	64	506	1089
	222	450	61.9	122	1672	930
	229	536	73.7	1799	3900	1940
	Total			8571	12074	20661
401-500	204	288	39.6	1437	3823	7941
	217	241	33.2	131	932	676
	223	158	21.7	162	438	425
	227	598	82.3	909	5850	9244
	235	414	57.0	3895	4373	8365
	240	133	18.3	631	537	501
	Total			7165	15953	27152
501-750	212	557	76.6	5499	4940	10735
	218	362	49.8	693	1783	1207
	224	228	31.4	214	702	625
	230	185	25.4	652	1340	1589
	239	120	16.5	1675	2586	2725
	Total			8733	11351	16881
751-1000	219	283	38.9	2021	405	1727
	231	186	25.6	376	1013	651
	236	193	26.5	1007	698	381
	Total			3404	2116	2758
1001-1250	220	303	41.7		1296	503
	225	195	26.8		834	693
	232	228	31.4		717	935
	Total				2847	2132
1251-1500	221	330	45.4		131	1246
	226	201	27.6		277	407
	233	237	32.6		889	596
	Total				1297	2249
Biomass (t)				35591	64760	82095
95% Lower				28260	48126	24180
95% Upper				42922	86821	188371

Table 17. Estimated biomass (tons) per stratum of *G. halibut* from the autumn survey of the W.Templeman and Teleost in fall-winter, 1995/96, fall 1996, and fall 1997 in Div. 3K.
All surveys done with Campelen trawl. Based on the latest stratification update.

Depth Range(m)	Stratum	Area (sq. nm.)	Trawlable Units (000)	1995/96	1996	1997
101-200	608	798	109.8	-	0	44
	612	445	61.2	-	0	135
	616	250	34.4	-	0	4
	618	1347	185.3	286	19	11
	619	1753	241.1	18	29	57
	Total			304	48	250
201-300	609	342	47.0	-	117	386
	611	600	78.8	-	113	265
	615	251	34.5	-	39	67
	620	2545	350.1	790	4213	1275
	621	2736	349.0	1067	3967	1320
	624	1105	152.0	507	2516	1610
	634	1555	213.9	727	2370	2144
	635	1274	175.3	128	1344	1545
	636	1455	200.2	1393	2336	1171
	637	1132	155.7	179	1722	869
	Total			4791	18737	10651
301-400	610	256	35.2	-	344	630
	614	263	36.2	-	154	399
	617	593	81.6	3844	2464	4941
	623	494	68.0	307	3588	1938
	625	888	122.2	1437	4381	3075
	626	1113	153.1	1962	5453	10283
	628	1085	149.3	529	1799	2685
	629	495	68.1	2682	6569	2179
	630	332	45.7	858	4800	3261
	633	2067	284.3	4649	3487	6739
	638	2059	283.2	1750	3952	7031
	639	1463	201.3	1520	1381	1556
	Total			19538	38372	44717
401-500	613	30	4.1	-	51	192
	622	691	95.1	2638	6896	11901
	627	1255	172.6	18946	15576	22176
	631	1321	181.7	10094	25499	14500
	640	69	9.5	179	105	59
	645	216	29.7	357	192	162
	650	134	18.4	252	147	242
	Total			32466	48466	49232
501-750	641	230	31.6	227	394	197
	646	325	44.7	327	564	1180
	651	359	49.4	1222	321	1361
	Total			1776	1279	2739
751-1000	642	418	57.5	1741	760	2036
	647	360	49.5	1087	749	2025
	652	516	71.0	2365	3585	2575
	Total			5193	5094	6636
1001-1250	643	733	100.8	1487	2121	6830
	648	228	31.4	-	1641	1118
	653	531	73.0	1583	2306	1643
	Total			3070	6068	9590
1251-1500	644	474	65.2	688	870	2036
	649	212	29.2	-	387	1083
	654	479	65.9	1375	1016	3612
	Total			2063	2273	6731
Biomass (t)				69206	120337	130546
95% Lower				55864	106961	112147
95% Upper				82547	150486	148945

Table 18. Estimated biomass (tons) per stratum of *G. helibut* from the autumn survey of the W. Templeman and Teleost in fall-winter, 1995/96, fall 1996, and fall 1997 in Div. 3L.
All surveys done with Campelen trawl. Based on the latest stratification update.

Depth Range (m)	Area Stratum (sq. nm.)	Trawable Units (000)	1995/96	1996	1997
30-56	784	268	36.9	-	0
Total				-	0
57-91	350	2071	284.9	1	0
	363	1780	244.9	0	0
	371	1121	154.2	0	3
	372	2460	338.4	0	0.4
	384	1120	154.1	1	0
	785	465	64.0	-	0
Total			2	3	0.4
93-183	328	1519	209.0	-	1
	341	1574	216.5	-	2
	342	585	80.5	-	1
	343	525	72.2	-	0
	348	2120	291.6	0	2
	349	2114	290.8	4	2
	364	2817	387.5	1	0
	365	1041	143.2	17	0
	370	1320	181.6	1	14
	385	2356	324.1	73	64
	390	1481	203.7	43	57
	786	84	11.6	-	67
	787	613	84.3	-	1
	788	252	35.9	-	0
	790	89	12.2	-	0
	793	72	9.9	-	0
	794	216	29.7	-	0
	797	98	13.5	-	0
	799	72	9.9	-	0
Total			139	221	1745
184-274	344	1582	217.6	16	11
	347	983	135.2	2	0
	366	1394	191.8	204	338
	369	961	132.2	72	108
	386	983	135.2	126	447
	389	821	112.9	71	900
	391	282	38.8	177	344
	789	61	9.9	-	0
	791	308	31.2	-	66
	795	164	22.6	-	5
	798	100	13.8	-	76
Total			668	2219	5026
275-366	345	1432	197.0	937	3747
	346	865	119.0	2237	5483
	368	334	45.9	385	690
	387	718	98.8	1546	1784
	388	361	49.7	310	711
	392	145	19.9	69	500
	796	175	24.1	-	37
	800	81	11.1	-	355
Total			5484	6042	8203
367-549	729	186	25.6	215	648
	731	216	29.7	242	-
	733	468	64.4	501	706
	735	272	37.4	526	1111
	792	50	6.9	-	938
Total			1484	2651	349
550-731	730	170	23.4	140	37
	732	231	31.8	83	463
	734	228	31.4	280	642
	736	175	24.1	271	1116
Total			774	2258	951
732-914	737	227	31.2	1244	2198
	741	223	30.7	-	867
	745	348	47.9	-	1075
	748	159	21.9	-	1722
Total			1244	4569	287
915-1097	738	221	30.4	1490	1906
	742	206	28.3	-	567
	746	392	53.9	-	783
	749	126	17.3	-	992
Total			1490	3381	377
1098-1280	739	254	34.9	-	1227
	743	211	29.0	-	931
	747	724	99.6	-	438
	750	556	76.5	-	586
Total			0	3182	1446
1281-1463	740	264	36.3	-	981
	744	280	38.5	-	2961
	751	229	31.5	-	1207
Total			0	5149	1101
Biomass (tons)			11285	29675	48596
95% Lower			8012	30981	-10736
95% Upper			14552	46170	107928

Table 19. Abundance and biomass estimates of G. halibut, by Division, from fall 1997 survey.
Upper and lower indicate approximate 95% confidence limits.

	Total	Upper	Lower		Mean	Upper	Lower
2G							
Abundance	62,524,357	74,604,334	50,444,381	No/Tow	55.33	66.02	44.65
Biomass (kg)	15,503,228	19,415,485	11,590,970	Kg/Tow	13.72	17.18	10.26
2H							
Abundance	239,069,105	327,042,860	151,095,350	No/Tow	236.29	323.24	149.34
Biomass (kg)	38,627,575	49,559,064	27,696,085	Kg/Tow	38.18	48.98	27.37
2J							
Abundance	517,294,461	1,567,463,577	(532,874,656)	No/Tow	148.80	450.88	-153.28
Biomass (kg)	82,095,000	188,370,866	(24,180,867)	Kg/Tow	23.61	54.18	-6.96
3K							
Abundance	956,832,665	1,150,814,487	762,850,844	No/Tow	187.73	225.79	149.67
Biomass (kg)	130,546,473	148,945,374	112,147,571	Kg/Tow	25.61	29.22	22.00
3L							
Abundance	153,954,272	181,978,445	125,930,100	No/Tow	24.15	28.55	19.76
Biomass (kg)	48,595,931	107,928,133	(10,736,272)	Kg/Tow	7.62	16.93	-1.68
3M							
Abundance	7,841,003	12,266,790	3,415,216	No/Tow	16.86	26.37	7.34
Biomass (kg)	6,966,401	10,789,057	3,143,745	Kg/Tow	14.98	23.20	6.76
3N							
Abundance	35,486,833	200,232,451	(129,258,786)	No/Tow	14.78	83.40	-53.84
Biomass (kg)	6,447,521	28,376,106	(15,481,065)	Kg/Tow	2.69	11.82	-6.45
3O							
Abundance	14,481,578	21,365,262	7,597,894	No/Tow	6.29	9.28	3.30
Biomass (kg)	2,058,410	3,417,162	699,659	Kg/Tow	0.89	1.48	0.30
2+3KLMNO							
Abundance	1,987,484,274	2,306,142,386	1,668,826,162	No/Tow	89.30	103.61	74.98
Biomass (kg)	330,840,538	362,376,853	299,304,223	Kg/Tow	14.86	16.28	13.45

Table 20. Biomass estimate, by division, from fall surveys in 1995-97.

	2G	2H	2J	3K	3L	2J3KL	3M	3N	3O	TOTAL
1995			35.6	69.2	11.3	116.1				
1996	22.3	26.1	64.8	120.3	36.6	221.7	10.2	5.1	1.0	286.4
1997	15.5	38.6	82.1	130.5	48.6	261.2	7.0	6.4	2.1	330.8

Table 21. Abundance at age, by division, from 1996 and 1997 fall surveys.

1996									
Age	2G	2H	2J	3K	3L	3M	3N	3O	Total (000s)
0	1732	582	36508	5488	720	39	607	1887	47563
1	38280	92106	349250	444197	29710	396	22262	1362	977563
2	18467	69304	155915	296627	32406	1624	14040	3176	591559
3	11254	25096	64009	203474	35042	1746	6129	1581	348331
4	9240	12639	34589	61979	17723	1427	3071	749	141417
5	8623	8840	22836	32775	14735	2683	1949	383	92824
6	5087	4712	9883	12422	9848	3913	750	119	46734
7	2079	1872	2966	4456	4825	2515	96	12	18821
8	1107	853	782	1138	1451	826	7	2	6166
9	1093	635	733	408	671	402	7	7	3956
10	210	156	138	239	221	50	0	4	1018
11	251	48	72	106	71	31	0	0	579
12	119	49	66	49	50	46	0	0	379
13	0	27	85	33	28	85	0	0	258
14	0	3	24	18	6	38	0	0	89
15	0	0	0	10	15	11	0	0	36
Unk	159	81	134	0	37	0	41	21	473
Total (000s)	97701	217003	677990	1063419	147559	15832	48959	9303	2277766
1997									
Age	2G	2H	2J	3K	3L	3M	3N	3O	Total (000s)
0	821	5799	11897	7649	2152	0	111	67	28496
1	8348	34687	55308	166704	11176	0	801	2139	279163
2	9751	59277	172556	314015	24000	1	10261	4081	593942
3	12125	60661	129939	268426	31299	18	12099	4068	518635
4	15335	45591	84511	107534	29139	70	6596	2835	291611
5	7424	16822	33570	56239	27814	867	3529	939	147204
6	4468	9271	19248	20864	14972	2423	1459	224	72929
7	2684	4709	7411	9910	8215	2733	491	36	36189
8	927	1449	1616	4042	3484	1190	103	59	12870
9	263	448	598	949	914	292	13	17	3494
10	217	132	242	251	245	51	3	0	1141
11	130	88	208	72	165	67	4	9	743
12	12	35	100	51	148	38	3	1	388
13	12	40	74	26	103	65	6	0	326
14	0	58	28	26	117	20	0	0	249
15	0	5	0	0	0	0	0	0	5
Total (000s)	62517	239072	517306	956758	153943	7835	35479	14475	1987385

Table 22. Abundance (000s) of Greenland halibut at age from Canadian research vessel surveys in Div. 2J3KL combined during fall 1978-94.
Estimates have NOT been converted to Campelen equivalents.

Age (yrs)	1978	1979	1980	1981	1982	1983	1984	Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	2538	2805	2994	7563	2137	1004	1452	7460	13005	1491	4025	3407	547	5814	1684	7510	14541	
2	25686	22523	8911	22486	5991	5905	7148	18147	22185	8685	12436	10414	5347	6726	14858	62818	30412	
3	54708	28846	15315	30875	23971	19036	21435	20024	32997	47694	28404	35816	14506	11369	26664	97955	42221	
4	55914	25799	22680	21226	31204	31465	36094	36224	55685	35752	50345	69334	68019	37832	34313	46098	43669	
5	57650	35886	35995	34277	31061	40182	72180	44886	45213	35854	58938	77935	65410	38273	23316	18385	31165	
6	45141	38805	42154	38654	29062	34742	38931	37715	57886	33486	39603	56524	48199	27416	17109	6912	7237	
7	28923	18843	27942	26647	32070	38908	30683	22359	45327	33956	29733	32108	28837	9020	8406	2520	3136	
8	13379	7378	9511	11458	32617	31538	21712	12761	12676	20722	9257	9627	6828	2155	962	739	947	
9	6983	3316	4207	5281	13535	11559	10222	6293	3306	7621	2525	2884	1839	475	95	63	114	
10	5112	3179	3229	2824	5375	3040	4132	3498	1430	2156	809	675	718	231	48	0	38	
11	4237	2102	3601	2255	2801	2049	1869	1592	960	1065	542	558	488	104	13	0	7	
12	2541	1843	2393	1030	1790	1497	1216	1218	961	642	309	161	267	61	0	13	0	
13	1611	1520	1551	579	1276	1089	964	517	441	504	267	56	160	14	0	0	4	
14	476	762	858	276	1306	713	804	636	411	200	210	73	115	5	0	0	0	
15	335	493	326	155	835	306	427	330	213	151	151	77	49	0	0	0	0	
16	243	426	182	19	325	81	294	210	62	100	81	23	27	2	0	0	0	
17	130	153	53	0	51	0	140	161	0	10	38	0	0	0	0	0	0	
Ages 1+	305607	194679	181902	205605	215407	223114	249703	214031	292758	230089	237673	299672	241356	139497	127468	243013	173491	
Ages 3-5	168272	90531	73990	86378	86236	90683	129709	101134	133895	119300	137687	183085	147935	87474	84293	162438	117055	
Ages 6-9	683426	94426	83814	82040	107284	116747	101548	79128	119195	95785	81118	101143	85703	39066	26572	10234	11434	
Ages 10+	14685	10478	12193	7138	13759	8775	9846	8162	4478	4828	2407	1623	1824	417	61	13	49	

Table 23. Abundance (000s) of G. halibut at age from Canadian r. v. surveys in Div. 233K combined during fall 1975-97. Data prior to 1995 are in Campelen equivalents. Age 0 not estimated prior to 1995.

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
0	67133	76275	47941	141166	33748	12131	31845	192802	125257	36234	74055	52954	9858	84583	62241	359882	80159	41996	19546	
1	128771	46187	158149	39889	34727	50917	113558	106161	81046	71555	95755	39744	59211	188121	281182	189873	397121	452542	486571	
2	315362	43767	109462	83918	75651	75711	74837	70143	65428	112555	109246	174201	70539	44644	148380	497522	171493	122856	267483	
3	243378	95583	50861	39304	41433	75711	71104	103171	54235	104606	99109	114836	174689	103158	95263	182333	112859	39605	96568	
4	146864	53099	49738	47202	57104	71101	66317	72301	52271	119818	108472	115858	65701	38552	42962	51870	50370	55611	89809	
5	90817	52627	49991	41105	51583	61334	69541	81840	53188	59218	87210	70699	40331	22086	13677	9898	15883	22305	40112	
6	68495	50976	49991	41105	32283	35482	43097	50698	42301	42805	71749	47138	41431	38580	36649	12485	10472	5905	4478	3513
7	40908	24408	11102	15613	41244	39418	27028	17028	22142	25791	12233	9604	6200	2383	1067	1867	1347	232	172	17321
8	19170	98177	4777	4960	7017	16566	15223	13058	7982	6546	9434	3134	2847	1500	635	140	89	32	69	5658
9	9940	7366	4572	3891	4213	6765	4414	6306	5296	2380	2833	1105	747	746	310	89	32	104	141	1547
10	6469	3000	4461	3349	4129	3180	2602	2257	1856	1481	781	568	640	181	12	22	13	49	377	493
11	4117	2638	2882	15559	2714	2291	1812	1997	1668	1454	463	151	389	104	151	115	0	0	0	280
12	2683	2193	1874	857	1929	1664	1480	874	879	754	361	35	223	22	0	41	9	0	118	100
13	992	1079	1070	446	1975	1109	1285	1002	542	583	327	81	155	8	15	24	0	0	42	54
14	560	698	411	268	1257	677	606	555	385	236	103	90	0	0	0	0	0	0	10	0
15	365	624	231	43	389	131	461	302	318	204	149	31	21	4	0	0	0	0	0	0
16	213	234	71	0	97	0	226	311	96	150	70	0	0	0	0	0	0	0	0	0
17	0	128	0	0	43	81	0	100	0	14	16	0	0	0	0	0	0	0	0	0
18	0	65	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0
19	0	25	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0	0	0
20	0	0	4205	35062	2831	0	0	0	0	4374	0	1647	4744	0	0	2484	758	0	0	134
Utk	3706	1122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ages 0+	1028562	511381	347004	651312	459351	435238	489484	642558	715824	647746	610710	750752	530726	413761	559589	1083893	902080	1052882	1741409	1474064
Ages 1+	382496	205046	94128	299315	73337	46859	82762	306460	231418	117280	145609	148709	49602	143794	241027	343422	549855	972723	1694413	1454518
Ages 1-2	481058	199843	132809	198097	221673	218093	248151	289461	185979	343900	387056	457363	368811	213503	282195	722818	739177	1245989	708583	680219
Ages 3-5	138513	90137	100972	142012	156921	143721	137355	182277	116016	135551	138224	115048	55833	33767	21782	15895	20562	32788	64638	1078
Ages 6-9	26495	16355	19096	45797	22229	13364	14849	12763	7859	5185	6459	630	2660	972	108	153	1074	974	1078	1078

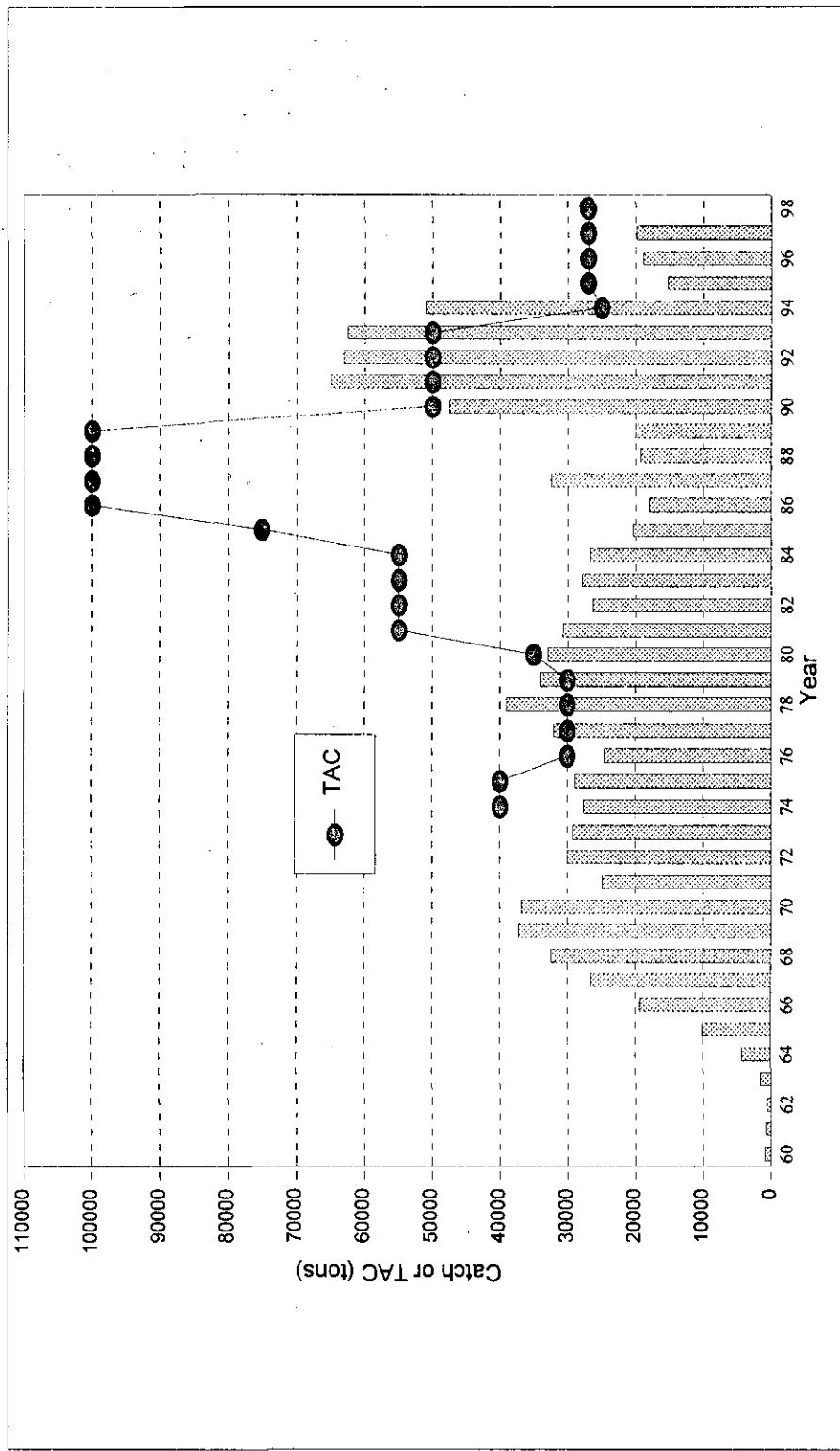


Fig. 1 Nominal catches and TAC's of *G. halibut* in Subarea 2 and Div. 3KLMNO.
TAC's from 1995 to 1998 set by NAFO Fisheries Commission.

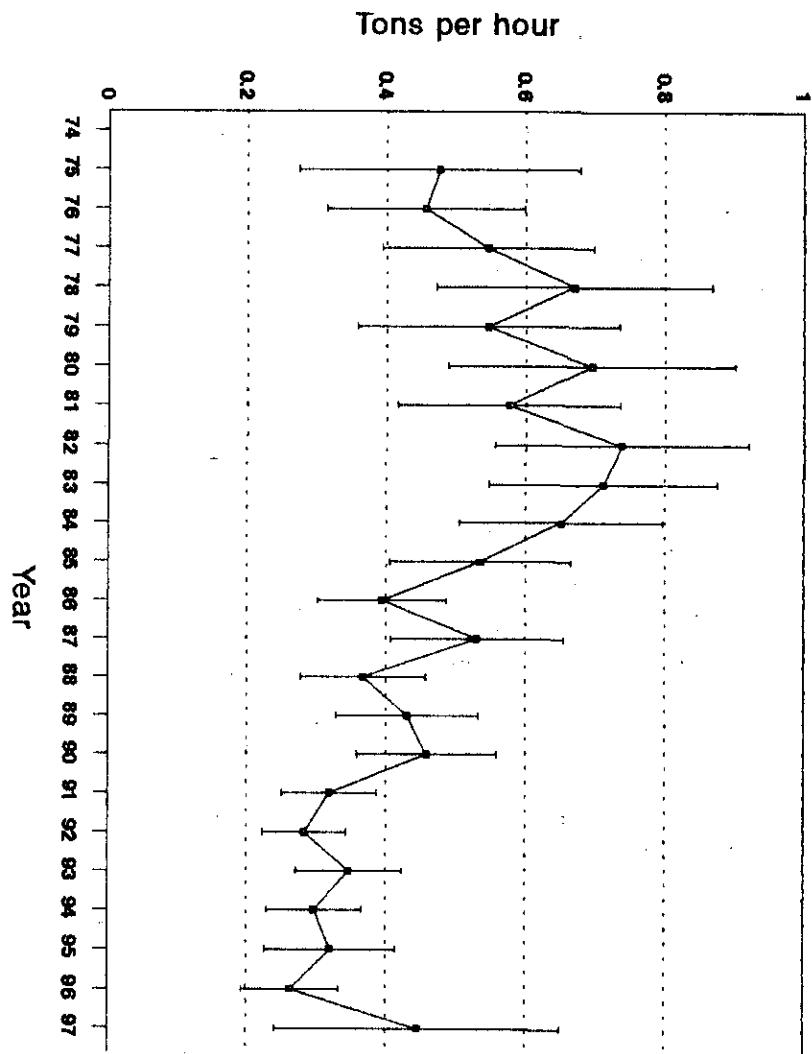


Fig. 2 Standardized CPUE (mean plus/minus 2 standard errors) for Greenland Halibut in SA2 + Div. 3KLMNO from 1975-1997.

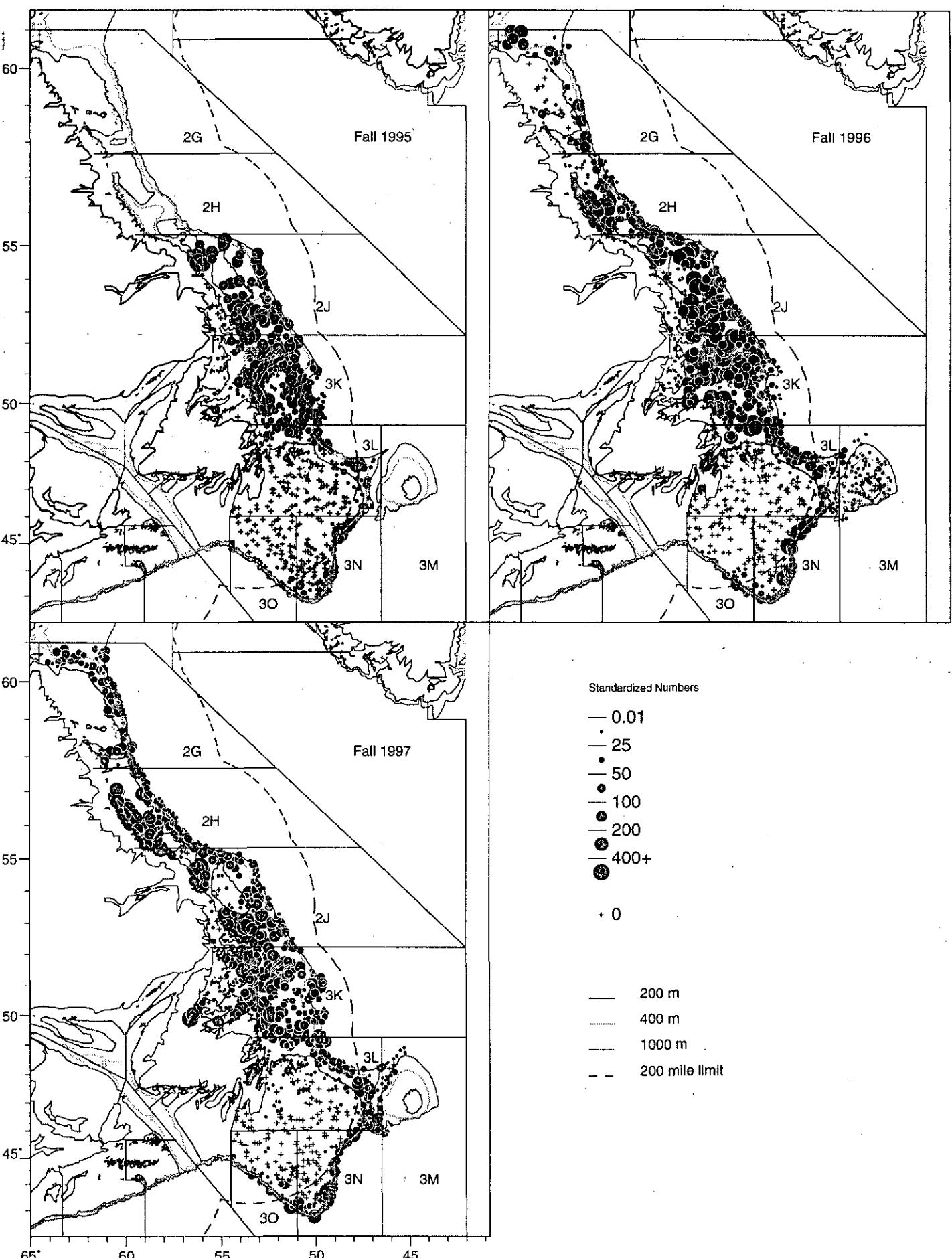


Fig. 3a. Distribution of Greenland Halibut catches from 1995, 1996, and 1997 Canadian fall surveys to NAFO Divisions 2GHJ3KLMNO using a Campelen 1800 survey trawl. (All set standardized to 15 min. (.8 nm.) tows).

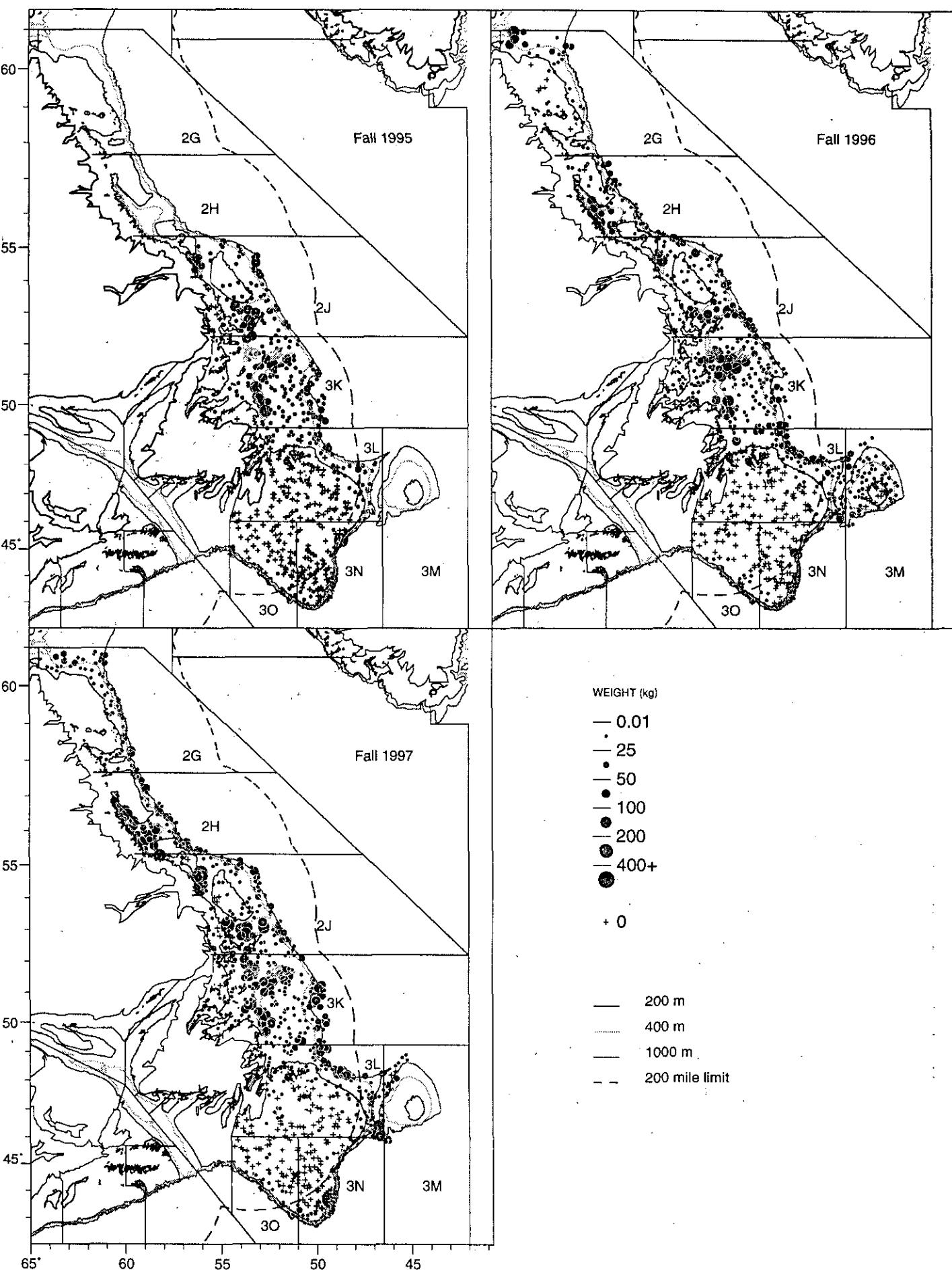


Fig. 3b. Distribution of Greenland Halibut catches from 1995, 1996, and 1997 Canadian fall surveys to NAFO Divisions 2GHJ3KLMNO using a Campelen 1800 survey trawl. (All set standardized to 15 min (8 nm) tows).

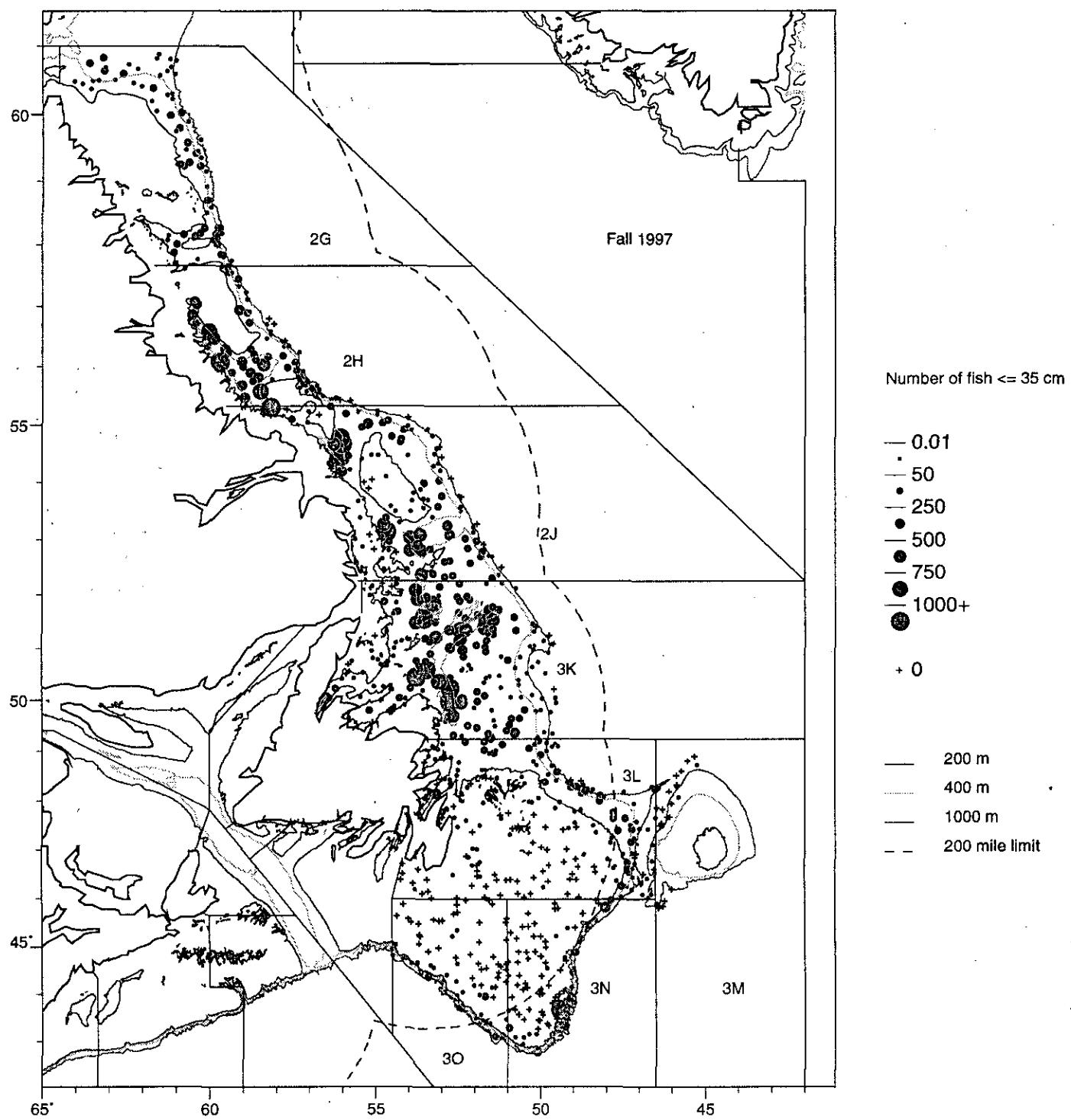


Fig. 4a. Distribution of Greenland Halibut catches from 1997 Canadian fall surveys to NAFO Divisions 2GHJ3KLMNO using a Campelen 1800 survey trawl. (All set standardized to 15 min. (.8 nm.) tows).

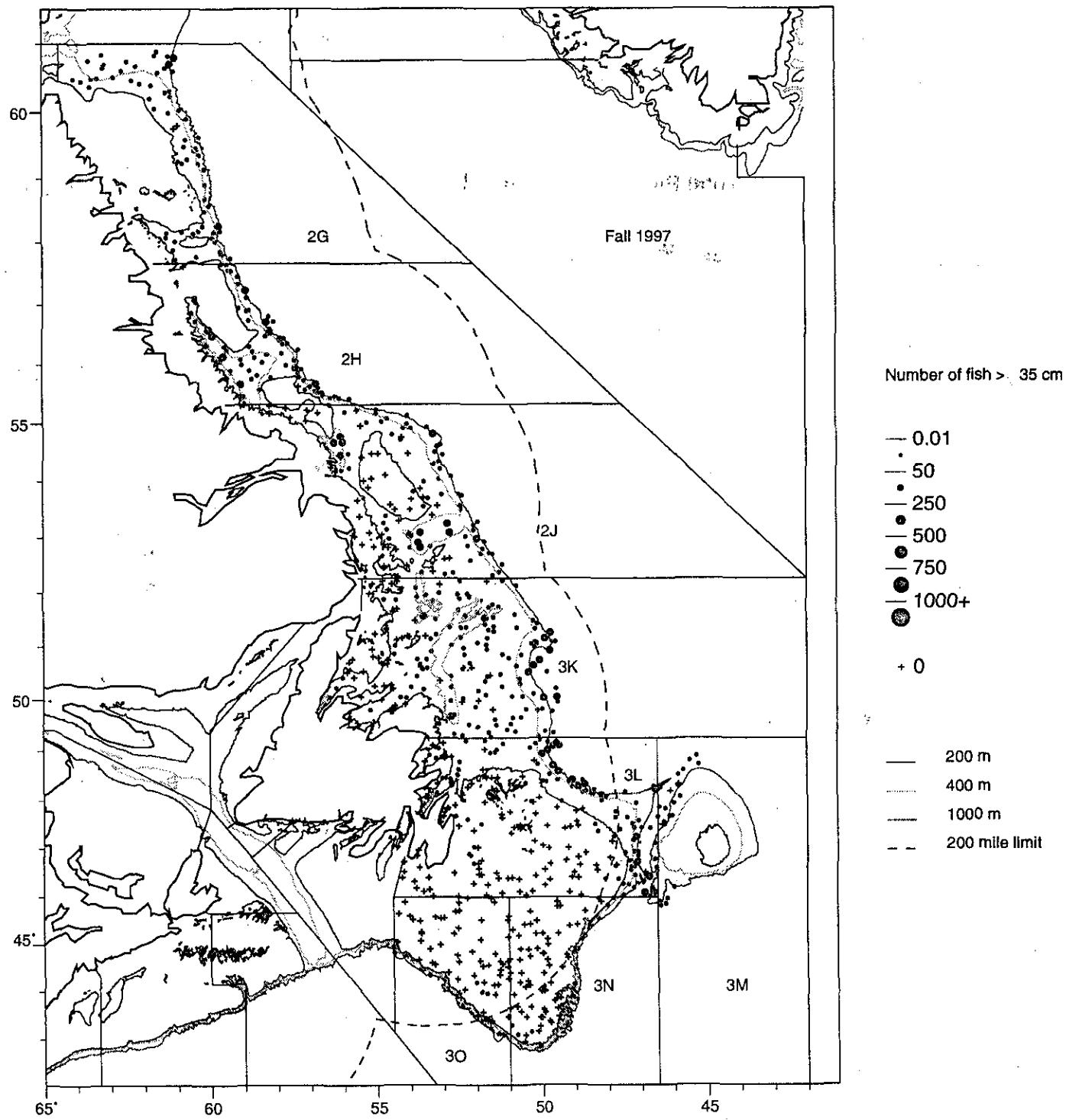


Fig. 4b. Distribution of Greenland Halibut catches from 1997 Canadian fall surveys to NAFO Divisions 2GHJ3KLMNO using a Campelen 1800 survey trawl. (All set standardized to 15 min. (.8 nm.) tows).

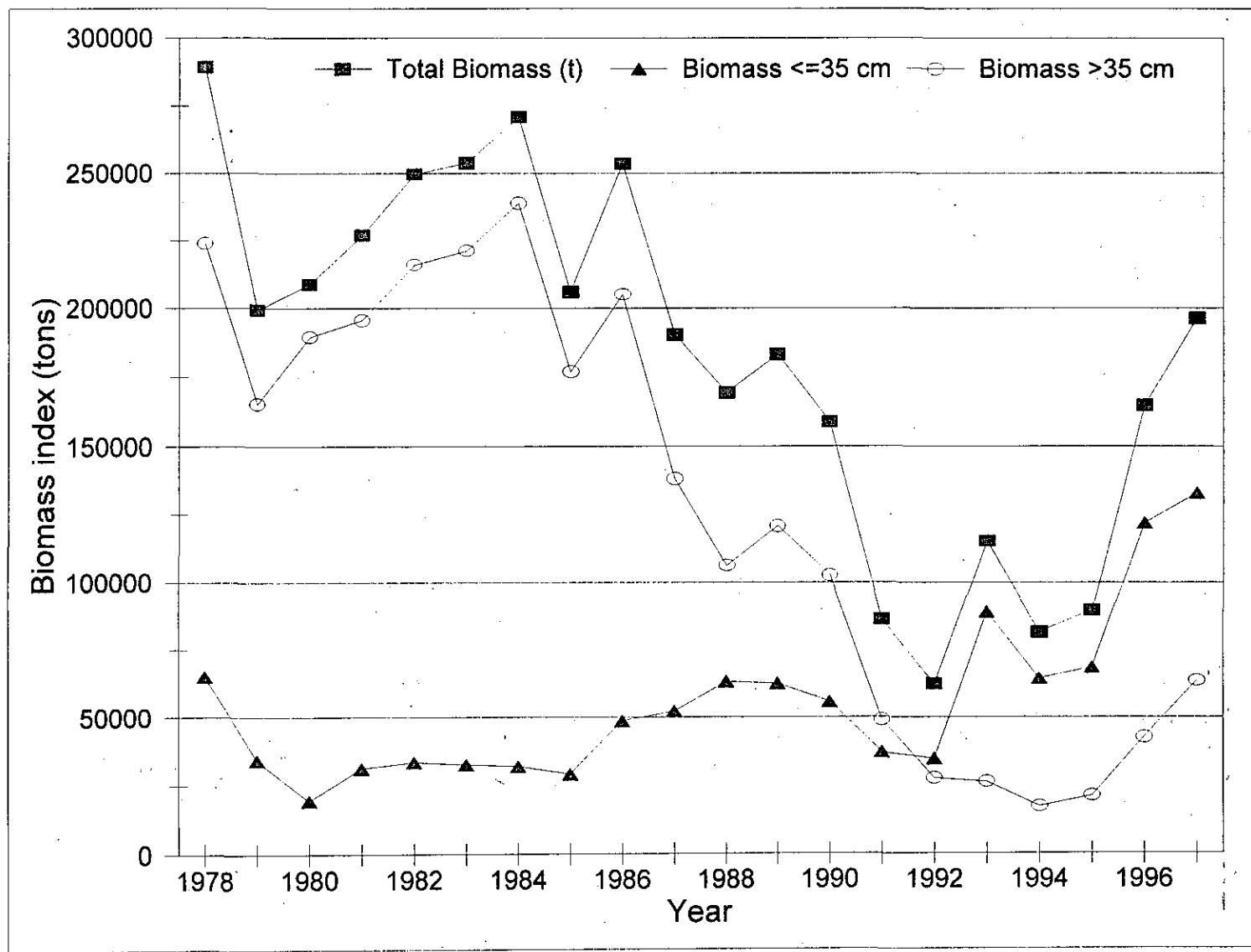


Fig. 5. Biomass index of *G. halibut* from fall surveys in Div. 2J3K from 1978-97, by size category. Biomass at length is generated from abundance at length and a length-weight relationship. All data expressed in Campelen trawl equivalents.

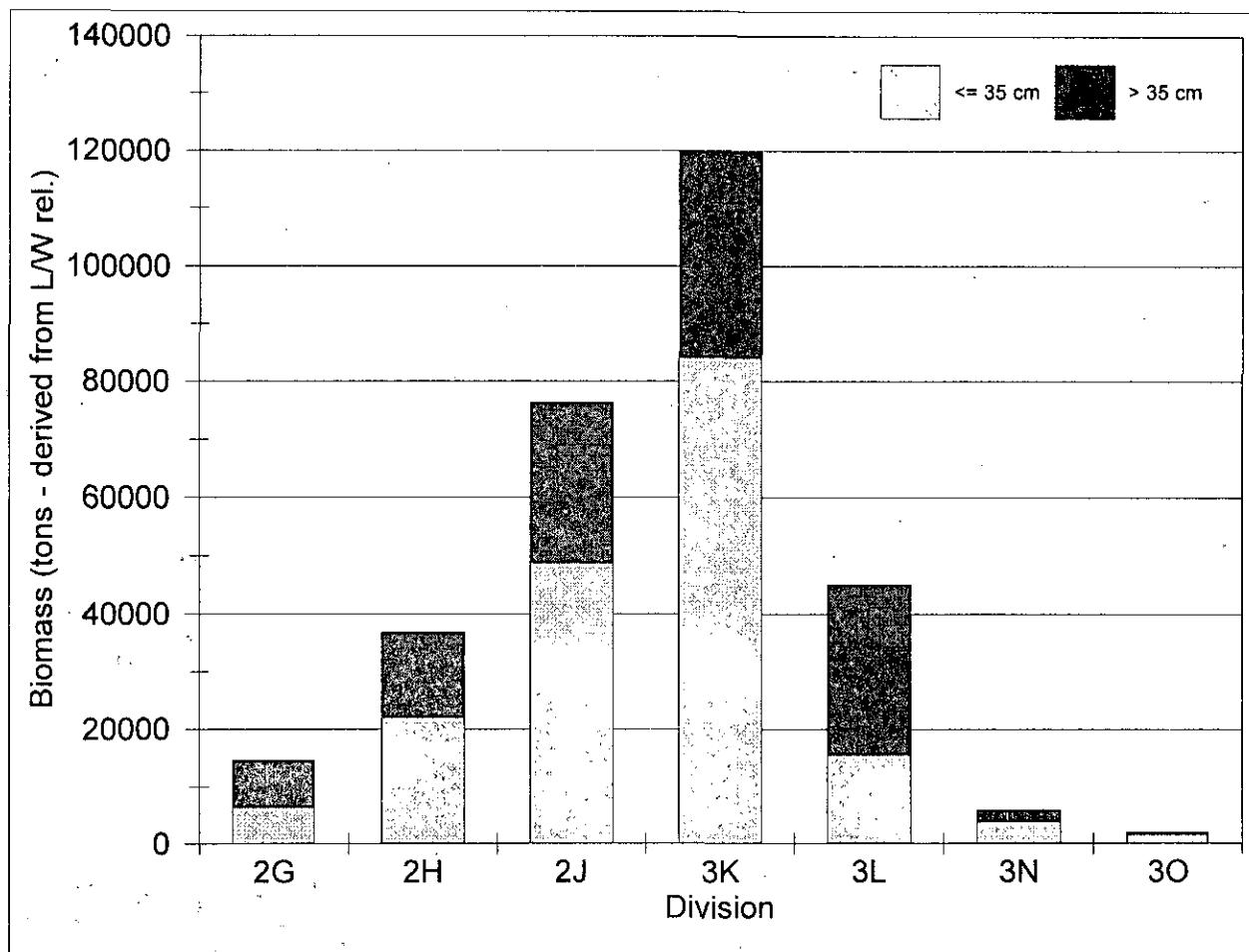


Fig 6. Biomass index of *G. halibut* from fall surveys in 1997, by size category. Biomass at length is generated from abundance at length and a length-weight relationship. All data expressed in Campelen trawl equivalents.

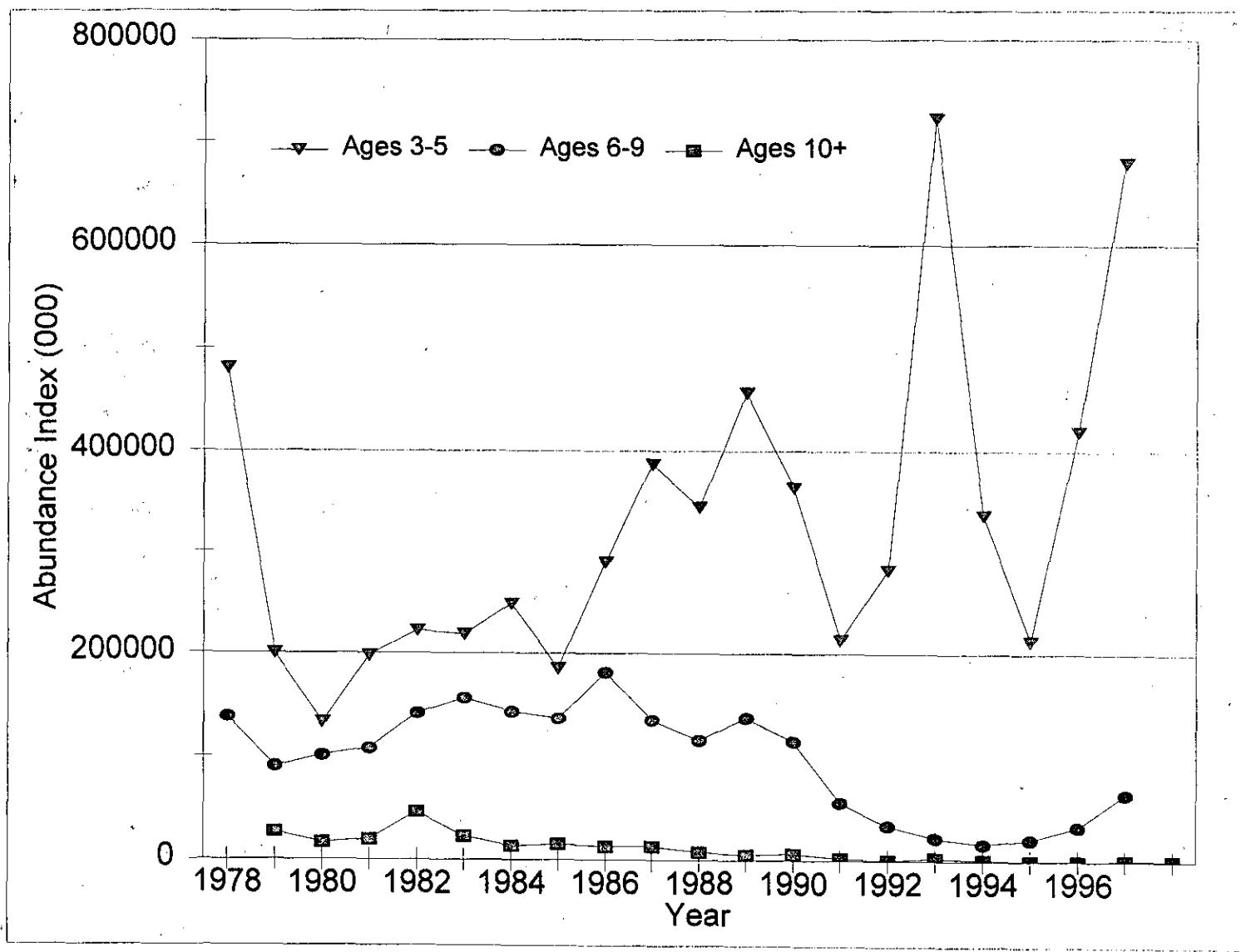


Fig. 7. Abundance at age from surveys in Div. 2J3K. All data in Campelen equivalents.

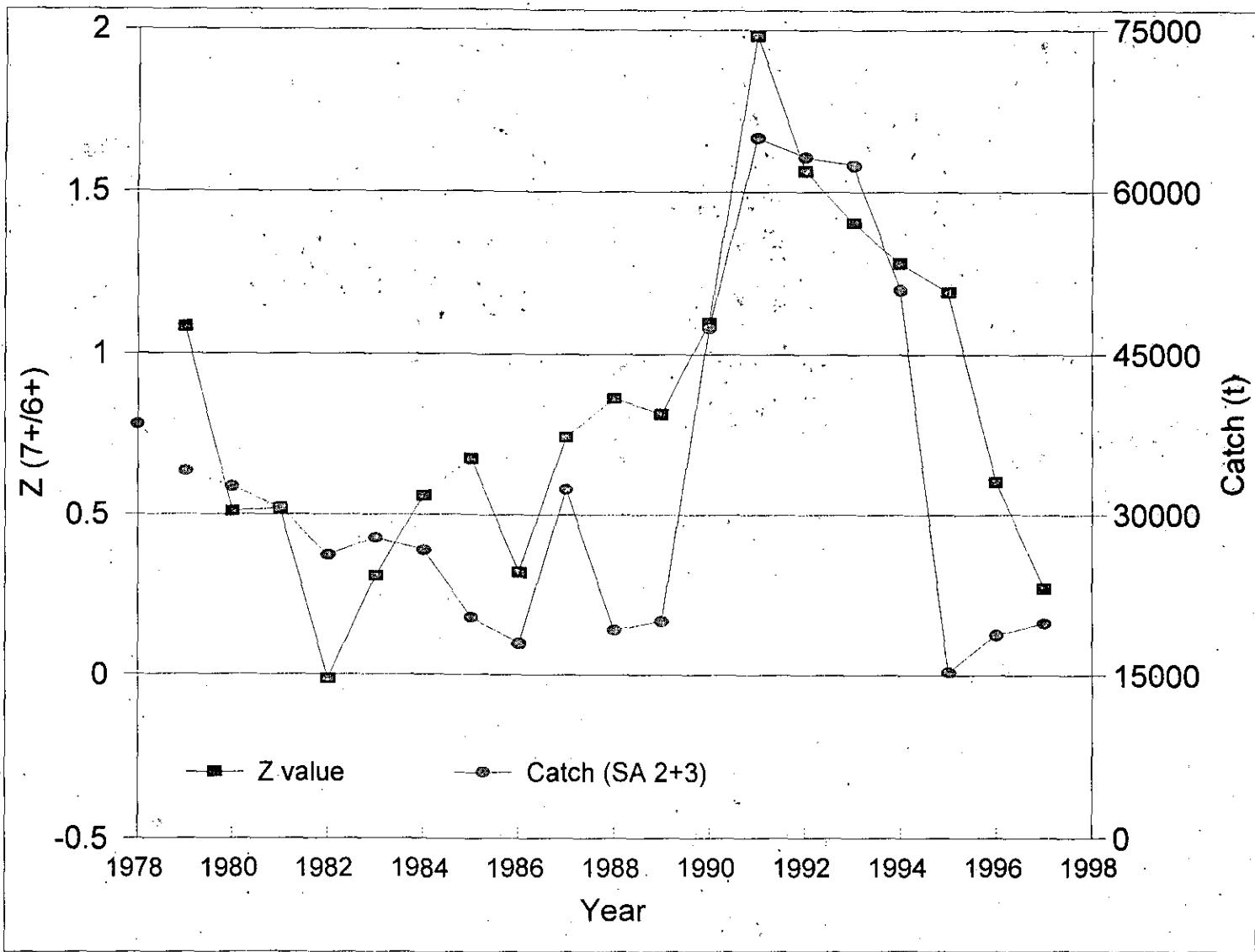


Fig. 8. Comparison of total mortality (Z) at ages 7+/6+ from surveys in Divs. 2J3K and total catch from the stock area (SA 2 + Div. 3KLMNO).