Northwest Atlantic Fisheries Organization

Serial No. N2893 NAFO SCR Doc. 97/59

SCIENTIFIC COUNCIL MEETING - JUNE 1997

A Stock Status Update for NAFO Divisions 2J+3KL Cod

by

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Introduction

The northern cod stock had declined to very low biomass levels by 1977 when Canada extended jurisdiction to 200 miles. This decline was primarily a result of heavy fishing by foreign fleets in the offshore during the 1960s and early 1970s, exacerbated by weak year classes in the late 1960s and early 1970s. Increasing fishing effort by Canadian trawlers in the offshore following extension of jurisdiction initially resulted in increasing catches. This expansion of the domestic offshore fishery coincided with the entry of the strong 1973-74 year classes to the fishable population and a strongly increasing trend in fish growth rates following low growth in the early 1970s. There was sufficient escapement over this period to allow the 3+ population biomass to rebuild from 1978 to 1984.

Spawner biomass increased to a peak in 1981 and then declined gradually. Increases in the proportion mature at younger ages and the strong year classes in the early 1980s kept the spawner stock from declining rapidly until the late 1980s. The 1976 and 1977 year classes were very weak and fish growth rates decreased in the early 1980s, so that the 3+ biomass began to decline after 1984. The 1978 to 1982 year classes were moderate to strong, but all experienced slow growth rates and were subject to increasing fishing mortality by Canadian effort in both the inshore and offshore. The 1983-85 year classes were very weak.

Although the 1986, and particularly the 1987 year classes initially appeared to be strong, abundance declined abruptly after the 1990 survey and very few fish from these year classes survived to reproduce. The mortality rate on these year-classes is higher than can be explained by estimated fishery removals alone. Body growth rates were particularly low from 1990 onwards. Fish became increasingly concentrated towards the edge of the shelf outside the 200 nautical mile boundary in an area known as the Nose of the Grand Bank over this period and were vulnerable to the offshore foreign fishery.

The stock had declined to exceptionally low levels by 1992 when a moratorium was imposed on directed commercial fishing. This moratorium remains in effect at the present time. The most recent assessment of this stock (Shelton et al. 1996) found no evidence of any stock recovery. The remaining fish appear to be concentrated in inshore areas, particularly the fjord like environments in some of the major bays.

Nominal catch

Nominal catches for this stock increased during the late 1950s and early 1960s and peaked at just over 800,000 t in 1968 (Table 1, Fig. 1). Catches declined rapidly thereafter and were at a low of 139,000 t in 1978. From 1982 to 1990 catches were above 200,000 t but declined to 172,000 t in 1991 before the moratorium on commercial fishing was declared in July of 1992. During the 1960s when the fishery was primarily by non-Canadian fleets (Fig. 2) most of the catches occurred in Div. 2J and 3L with 2J dominating (Fig. 3). Since extension of jurisdiction in 1977 catches have come mainly from Div. 3K and 3L (Fig. 3).

The fixed gear fishery maintained and even increased its catches over the 1980s to a peak of 117,000 t in 1990 (Table 2, Fig. 4), however not all these landings came from the inshore. Gillnet catches in the offshore, most notably on the Virgin Rocks (Div. 3L) increased rapidly in the late 1980s to a peak of 22,000 t in 1990 before declining (Shelton et al. 1996).

A recreational fishery together with by-catches accounted for 11,000 t in 1993. A limited (10 days) food fishery during August and September, together with by-catch, accounted for about 1,300 t of landings in 1994. In 1995 a sentinel fishery was introduced to continue to provide some data from commercial inshore fixed gear (Davis et al. 1996), however there was no recreational or food fishery. The sentinel survey continued in 1996 with 66 sites active over a 12 week period between June and December resulting in a catch of 397 t (Table 3). A food fishery was allowed in Divisions 2J3KL on two consecutive 3 day weekends, 20-22 September and 27-29 September. The purpose of this fishery was to allow Newfoundlanders to catch fish using feather or baited hooks for their own consumption. Fishers were allowed a maximum of 10 fish per day per individual to a maximum of 50 fish per boat. Landings were estimated to be 1,155 t. In addition to the sentinel fishery and the food fishery, there was a further 142 t taken as by-catch. The total catch for 1996 is estimated to be 1,694 t (Table 1).

Catch and weight at age

A summary of the sampling used to estimate the catch at age in 1996 is given in Table 4. A total of 184,500 fish were measured and 5,600 fish aged. Samples were relatively well distributed among divisions, gear types and months. Sampling is comparatively intense compared to the level prior to the moratorium when there was a substantial commercial catch

The age composition and mean length at age by gear is given in Table 5 and the total for all gears in Table 6. The following relationship was applied in deriving average weight at age:

$$\text{Log(weight)} = 3.0879 * \text{log(length)} - 5.2106.$$

Summing the products of total numbers and mean weights at age gives a catch of 1,498 t. This is 196 t less than the total catch given in Table 1 and Table 2. These differences need to be resolved by re-running the catch at age analysis accounting for all of the sentinel catch. In the mean time the total catch at age is approximated by multiplying up the numbers at age by a factor of 1.13 so that the sum of the products of numbers and weights at age in Table 6 is equal to the estimated catch in Table 1 (1,694 t).
The proportion of the catch numbers at age by the different gears in 1996 (Fig. 5) shows that for gillnets about 60% of the catch was age 6, 20% age 7 and about 10% age 5. The age composition for traps, longlines and handlines were comparatively similar to each other with age 4s, 5s and 6s predominating.

The catch numbers, average weights and biomass at age for the years 1962 to 1996 are presented in Tables 7 to 9. The catch numbers at age show that in both 1995 and 1996 the 1990 year class was most abundant in the catch comprising 36% and 32% respectively. In 1996 the 1991 year class comprised 27% of the catch and the 1992 year class 22% of the catch. Comparison of the sum of the products of numbers at age and mean weights at age in the catch and the total catch from Table 1 (Fig. 6) shows some discrepancies, but the proportion of calculated catch biomass to the catch in Table 1 indicates that the ratio is generally between 0.9 and 1.1 after 1966. The ratios for 1977 and 1992 suggest the greatest difference in these years for the more recent period. Explanations for the differences in these two years and in the pre-1966 data need to be considered.

A plot of the mean weigh at age data for 1972 to the present (Fig. 7) shows that although weights at age in the catch increased in the late 1970s they declined throughout the 1980s to low levels by the 1990s. There is some indication of an increase mean weights at age in the commercial catch after 1992. There are clearly problems in the estimates of mean weights at age for ages 8 and 9 in 1993 which need to be resolved.

Sentinel survey index

The sentinel survey has been operational since 1995 in NAFO Divisions 2J3KL. The 1996 survey was conducted from June 24 to December 31 with catch rate data being collected from 66 sites. Catch rates were higher in all divisions in 1996 over 1995 but not higher than those observed pre moratorium (Murphy et al. 1997). This increase in catch rate was made up primarily of fish with lengths >= 50 cm rather than an increase in the catch rate of small fish, suggesting that in 1996 existing fish in the population were more densely aggregated in the inshore area rather than there being any significant increase in recruitment.

Inshore surveys

A large concentration of spawning cod was found in Smith Sound, Trinity Bay (Div. 3L) in 1995. Hydroacoustic work in May 1995 suggested a biomass of around 17,000 t (Rose 1996). Samples in December 1995 showed that the fish were mainly aged 3 to 8 and in good condition. The survey of Trinity Bay was repeated and the Northwest and

Southeast arms were also surveyed during 15-26 April 1996 (Brattey and Porter 1997). A total of 52 transects totalling 44.85 n. miles were run in the survey area. Extensive biological sampling of cod was conducted, using an otter trawl, handlines and gillnets. Cod were generally large and of similar mean length in each stratum (54.7-56.2 cm). Average lengths and weights of cod sampled within each stratum were used to calculate target strengths and to convert acoustic integrated backscatter to cod biomass. Targets classified as cod were detected on 36 (69.2%0 of the transects. Average densities of cod on most transects were generally low,(<0.0001 fish/m^2), but relatively high densities (0.003-0.011 fish/m^2) were observed in three transects across deep (>200 m) water in the outer regions of Smith Sound. Total estimated biomass for the three areas combined was 171 t (CV=38.7%), with 90.4% coming from Smith Sound. The area surveyed was characterized by rough bottom and steep sides making it difficult to detect cod close to the bottom. Consequently, biomass for the surveyed area is probably underestimated. The results in conjunction with previous acoustic work on this area (Rose 1996) suggests that cod consistently spawn in the outer area of Smith Sound during April and it may be appropriate in future acoustic surveys to designate this area as a separate stratum and assign a higher level of sampling intensity to this area.

Pelagic juvenile cod survey

Pelagic juvenile fish surveys were carried out in August-September 1994-96 to provide an index of year class strength (Anderson and Dalley 1997). The abundance of pelagic juvenile cod decreased by a factor of eight from 1994 to 1996 (Fig. 8). This decline occurred first in the offshore in 1995 and occurred both inshore and offshore in 1996. Year class strength from these surveys predict that recruitment at age three for the 1996 year class will be extremely low. The observed decline in the abundance of pelagic juvenile cod coincided with the disappearance of spawning cod offshore. There is some evidence of declining abundance and reduced spawning of cod in Trinity Bay. The decline in abundance and geographical contraction in the range of pelagic juvenile cod is consistent with declining production associated with depensation and extremely low spawning population (Anderson and Dalley 1997).

Research vessel trawl survey data

Research vessel surveys have been conducted by Canada during the autumn in Div. 2J, 3K and 3L since 1977, 1978 and 1981 respectively. No survey was conducted in Div. 3L in 1984, however the results of the summer (August - September) survey have been used in assessments. The 1995 autumn survey continued into late January 1996. Spring surveys have been conducted by Canada in Div. 3L for the years 1971 to 1982 and 1985 to 1995. Surveys in Div. 2J3K were conducted by RV Gadus Atlantica (up to 1994) while those in Div. 3L by RV A.T. Cameron (1971-82) and RV Wilfred Templeman (1983-1995 for spring and 1983-1995 for autumn). The fall survey in Div. 2J3K in 1995 was conducted mainly by RV Teleost, although RV Templeman surveyed part of Div. 3K. In the autumn 1995 survey both the RV Teleost and RV Templeman used the Campelen 1800 trawl gear, replacing the Engels 145 high rise trawl gear. The selectivities of the two nets were tested through intensive comparative fishing experiments in 1995 and 1996 and their selectivities were found to be markedly different (Warren 1996, Warren et al. 1997). Conversion of Engels catches to Campelen equivalent catches is carried out in Stansbury (1996, 1997).

The survey stratification scheme is based on depth contours (Fig 9-11). The strata used in 1996 is similar to that used in 1995 except that 25 new strata have been added inshore of the 1995 survey in Divisions 3K and 3L to obtain an estimate of cod inshore of the standard survey area. These data are not used in the index for calibration of the SPA. Schemes for the allocation of sets among strata has varied considerably among years. Prior to 1988 set allocation was proportional to stratum area. In 1989 and 1990 an "adaptive design" was introduced in an attempt to minimize variance. However it was found that this method introduced a bias and additional set allocated by this method have been excluded. This method was replaced with a design in which set allocation is based on past observed stratum variance (Gagnon 1991) in 1991 to 1994, followed by a return to allocation based on stratum area in 1995. To account for incomplete coverage of strata in certain years, estimates of biomass and abundance for non-sampled strata were obtained using a multiplicative model. Because of apparent distributional changes in cod in recent years, the change in the stratification scheme in 1993 (Bishop 1994), and the change in vessel and trawl gear in 1995, this correction was last applied in 1991.

The distribution of cod in numbers per tow for all sets in the fall RV survey for all ages for 1993-1996 are plotted in Fig. 12. The data for 1993 and 1994 are unconverted Engels trawl catches, whereas those for 1995 and 1996 are for the Campelen trawl. The distribution by age for ages 1 to 4 are plotted in Fig. 13. The autumn time series of research vessel catches has been illustrated for 1981-1995 in numbers per standard tow (Shelton et al. 1996) and for 1984-1992 in weight (kg) per standard tow (Lilly 1994 1995). For the period 1981-1988 catches were wide-spread over the survey area. Commencing in 1989 the fish in Divisions 2J and 3K became increasingly concentrated toward the edge of the bank. By 1991, concentrations on Hamilton Bank and the plateau of Grand Bank disappeared, leaving fish in inner Hawke Saddle and in the saddles between Belle Isle Bank and Funk Island Bank and between Funk Island

Bank and Grand Bank. In 1992, only the concentration between Funk Island Bank and Grand Bank remained. This concentration was smaller in 1993 and disappeared in 1994 (Fig. 12). Catches were extremely small in 1994 but somewhat larger in 1995 and 1996 due to the ability of the Campelen trawl to catch small cod. The cod found in 1995 and 1996 were broadly distributed in moderate depths on the southern Labrador Shelf and the Northeast Newfoundland Shelf. Few cod were caught on Grand Bank. The 1996 survey revealed cod in some of the bays in Divisions 3K and 3L.

The cod catch at age in each set during the 1996 survey was determined by applying the appropriate Divisional age-length key to the length frequency of the catch in that set. The distribution at age is illustrated in Fig. 13. Age 1 cod were caught mainly on the inner part of the shelf, with largest catches occurring in a cluster off Cape Bauld and in various locations in the inshore from the Baie Verte Peninsula to Conception Bay. Age 2 cod had a more expanded distribution in the offshore compared with age 1 cod. Many of the large catches were on the slopes of the channels, the outer slopes of the banks, and in some of the inshore areas, most notably Trinity and Conception Bays and south of the Avalon Peninsula. Age 3 cod were caught on the outer slopes of Hamilton, Belle Isle and Funk Island Banks, in the southern Funk Island Deep, and in inshore strata in Trinity and Conception Bays and south of the Avalon Peninsula. Age 4 cod were caught in very low numbers, except in one set on the northern slope of Belle Isle Bank and several sets in inshore strata in Trinity and Conception Bays and south of the Avalon Peninsula. The very low abundance of young cod offshore in Division 3L, especially along the northeastern slope, is striking.

Cod abundance and biomass for all surveys from 1983-1996 are presented in Campelen equivalent units. Data collected by the Engels trawl has been converted following the method described in Stansbury (1996, 1997). Both fall and spring survey estimates are presented.

Fall survey estimates are given in Tables 10 to 20. Cod abundance and biomass estimates for NAFO division 2J 1983-1992 are given in Tables 10 and 11. Abundance and biomass estimates for NAFO division 2J for the revised stratification scheme 1993 to 1996 are given in Table 12. The revision of the stratification scheme is described in detail in Bishop (1994). Abundance and biomass estimates for NAFO division 3K for 1983-1992 are given in Tables 13 and 14. Abundance and biomass estimates for the revised stratification scheme for 1993-96 for NAFO division 3K are given in Table 15. Abundance and biomass estimates for NAFO division 3L from fall surveys 1983-1997 depths <= 200 fathoms are given in Tables 16 and 17. Cod abundance and biomass for NAFO Division 3L 1983-1997 for depths > 200 fathoms are given in Table 18. Fall 1996 abundance and biomass estimates for inshore strata in Divisions 3K and 3L are compared with totals for offshore and all strata fished in Table 19. A summary of fall survey abundance and biomass estimates for all strata fished for 1983 to 1996 is given in Table 20.

The spring survey estimates are in Tables 21 to 23. Cod abundance and biomass estimates for Division 3L spring surveys for 1985 to 1996 for depths <= 200 fathoms are given in Tables 21 and 22. Abundance and biomass estimates for Division 3L spring surveys for 1985-1996 depths for depths > 200 fathoms are given in Table 23 together with the total abundance and biomass for all Division 3L strata surveyed in spring.

Total biomass and abundance from the fall and the spring research vessel surveys are plotted in Figs. 14 and 15. Biomass and abundance declined abruptly after the fall of 1989 and spring of 1990 to very low levels by 1992. The stock has remained at very low levels in subsequent surveys, even with the addition of the new inshore strata.

Analysis

Sequential population analysis

A formulation of ADAPT, the adaptive framework for sequential population analysis (Gavaris 1988) was applied to the fall RV mean numbers at age index (Table 24a) and catch at age (Table 24b). For convenience, and probably no loss in accuracy, the survey index for 2 to 9 in the fall in year t-1 were moved forward in time to become the index for ages 3 to 10 on January 1 in year t.

Parameters estimated in the ADAPT were:

Population numbers

$N_{i,t}$ where i = 3 to 10, t = 1997,

and Catchabilities

K_i where i=3 to 10.

The following assumptions were made:

(i) natural mortality assumed to be 0.20,
(ii) fishing mortality on the oldest age (10) set to be equal to the mean for ages 7 to 9,
(iii) no error in the catch numbers at age.

Input data were:

Catch numbers at age
$C_{i,t}$ where i = 3 to 10 and t = 1962 to 1996

and Research Vessel survey estimates of mean numbers at age
$RV_{i,t}$ where i = 3 to 10 and t = 1984 to 1997.

The objective function which was minimized was
$\Sigma_{i,t} (\ln(RV_{i,t} - \ln(K_i N_{i,t})^2$.

The estimates of numbers at age at the beginning of the year from the ADAPT are given in Table 25. The associated estimates of F are given in Table 26 and the age specific residuals from the observed and predicted RV estimates are given in Table 27. The parameter estimates and CVs are given in Table 28. Estimated beginning of year 3+ population size is plotted in Fig. 16 together with the RV index used to calibrate the ADAPT, and the estimated F values are plotted in Fig. 17. The residuals from the ADAPT fit are plotted in Fig. 18. The ADAPT estimates of numbers at age 3 are plotted against the year in which they were born in Fig. 19. The estimates of recruitment show very low values after 1988. The estimate for the 1986 year class is shown to be somewhat higher than that for the 1987 year class although in the survey data the 1987 year class was initially the stronger of the two.

It is clear from the residual pattern (Fig. 18) that the model has considerable difficulty fitting the RV index, given the catch at age data. This is caused by the abrupt decline in the RV index after 1990. The Fs estimated for this period are extremely high (Fig. 17), but even so the modeled population is unable to decline at the rate indicated by the index. It has been estimated (unpublished analysis) that the residual pattern could be removed by including an additional catch of about 400,000 t in both 1991 and 1992 and a catch of about 150,000 t in 1993, taken primarily from the 1986 and 1987 year classes These year classes initially appeared to be very strong in the survey, but disappeared very rapidly at about this time.

Projection under F0.1

A projection was carried out to evaluate an F0.1 control rule applied in 1998, assuming that the 1997 catch would be 2,000 t with the same partial recruitment as the 1991 catch (Table 29). The partial recruitment applied in 1998 was also that for 1991, the last year of a full fishery. Geometric mean recruitment for 1994-96 was used for the number of age 3 fish in both 1997 and 1998. Weights at age were those estimated from the samples of catches in 1996. For the assumed partial recruitment and mean weights at age F0.1=0.384, (Fmax=0.729) corresponding to a 1998 catch of only 1,321 t. The assumed 1987 catch of 2,000 t would be about twice F0.1. Clearly, at the present estimated very low stock size even quite small removals can generate large Fs.

Maturity at age

The observed proportions mature at age and length for female and male cod from 1982 to 1997 from the survey are given in Tables 30-33 together with the parameters for a probit model with a logit function, the estimated A50 and L50 and the upper and lower 95% confidence intervals. The model estimates of proportions mature at age for 1982 to 1997 are given in Table 34 and illustrated in Fig. 20. Estimated proportions mature at ages 5 and 6 increased dramatically from 1986 onwards, but have dropped considerably in the most recent year.

Spawner stock and recruitment

Female spawner biomass was obtained by assuming a ratio 1:1 male to female from the product of the weights at age, proportion mature at age and numbers at age. Recruitment is plotted against female spawner stock biomass in Fig. 21. The plot illustrates the dramatic decline in both recruitment and spawner biomass since the early 1960s, some cyclical variability at a spawner biomass of less than 400,000 t from 1973 to 1981 and then a collapse in recruitment followed by a collapse in spawner biomass.

Survey lengths and weights at age

Mean weights at age for cod caught in the commercial fishery declined during the 1980s and early 1990s after peaking in the late 1970s or early 1980s. The sampling during autumn bottom-trawl surveys (Lilly 1997) illustrates that the changes varied with Division; there was a strong decline in Division 2J, a lesser decline in Division 3K, and little or no decline in Division 3L (Figs. 22, 23). These Divisional differences are more apparent in Fig. 24, which focuses on changes in mean lengths and weights of cod of ages 4 and 6. Superimposed on the long-term decline are periods of relatively quicker or slower growth associated with changes in water temperature (Shelton and Lilly 1995; Shelton et al. 1996). The trend toward very low mean lengths and weights at age in the early 1990s appears to have been reversed, but sample sizes at ages greater than age 4 have been very small in recent years, so the accuracy of these estimates is poor.

Population numbers at length

Population numbers at length, calculated by areal expansion of the stratified mean catch at length per tow, are illustrated for 1995 and 1996 in Fig. 25. There were very few cod longer than 50 cm in either year. A strong mode at 19 cm in 1995 in Divisions 2J and 3K moved to 28-31 cm in 1996. This mode was very weak in Division 3L. New strata were fished in the inshore in Divisions 3K and 3L in 1996. Very few cod were caught in the inshore strata in Division 3K (Fig. 26). The population in the inshore strata of Division 3L was similar in total numbers to the population in the offshore, but was dominated by small cod (Fig. 26).

Summary

The 1996 status of the Div. 2J3KL cod stock is updated based on an additional year of data from the research vessel bottom trawl survey, sentinel survey, inshore acoustic surveys and prerecruit surveys. The research vessel survey continues to show an extremely low abundance of cod throughout the survey area. Sentinel catch rates were higher in 1996 than 1995 but not higher than those observed pre-moratorium (Murphy et al. 1997) .

The 1990 year class has been noticeable in several data sets in the inshore over the last 5 years. However, this year class has been rare offshore.

An acoustic survey in Trinity Bay in 1996 suggests that the aggregation of fish is much smaller than it was in 1995.

The prerecruit indices indicate that all year classes after 1994 are very low. Initial indications are that the 1996 year class may be exceptionally weak.

There is no indication to suggest that the 2J3KL cod stock has begun to recover. Instead it is possible, given the available data, that the biomass is continuing to decline.

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Table 1. Historical catches (t) of cod from NAFO Divisions 2J3KL for the period 1959-96.

	2J				3K				3L				2J3KL			
	Offshore mobile gear		Fixed gear		Offshore mobile gear		Fixed gear		Offshore mobile gear		Fixed gear					
Year	Can.	Other	Can.	Total	Can.	Other	Can.	Total	Can.	Other	Can.	Total	Total Canada	Total Other	Total	TAC
1959	0	46372	17533	63905	0	97678	56264	153942	4515	51515	85695	141725	164007	195565	359572	
1960	1	164123	15418	179542	53	74999	47676	122728	7355	63985	94192	165532	164695	303107	467802	
1961	1	243144	17545	260690	0	64023	31159	95182	4675	73899	70659	149233	124039	381066	505105	
1962	0	226841	23424	250265	0	47015	42816	89831	4383	90276	72271	166930	142894	364132	507026	
1963	1	197868	23767	221636	0	79331	47486	126817	4446	83015	73295	160756	148995	360214	509209	
1964	13	197359	14787	212159	0	121423	40735	162158	10158	142370	75806	228334	141499	461152	602651	
1965	0	246650	25117	271767	21	50097	26467	76585	7353	130387	58943	196683	117901	427134	545035	
1966	39	226244	22645	248928	13	58907	32208	91128	8253	120206	55990	184449	119148	405357	524505	
1967	28	217255	27721	245004	114	78687	24905	103706	13478	200343	49233	263054	115479	496285	611764	
1968	4650	355108	12937	372695	1849	119778	40768	162395	15784	211808	47332	274924	123320	686694	810014	
1969	30	405231	4328	409589	56	80949	24923	105928	18255	151945	67973	238173	115565	638125	753690	
1970	0	212961	1963	214924	92	78274	21512	99878	14471	137840	53113	205424	91151	429075	520226	
1971	0	154700	3313	158013	31	61506	21111	82648	11976	148766	38115	198857	74546	364972	439518	
1972	0	149435	1725	151160	7	133369	14054	147430	4380	109052	46273	159705	66439	391856	458295	
1973	1123	52985	3619	57727	108	159653	13190	172951	1258	97734	24839	123831	44137	310372	354509	666000
1974	0	119463	1804	121267	19	149189	10747	159955	880	67918	22630	91428	36080	336570	372650	657000
1975	410	78578	3000	81988	189	112678	15518	128385	670	53770	22695	77135	42482	245026	287508	554000
1976	94	30691	3851	34636	771	79540	20879	101190	2187	40998	35209	78394	62991	151229	214220	300000
1977	525	39584	3523	43632	1051	26776	28818	56645	5362	26799	40282	72443	79561	93159	172720	160000
1978	4682	17546	6638	28866	7027	6373	29623	43023	9213	12263	45194	66670	102377	36182	138559	135000
1979	9194	6537	8445	24176	21572	16890	27025	65487	14184	12693	50359	77236	130779	36120	166899	180000
1980	13592	7437	17210	38239	21920	6830	37015	65765	15523	13963	42298	71784	147558	28230	175788	180000
1981	22125	4760	14251	41136	23112	3847	23002	49961	21754	15070	42827	79651	147071	23677	170748	200000
1982	58384	8923	14429	81736	8881	4074	42141	55096	27181	9271	56490	92942	207506	22268	229774	230000
1983	37276	4158	10748	52182	31621	2815	40683	75119	39123	10920	55001	105044	214452	17893	232345	260000
1984	9231	2782	13150	25163	48114	11059	35143	94316	47668	15973	49351	112992	202657	29814	232471	266000
1985	1466	78	10211	11755	68880	12945	30368	112193	36863	31176	39306	107345	187094	44199	231293	266000
1986	5734	7859	12916	26509	62086	5781	28384	96251	57805	53946	32202	143953	199127	67586	266713	266000
1987	39344	3999	16022	59365	39686	6160	27442	73288	44612	25916	36743	107271	203849	36075	239924	256000
1988	41468	9	17112	58589	40260	50	33820	74130	57805	26748	51405	135958	241870	26807	268677	266000
1989	33626	1003	23304	57933	37350	1179	20711	59240	40958	36621	59238	136817	215187	38803	253990	235000
1990	17883	183	14505	32571	26920	504	27516	54940	31187	25488	75266	131941	193277	26175	219452	199262
1991	621	82	2214	2917	30112	311	13332	43755	30264	49660	45416	125340	121959	50053	172012	190000
1992	0	0	18	18	584	273	884	1741	13627	14610	10960	39197	26073	14883	40956	0
1993 [1]	0	0	13	13	0	0	541	541	2	2425	8411	10838	8967	2425	11392	0
1994 [1]	0	0	9	9	0	0	368	368	0	50	936	986	1313	50	1363 [8]	0
1995 [1]	0	0	0	0	0	0	94	94	0	0	237	237	331	0	331 [9]	0
1996 [1]	0	0	3	3	0	0	853	853	1	0	734	735	1592	0	1694 [10]	0

[1] Provisional catches. [2] Includes French catch and an estimate of foreign catch by Canadian surveillance. [3] Figure is 4000 t less than Canadian statistics as this amount is concidered 3NO catch misreported as 3L.
[4] Derived from reported catch and Canadian surveillance estimate for foreign catch. [5] Includes 5000 t catch from the recreational fishery after the moritoriam was decla [6] Canadian surveillance estimates of foreign catch .
[7] Includes a 5053 t catch estimated for the recreational fishery additional to that recorded by Canadian statistics. [8] 1300 t is from the food fishery the remainder is by catch
[9] Catch includes 163 t caught in the sentinel survey and 168 t caught as bycatch.
[10] 1996 Catch is comprised of bycatch 142 t, sentinel survey catch of 397 t and a food fishery catch of 1155 t giving a total of 1,694 t. However 103 t of sentinel catch remains to be allocated by division and gear.

Table 2. Fixed gear cod catches (t) by division and gear type in NAFO Divisions 2J, 3K, and 3L from 1975 - 1996.

	2J					3K					3L					2J3KL
Year	Trap	GN	LL	HL	Total	TRAP	GN	LL	HL	Total	TRAP	GN	LL	HL	Total	Total
1975	642	2304	0	54	3000	4662	8645	565	1646	15518	10390	7552	1641	3112	22695	41213
1976	1022	2787	6	36	3851	7056	10666	718	2439	20879	18404	9066	2904	4835	35209	59939
1977	1285	2076	37	125	3523	11501	11611	1294	4412	28818	20988	8852	3591	6851	40282	72623
1978	2872	3376	55	335	6638	11329	11445	3647	3202	29623	23218	9023	5114	7839	45194	81455
1979	1333	5663	175	1274	8445	3532	11474	8414	3605	27025	20785	13488	7022	9064	50359	85829
1980	4679	11414	204	913	17210	12732	13549	8059	2675	37015	12871	11231	9394	8802	42298	96523
1981	3893	10105	72	181	14251	3952	10679	6360	2011	23002	10177	13579	11425	7646	42827	80080
1982	4464	9121	114	730	14429	16415	17571	6101	2054	42141	24248	20295	5704	6243	56490	113060
1983	3870	4854	842	1182	10748	10490	18305	2560	9328	40683	25690	16446	3834	9031	55001	106432
1984	5618	6116	379	1037	13150	9957	14362	2499	8325	35143	23103	14985	3824	7439	49351	97644
1985	4973	2992	252	1994	10211	13310	8082	2352	6624	30368	21594	8760	3245	5707	39306	79885
1986	4373	7804	109	630	12916	14555	7626	1555	4648	28384	15669	9865	2492	4176	32202	73502
1987	5158	9228	218	1418	16022	11278	10223	1590	4351	27442	11370	17419	3338	4616	36743	80207
1988	5907	9183	272	1750	17112	16261	11898	935	4726	33820	22148	18576	4004	6677	51405	102337
1989	6713	14846	290	1455	23304	8189	7921	700	3901	20711	23964	22231	4676	8367	59238	103253
1990	3616	9364	653	872	14505	11201	7726	3838	4751	27516	32158	28936	4545	9627	75266	117287
1991	1016	271	93	834	2214	7696	1384	1851	2401	13332	26524	11696 [2]	1247	5949	45416	[2] 60962
1992	0	0	2	16	18	27	103	9	745	884	1173	1131	16	8640 [3]	10960	[3] 11862
1993 [1]	0	0	1	12	13	3	37	9	492	541	11	93	80	8227 [3]	8411	[3] 8965
1994 [1]	0	0	0	9	9	0	8	0	359	367	6	38	22	870	936	1312
1995 [1]	<1	<1	0	0	0	13	52	28	2	95	12	176	33	16	237	332
1996 [1]	0	0	0	3	3	25	132	17	679	854	18	219	15	481	733	[4] 1694

[1] Provisional catches.

[2] Catch is 4000 (t) less than Canadian statistics as this amount is concidered 3NO gillnet catch misreported in 3L.

[3] Estimate for recreational fishery have been reported as 3L. Handline.

[4] 1996 Catch is comprised of bycatch 142 (t) sentinel survey catch of 294 (t) and a food fishery catch of 1155(t).
An amount of 103 t must still be allocated by gear type and division from the sentinel catches.

Table 3. Divisions 2J3KL cod landings from bycatch, sentinel survey and food fisheries in 1996 by gear, month and quarter.

	bycatch	food	Bycatch				food	bycatch					food	
Month	OT	Handline	Gillnet	Trap	Handline	Other	Handline	Ot	Gillnet	Longline	Handline	Other	Handline	total
JAN														0
FEB														0
MAR														0
APR									1.536					1.536
MAY			0.834						1.944					2.778
JUN			3.058	0.483					13.487					17.028
JUL			5.616	4.283	0		0		48.328			0.003		58.23
AUG	0.028		45.986	0.059				0.454	8.869					55.396
SEP		2.59	1.925	0.416	0.542		677.674	0.357	2.226				474.617	1160.347
OCT			0.075						1.198	0.528				1.801
NOV			0.005											0.005
DEC			0.122											0.122
TOTAL	0.028	2.59	57.499	5.241	0.542	0	677.674	0.811	77.588	0.528	0	0.003	474.617	1297.121

	2J				3K				3L					
	Sentinel				Sentinel				Sentinel				Sentinel	2J3KL
Month	Gillnet	Trap	LL	HL	Gillnet	Longline	Handline	Trap	Gillnet	Longline	Handline	Trap	Total	Total
JAN													0	0
FEB													0	0
MAR													0	0
APR													0	1.536
MAY													0	2.778
JUN					2.059			1.524	5.985			0.829	10.397	27.425
JUL	0.006		0.017	0.025	26.827		0	15.248	56.138		1.809	14.631	114.701	172.931
AUG	0.027	0.361		0.094	25.422	1.289		2.187	46.456	2.823	2.132	2.928	83.719	139.115
SEP	0.149	0.002	0.037	0.066	7.711	12.686		1.046	23.512	6.773	2.741		54.723	1215.07
OCT	0.071		0.024		5.537	3.243	0.219	0.172	9.246	4.852	0.142		23.506	25.307
NOV					7.052		0.195		0.104				7.351	7.356
DEC													0	0.122
TOTAL	0.253	0.363	0.078	0.185	74.608	17.218	0.414	20.177	141.441	14.448	6.824	18.388	294.397	1591.518

Total catch by quarter month and gear

		2J					3K					3L				
QRT	Month	OT	Gillnet	Trap	LL	HL	OT	Gillnet	Trap	LL	HL	OT	Gillnet	Trap	LL	HL
1	JAN	0			0	0		0	0	0	0	0	0	0	0	0
	FEB	0			0	0		0	0	0	0	0	0	0	0	0
2	MAR	0			0	0		0	0	0	0	0	0	0	0	0
	APR	0			0	0		0	0	0	0	0	1.536	0	0	0
	MAY	0			0	0		0.834	0	0	0	0	1.944	0	0	0
3	JUN	0			0	0		5.117	2.007	0	0	0	19.472	0.829	0	0
	JUL	0	0.006		0.017	0.025		32.443	19.531		0	0	104.466	14.631	0	1.809
	AUG	0.028	0.027	0.361		0.094		71.408	2.246	1.289	0	0.454	55.325	2.928	2.823	2.132
4	SEP	0	0.149	0.002		2.656		9.636	1.462	12.686	678.216	0.357	25.738	0	6.773	477.358
	OCT	0	0.071		0.037	0		5.612	0.172	3.243	0.219	0	10.444	0	5.38	0.142
	NOV	0			0	0		7.057	0	0	0.195	0	0.104	0	0	0
	DEC	0			0	0		0.122	0	0	0	0	0	0	0	0
	TOTAL	0.028	0.253	0.363	0.054	2.775	0	132.229	25.418	17.218	678.63	0.811	219.029	18.388	14.976	481.441

QRT	Month	OT	Gillnet	Trap	LL	HL	OT	Gillnet	Trap	LL	HL	OT	Gillnet	Trap	LL	HL	
1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2		0	0	0	0	0	0	0.834	0	0	0	0	3.48	0	0	0	
3		0.028	0.033	0.361	0.017	0.119	0	108.968	23.784	1.289	0	0.454	179.263	18.388	2.823	3.941	
4		0	0.22	0.002	0.037	2.656	0	22.427	1.634	15.929	678.63	0.357	36.286	0	12.153	477.5	
TOTAL		0.028	0.253	0.363	0.054	2.775	0	132.229	25.418	17.218	678.63	0.811	219.029	18.388	14.976	481.441	1694

Note that 103 t must still be allocated for the sentinel catch by gear, month and division.

Table 4. Sampling used to estimate cod catch at age for Divisions 2J3KL in 1996.

Division	Gear	Month	No. measured	Quarter	No. aged	Sample wt (t)	Catch wt (t)
2J	ST	1	2351			0.132	
		2	112			0.014	
		3	6345	QT1	99	0.565	
		4	22			0.002	
	TRAP	8	429	QT3	25	0.361	0.361
		9	3			0.002	0.002
	GN	7	3			0.006	
		8	16	QT3	12	0.027	0.033
		9	127			0.149	
		10	118	QT4	71	0.071	0.22
	LL	7	29	QT3		0.017	0.017
		9	52		1	0.038	
		10	23	QT4		0.024	0.062
	HL	7	18			0.008	
		8	203	QT3	59	0.094	0.102
		9	1028	QT4	96	0.991	2.762
2J			10879		363	2.501	
3K	TRAP	6	1286			0.63	
		7	12287	QT3	251	8.092	
		8	1647			0.358	
		9	822	QT4	62	0.764	15.085
		10	110				
	GN	6	1055			1.028	
		7	13549			16.597	
		8	12187	QT3	755	14.341	
		9	3363			3.532	
		10	2348	QT4	306	1.472	
		11	4215			3.327	97.918
	LL	8	1064	QT3	84	0.848	
		9	9699	QT4	339	6.001	
		10	2808			1.053	7.902
	HL	9	5303			8.214	
		10	113			0.219	
		11	116	QT4	215	0.195	678.63
3K			71972		2012	66.671	
3L	TRAP	6	742			0.829	
		7	11118	QT3	474	14.631	
		8	2479			2.928	18.388
	GN	6	2691			5.985	
		7	26331			56.138	
		8	21014	QT3	1190	46.456	
		9	10048			23.512	
		10	3851	QT4	560	9.246	
		11	40			0.104	219.029
	LL	8	1606			2.823	
		9	4506	QT4	176	6.773	
		10	3400			4.852	14.976
	HL	7	830	QT3	96	1.809	
		8	1076			2.132	
		9	11805			10.995	
		10	111	QT4	745	0.142	481.441
3L			101648		3241	189.355	
2J3KL			184499		5616	258.527	1694

Note, the catch does not add up to the 1,694 t in Tables 1-3 and does not include 103 t of sentinel catches.

Table 5. Estimated average weight (kg), length (cm) number, variance coffecient and of variation for the 1996 catch at age by gear for Divisions 2J3KL cod in 1996.

Cod trap

Age	Weight	Length	Number	Variance	CV
1	0.000	0.000	0.000	0.000	0.000
2	0.181	28.000	0.002	0.000	0.000
3	0.544	39.661	1.721	0.041	0.118
4	0.774	44.482	7.167	0.156	0.055
5	1.152	50.477	7.635	0.233	0.063
6	1.728	57.484	7.057	0.179	0.060
7	2.260	62.525	1.646	0.045	0.128
8	2.243	63.783	0.489	0.020	0.285
9	3.502	72.681	0.108	0.001	0.290
10	4.399	78.192	0.021	<0.001	0.481
11	4.457	79.000	0.004	<0.001	1.013
12	3.955	76.000	0.006	<0.001	1.006
13	7.624	94.000	0.001	<0.001	1.415

Long line

Age	Weight	Length	Number	Variance	CV
1	0.000	0.000	0.000	0.000	0.000
2	0.326	33.593	0.292	0.004	0.211
3	0.589	40.667	2.420	0.076	0.114
4	0.878	46.214	4.893	0.142	0.077
5	1.319	52.710	4.071	0.110	0.082
6	1.996	60.470	2.713	0.069	0.097
7	2.651	66.205	1.558	0.051	0.146
8	3.189	70.562	0.337	0.016	0.381
9	4.951	81.321	0.045	0.000	0.423
10	3.685	74.221	0.067	0.002	0.728
11	5.769	85.650	0.022	0.000	0.640
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000

Hand line

Age	Weight	Length	Number	Variance	CV
1	0.000	0.000	0.000	0.000	0.000
2	0.474	37.447	0.352	0.086	0.832
3	0.744	43.904	30.500	12.533	0.116
4	0.995	48.236	195.077	189.427	0.071
5	1.277	52.219	236.125	285.974	0.072
6	1.830	58.685	207.263	214.051	0.071
7	2.396	64.026	76.554	67.382	0.107
8	2.871	67.902	10.900	9.648	0.285
9	3.342	71.331	2.913	1.226	0.380
10	3.001	69.391	2.396	1.762	0.554
11	5.589	85.000	0.002	<0.001	0.000
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000

Gillnet

Age	Weight	Length	Number	Variance	CV
1	0.000	0.000	0.000	0.000	0.000
2	0.243	30.630	0.023	0.000	0.245
3	0.566	40.242	0.806	0.006	0.097
4	1.092	49.279	2.399	0.075	0.114
5	1.698	57.503	14.286	1.004	0.070
6	2.074	61.356	84.577	3.333	0.022
7	2.342	63.726	33.880	2.540	0.047
8	2.631	65.977	8.423	0.729	0.101
9	3.182	69.945	1.768	0.096	0.175
10	4.033	75.473	0.462	0.016	0.271
11	5.403	83.404	0.086	0.001	0.267
12	4.390	77.900	0.061	0.001	0.436
13	0.000	0.000	0.000	0.000	0.000

Table 6. Estimated average weight (kg), length (cm) number, variance and coffecient of variation for the total 1996 catch at age for Divisions 2J3KL cod in 1996. Adjusted Number is an interim pro rata adjustment to give the estimated catch of 1,694 t.

Total Age	Weight	Length	Number	Variance	CV	Adj. Number
1	0.000	0.000	0.000	0.000	0.000	0.000
2	0.400	35.500	0.670	0.090	0.447	0.758
3	0.720	43.393	35.461	12.668	0.100	40.112
4	0.985	48.072	209.623	189.956	0.066	237.117
5	1.297	52.464	262.225	287.557	0.065	296.618
6	1.897	59.422	301.735	217.811	0.049	341.310
7	2.382	63.945	113.686	70.076	0.074	128.597
8	2.765	67.041	20.146	10.422	0.160	22.788
9	3.302	70.946	4.835	1.325	0.238	5.469
10	3.188	70.515	2.946	1.782	0.453	3.332
11	5.441	83.698	0.114	0.001	0.239	0.129
12	4.352	77.734	0.066	0.001	0.408	0.075
13	7.625	94.000	0.001	0.000	1.415	0.001
14	4.457	79.000	0.007	0.000	1.003	0.008

ADJUSTED UP TO EQUAL THE TOTAL CATCH OF 1694 TONS IN TABLE 1

Table 7. Catch numbers at age (thousands) for cod caught in the commercial fishery in NAFO Divisions 2J3KL for the period 1962-96.

Age	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
2	301	1446	2872	85	819	790	288	59	6819	33	236	0
3	8666	5746	19338	5177	14057	15262	6142	4330	18104	12876	6737	3963
4	26194	27577	27603	28709	65992	77873	94291	39626	60102	71557	79809	40785
5	64337	60234	57757	46800	93687	100339	205805	100858	82357	95384	116562	94844
6	58163	118112	60681	66946	62812	96759	150541	163228	101249	98111	76196	59503
7	47314	58996	100147	64360	59312	54996	83808	107509	85696	57865	55984	35464
8	27521	29349	50865	68176	30423	38691	39443	52661	29218	25055	29553	27351
9	20142	15520	20892	33819	23844	17146	23171	19651	10857	11732	11750	14153
10	18036	11612	12264	14913	8762	16084	10984	12370	3825	4470	6393	7566
11	10444	8248	8698	6945	4528	5949	5591	6389	2000	2223	2987	3815
12	9468	4204	6352	3729	2280	3367	5249	4479	1200	1287	1660	2153
13	7778	3942	4989	3948	1825	2108	1939	3004	507	1140	1388	1173
14	5785	2933	4036	3730	1186	1529	1334	1557	224	720	725	450
15	4669	2928	2703	2722	967	685	818	622	214	355	748	278
16	3888	1737	1456	1859	806	424	610	567	244	474	606	309
17	3955	1263	1918	575	416	193	127	319	124	124	452	85
18	2161	1352	1154	971	279	107	89	100	32	128	136	27
19	232	328	501	183	486	72	83	46	10	148	195	38
20	403	182	312	226	178	211	26	99	34	78	36	8
Total	319457	355709	384538	353873	372659	432585	630339	517474	402816	383760	392153	291965

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	473	420	15	108	0	0	92	0	0	18	3	0
3	3231	3968	13767	7128	1323	1152	2554	2185	1702	2585	782	650
4	13201	14101	33727	65510	17556	12361	12025	7172	31286	13616	14871	14824
5	34927	25370	28049	40462	39206	37493	28814	13191	19003	42602	31760	36614
6	74403	34426	20898	12107	20319	29202	30016	24800	14397	19028	38624	33922
7	60539	39105	16811	5397	7711	10982	18017	22014	25435	12044	12503	28006
8	35687	36485	16022	3396	3078	3460	4830	11848	16930	14701	7246	7050
9	18854	13421	10931	2730	1530	1300	1217	3175	11936	8934	8910	3836
10	10492	7514	4637	1381	1083	757	520	779	1923	6341	4227	5162
11	5818	2315	1462	532	437	560	232	309	338	1018	2536	2905
12	2934	1179	631	296	219	183	229	195	156	248	451	1681
13	1078	808	292	149	105	116	56	125	90	90	146	254
14	652	372	251	75	62	51	65	48	153	41	48	107
15	249	165	100	42	40	43	37	14	40	29	41	39
16	338	82	50	21	21	38	13	28	12	11	30	20
17	162	5	40	20	7	7	10	20	13	9	7	17
18	113	8	64	14	8	7	14	5	4	6	7	1
19	45	22	30	2	2	4	4	5	0	2	4	3
20	20	1	20	6	7	9	10	5	0	3	3	5
Total	263216	179767	147797	139376	92714	97725	98755	85918	123418	121326	122199	135096

Age	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
2	1	42	25	8	58	35	0	0	0	0	1
3	831	2329	2779	1696	7693	3111	430	940	105	7	40
4	15219	9217	14651	17639	40557	31654	3860	4993	379	30	237
5	44168	32340	20184	21150	36410	53805	14535	3343	575	71	297
6	45869	49061	47917	25212	22695	29553	12211	1940	177	55	341
7	26025	28469	45725	38708	16390	9064	4526	700	74	20	129
8	14722	19505	18608	28499	17940	6164	1372	147	22	11	23
9	3104	5818	9026	8696	9156	4745	376	21	2	3	5
10	2000	1346	4337	3640	2865	1696	199	0	0	0	3
11	1977	676	774	1695	1084	641	104	0	0	0	0
12	1101	873	422	572	478	250	18	0	0	0	0
13	574	391	366	244	103	88	9	0	0	0	0
14	116	200	223	180	98	39	4	0	0	0	0
15	29	37	100	94	36	21	0	0	0	0	0
16	18	22	32	43	25	9	0	0	0	0	0
17	11	3	5	4	8	3	0	0	0	0	0
18	9	1	10	9	7	2	0	0	0	0	0
19	2	4	5	0	1	2	0	0	0	0	0
20	2	0	5	1	0	0	0	0	0	0	0
Total	155778	150334	165194	148090	155604	140882	37644	12084	1334	197	1076

Table 8. Catch weights at age (kg) for cod caught in the commercial fishery in NAFO Divisions 2J3KL for the period 1962-96

Age	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
2	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14		0.11
3	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.44	0.32	0.35
4	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.53	0.47	0.68
5	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.64	0.71	0.91
6	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.08	0.96	1.11
7	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.52	1.30	1.27
8	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.13	1.80	1.56
9	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.86	2.20	2.05
10	3.18	3.18	3.18	3.18	3.18	3.18	3.18	3.18	3.18	3.18	3.29	2.82	2.75
11	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.95	3.19	3.13
12	4.15	4.15	4.15	4.15	4.15	4.15	4.15	4.15	4.15	4.15	4.12	3.79	3.41
13	6.06	6.06	6.06	6.06	6.06	6.06	6.06	6.06	6.06	6.06	5.00	4.53	4.92
14	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	9.32	6.93	4.40
15	6.11	6.11	6.11	6.11	6.11	6.11	6.11	6.11	6.11	6.11	9.40	7.22	6.33
16	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	6.89	7.05	5.50
17	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	14.67	9.45	7.57
18	6.07	6.07	6.07	6.07	6.07	6.07	6.07	6.07	6.07	6.07	12.04	11.16	11.07
19	6.61	6.61	6.61	6.61	6.61	6.61	6.61	6.61	6.61	6.61	7.62	7.62	7.62
20	7.19	7.19	7.19	7.19	7.19	7.19	7.19	7.19	7.19	7.19	17.46	17.46	17.46

Age	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
2	0.26	0.25	0.09			0.41	0.00		0.31	0.34		0.21	0.32
3	0.45	0.45	0.45	0.40	0.46	0.53	0.55	0.53	0.62	0.59	0.48	0.51	0.43
4	0.63	0.61	0.60	0.72	0.74	0.77	0.78	0.84	0.87	0.88	0.73	0.72	0.66
5	0.96	0.93	0.97	1.04	1.13	1.16	1.17	1.20	1.32	1.20	1.10	1.04	1.03
6	1.18	1.32	1.66	1.58	1.67	1.71	1.64	1.77	1.75	1.79	1.43	1.54	1.32
7	1.39	1.75	2.33	2.46	2.46	2.38	2.23	2.10	2.28	2.28	2.06	1.85	1.87
8	1.74	2.07	2.82	3.26	3.57	3.56	2.86	2.66	2.61	2.71	2.66	2.35	1.93
9	2.21	2.24	3.46	4.05	4.41	5.01	3.81	3.09	3.18	2.96	3.23	2.94	2.80
10	2.61	2.99	3.88	4.46	5.25	5.49	5.32	4.18	3.50	3.65	3.32	3.47	3.51
11	3.34	3.67	4.78	5.02	5.80	6.72	6.29	6.16	4.79	4.28	4.06	3.80	4.80
12	3.66	4.56	6.13	6.72	7.03	7.87	7.06	7.19	7.76	6.19	4.55	4.54	4.64
13	4.78	6.18	7.31	8.10	8.96	8.38	7.32	8.00	9.07	8.39	7.03	5.34	5.74
14	5.20	8.19	8.40	7.42	8.54	10.03	10.01	8.36	9.14	10.26	9.67	7.12	6.13
15	5.20	9.77	8.81	8.20	9.46	11.31	8.99	7.86	10.62	11.44	11.37	11.77	8.53
16	5.46	11.23	11.75	11.26	10.70	13.87	11.54	7.91	10.57	11.61	11.27	11.24	13.51
17	8.51	12.44	10.63	11.61	13.12	10.68	10.48	9.58	13.13	17.47	12.68	14.15	9.10
18	9.24	11.16	12.27	8.92	13.49	16.09	11.15	12.95	15.97	12.94	12.42	16.14	21.77
19	7.62	7.62	7.62	10.57	15.51	12.04	9.82	0.00	9.73	15.21	14.38	12.30	17.66
20	17.46	17.46	17.46	16.00	14.77	11.37	12.59	0.00	15.88	12.81	19.49	15.72	0.00

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996
2	0.29	0.26	0.29	0.17				0.21	0.40
3	0.49	0.48	0.42	0.36	0.29	0.57	0.40	0.49	0.72
4	0.73	0.74	0.69	0.61	0.58	0.71	0.68	0.79	0.99
5	1.08	1.03	1.06	0.97	0.81	0.97	0.98	1.51	1.30
6	1.38	1.44	1.50	1.41	1.19	1.25	1.41	1.95	1.90
7	1.67	1.83	1.94	1.88	1.73	1.59	1.85	2.24	2.38
8	2.21	2.07	2.22	2.27	2.05	8.40	2.05	2.47	2.77
9	2.51	2.64	2.44	2.63	2.66	9.23	3.05	2.53	3.30
10	3.04	3.02	3.06	3.14	2.24			2.93	3.19
11	4.37	3.96	3.58	3.80	2.68			4.51	5.44
12	5.49	5.41	4.68	4.96	4.95			2.01	4.35
13	6.55	7.50	6.23	5.49	5.34				7.63
14	8.60	9.24	8.51	7.61	7.02				4.46
15	9.76	10.05	9.78	11.58					
16	9.73	9.34	12.58	11.01					
17	12.58	15.74	15.45	12.82					
18	16.01	18.66	13.58	13.00					
19	16.60		17.26	13.10					
20	11.03	17.64							

Table 9. Catch biomass (tons) for cod caught in the commercial fishery in NAFO Divisions 2J3KL for the period 1962-96.

Age	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
2	42	202	402	12	115	111	40	8	955	5	33	0
3	2946	1954	6575	1760	4779	5189	2088	1472	6155	4378	2964	1268
4	14407	15167	15182	15790	36296	42830	51860	21794	33056	39356	42299	19169
5	56617	53006	50826	41184	82445	88298	181108	88755	72474	83938	74600	67339
6	71540	145278	74638	82344	77259	119014	185165	200770	124536	120677	82292	57123
7	78541	97933	166244	106838	98458	91293	139121	178465	142255	96056	85096	46103
8	58345	62220	107834	144533	64497	82025	83619	111641	61942	53117	62948	49232
9	53175	40973	55155	89282	62948	45265	61171	51879	28662	30972	33605	31137
10	57354	36926	39000	47423	27863	51147	34929	39337	12164	14215	21033	21336
11	39269	31012	32704	26113	17025	22368	21022	24023	7520	8358	11799	12170
12	39292	17447	26361	15475	9462	13973	21783	18588	4980	5341	6839	8160
13	47135	23889	30233	23925	11060	12774	11750	18204	3072	6908	6940	5314
14	32049	16249	22359	20664	6570	8471	7390	8626	1241	3989	6757	3119
15	28528	17890	16515	16631	5908	4185	4998	3800	1308	2169	7031	2007
16	22667	10127	8488	10838	4699	2472	3556	3306	1423	2763	4175	2178
17	25470	8134	12352	3703	2679	1243	818	2054	799	799	6631	803
18	13117	8207	7005	5894	1694	649	540	607	194	777	1637	301
19	1534	2168	3312	1210	3212	476	549	304	66	978	1486	290
20	2898	1309	2243	1625	1280	1517	187	712	244	561	629	140
total	644926	590090	677428	655244	518248	593302	811698	774346	503047	475357	458793	327188

Age	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	52	109	4	10	0	0	38	0	0	6	1	0
3	1131	1786	6195	3208	529	530	1354	1202	902	1603	461	312
4	8977	8884	20573	39306	12640	9147	9259	5594	26280	11846	13086	10822
5	31784	24355	26086	39248	40774	42367	33424	15433	22804	56235	38112	40275
6	82587	40623	27585	20098	32104	48767	51327	40672	25483	33299	69137	48508
7	76885	54356	29419	12575	18969	27016	42880	49091	53414	27460	28507	57692
8	55672	63484	33166	9577	10034	12352	17195	33885	45034	38370	19637	18753
9	38651	29660	24485	9446	6197	5733	6097	12097	36882	28410	26374	12390
10	28853	19612	13865	5358	4830	3974	2855	4144	8038	22194	15429	17138
11	18210	7732	5366	2543	2194	3248	1559	1944	2082	4876	10854	11794
12	10005	4315	2877	1814	1472	1286	1802	1377	1122	1924	2792	7649
13	5304	3862	1805	1089	851	1039	469	915	720	816	1225	1786
14	2869	1934	2056	630	460	436	652	480	1279	375	492	1035
15	1576	858	977	370	328	407	418	126	314	308	469	443
16	1859	448	562	247	236	407	180	323	95	116	348	225
17	1226	43	498	213	81	92	107	210	125	118	122	216
18	1251	74	714	172	71	94	225	56	52	96	91	12
19	343	168	229	15	21	62	48	49	0	19	61	43
20	349	17	349	105	112	133	114	63	0	48	38	97
total	367583	262319	196809	146023	131904	157091	170005	167661	224625	228118	227236	229191

Age	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
2	0	13	7	2	17	6	0	0	0	0	0
3	424	1001	1362	814	3231	1120	125	536	42	3	29
4	10958	6083	10695	13053	27984	19309	2239	3545	258	24	234
5	45935	33310	21799	21785	38595	52191	11773	3243	564	107	385
6	70638	64761	66125	36305	34043	41670	14531	2425	250	107	647
7	48146	53237	76361	70836	31797	17040	7830	1113	137	45	306
8	34597	37645	41124	58993	39827	13992	2813	1235	45	27	63
9	9126	16290	22655	22957	22341	12479	1000	194	6	8	18
10	6940	4724	13184	10993	8767	5325	446	0	0	0	11
11	7513	3245	3382	6712	3881	2436	279	0	0	0	1
12	4999	4051	2317	3095	2237	1240	89	0	0	0	0
13	3065	2244	2397	1830	642	483	48	0	0	0	0
14	826	1226	1918	1663	834	297	28	0	0	0	0
15	341	316	976	945	352	243	0	0	0	0	0
16	202	297	311	402	315	99	0	0	0	0	0
17	156	27	63	63	124	38	0	0	0	0	0
18	145	22	160	168	95	26	0	0	0	0	0
19	25	71	83	0	17	26	0	0	0	0	0
20	31	0	55	18	0	0	0	0	0	0	0
total	244066	228564	264975	250632	215096	168021	41200	12290	1301	321	1694

Table 10. Cod abundance (thousands) for NAFO division 2J 1983-1992 in Campelen equivalent units.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	Gadus 86-88 1983	Gadus 101-102 1984	Gadus 116-118 1985	Gadus 131-132 1986	Gadus 145-146 1987	Gadus 159-160 1988	Gadus 174-176 1989	Gadus 190-191 1990	Gadus 208-209 1991	Gadus 224-226 1992
	Mean survey date		05-Nov-83	05-Nov-84	30-Oct-85	11-Nov-86	06-Nov-87	14-Nov-88	10-Nov-89	12-Nov-90	14-Nov-91	05-Nov-92
101-200	201	1427	87811	52543	82806	99720	25126	319	0	0	0	0
	205	1823	122517	182501	48964	44029	34532	38745	502	1223	0	0
	206	2582	55637	142654	68017	134937	17607	83620	48332	2874	3197	3339
	207	2246	145830	101693	171902	37826	38648	45550	9825	15492	0	1545
201-300	202	440	5387	8111	4086	31746	7838	1025	0	0	0	0
	209	1608	108766	14599	39668	142610	48249	47602	140710	8590	9006	2522
	210	774	389901	16929	772	97706	479	10221	43414	34603	24230	2783
	213	1725	62645	33648	67470	102247	36569	43632	183006	89430	25390	1948
	214	1171	18102	112678	78314	157299	128223	115524	70582	18267	2942	897
	215	1270	25616	42569	26380	293011	27603	90521	1689	9434	2271	2114
	228	1428	22525	8643	2582	61157	4153	6679	14364	15813	154727	1964
	234	508	50198	16841	11926	22187	6825	2690	0	0	0	256
301-400	203	480	990	1552	638	5745	3962	5910	0	0	66	110
	208	448	5947	760	4622	9768	12572	1849	53462	8012	986	2465
	211	330	4698	908	2361	4880	4835	6945	35386	23197	67475	8058
	216	384	18	740	396	317	9720	1347	2562	872	687	106
	222	441	0	20	698	61	849	182	33214	4853	1597	364
	229	567	6357	208	3536	1872	338	1222	6214	5577	11518	1508
401-500	204	354	1704	5235	0	1802	1242	5405	268	146	0	162
	217	268	0	38	0	0	184	0	0	0	74	0
	227	686	47	0	0	157	236	252	3350	18150	6810	582
	235	420	9620	404	144	0	780	462	664	3178	12537	212
total strata fished <= 500 meters			1124316	743236	615282	1249077	410570	508714	647594	260268	323637	30960
1 STD strata fished <= 500 meters			320612	112688	88262	261581	66519	74633	112157	45978	165231	5287
501-750		1591	0	91 [1]	23	761	365	646	206	4540	41553	274
751-1000		517	0	0	0	34	0	0	0 [1]	0	0	325
total strata fished > 500 meters			0	91	23	795	365	646	206	4540	41553	599
total all strata fished			1,124,317	743,328	615,304	1,249,871	410,936	509,360	647,797	264,807	365,191	31,560
1 STD all strata fished			320612	112687	88263	261582	66519	74635	112159	46014	170124	5304

[1] all strata in the depth range have not been fished. Strata not fished in the <= 500 meter depth range have been filled using a multiplicative model using data to 1992. std are for strata fished in the depth range.

Table 11 . Cod biomass (t) for NAFO division 2J 1983 -1992 in Campelen equivalent units.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	Gadus 86-88 1983	Gadus 101-102 1984	Gadus 116-118 1985	Gadus 131-132 1986	Gadus 145-146 1987	Gadus 159-160 1988	Gadus 174-176 1989	Gadus 190-191 1990	Gadus 208-209 1991	Gadus 224-226 1992
Mean survey date			05-Nov-83	05-Nov-84	30-Oct-85	11-Nov-86	06-Nov-87	14-Nov-88	10-Nov-89	12-Nov-90	14-Nov-91	05-Nov-92
101-200	201	1427	61842	41743	58556	88676	27395	208	0	0	0	0
	205	1823	53701	95026	30679	38754	31421	61555	691	182	0	0
	206	2582	33286	121643	49111	123683	16999	92563	38555	661	1333	1489
	207	2246	46134	55054	107180	25989	36773	18803	2352	6370	0	649
201-300	202	440	8365	7647	3064	32711	11398	1874	0	0	0	0
	209	1608	127333	17017	35398	119210	56901	28242	52339	1670	3966	990
	210	774	241006	21752	1521	87332	737	10667	36642	12536	13406	1116
	213	1725	50086	27703	55229	98497	41997	53146	120476	34360	11859	587
	214	1171	19316	104048	77051	189715	170212	137161	56924	13766	1018	399
	215	1270	30986	31690	30602	379256	36553	146322	315	8508	1073	760
	228	1428	8049	7695	1244	52833	4800	10296	12552	8973	65772	672
	234	508	16910	11930	9173	22705	7342	5157	0	0	0	68
301-400	203	480	2250	3445	582	7875	6300	9640	0	0	45	77
	208	448	7465	1115	4301	8575	16641	3653	22845	3699	455	1091
	211	330	6334	1570	3287	4661	7667	7283	56896	10465	35048	3629
	216	384	52	1592	429	435	13557	2201	3178	255	287	25
	222	441	0	32	784	59	1192	247	9028	2559	579	175
	229	567	2354	263	3823	2399	340	1889	6166	4265	4906	595
401-500	204	354	2458	5863	0	2174	1732	8318	36	37	0	48
	217	268	0	60		0	211	0	0	0	45	0
	223	180	0	0	0	0	0	57	23	212	107	13
	227	686	217	0	0	224	341	353	5407	17904	4643	311
	235	420	4348	332	133	0	1090	717	962	1930	5594	101
total strata fished <= 500 meters			722492	557160	472147	1285763	491599	598478	425387	128352	150136	12795
1 STD strata fished <= 500 meters			177183	83218	65293	325107	31381	97959	218324	25701	72612	2315
501-750		1591	0	0 [1]	0	0	0	193	0	3591	20755	159
751-1000		517	0	0	0	62	0	0	0 [1]	0	0	144
total strata fished > 500 meters			0	0	0	62	0	193	0	3591	20755	303
total all strata fished			722491	557302	472214	1287042	492144	599436	425874	131943	170892	13096
1 STD all strata fished			177183	83218	65293	325108	84935	97963	85921	25746	74135	2326

[1] all strata in the depth range have not been fished. Strata not fished in the <= 500 meter depth range have been filled using a multiplicative model using data to 1992. std are for strata fished in the depth range.

Table 12. Abundance and biomass estimates for NAFO division 2J for the revised stratification scheme in Campelen equivalent units for 1993 and 1994 and actual Campelen units for 1995 and 1996.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	GADUS 236-238 1993	GADUS 250-252 1994	TELEOST 20-23 1995-6	TELEOST 39 1996	GADUS 236-238 1993	GADUS 250-252 1994	TELEOST 20-23 1995-6	TELEOST 39 1996
Mean survey date			07-Nov-93	17-Nov-94	28-Dec-95	30-Oct-96	07-Nov-93	17-Nov-94	28-Dec-95	30-Oct-96
			ABUNDANCE (000'S)				BIOMASS TONS			
101-200	201	633	0	0	nf	0	0	0	nf	0
	205	1594	63	219	nf	110	63	151	nf	16
	206	1870	547	0	0	184	155	0	0	62
	207	2246	2128	2699	350	588	452	507	44	57
	237	733	151	0	273	134	83	0	13	8
	238	778	nf	0	nf	107	nf	0	nf	21
201-300	202	621	0	0	49	0	0	0	9	0
	209	680	374	514	327	249	100	67	52	20
	210	1035	5731	854	1424	320	1158	139	108	26
	213	1583	871	0	2504	835	346	0	336	214
	214	1341	1771	338	323	959	700	174	39	273
	215	1302	1719	358	90	2373	443	210	21	773
	228	2196	436	0	949	2068	294	0	263	665
	234	530	0	0	nf	73	0	0	nf	22
301-400	203	487	0	301	0	335	0	220	0	136
	208	588	0	162	768	566	0	41	123	200
	211	251	414	322	708	483	241	110	141	81
	216	360	0	173	927	715	0	96	234	194
	222	450	279	846	495	543	146	276	124	290
	229	536	590	295	627	946	109	124	184	305
401-500	204	288	0	0	16	20	0	0	1	8
	217	241	66	55	561	63	67	19	135	26
	223	158	0	0	880	91	0	0	135	32
	227	598	795	0	370	1207	441	0	109	748
	235	414	1044	1006	541	101	318	559	175	84
	240	133	9	0	123	9	13	0	68	2
total strata fished <= 500 meters			16989	8145	12305	13081	5129	2693	2312	4261
1STD strata fished <= 500 meters			4595	2584	1822	1968	883	514	272	796
501-750	212	557	77	128	69	136	93	15	15	22
	218	362	0	50	1660	75	0	519	519	12
	224	228	0	0	596	0	0	205	205	0
	230	185	0	34	13	0	0	14	14	0
	239	120	17	17	0	8	17	0	0	2
751-1000	219	283	0	0	0	0	0	0	0	0
	231	186	0	0	0	0	0	0	0	0
	236	193	0	0	12	0	0	2	2	0
1001-1250[1]		753	nf	nf	nf	0	nf	nf	nf	0
1251-1500[1]		768	nf	nf	nf	0	nf	nf	nf	0
total strata fished > 500 meters			94	229	2350	219	110	755	755	36
total all strata fished			17082	8373	14654	13300	5238	2877	3067	4298
1 STD all strata fished			4596	2588	2057	1973	888	524	380	797

[1] **not all strata fished in the depth range. Because of the short time series with the revised stratification scheme and a switch in 1995 to a different vessel and gear no attempt has been made to fill strata which were not fished using a multiplicative mode.**

Table 13. Cod abundance (thousands) for NAFO division 3K 1983-1992 in Campelen equivalent units.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	GADUS 87-88 1983	GADUS 101-103 1984	GADUS 117-118 1985	GADUS 131-132 1986	GADUS 146-147 1987	GADUS 160-161 1988	GADUS 175-176 1989	GADUS 191-192 1990	GADUS 209-210 1991	GADUS 224-226 1992
Mean survey date			26-Nov-83	23-Nov-84	18-Nov-85	01-Dec-86	27-Nov-87	05-Dec-88	05-Dec-89	04-Dec-90	04-Dec-91	26-Nov-92
101-200	618	1455	17028	24569	26453	64689	14954	57577	14811	13210	721	1268
	619	1588	3835	9955	1155	17476	6826	19598	63705	2578	0	218
201-300	620	2709	126888	110535	4685	135397	32793	100337	253826	11304	3780	2236
	621	2859	33593	32109	8338	27811	16059	32525	44025	14230	2517	131
	624	668	10016	9786	2550	2573	1746	3982	4901	24948	7076	735
	632	447	30765	9851	4591	4735	7410	51959	4888	22044	10336	1438
	634	1618	61564	31160	29182	323578	60702	21441	269092	4610	99321	694
	635	1274	7711	29442	4682	14225	3593	9534	5934	3505	1490	701
	636	1455	8807	17788	3828	21566	6777	12743	13850	715	1134	133
	637	1132	31704	73889	15928	46132	15805	24915	13766	6634	5320	156
301-400	623	1027	29291	51057	3697	4026	11782	23649	102872	50690	3155	5557
	625	850	4677	1988	7156	3196	11400	5554	21251	11693	1676	546
	626	919	6953	3266	2705	62324	5815	5006	12566	9260	1264	632
	628	1085	7935	4670	6617	2687	1582	18448	12575	5522	9303	4179
	629	495	2357	2557	1647	5720	938	7276	3135	6521	978	1853
	630	544	1497	2170	262	262	524	524	7009	1085	499	150
	633	2179	15312	21312	38293	96780	49404	15737	220703	243039	185926	7410
	638	2059	53867	17476	37259	36467	24472	23650	137139	360185	200000	7511
	639	1463	12449	5283	8780	15127	5980	12176	19270	52757	91771	2262
401-500	622	632	304	1434	283	1652	174	3188	21561	12476	1449	1594
	627	1194	1032	1038	372	4658	2633	1173	10505	85313	4506	3692
	631	1202	1025	33	472	207	3059	6063	42471	28964	15157	992
	640	198	194	0	9	14	0	109	2982	150	1970	17459
	645	204	0	0	9	90	112	28	4686	379	0	75
total strata fished <=500 meters			447748	451517	208952	891302	284541	457191	1307523	971810	649350	61622
1 STD strata fished <=500 meters			61132	68574	27228	321032	44267	73335	270219	184614	159892	17726
501-750[1]		917	0	0	0	nf	107	nf	nf	92	122	263
51-1000[1]		1340	nf	nf	0	nf	nf	nf	nf	128	56	0
total strata fished > 500 meters			0	0	0	0	107	0	0	220	178	263
total all strata fished			447748	451517	208952	891302	284648	457191	1307523	972029	649529	61886
1 STD all strata fished			61132	68574	27228	321032	44267	73335	270219	184614	159892	17726

[1] all strata in the depth range have not been fished. Strata not fished in the <= 500 meter depth range have been filled using a multiplicative model using data to 1992. std are for strata fished in the depth range.

Table 14. Cod biomass (t) for NAFO division 3K 1983 -1992 in Campelen equivalent units.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	GADUS 87-88 1983	GADUS 101-103 1984	GADUS 117-118 1985	GADUS 131-132 1986	GADUS 146-147 1987	GADUS 160-161 1988	GADUS 175-176 1989	GADUS 191-192 1990	GADUS 209-210 1991	GADUS 224-226 1992
Mean survey date			26-Nov-83	23-Nov-84	18-Nov-85	01-Dec-86	27-Nov-87	05-Dec-88	05-Dec-89	04-Dec-90	04-Dec-91	26-Nov-92
101-200	618	1455	**7987**	18702	24894	53641	10200	2443	1575	1514	261	450
	619	1588	**1491**	4801	1113	3157	2538	1212	3363	154	0	119
201-300	620	2709	67557	87523	8223	131461	27088	13232	24447	1636	1158	847
	621	2859	18041	25813	6216	19356	3294	11590	7313	1021	359	194
	624	668	3920	3082	2340	2798	802	3087	1660	8649	3809	331
	632	447	33968	**10779**	4106	4540	7824	51549	2030	8677	5581	663
	634	1618	56301	24843	28663	436500	80357	19008	322401	1976	77639	450
	635	1274	4940	11970	3551	16754	3329	3843	2609	998	617	319
	636	1455	11657	13899	3977	13264	5871	9229	3577	431	334	138
	637	1132	36769	75369	15341	50718	15913	29982	13010	2665	2332	85
301-400	623	1027	23690	46679	5155	4602	17254	3662	22849	12857	1130	1960
	625	850	5410	2474	7062	3405	11136	5766	12105	4049	861	291
	626	919	5565	3377	4274	41267	4852	1188	5858	718	345	218
	628	1085	8807	4909	7807	2564	1484	7998	7102	2184	4028	1345
	629	495	2506	1739	955	5557	907	1391	1550	2003	95	535
	630	544	1452	1564	435	292	743	863	9065	644	267	85
	633	2179	15440	23201	39817	115810	66782	15297	148660	169097	132091	4366
	638	2059	56662	12773	35965	37822	31829	18946	184194	353107	150413	3564
	639	1463	17739	5242	8657	14185	6332	7526	7803	24244	74514	941
401-500	622	632	541	1487	215	1307	163	847	8794	2974	498	564
	627	1194	970	772	360	5307	1150	1208	4805	13523	1248	765
	631	1202	2700	138	493	273	3049	6448	31211	11300	8691	732
	640	198	**385**	0	16	22	0	299	2436	204	1231	16334
	645	204	0	0	50	**265**	139	122	1628	368	0	48
total strata fished <=500 meters			374634	370356	209686	964600	303038	216734	830045	624993	467505	35346
1 STD strata fished <=500 meters			51399	58138	26560	428297	61366	50225	289567	207590	128742	16146
501-750[1]		917	0	0	0	**nf**	174	**nf**	**nf**	72	133	258
751-1000[1]		1340	**nf**	**nf**	0	**nf**	**nf**	**nf**	**nf**	70	39	0
total strata fished > 500 meters			0	0	0	0	174	0	0	142	172	258
total all strata fished			374634	370356	209686	964600	303212	216734	830045	645136	649529	35604
1 STD all strata fished			51399	58138	26560	428297	61366	50225	289567	198748	159892	16146

[1] all strata in the depth range have not been fished. Strata not fished in the <= 500 meter depth range have been filled using a multiplicative model using data to 1992. std are for strata fished in the depth range.

Table 15. Abundance and biomass estimates for the revised stratification scheme in NAFO Division 3K in Campelen equivalent units for 1993 and 1994 and actual Campelen units for 1995-96.

Depth range meters	Stratum number	Stratum area sq. mi.	GADUS 236-238 1993	GADUS 250-252 1994	WT 176-81 TELEOST 20-23 1995-6	WT 196-199 TELEOST 40-42 1996	GADUS 236-238 1993	GADUS 250-252 1994	WT 176-181 TELEOST 20-23 1995-6	WT 196-199 TELEOST 40-42 1996
Mean survey date			23-Nov-93	07-Dec-94	26-Dec-95	14-Nov-96	23-Nov-93	07-Dec-94	26-Dec-95	14-Nov-96
			abundance (000's)				biomass (tons)			
101-200	618	1347	2409	159	1170	1887	721	40	87	221
	619	1753	965	0	655	218	708	0	32	42
201-300	620	2545	3268	350	1465	947	614	118	238	230
	621	2736	0	251	2393	303	0	267	302	77
	624	1105	391	152	813	2432	177	85	251	714
	634	1555	468	642	214	1246	189	417	97	391
	635	1274	467	0	88	386	189	0	10	94
	636	1455	734	200	286	133	334	141	92	39
	637	1132	4983	389	242	810	2039	74	74	358
301-400	617	593	1876	184	693	109	383	74	97	14
	623	494	1138	0	578	510	213	0	32	144
	625	888	285	0	342	131	229	0	99	66
	626	1113	714	204	2709	1415	468	89	289	340
	628	1085	1443	299	1556	826	736	80	353	409
	629	495	908	375	545	68	343	20	70	12
	630	332	0	0	41	0	0	0	11	0
	633	2067	1153	2218	851	1381	502	1067	420	535
	638	2059	8780	1187	1252	2155	3913	401	635	723
	639	1463	1489	1711	712	1025	622	761	290	415
401-500	622	691	1141	57	542	230	299	32	68	55
	627	1255	2992	604	4924	1918	891	226	702	466
	631	1321	0	182	501	273	0	208	99	45
	640	69	228	16	218	25	131	11	90	13
	645	216	79	119	134	30	84	87	48	14
	650	134	995	65	276	92	441	43	112	40
total strata fished <= 500 meters			36907	9361	23200	18550	14227	4241	4578	5457
1 STD strata fished <= 500 meters			5817	2408	1734	2115	1925	1062	427	608
501-750	641	230	11	21	63	47	16	18	83	101
	646	325	75	0	0	0	51	0	0	0
	651	359	16	123	691	25	25	116	317	30
751-1000	642	418	115	0	0	0	72	0	0	0
	647	360	0	0	0	0	0	0	0	0
	652	516	142	106	0	0	208	62	0	0
1001-1250[1]		1264	nf	nf	0	0	nf	nf	0	0
1251-1500[1]		953	nf	nf	0	0	nf	nf	0	0
total strata fished > 500 meters			359	250	754	72 0	372	196	400	131
total all strata fished			37265	9612	23954	18621	14598	4437	4978	5588
1 STD all strata fished			5819	2412	1790	2116	1927	1066	475	608

[1] not all strata fished in the depth range. Because of the short time series with the revised stratification scheme and a switch in 1995 to a different vessel and gear no attempt has been made to fill strata which were not fished using a multiplicative mode.

Table 16. Cod abundance (thousands) for NAFO division 3L from fall surveys 1983-1997 depths <= 200 fathoms the 1983 -94 data are in Campelen equivalent units and 1995-96 in actual Campelen units.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	WT 7-9 1983	WT 16-18 1984	WT 37-39 1985	AN 72 1986	WT 65 1987	WT 78 1988	WT 87 1989	WT 101 1990	WT 114-115 1991	WT 129-130 1992	WT 145-146 1993	WT 160-162 1994	WT 176-181 1995	Teleost 41 WT 196-198 1996
Mean survey date			27-Oct-83	15-Aug-84	27-Oct-85	21-Nov-86	24-Oct-87	03-Nov-88	20-Oct-89	05-Nov-90	21-Nov-91	16-Nov-92	23-Nov-93	22-Nov-94	27-Nov-95	02-Nov-96
31-50	350	2071	26886	62391	66442	43614	15131	13276	10854	5911	5359	1140	1804	122	1045	285
	363	1780	38933	73152	143316	6156	21384	23286	43993	52247	3702	13036	408	367	365	82
	371	1121	20972	36304	5199	565	3547	4472	193	7556	411	1079	103	0	31	0
	372	2460	157018	160636	65709	16318	57710	16269	32627	141824	3774	2919	299	0	353	414
	384	1120	29119	73645	1560	801	34383	1489	986	41791	1061	146	154	0	0	0
51-100	328	*1519*	*6868*	*1985*	*1802*	*37264*	*2507*	*8806*	*1224*	*2090*	279	1114	488	139	0	334
	341	1574	14723	8401	4949	6124	337	1245	298	1985	505	217	1516	0	36	289
	342	585	2837	4466	912	885	1073	429	80	2052	161	54	0	80	40	121
	343	525	915	14408	1517	1974	337	650	24	1372	481	722	72	96	36	0
	348	2120	8934	34810	6978	6008	3143	3995	6189	6389	1896	3208	nf	219	250	393
	349	2114	9306	62170	15645	8724	2472	7302	1745	4736	3722	58	1939	208	122	166
	364	2817	25576	97381	20064	3720	4789	10048	1656	13595	291	388	1421	323	43	116
	365	1041	7074	102281	4242	8821	1456	1690	573	895	1575	286	95	95	215	207
	370	1320	5811	52295	2865	2905	1059	623	121	1888	121	484	666	0	73	0
	385	*2356*	*5445*	*20391*	*756*	*4497*	*972*	*25*	*29*	1713	389	648	0	0	0	36
	390	1481	815	33751	553	5229	23276	3107	2183	1290	0	136	0	0	34	0
101-150	344	1494	5823	15722	10733	8250	5600	4874	4580	9454	3186	5446	2363	771	530	2950
	347	983	5995	11719	3056	3651	2502	10628	4571	30560	609	676	439	34	199	391
	366	1394	11314	56011	*51115*	59062	25367	66130	17888	9812	19359	44544	2972	115	230	236
	369	961	9628	14919	5222	53011	11336	12241	1005	2809	12559	1884	227	0	78	0
	386	983	*10316*	8587	4327	14705	7167	4895	6464	7099	135	766	135	0	0	45
	389	821	*10850*	3614	4518	4179	49636	13270	10023	2936	10842	0	0	0	38	0
	391	282	16778	291	6440	485	2289	427	1028	1629	233	129	116	0	0	0
151-200	345	1432	*6821*	*7936*	*14730*	*12410*	*8963*	*11285*	*5881*	*11977*	4432	985	1510	542	2780	433
	346	865	17634	9023	9567	14120	30253	27058	9073	14517	37387	33292	1417	136	754	379
	368	334	*21267*	2688	6524	12497	3101	5008	1861	11555	27437	30338	15627	88	299	128
	387	718	*12466*	19062	3704	22519	4708	1753	1350	3325	2963	2864	2601	779	66	44
	388	361	*5572*	4817	1341	*3629*	844	1813	5761	1962	1556	579	414	177	99	0
	392	145	150	1107	339	110	10	289	40	598	259	20	27	0	19	18
total strata fished <= 200 fathoms			428505	993964	464125	358606	325352	256383	172299	395569	144684	147159	36813	4292	7732	7066
1 STD strata fished <= 200 fathoms			47712	106973	88489	50292	50645	26946	30742	58945	17534	33948	12486	951	1993	1939

[1] all strata in the depth range have not been fished. Strata not fished in the <= 200 fathom depth range have been filled using a multiplicative model using data to 1992. std are for strata fished in the depth range.

Table 17. Cod biomass (t) for NAFO division 3L from fall surveys 1983 - 1997 depths < = 200 fathoms in Campelen equivalent units.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	WT 7-9	WT 16-18	WT 37-39	AN 72	WT 65	WT 78	WT 87	WT 101	WT 114-115	WT 129-130	WT 145-146	WT 160-162	WT 176-181	Teleost 41 WT 196-199
			1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Mean survey date			27-Oct-83	15-Aug-84	27-Oct-85	21-Nov-86	24-Oct-87	03-Nov-88	20-Oct-89	05-Nov-90	21-Nov-91	16-Nov-92	23-Nov-93	22-Nov-94	27-Nov-95	02-Nov-96
31-50	350	2071	18204	42081	35227	46248	14242	16885	10769	6602	6434	1877	1522	179	1276	362
	363	1780	36935	50726	103274	9116	22124	30177	33959	35121	4266	7504	344	211	506	224
	371	1121	13316	24055	3285	366	4935	7746	457	9110	481	893	91	0	10	0
	372	2460	100388	74560	62776	22328	68454	19194	29816	177108	3164	1896	287	0	54	557
	384	1120	15999	57404	1314	163	27226	1681	223	61815	674	127	67	0	0	0
51-100	328	1519	2634	832	1378	11971	603	3397	1101	415	185	1748	166	248	0	537
	341	1574	4517	5043	2694	4218	473	1273	198	1237	920	253	289	0	2	248
	342	585	752	1733	554	588	451	583	114	1029	383	123	0	36	22	184
	343	525	1341	6036	518	1930	404	661	90	653	132	459	79	34	18	0
	348	2120	6763	24084	4851	5686	3229	3906	4158	2995	1666	1504	nf	322	181	326
	349	2114	5245	23149	9512	7711	2203	8207	2690	3630	5454	66	1755	54	88	117
	364	2817	5306	21027	4966	2813	3463	7216	1681	6851	915	526	873	302	1	95
	365	1041	2101	20303	2383	4292	2116	1961	797	509	2814	347	54	114	129	147
	370	1320	2403	21444	1579	579	1605	1128	224	1159	189	673	171	0	72	0
	385	2356	1719	5657	316	2583	1624	303	110	1620	300	735	0	0	0	11
	390	1481	1366	6250	108	561	1850	516	294	283	0	81	0	0	13	0
101-150	344	1494	3698	12067	9056	7635	4726	2746	2435	5079	809	3003	988	382	233	2214
	347	983	6183	10733	2265	3960	1906	9386	5239	18473	369	181	351	20	99	324
	366	1394	15941	18725	54100	70142	28721	76378	18189	8194	15225	40824	2426	116	121	87
	369	961	9321	8962	8086	65455	19792	12361	3266	3223	13072	937	180	0	174	0
	386	983	6055	5281	6595	23005	5487	6410	7472	10209	124	366	194	0	0	20
	389	821	5277	4726	5017	3420	9036	2951	5134	3838	3388	0	0	0	12	0
	391	282	1418	157	1522	711	400	76	158	577	74	18	53	0	0	0
151-200	345	1432	10540	7499	15729	16629	9962	14557	7883	7575	1775	736	957	245	1441	370
	346	865	14781	6034	10546	15984	36414	33516	14619	13512	27945	29383	702	91	459	243
	368	334	23841	2557	10438	21732	7227	7539	4904	13883	26629	29646	10776	80	129	48
	387	718	15000	14254	7063	37565	5152	2623	1146	9129	3515	2018	1984	321	25	19
	388	361	5572	1730	3116	3629	389	1067	3506	1564	740	390	268	119	35	0
	392	145	172	245	251	43	15	110	55	276	117	9	19	0	15	7
total strata fished <= 200 fathoms			278412	477355	368514	387438	284230	274553	160688	405668	121761	126323	24594	2873	5114	6140
1 STD strata fished <= 200 fathoms			35321	40504	58214	62019	31955	30073	21690	81110	15570	33260	8723	502	1187	1587

[1] **all strata in the depth range have not been fished. Strata not fished in the <= 200 fathom depth range have been filled using a multiplicative model using data to 1992. std are for strata fished in the depth range.**

Table 18. Cod abundance (thousands) and biomass (t) for NAFO division 3L 1983-1997 depths > 200 fathoms in Campelen equivalent units.

Stratum depth (fathoms)	Stratum number	Area sq. nautical miles	WT 7-9	WT 16-18	WT 37-39	AN 72	WT 65	WT 78	WT 87	WT 101	WT 114-115	WT 129-130	WT 145-146	WT 160-162	WT 176-181	Teleost 41 WT 196-198
			1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Mean survey date			27-Oct-83	15-Aug-84	27-Oct-85	21-Nov-86	24-Oct-87	03-Nov-88	20-Oct-89	05-Nov-90	21-Nov-91	16-Nov-92	23-Nov-93	22-Nov-94	27-Nov-95	02-Nov-96
ABUNDANCE																
201-300	729	186	nf	320	0	0	nf	nf	nf	38	0	13	213	0	0	0
	731	216	nf	15	30	nf	nf	nf	nf	15	30	168	277	21	13	nf
	733	468	nf	1481	43	nf	nf	nf	nf	386	21	494	1223	107	32	0
	735	272	nf	25	94	0	nf	nf	nf	nf	923	886	9155	180	187	0
301-400	730	170	nf	0	0	nf	nf	nf	nf	nf	0	0	0	8	0	0
	732	231	nf	0	0	nf	nf	nf	nf	0	0	0	0	0	0	0
	734	228	nf	0	0	nf	nf	nf	nf	0	0	0	31	42	0	0
	736	175	0	nf	0	0	nf	nf	nf	0	24	0	96	28	32	0
401-500		957	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	16	0
501-600		945	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	0	0
601-700		1745	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	0
701-800		773	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	0
total strata fished > 200 fathoms			0	1841	167	0	0	0	0	439	998	1561	10995	386	280	0
total all strata fished offshore			428505	995804	464291	358606	325352	256383	172299	396008	145682	148719	47809	4678	8013	7066
1 STD all strata fished offshore			47712	106981	88490	50292	50645	26946	30742	58946	17559	33959	13351	954	2002	1939
BIOMASS																
201-300	729	186	nf	206	0	0	nf	nf	nf	107	0	45	208	0	0	0
	731	216	nf	92	248	nf	nf	nf	nf	19	49	131	177	23	5	nf
	733	468	nf	1678	461	nf	nf	nf	nf	937	28	316	837	85	14	0
	735	272	nf	276	466	0	nf	nf	nf	nf	1214	1233	4809	91	109	0
301-400	730	170	nf	0	0	nf	nf	nf	nf	nf	0	0	0	8	0	0
	732	231	nf	0	0	nf	nf	nf	nf	0	0	0	0	0	0	0
	734	228	nf	0	0	nf	nf	nf	nf	0	0	0	18	42	0	0
	736	175	0	nf	0	0	nf	nf	nf	0	56	0	51	28	15	0
401-500		957	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	17	0
501-600		945	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	0	0
601-700		1745	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	0
701-800		773	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	0
total strata fished > 200 fathoms			0	2252	1175	0	0	0	0	1063	1347	1725	6100	277	160	0
total all strata fished offshore			278412	479606	369689	387438	284230	274553	160688	406730	123108	128048	30694	3149	5275	6140
1 STD all strata fished offshore			35321	40525	58217	62019	31955	30073	21690	81110	15618	33279	9033	506	1193	1587

nf not all strata fished in the depth range. Strata not fished in the greater than 200 fathom depth range have not been filled using a multiplicative model.

Table 19 . Fall 1996 abundance (thousands) and biomass (t) estimates for inshore strata in Divisions 3K and 3L compared with totals for offshore and all strata fished in Campelen units.

		3K		
Stratum depth (meters)	Stratum number	Area sq. nautical miles	WT 196-199 TELEOST 40-42 1996	WT 196-199 TELEOST 40-42 1996
Mean survey date			14-Nov-96	14-Nov-96
			abundance	biomass
101-200	608	798	915	201
	612	445	510	111
	616	250	103	4
201-300	609	342	436	108
	611	600	122	25
	615	251	0	0
301-400	610	256	31	3
	614	263	16	2
401-500	613	30	0	0
total inshore strata			2133	454
total offshore			18622	5588
total all strata fished			20756	6039
STD all strata fished			2209	491

		3L		
Stratum depth (fathoms)	Stratum number	Area sq. nautical miles	Teleost 41 WT 196-198 1996	Teleost 41 WT 196-198 1996
Mean survey date			02-Nov-96	02-Nov-96
			abundance	biomass
16-30	784	268	1161	80
31-50	785	465	3998	6627
51-100	786	84	12	2
	787	613	42	135
	788	252	2409	177
	790	89	55	56
	793	72	599	155
	794	216	609	84
	797	98	20	11
	799	72	857	410
101-150	795	164	11	5
101-200	789	81	0	0
	791	308	191	114
	798	100	14	47
151-200	796	175	0	0
201-300	792	50	0	0
total inshore strata			9978	7903
total offshore			7066	6140
total all strata fished			17044	14044
STD all strata fished			3932	6198

Table 20. Summary of Fall Survey Abundance (thousands) and Biomass (t) for all strata fished 1983-1994 in Campelen equivalent units and 1995-96 in actual Campelen units.

DIVISION	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Total abundance all strata fished															
2J	1,124,317	743,328	615,304	1,249,871	410,936	509,360	647,797	264,807	365,191	31,560	17082	8373	14654	13300	
3K	447748	451517	208952	891302	284648	457191	1307523	972029	649529	61886	37265	9612	23954	20756	
3L	428505	995804	464291	358606	325352	256383	172299	396008	145682	148719	47809	4678	8013	17044	
2J3KL	2,000,570	2,190,649	1,288,547	2,499,779	1,020,936	1,222,934	2,127,619	1,632,844	1,160,402	242,165	102,156	22,663	46,621	51,100	
Total biomass all strata fished															
2J	722491	557302	472214	1287042	492144	599436	425874	131943	170892	13096	5238	2877	3067	4298	
3K	374634	370356	209686	964600	303212	216734	830045	645136	649529	35604	14598	4437	4978	6039	
3L	278412	479606	369689	387438	284230	274553	160688	406730	123108	128048	30694	3149	5275	14044	
2J3KL	1375537	1407264	1051589	2639080	1079586	1090723	1416607	1183809	943529	176748	50530	10463	13320	24381	
Percent abundance															MEAN
2J	56	34	48	50	40	42	30	16	31	13	17	37	31	26	34
3K	22	21	16	36	28	37	61	60	56	26	36	42	51	41	38
3L	21	45	36	14	32	21	8	24	13	61	47	21	17	33	28
2J3KL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Percent biomass															
2J	53	40	45	49	46	55	30	11	18	7	10	27	23	18	31
3K	27	26	20	37	28	20	59	54	69	20	29	42	37	25	35
3L	20	34	35	15	26	25	11	34	13	72	61	30	40	58	34
2J3KL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	

Table 21. Cod abundance (000's) for NAFO division 3L spring 1985 -1996 depths <= 200 fathoms the 1985-1995 data in Campelen equivalent units and the 1996 survey in actual Campelen units.

Depth range (fath)	Stratum number	Stratum area sq mi.	WT 28-30 1985	WT 48 1986	WT 59-60 1987	WT 70-71 1988	WT 83 1989	WT 96 1990	WT 106-107 1991	WT 119-122 1992	WT 137-138 1993	WT 152-154 1994	WT 168-170 1995	WT 189-191 1996
Mean Date			07-May-85	16-May-86	23-May-87	15-May-88	18-May-89	26-May-90	20-May-91	24-May-92	31-May-93	01-Jun-94	06-Jun-95	14-Jun-96
31-50	350	2071	52111	14685	17275	90559	24682	8018	748	414	32	0	0	412
	363	1780	25710	24878	27778	46453	21738	3918	1504	789	306	0	0	111
	371	1121	29035	2262	3503	3115	4086	3315	32260	123	93	0	0	0
	372	2460	83387	37973	21684	37778	17675	2852	541	34	62	0	0	217
	384	1120	591	4442	5238	1078	1566	193	270	0	31	0	0	102
51-100	328	1519	5642	2113	2866	522	0	3194	1846	0	453	0	0	90
	341	1574	17899	5678	14651	20425	7984	2436	469	0	0	736	0	340
	342	585	3702	1127	1328	402	5445	523	0	1314	322	188	0	0
	343	525	9076	4496	1300	2744	8065	891	2239	1565	614	361	361	36
	348	2120	38479	16258	21435	19062	12022	6575	73	227	109	365	510	151
	349	2114	32383	21146	12795	14649	25115	10986	1066	711	905	0	0	424
	364	2817	38614	10691	21365	13718	24050	4456	1902	0	97	0	0	234
	365	1041	22237	6272	15466	15931	8306	2076	322	36	0	0	0	58
	370	1320	57062	2973	16783	8861	18226	1219	34833	0	91	0	0	61
	385	2356	22038	997	1886	5736	25360	7808	17055	97	383	0	0	30
	390	1481	2513	484	320	0	891	41	122	34	102	0	0	59
101-150	344	1494	10481	21142	3288	4110	31503	4864	986	1165	514	0	822	565
	347	983	7221	14225	7077	11981	6694	913	1690	34	304	0	0	0
	366	1394	207996	63401	41749	8885	33414	15053	12651	415	384	0	0	245
	369	961	58351	33952	16392	28158	13021	6134	3701	198	0	0	0	30
	386	983	46544	12395	14766	26504	37547	32048	32544	68	54	0	0	0
	389	821	70767	10458	8150	11181	13214	5788	9524	75	0	0	56	0
	391	282	5916	4442	2812	1494	2819	45154	6750	0	0	0	0	0
151-200	345	1432	16153	41480	60278	19723	29548	14232	3217	492	525	2167	197	773
	346	865	10650	63279	18991	11602	9965	145882	10812	1577	833	278	476	487
	368	334	10154	10912	14289	414	4150	51551	4992	10866	1355	184	23	402
	387	718	131461	22816	691	2272	16336	241169	93995	23145	6288	0	560	142
	388	361	2955	11496	25	1738	1606	36947	10809	4618	2235	0	174	84
	392	145	6642	1855	20	2094	645	22130	4618	40	479	0	110	111
total strata fished <= 200 fath			1025769	468328	374201	411190	405673	680365	263087	48038	16569	4278	3289	5166
1 STD strata fished <= 200 fath			143389	39174	51595	50874	34169	176063	56184	13459	3989	1279	1043	522

[1] all strata in the depth range have not been fished. Strata not fished in the <= 200 fathom depth range have been filled using a multiplicative model using data to 1992. std are for strata fished in the depth range.

Table 22. Cod biomass (t) for NAFO division 3L spring 1985 -1996 depths <= 200 fathoms the 1985-1995 data are in Campelen equivalent units and the 1996 survey in actual Campelen units.

Depth range (fath) Mean Date	Stratum number	Stratum area sq mi.	WT 28-30 1985 07-May-85	WT 48 1986 16-May-86	WT 59-60 1987 23-May-87	WT 70-71 1988 15-May-88	WT 83 1989 18-May-89	WT 96 1990 26-May-90	WT 106-107 1991 20-May-91	WT 119-122 1992 24-May-92	WT 137-138 1993 31-May-93	WT 152-154 1994 01-Jun-94	WT 168-170 1995 06-Jun-95	WT 189-191 1996 14-Jun-96
31-50	350	2071	61578	29203	32147	116896	41232	14057	1636	315	35	0	0	359
	363	1780	29020	26035	38567	49356	30897	12388	2289	526	111	0	0	61
	371	1121	29516	5426	7039	6714	7089	5149	44086	36	37	0	0	0
	372	2460	87371	39729	37570	52582	31350	12849	1553	112	96	0	0	83
	384	1120	557	7038	7416	1515	1308	1029	653	0	71	0	0	65
51-100	328	1519	568	1708	3573	879	0	5670	180	0	243	0	0	6
	341	1574	11711	12988	20564	32613	9121	5854	376	0	0	65	0	127
	342	585	1445	2669	1041	600	1400	1035	0	66	64	33	0	0
	343	525	2833	3087	1981	2878	3927	255	207	70	52	46	42	9
	348	2120	17699	22373	52505	40777	18921	6772	273	37	43	47	87	53
	349	2114	31189	44296	22988	34821	50689	3835	836	125	158	0	0	303
	364	2817	21165	17309	34942	26822	34642	15553	1228	0	124	0	0	20
	365	1041	5934	6427	19818	18776	10427	2210	154	81	0	0	0	5
	370	1320	21097	6523	16440	12422	15405	1288	29422	0	74	0	0	6
	385	2356	6499	894	2131	4572	10414	2269	13797	95	256	0	0	4
	390	1481	874	764	891	0	520	129	604	58	83	0	0	31
101-150	344	1494	1926	16730	1768	2949	15613	696	103	167	83	0	95	111
	347	983	6837	19615	8729	17943	5283	669	199	35	83	0	0	0
	366	1394	111212	62264	42788	15741	32354	12386	6899	111	121	0	0	104
	369	961	36262	27273	23039	37815	18342	7693	3547	78	0	0	0	16
	386	983	13632	5635	10490	10110	19985	59202	17066	154	66	0	0	0
	389	621	21457	3540	2864	3284	3509	1529	1654	114	0	0	36	0
	391	282	1380	1944	797	316	513	6018	1220	0	0	0	0	0
151-200	345	1432	6738	39168	63833	24326	40145	5601	466	332	120	437	108	149
	346	865	1650	48302	18827	13037	10501	136822	4834	613	302	86	91	178
	368	334	4237	13403	16324	1286	5297	41814	3318	4684	590	120	22	148
	387	718	60424	16437	508	1609	8453	101468	37550	18465	2329	0	227	84
	388	361	1143	5814	27	695	676	35162	4031	1078	1431	0	60	12
	392	145	5177	1121	11	573	251	6418	1107	22	63	0	37	18
total strata fished	<= 200 fathoms		601128	487714	489618	531905	428264	505819	164236	27374	6633	834	805	1951
1 STD strata fished	<= 200 fathoms		78100	37492	58340	63543	30961	106059	50106	10276	1896	201	197	256

[1] all strata in the depth range have not been fished. Strata not fished in the <= 200 fathom depth range have been filled using a multiplicative model using data to 1992. std are for strata fished in the depth range.

Table 23. Cod abundance (thousands) and biomass (t) for Division 3L spring surveys for1985-1996 for depths > 200 fathoms and totals for all strata fished.

Depth range (fath)	Stratum number	Stratum area nautical miles	WT 28-30 1985	WT 48 1986	WT 59-60 1987	WT 70-71 1988	WT 83 1989	WT 96 1990	WT 106-107 1991	WT 119-122 1992	WT 137-138 1993	WT 152-154 1994	WT 168-170 1995	WT 189-191 1996
Mean Date			07-May-85	16-May-86	23-May-87	15-May-88	18-May-89	26-May-90	20-May-91	24-May-92	31-May-93	01-Jun-94	06-Jun-95	14-Jun-96
							abundance							
201-300	729	186	102	nf	nf	nf	nf	nf	141	3876	192	77	0	2
	731	216	30	nf	nf	nf	nf	nf	3046	267	416	9701	0	69
	733	468	1674	nf	nf	nf	nf	nf	7339	2672	880	1513	483	28
	735	272	94	nf	nf	nf	nf	nf	nf	92905	0	6080	673	3823
301-400	730	170	0	nf	nf	nf	nf	nf	0	0	0	0	0	0
	732	231	0	nf	nf	nf	nf	nf	0	0	0	0	0	0
	734	228	0	nf	nf	nf	nf	nf	267	0	0	0	0	0
	736	175	0	nf	nf	nf	nf	nf	nf	60	0	0	0	0
401-500	737	227	nf	nf	nf	nf	nf	nf	nf	nf	nf	0	nf	nf
	741	223	nf	nf	nf	nf	nf	nf	nf	nf	nf	0	nf	nf
	745	348	nf	nf	nf	nf	nf	nf	nf	nf	nf	0	nf	nf
	748	159	nf	nf	nf	nf	nf	nf	nf	nf	nf	0	nf	nf
Total >200 fathoms			1900	0	0	0	0	0	10793	99780	1488	17371	1156	3922
Total all strata fished			1027668	468328	374201	411190	405673	680365	273879	147819	18056	21649	4445	5872
1 STD all strata fished			143399	39174	51595	50874	34169	176063	56567	93188	4007	9990	1275	3638
							biomass							
201-300	729	186	78	nf	nf	nf	nf	nf	320	1683	78	29	0	13
	731	216	78	nf	nf	nf	nf	nf	1967	389	248	5913	0	152
	733	468	755	nf	nf	nf	nf	nf	6351	1959	345	556	219	41
	735	272	894	nf	nf	nf	nf	nf	nf	50199	0	3238	386	5512
301-400	730	170	0	nf	nf	nf	nf	nf	0	0	0	0	0	0
	732	231	0	nf	nf	nf	nf	nf	0	0	0	0	0	0
	734	228	0	nf	nf	nf	nf	nf	437	0	0	0	0	0
	736	175	0	nf	nf	nf	nf	nf	nf	69	0	0	0	0
401-500	737	227	nf	nf	nf	nf	nf	nf	nf	nf	nf	0	nf	nf
	741	223	nf	nf	nf	nf	nf	nf	nf	nf	nf	0	nf	nf
	745	348	nf	nf	nf	nf	nf	nf	nf	nf	nf	0	nf	nf
	748	159	nf	nf	nf	nf	nf	nf	nf	nf	nf	0	nf	nf
Total >200 fathoms			1805	0	0	0	0	0	9075	54299	671	9736	605	5718
Total all strata fished			602932	487714	489618	531905	428264	505819	173311	81673	7304	10570	1410	10884
1 STD all strata fished			78105	37492	58340	63543	30961	106059	50374	50990	1899	5960	440	5091

nf not all strata fished in the depth range. Strata not fished in the greater than 200 fathom depth range have not been filled using a multiplicative model.

Table 24a. Survey mean numbers at age (note that the value at age in year t has been moved forward to become value at age a+1 in year t+1).

Year/age	3	4	5	6	7	8	9	10	3+ RV
1984	58.68	41.65	24.08	15.93	4.67	2.67	5.48	2.77	155.91
1985	52.62	53.05	31.67	19.82	10.93	2.37	1.35	1.93	173.75
1986	9.81	29.73	32.81	16.18	10.25	4.76	0.86	0.71	105.10
1987	14.81	20.48	55.20	62.23	30.82	13.08	5.77	1.31	203.71
1988	12.42	8.02	9.25	22.83	17.22	5.05	2.97	1.41	79.17
1989	19.41	14.48	7.51	8.67	15.21	13.51	2.82	1.58	83.18
1990	66.33	33.08	21.96	12.16	9.74	10.34	5.44	1.44	160.49
1991	16.98	48.74	29.59	13.54	6.93	4.29	4.12	1.60	125.80
1992	10.22	14.80	41.55	18.47	4.58	1.29	0.54	0.35	91.80
1993	2.48	5.89	4.54	4.52	1.75	0.39	0.04	0.02	19.62
1994	3.05	2.03	1.72	0.51	0.31	0.06	0.01	0.00	7.68
1995	0.51	0.71	0.31	0.12	0.03	0.02	0.01	0.00	1.70
1996	0.97	0.74	0.30	0.12	0.06	0.01	0.00	0.00	2.21
1997	1.37	0.85	0.41	0.15	0.04	0.03	0.00	0.00	2.86

Table 24b . Commercial catch at age 1962 to 1995

CATCH	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1962	8666	26194	64337	58163	47314	27521	20142	18036	10444	9468	7778	5785	4669	3888	3955	2161	232	403
1963	5746	27577	60234	118112	58996	29349	15520	11612	8248	4204	3942	2933	2928	1737	1263	1352	328	182
1964	19338	27603	57757	60681	100147	50865	20892	12264	8698	6352	4989	4036	2703	1456	1918	1154	501	312
1965	5177	28709	46800	66946	64360	68176	33819	14913	6945	3729	3948	3730	2722	1859	575	971	183	226
1966	14057	65992	93687	62812	59312	30423	23844	8762	4528	2280	1825	1186	967	806	416	279	486	178
1967	15262	77873	100339	96759	54996	38691	17146	16084	5949	3367	2108	1529	685	424	193	107	72	211
1968	6142	94291	205805	150541	83808	39443	23171	10984	5591	5249	1939	1334	818	610	127	89	83	26
1969	4330	39626	100858	163228	107509	52661	19651	12370	6389	4479	3004	1557	622	567	319	100	46	99
1970	18104	60102	82357	101249	85696	29218	10857	3825	2000	1200	507	224	214	244	124	32	10	34
1971	12876	71557	95384	98111	57865	25055	11732	4470	2223	1287	1140	720	355	474	124	128	148	78
1972	6737	79809	116562	76196	55984	29553	11750	6393	2987	1660	1388	725	748	606	452	136	195	36
1973	3963	40785	94844	59503	35464	27351	14153	7566	3815	2153	1173	450	278	309	85	27	38	8
1974	3231	13201	34927	74403	60539	35687	18854	10492	5818	2934	1078	652	249	338	162	113	45	20
1975	3968	14101	25370	34426	39105	36485	13421	7514	2315	1179	808	372	165	82	5	8	22	1
1976	13767	33727	28049	20898	16811	16022	10931	4637	1462	631	292	251	100	50	40	64	30	20
1977	7128	65510	40462	12107	5397	3396	2730	1381	532	296	149	75	42	21	20	14	2	6
1978	1323	17556	39206	20319	7711	3078	1530	1083	437	219	105	62	40	21	7	8	2	7
1979	1152	12361	37493	29202	10982	3460	1300	757	560	183	116	51	43	38	7	7	4	9
1980	2554	12025	28814	30016	18017	4830	1217	520	232	229	56	65	37	13	10	14	4	10
1981	2185	7172	13191	24800	22014	11848	3175	779	309	195	125	48	14	28	20	5	5	5
1982	1702	31286	19003	14397	25435	16930	11936	1923	338	156	90	153	40	12	13	4	0	0
1983	2585	13616	42602	19028	12044	14701	8934	6341	1018	248	90	41	29	11	9	6	2	3
1984	782	14871	31760	38624	12503	7246	8910	4227	2536	451	146	48	41	30	7	7	4	3
1985	650	14824	36614	33922	28006	7050	3836	5162	2905	1681	254	107	39	20	17	1	3	5
1986	831	15219	44168	45869	26025	14722	3104	2000	1977	1101	574	116	29	18	11	9	2	2
1987	2329	9217	32340	49061	28469	19505	5818	1346	676	873	391	200	37	22	3	1	4	0
1988	2779	14651	20184	47917	45725	18608	9026	4337	774	422	366	223	100	32	5	10	5	5
1989	1696	17639	21150	25212	38708	28499	8696	3640	1695	572	244	180	94	43	4	9	0	1
1990	7693	40557	36410	22695	16390	17940	9156	2865	1084	478	103	98	36	25	8	7	1	0
1991	3111	31654	53805	29553	9064	6164	4745	1696	641	250	88	39	21	9	3	2	2	0
1992	430	3860	14535	12211	4526	1372	376	199	104	18	9	4	0	0	0	0	0	0
1993	940	4993	3343	1940	700	147	21	0	0	0	0	0	0	0	0	0	0	0
1994	105	379	575	177	74	22	2	0	0	0	0	0	0	0	0	0	0	0
1995	7	30	71	55	20	11	3	0	0	0	0	0	0	0	0	0	0	0
1996	40.11	237.11	296.61	341.31	128.59	22.78	5.47	3.33	0.13	0.07	0.001	0	0	0	0	0	0	0

Table 25. ADAPT estimates of the numbers at age (bias adjusted) at the beginning of the year from 1962 to 1997.

Year	3	4	5	6	7	8	9	10	11
1962	708013	544761	711104	356616	192263	107291	79017	71425	0
1963	605431	571845	422372	524186	239604	114894	63118	46597	42273
1964	859788	490495	443299	291552	322976	143156	67700	37730	27717
1965	1025776	686474	376676	310903	184124	174585	71631	36684	19893
1966	1199209	835158	536124	266223	194342	93071	81916	28458	16693
1967	877263	969134	624247	354610	161507	105896	48919	45665	15439
1968	729973	704460	723223	420744	203439	82933	52043	24687	22975
1969	664412	592104	491813	407364	209601	91599	32696	21906	10398
1970	734713	540064	449024	311940	187469	75784	28178	9320	6933
1971	588407	585185	387993	293512	164597	76950	35891	13351	4209
1972	253411	470120	414625	231947	152347	82908	40533	18865	6924
1973	141107	201393	313055	234814	121578	74588	41400	22639	9714
1974	138340	111951	128198	171204	138788	67708	36569	21210	11752
1975	233247	110346	79760	73594	73668	59523	23645	13137	8007
1976	427408	187383	77638	42547	29519	25485	16355	7423	4075
1977	338722	337503	123061	38437	16193	9219	6658	3718	1965
1978	308256	270886	217383	64473	20609	8419	4506	3009	1807
1979	154321	251184	205943	142692	34559	9968	4136	2318	1493
1980	158284	125307	194496	134869	90558	18444	5060	2220	1219
1981	361103	127286	91750	133288	83433	57934	10762	3049	1350
1982	319282	293673	97741	63237	86810	48536	36775	5962	1797
1983	346993	259868	212236	62926	38831	48245	24565	19405	3157
1984	427028	281759	200475	135440	34445	20987	26309	12110	10201
1985	333742	348914	217265	135536	76215	17001	10688	13552	6126
1986	155193	272658	272287	144919	80488	37315	7614	5314	6474
1987	127317	126311	209500	183161	77506	42558	17375	3457	2560
1988	154877	102135	95100	142401	105897	37957	17424	9010	1626
1989	168066	124293	70424	59709	73631	45828	14477	6223	3506
1990	78125	136069	85874	38679	26342	25801	12241	4131	1860
1991	14481	57027	75007	37753	11502	7028	5275	1962	851
1992	8820	9058	18525	13943	4967	1464	401	214	131
1993	2644	6833	3965	2410	810	161	23	8	4
1994	2280	1322	1194	330	273	54	5	1	5
1995	1908	1772	742	464	112	157	24	2	1
1996	2445	1556	1424	544	331	74	119	17	2
1997	10000	1966	1060	899	142	156	40	92	11

Table 26. Estimates of the fishing mortality at age (bias corrected) from the ADAPT.

Year	3	4	5	6	7	8	9	10
1962	0.014	0.054	0.105	0.198	0.315	0.331	0.328	0.325
1963	0.011	0.055	0.171	0.284	0.315	0.329	0.315	0.32
1964	0.025	0.064	0.155	0.26	0.415	0.492	0.413	0.44
1965	0.006	0.047	0.147	0.27	0.482	0.557	0.723	0.587
1966	0.013	0.091	0.213	0.3	0.407	0.443	0.384	0.412
1967	0.019	0.093	0.195	0.356	0.467	0.51	0.484	0.487
1968	0.009	0.159	0.374	0.497	0.598	0.731	0.665	0.665
1969	0.007	0.077	0.255	0.576	0.817	0.979	1.055	0.95
1970	0.028	0.131	0.225	0.439	0.69	0.547	0.547	0.595
1971	0.024	0.145	0.314	0.456	0.486	0.441	0.443	0.457
1972	0.03	0.207	0.369	0.446	0.514	0.494	0.382	0.464
1973	0.031	0.252	0.404	0.326	0.385	0.513	0.469	0.456
1974	0.026	0.139	0.355	0.643	0.647	0.852	0.824	0.774
1975	0.019	0.152	0.428	0.714	0.861	1.092	0.959	0.971
1976	0.036	0.22	0.503	0.766	0.964	1.142	1.281	1.129
1977	0.023	0.24	0.446	0.423	0.454	0.516	0.594	0.521
1978	0.005	0.074	0.221	0.424	0.526	0.511	0.465	0.501
1979	0.008	0.056	0.223	0.255	0.428	0.478	0.422	0.443
1980	0.018	0.112	0.178	0.28	0.247	0.339	0.307	0.297
1981	0.007	0.064	0.172	0.229	0.342	0.254	0.391	0.329
1982	0.006	0.125	0.24	0.288	0.387	0.481	0.439	0.436
1983	0.008	0.059	0.249	0.403	0.415	0.406	0.507	0.443
1984	0.002	0.06	0.191	0.375	0.506	0.475	0.463	0.481
1985	0.002	0.048	0.205	0.321	0.514	0.603	0.499	0.539
1986	0.006	0.063	0.196	0.426	0.437	0.564	0.59	0.53
1987	0.02	0.084	0.186	0.348	0.514	0.693	0.457	0.555
1988	0.02	0.172	0.265	0.46	0.638	0.764	0.83	0.744
1989	0.011	0.17	0.399	0.618	0.849	1.12	1.054	1.008
1990	0.115	0.396	0.622	1.013	1.121	1.387	1.631	1.38
1991	0.269	0.924	1.483	1.828	1.861	2.663	3.005	2.51
1992	0.055	0.626	1.84	2.646	3.23	3.955	3.955	3.713
1993	0.493	1.545	2.287	1.977	2.511	3.292	3.292	0
1994	0.052	0.377	0.744	0.876	0.352	0.592	0.591	0
1995	0.004	0.019	0.111	0.14	0.218	0.08	0.145	0
1996	0.018	0.183	0.26	1.139	0.554	0.411	0.052	0.238

Table 27. Residuals from the observed and predicted estimates from the ADAPT

Age	3	4	5	6	7	8	9	10	11
1984	-0.691	-0.719	-0.897	-0.905	-0.820	-0.792	-0.681	-0.551	-0.757
1985	-0.553	-0.690	-0.704	-0.687	-0.764	-0.700	-1.181	-1.025	-0.788
1986	-1.467	-1.023	-0.894	-0.957	-0.883	-0.789	-1.293	-1.089	-1.049
1987	-0.857	-0.626	-0.112	0.156	0.256	0.090	-0.214	-0.046	-0.169
1988	-1.229	-1.351	-1.108	-0.595	-0.639	-0.747	-0.881	-0.931	-0.935
1989	-0.865	-0.957	-1.016	-0.694	-0.399	0.049	-0.748	-0.447	-0.635
1990	1.127	-0.221	-0.142	0.079	0.183	0.356	0.077	-0.130	0.166
1991	1.447	1.033	0.292	0.210	0.671	0.777	0.641	0.720	0.724
1992	1.423	1.676	2.021	1.517	1.097	1.143	1.185	1.416	1.435
1993	1.167	1.025	1.343	1.815	1.950	2.157	1.443	2.081	1.623
1994	1.427	1.521	1.504	1.547	1.005	1.397	1.621	0.000	1.253
1995	-0.245	0.113	0.205	-0.284	-0.418	-1.194	0.030	0.000	-0.224
1996	0.010	0.230	-0.504	-0.435	-0.718	-1.063	0.000	0.000	-0.310
1997	-0.694	-0.010	0.013	-0.768	-0.520	-0.684	0.000	0.000	-0.333

Table 28. Parameter estimates from adapt.

Estimates for index catchability parameters

PAR. EST.	STD. ERR.	REL. ERR.	BIAS	REL. BIAS
-8.202E0	2.906E-1	-3.543E-2	-9.301E-3	1.134E-3
-8.101 0	2.914E-1	-3.597E-2	-1.000E-2	1.235E-3
-8.130E0	2.876E-1	-3.538E-2	-1.109E-2	1.364E-3
-8.143E0	2.872E-1	-3.526E-2	-1.527E-2	1.876E-3
-8.086E0	2.983E-1	-3.690E-2	-3.337E-3	4.127E-4
-8.178E0	3.018E-1	-3.691E-2	7.918E-3	-9.682E-4
-7.796E0	3.046E-1	-3.908E-2	1.216E-2	-1.559E-3
-7.832E0	3.293E-1	-4.205E-2	1.113E-4	-1.421E-5

Terminal year class abundance

AGE	PAR. EST.	STD. ERR.	REL. ERR.	BIAS	REL. BIAS
3	10000	0	0	0	0
4	2831	2185	0.77	865	0.31
5	1374	945	0.69	314	0.23
6	1112	715	0.64	213	0.19
7	218	198	0.91	76	0.35
8	212	162	0.77	56	0.27
9	64	64	1.01	24	0.37
10	144	134	0.93	52	0.36
11	11	6	0.56	-1	-0.05

Table 29. Projection of F0.1 catch in 1998 assuming a 2,000 t catch in 1997. Numbers are in thousands.

POPULATION NUMBERS

	1997	1998
3	2199	2199
4	1966	1677.134
5	1060	1268.031
6	899	593.2739
7	142	459.7387
8	156	61.01597
9	40	67.03162
10	92	17.1876
11	11	39.53147
3+	6,565	6,382

POPULATION BIOMASS (AVERAGE)

	1997	1998
3	1386.9359	1406.1333
4	1567.7159	1399.1625
5	1043.0343	1338.9941
6	1242.5409	893.81484
7	228.3721	829.60514
8	291.2277	127.80777
9	89.176413	167.67775
10	198.02457	41.509938
11	40.409581	162.94473
3+	6,087.44	6,367.65

POPULATION BIOMASS AT BEGINNING OF YEAR

	1997	1998
	1354	1354
	1656	1412
	1198	1433
	1410	931
	302	977
	400	157
	121	203
	298	56
	46	165
3+	6785	6687

CATCH NUMBERS

	1997	1998
3	137	82
4	380	202
5	306	234
6	308	132
7	62	134
8	68	18
9	17	19
10	40	5
11	5	11
3+	1322	837

CATCH BIOMASS

	1997	1998
3	98	59
4	374	199
5	397	303
6	585	250
7	147	318
8	188	49
9	57	64
10	128	16
11	26	63
3+	2000	1321

FISHING MORTALITY

	1997	1998
	0.071	0.042
	0.239	0.142
	0.380	0.226
	0.471	0.280
	0.645	0.384
	0.645	0.384
	0.645	0.384
	0.645	0.384
	0.645	0.384
3+		

WEIGHT AT BEGINNING OF YEAR

	1996	1997	1998	1999
3	0.62	0.62	0.62	0.62
4	0.86	0.84	0.84	0.84
5	1.07	1.13	1.13	1.13
6	1.69	1.57	1.57	1.57
7	2.21	2.13	2.13	2.13
8	2.53	2.57	2.57	2.57
9	3.36	3.02	3.02	3.02
10	2.44	3.24	3.24	3.24
11	4.16	4.16	4.16	4.16

Table 30. Observed proportion mature at age of female Atlantic cod (Gadus morhua) in NAFO Div. 2J3KL (1982-1997). A50=median age at maturity (years); L95% and U95%=lower and upper 95% confidence intervals. Parameter estimates of the logit model are shown: Int=intercept, SE=standard error, n=number of fish examined, dot=no fish sampled.

AGE	1982	1983	1984	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
2	0	0	0	0	0	0	0	0	0	0	0	.	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0.01	0	0	0.01	0	0	0	0.02	0.05	0.07	0.05	0.01
5	0.01	0.05	0.05	0.03	0.02	0.08	0.08	0.11	0.13	0.29	0.30	0.55	0.59	0.62	0.34
6	0.44	0.45	0.49	0.42	0.47	0.39	0.67	0.70	0.43	0.63	0.84	0.90	1	0.98	0.59
7	0.88	0.93	0.84	0.85	0.88	0.90	0.90	0.91	0.88	0.83	0.84	0.98	1	1	1
8	0.96	0.99	0.93	1	0.97	0.96	0.97	0.99	0.97	0.98	1	1	1	1	1
9	1	1	1	1	0.98	1	1	1	1	1	1	1	1	.	1
10	1	1	1	1	1	1	1	1	1	1	1	.	.	.	1
11	1	1	1	1	1	1	1	1	0.84	1	1	1	.	.	1
12	1	1	1	1	1	1	1	1	1	1	1	.	.	.	.
13	1	1	1	1	1	1	1	1	1	1	.	.	.	.	.
A50	6.27	6.07	6.13	6.20	6.18	6.16	5.91	5.81	6.19	5.72	5.44	5.01	4.86	4.86	5.50
L 95%	6.12	5.96	6.01	6.10	6.06	6.05	5.78	5.70	6.06	5.60	5.32	4.89	4.68	4.75	5.34
U 95%	6.41	6.20	6.26	6.29	6.30	6.28	6.03	5.93	6.33	5.84	5.56	5.13	5.04	4.98	5.70
Slope	2.30	2.70	2.22	2.48	2.25	2.21	2.17	2.48	1.59	1.61	2.00	2.52	3.38	3.55	2.29
SE	0.18	0.23	0.19	0.17	0.17	0.17	0.14	0.18	0.09	0.11	0.15	0.24	0.65	0.39	0.23
Int	-14.45	-16.43	-13.59	-15.37	-13.91	-13.65	-12.81	-14.39	-9.84	-9.19	-10.90	-12.64	-16.46	-17.25	-10.31
SE	1.17	1.34	1.15	1.05	1.08	1.05	0.86	1.04	0.55	0.61	0.82	1.22	3.22	1.86	0.97
n	1028	1354	1202	1260	1037	1146	1386	1422	1361	1045	697	489	139	561	717

Table 31. Observed proportion mature at age of male Atlantic cod (Gadus morhua) in NAFO Div. 2J3KL (1982-1997). A50=median age at maturity (years); L95% and U95%=lower and upper 95% confidence intervals. Parameter estimates of the logit model are shown: Int=intercept, SE=standard error, n=number of fish examined, dot=no fish sampled.

AGE	1982	1983	1984	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0.02	0	0.05	0	0.06	0	0.02	0.10
4	0.14	0.24	0.15	0.05	0.21	0.05	0.08	0.25	0.25	0.48	0.48	0.40	0.70	0.19	0.40
5	0.58	0.56	0.72	0.59	0.47	0.61	0.66	0.66	0.57	0.88	0.83	0.94	0.95	0.69	0.70
6	0.96	0.85	0.95	0.86	0.86	0.86	0.95	0.95	0.72	0.93	1	1	0.96	0.95	0.97
7	0.99	1	1	0.97	0.93	0.97	0.98	0.99	0.98	0.98	1	1	1	0.99	1
8	0.99	1	1	1	0.99	1	0.99	1	1	1	1	1	1	1	1
9	1	0.99	1	1	1	1	1	1	1	1	1	1	1	.	1
10	1	1	0.98	1	1	1	1	1	1	1	1	.	.	1	1
11	1	1	1	0.97	1	1	1	0.99	1	1	1	.	.	.	1
12	1	1	1	1	1	1	1	1	1	1	1	.	.	.	.
13	1	1	1	1	1	1	1	1	1	1	1	.	.	.	.
A50	4.83	4.86	4.72	5.02	5.04	5.03	4.85	4.64	4.91	4.13	4.12	4.11	3.73	4.65	4.31
L 95%	4.70	4.75	4.61	4.91	4.89	4.90	4.74	4.52	4.79	4.00	4.01	3.99	3.38	4.51	4.19
J 95%	4.97	4.98	4.84	5.12	5.19	5.15	4.96	4.75	5.04	4.25	4.24	4.22	3.94	4.83	4.46
Slope	2.29	1.80	2.26	1.96	1.66	2.15	2.60	1.96	1.50	1.94	2.45	2.84	2.44	2.26	1.73
SE	0.19	0.12	0.16	0.13	0.12	0.16	0.20	0.13	0.10	0.14	0.24	0.31	0.53	0.23	0.13
Int	-11.05	-8.74	-10.69	-9.86	-8.37	-10.82	-12.62	-9.10	-7.40	-8.01	-10.11	-11.68	-9.10	-10.5	-5.74
SE	0.90	0.56	0.76	0.66	0.64	0.80	0.94	0.60	0.47	0.63	1.02	1.28	2.15	0.98	0.40
n	923	1359	1119	1187	954	1095	1205	1235	1165	843	599	375	141	539	746

Table 32. Observed proportion mature at length of female Atlantic cod (Gadus morhua) in NAFO Div. 2J3KL (1982-1997). L50=median length at 50% maturity (in cm); L95% and U95%=lower and upper 95% confidence intervals. Length in 3cm intervals:e.g.,55cm=54-56 cm. Parameter estimates of the logit model are shown: Int=intercept, SE=standard error, n=number of fish examined, dot=no fish sampled.

LEN	1982	1983	1984	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0
31	0	0	0	0.04	0	0	0	0	0	0	0.02	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0.02	0.01	0	0	0	0
37	0	0	0	0	0	0	0	0	0.01	0.06	0.11	0.08	0.03	0	0.01
40	0	0	0	0.01	0	0	0	0	0	0.19	0.15	0.20	0.26	0.06	0.04
43	0	0	0	0.02	0.04	0.02	0.08	0	0.08	0.39	0.38	0.49	0.70	0.45	0.25
46	0.01	0	0.02	0.22	0.16	0.32	0.18	0.17	0.18	0.54	0.56	0.64	0.87	0.87	0.47
49	0.02	0.08	0.03	0.33	0.50	0.50	0.60	0.51	0.43	0.68	0.76	0.74	0.90	0.98	0.70
52	0.18	0.12	0.37	0.52	0.72	0.62	0.83	0.71	0.46	0.70	0.80	0.89	1	1	0.94
55	0.69	0.35	0.37	0.72	0.91	0.78	0.92	0.86	0.69	0.76	0.95	1	1	0.8	1
58	0.77	0.89	0.59	0.91	0.89	0.80	0.96	1	0.87	0.92	1	0.85	1	0.83	1
61	0.93	1	0.83	0.97	0.90	0.92	0.98	1	0.95	0.91	0.92	1	1	1	1
64	0.97	0.99	0.95	1	1	0.95	1	1	1	0.97	1	1	1	1	1
67	0.97	0.97	0.99	1	0.94	1	1	1	1	1	1	1	.	1	1
70	1	1	0.99	1	1	1	1	1	1	1	1	1	1	.	1
73	1	1	1	1	0.97	1	1	1	1	1	1	.	.	.	1
76	0.98	1	1	1	1	1	1	1	1	1	1	1	.	.	1
79	1	1	1	1	1	1	1	1	1	1	1	.	.	.	1
82	1	1	1	1	1	1	1	1	1	1	1	.	.	.	1
85	1	1	1	1	1	1	1	0.98	1	1	.	.	.	.	.
88	1	1	1	1	1	1	1	0.96	1	1	.	1	.	.	.
91	1	1	1	1	1	1	1	1	1	1	1	.	.	.	.
L50	55.04	55.39	56.06	51.40	50.46	50.72	48.91	49.74	51.53	46.96	45.40	44.56	42.21	44.37	46.75
L 95%	54.14	54.75	55.19	50.67	49.54	49.84	48.20	49.11	50.77	46.03	44.55	43.65	40.95	43.42	45.80
U 95%	55.92	56.06	56.93	52.12	51.37	51.58	49.60	50.38	52.27	47.88	46.28	45.49	43.48	45.56	47.88
Slope	0.41	0.55	0.35	0.33	0.30	0.27	0.44	0.48	0.32	0.22	0.28	0.30	0.51	0.48	0.45
SE	0.04	0.06	0.03	0.02	0.02	0.02	0.04	0.04	0.02	0.01	0.02	0.03	0.09	0.06	0.05
Int	-22.80	-30.53	-19.59	-17.16	-15.09	-13.88	-21.50	-23.85	-16.36	-10.26	-12.68	-13.26	-21.42	-21.4	-21.18
SE	2.10	3.07	1.65	1.24	1.16	0.96	1.73	1.99	1.07	0.64	0.96	1.21	3.77	2.7	2.49
n	1027	1353	1202	1260	1037	1145	1384	1419	1360	1045	693	488	172	560	717

Table 33. Proportion mature at length of male Atlantic cod (Gadus morhua) in NAFO Div. 2J3KL (1982-1995). L50=median length at 50% maturity (cm); L95% and U95%=lower and upper confidence intervals. Length in 3 cm intervals: e.g., 55 cm=54-56 cm. Parameter estimates of the logit model are shown: Int=intercept, SE=standard error, n=number of fish examined, dot=no fish sampled.

LEN	1982	1983	1984	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0
28	0	0	0.01	0	0	0	0	0.02	0.01	0.03	0.03	0.07	0	0.05	0.03
31	0	0	0	0.04	0	0	0	0	0.08	0.38	0.22	0.18	0	0.23	0.17
34	0	0.04	0	0.09	0.09	0.04	0	0.10	0.10	0.64	0.49	0.24	0.55	0.32	0.42
37	0.01	0.14	0.06	0.25	0.34	0.07	0.09	0.21	0.36	0.72	0.66	0.32	0.74	0.42	0.45
40	0.09	0.35	0.14	0.49	0.52	0.36	0.20	0.41	0.44	0.87	0.72	0.58	0.97	0.56	0.51
43	0.16	0.46	0.45	0.58	0.60	0.66	0.62	0.62	0.66	0.90	0.74	0.80	1	0.83	0.72
46	0.56	0.49	0.60	0.77	0.76	0.80	0.82	0.80	0.62	0.96	0.92	1	1	0.95	0.89
49	0.79	0.60	0.87	0.91	0.87	0.89	0.96	0.94	0.71	0.84	0.95	1	0.94	1	0.89
52	0.94	0.70	0.92	0.91	0.96	0.95	0.98	0.99	0.74	0.96	1	1	1	1	0.91
55	1	0.91	0.98	0.90	0.95	0.97	0.99	0.97	0.89	0.96	1	1	1	1	1
58	1	0.99	0.99	0.96	0.93	1	1	1	1	0.98	1	1	1	1	1
61	1	1	0.99	1	0.95	1	1	1	1	1	1	1	.	1	1
64	0.99	1	0.99	1	1	1	1	1	1	1	1	1	1	1	1
67	1	1	1	1	1	1	1	0.99	1	1	1	1	1	1	1
70	1	0.97	1	1	1	1	1	1	1	1	1	.	1	1	1
73	1	1	1	0.96	1	1	1	1	1	1	1	1	.	1	1
76	1	1	1	1	1	1	1	1	1	1	1	.	.	.	1
79	0.97	1	1	1	1	1	1	1	1	1	.	.	.	.	1
82	1	1	1	1	1	1	1	1	1	1	.	.	.	.	1
85	1	1	1	1	1	1	1	1	1	1	1	.	.	.	1
88	1	0.94	1	1	1	1	1	1	1	.	.	.	.	.	.
91	1	1	1	1	1	1	1	1	1	1	1	.	.	.	.
L50	45.88	45.58	44.54	41.81	41.59	42.17	42.52	41.31	42.67	34.12	35.77	38.17	34.39	37.80	38.60
L 95%	45.05	44.62	43.70	40.93	40.56	41.45	41.89	40.56	41.70	33.15	34.72	37.12	32.98	36.80	37.64
U 95%	46.66	46.53	45.37	42.67	42.62	42.88	43.13	42.06	43.64	35.03	36.75	39.07	35.54	38.93	39.70
Slope	0.41	0.22	0.35	0.24	0.25	0.36	0.40	0.33	0.20	0.24	0.24	0.32	0.47	0.28	0.24
SE	0.04	0.01	0.03	0.02	0.02	0.03	0.03	0.02	0.01	0.02	0.02	0.03	0.09	0.03	0.02
Int	-19.02	-10.21	-15.78	-10.07	-10.40	-15.10	-19.94	-13.67	-8.71	-8.04	-8.70	-12.28	-16.23	-10.48	-9.24
SE	1.75	0.63	1.29	0.65	0.80	1.19	1.31	0.96	0.52	0.65	0.82	1.27	3.13	0.94	0.68
n	920	1357	1119	1187	954	1094	1203	1233	1160	843	599	374	176	560	744

Table 34. Estimated proportion mature at age for female cod in NAFO Div. 2J3KL on Jan. 1. No estimate was produced for 1985 because of the timing of the fall survey in 3L in 1984. Age at 50% maturity for the population is also given for each year.

AGE	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	0	0	0						0						0	0
2	0	0	0		0	0	0	0	0	0.001	0.003	0.001		0	0	0
3	0.001	0	0.001		0	0.001	0.001	0.002	0.001	0.006	0.013	0.007	0.006	0.002	0.001	0.003
4	0.005	0.004	0.009		0.004	0.007	0.008	0.016	0.011	0.030	0.059	0.053	0.073	0.051	0.046	0.031
5	0.051	0.052	0.075		0.049	0.066	0.070	0.123	0.118	0.130	0.240	0.292	0.494	0.612	0.625	0.241
6	0.350	0.450	0.428		0.381	0.401	0.409	0.551	0.615	0.423	0.611	0.753	0.924	0.979	0.983	0.758
7	0.844	0.924	0.873		0.880	0.864	0.864	0.915	0.950	0.782	0.887	0.958	0.993	0.999	1	0.969
8	0.982	0.995	0.984		0.989	0.984	0.983	0.989	0.996	0.946	0.975	0.994	0.999	1	1	0.997
9	0.998	1	0.998		0.999	0.998	0.998	0.999	1	0.989	0.995	0.999	1	1		1
10	1	1	1		1	1	1	1	1	0.998	0.999	1				1
11	1	1	1		1	1	1	1	1	1	1	1	1			1
12	1	1	1		1	1	1	1	1	1	1	1				
13	1	1	1		1	1	1	1	1	1	1					
14	1	1	1		1	1	1	1	1	1	1					
15	1	1	1		1	1	1	1	1	1						
A50	6.27	6.07	6.13		6.2	6.18	6.16	5.91	5.81	6.19	5.72	5.44	5.01	4.86	4.86	5.50
n	1028	1354	1202		1260	1037	1146	1386	1422	1361	1045	697	489	139	561	717

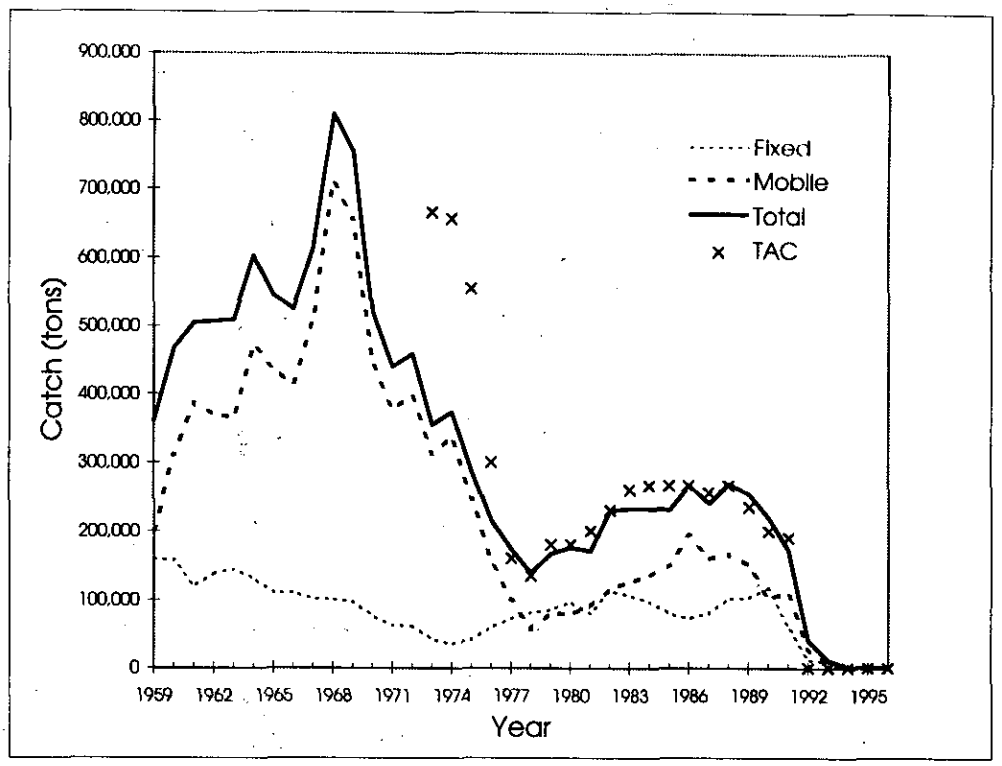

Fig. 1. Division 2J3KL cod landings from fixed gear, mobile gear, the total catch and the TAC.

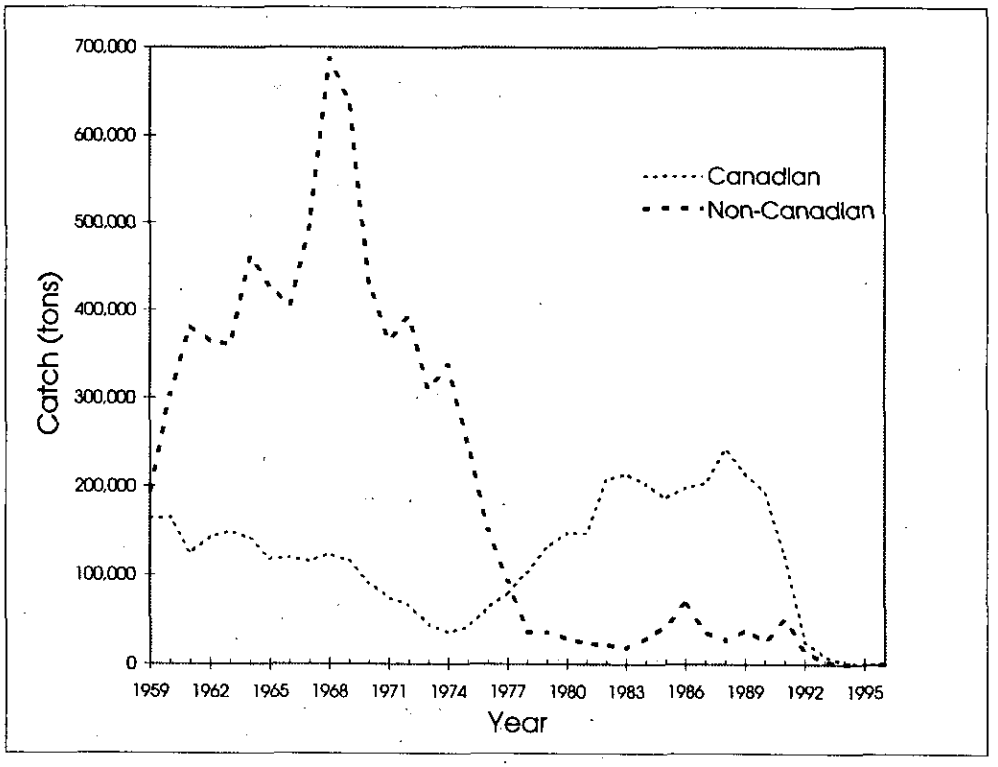

Fig. 2. Divisions 2J3KL cod landings by Canadian and non-Canadian vessels.

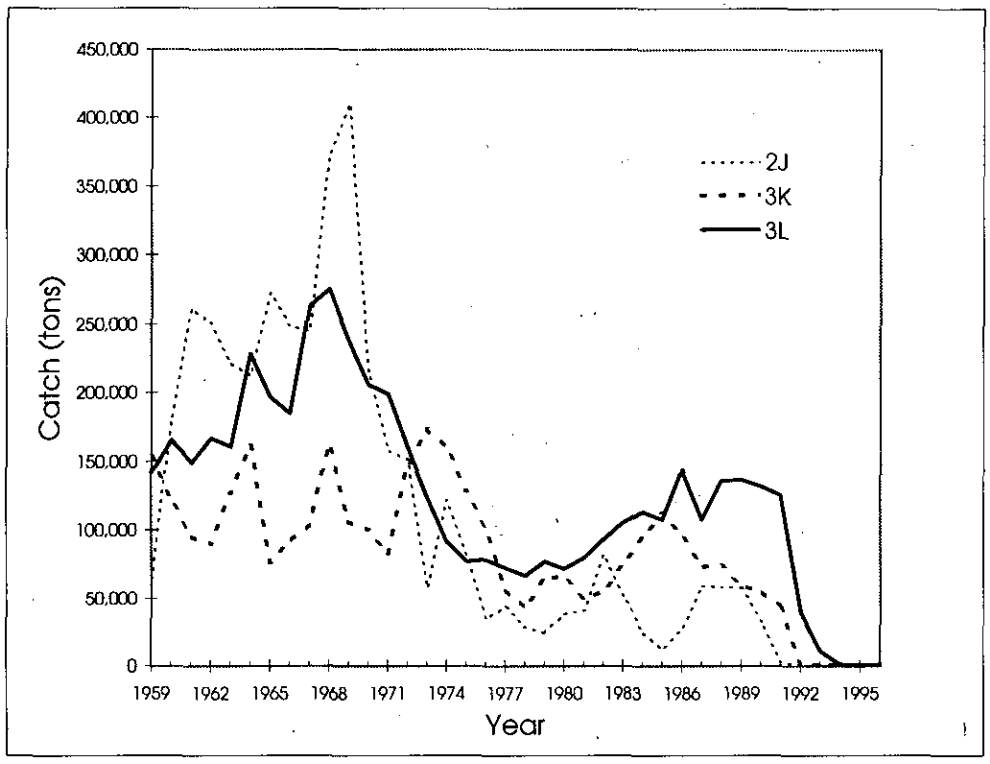

Fig. 3. Divisions 2J3KL cod landings by division.

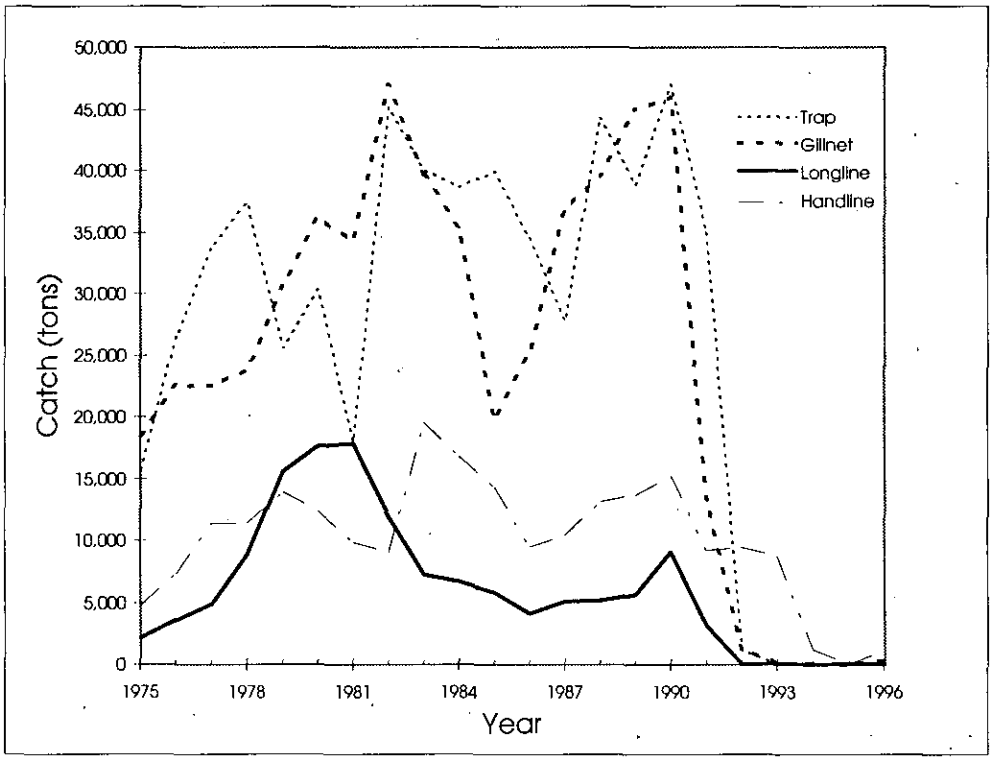

Fig. 4. Divisions 2J3KL fixed gear cod landings by gear type.

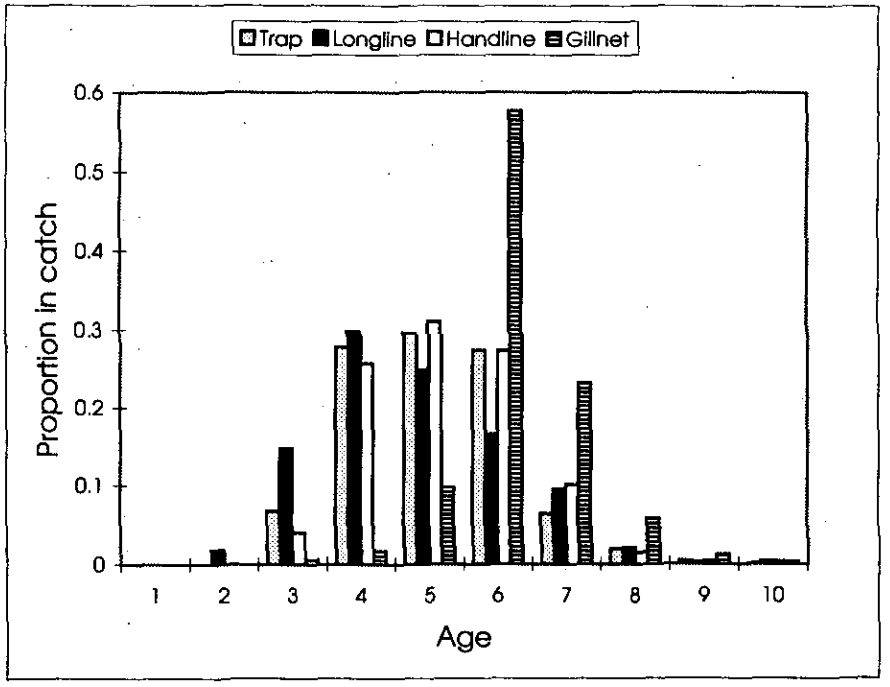

Fig. 5. Age composition of the commercial catch by gear type in 1996.

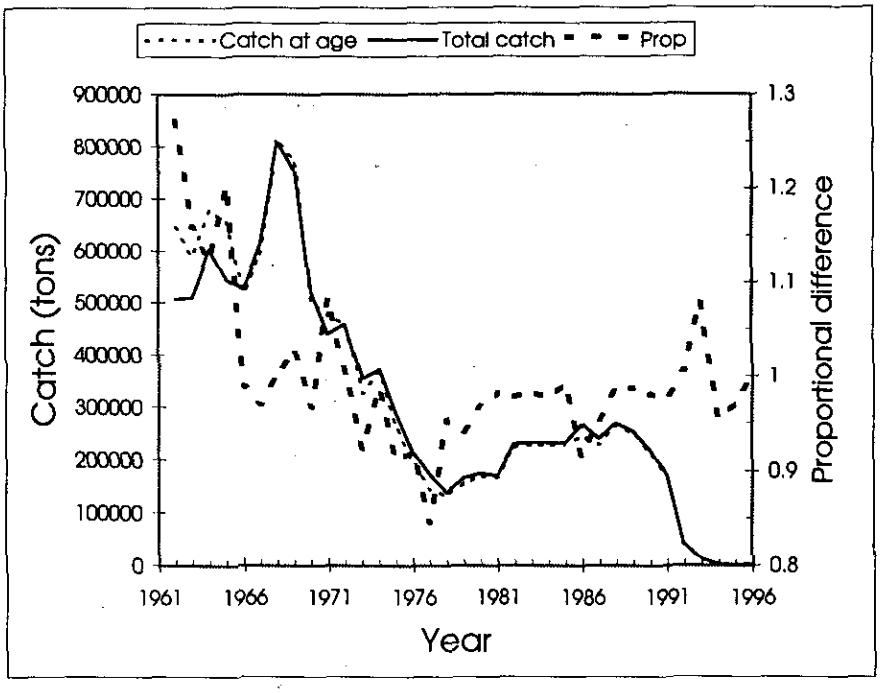

Fig. 6. Comparition of the total catch in Table 1 and the sum of the produc of mean weights at age and numbers at age in the catch. The proportion of the calculated catch at age over the total given in Table 1 is also plotte

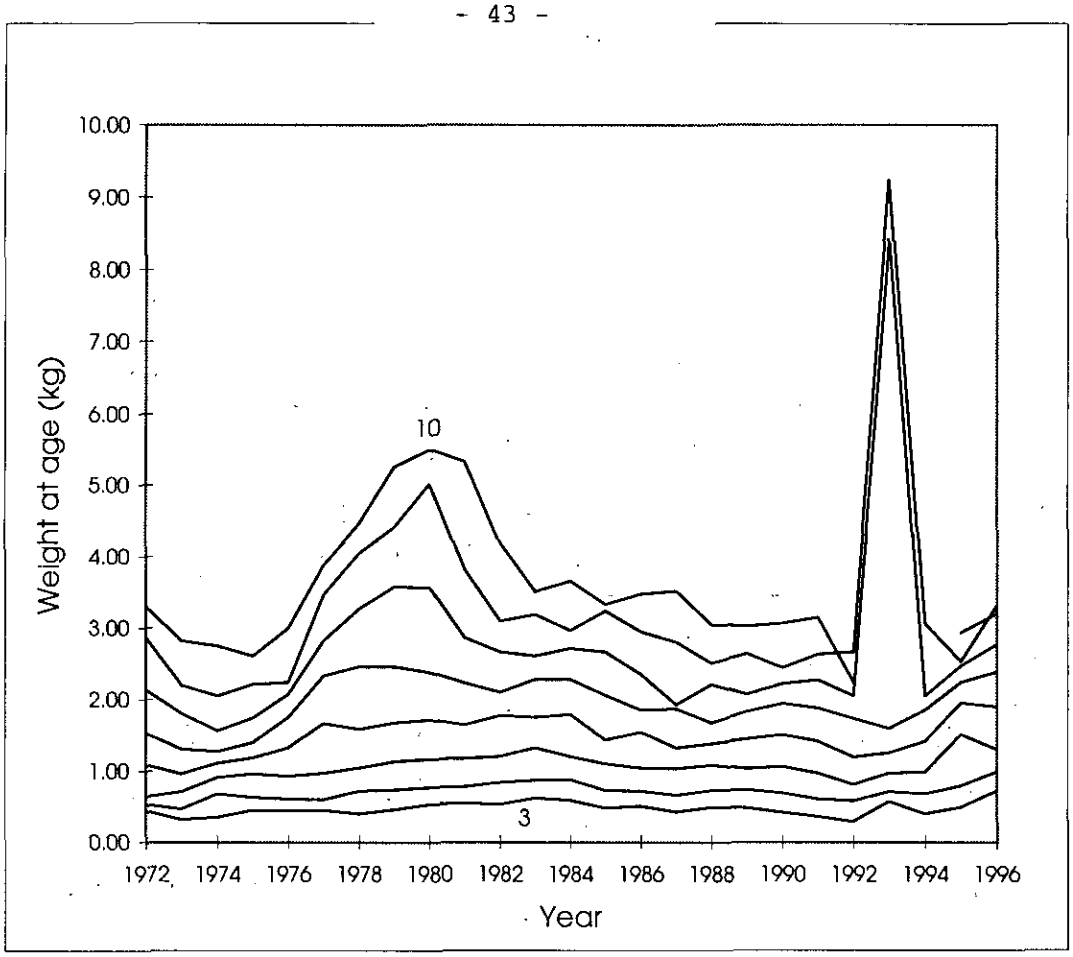

Fig. 7. Mean weights at age calculated from mean lengths at age in the commercial catch.

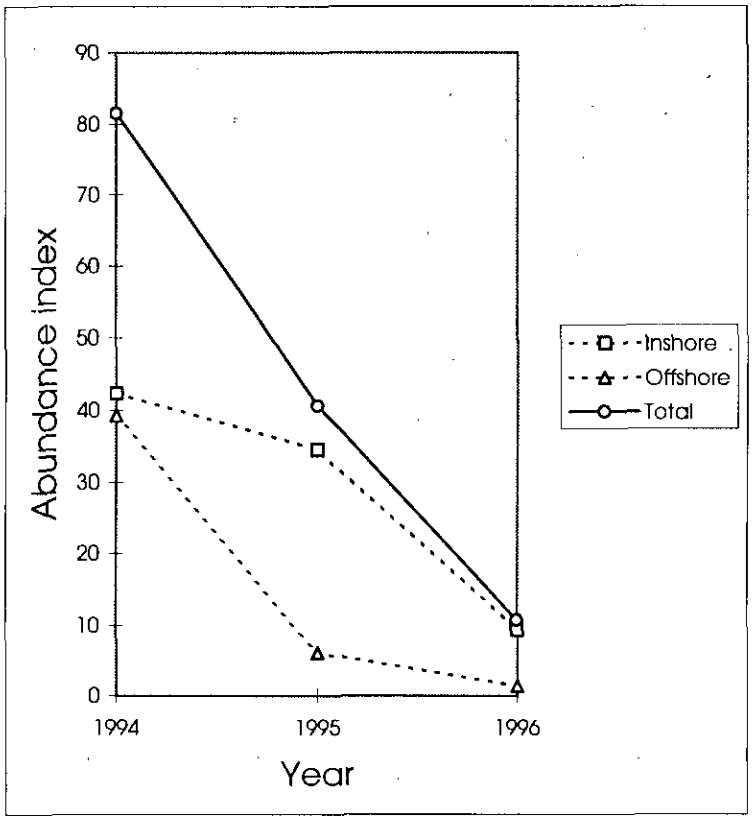

Fig. 8. Index of pelagic juvenile cod abundance (from Anderson and Dalley 1997).

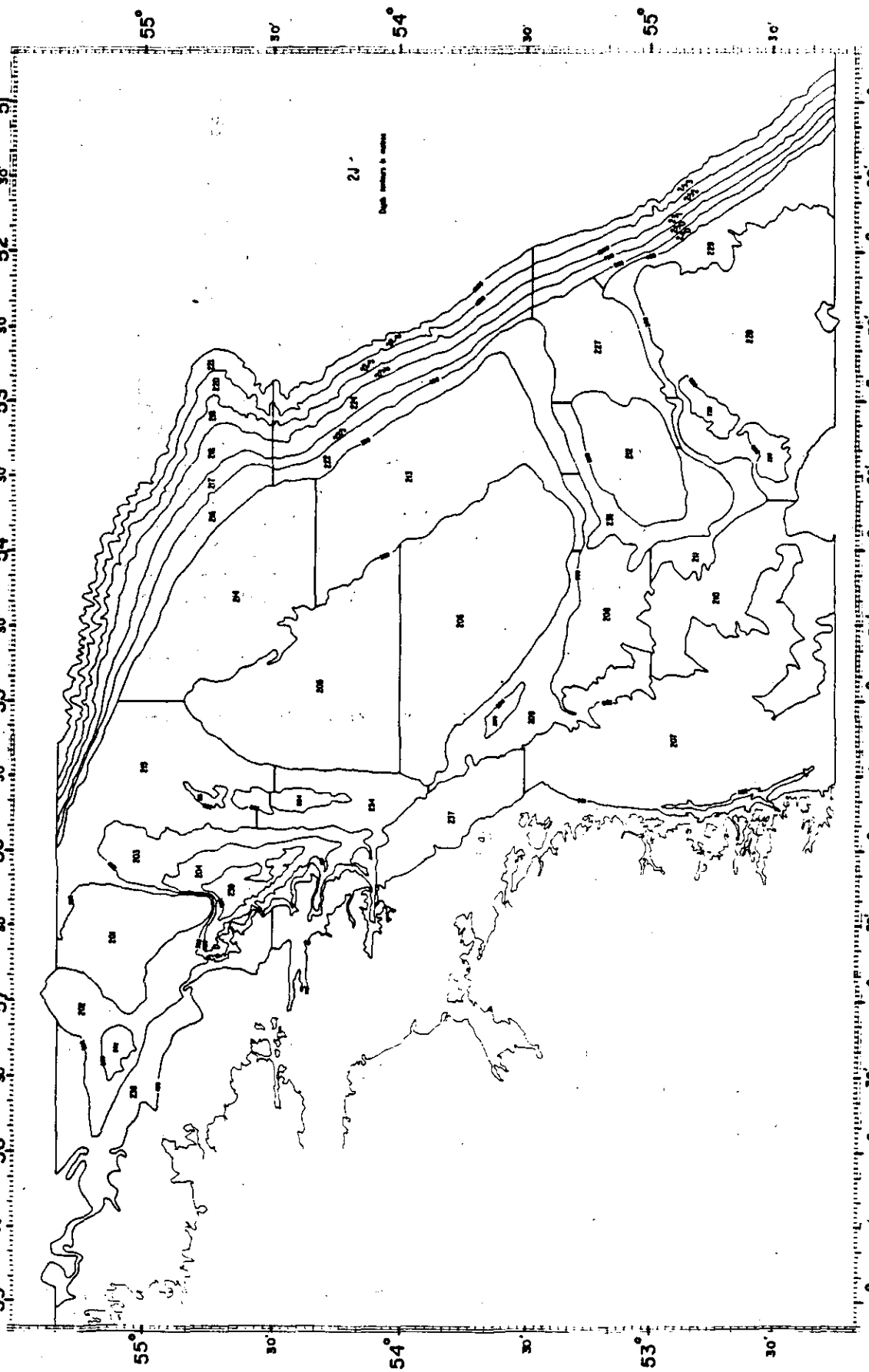

Fig. 9. Area of stratification for RV surveys in NAFO Division 2J.

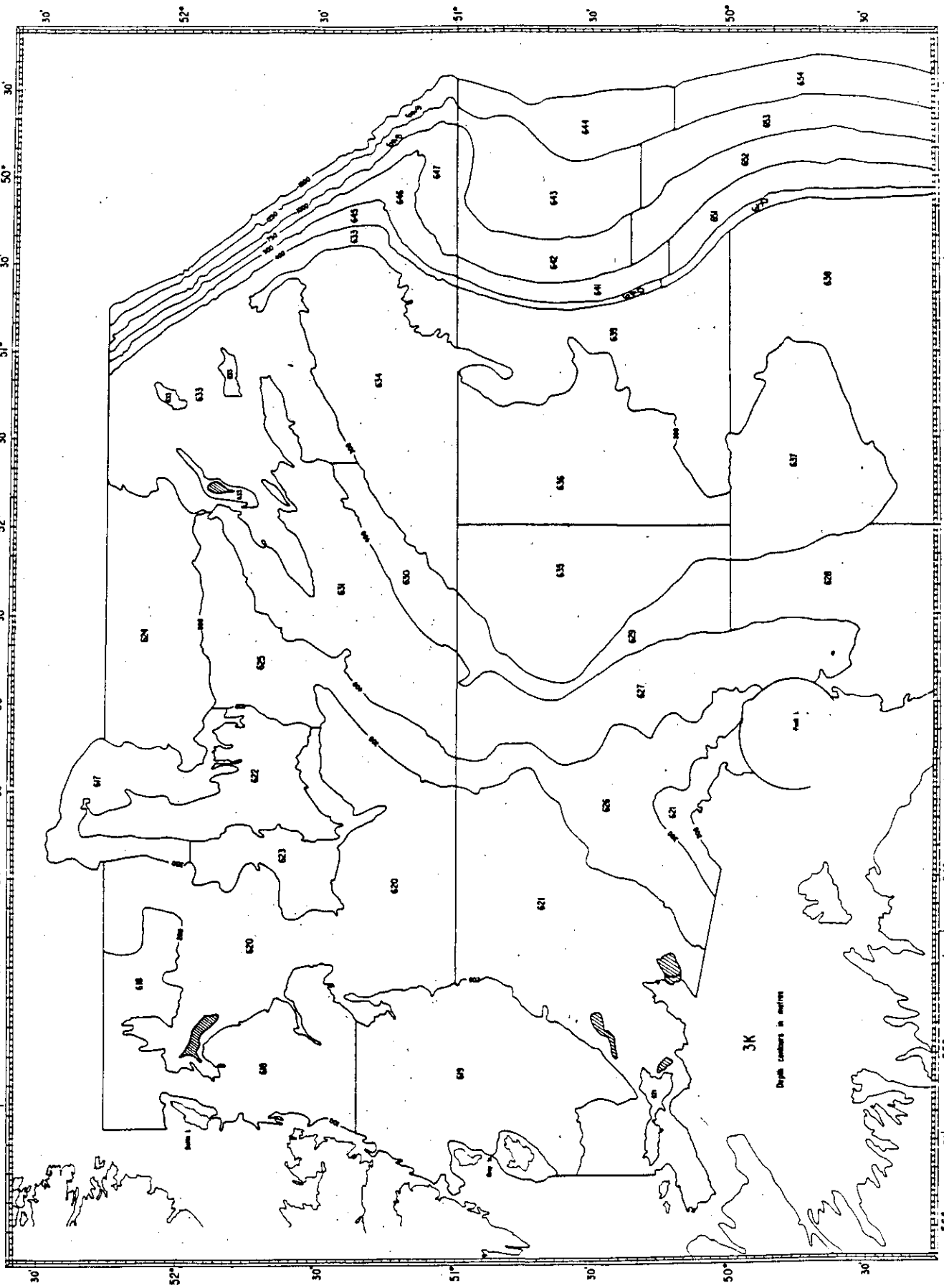

Fig.10. Area of stratification for RV surveys in NAFO Division 3K.

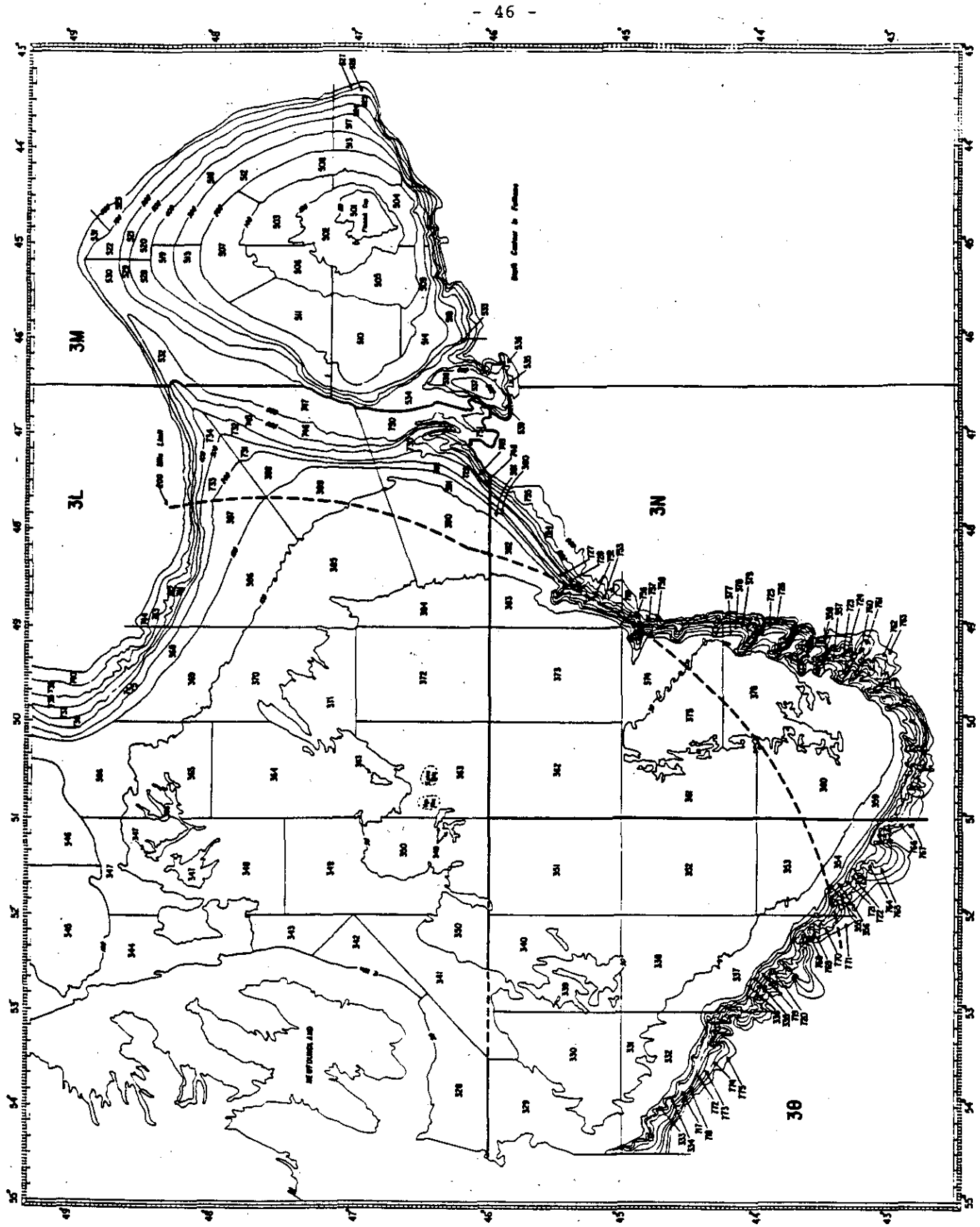

Fig. 11. Area of stratification for RV surveys in NAFO Division 3L.

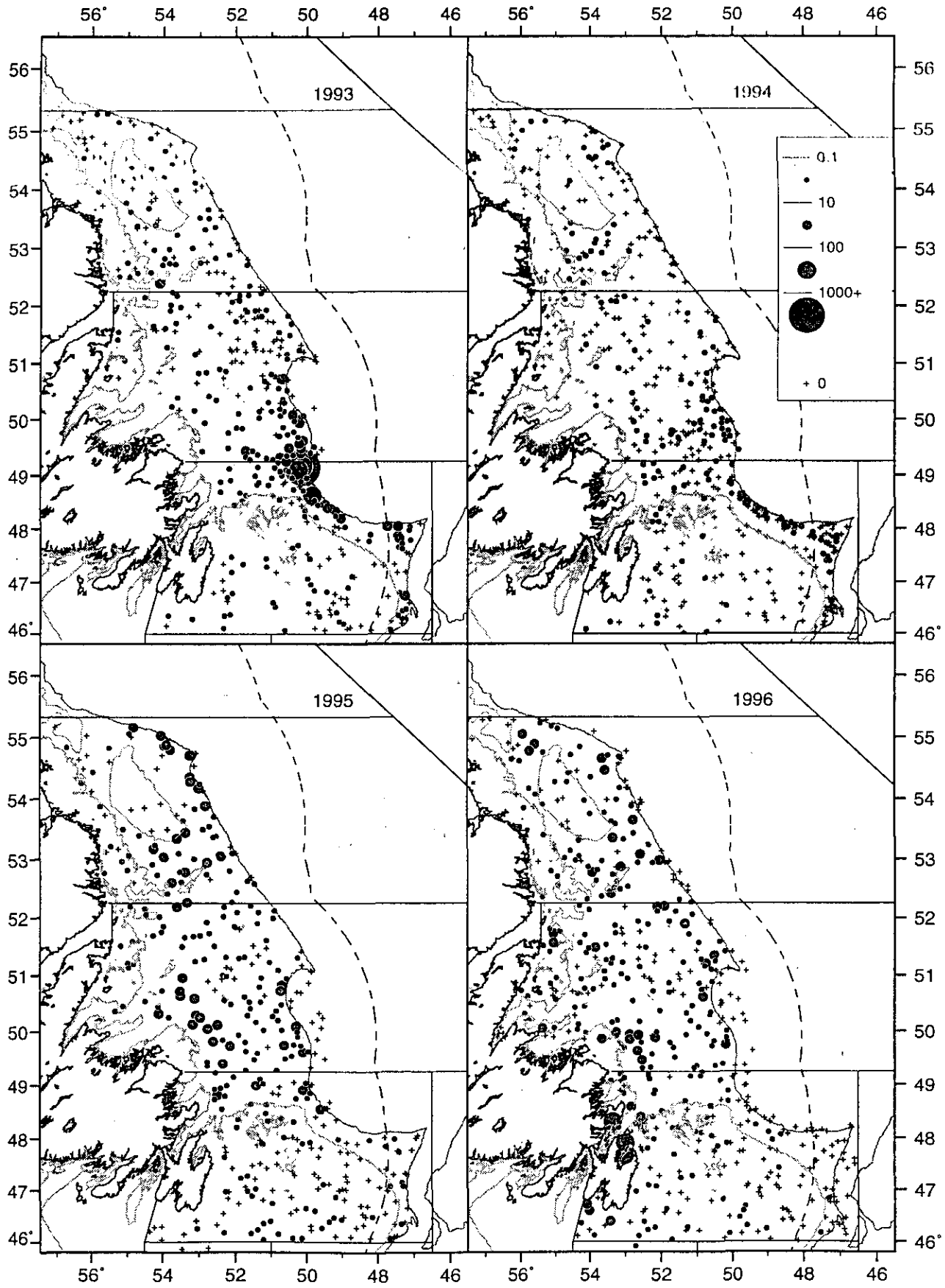

Fig. 12. Cod distribution (numbers per tow) for all ages and all sets in the fall survey for the years 1993 to 1996. The 1993-94 surveys are with the Engels trawl whereas the 1995-96 surveys are with the Campelen trawl.

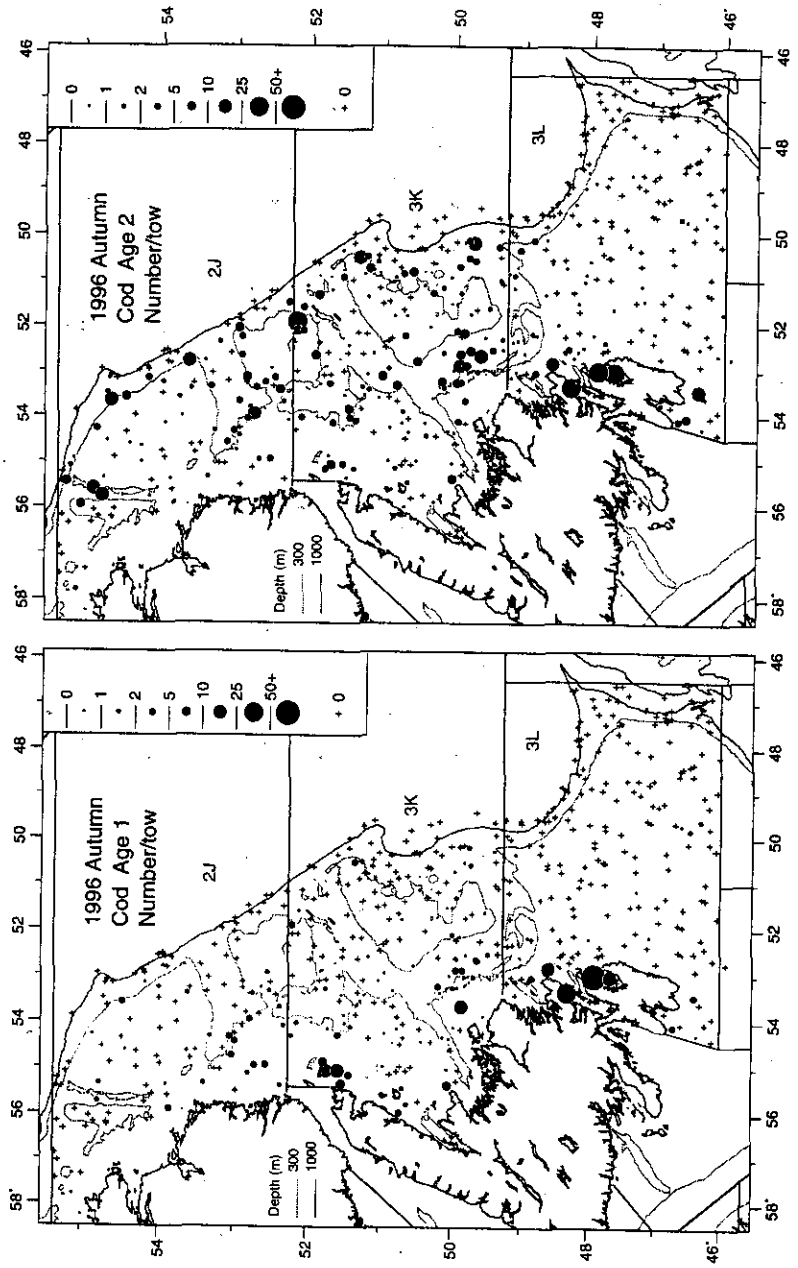

Fig. 13. Cod distribution (numbers per tow) for ages 1 and 2 fish for all sets in the fall 1996 survey carried out with the Campelen trawl.

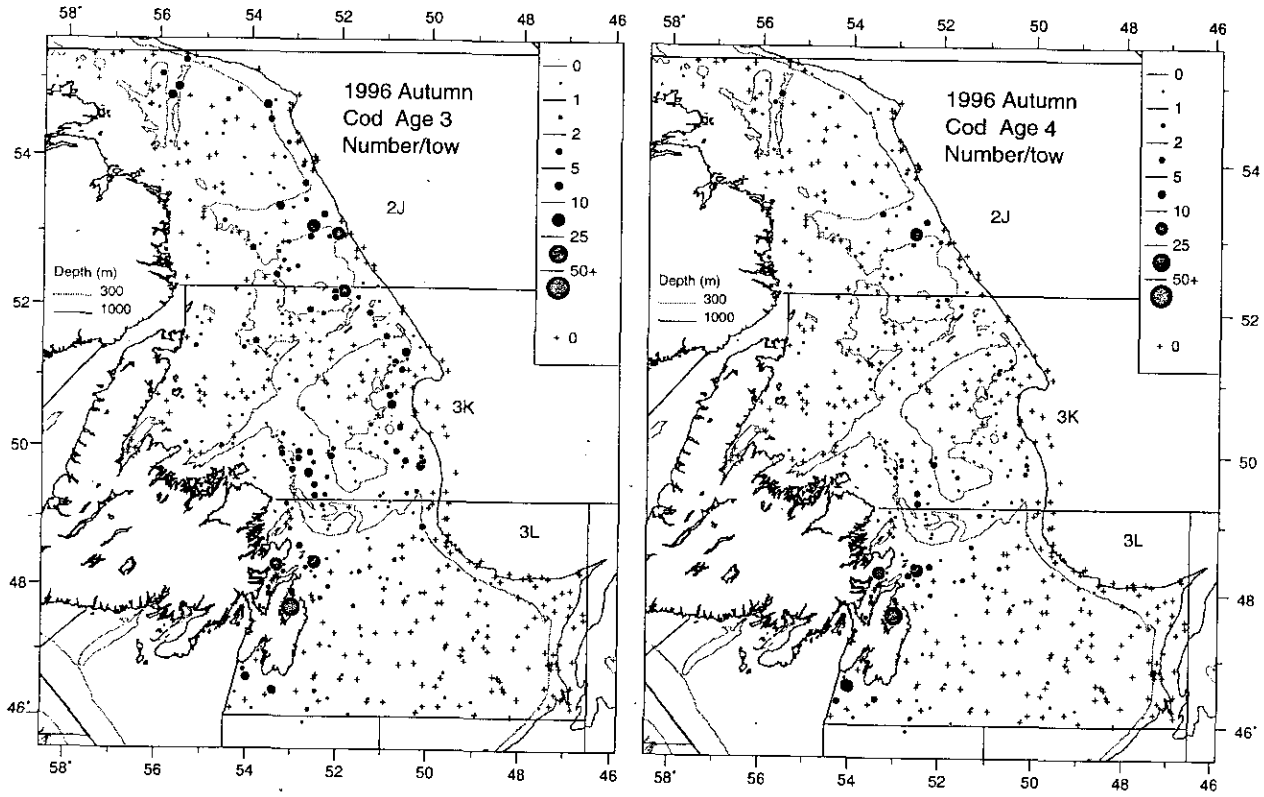

Fig. 13 contd. Cod distribution (numbers per tow) for ages 3 and 4 fish for all sets in the fall 1996 survey carried out with the Campelen trawl.

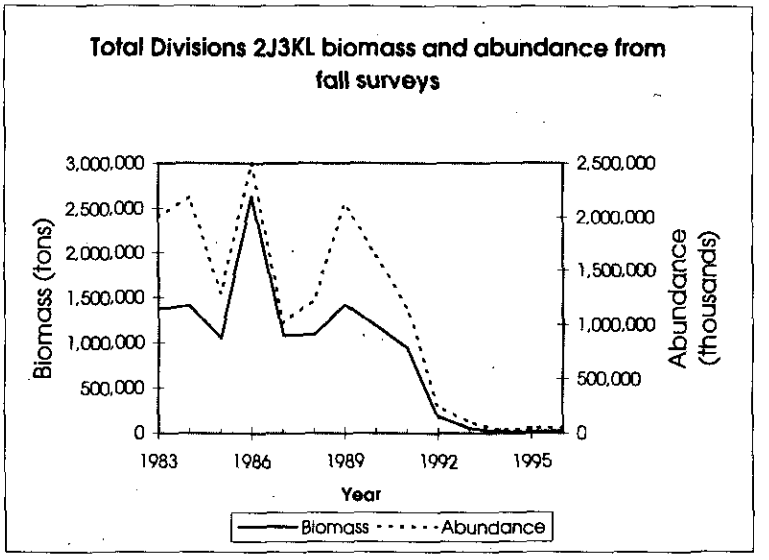

Fig. 14. Biomass and abundance estimates from the Divisions 2J3KL fall trawl survey.

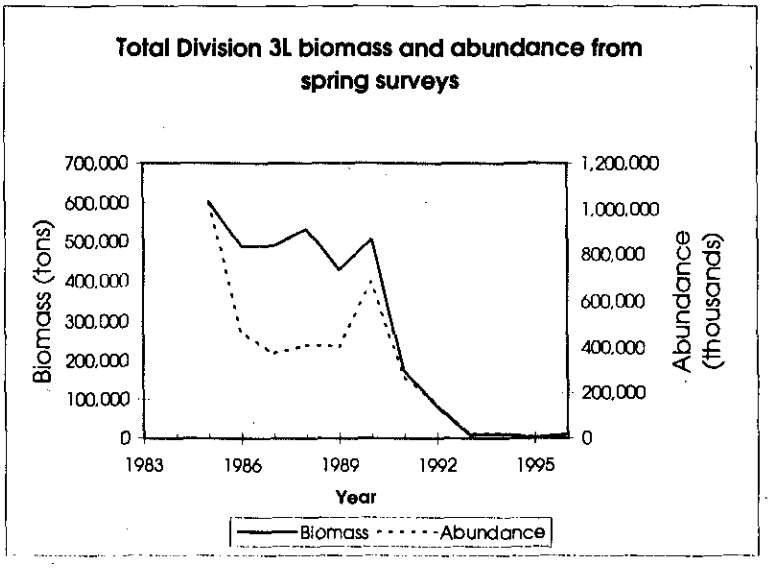

Fig. 15. Biomass and abundance estimates from the Division 3L spring trawl survey.

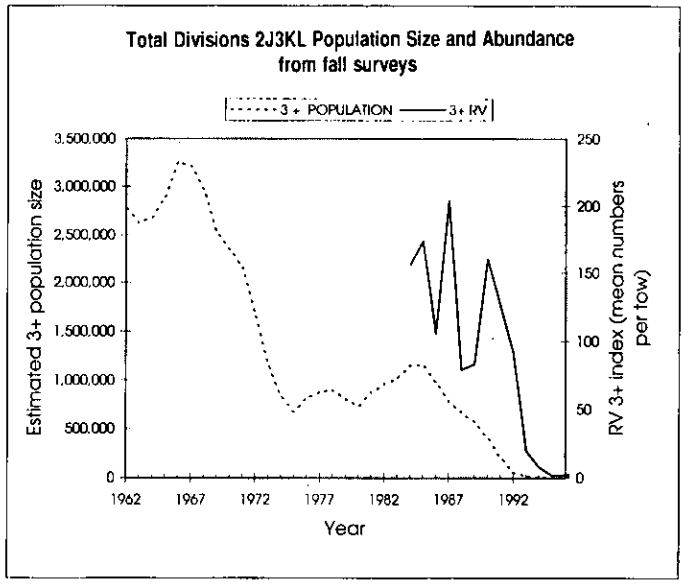

Fig. 16. ADAPT estimates of the beginning of the year 3+population size and the RV index used to calibrate the SPA.

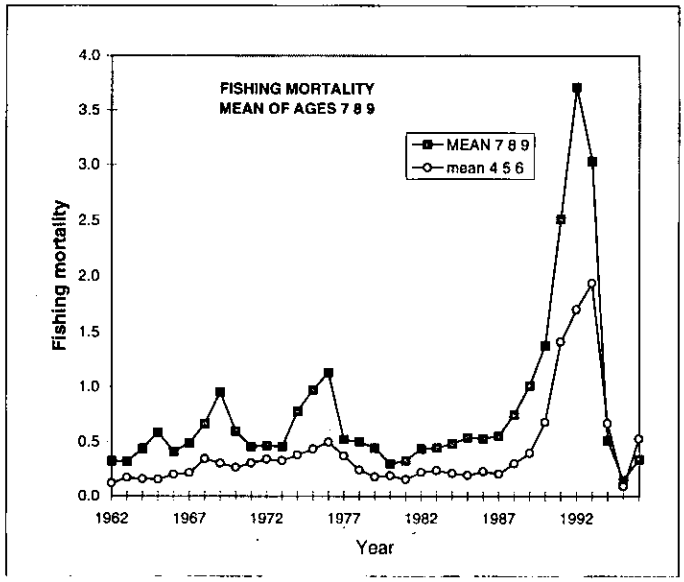

Fig. 17. ADAPT estimates of fishing mortality. The mean for ages 7-9 and for ages 4-6 are plotted.

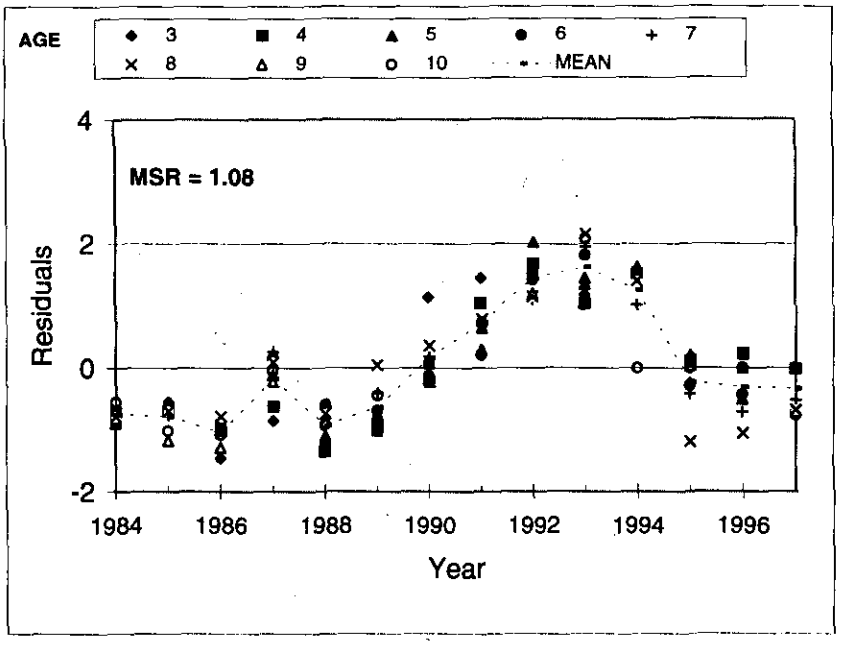

Fig. 18. Residuals from the ADAPT fit to the RV index.

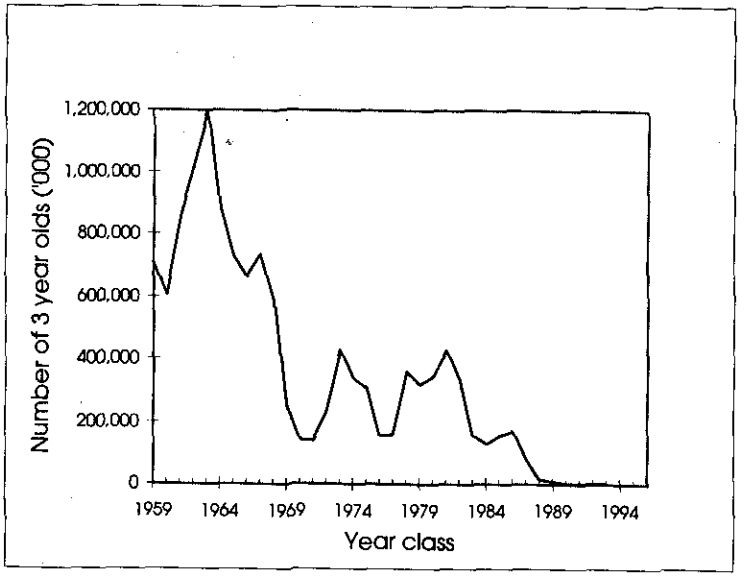

Fig. 19. Recruitment estimates from ADAPT (numbers at age 3).

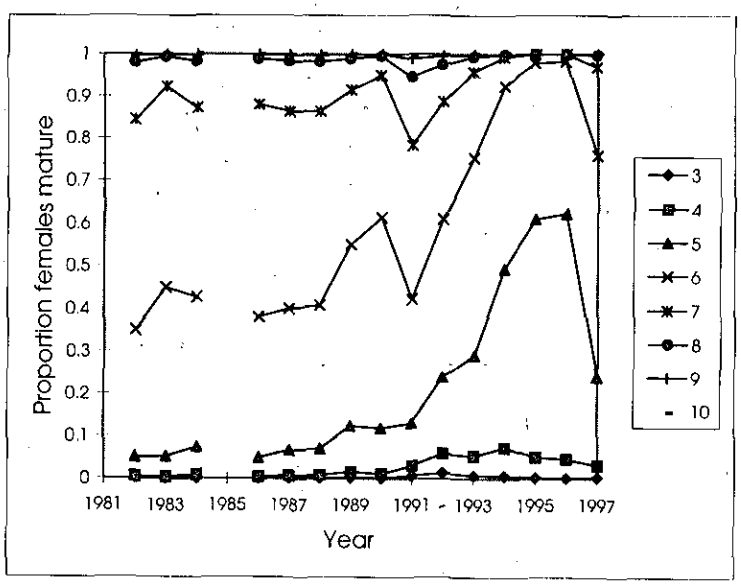

Fig. 20. Estimated female proportion mature at age for ages 3-10 from the survey.

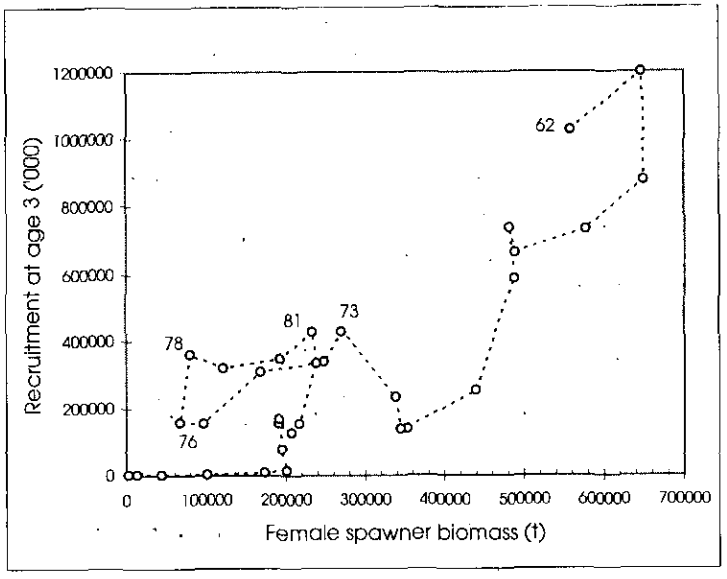

Fig. 21. Female spawner biomass and recruitment for Divisions 2J3KL for 1962 to 1993.

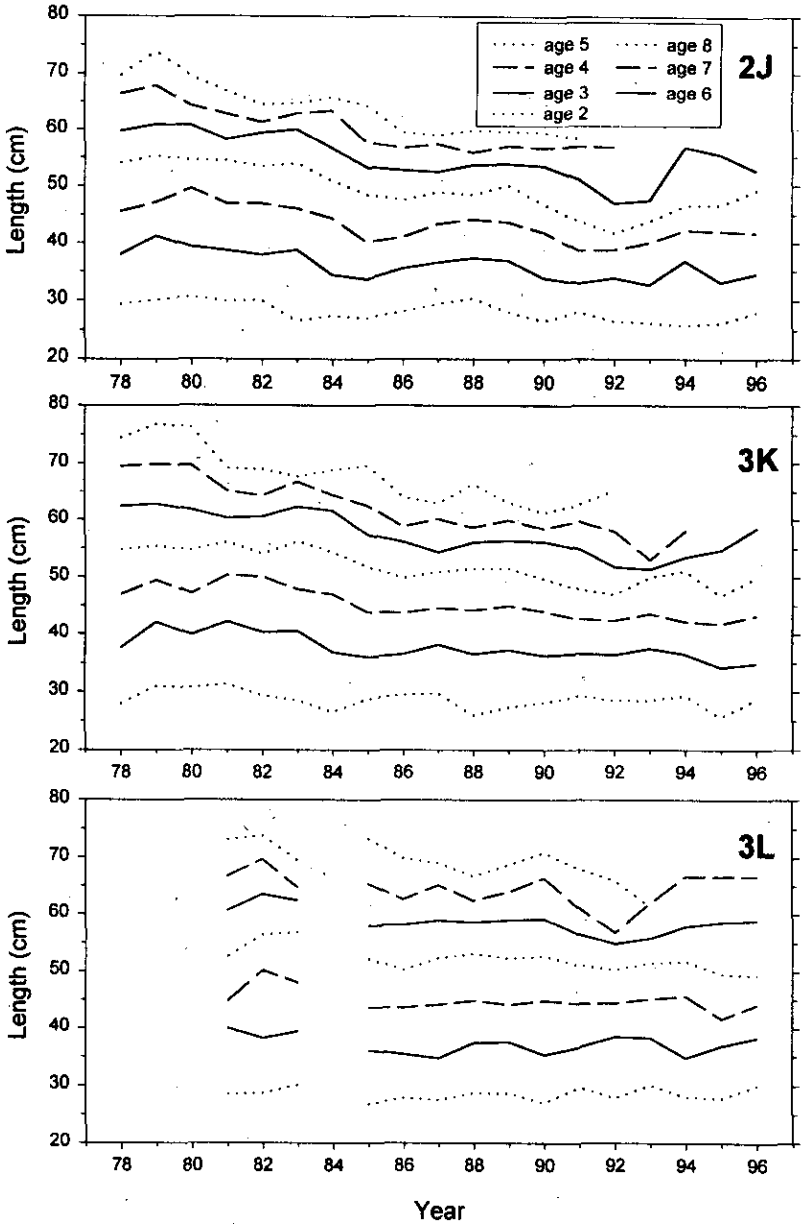

Fig.22. Mean lengths at age for cod caught during the autumn bottom-trawl surveys.

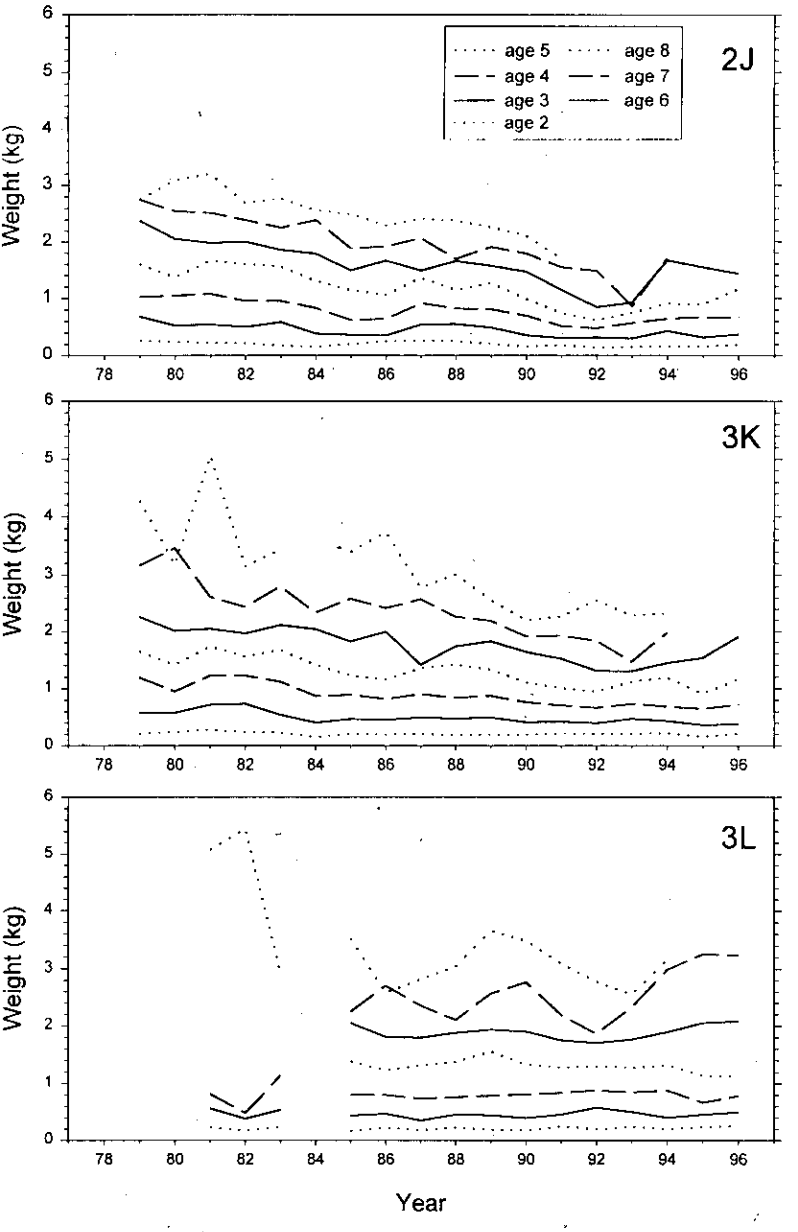

Fig.23. Mean weights at age for cod caught during the autumn bottom-trawl surveys.

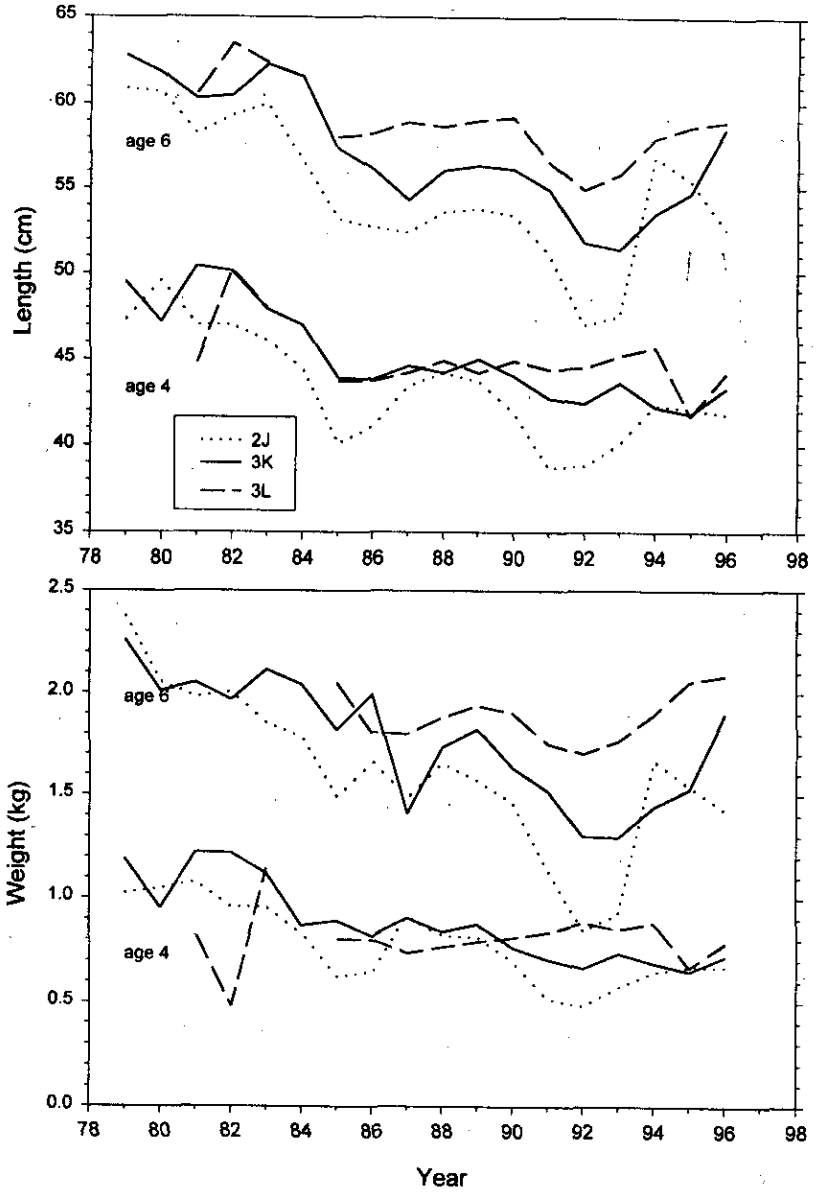

Fig.24. Mean lengths and weights by Division for cod of ages 4 and 6 caught during the autumn bottom-trawl surveys in Divisions 2J, 3K and 3L.

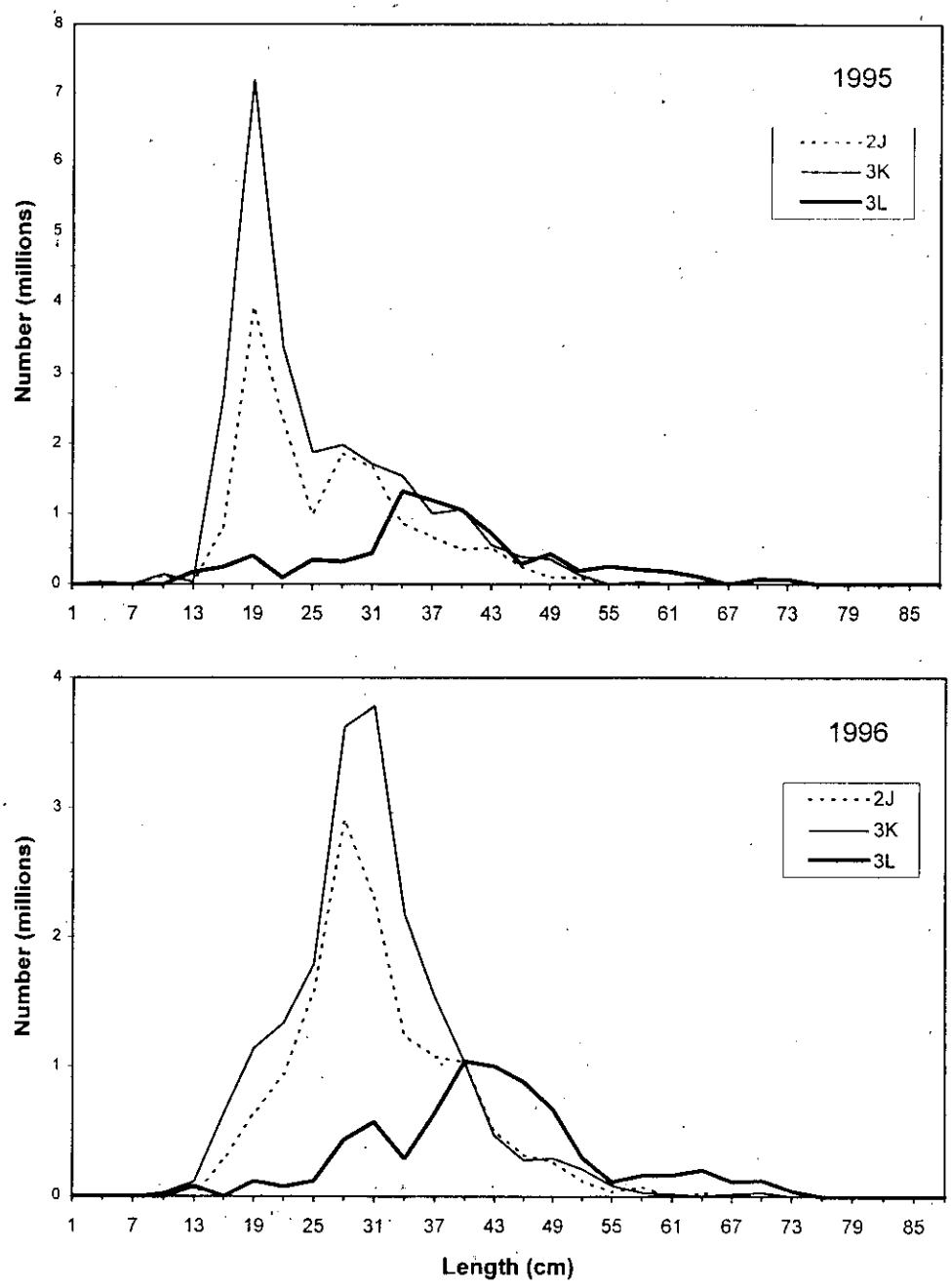

Fig.25. Population numbers, by 3-cm length-groups, in Divisions 2J, 3K and 3L in 1995 and 1996, as calculated from catches during autumn bottom-trawl surveys. Only offshore strata are included in the 1996 calculations.

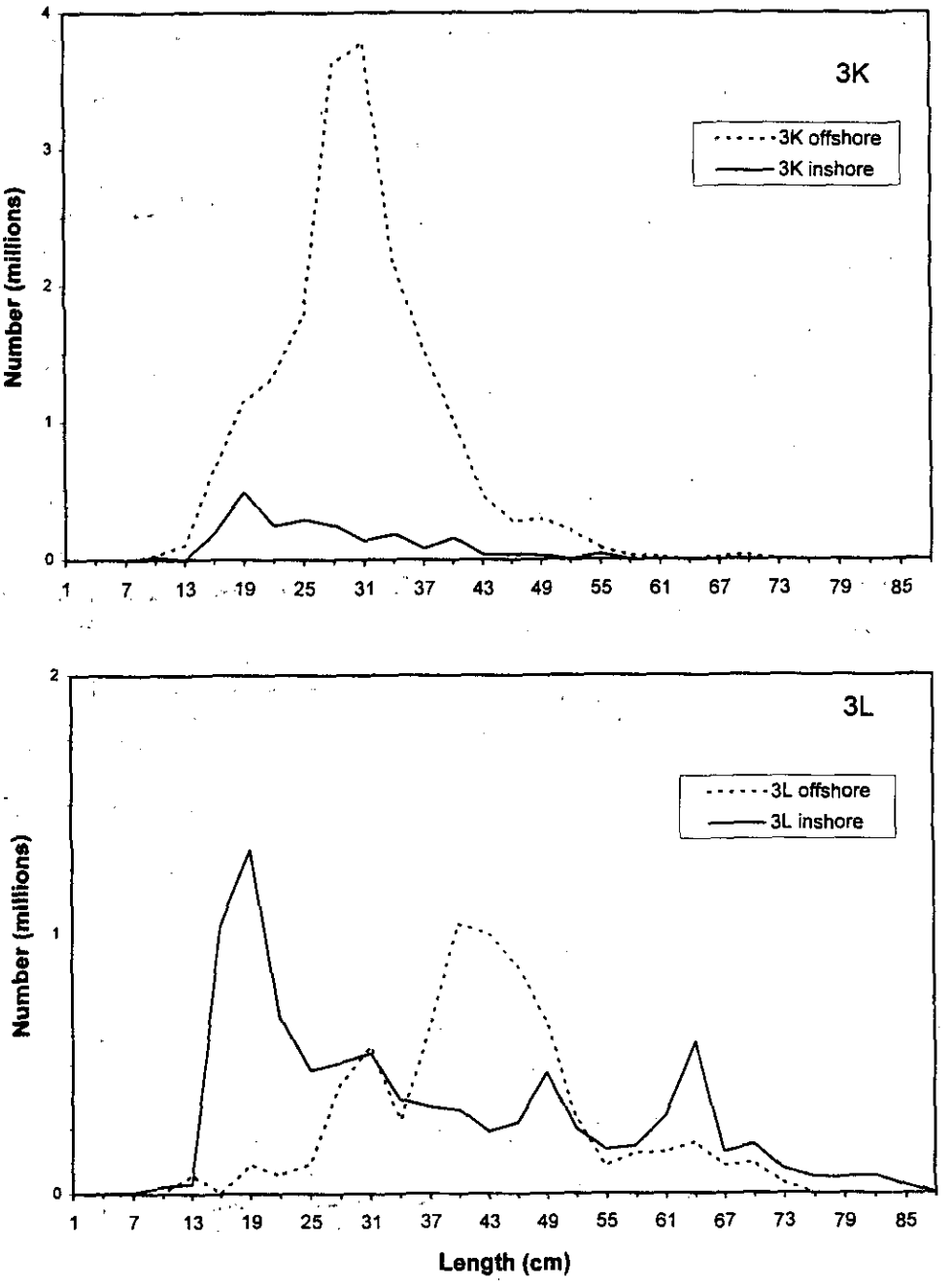

Fig.26. Population numbers, by 3-cm length-groups, in offshore and inshore strata of Divisions 3K and 3L in 1996, as calculated from catches during the autumn bottom-trawl survey.