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An assessment of the cod stock in NAFO Divisions 2J+3KL

by

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Abstract

A moratorium on commercial fishing on this stock has been in effect since 1992. Although catches from a recreational fishery were relatively high in the year following the moratorium, catches over the last two years are thought to have been minimal. The Sentinel Survey resulted in a catch of about 330 t in 1995. This catch was submitted to intensive biological sampling. Autumn research vessel survey indices of cod biomass and abundance in divisions 2J3KL have indicated severe declines in recent years. The 1995 estimate cannot be compared directly with the preceding estimates because of a change in survey gear and vessel, however the mean catch per tow remained exceptionally low throughout the survey area in 1995. There is some indication from mean weights at age in both the Sentinel Survey catches and the trawl survey that the downward trend has been reversed in the most recent years. Of particular concern in the assessment of this stock is the absence of any indication of good recruitment.

Resumé

Un moratoire de la pêche commerciale de ce stock est en vigueur depuis 1992. Bien que les prises récréatives étaient relativement élevées l'année suivant la mise en place du moratoire, on croit qu'elles étaient faibles au cours des deux dernières années. Les pêches de contrôle ont donné des prises d'environ 350 t en 1995, prises qui ont été soumises à un échantillonnage biologique exhaustif. Les indices de la biomasse et de l'abondance de la morue obtenus dans le cadre du relevé de recherche d'automne effectué dans les divisions 2J3KL accusent une baisse marquée dans les dernières années. L'estimation de 1995 ne peut être comparée directement avec les estimations précédentes, les engins et les bateaux utilisés pour les relevés n'étant pas les mêmes. Toutefois, les prises moyennes par trait sont demeurées exceptionnellement faibles dans toute la zone du relevé en 1995. Le poids moyen selon l'âge obtenu des pêches de contrôle et du relevé au chalut indique dans une certaine mesure un renversement de la tendance à la baisse dans les dernières années. L'absence de signes d'un bon recrutement est particulièrement inquiétant.

Introduction

The cod stock in NAFO divisions 2J3KL 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. Increased fishing effort by Canadian trawlers in the offshore resulted in increasing catches following extension of jurisdiction. This occurred over a time period which coincided with the entry of the strong 1973, 1974 and 1975 year classes to the fishery 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 spawner biomass to partially rebuild from 1978 to 1981. However, the 1976 and 1977 year classes were very weak and fish growth rates decreased in the early 1980s so that the spawner biomass began to decline after 1982.

The 1978 to 1982 year classes ranged from moderate to strong (1981), however these year classes experienced slow growth rates (particularly in 1984 and 1985) and increasing fishing mortality by Canadian effort in both the inshore and offshore. The strength of the following two year classes is uncertain. Survey data up to age 4 suggest that these yearclasses were relatively strong but surveys after 1991 failed to confirm this interpretation. Several hypotheses are compatible with the observations, including systematic sampling error (so-called year effect in the data) and high mortality (natural mortality or unreported deaths due to fishing). Fish growth rates remained low over this period while catches continued to increase until the late 1980s. The stock collapsed to exceptionally low levels by the early 1990s.

A moratorium was imposed on directed commercial fishing in July 1992. Although catches from a recreational fishery were relatively high, given the state of the stock, in the year following the imposition of the moratorium, catches over the last two years are thought to be less than 2,000 t.

The current assessment updates the status of the stock under the moratorium, adding to the information contained in Bishop et al. (1995) and Bishop et al. (1994). The expectation is that the stock will eventually recover as a result of the virtual elimination of fishing activity, however the rate at which it will recover cannot be predicted. It is anticipated that it will take at least several more years because all recent year classes appear to have been weak.

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 imposition of the moratorium on commercial fishing in July of 1992. During the 1960s when the fishery was dominated by non-Canadian fleets (Fig. 2) most of the catches occurred in Div. 2J and 3L with 2J dominating. Since that time catches have been 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 (Table 3).

A recreational fishery together with bycatches accounted for 11,000 t in 1993. A limited (10 days) food fishery during August and September, together with bycatch, accounted for about 1,000 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). Sentinel catches and a small amount of bycatch from the few continuing fisheries resulted in reported landings of less than 1,000 t in 1995. The Sentinel Fishery landings occurred predominantly from June to November and were dominated by gillnet catches in Div. 3K and 3L (Table 4).

Catch and weight at age

A summary of the sampling from the Sentinel Fishery used to estimate the catch at age in 1995 is given in Table 5. A total of about 10,000 fish were measured for length and more than 5,000 otoliths were read for age, representing much more intensive sampling than would normally be directed at a commercial catch. The samples are well distributed across divisions, months and gears.

The estimated catch, average weight and average length at age from the Sentinel Fishery and the bycatch for 1995 are given in Table 6. The following relationship was applied in deriving average weight at age:

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

Coefficients of variation for the estimated catch at age were less than 10% for ages 2 to 7. The 1990 and 1989 year classes were most abundant in the Sentinel Fishery catches for 1995.

The age composition and mean length at age for the various fishing gear which participated in the Sentinel Fishery is given in Table 7. Trap selectivity, both in terms of age and length at age are lower than the equivalent values for gillnet. Line trawl and handline catches also comprised a greater proportion of younger fish than did gillnets.

The catch numbers, average weights and biomass at age for the years 1962 to 1992 are presented in Tables 8 to 10. Although the modal ages class has remained relatively constant over the time period (ages 5 - 7) the disappearance of the older fish in the catches is very marked, particularly over the last 10 years (Table 8, Fig. 5).

Weights at age for the 1962 to 1971 period are estimates obtained using data for 1964 to 1968 from Div. 2J and 1965 to 1970 from Div. 3KL weighted by divisional catch. Weights at age are calculated from annual mean lengths at age and a constant length-weight relationship (given above). A plot of the data for 1972 to the present (Fig. 6) 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 in the most recent two years.

In addition to the reported catch at age, Kulka (1996) estimated the time series of discarded catch at age (Table 11). Although the estimated discards are generally an order of magnitude less than the nominal catch, the increase in the estimates of young fish in the discards over the late 1980s is of interest and the impact on catch at age analysis should be investigated.

Sentinel Survey

In addition to providing catch at age data for an analytical assessment, the Sentinel Survey provided information on catch rates and fish condition. These results are discussed in detail in Davis (1996) and are only summarized here.

The 1995 Sentinel Survey indicated that the catch rates were lower than the last year of the commercial fishery off Labrador and the Northern Peninsula, same as the last year in White Bay, higher than the last year in Notre Dame Bay, and variable in Trinity Bay, Conception Bay and eastern Avalon. Fishers involved in the survey cautioned that high catch rates in some areas may have been a consequence of the lack of competition among gear because of the low levels of effort involved. Sentinel fisher and biological sampling of the catch both indicated that fish in the 1995 Sentinel catch were in good condition.

Inshore surveys

A large concentration of spawning cod was found in Smith Sound, Trinity Bay 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. Samples in April 1996 found them to be spawning again (Bratney 1996). The April 1996 survey also revealed adult cod in Northwest Arm and Southeast Arm, Trinity Bay. Unusually high parasite incidences suggested that these cod had resided in the inshore throughout the fall and winter months (Bratney 1996). Acoustic estimates of the biomass of cod in all three arms of Trinity Bay from the April 1996 survey are being prepared.

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 February 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 autumn 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). Application of the conversion of *Engels* catches to *Campelen* equivalents are explored in Stansbury (1996).

The survey stratification scheme is based on depth contours. The strata used in 1995 are shown in Figs. 7-9. 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, but 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.

Cod abundance and biomass estimates by division, stratum and trip are given in Tables 12 to 19 for the autumn surveys and Tables 20 and 21 for the spring surveys. The time series of autumn abundance and biomass for Div. 2J, 3K and 3L surveys are plotted in Figs. 10 to 12. The decline in numbers and biomass in all 3 divisions is clear after 1989 and recent values are the lowest on record. Despite the fact that the catch in the most recent survey is not corrected for the greater catchability of the younger ages by the new trawl gear, the 1995 estimate is not significantly different from the previous two years.

The autumn time series of numbers per tow at each set location are mapped in Fig. 13 for the period 1981 to 1995. For the period 1981 to 1988 catches were wide-spread over the survey area. Commencing in 1989 changes started to occur in that fewer cod were found near the coast. Over the period 1990 to 1991 the remaining fish became increasingly limited to three areas offshore in deep water - Hawke Channel in 2J, Belle Ilse Bank/Funk Island Bank, and the area area between Funk Island Bank and Grand Bank. By the autumn of 1992 only the southern concentration remained although apparently reduced in extent. This concentration appeared to be further reduced in both extent and average density in 1993 and no concentrations were encountered in the 1994 and 1995 surveys.

The stratified mean numbers per tow at age by division are given in Tables 22 to 24 for the depth range that has been consistently sampled over the time period (i.e. not including the strata deeper than 500m in 2J and 3K and 200 fathoms in 3L). The combined Div. 2J3KL stratified mean numbers per tow as well as the associated coefficients of variation are given in Table 25. The overall decline and contraction of the age composition after 1989 in 2J and one or two years later in the 3K and 3L is striking.

Analysis

Sequential population analysis

A formulation of ADAPT, the adaptive framework for sequential population analysis (Gavaris 1988) was applied to the survey mean numbers at age (Table 25) and catch at age (Table 8).

Parameters estimated in the ADAPT were:

Population numbers
 $N_{i,t}$ where $i = 3$ to 12, $t = 1995$,
 and Catchabilities
 K_i where $i=3$ to 12.

Structure imposed was:

- (i) natural mortality assumed to be 0.20,
- (ii) fishing mortality on the oldest age (12) set to be equal to the mean for ages 7-9,
- (iii) no error in the survey mean numbers at age,
- (iv) no error in the catch numbers at age.

Input data were:

Catch numbers at age

$$C_{i,t} \quad \text{where } i = 3 \text{ to } 12 \text{ and } t = 1978 \text{ to } 1995$$

and Research Vessel survey estimates of mean numbers at age

$$RV_{i,t} \quad \text{where } i = 3 \text{ to } 12 \text{ and } t = 1978 \text{ to } 1995.$$

The objective function which was minimized was

$$\sum_{i,t} (\ln(RV_{i,t}) - \ln(K_i N_{i,t}))^2.$$

The results are summarized in Table 26. There are strong year effects in the residuals as well as a possible age effect. Residuals in the last three years are generally negative whereas those for 1989 to 1992 are generally positive. This indicates that the model is having trouble fitting the data, specifically the rapid decline in the survey in the most recent years.

These estimates would be considered "illustrative" of the population dynamics, but not sufficiently well estimated to allow the projection of stock size under different levels of fishing mortality. Nevertheless, the general values and trends in numbers at age and fishing mortality at age give a reasonable representation of what are thought to be the dynamics of the stock and the pattern of fishing in the post 1977 period.

In the ADAPT reconstruction, numbers at age 4 and older declined in the early part of the time series and then recovered as a consequence of the strong year-classes that entered the 3+ population in the early 1980s (Fig. 14). When recruitment fell to lower levels thereafter, there was a sequential decline in the numbers at age accelerated by the rapidly increasing fishing mortality. Fishing mortality increased slowly throughout the 1980s, but at an increased rate after 1978 to a peak in the early 1990s (Fig. 15). Note that despite the moratorium being introduced in 1992, the recreational fishery in 1993 yielded relatively high fishing mortalities.

Spawner stock and recruitment

Using the ADAPT estimates of numbers at age in Table 26 and beginning of year weights at age estimated from the commercial catches (Table 27), the beginning of year 3+ biomass can be calculated (Table 28). By applying the estimated beginning of year proportion mature at age (females) from Morgan and Bratley (1996) (Table 29, Fig. 16) the mature biomass can be estimated (Table 30). The convention of applying the female proportions mature to the total male plus female population was followed.

The ADAPT reconstruction suggests that the 3+ biomass reached a peak for the post-extension of jurisdiction period in 1985 and that there has been a steady decline thereafter (Fig. 17). Spawner biomass estimated using knife-edge recruitment at age 7 and using the proportion mature at age estimated by Morgan and Bratley (1986) are reasonably similar and suggest that the spawner biomass was nearly constant over the period 1982 to 1988, whereafter it declined very rapidly.

The spawner biomass estimated using the maturity data and the ADAPT estimates of 3 year olds are depicted as a scatter plot in Fig. 18 with the years joined in sequence. The relatively low recruitment values for the 1987 and subsequent cohorts at intermediate to low spawner biomass compared to the 1978 to 1980 year classes which arose from similar

spawner biomass levels reflects a strong time-dependent signal in the data in addition to any spawner biomass signal. Attempts have been made to capture this pattern in the recruitment data using nonparametric stock recruit models with time as one of the variables (e.g. Shelton and Morgan 1994). This time-dependence, a sort of compensatory or “non-stationary” effect in a sense, may have implications for stock recovery.

Multiplicative model analysis of survey data

Estimate of cohort strength were obtained following the general approach of Sinclair and Chouinard (1991) by fitting the following general linear model to the survey mean numbers per tow data for Div. 2J3KL combined (Table 25):

$$\log (N_{i,j,k,t}) = \tau + \alpha_i + \beta_j + \gamma_k + \varepsilon$$

where

$N_{i,j,k,t}$ = mean numbers per tow of age i using net type j , belonging to cohort k at the time of the autumn survey in year t

τ = intercept,

α_i = age effect for $i = 1 \dots 13$ and $i = 1 \dots 3$ in two separate formulations,

β_j = survey net type effect where $j = 1$ for non-Campelen gear and $j = 2$ for Campelen gear,

γ_k = cohort effect,

and ε = residuals from the fitted model.

The predicted cohort strengths were then back-transformed (bias not corrected) and plotted against the numbers at age 3 estimated by ADAPT for the equivalent cohort (Fig. 19). It is clear that there is a close resemblance between the multiplicative model fitted to ages 1-13 and ADAPT estimates of relative year class size. One difference is in the estimates of the 1986 cohort which ADAPT indicates is relatively strong, whereas the multiplicative model suggests that it is not. The multiplicative model does, however, indicate that the 1987 yearclass is stronger than those yearclasses on either side. Note that the multiplicative model and ADAPT do not provide independent estimates because both depend on the survey data. The main difference is that the ADAPT accounts for the catches whereas this version of the multiplicative model does not. The strength of the 1986 and 1987 yearclasses is very controversial.

If the multiplicative model is applied only to ages 1 to 3 (i.e. as above but with $i = 1 \dots 3$, Fig. 19) then the 1987 yearclass appears to be comparable to the 1973-75 and 1981-82 yearclasses. However the interpretation of yearclass strength from information on a cohort from only a few ages is very susceptible to the problem of year effects in the survey data. The presence of such year effects for the period 1989 to 1992 is indicated by the positive residuals in the ADAPT formulation (Table 26). This could be interpreted in two ways - either the survey estimates in the preceding and following years are too low, or the estimates over the period 1989 to 1992 are too high. This assumes that the catch data are accurate, that natural mortality is constant and that immigration and emigration are negligible. These assumptions may be wrong. This problem has not yet been resolved.

Estimate of relative total mortality were obtained by fitting the following general linear model to the survey mean numbers per tow data for Div. 2J3KL combined (Table 25):

$$\log (N_{i,j,k,t}) = \tau + \beta_j + \gamma_k + \alpha\gamma_k + \varepsilon$$

where

$N_{i,j,k,t}$ = mean numbers per tow of age i for $i=3$ to 8, using net type j , belonging to cohort k at the time of the autumn survey in year t

τ = intercept,

α = age effect ,

β_j = survey net type effect where $j = 1$ for non-Campelen gear and $j = 2$ for Campelen gear,

γ_k = cohort effect,

and ε = residuals from the fitted model.

The separate slopes parameter estimates ($\alpha\gamma_k$) are plotted as relative estimates of the average mortality experienced by a cohort over age 3 to 8 (Fig. 20). The plot shows a decrease in total mortality on the 1972 to 1978 cohorts followed by a trend of increasing mortality on the subsequent cohorts up to the 1987, as Canadian fishing effort replace the foreign effort in the offshore. The decline in total mortality on the more recent cohorts can be explained by a combination of events, including the change to the Campelen net in 1995, the effect of the moratorium from 1992 onwards, and the partial recruitment to the fishery of the younger ages.

Spawner biomass per recruit

Spawner biomass per recruit (age 3) at $F = 0$ ($SPR_{F=0}$) and at the F estimated in the ADAPT (Table 26) ($SPR_{F=F}$) were carried out using the annual weights at age estimated from the commercial samples (Table 27) and the maturity at age (Table 29). The SPR estimates (Fig. 21) suggest that for the cohorts from 1965 to 1995 $SPR_{F=0}$ varied between about 4 kg and 6.5 kg with a declining trend over the 1970 to 1980 cohorts and an increasing trend for cohorts subsequent to the 1985 cohort. $SPR_{F=F}$ was relatively constant at a value of about 1 kg for cohorts up to about the 1975 cohort and then declined steadily to very low values for the mid-1980's cohorts. The subsequent increase in $SPR_{F=F}$ is a result of the combination of changes in F (moratorium), growth and maturity. Note that all estimates for incomplete cohorts are based on assuming that values of fishing mortality, weight and maturity at age measured in the last year pertain for the remainder of the cohort's lifetime.

As a biological reference point, $SPR_{F=F}/SPR_{F=0}$ is sometimes calculated and expressed as a percentage (%SPR). A reference point can then be chosen and fishing mortalities adjusted to remain above this level. The values for %SPR are plotted in Fig. 22. It is clear that %SPR steadily declined for all cohorts between the 1973 and 1986 cohorts, reaching very low levels, before increasing again for recent cohorts.

Survey lengths and weights at age

Mean lengths at age (Table 31a) were calculated as in recent years by weighting individual measurements in the biological sample by the ratio of the total survey catch per 3 cm length class to the number of fish sampled in that length class. The sampling of fish for length at age was length-stratified within each Division (Shelton and Lilly 1995), so it may be more appropriate to weight each individual measurement by the ratio of the population number per 3 cm length class to the number of fish sampled in the same length class, where the population number is calculated by areal expansion of the stratified mean catch at length per tow (Smith and Somerton 1981). Mean lengths at age calculated in this manner are provided in Table 31b and Fig. 23.

Mean weights at age (Table 32a) were calculated as in recent years by applying a standard weight/length relationship to the mean lengths at age shown in Table 31a. A few adjustments have been made to the table as it appeared in the previous assessment document (Bishop et al. 1995; Table 18). For Div. 3K, small corrections were applied to the data for 1991. For Div. 3L, the numbers in the age column have been incremented by 1. For example, in 1981 the weight at age of 0.20 refers to cod of age 2, not age 1. In addition, data for Div. 3L in 1984 have been deleted. These data came from a summer survey which was part of planned seasonal surveying. There was no autumn survey in 1984.

An alternative to using a standard weight/length relationship is to use the actual weights of those fish weighed at sea or frozen at sea and weighed after thawing in the laboratory. In most years, sample sizes for weights were much smaller than sample sizes for lengths (Shelton and Lilly 1995), but using the actual weights has the advantage of accounting for variability in weight at length. Alternative mean weights at age (Table 32b; Fig. 24) were calculated by weighting each individual fish weight by the ratio of the population number at length to the number of fish sampled at length .

As noted above, 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 research sampling illustrates that the changes varied with Division; there was a strong decline in Div. 2J, a lesser decline in Div. 3K, and little or no decline in Div. 3L. These Divisional differences are more apparent in Fig. 25, 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). The trend toward very low mean lengths and weights at age in the early 1990s appears to have been reversed, but sample sizes have been very small in recent years.

Summary

There is little doubt that the Division 2J3KL cod stock remains at very low level. There is no indication of a strong yearclass which could form the basis for a recovery. The trawl surveys and the Sentinel Survey catches show that there are very few fish older than age 9 in the population. Several relatively strong yearclasses followed by good survival are required to rebuild the population. Even then, it will take a number of years before the spawner biomass recovers to a level at which the stock could be considered to be out of immediate danger, provided a cautious management approach is adopted. The only significant aggregations of fish that have been surveyed in the last two years are in the inshore areas of Trinity Bay (Bratney 1996). More aggregations of similar size may exist in the other major bays but this has not been determined and would require initiating a new trawl and hydroacoustic survey to complement the trawl survey that covers the shelf outside 12 miles.

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Table 1. Historical catches (t) of cod from NAFO Divisions 2J3KL for the period 1959-95.

Year	2J		3K				3L				2J3KL					
	Offshore mobile gear		Fixed gear		Offshore mobile gear		Fixed gear		Offshore mobile gear		Fixed gear		Total Canada	Total Other	Total	TAC
	Can.	Other	Can.	Total	Can.	Other	Can.	Total	Can.	Other	Can.	Total				
1959	0	46372	17533	63905	0	97678	58264	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	89631	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	196883	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	611784	-
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	31178	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 ²	45416 ³	125343	121959	50053	172015	190000
1992	0	0	18	18	584	273	884	1741	13627	14610 ⁴	10960 ⁵	39202	26073	14883	40961	0
1993 ¹	0	0	13	13	0	0	541	541	2	2425 ⁶	8411 ⁷	10845	8967	2425	11399	0
1994 ¹	0	0	9	9	0	0	368	368	0	50	936	966	1313	50	1363 ⁸	0
1995 ¹	0	0	0	0	0	0	94	94	0	0	237	237	331	0	331 ⁹	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 considered 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 moratorium was declared.

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 fishery and 168 t caught as bycatch.

Table 2. Fixed gear cod catches (t) by division and gear in NAFO Divisions 2J, 3K and 3L from 1975 - 1995.

Year	2J					3K					3L				Total	Total
	Trap	GN	LL	HL	Total	TRAP	GN	LL	HL	Total	TRAP	GN	LL	HL		
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	1	13	52	28	2	95	12	176	33	16	237	332

¹ Provisional catches.

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

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

Table 3. Fixed gear catches inshore versus offshore .

YR	3L Inshore		3L Offshore		TOTAL ¹
	GN	OTHER	GN	OTHER	
1975	7440	14908	0	0	22348
1976	9012	26141	8	0	35161
1977	8768	31433	46	0	40247
1978	9024	36237	0	18	45279
1979	13486	36876	1	32	50395
1980	11228	31061	0	9	42298
1981	12117	29243	1630	3	42993
1982	20274	36184	1049	0	57507
1983	16451	38557	0	1148	56156
1984	14947	34121	808	898	50774
1985	8753	29688	1590	856	40887
1986	8277	21953	1652	387	32269
1987	11660	17946	5752	194	35552
1988	9143	30648	9422	887	50100
1989	8329	34682	13890	558	57459
1990	7174	43841	21721	157	72893
1991	2219	33657	9499	2	45377
1992	161	4817	952	13	5943
1993	75	3277	29	5	3386
1994	27	899	0	0	926
1995	176	61		0	237

¹Totals may differ from 3L fixed gear totals in table 2 as data is from different source.

Table 4. Cod landings (t) from bycatch and the Sentinel Survey from Divisions 2J, 3K and 3L in 1995.

Bycatch and Sentinel separately													2J3KL						
Month	Bycatch 3K			Bycatch 3L				Sentinel 2J		Sentinel 3K				Sentinel 3L					
	Gillnet	Trap	Other	Gillnet	Longline	Handline	Trap	Other	Gillnet	Trap	Gillnet	Longline	Handline	Trap	Gillnet	Longline	Handline	Trap	TOTAL
J	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A	0	0	0	1.89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.89
M	0.84	0	0.04	12.66	0	0	0.14	0	0	0	0	0	0	0	0	0	0	0	13.68
J	5.74	0.16	0.31	23.06	0	0	0.82	0	0	0	0	0	0	0	0	0	0	0	30.09
J	9.16	0.02	0.23	47.02	0	0.35	0	0	0	0.962	0	0	3.453	8.306	0	1.998	4.473	0	75.972
A	12.63	0.04	0	17.53	0	0	0	0.098	0.156	5.925	0.353	0	7.56	12.741	2.572	1.626	6.641	0	67.618
S	1.21	0	0	12.45	9.86	0	0	0.105	0.064	5.476	8.36	0	0.706	10.585	8.672	5.075	0.108	0	62.502
O	0.13	0	0	5.81	0	0	0	0.083	0	7.301	15.35	0	0	16.789	11.787	5.247	0	0	62.414
N	0	0	0	6.78	0	0	0	0	0	2.262	4.406	1.543	0	0.444	0.334	1.379	0	0	17.128
D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	29.71	0.22	0.58	127.18	9.86	0.35	0.96	0.286	0.22	21.928	28.469	1.543	11.719	48.865	23.365	15.325	11.222	0	331.294

Bycatch and Sentinel combined														
Month	2J		3K					3L					2J3KL	
	Gillnet	Trap	Gillnet	Longline	Handline	Trap	Other	Gillnet	Longline	Handline	Trap	Other		TOTAL
J	0	0	0	0	0	0	0	0	0	0	0	0	0	
F	0	0	0	0	0	0	0	0	0	0	0	0	0	
M	0	0	0	0	0	0	0	0	0	0	0	0	0	
A	0	0	0	0	0	0	0	0	1.89	0	0	0	1.89	
M	0	0	0.84	0	0	0	0.04	0	12.66	0	0	0.14	13.68	
J	0	0	5.74	0	0	0.16	0.31	0	23.06	0	0	0.82	30.09	
J	0	0	10.122	0	0	3.473	0.23	0	55.326	0	2.348	4.473	75.972	
A	0.098	0.156	18.555	0.353	0	7.6	0	0.098	30.271	2.572	1.626	6.641	67.872	
S	0.105	0.064	6.686	8.36	0	0.706	0	0.105	23.035	18.532	5.075	0.108	62.671	
O	0.083	0	7.431	15.35	0	0	0	0.083	22.599	11.787	5.247	0	62.497	
N	0	0	2.262	4.406	1.543	0	0	0	7.204	0.334	1.379	0	17.128	
D	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL	0.286	0.22	51.636	28.469	1.543	11.939	0.58	0.286	176.045	33.225	15.675	11.222	0.96	331.8

Table 5. Sampling used to estimate catch at age for Divisions 2J3KL in 1995.

DIVISION	GEAR	MONTH	No. measured	No. aged	Sample wt (t)	Catch wt (t)	
2J	GN	8	36		0.10		
		9	55		0.11		
		10	33		0.08	0.29	
	TRAP	8	221		0.16		
		9	99		0.06	0.22	
	2J	Total		444	20	0.51	0.51
3K	GN	5				0.84	
		6				5.74	
		7			0.96	10.12	
		8	2820		5.93	18.56	
		9	2295		5.48	6.69	
		10	2474		7.30	7.43	
		11	1577		2.26	2.26	
		TRAP	6				0.04
			7	3242		3.47	3.70
			8	7019		7.60	7.60
			9	674		0.71	0.71
	LL +HL	8	271		0.35	0.35	
		9	7444		8.36	8.36	
		10	11237		15.35	15.35	
		11	5000		5.95	5.95	
	3K	Total		44053	990	63.722	94.17
	3L	GN	4				1.89
			5				12.66
6						31.37	
7			2617		8.31	59.76	
8			6659		12.74	28.12	
9			4403		10.59	29.24	
10			5652		16.79	6.25	
11			938		0.44	6.76	
TRAP			5				0.14
			6				0.82
			7	3879		4.47	4.47
		8	6569		6.64	6.64	
		9	116		0.11	0.11	
LL+HL		7	971		2.00	2.35	
		8	1361		4.20	4.20	
		9	9052		13.75	23.61	
		10	13829		17.03	17.03	
		11	1202		1.71	1.71	
3L	Total		57248	764	98.78	237.13	
2J3KL	Total		101745	1774	163.008 0	331.806	

TABLE 6. Estimated catch, average weight, and average length-at-age from the sentinel and by-catch fisheries in NAFO Divs: 2J3KL during 1995.

AGE	AVERAGE		CATCH (000s)		
	WEIGHT	LENGTH	NUMBER	STD. ERR.	C. V.
2	0.210	29.246		0.02	0.26
3	0.491	38.444	7	0.47	0.07
4	0.794	44.812	30	0.99	0.03
5	1.505	54.887	71	3.04	0.04
6	1.952	60.071	55	3.04	0.05
7	2.240	62.719	20	2.23	0.11
8	2.468	64.810	11	1.89	0.18
9	2.533	65.030	3	1.10	0.40
10	2.927	67.403		0.08	0.35
11	4.514	79.206		0.03	0.48
12	2.006	61.000			0.99

Table 7. estimated catch and mean length from the sentinel and by catch fisheries in NAFO Divs. 2J3KL during 1995, by gear.

AGE	CATCH (000s)			
	TRAP	GILLNET	LINE TRAWL	HAND LINE
1				
2		0.010	0.050	0.005
3	1.468	0.670	3.783	1.061
4	7.256	3.021	15.906	4.154
5	11.287	36.628	17.353	5.683
6	2.331	41.749	8.191	3.050
7	0.540	16.543	2.216	0.679
8	0.170	9.387	0.900	0.263
9	0.038	2.354	0.255	0.104
10		0.142	0.063	0.020
11		0.032	0.026	0.005
12				

AGE	MEAN LENGTH (cm)			
	TRAP	GILLNET	LINE TRAWL	HAND LINE
1				
2		28.297	29.252	31.000
3	37.803	38.272	38.430	39.489
4	43.504	45.086	45.274	45.129
5	50.030	58.126	52.397	51.261
6	56.097	61.128	57.449	55.684
7	59.406	63.088	61.880	59.106
8	62.655	64.828	65.411	63.482
9	63.068	64.884	67.407	63.221
10	58.000	69.060	64.264	65.449
11		79.006	79.274	80.176
12	61.000	61.000		

TABLE 8. CATCH NUMBERS AT AGE (THOUSANDS) FROM THE COMMERCIAL COD FISHERY IN NAFO DIVISIONS 2J3KL FOR THE YEARS 1962-95

	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
2+	319457	355709	384538	353873	372659	432585	630339	517474	402816	383760	392153	291965
	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	17044	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
2+	263216	179767	147797	139376	92714	97725	98755	85918	123418	121326	122199	135096
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995		
2	1	42	25	8	58	35	0	0	0	0		
3	831	2329	2779	1696	7693	3111	430	940	105	7		
4	15219	9217	14651	17639	40557	31654	3860	4993	379	30		
5	44168	32340	20184	21150	36410	53805	14535	3343	575	71		
6	45869	49061	47917	25212	22695	29553	12211	1940	177	55		
7	26025	28469	45725	38708	16390	9064	4526	700	74	20		
8	14722	19505	18608	28499	17940	6164	1372	147	22	11		
9	3104	5818	9026	8696	9156	4745	376	21	2	3		
10	2000	1346	4337	3640	2865	1696	199	0	0	0		
11	1977	676	774	1695	1084	641	104	0	0	0		
12	1101	873	422	572	478	250	18	0	0	0		
13	574	391	366	244	103	88	9	0	0	0		
14	116	200	223	180	98	39	4	0	0	0		
15	29	37	100	94	36	21	0	0	0	0		
16	18	22	32	43	25	9	0	0	0	0		
17	11	3	5	4	8	3	0	0	0	0		
18	9	1	10	9	7	2	0	0	0	0		
19	2	4	5	0	1	2	0	0	0	0		
20	2	0	5	1	0	0	0	0	0	0		
2+	155778	150334	165194	148090	155604	140882	37644	12084	1334	197		

TABLE 10. CATCH BIOMASS AT AGE (TONS) FROM THE COMMERCIAL COD FISHERY IN NAFO DIVISIONS 2J3KL FOR THE YEARS 1962-95

	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
2+	644926	590090	677428	655244	518248	593302	811698	774346	503047	475357	458793	327188
	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
2+	367583	262319	196809	146023	131904	157091	170005	167661	224625	228118	227236	229191
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995		
2	0	13	7	2	17	6	0	0	0	0		
3	424	1001	1362	814	3231	1120	125	536	42	3		
4	10958	6083	10695	13053	27984	19309	2239	3545	258	24		
5	45935	33310	21799	21785	38595	52191	11773	3243	564	107		
6	70638	64761	66125	36305	34043	41670	14531	2425	250	107		
7	48146	53237	76361	70836	31797	17040	7830	1113	137	45		
8	34597	37645	41124	58993	39827	13992	2813	1235	45	27		
9	9126	16290	22655	22957	22341	12479	1000	194	6	8		
10	6940	4724	13184	10993	8767	5325	446	0	0	0		
11	7513	3245	3382	6712	3881	2436	279	0	0	0		
12	4999	4051	2317	3095	2237	1240	89	0	0	0		
13	3065	2244	2397	1830	642	483	48	0	0	0		
14	826	1226	1918	1663	834	297	28	0	0	0		
15	341	316	976	945	352	243	0	0	0	0		
16	202	297	311	402	315	99	0	0	0	0		
17	156	27	63	63	124	38	0	0	0	0		
18	145	22	160	168	95	26	0	0	0	0		
19	25	71	83	0	17	26	0	0	0	0		
20	31	0	55	18	0	0	0	0	0	0		
2+	244066	228564	264975	250632	215096	168021	41200	12290	1301	321		

Table 11. Number of cod discarded by age from the cod and shrimp directed fisheries in NAFO Divisions 2J3KL (from Kulka 1996).

Age/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	0	0	0	0	0	0	11,759	17,257	187,669	284,928	80,388	14,189	3,469	2,668
2	0	3,026	0	45	925	62	9,674	39,204	535,703	887,234	511,453	468,579	315,446	117,247	33,911
3	6,540	249,251	447,424	157,092	396,004	84,133	537,680	96,809	545,495	622,664	709,224	363,299	180,622	45,367	14,896
4	60,369	408,524	1,284,176	1,939,526	3,154,599	1,936,741	4,075,233	673,300	1,092,489	1,666,380	2,114,216	615,885	386,419	12,113	3,952
5	49,273	96,194	302,991	989,955	1,430,782	3,232,521	4,406,498	2,723,640	1,131,458	869,880	1,027,604	609,638	201,927	1,207	1,751
6	7,831	19,547	67,290	118,733	251,973	573,057	1,053,066	1,107,711	678,534	179,174	85,363	112,240	26,336	1,144	82
7	68	3,599	5,209	14,518	1,073	107,142	108,652	80,670	148,652	31,761	5,580	7,255	1,260	124	120
8	0	0	134	3,475	9,285	14,570	6,769	20,805	6,227	8,557	3,626	675	254	51	16
9	0	0	0	1,136	100	2,360	273	7,240	2,028	484	1,868	244	3	0	0
10	0	0	0	228	0	3,215	634	2,543	402	127	217	95	0	0	0
11+	0	0	0	0	0	0	118	1,412	182	59	70	51	0	0	0
Total	124,081	780,141	2,107,224	3,224,708	5,244,741	5,953,800	10,198,597	4,765,093	4,158,427	4,453,989	4,744,150	2,258,349	1,126,455	180,723	57,396

Table 12 . Cod abundance estimates (thousands of fish) from research vessel surveys in NAFO Division 2J (Fall).

Depth range (m)	Stratum number	area sq. mi.	Gadus 15	Gadus 29	Gadus 44	Gadus 58	Gadus 71	Gadus 86-88	Gadus 101-102	Gadus 116-118	Gadus 131-132	Gadus 145-146	Gadus 159-160	Gadus 174-176	Gadus 190-191	Gadus 208-209	Gadus 224-226
			1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Mean date			22-Nov-78	26-Nov-79	29-Nov-80	21-Nov-81	7-Nov-82	5-Nov-83	5-Nov-84	30-Oct-85	11-Nov-86	6-Nov-87	14-Nov-88	10-Nov-89	12-Nov-90	14-Nov-91	5-Nov-92
101-200	201	1427	3071	1500	5749	8377	16692	16246	10533	15246	21638	6784	54	0	0	0	0
	205	1823	8039	1574	787	4550	21765	13547	25230	8159	9481	7841	13707	164	68	0	0
	206	2582	1634	1236	2104	6220	5868	8694	30077	12764	29985	4222	21638	9363	211	420	485
	207	2246	5100	2664	3406	5479	9094	13024	14210	27850	6310	9027	4504	711	1740	0	225
	Total	8078	17844	6974	12046	24626	53419	51511	80050	64019	67414	27874	39903	10238	2019	420	710
201-300	202	440	462	396	5681	2378	2378	1833	1866	760	7663	2626	746	0	0	0	0
	209	1608	3531	21485	3410	10099	7681	29567	3863	8599	28567	13594	6711	14318	583	1224	338
	210	774	4169	2760	2982	445	4703	59785	4953	299	21187	145	2401	8686	3776	3976	363
	213	1725	19714	18516	19811	2158	5807	12806	6915	14028	23624	10316	12334	30271	10278	3663	206
	214	1171	10880	6527	10958	3956	5900	4659	25667	19030	43496	40024	31085	13844	3621	334	132
	215	1270	34281	9986	25692	35768	27583	7233	8040	7424	85617	8593	32304	111	2089	337	255
	228	1428	3509	6780	8254	10701	2187	2269	1853	352	12702	1164	2272	3001	2358	20652	236
	234	508	553	267	1508	534	2250	4698	3005	2339	5415	1760	1125	0	0	0	25
	Total	8924	76899	66717	78294	66039	58489	122850	56162	52831	228271	78222	88978	70231	22685	30186	1555
	301-400	203	480	299	236	3081	81	1117	462	703	156	1784	1405	2090	0	0	12
208		448	247	1480	202	303	1368	1749	224	1043	2051	3918	757	6356	1073	146	359
211		330	5450	2737	4659	1746	2415	1325	297	776	1090	1709	1647	12299	3109	10582	1181
216		384	152	202	3603	86	14	10	331	115	84	3127	476	749	86	96	10
222		441	1479	149	1258	132	0	11	11	182	17	281	66	2847	712	188	55
229		567	234	2873	1319	447	298	670	71	936	539	85	440	1475	1085	1518	199
Total		2650	7861	7677	14122	2795	5212	4227	1637	3208	5575	10525	5476	23726	6065	12542	1828
401-500	204	354	151	116	163	1342	142	540	1422	0	518	425	1860	13	13	0	18
	217	268	1	0	1	0	0	0	5	0	0	50	0	0	0	13	0
	223	180	1	0	2	0	0	0	0	0	0	14	7	68	32	5	
	227	686	88	73	108	0	21	26	0	0	51	77	86	1146	4446	1337	94
	235	420	146	114	158	158	126	1135	63	32	0	268	173	236	567	1734	32
Total	1908	397	305	432	1500	289	1701	1490	32	589	820	2133	1402	5094	3116	149	
501-750	Total	1591	nf	nf	nf	50	50	0	33 ¹	12	249	125	218	100	936	6350	50
751-1000	Total	517	nf	nf	nf	0 ¹	0 ¹	0	0 ¹	0	14	0	0	0 ¹	0	0	48
Total ²			103001	81673	104894	94960	117409	180289	139339	120090	301829	117441	136490	105597	35863	46264	4242
Mean No. per tow			63.64	50.47	64.82	58.68	72.55	111.4	86.1	74.21	186.5	72.57	84.78	65.25	22.16	28.59	2.62
Unadjusted total for all sampled strata			98643	81130	104461	95010	117459	180290	139366	120103	302093	117569	136682	105669	36801	52613	4336
1 STD			18504	24330	17535	33879	16808	282198	22407	17042	83359	23144	23293	22039	7478	36843	871

Note shaded numbers are estimates for non sampled strata and only 0-500 m strata are used in deriving these estimates.

nf =not fished

¹ not all strata fished

² total and mean no. per tow include sampled and estimated values for depths to 500 meters. Estimates were derived from a multiplicative model using survey data to 1991.

Table 13 . Cod biomass estimates (t) from research vessel surveys in NAFO Division 2J (Fall).

Depth range (m)	Stratum number	Stratum area sq mi.	GADUS	GADUS	GADUS	GADUS	GADUS	GADUS	GADUS	GADUS	GADUS	GADUS	GADUS	GADUS	GADUS	GADUS	GADUS
			15	29	44	58	71	86-88	101-102	116-118	131-132	145-146	159-160	174-176	190-191	208-209	224-226
			1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
			22-Nov-78	26-Nov-79	29-Nov-80	21-Nov-81	7-Nov-82	5-Nov-83	5-Nov-84	30-Oct-85	11-Nov-86	6-Nov-87	14-Nov-88	10-Nov-89	12-Nov-90	14-Nov-91	5-Nov-92
101-200	201	1427	4847	3256	11319	15998	18085	16764	12033	14952	24712	9158	84	0	0	0	0
	205	1823	16200	2669	1676	10126	39216	17742	25093	7526	11016	9456	27403	240	11	0	0
	206	2582	2074	2671	3849	13153	8533	11442	39133	13186	34327	5313	36617	13183	107	221	252
	207	2246	8209	4192	7738	12284	12612	12608	18136	27954	7864	11883	7613	465	1770	0	101
	Total	8078	31330	12788	24582	51561	78446	58556	94395	63618	77919	35810	71717	13888	1888	221	353
201-300	202	440	525	749	12964	6292	5681	3798	2948	850	10363	4533	1436	0	0	0	0
	209	1608	5384	43569	12810	22275	18351	53925	7678	12245	37475	19297	11006	13957	228	746	154
	210	774	5572	5771	5810	823	10428	97578	9448	782	25147	360	4532	13125	2115	2932	161
	213	1725	31627	31100	34068	5622	8073	14748	9401	16121	27904	13819	20289	36371	6159	2227	83
	214	1171	20791	13231	25096	9669	10993	6944	33853	24715	61918	62937	52313	19424	4369	175	79
	215	1270	55780	19546	64301	96161	60996	12584	10471	10732	131984	14279	65032	40	3013	228	123
	228	1428	5671	12374	16972	23904	4357	2215	3012	299	15820	1749	4845	4582	3096	11877	121
	234	508	1030	553	3699	1192	4614	5370	3657	2402	7178	2790	2521	0	0	0	10
	Total	8924	126380	126893	175720	165938	123493	197162	80468	68146	317789	119764	161974	87499	18980	18185	731
	301-400	203	480	649	641	7467	230	3141	1369	2054	192	2982	2798	4396	0	0	10
208		448	438	3341	631	908	3750	3153	454	1454	2589	6120	1816	5189	682	82	185
211		330	10285	5685	9384	4747	6490	3016	954	1400	1462	3573	3412	26274	2162	6930	615
216		384	311	484	10204	454	86	24	908	180	142	5462	937	1356	48	52	3
222		441	2029	653	2780	281	0	105	22	281	15	463	91	1199	656	84	28
229		567	319	7394	3150	1144	467	516	106	1397	816	96	786	2525	1641	916	116
Total		2650	14031	18198	33616	7764	13934	8183	4498	4904	8006	18512	11438	36543	5189	8074	964
401-500	204	354	261	258	397	3149	316	1506	2192	0	829	683	3514	2	3	0	9
	217	268	3	3	9	0	0	0	7	0	0	80	0	0	0	9	0
	223	180	2	2	7	0	0	0	0	0	0	19	4	39	34	3	
	227	686	186	183	291	0	36	129	0	0	101	117	137	2483	6291	1063	64
	235	420	252	249	385	347	315	1584	121	24	0	497	334	410	465	925	16
Total	1908	704	695	1089	3496	667	3219	2320	24	930	1377	4004	2899	6798	2031	92	
501-750	Total	1591	nf	nf	nf	137	140	0	58 ¹	31	515	202	388	269	1097	3817	37
751-1000	Total	517	nf	nf	nf	0 ¹	0 ¹	0	0 ¹	0	27	0	0	0 ¹	0	0	28
Total ²			172445	158574	235007	228759	216540	267120	181681	136692	404644	175463	249133	140829	32855	28511	2140
Mean Wt. per tow			106.55	97.98	145.21	141.35	133.8	165.06	112.26	84.46	250.03	108.42	153.94	87.02	20.3	17.62	1.32
Unadjusted total for all sampled strata			165109	157237	233916	228894	216680	267121	181731	136723	405185	175668	248085	141098	33950	32327	2207
1 STD			31859	48927	40252	97914	36101	453868	29966	18838	130971	36414	44428	46468	8605	20910	452

Note: shaded numbers are estimates for non sampled strata and only 0-500 m strata are used in deriving these estimates.

nf not fished

¹ not all strata fished

² Total and mean no. per tow include sampled and estimated values for depths to 500 meters. Estimates were derived from a multiplicative model using survey data to 1991.

Table 14 . Abundance and Biomass for Division 2J Using revised stratification scheme.

Depth range (m)	Stratum number	Stratum area sq mi.	GADUS			GADUS			TELEOST		
			236-238	250-252	20-23	236-238	250-252	20-23	236-238	250-252	20-23
Mean Date			1993	1994	1995-6 ²	1993	1994	1995-6 ²	1993	1994	1995-6 ²
			7-Nov-93	17-Nov-94	28-Dec-95	7-Nov-93	17-Nov-94	28-Dec-95	7-Nov-93	17-Nov-94	28-Dec-95
			abundance (000's)			biomass (t)					
101-200	201	633	0	0	nf	0	0	nf			
	205	1594	17	40	nf	16	28	nf			
	206	1870	53	0	0	24	0	0			
	207	2246	156	170	350	49	54	44			
	237	733	28	0	272	15	0	13			
	238	778	nf	0	nf	nf	0	nf			
	Total	7076	254	210	622	104	82	57			
201-300	202	621	0	0	49	0	0	9			
	209	680	34	26	327	10	3	52			
	210	1035	408	52	1424	125	26	108			
	213	1583	119	0	2504	82	0	336			
	214	1341	221	50	323	111	33	39			
	215	1302	156	66	90	71	51	21			
	223	158	0	0	880	0	0	135			
	228	2196	92	0	949	63	0	263			
	234	530	0	0	nf	0	0	nf			
Total	9446	1030	194	6546	462	113	963				
301-400	203	487	0	73	0	0	67	0			
	208	588	0	15	768	0	4	123			
	211	251	72	38	708	58	21	141			
	216	360	0	27	927	0	15	234			
	222	450	51	90	495	41	33	124			
	229	536	40	40	627	8	20	184			
	Total	2672	163	283	3525	107	160	806			
401-500	204	288	0	0	16	0	0	1			
	217	241	18	6	561	17	2	135			
	227	598	135	0	370	93	0	109			
	235	414	104	166	541	48	107	175			
	240	133	5	0	123	7	0	68			
Total	1674	262	172	1611	165	109	488				
501-750	212	557	21	28	69	25	28	15			
	218	362	0	14	1660	0	13	519			
	224	228	0	0	596	0	0	205			
	230	185	0	9	13	0	12	14			
	239	120	5	3	0	5	2	0			
	Total	1452	26	54	2338	30	55	753			
751-1000	219	283	0	0	0	0	0	0			
	231	186	0	0	0	0	0	0			
	236	193	0	0	12	0	0	2			
	Total	662	0	0	12	0	0	2			
Total ¹			1735	913	14654	868	519	3069			
Mean wt. or # per tow			1.00	0.51	5.26	0.50	0.28	1.1			
1 STD			348	193	2222	139	133	429			

nf strata not fished

¹ Totals and means presented are for all strata fished. Because of the short time series with the new stratification scheme and a change in vessel and gear in 1995 no attempt has been made to fill for missing strata.

² Survey gear changed from Engels 145 to Campelen 1800.

Table 15 . Cod abundance estimates (thousands of fish) from research vessel surveys in NAFO Division 3K (Fall).

Depth range (m)	Stratum number	Stratum area sq mi	GADUS 15 1978	GADUS 29 1979	GADUS 44 1980	GADUS 58-59 1981	GADUS 71-72 1982	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 Date			10-Nov-78	25-Nov-79	29-Nov-80	5-Dec-81	25-Nov-82	26-Nov-83	23-Nov-84	18-Nov-85	1-Dec-86	27-Nov-87	5-Dec-88	5-Dec-89	4-Dec-90	4-Dec-91	26-Nov-92
101-200	618	1455	2031	2855	1580	1899	1407	2083	4806	6458	12975	2652	1074	560	573	87	146
	619	1588	521	751	398	426	348	530	1243	221	930	671	460	1430	72	30	40
	Total	3043	2552	3606	1976	2128	1755	2593	6049	6679	13905	3323	1534	1990	645	117	186
201-300	620	2709	17749	26203	15206	12689	4248	17610	22825	1728	31158	6449	4236	9368	606	378	271
	621	2859	14655	25646	2739	7453	6472	4603	6070	1531	4654	930	2854	2512	441	129	72
	624	668	13121	23166	627	3686	2470	1128	978	552	602	234	789	520	2733	1128	100
	632	447	727	2265	5078	3171	2494	8321	2236	1029	1158	1879	12516	604	2684	1631	206
	634	1618	4057	18157	13651	19455	11384	14186	6229	7112	99787	18660	4676	77314	625	21400	136
	635	1274	3921	1492	3706	4743	3175	1227	3275	874	3727	829	1033	710	319	192	104
	636	1455	1820	2446	6051	3695	7001	2603	3413	928	3440	1482	2312	1136	109	109	36
	637	1132	2634	5778	3909	4744	6409	8718	19062	3824	11939	3781	6936	3212	816	708	28
	Total	12162	58684	105153	50967	59636	43653	58396	64088	17578	156465	34244	35332	95376	8333	25675	953
301-400	623	1027	6142	2981	7593	878	1557	5769	11784	1015	1060	3855	1172	6877	4390	360	642
	625	850	1340	2488	1515	1021	2169	1276	574	1723	808	2760	1340	3238	1308	255	85
	626	919	3191	759	1012	2235	911	1276	770	826	10451	1173	317	1628	310	115	69
	628	1085	1433	2891	1008	1371	570	1955	1140	1826	624	375	2101	1853	684	1249	434
	629	495	724	449	144	50	412	562	459	272	1348	237	431	425	655	37	175
	630	544	255	388	315	225	172	306	414	82	65	177	191	2151	204	82	27
	633	2179	4283	3044	2944	3106	3552	3748	5954	10059	26717	15375	3660	39354	46720	36933	1295
	638	2059	2720	8081	3246	9158	5699	13843	3323	8189	9080	7388	4637	41590	91652	41601	1084
	639	1463	1603	3075	741	1303	2921	4095	1304	2128	3423	1459	1977	2320	7264	20390	299
	Total	10621	21691	24156	18518	19345	17963	32830	25702	27120	53576	32799	15826	99436	153187	101022	4110
401-500	622	632	306	436	234	356	190	142	308	59	332	47	237	2499	1020	158	190
	627	1194	478	685	365	104	152	193	178	89	1262	341	284	1304	4977	403	266
	631	1202	571	801	430	162	0	523	18	103	68	752	1585	8185	3564	2587	211
	640	198	24	37	16	0	0	25	7	10	7	7	59	632	52	352	4414
	645	204	19	29	13	0	5	8	15	15	32	31	15	505	103	0	15
Total	3430	1398	1988	1060	622	347	891	526	276	1701	1178	2180	13125	9716	3500	5096	
501-750	Total	917	nf	nf	nf	0	0	15	0	0	nf	44	nf	nf	25	33	64
751-1000	Total	1340	nf	nf	nf	0	0	nf	0 ¹	0	nf	0 ¹	nf	nf	23	10	0
Total ²			84311	134903	72521	81732	63717	94508	96355	51652	225648	71544	54871	209692	171919	130316	10346
Mean no. per tow			38.39	61.43	33.02	37.22	29.01	43.04	43.88	23.52	102.75	32.58	24.99	95.50	8.29	59.34	4.71
Unadjusted total for all sampled strata			80120	129310	69485	79602	61791	91908	94131	51653	225616	71587	54871	209925	171930	130355	10410
1 STD			19002	45053	11920	12664	6736	14024	15554	6775	136309	14992	76547	75501	57923	37028	9387

Note shaded numbers are estimates for non sampled strata and only 0-500 m strata are used in deriving these estimates.

nf =not fished

¹ not all strata fished

² Total and mean no. per tow include sampled and estimated values for depths to 500 meters. Estimates were derived from a multiplicative model using survey data to 1991.

Table 16 . Cod biomass estimates (t) from research vessel surveys in NAFO Division 3K (Fall).

Depth range (m)	Stratum number	Stratum area sq. mi.	GADUS 15 1978	GADUS 29 1979	GADUS 44 1980	GADUS 58-59 1981	GADUS 71-72 1982	GADUS 87-88 1983	GADUS 101-103 1984	GADUS 117-118 1985	GADUS 132-133 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 Date			10-Nov-78	25-Nov-79	29-Nov-80	5-Dec-81	25-Nov-82	28-Nov-83	23-Nov-84	18-Nov-85	1-Dec-86	27-Nov-87	5-Dec-88	5-Dec-89	4-Dec-90	4-Dec-91	26-Nov-92
101-200	618	1455	2015	3623	2319	2383	1891	2600	9363	10318	18917	3979	97	209	202	39	450
	619	1588	681	1258	790	813	637	890	3004	652	811	1164	469	254	4	15	20
	Total	3043	2696	4879	3109	3196	2528	3490	12367	10970	19728	5143	566	463	206	54	470
201-300	620	2709	32708	55286	33699	33603	9851	33248	41781	4190	46251	11244	2721	2293	263	174	126
	621	2859	25889	63106	5939	10935	11764	6750	14149	2229	7283	887	4361	1401	59	42	95
	624	668	29936	40531	1742	7973	5365	1586	959	953	1153	232	1112	284	1597	712	44
	632	447	873	3896	10165	7566	5721	13992	4163	1667	2072	2726	16458	514	1726	1217	112
	634	1618	6907	29309	29404	40573	23579	22967	11703	11161	163994	32997	7054	116699	432	20673	108
	635	1274	3702	2551	7902	10271	7249	3236	5457	1619	7900	1404	1423	745	195	96	62
	636	1455	2248	5040	11959	8428	14144	6335	7065	1884	4489	3011	4087	649	142	39	45
	637	1132	3540	10813	7871	9829	13256	17317	34548	6209	17860	7109	11429	4815	579	475	16
	Total	12162	105803	210332	108681	129178	90929	105431	119825	29912	251002	59610	48645	127400	4993	23428	608
301-400	623	1027	11293	7522	15746	2175	4849	12071	20190	2303	2182	7108	1041	3353	1665	178	284
	625	850	1825	5538	4626	2640	4817	3499	1397	2935	1446	4490	2549	3446	657	152	48
	626	919	6976	1940	3242	4781	2076	3932	1653	1735	12331	1914	327	1696	31	36	26
	628	1085	2729	6206	2739	3848	1480	3841	2112	3000	842	658	2329	1739	397	798	279
	629	495	1145	1070	337	150	1255	1167	832	346	2066	322	270	443	273	5	76
	630	544	531	1019	1174	939	488	847	708	230	84	327	415	3728	191	49	18
	633	2179	6947	6379	8073	8406	8482	6558	10861	16779	45140	26825	6307	40630	50281	33839	929
	638	2059	4210	13362	7161	17706	10143	23310	5511	13854	13234	12674	6547	92164	125508	41930	750
	639	1463	2204	5734	1949	3225	8335	9295	2684	3349	5372	2526	3185	1589	5031	22727	185
	Total	10621	37860	48770	45047	43870	41935	64520	45948	44531	82697	56844	22970	148786	184032	99714	2595
401-500	622	632	457	830	527	1257	561	287	646	79	451	47	353	2249	416	90	83
	627	1194	688	1257	796	267	330	601	318	127	2121	350	446	1580	1319	218	114
	631	1202	874	1589	1009	451	0	1489	72	220	113	1200	2165	9010	1930	1767	203
	640	198	61	115	71	0	0	61	119	59	11	45	216	841	97	302	4889
	645	204	52	99	61	0	54	42	176	130	79	47	77	197	123	0	12
Total	3430	2132	3890	2464	1975	945	2500	1331	615	2775	1689	3257	13877	3885	2377	5301	
501-750	Total	917	nf	nf	nf	0	0	88	0	0	nf	73	nf	nf	28	44	66
751-1000	Total	1340	nf	nf	nf	0	0	nf	0 ¹	0	nf	0 ¹	nf	nf	18	7	0
Total ²			148482	267862	159298	178220	136328	175936	179468	86029	356203	123283	75437	290535	193130	125576	8974
Mean wt. per tow			67.61	121.97	72.54	81.15	62.08	80.11	81.72	39.17	162.2	56.14	34.35	132.3	87.94	57.18	4.09
Unadjusted total for all sampled strata			143132	259102	153728	175023	133310	172458	175308	88030	356120	123358	75437	290528	193164	125625	9040
1 STD			36655	63582	24056	31388	12891	22067	26381	10846	220349	28509	105265	128071	94676	39603	10443

Note shaded numbers are estimates for non sampled strata and on 1y 0-500 m strata are used in deriving these estimates.

nf not fished

¹ not all strata fished

² Total and mean wt. per tow include sampled and estimated values for depths to 500 meters. Estimates were derived from a multiplicative model using survey data to 1991.

Table 17 . Abundance and Biomass for Division 3K .

Using revised stratification scheme.

Depth range (m)	Stratum number	Stratum area sq. mi.	WT 176-81			WT 176-81		
			GADUS 236-238	GADUS 250-252	TELEOST 20-23	GADUS 236-238	GADUS 250-252	TELEOST 20-23
			1993	1994	1995-6 ²	1993	1994	1995-6 ²
Mean Date			23-Nov-93	7-Dec-94	26-Dec-95	23-Nov-93	7-Dec-94	26-Dec-95
			abundance	(000's)		biomass	(t)	
101-200	618	1347	236	14	1170	110	4	87
	619	1753	197	0	655	148	0	32
	Total	3100	433	14	1825	258	4	119
201-300	620	2545	191	38	1465	103	12	238
	621	2736	0	68	2580	0	72	302
	624	1105	47	28	813	34	16	251
	634	1555	58	117	214	29	113	97
	635	1274	64	0	88	34	0	10
	636	1455	109	36	286	121	27	92
	637	1132	623	24	242	434	8	74
	Total	11802	1092	311	5688	755	248	1064
301-400	617	593	134	24	693	47	14	97
	623	494	76	0	578	18	0	32
	625	888	67	0	342	78	0	99
	626	1113	139	28	2709	131	12	289
	628	1085	217	27	1556	118	10	353
	629	495	99	9	545	60	1	70
	630	332	0	0	41	0	0	11
	633	2067	155	341	851	107	207	420
	638	2059	1182	125	1252	791	70	635
	639	1463	198	233	712	114	150	290
	Total	10589	2267	787	9276	1464	464	2296
401-500	622	691	91	10	542	48	6	68
	627	1255	283	71	4924	120	63	702
	631	1321	0	50	501	0	79	99
	640	69	38	3	218	27	3	90
	645	216	22	22	134	23	28	48
	650	134	134	13	276	82	12	112
	Total	3686	568	169	6595	300	191	1119
501-750	641	230	6	6	63	8	4	83
	646	325	16	0	0	12	0	0
	651	359	9	34	691	14	35	317
	Total	914	31	40	754	34	39	400
751-1000	642	418	21	0	0	21	0	0
	647	360	0	0	0	0	0	0
	652	516	52	19	0	85	11	0
	Total	1294	73	19	0	106	11	0
1000-1500			nf	nf	0	nf	nf	0
Total ¹			4463	1342	24142	2919	955	5000
Mean # or wt. per tow			1.86	0.57	5.22	1.22	0.41	1.08
1 STD			651	380	1907	456	238	505

nf strata not fished

¹Totals and means presented are for all strata fished. Because of the short time series with the new stratification scheme and a change in vessel and gear in 1995 no attempt has been made to fill for missing strata.

²Survey gear changed from Engels 145 to Campelen 1800.

Table 18 . Cod abundance estimates (thousands of fish) from research vessel surveys in NAFO Division 3L (Fall).

Depth range (fath)	Stratum number	Stratum area sq mi.	ATC		WT		WT		AN		WT		WT		WT		WT	
			323-325 1981	333-334 1982	7-9 1983	16-18 1984	37-39 1985	72 1986	65 1987	78 1988	87 1989	101 1990	114-115 1991	129-130 1992	145-146 1993	160-162 1994	176-181 1995 ³	
Mean Date			6-Nov-81	19-Nov-82	27-Oct-83	15-Aug-84	27-Oct-85	21-Nov-86	24-Oct-87	3-Nov-88	20-Oct-89	5-Nov-90	21-Nov-91	16-Nov-92	23-Nov-93	22-Nov-94	27-Nov-95	
31-50	350	2071	4923	2332	6335	15455	13698	15197	4785	3902	3327	1498	1825	505	622	67	1045	
	363	1780	802	1980	13050	19374	40659	2439	6770	9193	12159	12259	1377	2517	134	67	365	
	371	1121	105	1010	4879	8018	1058	151	1330	1963	105	2844	168	280	28	0	31	
	372	2480	14256	8879	37532	27415	21453	6039	21406	5128	8956	54511	781	585	87	0	353	
	384	1120	168	273	6025	20303	452	52	8589	338	67	19295	103	40	32	0	0	
Total	8552	20254	14254	67621	90565	77320	23878	42880	20522	24614	80407	4254	3927	903	134	1794		
51-100	328	1519	2296	375	954	285	385	4598	257	928	309	114	76	274	76	76	0	
	341	1574	1930	975	1359	1512	945	1287	144	266	74	217	236	79	118	0	36	
	342	585	381	1039	274	439	205	219	176	132	44	417	66	29	0	15	40	
	343	525	897	223	328	2089	236	617	131	210	13	236	53	158	26	13	36	
	348	2120	1724	3310	1953	7002	1284	1999	1008	1194	1432	984	557	517	149	119	250	
	349	2114	2154	1492	1622	8059	3047	2739	681	2257	730	1111	1587	32	835	23	122	
	364	2817	983	1113	1629	8162	1774	984	1012	2145	442	2397	159	169	352	70	43	
	365	1041	8693	2090	578	8400	684	1583	521	375	234	195	547	104	26	52	215	
	370	1320	173	413	727	7799	561	248	380	255	66	357	66	165	66	0	73	
	385	2356	44	309	318	1827	118	702	197	27	16	354	108	212	0	0	0	
	390	1481	37	111	111	2483	48	241	764	125	79	111	0	37	0	0 ³	34	
	Total	17452	17295	11450	9453	48057	9287	15197	5271	7914	3439	6493	3453	1776	1448	368	849	
	101-150	344	1494	2075	5047	1103	3701	2978	2464	1654	977	881	2093	336	1009	393	154	530
347		983	2706	2915	2041	2976	576	1290	553	2966	1476	7600	148	74	129	9	199	
366		1394	5197	8022	4447	6221	18207	23099	9433	23992	6278	2703	5454	14704	942	42	230	
369		981	2669	1371	2525	2803	1960	21671	5194	3203	418	866	4408	334	62	0	78	
388		983	861	553	1443	1513	1269	5737	1107	1004	1550	2287	49	123	49	0	0	
389		821	933	1756	1622	811	961	985	3374	1017	1263	801	1335	0	0	0	38	
391		282	72	95	635	32	635	95	169	32	84	191	28	7	21	0	0	
Total		6918	14513	19759	13816	18057	26586	55341	21484	33181	11930	16541	11758	16251	1596	205	1075	
151-200	345	1432	2015	3637	2929	2300	4658	5105	3386	4208	2319	2828	618	242	358	94	2780	
	346	865	5822	2337	4389	1731	3441	5089	11834	10259	4091	4523	10631	10783	242	37	754	
	368	334	1316	1429	2845	602	2871	8168	1817	1580	928	4182	9540	10568	4240	27	299	
	387	718	808	3000	1767	3072	1253	10618	880	377	305	1590	1048	683	790	120	66	
	388	361	283	253	460	528	461	446	149	339	935	420	271	135	108	48	99	
	392	145	20	147	33	103	60	18	5	38	16	65	47	4	21	0	19	
Total	3855	10244	10803	12253	8336	12744	27442	17871	16801	8594	13586	22153	22415	5759	324	4017		
201-300	Total	1142	nf	20 ¹	nf	410	90	0 ¹	nf	nf	nf	180 ¹	404	541	2390	75	232	
301-400	Total	804	nf	nf	0 ¹	0 ¹	0	0 ¹	nf	nf	nf	0 ¹	13	0	31	29	32	
401-500	Total	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	16	
Total ²			62303	56265	103140	165002	125933	121853	87504	78420	48577	127023	41616	44369	9692	1032	7733	
Mean no. per tow			22.57	20.38	37.37	59.78	45.62	44.14	31.7	28.41	17.6	46.02	15.08	16.07	3.51	0.37	1.53	
Unadjusted total for all sampled strata			60719	55689	94623	165427	126027	121411	87505	78427	48578	127207	42036	44809	11966	1137	8013	
1 STD			11347	5702	14214	15973	24791	24243	10809	10049	8502	28996	5953	12038	4021	184	2309	

Note shaded numbers are estimates for non sampled strata and only 0-200 fathom strata are used in deriving these estimates.

nf not fished

¹ not all strata fished

² Total and mean no. per tow include sampled and estimated values for depths to 200 fathom. Estimates were derived from a multiplicative model using survey data to 1991.

³ Survey gear changed from Engels 145 to Campelen 1800.

Table 19 . Cod biomass (t) from research vessel cruises in NAFO Division 3L (Fall).

Depth range (fath)	Stratum number	Stratum area sq mi.	ATC 323-325 1981	ATC 333-334 1982	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 ³
Mean Date			6-Nov-81	19-Nov-82	27-Oct-83	15-Aug-84	27-Oct-85	21-Nov-86	24-Oct-87	3-Nov-88	20-Oct-89	5-Nov-90	21-Nov-91	16-Nov-92	23-Nov-93	22-Nov-94	27-Nov-95
31-50	350	2071	6244	3848	8463	16498	11219	21047	6486	8216	4815	3270	3165	984	645	105	1276
	363	1780	852	2009	17993	20017	40414	4605	11261	15379	13532	14606	2065	2815	128	90	506
	371	1121	137	1363	6126	11210	1304	89	2710	4404	231	4906	230	398	26	0	102
	372	2460	20737	6882	44364	27045	29915	11255	40873	9964	13626	99532	1636	778	146	0	54
	384	1120	112	1090	5941	27463	583	53	13690	911	76	33264	293	47	24	0	0
	Total	8552	28082	15192	82887	102233	83435	37049	75020	38874	32280	155578	7389	5022	969	195	1938
51-100	328	1519	334	370	699	299	656	3128	131	1215	437	130	84	930	33	133	0
	341	1574	2146	901	1949	1760	957	1793	309	561	69	582	463	87	56	0	2
	342	585	834	951	263	736	205	233	167	237	60	257	186	65	0	8	22
	343	525	1419	237	661	2261	99	690	194	269	39	234	30	138	35	5	18
	348	2120	2651	4249	3125	11537	1995	2384	1512	1973	1312	1026	645	500	124	155	181
	349	2114	3604	3174	2266	8257	3856	3211	1069	3835	1238	1681	2444	37	608	5	88
	364	2817	1932	1800	1946	4536	1419	1298	1521	3309	773	2536	482	256	278	131	1
	365	1041	17904	3702	961	3624	977	1512	1087	1035	316	205	1288	159	55	59	129
	370	1320	300	446	1184	7891	597	69	842	562	116	520	160	332	64	0	72
	385	2356	38	43	1019	1886	94	1095	951	326	64	711	124	278	0	0	0
	390	1481	9	58	852	1130	9	35	277	204	108	65	0	26	0	0	13
Total	17452	31171	15931	14925	43917	10864	15448	8060	13526	4532	7947	5906	2808	1253	496	526	
101-150	344	1494	3869	7701	1682	6121	4010	3623	2019	897	854	1485	140	760	207	120	233
	347	983	4550	4805	3167	5731	996	1833	701	3852	2332	5735	122	20	132	6	99
	366	1394	9313	11920	8999	7101	27549	34160	15868	39741	8412	3593	6226	15681	936	54	121
	369	961	7755	2290	5849	3962	4557	33585	12236	6341	2034	1683	6328	351	78	0	174
	386	983	1414	1430	3892	2546	4162	13630	2869	4044	4007	5653	49	143	93	0	0
	389	821	1428	3428	2791	2737	2521	1723	1733	704	2009	1875	907	0	0	0	12
	391	282	63	487	159	79	325	370	70	6	23	165	15	1	10	0	0
	Total	6918	28392	32061	26539	28277	44120	88924	35496	55585	19671	20189	13787	16956	1456	180	639
151-200	345	1432	4703	7686	6443	3673	8104	9106	5375	7693	4028	3034	520	222	263	63	1441
	346	865	12012	4212	7746	3003	5805	7670	19771	18031	7978	6309	10622	11524	226	31	459
	368	334	5948	3604	7481	1222	6011	12300	5353	4319	3165	7317	11827	12239	3991	31	129
	387	718	1334	9216	5379	7465	4056	20225	2740	1289	476	8644	1733	820	722	92	25
	388	361	415	461	816	616	1951	592	115	366	1362	1066	258	125	91	43	35
	392	145	27	220	109	68	106	11	8	41	22	120	30	2	6	0	15
Total	3855	24439	25399	27973	16047	26033	49904	33362	31739	17031	26490	24990	24932	5299	260	2104	
201-300	Total	1142	nf	20 ¹	nf	1224	721	0 ¹	nf	nf	nf	522 ¹	647	787	1932	65	128
301-400	Total	804	nf	nf	0 ¹	0 ¹	0	0 ¹	nf	nf	nf	0 ¹	32	0	21	37	15
401-500	Total	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	17
Total ²			112086	88586	152325	190480	164451	191326	151936	139727	73512	210203	52073	49718	8977	1129	5114
Mean wt. per tow			40.6	32.09	55.18	69	59.57	69.31	55.04	50.61	26.63	76.14	18.86	18.01	3.25	0.41	1.01
Unadjusted total			109819	87997	131268	191702	165169	190732	151936	139726	73514	210725	52750	50506	10930	1232	5275
1 STD			21713	8985	22070	17204	24049	36930	19632	16398	9679	54249	7466	13455	3775	239	1280

Note shaded numbers are estimates for non sampled strata and only 0-200 fathom strata are used in deriving these estimates.

nf not fished

¹ not all strata fished

² Total and mean no. per tow include sampled and estimated values for depths to 200 fathom. Estimates were derived from a multiplicative model using survey data to 1991.

³ Survey gear changed from Engels 145 to Campelen 1800.

Table 20 . Cod abundance estimates (thousands of fish) from research vessel surveys in NAFO Division 3L (Spring).

Depth range (fath)	Stratum number	Stratum area sq. mi.	ATC 1978	ATC 1979	ATC 1980	ATC 1981	ATC 1982	WT 1985	WT 1986	WT 1987	WT 1988	WT 1989	WT 1990	WT 1991	WT 1992	WT 1993	WT 1994	WT 1995
Mean Date			11-May-78	25-May-79	22-May-80	22-Apr-81	11-May-82	7-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	1-Jun-94	6-Jun-95
31-50	350	2071	1373	7756	2798	829	1221	15883	5893	6685	32355	9836	2199	369	71	17	0	0
	363	1780	2378	7649	1817	3296	1924	7182	7429	11194	14621	3982	2119	363	59	50	0	0
	371	1121	477	1599	2917	0	189	8061	926	1647	1178	1501	996	15483	17	17	0	0
	372	2460	9022	6135	3293	5032	1477	27099	12451	9290	13346	4281	1794	203	18	34	0	0
	384	1120	56	2711	1555	28	42	98	1906	2174	387	280	84	147	0	17	0	0
	Total	8552	13306	25850	12380	9185	4853	58323	28605	30990	61887	19880	7192	16565	165	135	0	0
51-100	328	1519	104	296	243	0	342	257	443	794	285	0	1124	76	0	76	0	0
	341	1574	325	827	1024	1004	2150	3505	1661	2599	8330	1669	591	59	0	0	24	0
	342	585	922	132	417	132	278	586	454	307	176	454	176	0	29	29	15	0
	343	525	867	768	1399	887	2374	1103	719	381	801	1340	105	99	39	20	20	20
	348	2120	2361	3687	3456	887	2467	4986	5450	10702	8391	4367	1345	60	18	20	20	40
	349	2114	4628	4035	2997	595	3729	7016	6767	4616	5951	11148	1092	175	53	71	0	0
	364	2817	599	4705	2996	1128	1304	5821	3483	8064	5286	7250	2115	308	0	35	0	0
	365	1041	391	2481	1035	977	4689	1797	1516	5798	5236	2683	430	59	20	0	0	0
	370	1320	363	817	1486	0	248	7394	805	4742	2715	4013	212	11593	0	33	0	0
	385	2356	59	783	3139	59	0	2087	258	514	849	3493	611	4863	35	96	0	0
	390	1481	1056	2223	1223	389	139	358	97	79	0	125	22	67	19	37	0	0
	Total	17452	11675	20754	19415	6058	17720	34910	21653	38596	38020	36542	7823	17359	213	417	79	60
	101-150	344	1494	11607	15981	7947	29001	9168	695	4864	449	841	5239	299	45	79	37	0
347		983	6272	5737	10212	3247	10773	1668	5519	2410	5003	1439	221	92	18	37	0	0
366		1394	9200	11118	5232	56749	18521	41420	20339	13214	4133	10215	3645	4238	52	60	0	0
369		961	577	2813	6757	7286	1876	10950	9534	6810	10929	5134	1890	1205	36	0	0	0
386		983	615	2749	2068	2693	812	5372	1783	3011	3320	6924	14920	6911	37	30	0	0
389		821	1130	1464	5259	1140	2712	8677	1380	1150	1335	1430	447	760	41	0	0	15
391		282	201	1117	1757	688	191	476	603	286	127	191	2593	445	0	0	0	0
Total		6918	29602	40979	39230	100804	44053	69258	44022	27330	25688	30572	24015	13696	263	164	0	60
151-200		345	1432	5321	1800	6385	15264	2714	2107	13160	21498	7820	12860	2069	1496	125	54	193
	346	865	1676	1380	1125	2727	801	714	16999	6324	4058	3360	52513	760	276	130	43	43
	368	334	374	56	113	1880	639	1492	4250	5382	238	1270	14491	167	2269	263	63	13
	387	718	198	256	108	296	1419	24226	5686	189	552	2878	43939	17660	8192	1078	0	108
	388	361	257	190	41	393	989	488	2520	14	244	289	13603	1805	501	650	0	27
	392	145	44	178	5	196	218	1818	403	5	234	98	2961	528	11	27	0	16
Total	3855	7870	3860	7777	20756	6780	30845	43018	33412	13146	20755	129576	22416	11374	2202	299	250	
201-300	Total	1142	nf	nf	nf	204 ¹	nf	329	nf	nf	nf	nf	nf	3498 ¹	26821	321	4632	262
301-400	Total	804	nf	nf	nf	nf	nf	0	nf	nf	nf	nf	nf	144 ¹	26	0	0	0
Total ²			62452	91444	78804	136800	73406	193336	137303	130329	138742	107747	168602	70035	12016	2918	377	370
Mean no. per tow			22.62	33.12	28.54	49.55	26.59	70.03	49.74	47.21	50.26	39.03	61.07	25.37	4.35	1.06	0.14	0.13
Unadjusted total for all sampled strata			51099	91444	78561	136875	73406	193665	137300	130329	138741	107747	168604	65810	38863	3238	5009	631
1 STD			10919	11210	7367	65555	10384	31124	11992	24815	19404	9167	47693	22307	161003	1923	18007	1250

Note shaded numbers are estimates for non sampled strata and only 0-200 fathom strata are used in deriving these estimates.

nf not fished

¹ not all strata fished

² Total and mean no. per tow include sampled and estimated values for depths to 200 fathom. Estimates were derived from a multiplicative model using survey data to 1991.

Table 21 . Cod biomass estimates (t) from research vessel surveys in NAFO Division 3L (Spring).

Depth range (fath)	Stratum number	Stratum area sq. mi.	ATC				WT				WT				WT			
			ATC	ATC	ATC	ATC	WT	WT	WT	WT	WT	WT	WT	WT	WT	WT	WT	
Mean Date			11-May-78	25-May-79	22-May-80	22-Apr-81	11-May-82	7-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	1-Jun-94	6-Jun-95
31-50	350	2071	2108	13637	7124	2539	4775	31785	16344	19008	56567	22760	8359	1059	170	24	0	0
	363	1780	3923	11237	4182	7082	6721	14881	12152	19419	23096	8070	8270	1433	343	19	0	0
	371	1121	1492	2439	8148	0	789	15647	3184	4122	4005	4080	3282	25696	6	6	0	0
	372	2460	7015	8342	7448	7155	3978	44792	19171	22017	27917	12397	8981	883	69	56	0	0
	384	1120	19	3521	2480	308	231	284	3667	3681	844	549	578	381	0	41	0	0
	Total	8552	14557	39176	29382	17084	16494	107389	54518	68247	112429	47856	29470	29452	588	146	0	0
51-100	328	1519	105	518	338	0	893	74	838	1897	456	0	3577	59	0	97	0	0
	341	1574	1007	2468	3291	2038	8495	4735	8022	12076	16947	4772	3291	167	0	0	2	0
	342	585	3014	409	961	277	871	429	1639	604	307	483	509	0	2	6	2	0
	343	525	1791	1190	2936	946	4768	795	1502	1064	1346	1511	92	31	2	2	2	2
	348	2120	3551	7129	7855	1966	5709	7904	11590	33966	23118	9796	3958	229	3	8	2	9
	349	2114	8890	8800	7262	1321	10182	16005	27730	14008	17951	28008	1622	573	34	12	0	0
	364	2817	929	7884	7154	2361	3938	9837	9223	20328	13755	18200	10495	709	0	59	0	0
	365	1041	533	2953	2442	2090	6056	2160	3329	9791	8361	5262	1373	68	51	0	0	0
	370	1320	368	1046	2807	0	99	7054	3511	7679	5896	6663	980	12956	0	29	0	0
	385	2356	80	1118	6278	413	0	2084	424	1068	2133	3088	792	6510	41	91	0	0
	390	1481	796	2125	2798	500	217	261	406	503	0	197	63	367	37	29	0	0
		Total	17452	21064	35640	44202	11912	41228	51338	68214	102982	90270	77980	26752	21669	170	333	8
101-150	344	1494	20390	19398	10172	50712	19583	648	8032	1023	1121	5808	183	6	15	6	0	4
	347	983	8502	7705	16019	8043	21435	3416	10419	4919	8818	2386	312	15	22	15	0	0
	366	1394	7733	11509	5912	81497	21817	45178	30705	19201	7551	13832	5895	4074	35	65	0	0
	369	961	1000	2448	7406	9378	4959	19297	11488	11564	16889	9252	3960	1318	31	0	0	0
	386	983	252	2881	2361	4593	1279	3877	1906	4368	3274	6748	38420	6640	92	37	0	0
	389	821	1065	1098	6923	478	1664	6169	900	647	692	616	513	226	64	0	0	10
	391	282	356	1048	2064	1212	95	429	826	201	41	95	621	283	0	0	0	0
		Total	6918	39298	46087	50857	155913	70832	79014	64276	41923	38386	38737	49904	12562	259	123	0
151-200	345	1432	10700	4844	11674	29493	6060	2939	17444	28741	11340	18456	2048	2323	167	17	97	30
	346	865	1650	2137	2154	4307	1223	341	20427	8298	5203	4496	57484	655	213	82	18	9
	368	334	542	239	796	1761	809	1536	6412	7166	652	2503	18601	281	1407	195	58	8
	387	718	184	459	256	243	2353	21491	6555	195	520	2506	28531	9249	8121	650	0	53
	388	361	182	349	108	190	1321	346	1572	10	179	122	14910	1005	241	486	0	9
	392	145	66	189	0	128	256	2237	435	3	98	57	1162	179	10	5	0	9
	Total	3855	13334	8217	14988	36122	12022	28890	52845	44413	17992	28140	122736	13902	10159	1435	173	118
201-300	Total	1142	nf	nf	nf	225 ¹	nf	887	nf	nf	nf	nf	nf	3434 ¹	16712	208	3248	200
301-400	Total	804	nf	nf	nf	nf	nf	0	nf	nf	nf	nf	nf	258 ¹	30	0	0	0
Total ²			88251	129116	139428	221031	140580	266632	239860	257568	259082	192713	228864	77583	11177	2039	181	143
Mean wt. per tow			31.97	46.77	50.51	80.07	50.92	96.58	86.89	93.3	93.85	69.81	82.9	28.1	4.05	0.74	0.07	0.05
Unadjusted total for all sampled strata			78212	129117	139030	220979	140578	267516	239857	257566	259080	192713	228865	72416	27919	2248	3428	343
1 STD			12350	13284	13968	93505	15625	35578	19471	31747	33194	16713	53269	34784	99589	1263	13347	776

Note shaded numbers are estimates for non sampled strata and only 0-200 fathom strata are used in deriving these estimates.

nf not fished

¹ not all strata fished

² Total and mean no. per tow include sampled and estimated values for depths to 200 fathom. Estimates were derived from a multiplicative model using survey data to 1991.

TABLE 25. MEAN NUMBERS PER TOW OF COD FROM AUTUMN RV SURVEYS IN DIV. 2J3KL.

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0.41	0.27	0.16	0.51	1.04	0.36	0.02	0.14	0.21	0.59	0.66	0.40	0.03	0.01	0.00	0.01	1.58
2	0.32	3.00	1.59	2.49	6.09	5.57	1.10	1.85	1.56	2.14	8.25	1.91	1.34	0.29	0.37	0.05	0.97
3	1.94	2.48	5.11	5.88	12.31	10.79	7.27	4.77	2.04	3.93	8.98	10.93	3.35	1.78	0.60	0.16	0.74
4	11.78	3.83	2.74	5.93	10.65	15.23	12.35	20.70	4.03	3.20	8.30	12.95	13.97	2.30	0.83	0.13	0.30
5	16.79	13.23	3.26	3.83	10.88	11.34	10.01	31.29	13.23	5.29	6.20	8.61	9.00	2.72	0.34	0.08	0.12
6	10.53	13.31	9.67	2.79	3.88	9.59	7.28	21.29	11.61	10.57	6.52	5.64	3.31	1.42	0.22	0.02	0.06
7	2.27	4.99	8.78	5.82	2.44	2.30	4.24	10.14	4.38	10.13	8.23	3.90	1.10	0.35	0.04	0.02	0.01
8	0.92	1.19	3.66	5.31	5.35	1.37	0.92	5.26	2.67	2.58	4.84	3.98	0.50	0.04	0.01	0.01	0.00
9	0.31	0.37	0.74	2.59	2.94	2.09	0.78	1.37	1.38	1.55	1.62	1.68	0.35	0.02	0.00	0.00	0.00
10	0.26	0.23	0.23	0.57	1.42	1.30	0.67	0.58	0.34	0.79	0.98	0.55	0.16	0.01	0.00	0.00	0.00
11	0.19	0.11	0.10	0.16	0.36	0.54	0.41	0.68	0.17	0.15	0.43	0.23	0.04	0.00	0.00	0.00	0.00
12	0.06	0.16	0.11	0.09	0.14	0.28	0.15	0.42	0.19	0.11	0.16	0.12	0.02	0.01	0.00	0.00	0.00
13	0.04	0.05	0.10	0.07	0.13	0.12	0.06	0.19	0.13	0.08	0.10	0.04	0.01	0.00	0.00	0.00	0.00
1+	45.80	43.21	36.23	36.03	57.63	60.87	45.25	98.68	41.96	41.11	55.29	50.93	33.18	8.96	2.41	0.48	3.79
2+	45.39	42.94	36.08	35.52	56.58	60.51	45.23	98.54	41.74	40.53	54.62	50.53	33.15	8.94	2.41	0.47	2.21
3+	45.07	39.94	34.49	33.03	50.49	54.94	44.13	96.69	40.18	38.38	46.37	48.62	31.81	8.65	2.03	0.42	1.24
4+	43.13	37.47	29.38	27.16	38.18	44.15	36.86	91.92	38.14	34.46	37.39	37.70	28.46	6.87	1.43	0.26	0.50
5+	31.35	33.64	26.64	21.23	27.53	28.93	24.52	71.22	34.11	31.26	29.09	24.75	14.49	4.57	0.61	0.13	0.20
6+	14.57	20.41	23.38	17.40	16.66	17.59	14.50	39.93	20.88	25.97	22.89	16.14	5.49	1.85	0.27	0.05	0.08

COEFFICIENTS OF VARIATION - PERCENT

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	18	33	34	23	46	26	64	28	38	33	22	25	56	53	18	0	16
2	22	39	22	23	28	17	16	18	24	12	15	16	24	19	29	96	15
3	17	53	22	18	19	16	20	16	15	17	23	17	28	18	29	34	21
4	22	38	20	14	23	16	18	24	13	21	36	21	29	29	30	26	24
5	26	27	24	17	26	20	16	31	16	19	44	31	27	34	38	38	26
6	32	28	29	19	28	15	14	35	18	18	37	38	25	32	35	63	38
7	33	24	29	20	24	15	12	36	18	17	32	40	28	31	26	63	33
8	32	21	32	18	25	14	9	33	18	14	31	41	27	31	44	50	50
9	25	22	28	16	22	13	9	32	16	14	36	37	26	50	0	0	0
10	26	24	26	11	25	12	9	29	17	14	47	35	29	33	0	0	0
11	23	33	23	15	26	12	10	25	16	13	46	30	26	0	0	0	0
12	28	26	23	26	24	13	11	30	15	14	54	32	43	0	0	0	0
13	27	32	20	15	7	13	13	23	13	13	71	29	97	0	0	0	0

TABLE 26. Results from adapt using Autumn Research Vessel Index

POPULATION NUMBERS (000S)										2/ 5/96
	1978	1979	1980	1981	1982	1983	1984	1985	1986	
3	300361	152273	160668	359789	320655	349967	432340	338480	157710	
4	272786	244718	123628	129233	292593	260990	284190	353262	276536	
5	209088	207453	189173	90338	99318	211246	201361	219219	275813	
6	63704	135712	135923	128810	62027	64120	134406	136122	146352	
7	19658	33771	84688	84125	83021	37756	35280	75094	80754	
8	7741	9117	17712	53034	48956	44957	20014	17571	36141	
9	4072	3553	4334	10131	32700	24763	23506	9830	8007	
10	3176	1950	1733	2447	5422	15973	12191	11183	4577	
11	1054	1621	911	948	1299	2699	7340	6156	4485	
12	635	467	820	536	497	757	1289	3715	2412	
13	268	322	217	464	263	265	396	647	1520	
3+	882543	790956	719809	859856	946750	1013495	1152311	1171280	994307	
	1987	1988	1989	1990	1991	1992	1993	1994	1995	
3	129587	158642	175404	87737	21259	10565	5575	5265	20961	
4	128370	103989	127370	142074	64872	14591	8261	3714	4216	
5	212638	96761	71882	88322	79623	24471	8453	2246	2698	
6	185852	144831	60958	39715	39366	16505	6883	3896	1318	
7	78319	107771	75220	27095	11981	5490	2464	3880	3030	
8	42567	38362	46861	26561	7353	1607	399	1384	3110	
9	16269	17202	14571	12580	5513	443	75	194	1113	
10	3747	8055	5917	4061	2015	220	23	42	157	
11	1938	1850	2671	1551	733	115	0	18	34	
12	1883	975	814	653	289	20	0	0	15	
13	978	752	416	149	102	10	0	0	0	
3+	802147	679189	582085	430498	233106	74038	32134	20640	36653	

ADAPT (6 INDEX) TUNING JUNE 1991

2J3KL COD

5/02/96 15:52

FISHING MORTALITY

2/ 5/96

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
3	0.005	0.008	0.018	0.007	0.006	0.008	0.002	0.002	0.006	0.020	0.020	0.011
4	0.074	0.057	0.114	0.063	0.126	0.059	0.060	0.047	0.063	0.083	0.169	0.166
5	0.232	0.223	0.184	0.176	0.238	0.252	0.192	0.204	0.195	0.184	0.262	0.393
6	0.435	0.272	0.280	0.239	0.296	0.397	0.382	0.322	0.425	0.345	0.455	0.611
7	0.568	0.445	0.268	0.341	0.413	0.435	0.497	0.531	0.440	0.514	0.633	0.841
8	0.579	0.544	0.359	0.284	0.482	0.448	0.511	0.586	0.598	0.706	0.768	1.115
9	0.537	0.518	0.372	0.425	0.517	0.509	0.543	0.564	0.559	0.503	0.867	1.078
10	0.473	0.561	0.403	0.434	0.498	0.578	0.483	0.714	0.660	0.506	0.904	1.139
11	0.613	0.481	0.330	0.447	0.339	0.539	0.481	0.737	0.668	0.487	0.621	1.209
12	0.480	0.567	0.369	0.514	0.426	0.449	0.489	0.693	0.702	0.718	0.651	1.498
13	0.559	0.502	0.333	0.350	0.470	0.464	0.517	0.561	0.533	0.574	0.756	1.011

	1990	1991	1992	1993	1994	1995
3	0.102	0.176	0.046	0.206	0.022	0.000
4	0.379	0.775	0.346	1.103	0.120	0.008
5	0.608	1.374	1.068	0.575	0.333	0.029
6	0.998	1.770	1.702	0.373	0.052	0.047
7	1.104	1.809	2.421	0.377	0.021	0.007
8	1.372	2.609	2.870	0.522	0.018	0.004
9	1.632	3.020	2.777	0.373	0.011	0.003
10	1.512	2.663	6.242	0.000	0.000	0.000
11	1.481	3.406	7.048	0.003	0.000	0.000
12	1.656	3.140	8.544	0.014	0.004	0.000
13	1.369	2.479	2.689	0.424	0.017	0.005

TABLE 26. (CONT'D)

MEAN SQUARE RESIDUALS : 1.986694676
 MEAN RESIDUAL : 0.00001517938362
 SUM OF ALL RESIDUALS : 0.002732289052

LOG RESIDUALS FROM RV

2/ 5/96

	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	-0.672	-1.011	-0.813	-0.904	-0.651	-0.004	-0.346	-0.495	-0.150
4	-0.333	-0.217	-0.607	-1.031	-1.021	-0.383	-0.108	-0.546	0.229
5	-0.055	0.129	-0.051	-0.721	-0.599	-0.301	-0.262	-0.460	0.441
6	0.229	-0.029	0.211	-0.091	-0.551	-0.164	-0.011	-0.355	0.740
7	0.377	0.057	-0.235	0.405	0.072	0.006	0.077	-0.037	0.680
8	0.250	0.424	-0.152	-0.193	0.441	0.501	0.010	-0.197	0.842
9	0.242	-0.065	-0.220	-0.334	-0.163	0.231	-0.025	-0.114	0.647
10	-0.417	-0.085	-0.239	-0.554	-0.394	-0.482	-0.382	-0.746	-0.044
11	-0.678	-0.747	-0.854	-0.902	-0.807	-0.553	-1.211	-1.077	-0.312
12	-1.309	-1.403	-1.127	-0.938	-1.150	-1.120	-0.920	-2.368	-0.924

	1987	1988	1989	1990	1991	1992	1993	1994	1995
3	-0.789	-0.337	0.382	1.354	1.658	1.605	1.303	-0.130	0.000
4	-0.622	-0.563	0.186	0.716	1.939	1.234	1.477	-0.479	0.129
5	-0.169	-0.226	0.349	0.669	1.518	1.222	-0.247	-0.590	-0.646
6	-0.178	0.078	0.604	1.243	1.425	1.386	-0.823	-2.946	-0.768
7	-0.063	0.566	0.909	1.424	1.624	1.817	-1.424	-2.897	-3.356
8	0.098	0.227	0.974	1.582	1.925	1.159	-0.988	-2.693	-4.208
9	-0.106	0.287	0.690	1.379	1.918	1.347	-0.462	-1.749	-3.504
10	-0.514	-0.081	0.659	0.802	1.290	4.040	-0.096	-0.719	-2.036
11	-1.001	-0.956	0.249	0.397	1.155	4.983	3.624	-0.343	-0.966
12	-1.440	-1.444	-0.069	-0.041	0.527	7.319	4.300	3.038	-0.932

SUM OF RV RESIDUALS : 0.002730488873 MEAN RESIDUAL : 0.00001516938263
 ADAPT (6 INDEX) TUNING JUNE 1991

2J3KL COD 5/02/96 15:52
 APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.013175
 MEAN SQUARE RESIDUALS 1.986695

PARAMETER	AGE	ESTIMATE	STD. ERR.	T-STAT	C.V.
NUMBERS					
	3	20996	30489	0.689	1.452
	4	4223	4330	0.975	1.025
	5	2704	2350	1.150	0.869
	6	1321	1201	1.101	0.909
	7	3035	2210	1.373	0.728
	8	3115	2305	1.352	0.740
	9	1115	848	1.316	0.760
	10	157	125	1.258	0.795
	11	35	27	1.265	0.791
	12	15	11	1.348	0.742

INDEX 1: RV					
	3	4.24E-5	1.49E-5	2.847	0.351
	4	7.57E-5	2.60E-5	2.906	0.344
	5	1.05E-4	3.60E-5	2.913	0.343
	6	1.23E-4	4.21E-5	2.923	0.342
	7	1.14E-4	3.89E-5	2.943	0.340
	8	1.30E-4	4.45E-5	2.931	0.341
	9	1.80E-4	6.18E-5	2.910	0.344
	10	2.93E-4	1.00E-4	2.922	0.342
	11	4.58E-4	1.56E-4	2.934	0.341
	12	1.01E-3	3.42E-4	2.948	0.339

Table 31a. Average length (cm) at age of cod caught during autumn bottom-trawl surveys in Div. 2J3KL in 1978-1995.
Mean lengths at age were calculated by adjusting to the length-frequency of the catch.

Division 2J

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
2	29	30	31	30	30	26	27	27	28	29	31	28	27	28	26	26	26	27
3	38	41	39	39	38	39	34	34	36	36	37	38	35	34	34	32	36	33
4	48	48	50	47	47	46	44	40	41	43	44	44	42	39	39	41	42	42
5	54	56	54	55	53	54	51	49	48	49	48	50	47	44	42	44	47	47
6	60	61	61	58	59	60	57	53	53	52	53	54	53	52	46	48	58	56
7	66	68	64	63	61	63	63	58	57	57	56	57	56	57	60	46	56	
8	69	74	70	67	64	65	66	64	60	59	60	59	59	59				
9	79	69	82	73	69	69	67	67	68	61	63	61	61	63				
10	80	77	83	84	77	74	72	70	68	68	66	61	61	65				
11	87	87	86	90	86	75	78	73	72	77	74	69	71	74				
12	90	86	87	89	85	95	83	76	77	75	80	67	70	65				

Division 3K

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
2	28	31	31	31	29	28	26	29	30	30	27	28	29	29	29	29	29	28
3	38	42	40	42	40	41	37	36	36	38	38	37	38	37	37	38	36	35
4	47	49	47	50	50	48	46	44	44	45	44	45	44	43	43	44	42	41
5	55	55	55	56	54	56	55	52	50	51	52	52	50	48	47	50	51	46
6	62	63	62	60	60	62	60	57	56	54	56	56	58	55	52	51	54	55
7	69	70	70	65	64	67	64	62	59	60	58	60	59	60	58	53	58	
8	74	77	76	69	69	67	69	69	64	63	66	63	62	63	63	64	64	
9	76	83	86	82	75	72	72	70	67	69	73	68	65	65	64			67
10	82	77	88	90	79	76	74	73	77	74	78	74	68	69				
11	88	85	104	92	90	85	88	79	76	81	82	75	72	81				
12	92	77	94	92	97	85	90	87	74	86	89	82	73	70				

Division 3L

Age	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
2		29	29	29		27	28	27	28	29	27	30	28	30	27
3		40	38	39		36	35	35	37	38	35	37	39	38	36
4		45	50	49		44	44	44	45	44	45	44	45	45	41
5		53	57	57		52	50	52	53	53	52	51	50	52	49
6		61	63	62		58	58	59	58	59	59	56	54	56	58
7		67	70	65		65	63	65	62	64	66	60	56	62	67
8		73	74	69		73	70	69	67	69	71	67	66	63	73
9		83	83	73		73	73	75	69	74	76	71	72		
10		94	93	76		83	78	81	74	83	77	72	69	88	
11		102	95	91		86	82	88	88	88	83	73	78		
12		118	112	89		97	87	85	96	93	87	82	94		

Table 31b. Average length (cm) at age of cod caught during autumn bottom-trawl surveys in Div. 2J3KL in 1978-1995.
Mean lengths at age were calculated by adjusting to the length-frequency of the population.

Division 2J

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1																		19.9
2	29.3	30.1	30.6	29.9	30.0	28.8	27.4	27.0	28.2	29.4	30.3	28.1	26.5	28.1	26.5	28.2	25.8	28.2
3	38.0	41.3	39.4	38.7	37.9	38.8	34.3	33.6	35.5	36.5	37.3	36.9	33.8	32.9	33.8	32.6	36.8	33.1
4	45.6	47.3	49.6	47.0	47.0	46.1	44.4	40.1	41.1	43.4	44.2	43.7	41.9	38.7	38.8	40.1	42.3	42.1
5	54.0	55.3	54.5	54.4	53.4	53.9	50.9	48.5	47.6	48.9	48.5	50.1	48.9	43.9	41.8	43.9	48.6	46.7
6	59.7	60.9	60.7	58.2	59.3	60.0	56.6	53.2	52.7	52.4	53.6	53.8	53.4	51.1	47.0	47.5	56.8	55.4
7	66.4	67.9	64.3	62.8	61.3	62.9	63.4	57.5	56.7	57.3	55.8	57.0	56.6	56.9	56.8	47.0	56.2	
8	69.7	73.9	69.5	68.9	64.5	64.7	65.8	64.3	59.5	58.9	59.8	59.6	59.4	58.3				
9	79.3	69.2	82.0	73.6	68.9	68.6	66.9	67.2	67.6	61.7	63.8	62.7	61.1	63.8				
10	80.4	76.9	83.3	84.2	77.0	73.5	71.6	70.2	68.2	67.8	66.2	64.7	63.1	65.5				
11	87.7	87.6	86.5	90.1	85.5	75.0	78.4	72.8	72.2	77.5	73.9	69.8	73.6	72.7				
12	91.6	85.9	87.9	88.6	94.6	95.0	83.0	75.9	76.2	75.5	80.5	67.8	73.5	68.5				

Division 3K

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1																		18.8
2	27.9	30.9	30.7	31.3	29.3	28.5	26.5	28.7	29.5	29.7	25.9	27.3	28.1	29.2	28.5	28.5	29.3	25.6
3	37.6	42.1	39.9	42.2	40.3	40.5	38.8	36.0	36.5	38.1	36.5	37.2	36.2	36.6	36.4	37.5	36.5	34.2
4	47.0	49.5	47.2	50.4	50.1	47.9	47.0	43.9	43.8	44.6	44.2	45.0	44.0	42.7	42.4	43.6	42.2	41.8
5	54.8	55.4	54.7	56.1	54.0	56.2	54.3	51.8	49.9	50.9	51.5	51.5	49.7	47.9	47.0	50.0	51.1	46.8
6	62.4	62.8	61.8	60.3	60.5	62.3	61.6	57.3	56.1	54.3	56.0	56.3	56.1	54.9	51.8	51.4	53.5	54.7
7	69.5	69.9	69.7	65.2	64.3	66.8	64.4	62.5	58.8	60.1	58.6	59.9	58.4	59.7	57.9	53.0	58.1	
8	74.4	76.8	76.3	69.2	69.0	67.7	68.8	69.6	64.1	62.9	66.3	63.1	61.2	62.7	65.2	64.0	61.7	
9	76.6	83.3	86.0	81.7	74.8	72.5	72.9	70.2	67.3	69.7	73.1	68.1	63.8	65.6	64.0			68.0
10	81.9	78.3	87.6	90.5	79.8	76.4	78.1	73.1	76.8	74.5	78.7	74.0	64.7	69.1				
11	88.4	86.0	103.4	91.6	89.6	84.9	84.9	79.2	75.9	80.8	82.4	75.7	69.3	80.7				
12	92.1	78.9	94.2	92.1	97.0	85.1	90.2	87.1	73.7	86.6	88.5	82.2	71.1	68.4				

Division 3L

Age	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	
1															18.8	
2		28.5	28.7	30.1		26.8	27.9	27.5	28.7	28.7	27.0	29.7	27.9	30.1	28.1	27.8
3		40.0	38.2	39.4		38.1	35.4	34.7	37.4	37.6	35.3	36.7	38.5	38.3	34.8	38.9
4		44.8	50.2	48.0		43.7	43.7	44.2	44.9	44.2	44.9	44.4	44.5	45.2	45.7	41.7
5		52.6	56.4	56.8		52.2	50.3	52.3	53.1	52.3	52.7	51.1	50.4	51.5	51.8	49.6
6		60.6	63.5	62.4		58.0	58.2	58.9	58.6	59.0	59.2	56.5	54.9	55.8	57.9	58.6
7		66.7	69.7	64.7		65.4	62.6	65.1	62.4	63.9	66.4	61.1	56.8	61.9	66.7	66.7
8		73.1	73.8	69.5		73.3	69.9	69.0	66.7	68.7	70.9	68.0	66.0	61.4	67.0	74.0
9		82.2	83.0	73.6		72.8	73.1	75.2	69.6	74.4	75.3	71.5	77.3			
10		91.2	93.1	76.3		82.6	77.7	80.8	74.3	83.7	76.2	73.2	70.4	87.0		
11		103.7	94.1	90.0		86.5	81.5	87.9	88.9	88.1	82.5	74.5	77.1			
12		119.2	110.5	87.5		97.8	86.8	85.4	96.7	94.1	88.9	81.1	94.5			

Table 32a. Average weight (kg) at age of cod caught during autumn bottom-trawl surveys in Div. 2J3KL in 1978-1995.
 These weights were calculated from the mean lengths at age (Table 31a) using a standard weight/length relationship.

Division 2J

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
2	0.21	0.23	0.24	0.22	0.22	0.15	0.17	0.18	0.19	0.21	0.24	0.19	0.17	0.19	0.15	0.15	0.15	0.16
3	0.48	0.60	0.52	0.50	0.47	0.50	0.34	0.32	0.38	0.41	0.44	0.46	0.35	0.32	0.32	0.28	0.41	0.30
4	0.83	0.93	1.06	0.80	0.82	0.84	0.75	0.55	0.59	0.70	0.75	0.72	0.62	0.50	0.51	0.57	0.63	0.63
5	1.38	1.50	1.40	1.42	1.32	1.36	1.14	0.99	0.93	1.02	0.98	1.07	0.87	0.71	0.63	0.75	0.90	0.87
6	1.88	2.02	1.99	1.75	1.83	1.92	1.60	1.31	1.28	1.25	1.33	1.37	1.29	1.19	0.88	0.98	1.58	1.53
7	2.61	2.79	2.35	2.19	2.02	2.22	2.26	1.69	1.60	1.65	1.53	1.60	1.55	1.65	1.86	0.84	1.58	
8	2.95	3.61	3.03	2.67	2.37	2.42	2.52	2.35	1.87	1.83	1.88	1.81	1.78	1.78				
9	4.51	2.99	4.94	3.54	2.93	2.90	2.68	2.74	2.81	2.05	2.27	2.05	1.99	2.19				
10	4.60	4.18	5.17	5.45	4.13	3.61	3.30	3.10	2.82	2.78	2.51	2.05	2.03	2.42				
11	6.11	6.07	5.84	6.69	5.71	3.75	4.30	3.46	3.33	4.20	3.63	2.95	3.23	3.69				
12	6.78	5.75	5.98	6.46	7.80	7.93	5.27	3.94	4.04	3.84	4.56	2.72	3.07	2.42				

Division 3K

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
2	0.18	0.24	0.24	0.25	0.21	0.19	0.15	0.20	0.22	0.22	0.17	0.18	0.20	0.21	0.21	0.20	0.20	0.14
3	0.45	0.64	0.55	0.64	0.56	0.57	0.44	0.39	0.41	0.47	0.41	0.44	0.41	0.42	0.42	0.45	0.40	0.35
4	0.89	1.05	0.90	1.11	1.09	0.98	0.82	0.72	0.73	0.79	0.74	0.77	0.74	0.87	0.67	0.71	0.64	0.61
5	1.47	1.48	1.42	1.55	1.38	1.57	1.42	1.19	1.07	1.16	1.19	1.20	1.09	0.95	0.92	1.06	1.15	0.86
6	2.14	2.18	2.09	1.95	1.92	2.16	1.92	1.64	1.54	1.40	1.53	1.56	1.56	1.43	1.22	1.18	1.34	1.42
7	3.00	3.04	3.04	2.45	2.35	2.67	2.29	2.18	1.78	1.90	1.76	1.91	1.79	1.89	1.74	1.30	1.72	
8	3.66	4.07	4.00	2.97	2.93	2.74	2.90	2.99	2.34	2.21	2.57	2.25	2.11	2.17	2.24	2.33	2.33	
9	4.00	5.15	5.75	5.04	3.77	3.38	3.35	3.04	2.69	2.96	3.49	2.77	2.44	2.48	2.33			2.68
10	5.04	4.17	6.15	6.78	4.51	4.00	3.70	3.45	4.10	3.67	4.35	3.63	2.77	2.91				
11	6.29	5.67	10.57	7.02	6.60	5.49	6.18	4.46	3.91	4.76	4.94	3.78	3.40	4.82				
12	7.02	4.10	7.67	7.09	8.29	5.53	6.69	6.05	3.61	5.86	6.35	5.00	3.43	3.02				

Division 3L

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
2				0.20	0.20	0.21		0.18	0.18	0.17	0.18	0.20	0.17	0.23	0.18	0.23	0.17	0.18
3				0.54	0.47	0.52		0.39	0.37	0.35	0.44	0.45	0.36	0.44	0.50	0.48	0.38	0.43
4				0.78	1.10	1.01		0.72	0.72	0.75	0.78	0.75	0.79	0.75	0.77	0.80	0.80	0.61
5				1.28	1.59	1.63		1.25	1.11	1.25	1.31	1.27	1.25	1.14	1.11	1.19	1.16	1.04
6				1.97	2.26	2.16		1.72	1.74	1.81	1.74	1.80	1.82	1.57	1.40	1.50	1.71	1.73
7				2.63	3.04	2.49		2.49	2.17	2.46	2.13	2.32	2.59	1.93	1.55	2.11	2.33	2.68
8				3.49	3.64	2.99		3.48	3.05	2.91	2.66	2.90	3.21	2.74	2.55	2.17	2.68	3.49
9				5.17	5.27	3.51		3.43	3.54	3.81	2.99	3.64	3.91	3.16	3.40			
10				7.62	7.33	3.92		5.10	4.22	4.87	3.64	5.27	4.05	3.39	2.95	6.22		
11				9.90	7.78	6.83		5.88	4.98	6.18	6.31	6.15	5.15	3.51	4.23			
12				15.39	12.99	6.33		8.43	6.09	5.65	8.24	7.38	5.96	4.91	7.67			

Table 32b. Average weight (kg) at age of cod caught during autumn bottom-trawl surveys in Div. 2J3KL in 1978-1995.
Actual weights at age and length were adjusted to the length-frequency of the population.

Division 2J

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1																		0.064
2	0.223	0.263	0.240	0.228	0.215	0.176	0.153	0.200	0.254	0.266	0.253	0.204	0.158	0.187	0.139	0.153	0.155	0.162
3	0.487	0.682	0.528	0.548	0.501	0.587	0.384	0.363	0.350	0.545	0.553	0.488	0.355	0.307	0.318	0.300	0.433	0.319
4	0.947	1.023	1.046	1.077	0.955	0.958	0.829	0.822	0.845	0.913	0.819	0.810	0.697	0.518	0.482	0.575	0.646	0.671
5	1.580	1.593	1.363	1.663	1.601	1.554	1.303	1.138	1.054	1.355	1.145	1.263	0.987	0.743	0.620	0.751	0.909	0.898
6	2.199	2.379	2.055	1.982	2.004	1.853	1.782	1.486	1.660	1.483	1.653	1.567	1.462	1.139	0.844	0.923	1.664	1.540
7	2.515	2.748	2.548	2.519	2.392	2.252	2.388	1.880	1.914	2.067	1.690	1.907	1.784	1.540	1.478	0.860	1.700	
8	3.862	2.753	3.090	3.197	2.686	2.773	2.562	2.497	2.292	2.409	2.379	2.259	2.108	1.692				
9	4.365	6.193	5.986	3.944	3.872	3.346	3.023	2.652	3.810	1.818	2.717	2.616	2.299	2.367				
10	5.771	5.428	7.628	6.586	6.507	4.022	3.459	3.223	4.513	4.648	2.880	3.143	2.539	2.721				
11	6.358	7.191	6.546	6.906	7.660	4.165	5.669	4.178	4.638	4.550	3.868	3.771	4.397	3.983				
12	9.736	6.206	7.723	10.797	10.055	8.946	6.539	4.014	6.161	4.649	6.732	3.206	4.340	3.391				

Division 3K

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1																		0.054
2	0.171	0.207	0.238	0.275	0.234	0.227	0.146	0.209	0.192	0.204	0.177	0.193	0.190	0.213	0.205	0.205	0.217	0.153
3	0.410	0.577	0.578	0.720	0.738	0.540	0.404	0.466	0.454	0.493	0.476	0.491	0.414	0.423	0.398	0.473	0.434	0.362
4	0.876	1.190	0.950	1.222	1.218	1.120	0.867	0.891	0.817	0.904	0.838	0.874	0.761	0.705	0.665	0.735	0.688	0.649
5	1.478	1.644	1.410	1.730	1.555	1.670	1.412	1.219	1.154	1.350	1.411	1.325	1.100	1.006	0.947	1.119	1.188	0.907
6	2.393	2.259	2.011	2.051	1.966	2.114	2.041	1.818	1.993	1.409	1.734	1.821	1.630	1.517	1.301	1.296	1.442	1.527
7	2.938	3.161	3.462	2.620	2.445	2.804	2.343	2.590	2.421	2.580	2.264	2.190	1.908	1.923	1.828	1.461	1.978	
8	5.830	4.281	3.179	5.051	3.151	3.440		3.396	3.739	2.784	3.012	2.566	2.203	2.274	2.561	2.290	2.326	
9	4.671	4.861	6.003	7.332	4.375	3.736	3.693	4.149	3.247	3.398	4.257	3.229	2.441	2.626	2.190			3.280
10	6.499	4.608	7.532	6.321	6.192	4.862	4.667	4.890	4.920	5.354	4.888	4.204	2.711	3.107				
11	5.243	8.365	13.000	9.326	6.515	7.512	6.300	6.520	5.847	10.631	5.408	4.604	3.251	4.933				
12	9.492	10.190	7.097	8.103	9.555	6.047	6.089	6.329	6.465	7.017	7.628	5.593	3.665	3.222				

Division 3L

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1																		0.110
2				0.224	0.169	0.236		0.167	0.223	0.179	0.224	0.166	0.173	0.248	0.198	0.240	0.198	0.235
3				0.564	0.380	0.539		0.438	0.468	0.353	0.459	0.443	0.395	0.456	0.581	0.505	0.402	0.459
4				0.820	0.480	1.142		0.801	0.796	0.735	0.764	0.789	0.810	0.836	0.883	0.849	0.880	0.668
5				1.245		1.477		1.382	1.227	1.313	1.372	1.556	1.330	1.280	1.303	1.274	1.319	1.134
6				1.980		1.984		2.049	1.807	1.796	1.879	1.937	1.902	1.748	1.700	1.764	1.893	2.055
7				2.638		2.278		2.247	2.703	2.351	2.103	2.567	2.767	2.191	1.862	2.327	2.986	3.253
8				5.077	5.440	2.930		3.521	2.579	2.818	3.043	3.653	3.481	3.089	2.781	2.550	3.160	4.200
9				5.804	6.647	4.005		4.111	4.197	3.801	3.015	3.666	4.274	3.678	4.926			
10				11.762	8.339	4.390		6.132	5.476	7.540	3.483	6.830	4.557	3.949	3.349	6.440		
11				11.560	7.486	8.333		5.312	4.460	7.402	7.471	7.461	5.847	4.471	4.946			
12				18.553	10.653	9.902		12.081	10.511	5.525	9.410	11.395	6.642	5.307	8.652			

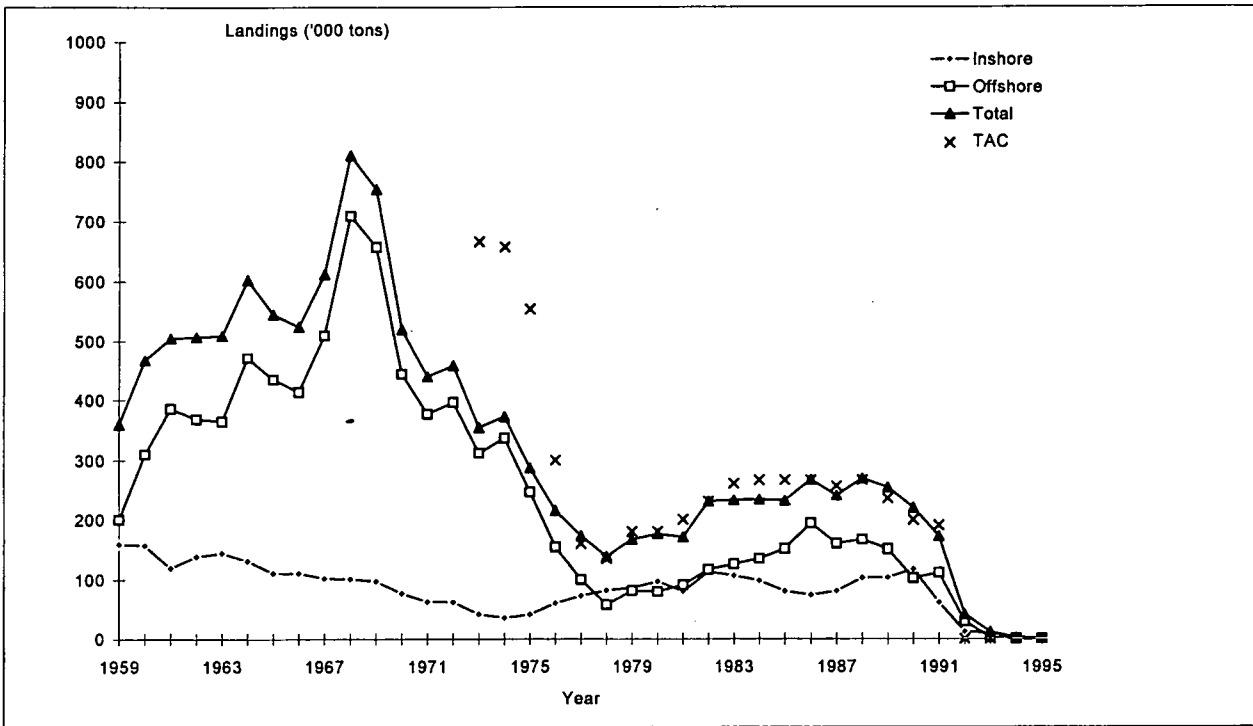


Fig. 1. Inshore landings, offshore landings and TAC for Divisions 2J3KL.

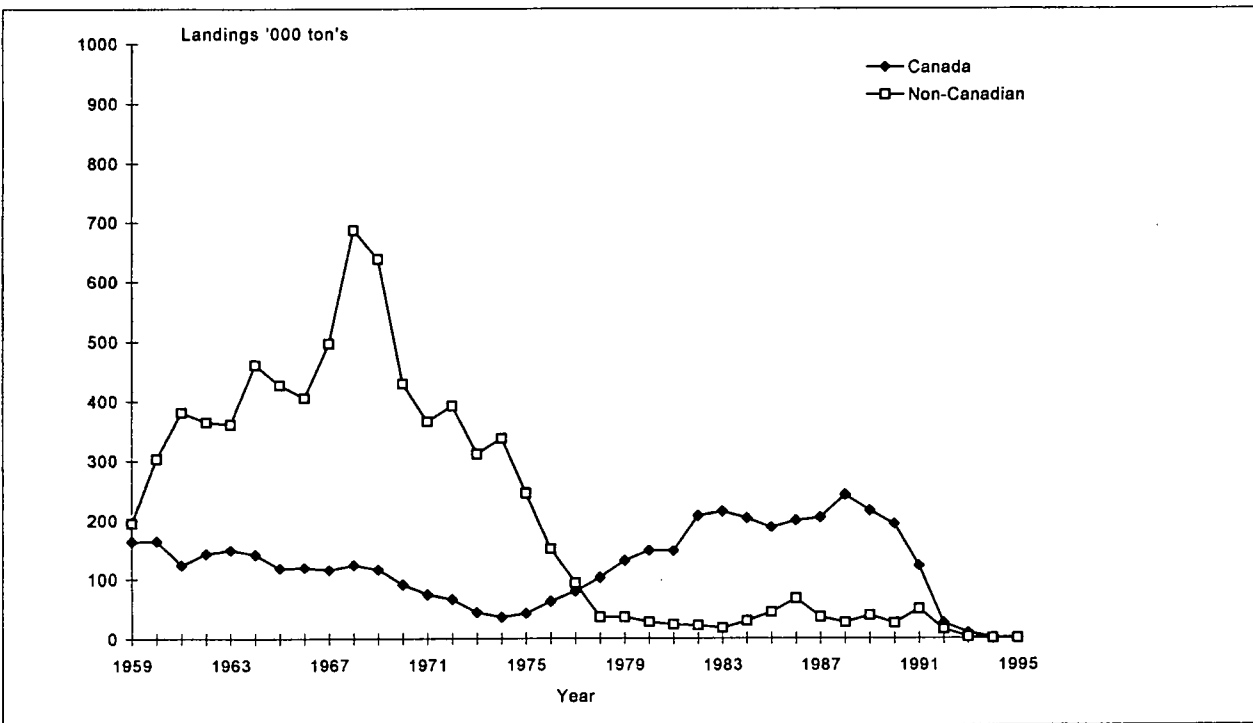


Fig. 2. Landings of cod in Divisions 2J3KL by Canadian and other vessels.

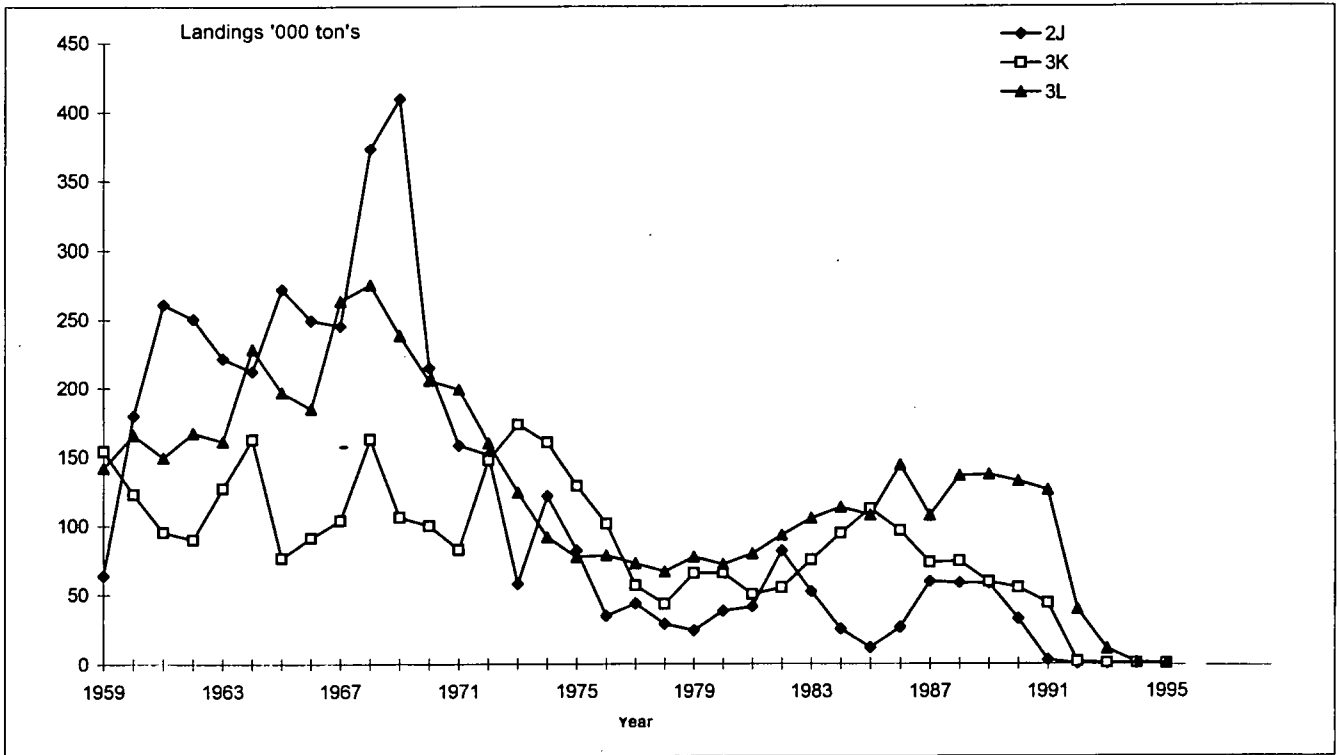


Fig. 3. Divisions 2J3KL cod landings by division.

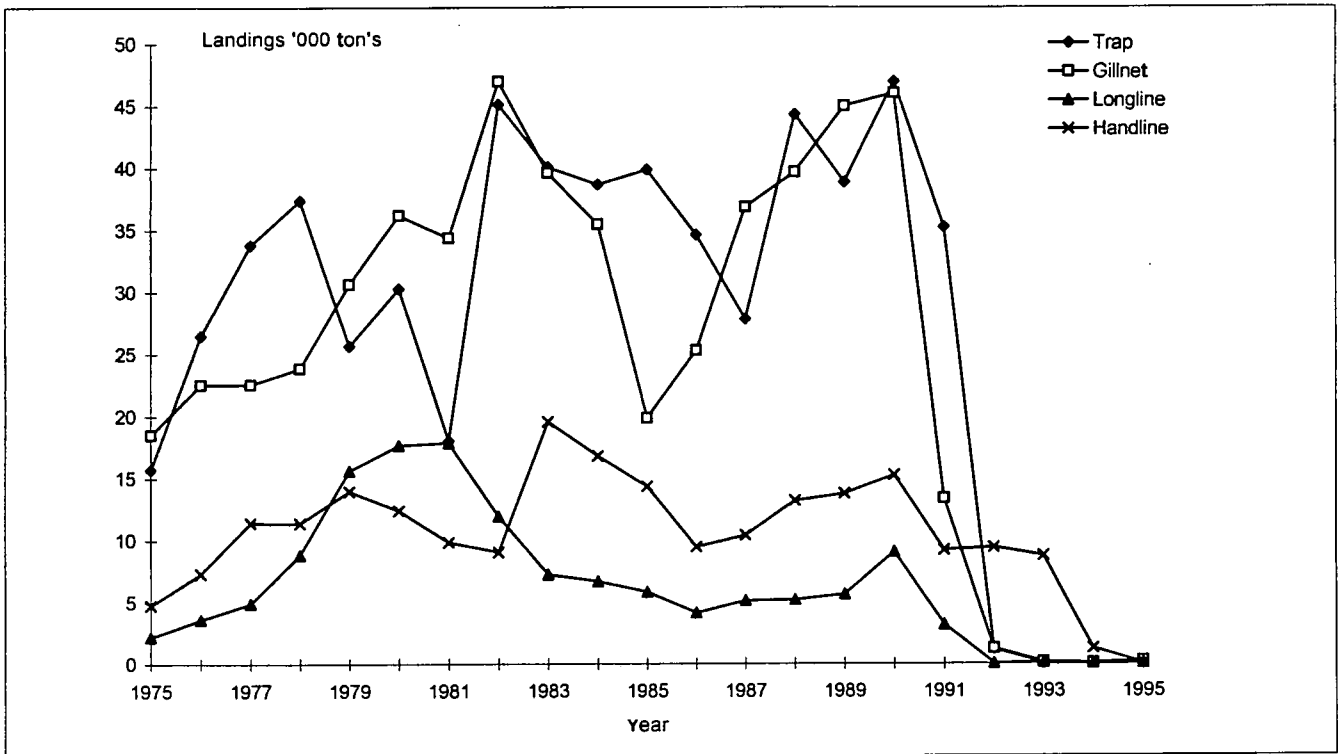


Fig. 4. Divisions 2J3KL inshore cod landings by gear type.

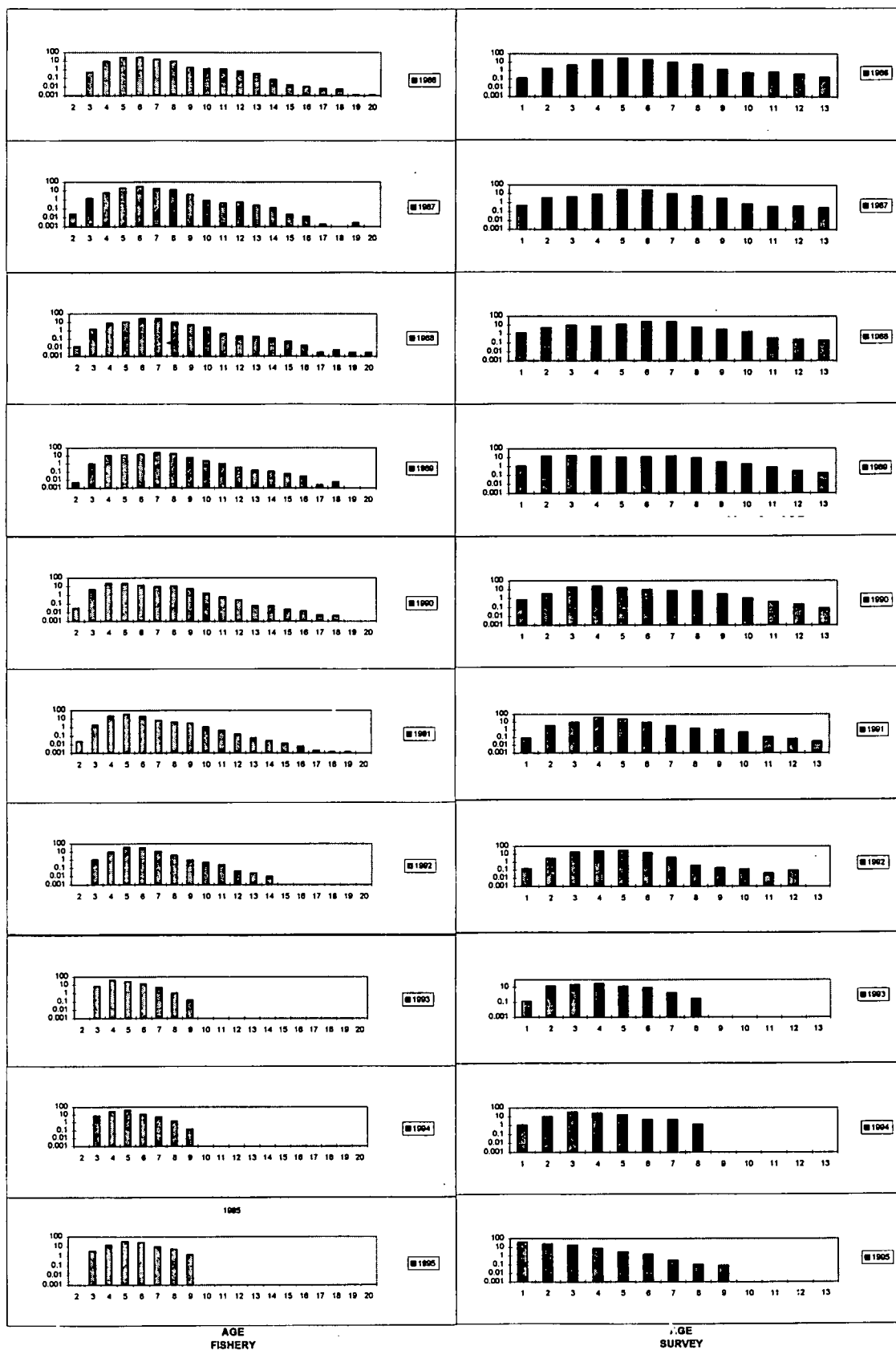


Fig. 5. Logarithm of the annual proportion at age in the commercial landings and the research survey catches of cod for the years 1986 to 1995.

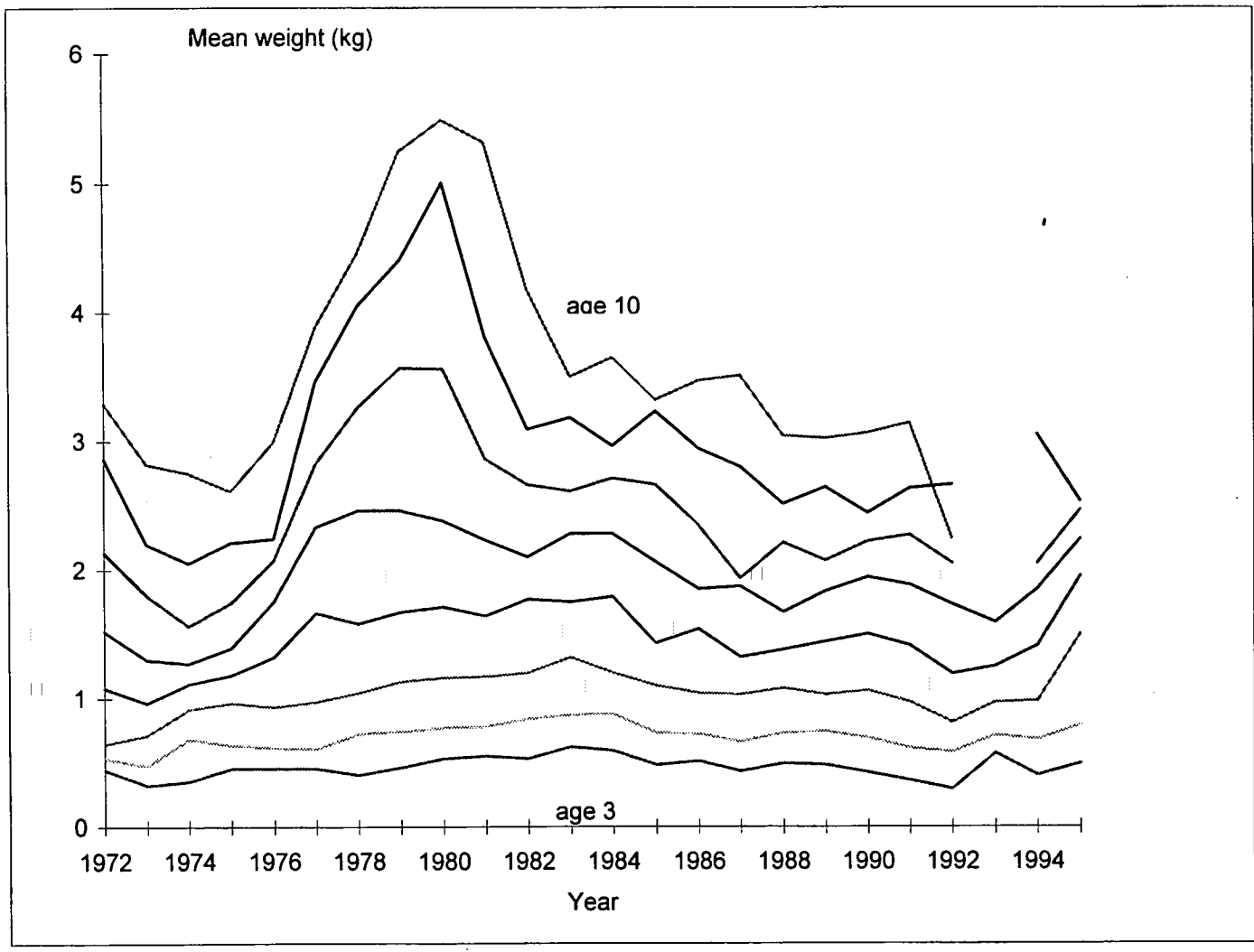


Fig. 6. Mean weights at age in the Division 2J3KL commercial catches of cod.

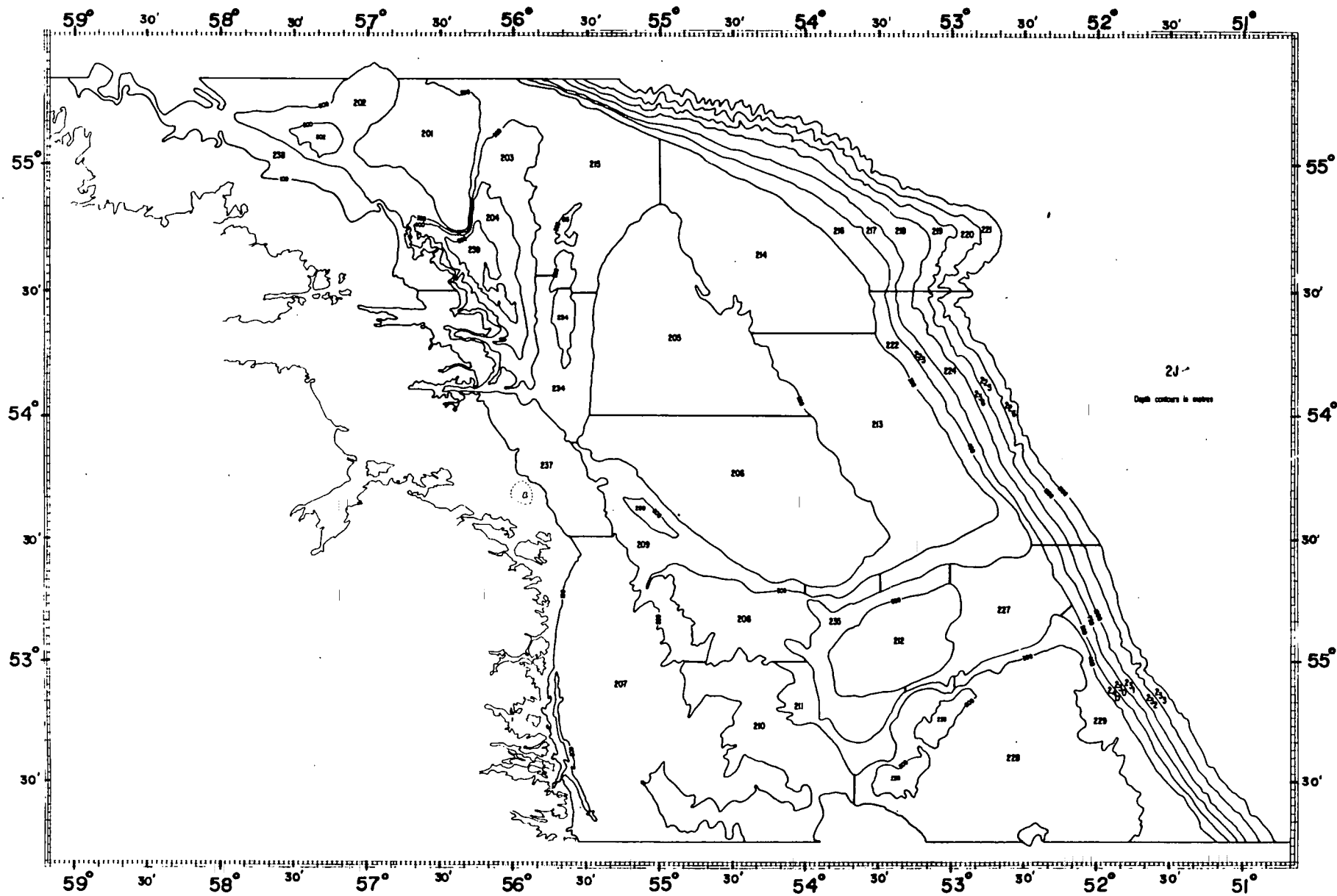


Fig. 7. Area of stratification for RV surveys in NAFO Division 2J.

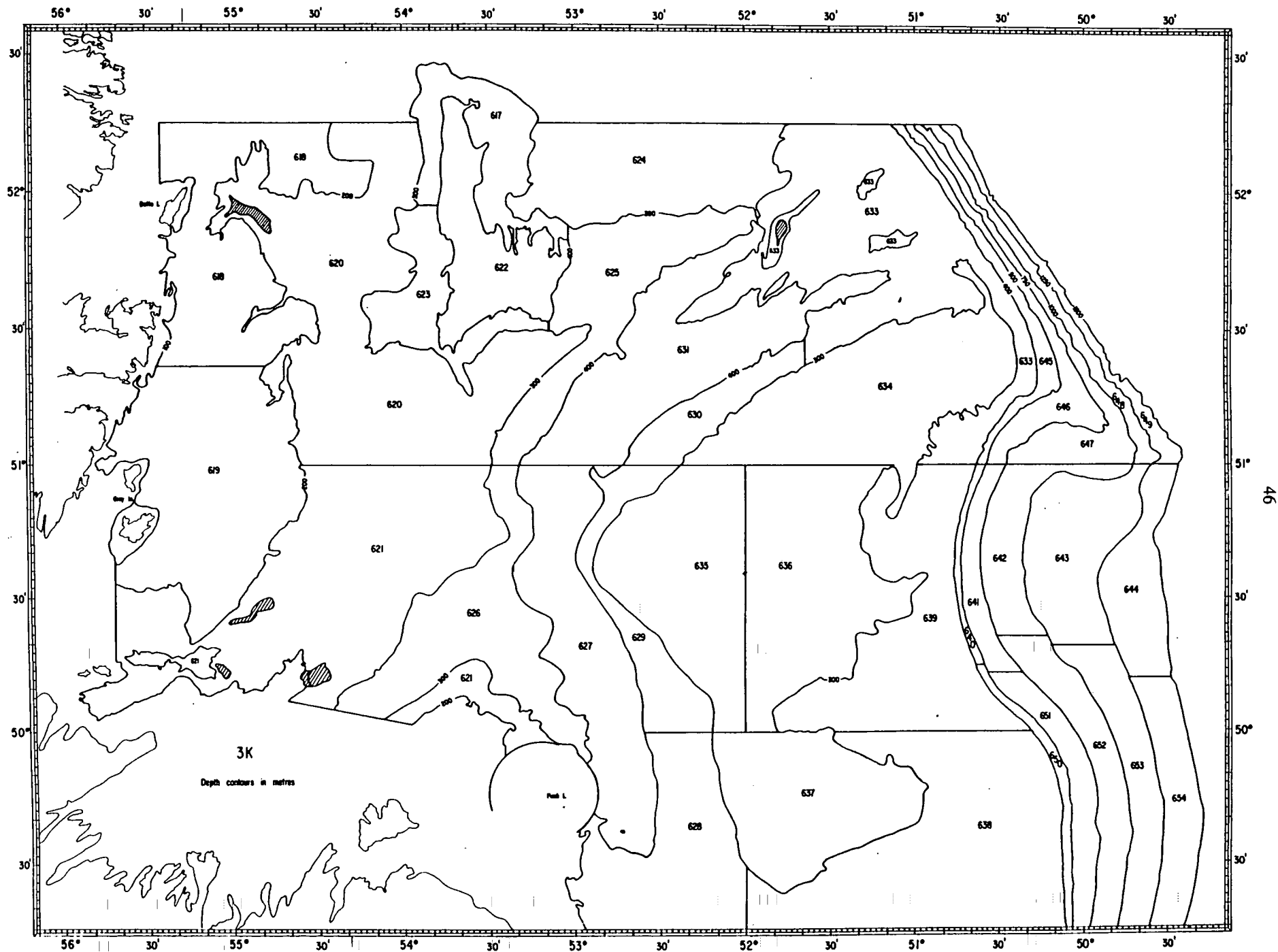


Fig. 8. Area of stratification for RV surveys in NAFO Division 3K.

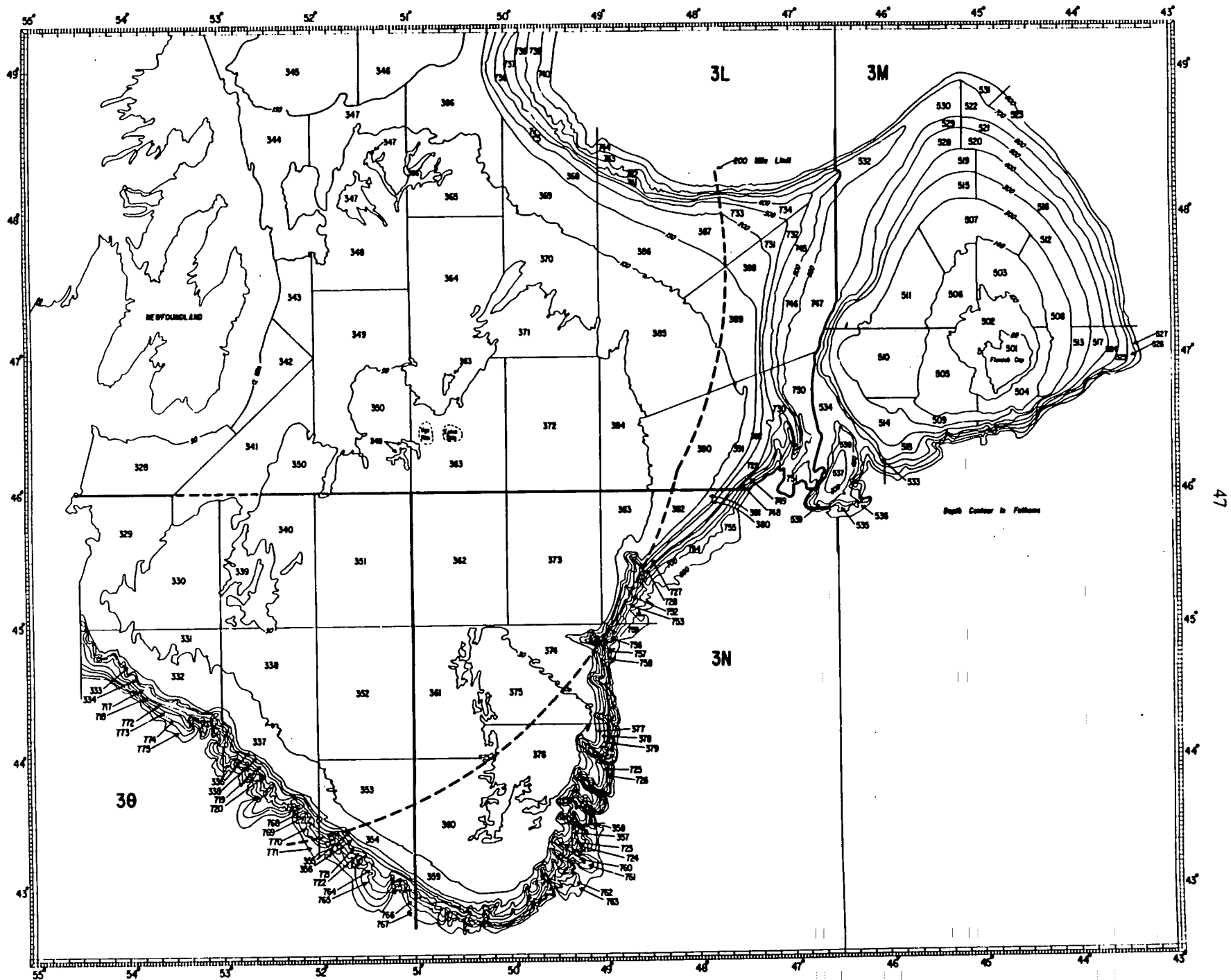


Fig. 9. Area of stratification for RV surveys in NAFO Division 3L.

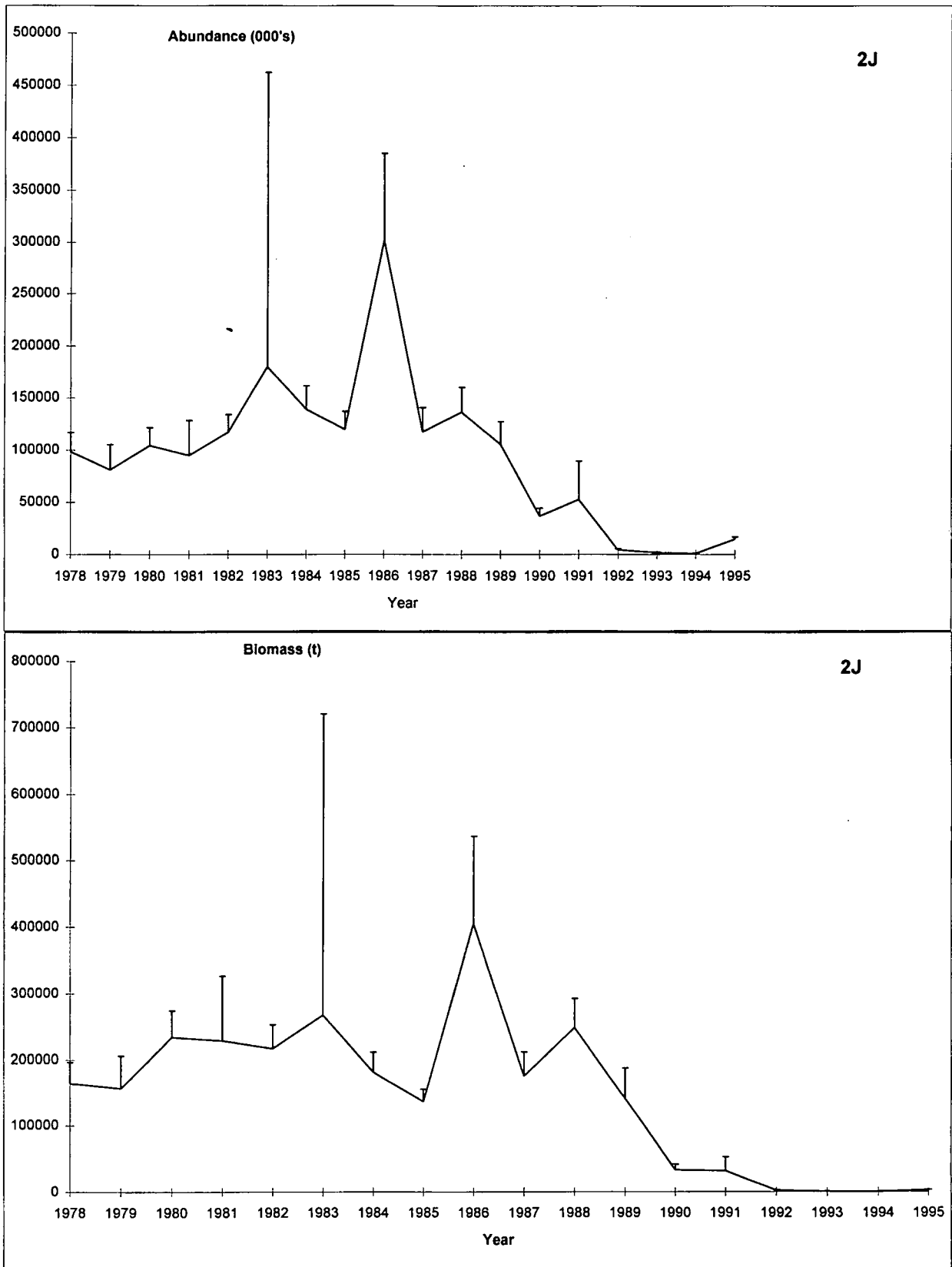


Fig. 10. Annual estimates of abundance and biomass for the autumn RV trawl survey in Division 2J. Vertical bar indicates one standard error.

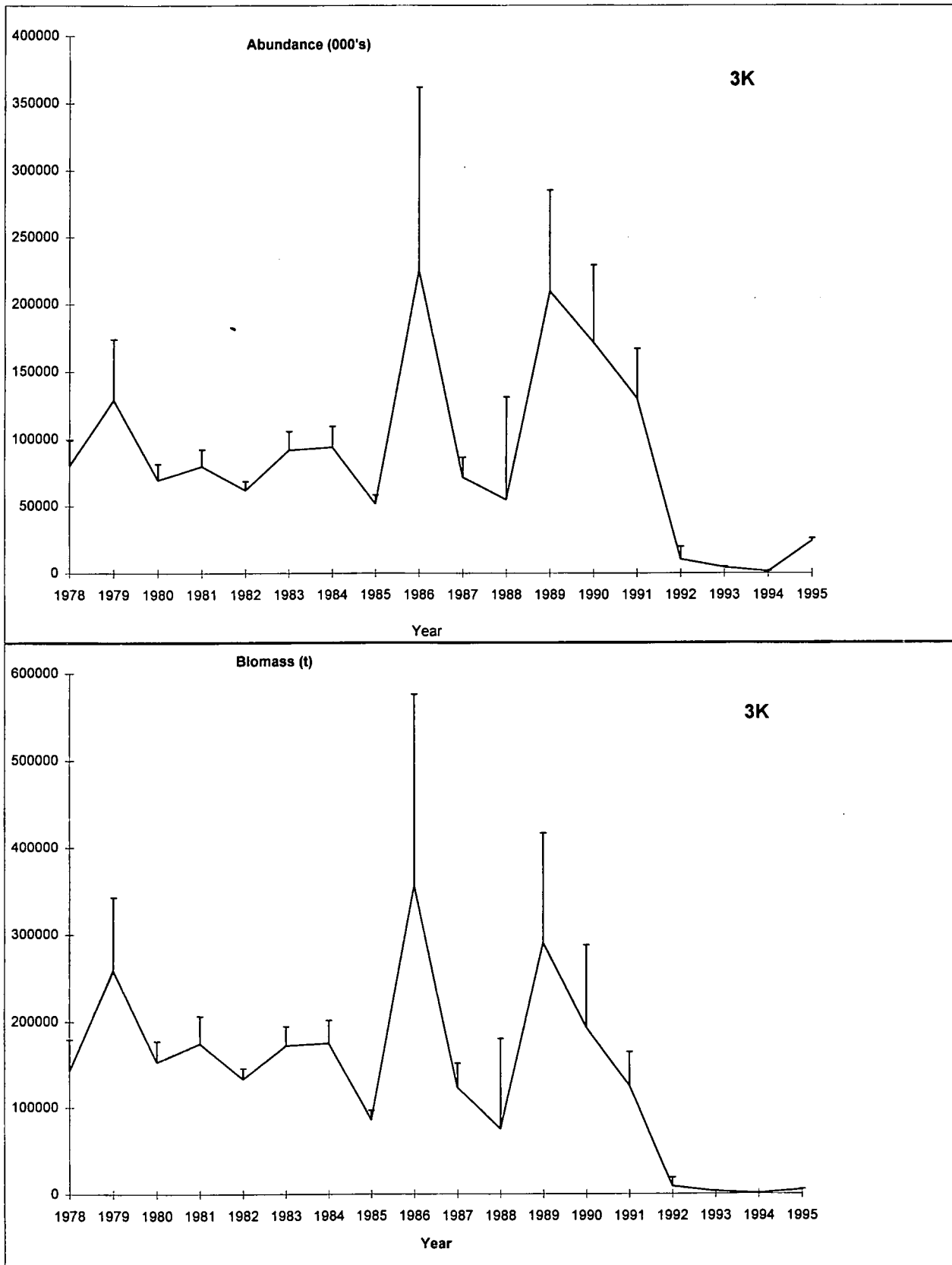


Fig. 11. Annual estimates of abundance and biomass for the autumn RV trawl survey in Division 3K. Vertical bar indicates one standard error.

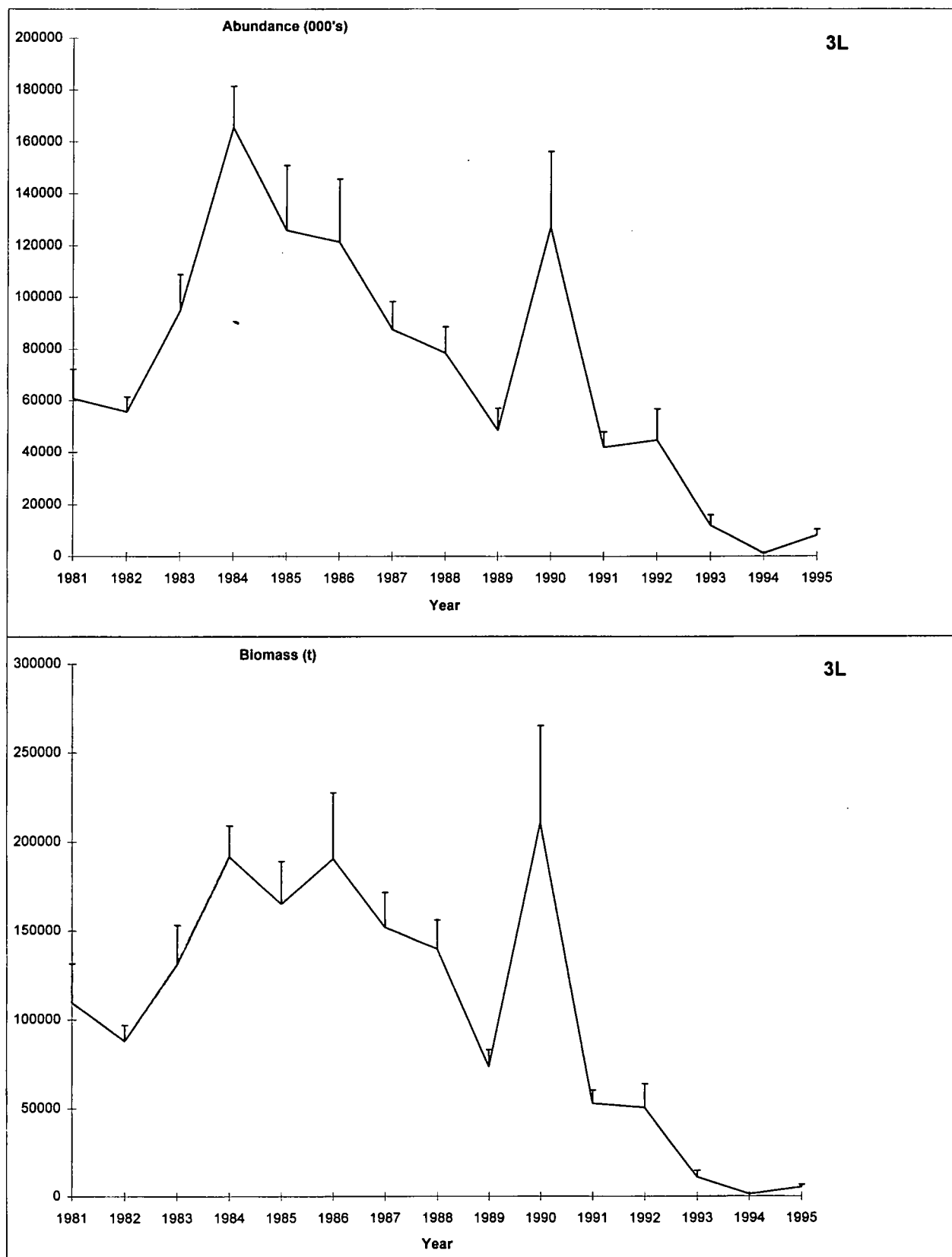


Fig. 12. Annual estimates of abundance and biomass for the autumn RV trawl survey in Division 3L. Vertical bar indicates one standard error.

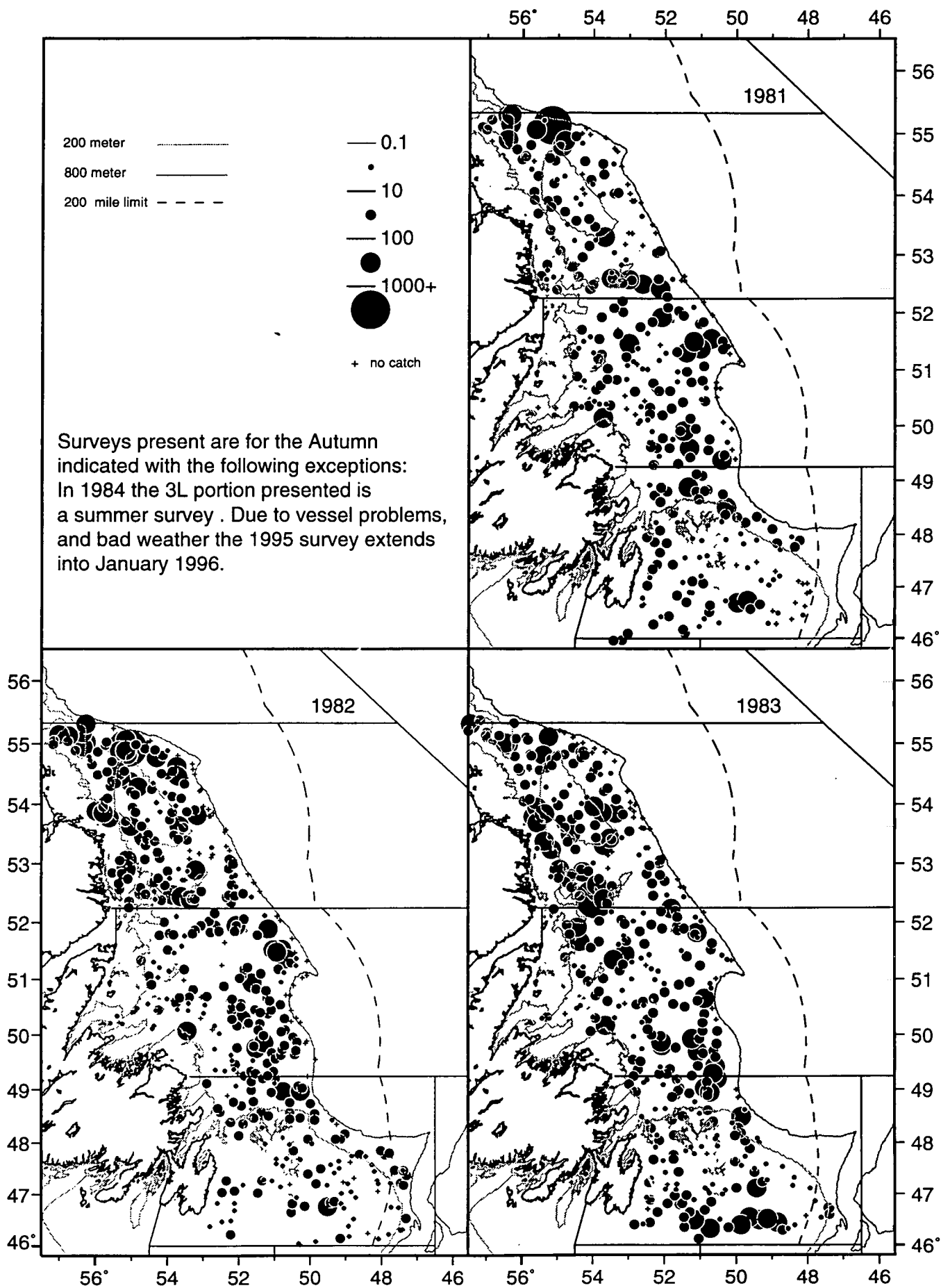


Fig. 13. Cod distribution from autumn RV trawl surveys (numbers per tow).

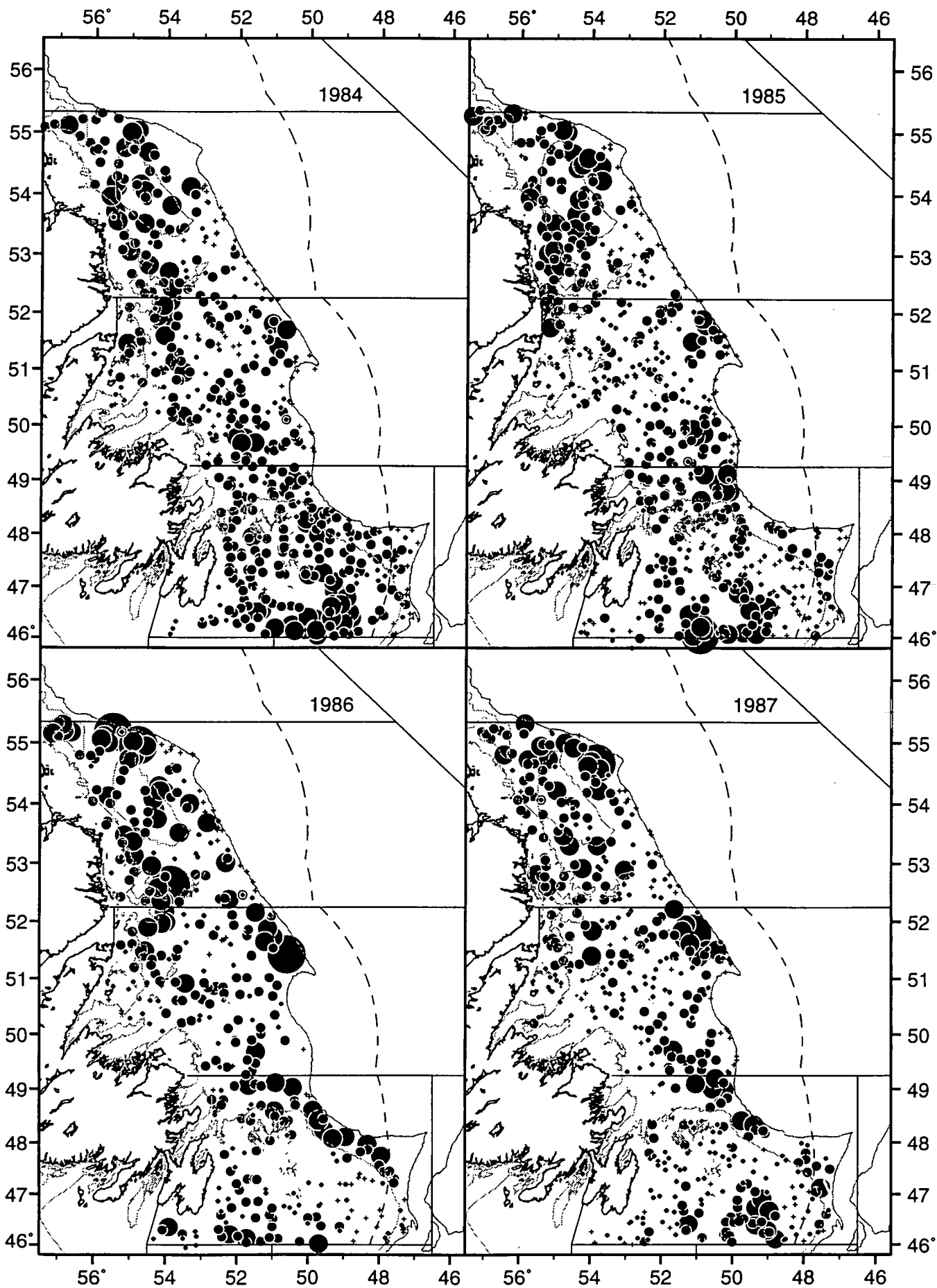


Fig. 13 contd. Cod distribution from autumn RV trawl surveys (numbers per tow).

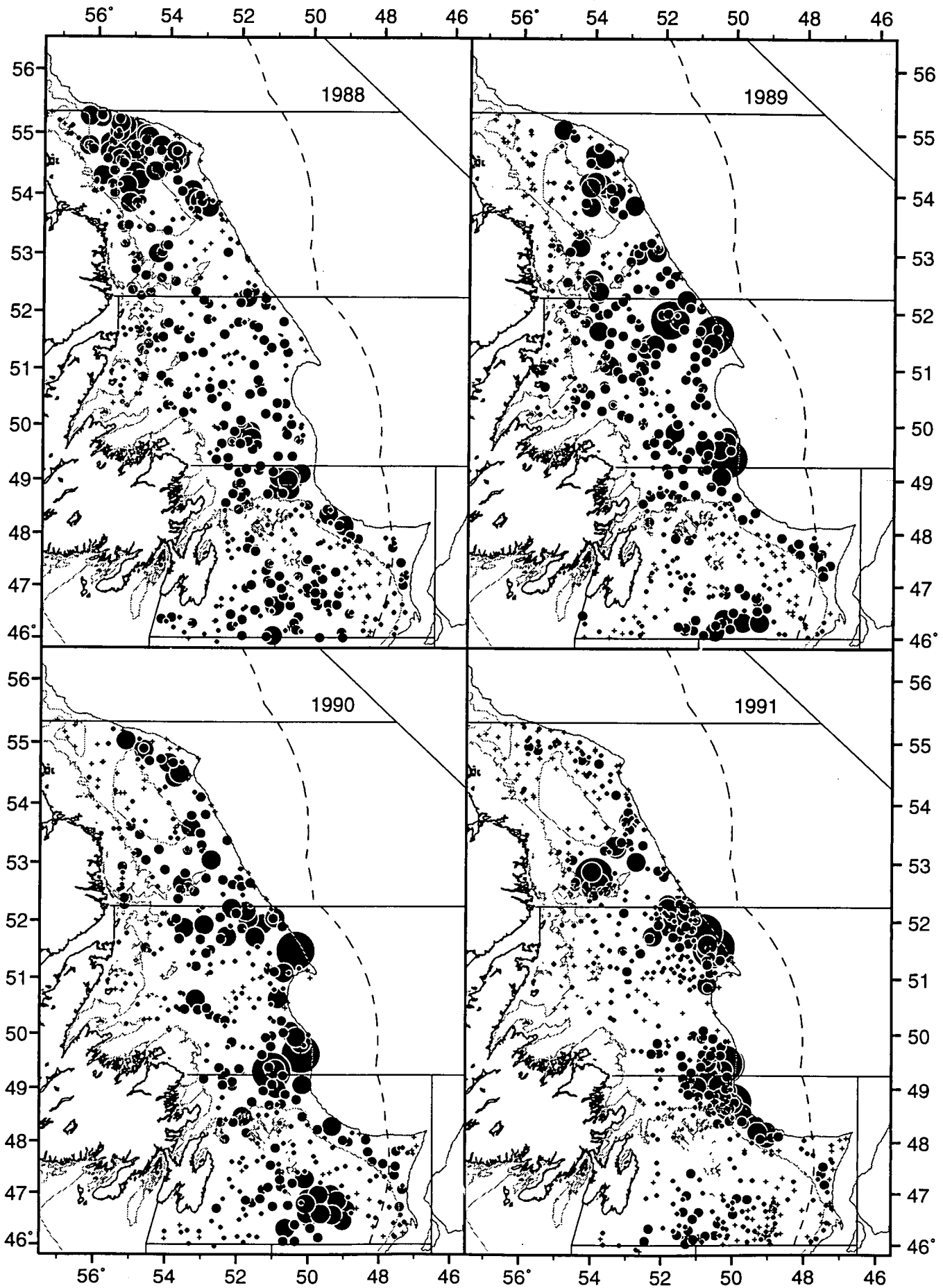


Fig. 13 contd. Cod distribution from autumn RV trawl surveys (numbers per tow).

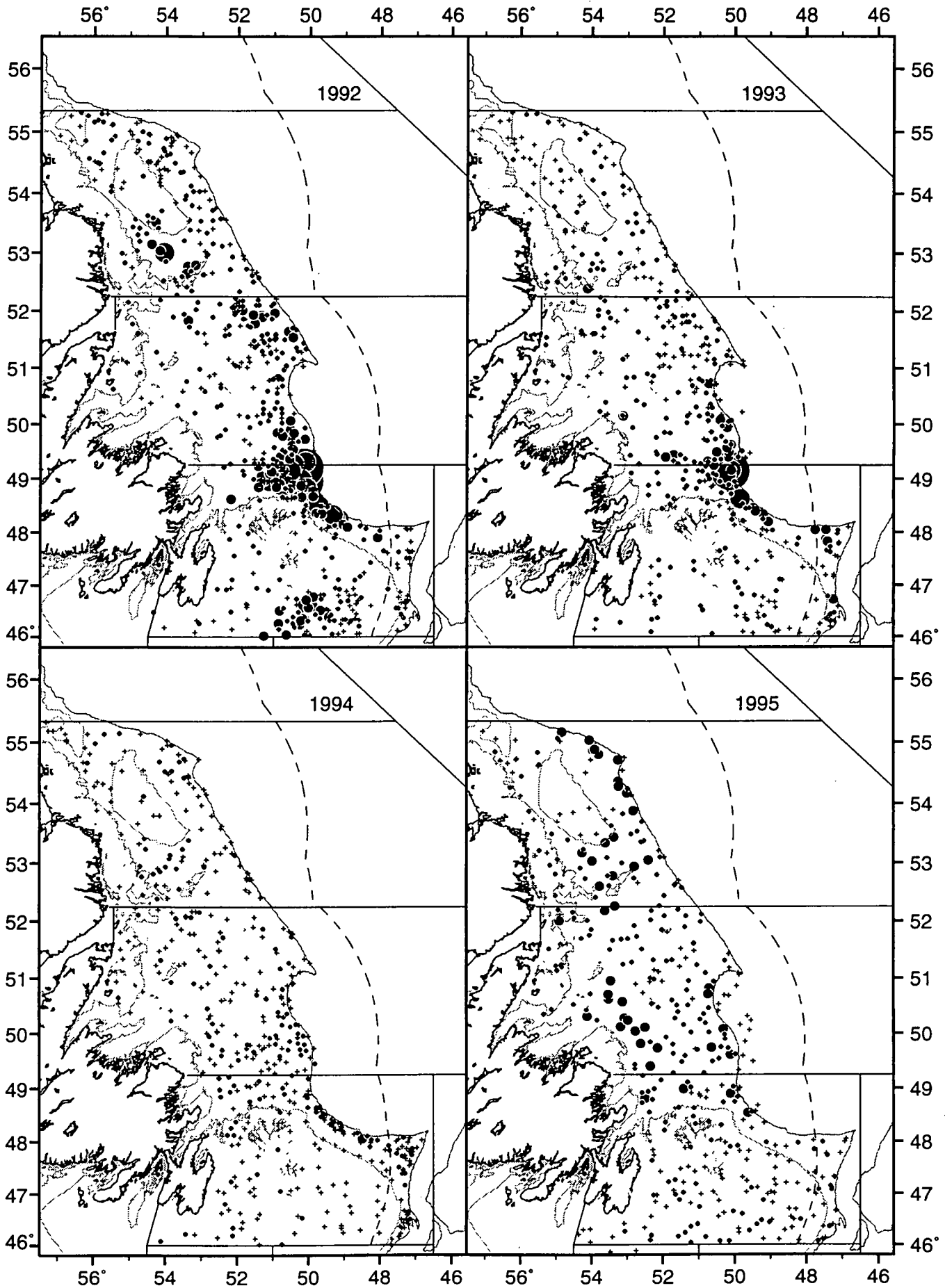


Fig. 13 contd. Cod distribution from autumn RV trawl surveys (numbers per tow).

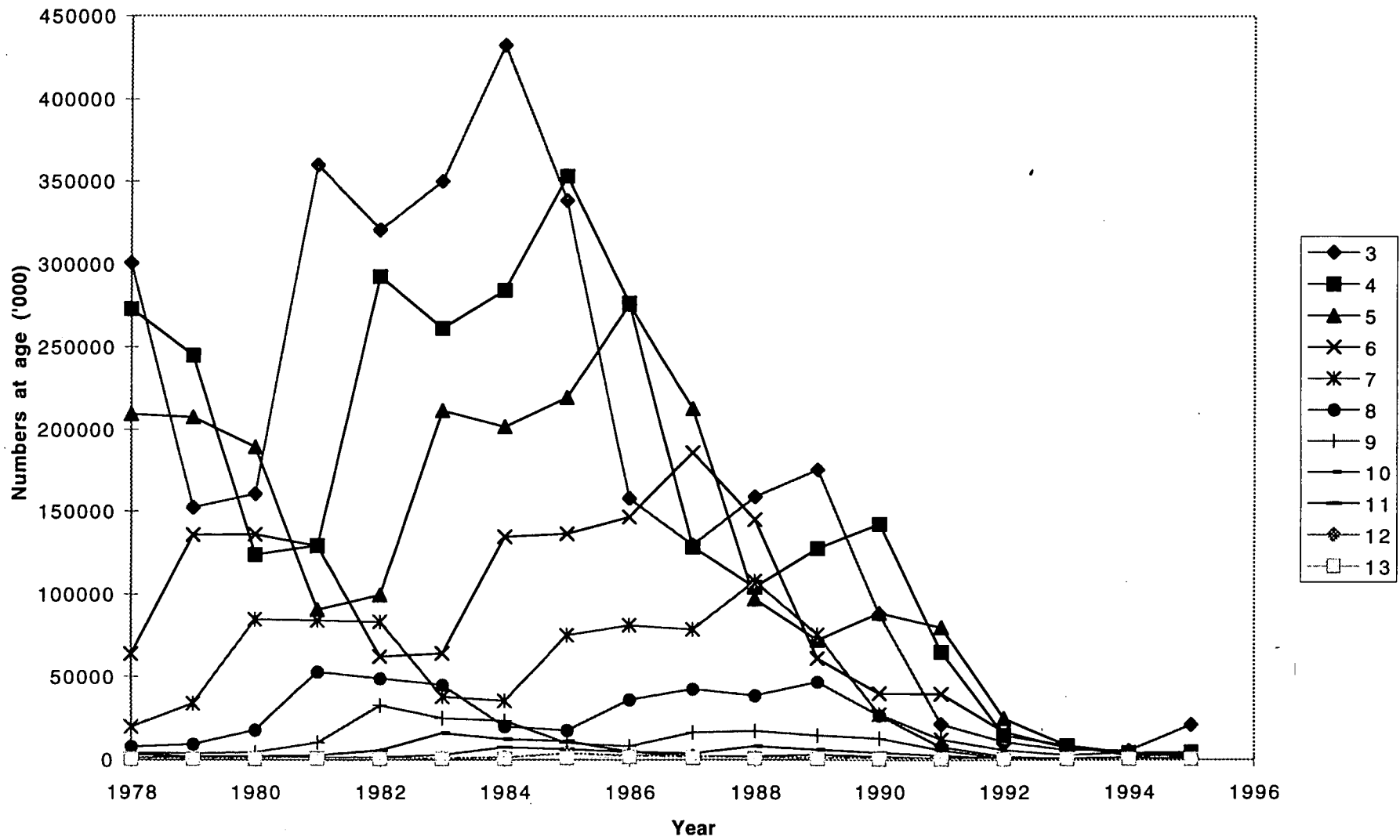


Fig. 14. ADAPT estimates of numbers at age.

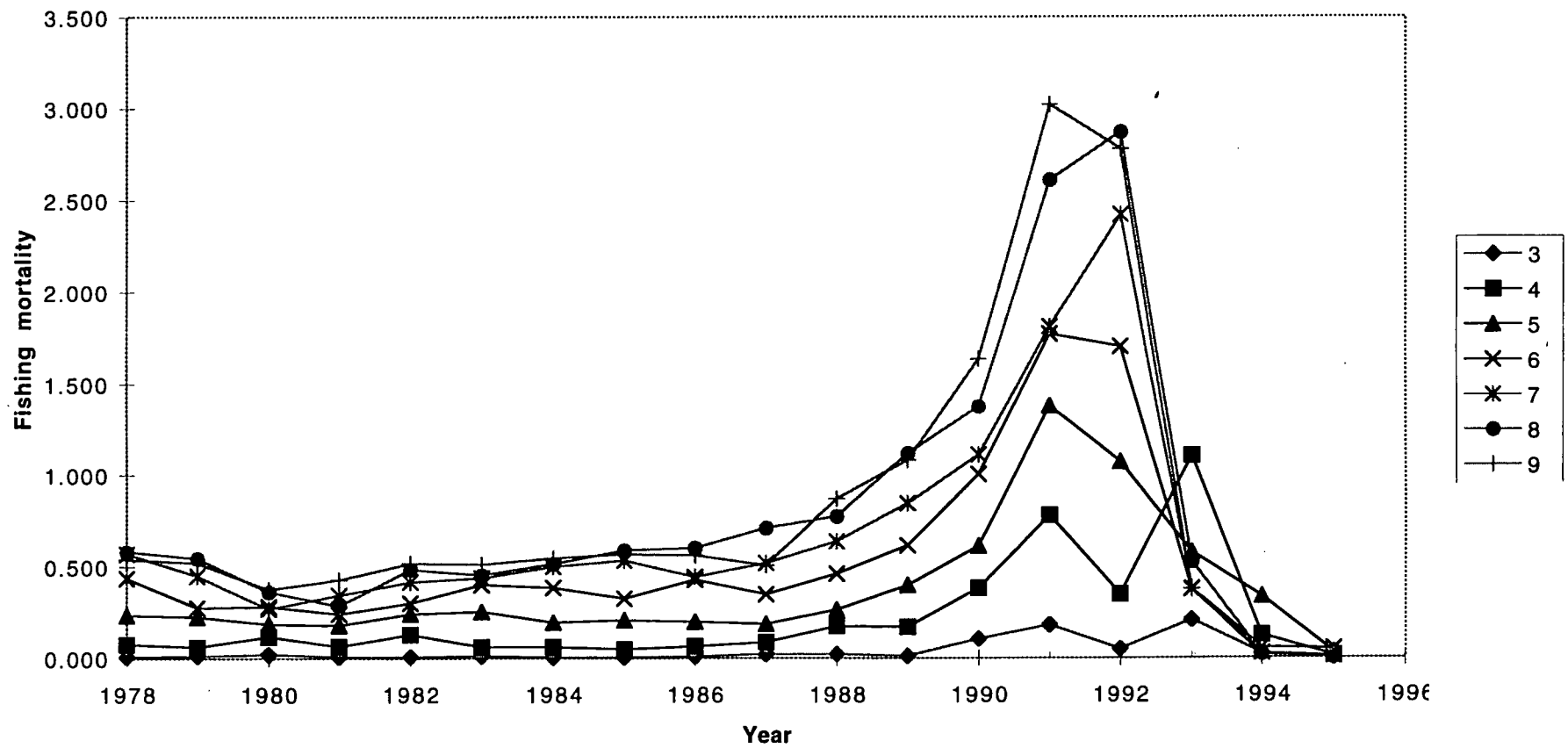


Fig. 15. ADAPT estimates of fishing mortality at age.

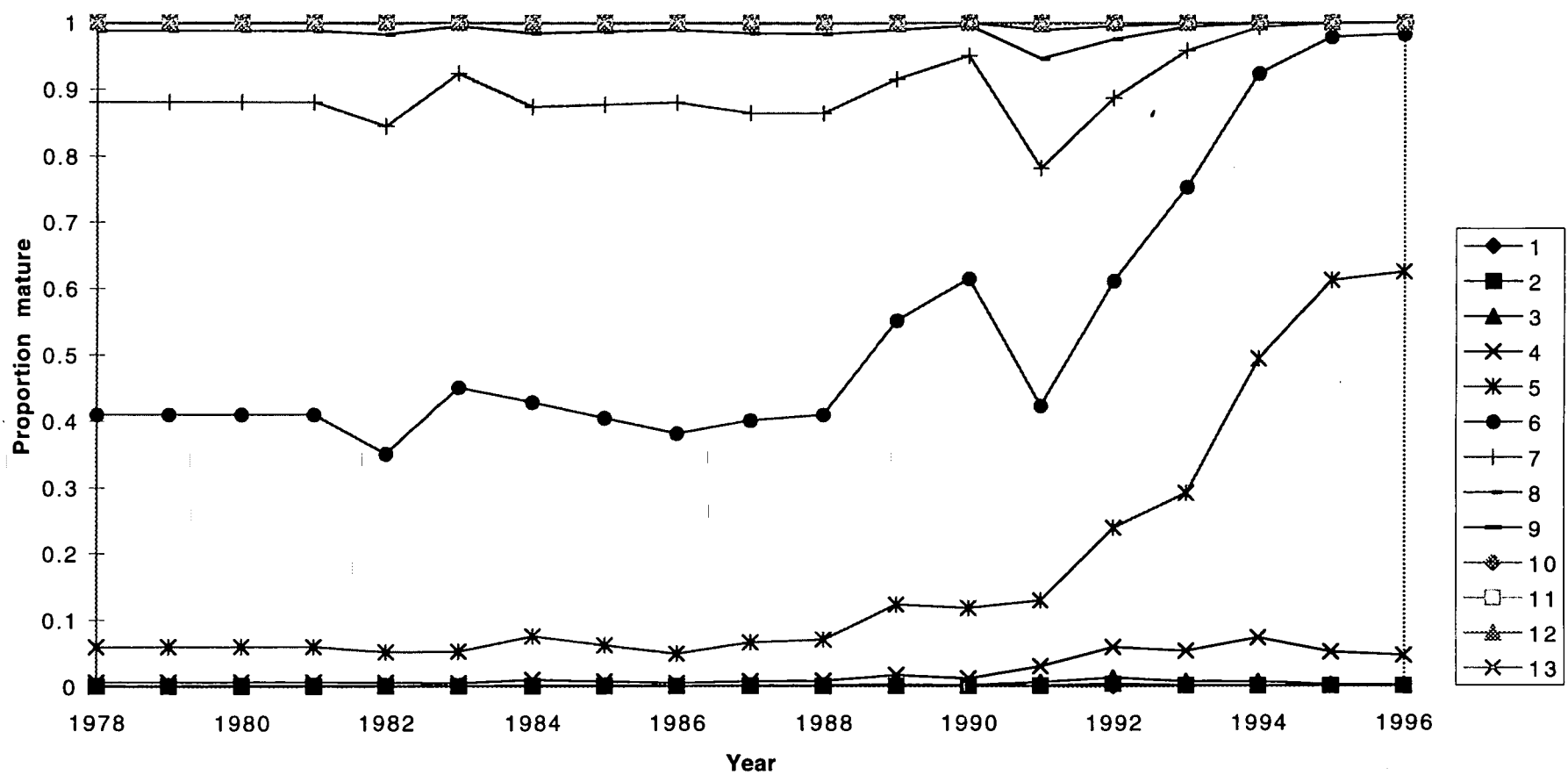


Fig. 16. Estimates of proportion mature at age(from Morgan and Bratney 1996).

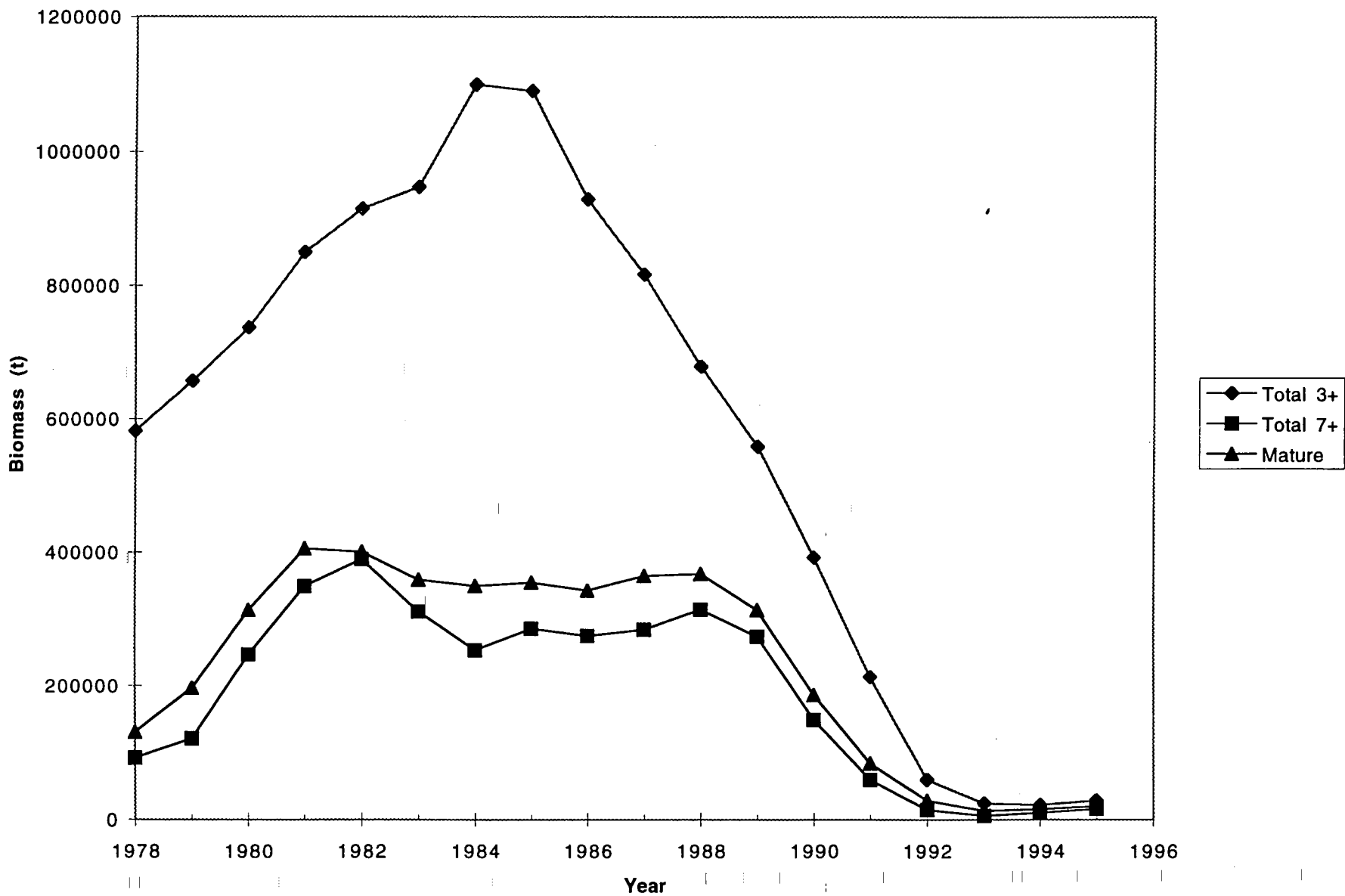


Fig. 17. Estimates of 3+, 7+ and mature biomass from ADAPT and maturity estimates.

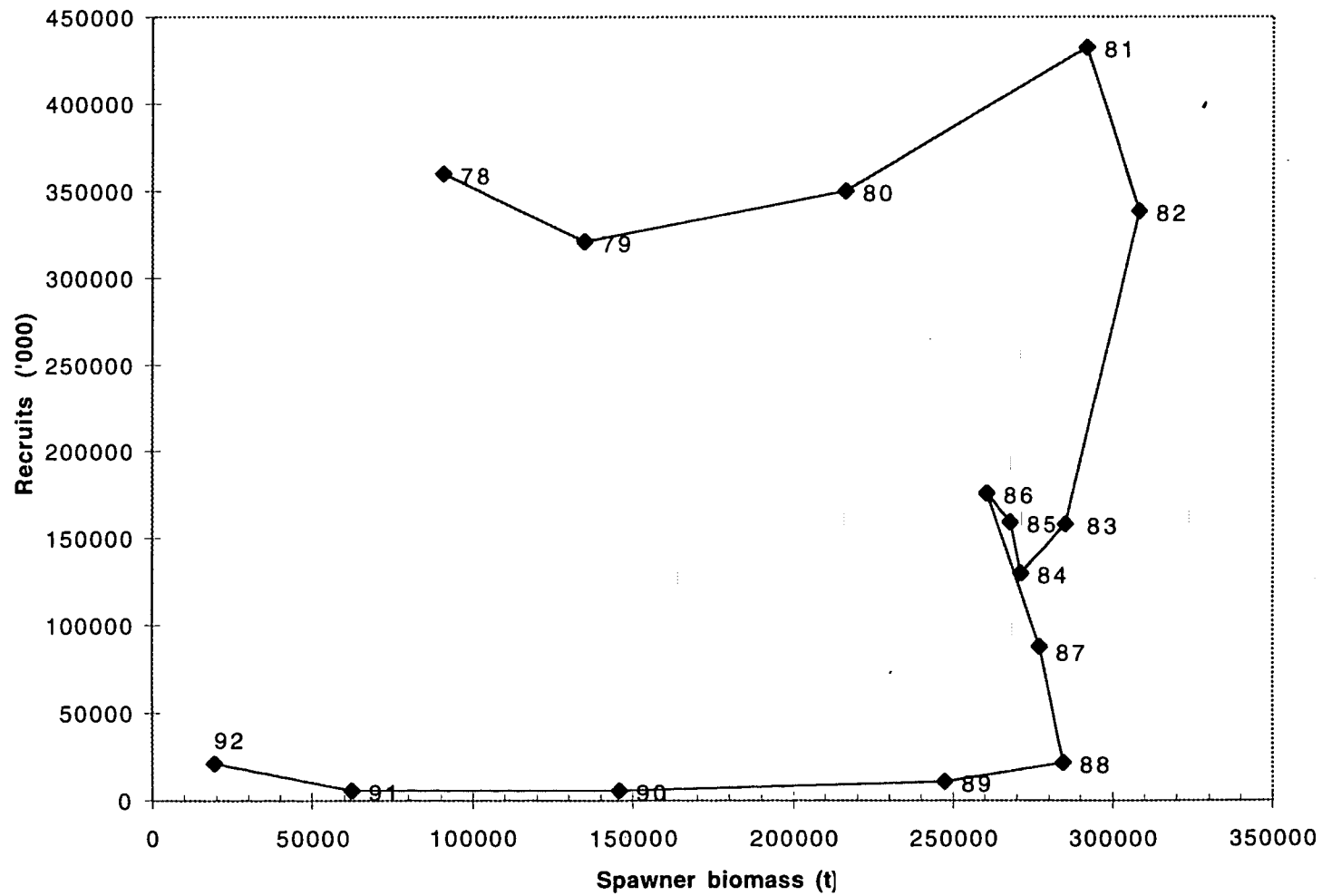


Fig. 18. Phase plot of spawner biomass and recruitment from ADAPT and maturity estimates.

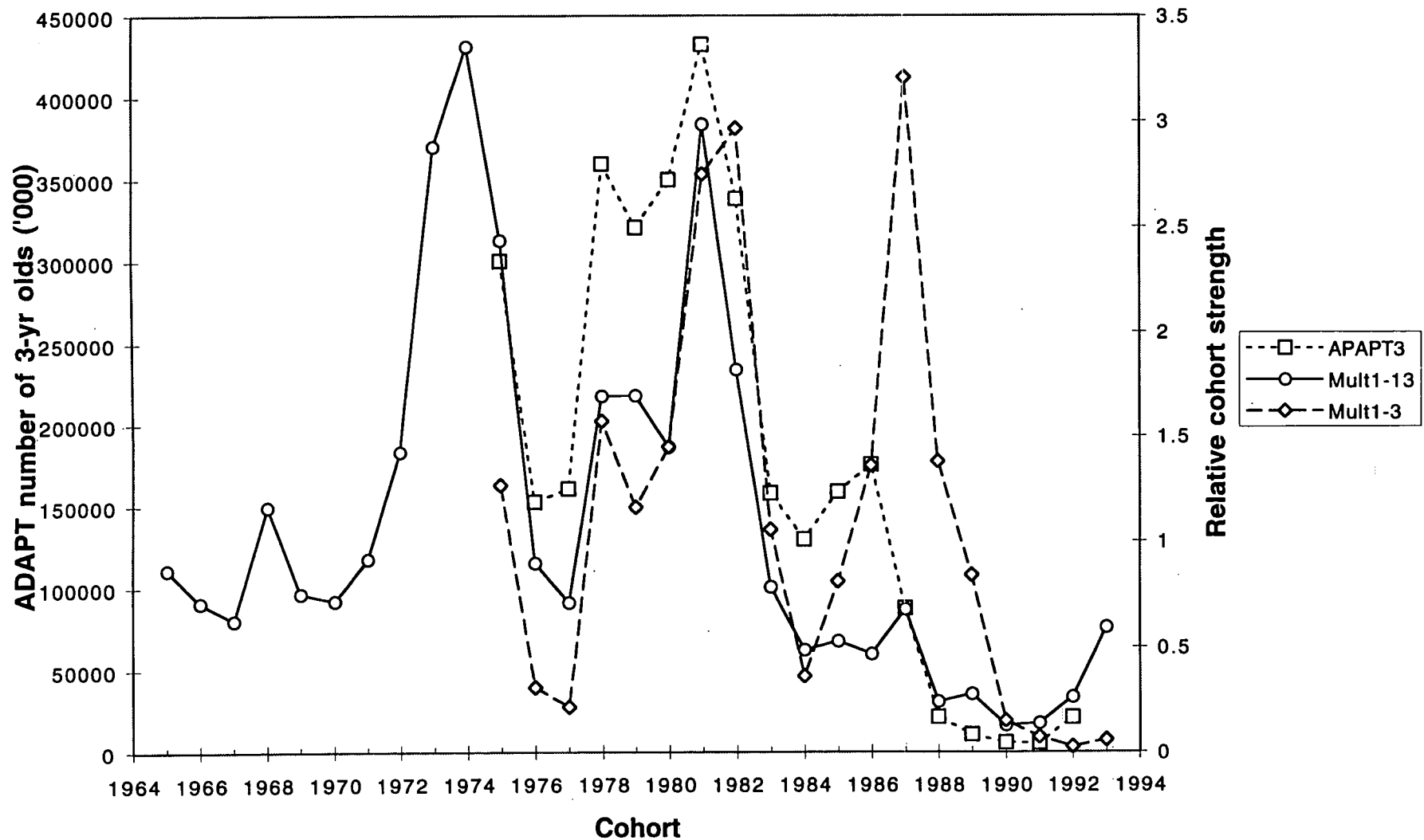


Fig. 19. ADAPT numbers at age 3 and the multiplicative model estimates of relative yearclass strength using data for ages 1-13 and 1-3.

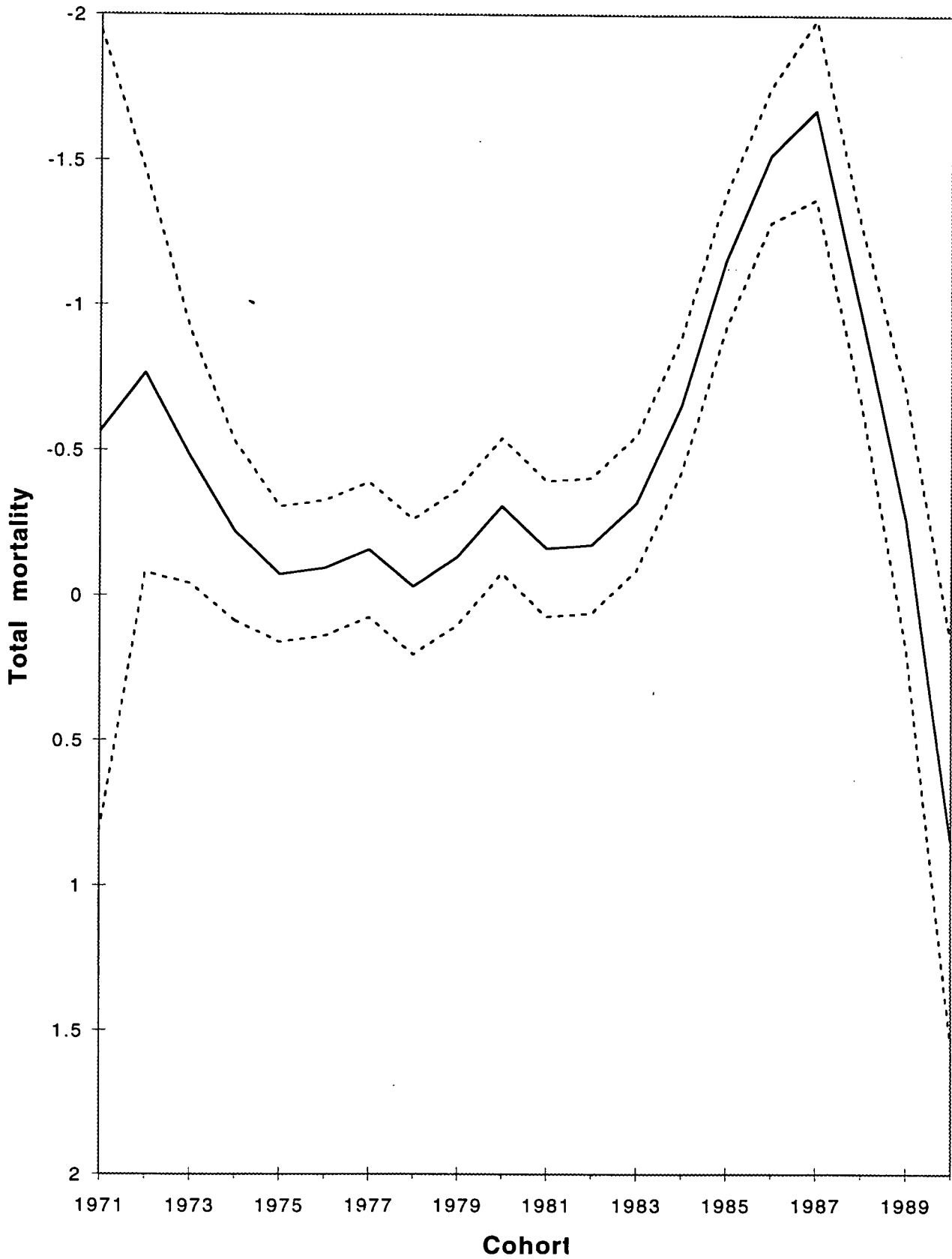


Fig. 20. Estimates of total relative mortality from the fit of a multiplicative model to survey numbers at age for ages 3 to 8. The broken lines indicate plus and minus one standard error.

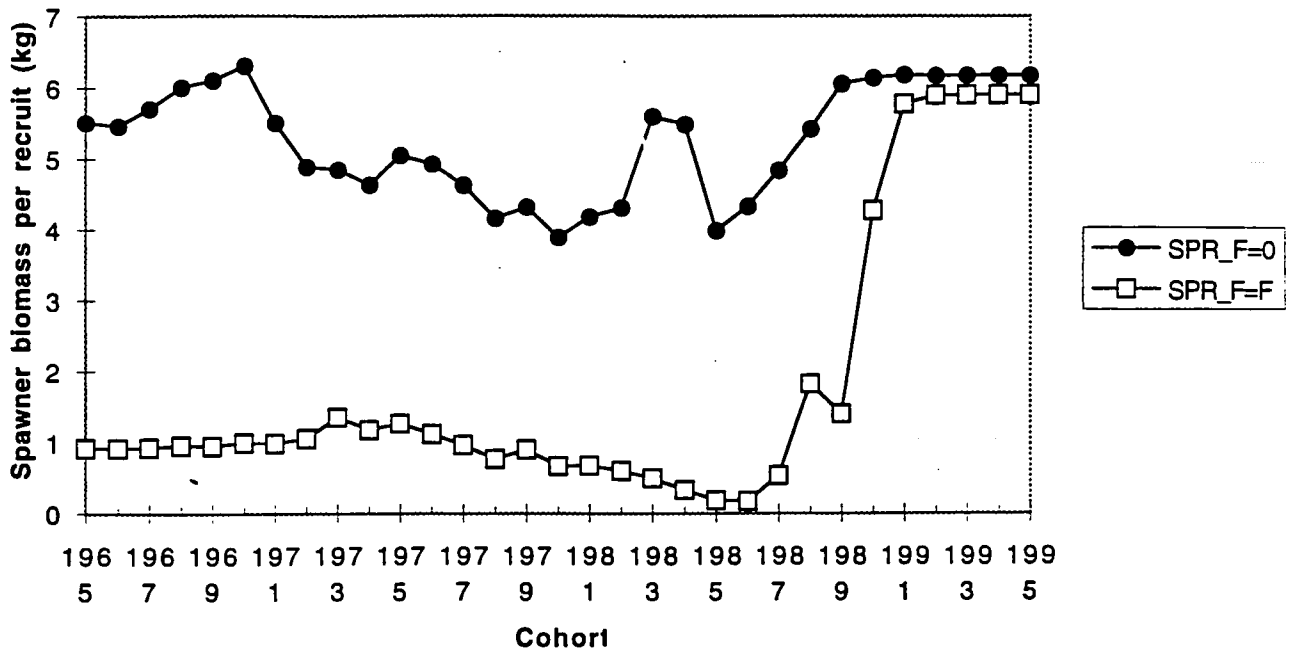


Fig. 21. Estimates of spawner biomass per recruit at zero fishing mortality and at the fishing mortality estimated in the ADAPT.

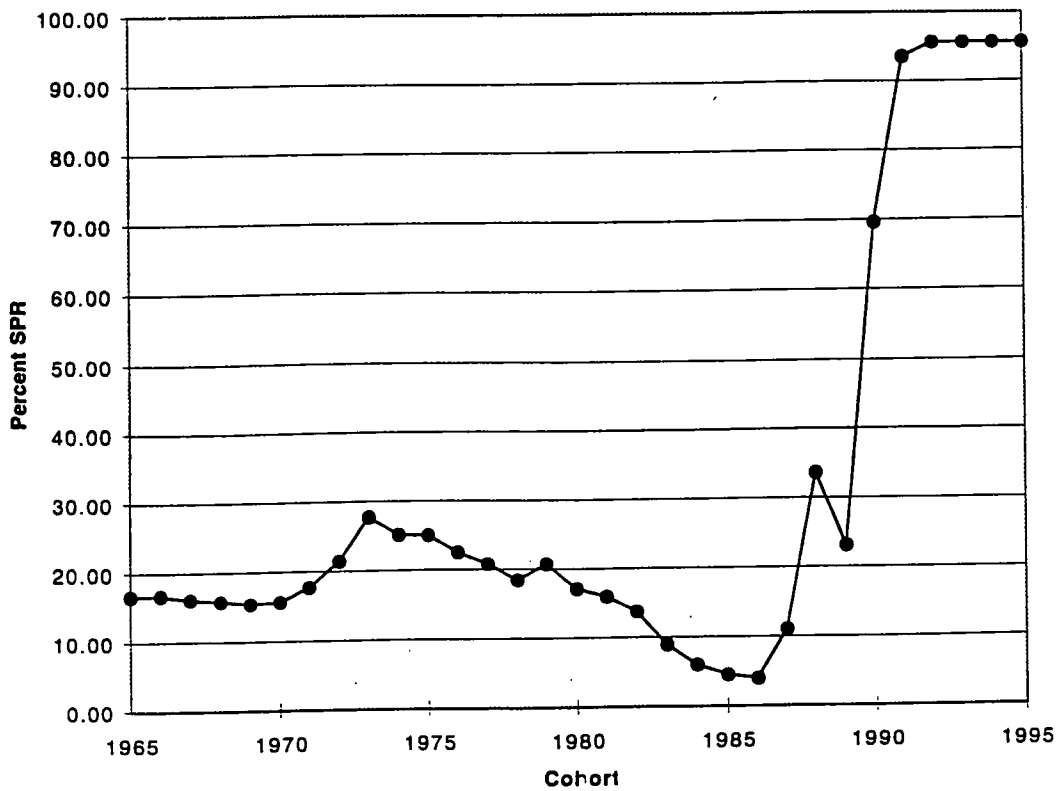


Fig. 22. The percentage of the potential spawner biomass per recruit (i.e. at $F=0$) realized at the prevailing level of fishing mortality. This quantity is termed %SPR.

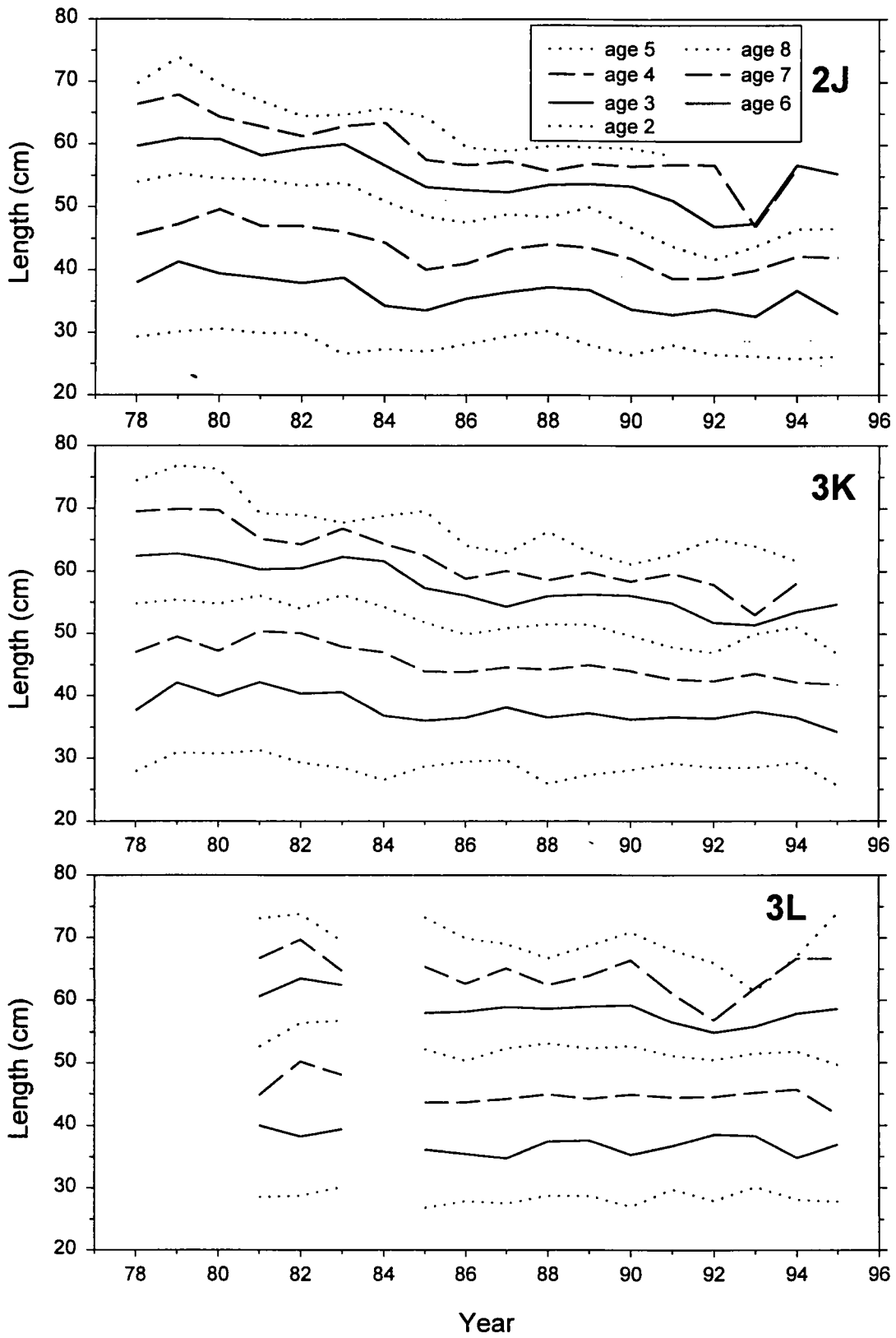


Fig. 23. Mean lengths at age for cod caught during the autumn bottom-trawl surveys. Data from Table 31b.

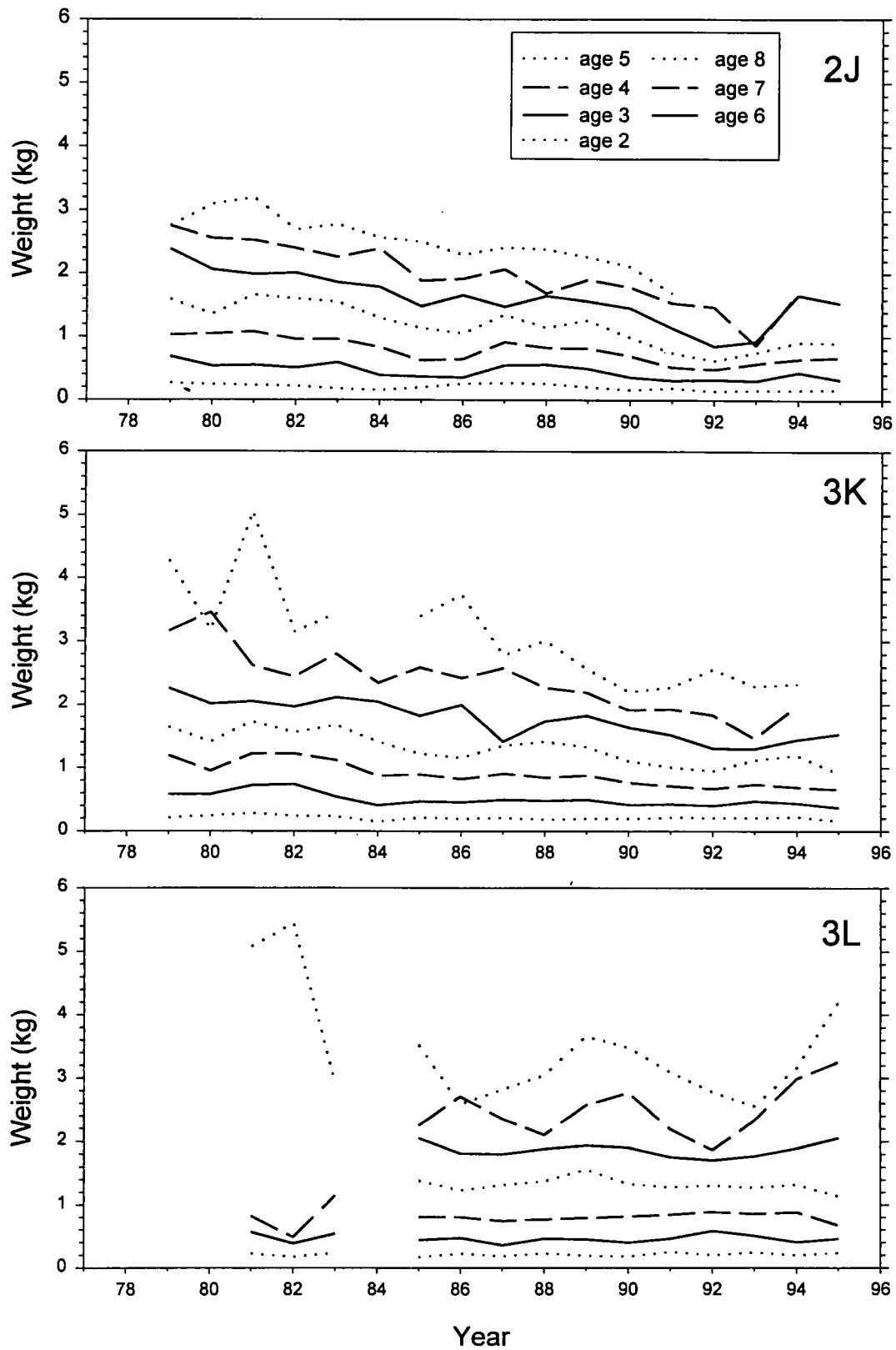


Fig. 24. Mean weights at age for cod caught during the autumn bottom-trawl surveys. Data from Table 32b.

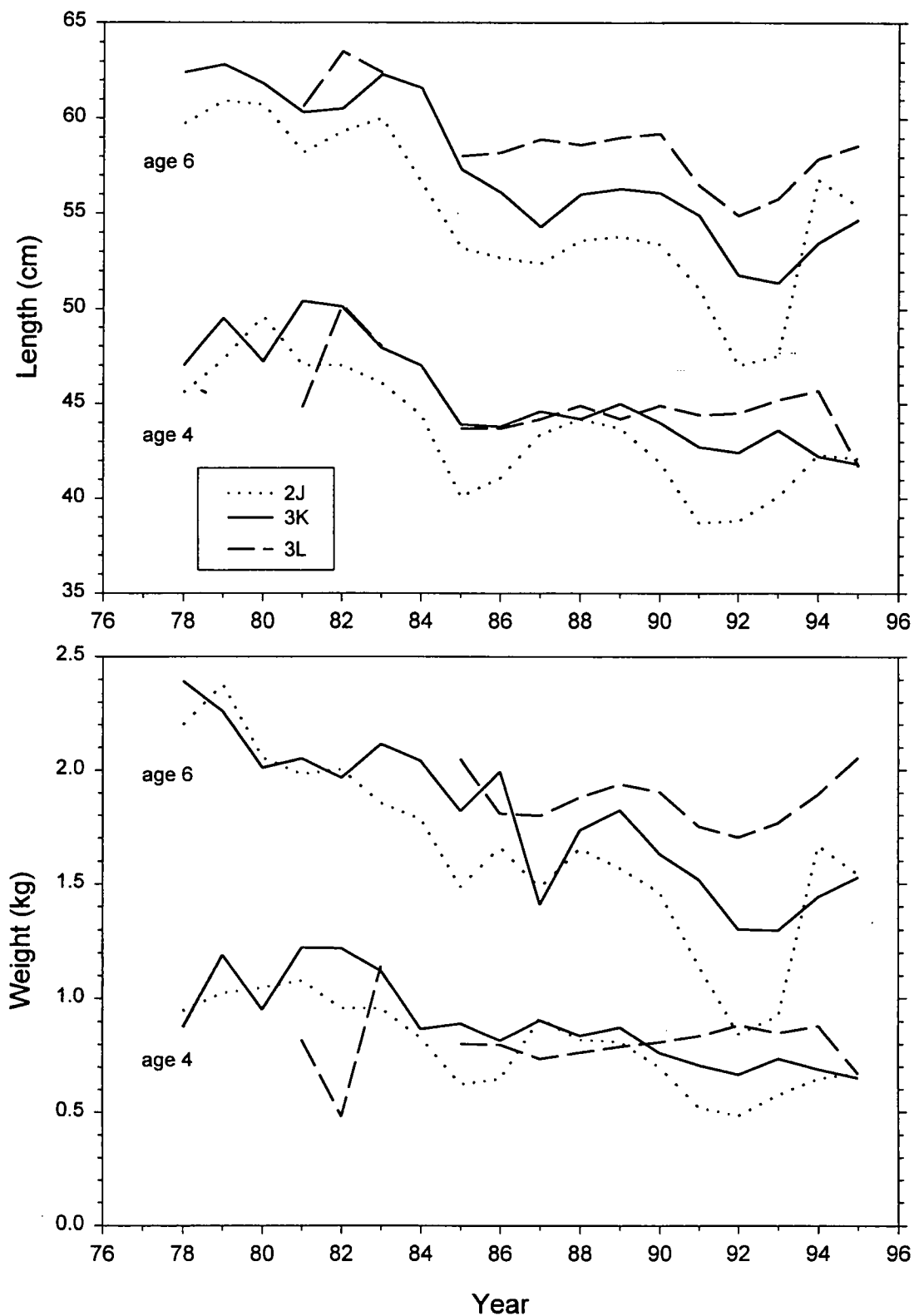


Fig. 25. Mean lengths and weights by Division for cod of ages 4 and 6 caught during the autumn bottom-trawl surveys.