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An Assessment of the Cod Stock in NAFO Divisions 2J+3KL.

by

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#### **Introduction**

The assessment of this stock and events in the fishery have suggested that there has been a substantial stock decline in recent years. Some indications of this decline first became evident from the autumn survey results in 1990, in that the estimates for Div. 2J were considerably reduced. However, those for 3K and 3L were among the highest in the time series and consequently the decline in Div. 2J was felt to be a distributional change. The spring 1991 assessment was consistent with previous assessments and there was some optimism because of strong 1986 and 87 yearclasses. The age 3+ biomass was estimated in excess of 1.0 million tons.

Subsequent events in the fishery along with results from the autumn 1991 surveys did not support this conclusion and lead to a downward revision of the estimated stock size. These events included: lack of cod in commercial catches in Dives. 2J and northern 3K in early 1991; apparent distributional shifts further south as well as to deeper water; and reduced catches by the fixed gear fishery, especially gillnet, in the summer of 1991. The autumn 1991 survey results were also much lower (over 50%) than those for 1990, particularly in Div. 3L. This information was considered at a preliminary assessment in January of 1992 and resulted in a recommendation for a reduced catch in 1992.

By mid 1992, after another assessment, CAFSAC advised that the 2J3KL cod stock was at an extremely low level with biomass estimates being at or near the lowest observed. The decline in biomass of the stock could not be attributed to fishing alone and it was considered likely that natural mortality in 1991 was higher than usual. The fishery was expected to be dependent on the 1986 and 87 yearclasses with the 1988 year class being below normal and approximating the low 1983 and 84 year classes. Analysis indicated a 1992 F<sub>0.1</sub> catch of between 50,000t and 79,000t. Reported and projected catches by mid-year would account for approximately 35,000t. CAFSAC recommended that the catch in 1992 be restricted to the lowest possible level. Similar advice was provided after the June 1992 Scientific Council meeting of NAFO. The Canadian offshore fishery was closed in May 1992, and subsequently the entire Canadian commercial cod in 2J3KL was closed with the announcement of the cod moratorium in July 1992.

#### **Nominal catch**

Nominal catches for this stock increased during the late 1950's and early 1960's and peaked at just over 800,000t in 1968 (Table 1, Figure 1). Catches rapidly declined thereafter and were at a low of 139,000t in 1978. During 1982 to 1990 catches were in the range of 219,000 to 270,000t; however, a reduction to approximately 170,000t occurred during 1991 and further to 44,000t in 1992. The total Canadian catch increased from a low of about 36,000t in 1974 to 214,000t in 1983. Catches then declined to 190,000t in 1986 but increased to a high of 242,000t in 1988. Since 1988 catches have again declined and in 1992 the Canadian catch was approximately 29,000t.

During the 1960's, when the fishery was dominated by non-Canadian fleets (Fig.2), most of the catch occurred in Divisions 2J and 3L with 2J generally predominating. Since that time catches have been mainly from Divisions 3K and 3L (Fig.3).

The total cod catch for 2J3KL in 1992 was approximately 44,000t. This estimate included; the reported Canadian catch of 23,976t., a French catch of 583t, a foreign catch (outside the 200 mile limit on the Nose of the Grand Bank) estimated by Canadian Surveillance at 14,300t and an additional 5,000t estimated from the inshore "recreational fishery". The latter estimate was based on a combination of information supplied by Dept. of Fisheries and Oceans and Union (FFAW) officials. The annual Canadian reported catch has included estimates for the recreational fishery. In 1992, this estimate was approximately 5,000 tons.

Because of the moratorium in 1992, catches by inshore fixed gears (Table 2; Fig. 4) which are normally taken mainly in the second half of the year, were low.

No commercial catch was reported from Div. 2J in 1992 (Table 3). Almost all (95%) of the total Canadian catch was taken in Div. 3L over the January to May period. Approximately 30% of the total Canadian catch was taken by the "recreational fishery" using jiggers or baited hooks. The Canadian offshore otter trawl fishery was typified by low catch rates and catches of small fish.

Information from Canadian surveillance indicate that the catch by foreign fleets outside the 200 mile limit in Div. 3L was in the vicinity of 14,300t in 1992. About 10,000t of this total was obtained by EEC countries (mainly Spain and Portugal). The 1992 EEC catch reported to NAFO was about 9,500t.

#### **Catch and weight at age**

A summary of the sampling used to derive the catch and weight at age of the Canadian and French catches in 1992 is given in Table 4. The following relationship was applied in deriving average weight at age: log weight = 3.0879 log length - 5.2106. Coefficients of variation on the estimated catch were less than 10% for most ages (Table 5). The 1986 and 1987 yearclasses were the most abundant in the commercial catch in 1992. The age composition of the catch by foreign fleets fishing outside the 200 mile zone in 1992 was estimated using the age compositions obtained for the Canadian and French otter trawl catch in Div. 3L.

The catch numbers, average weights and biomass at age for the years 1962-1992 are presented in Tables 7 to 9. Weights at age for the 1962-71 period are estimates obtained using weight at age data for 1964-68 from Division 2J and 1965-70 from Divisions 3KL weighted by Divisional catch. Average weights increased from the early 1970's to the early 1980's and subsequently declined. Average weights at age for ages 4 to 7 were the lowest since those of the 1960's and early 1970's (Table 8; Figure 5). The catch biomass at age for 1992 using available sampling data was approximately 94% of that reported.

#### **Research vessel survey data**

##### Stratified random trawl surveys

Research vessel surveys have been conducted by Canada during autumn in Division 2J, 3K, and 3L since 1977, 1978, and 1981 respectively. The 1984 autumn survey in Div. 3L was conducted earlier in the year than the other surveys (August-September as opposed to October-November). Spring surveys have been conducted by Canada in Div. 3L for the years 1971-82 and 1985-92. Surveys in Divs. 2J3K have been conducted by the R.V. Gadus Atlantica while those in Div. 3L have been conducted by the R.V. A.T.Cameron (1971-82) and R.V. Wilfred Templeman (1983-92). 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 recent years, this analysis did not include 1992 survey data. Estimated values presented are those provided previously. Stratification charts used for the surveys in the three NAFO Divisions are represented in Figures 6-8.

Divisional survey estimates of biomass and abundance have shown large fluctuations in recent years. Values observed in 1992 in Div. 2J were the lowest in the time series (Tables 10-11; Figure 9.). Biomass estimates have indicated a declining trend since 1988. Both indices have declined substantially in Division 3K since 1989 (Tables 12-13; Figure 10). The 1991 and 1992 estimates for Division 3L were similar but among the lowest in the time series. (Tables 14-15, Figure 11). In these autumn surveys cod abundance and biomass were low in the shallow water strata. This was particularly true for Division 3L where in contrast to previous years, cod catches were low in large strata in the 31-50 fathom depth range. Biomass and abundance from the Div. 3L spring surveys declined substantially since 1990 and in 1992 were the lowest in the time series since 1977 (Tables 16-17, Figure 12).

Percent biomass by Div. (Table 18) was fairly stable for a period in the early 1980's and averaged about one third in each of the three Divs. In recent years the percentages have become quite variable with the highest and lowest percents for each of the three Divs. occurring since 1987. The average percentages for the 1981-92 period of about 33% for each Div. are not reflective of the situation in recent years when over 80% of the biomass has occurred in one Div. (3L-1992).

Tables 19-22 give the mean numbers per tow at age for the surveys conducted in all Divs. In Divs. 2J and 3K the 1987 year-class (age 4) was still the most abundant in 1992 but at very much reduced values. A similar pattern was observed for the 3L survey although the 1988 year class appeared to be slightly stronger in this area.

There were no autumn surveys in Div. 3L for the years 1978-80. An index for these years was estimated by averaging yearclass estimates in successive spring surveys in Div. 3L for the period 1977-81. The total stock area index at age for autumn was then calculated by averaging (weighted by surveyed area) the results for all three Divs. The surveyed area, in nautical miles, used as weights for this average are: 2J - 21,560; 3K - 29,256; 3L - 36,777. This 2J3KL index (Table 23) indicated that the total abundance had declined substantially. Coefficients of variation for the age-by-age means are also presented in Table 23.

In both 1991 and 1992 there were some indications, based on the commercial and recreational fisheries, that cod may have remained in inshore waters later than usual and in significant numbers. During the autumn surveys, time was allotted for limited coverage (using the bridge sounder to detect fish and trawling where possible) of those areas which are not normally included in the regular survey area. The results indicated that very few cod were encountered in the inshore areas surveyed.

Survey average weights at age (Tables 24-27) indicated that there was a decline in average weights at ages 4 to 6 since 1989 in Div. 2J and 3K, and for ages 5-8 since 1990 in 3L, while remaining stable or showing some increase at older ages. Recent average weights for all divisions are substantially lower than those observed in the early to mid 1980's.

Distribution plots (Fig.13-15) of the numbers of cod caught per tow during the autumn surveys from 1981 to 1992 indicate a fairly typical pattern from 1981 to 1988. Catches were spread over the entire survey area and most large catches were in shallower water. Commencing in 1989 changes started to occur in that fewer cod were found near the coast, mainly in Div. 2J. During 1990 and 1991 most cod were found on the seaward slopes of the offshore Banks and in 1992 there were virtually none in 2J3K and low abundance in Div.3L. This apparent movement to deeper water is also indicated in Figures 16-18 in that abundances have increased at depths greater than 300m, mainly since 1989, in spite of decreases in total abundance.

#### Winter Hydroacoustic surveys

An annual winter (February) hydroacoustic survey series was started in 1987. The purpose of these surveys is to determine the abundance and distribution of cod on the seaward slopes of the offshore Banks within the management unit. Only from 1991-93 were sufficient data collected to produce such estimates. Similar information for years prior to 1991 could not be obtained because of problems encountered with hydroacoustic hardware and operation of vessel and gear particularly with respect to ice conditions.

In the initial survey (1987) a large concentration was observed in southern 2J and northern 3K at depths ranging from 300 to 500 meters. In 1988 and 1989 the major concentration was found slightly farther south but in the same depth zone. In the 1990 survey commercial concentrations of cod were found still slightly farther south in Div. 3K and mainly at 550m, about 150m deeper than in previous years. Over the period 1991-93 the surveys indicated substantial declines in cod densities, particularly in 1993 (Table 28). Significant concentrations were encountered outside the survey area (Fig. 15) at depths approximating 930m on the nose of the Bank.

#### Cod tagging survey

The 1993 offshore cod tagging initiative in January along the entire shelf break from Hamilton Bank (2J) to the Nose of the Bank (3L) at depths ranging from 150m to 600m was unable to locate any cod concentrations suitable for tagging.

#### Spring acoustic studies of cod distribution and abundance (3KL)

Systematic searches along polygonal grids have been made for cod in northern 3L and southern 3K in the springs (late May to early July) of

1990, 1991, and 1992 (Fig. 20). Search vessels were equipped with fully calibrated (ICES standard; Foote et al. 1987) scientific echosounders (Biosonics 102, 120 and 38 kHz; Simrad EK400, 49 kHz). In this report only data collected at 38 kHz using the same echosounder and transducer aboard the vessel *Gadus Atlantica* will be discussed unless specified. All acoustic data were collected via simultaneous integration at 1 km intervals and single target measurement using Biosonics ESP signal processors. Species identification was based on the algorithm of Rose and Leggett (1988) coupled with echogram interpretations and biological sampling. Acoustic data were further processed and analyzed using a combination of Biosonics ESP software and programs developed at NAFC. Standard practices for integration and target strength determination were followed. Mean target strengths were calculated from a combination of in situ and experimental values for fish of the size captured in trawls (Rose, unpubl. data). For the years 1990, 1991, and 1992, mean TS values of -33.0, -34.0, and -34.5 dB per fish were used). Fish were separated from bottom echoes using a bottom-up integration algorithm designed to integrate as close to the bottom detect signal as possible without bottom intrusion. Both bottom and midwater trawl sampling assisted acoustic signal interpretations and provided biological samples. Full details of the acoustic methodology will be published elsewhere.

In each year, cod were highly aggregated in the basin south of Funk Island Bank (termed the "Bonavista migration corridor"). Cod were also aggregated along the north Cape of the Grand Bank in 1991 and 1992 (no sampling was conducted there in 1990). Fish were located at depths of less than 400 m in 1990 and 1991. In 1992 fish were located up to and likely deeper than our average detection limits (ca. 600 m). However, all measurements reported here were made at depths of 300-350 m. It is uncertain if all fish had migrated to these depths by the end of the study period in 1992 (although the observed migration of fish onto the shelf had ceased well before that time).

The shoreward passage of migrating cod past the central portion of the migration corridor occurred approximately 2 weeks later in 1991 than in 1990, and 4 weeks later in 1992 than in 1991. The delay in the migration appeared to result from events occurring well offshore and not further inshore at the intersection of the cold intermediate layer with the bottom.

The size distribution of the migrating cod differed between years (Fig. 21). The large fish (>55 cm) which were numerous in 1990 could not be located in either 1991 or 1992.

Spawning within the migration corridor also occurred progressively later over the study period (Fig. 22). In 1990, fish first encountered in early June were virtually all spent. In 1991, it appeared that 50% of the spawning occurred in June. In 1992, spawning was observed continuously for over 2 weeks in mid-June (Fig. 23). The acoustic estimate of the fish abundance indicated this spawning school was comprised of approximately 70,000,000 fish. This school was made up of the largest fish encountered in 1992 (modal length 52 cm as compared to 42 cm for all sets). The maturity data indicate that these fish were still spawning at late as early July.

Acoustic results based on attempts to map the edges of the aggregations migrating through the Bonavista corridor and assess their mean internal densities are presented in Fig. 24. These assessments were made by transecting the aggregation across its centre from different angles as many times as possible (here 4-7) during a 24 hour period when the aggregation remained relatively immobile but poised to start migrating. In 1990 and 1992 this analysis includes but a single aggregation per year; in 1991 two main aggregations were identified and their statistics summed. Fish located on the north Cape of the Grand Bank are not included in these analyses. The densities within the aggregations remained relatively stable in the 3 years studied (Fig. 24, top). However, the volume of the aggregations declined sharply from 1990 to 1991 and less so from 1991 to 1992 (Fig. 24, middle). The overall estimates of abundance decline dramatically from 1990 to 1991, then slightly from 1991 to 1992 (Fig. 24, bottom).

A regular block grid employing more conventional acoustic survey techniques (non-stratified systematic transects - mean density based on transect averaging over full area) was conducted over the full area surveyed in June 1992 (Fig. 20). For this work an EK400 49kHz echosounder was used. Data integrated using the same target strength value as at 38 kHz indicated a total abundance of 2.5E8 fish (as compared to 2.0E8 at 38 kHz in the Bonavista corridor).

#### Commercial catch rates

In the most recent assessment of this stock, commercial catch and effort data were analysed in a multiplicative model and were initially included in calibration models. However, the results indicated a lack of fit based on the occurrence of patterns in the residuals which could not be explained. This problem has been observed in the past and has not been

resolved. With this situation and the much reduced otter trawl fishery in 1992, further analysis of catch and effort data was not conducted at this time.

#### **Estimation of stock parameters**

Formulations of the adaptive framework (ADAPT) and the Laurec-Shepherd (L/S) calibration analyses were examined in an effort to evaluate the abundance index and for the determination of stock size. The formulation of ADAPT used was that accepted at the most recent assessment of this stock and is described as follows:

#### **Parameters estimated by ADAPT:**

- Yearclass estimates  
 $N_{i,1992}$                                    *i* = 3 to 12
- Catchabilities for RV numbers  
 $K_i$    *i* = 3 to 12

#### **Additional structure imposed:**

- Natural mortality assumed to be 0.20.
- Error in the catch at age was assumed negligible.
- F on oldest age group (13) set to 50% of the unweighted F for age groups 7-9.
- Intercepts not fitted.

#### **Input data:**

- $C_{i,t}$    *i* = 3 to 13      *t* = 1978-92
- $RV_{i,t}$    *i* = 3 to 12      *t* = 1978-92
- Fall RV related to population at end of November.

#### **Objective function:**

- Minimize

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

#### **Summary:**

- Number of observations = 150
- Number of parameters estimated = 20

In previous assessments it had been established that intercepts were not significant and hence were not included in this analysis. The CV's on the estimated age 3-12 abundance (Table 29) ranged from 11% to 60% while those on estimated slopes were approximately 16%. Patterns of residuals that were observed in a similar analysis for the most recent NAFO assessment of this stock (Baird et al, 1992) were similar to those obtained in the current analysis which included the data from the 1992 survey. Residuals for the last year (1992) were all negative while those in preceding years were all positive. This pattern reflects the inclusion in the model of the very low abundance values observed in the 1992 survey.

A formulation of the Laurec-Shepherd calibration technique was evaluated using the same structure as for the ADAPT analysis except that the F on the oldest age group was set to 50% of the 5 previous ages. The results (Table 30) indicate that catchability residuals were large and positive for the period 1989-91 and mostly negative in the earlier period.

#### **Assessment Results**

##### Fishing mortality and stock abundance

The calibrations incorporating the extremely low survey abundance estimates for 1992 indicate that fishing mortalities are very high and that stock size has declined substantially in recent years to levels not previously observed (Figs.25-27). A summary of some VPA population parameters for 1992 from the two methods are as follows:

Parameter	ADAPT	L/S
Biomass-3+ (000's t)	210	108
Biomass-7+ (000's t)	22	15
Pop. numbers-3+ (millions)	335	192
F (7-9)	1.17	2.86

The analysis also suggested that estimates of F and population abundance for 1991 were substantially different from those estimated during the 1992 assessment. For example, the current estimate of F in 1991 from ADAPT was 2.2 as compared with 0.7 from the 1992 assessment. In the 1993 assessment the age 3+ population numbers for 1991 were estimated to be 470 million compared to an estimate of 940 from the 1992 assessment.

The results were very similar to those obtained during the 1992 assessment (substantial decline in population biomass and increases in F, as well as differences in results with calibration technique). Part of the reason for the latter relates to differences in the degree of influence each method places on terminal survey year. The L/S method estimates the current population at the same level as the current catchabilities adjusted RV while the ADAPT considers all RV estimates of a cohort to determine year class strength.

The RV residual pattern determined in ADAPT, indicating substantial year effects, was also observed previously. In 1992, reasons for this pattern were thought to have resulted from increased natural mortality rather than increased availability. The current analysis indicates that this pattern persists and has not been explained. The reduction in commercial catch would indicate that the large declines in stock abundance were caused by factors other than fishing mortality.

#### Recruitment

The 1986 and 1987 yearclasses were previously considered to be well above average. The current analyses estimate these yearclasses to be at or above the 1978-91 geometric mean (ADAPT-225 million) or below the mean (L/S-200 million). The 1988 yearclass continues to be estimated at below average values. Information available relating recruitment to spawning stock size and environmental variables (salinity and temperature) predict that recruiting yearclasses in the near future will probably be small.

#### Prognosis

Results from the 1992 assessment of this stock were disturbing in that they indicated a substantial change in stock status as compared with previous assessment. The stock was at a very low level and there were suggestions that the decline was partially related to changes in natural mortality. The results from the current assessment, regardless of the methodology used, substantiates the previously observed declines and indicates that the stock decline has continued in 1992. This has apparently occurred in spite of reduced commercial catch. The reasons for the decline have not been determined. They would not appear to be fishery related although there is no direct evidence to suggest a high natural mortality.

With the low stock size, high mortality rates and the possibility of weak recruiting yearclasses, the prospects for stock rebuilding are not good in the near future.

#### References

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Table 1. Historical catches of cod from NAFO Divisions 2J3KL for the period 1959-92.

Year	Offshore mobile gear			Fixed gear			Offshore mobile gear			Offshore mobile gear			Fixed gear			Total			Total	
	Can.	Other	Total		Total		Can.	Other	Total	Can.	Other	Total	Can.	Other	Total	Canada	gear	Total	offshore mobile gear	Total
1959	-	46372	46372	17533	63905	-	97678	97678	56264	153942	4515	51515	56030	85695	141725	164007	159492	200080	359572	
1960	1	164036	164036	15418	179455	53	69855	69908	47676	117584	7355	60213	67568	94192	161760	16695	157286	301513	458799	
1961	1	243147	243148	17545	260693	-	60574	60574	31159	91733	4675	70318	74993	70659	144652	124039	119163	378715	498078	
1962	-	226841	226841	23424	250265	-	45554	45554	42816	88370	4383	87463	91846	72271	164117	142894	138511	364241	502752	
1963	1	197668	197669	23767	221636	-	79331	79331	47486	126817	4446	83015	87461	73295	160756	148995	144548	364661	509209	
1964	13	197359	197372	14787	212159	-	121423	121423	40735	162158	10158	142270	152328	75806	228334	141499	131328	471323	602651	
1965	-	246650	246650	25117	271767	21	50097	50118	26467	76585	7553	130387	137740	58943	196683	117901	110527	434508	545035	
1966	39	226244	226244	22645	248928	13	58907	58920	32208	91128	8253	120206	128459	55990	184449	119148	110843	413662	524505	
1967	28	217255	217283	27721	245004	114	78687	78801	24905	103706	13478	200343	213821	49233	26054	115479	101859	509905	611764	
1968	4650	355108	359738	12937	372695	1849	119778	121627	40768	162395	15784	211808	227592	47332	27924	123320	101037	708977	810014	
1969	30	405231	405261	4328	409589	56	80949	81005	24923	105928	18255	151945	170200	67973	238173	115565	97224	656466	733690	
1970	-	212961	212961	1963	214924	92	78274	78366	21512	99878	14471	137840	152311	53113	205424	91151	76888	441638	520226	
1971	-	154700	154700	3313	158013	31	61506	61537	21111	82648	11976	148766	160742	38115	198857	74546	62539	376979	439518	
1972	-	149435	149435	1725	151160	7	133369	133376	14054	147430	4380	109052	113432	46273	159705	66439	62052	396243	458295	
1973	1123	52985	54108	3619	57727	108	159653	159761	13190	172951	1258	97734	98992	24839	123831	44137	41648	312861	354509	666600
1974	-	119463	119463	1804	121267	19	149189	149208	10747	159955	880	67918	68798	22630	91428	36080	351181	337469	372650	657000
1975	410	78378	78398	3000	81988	189	112678	112867	151518	128385	670	53770	54440	22695	77135	42482	41213	246295	287508	554000
1976	94	30691	30795	3851	34636	771	79540	80311	20879	101190	2187	40998	43185	35209	78394	62991	59939	154281	214220	300000
1977	525	39584	40109	3523	43632	1051	26776	27827	28818	56645	52622	26799	32161	40282	72443	79561	72623	100097	172720	160000
1978	4682	17546	22228	6638	28866	7027	6373	13400	29623	43023	9213	12263	21476	45194	66670	102377	81455	57104	138559	139000
1979	9194	6337	15731	8445	24176	21579	16890	38469	27018	65487	14184	12693	26877	50359	137236	130779	85522	81077	166899	180000
1980	13592	7437	21029	17210	38239	21920	6830	28750	37015	65765	15523	13963	29486	42298	71784	147558	96523	79265	175788	180000
1981	22125	4760	26885	14215	41100	23112	3847	26959	23002	49961	21760	15070	36830	42821	79651	147035	80038	90674	170712	200000
1982	58384	8823	67307	14429	81736	8881	4074	12955	42141	55096	27192	9271	36463	56479	92942	207306	113049	116725	229774	230000
1983	37281	4158	41439	10743	52182	31623	2815	34438	40681	75119	39125	10920	50044	54999	105043	214452	106423	125922	232345	268000
1984	10754	1259	12013	13150	25163	48114	11059	59173	35143	94316	49620	13944	63364	49428	112992	206209	97721	134750	232471	266000
1985	1541	5	1546	10209	11755	72111	9714	81825	30368	112193	39112	28927	68039	39306	107345	196247	79883	151410	231293	266000
1986	4527	7373	12011	12567	24578	58239	2226	60465	28539	89004	55117	51555	106672	31263	137935	19352	72369	179137	251506	266000
1987	38216	3620	41836	16139	57975	39240	6119	45359	27141	72500	43185	25883	69068	35467	104535	193988	78747	156263	235010	256000
1988	41468	9	41477	17112	58589	40260	50	40310	33820	74130	59107	26748	85855	50103	133958	241870	101035	167642	266677	266000
1989	33584	1014	34398	22920	57518	37280	1194	38474	20711	59185	40943	36540	77483	136721	214676	102869	150555	253424	233000	
1990	17863	689	18493	14332	32884	26893	883	27691	25577	55353	33371	26456	59827	70624	130451	190660	112533	106155	218688	198262
1991	635	84	719	2195	2914	29505	1009	30514	13318	43832	30146	49660	79806	44317	124123	120116	59830	111039	170869	190000
1992	-	-	19	19	584	273	857	899	1756	16418	14610	31028	10876*	41904	28796	11794	31885	43679	-	

<sup>a</sup>Includes surveillance catch estimate of 14300 t.<sup>b</sup>Includes estimate of 50000 t catch in recreational fishery additional to that obtained from official stats.

**Table 2.** Fixed gear cod catches (000't) by division and gear in NAFO Divisions 2J, 3K, and 3L from 1975 to 1992.

Year	2J				3K			
	Trap	GN	LL	HL	Trap	GN	LL	HL
1975	0.7	2.3	0	<0.1	4.7	8.5	0.6	1.6
1976	0.4	2.4	<0.1	<0.1	7.1	10.6	0.7	2.4
1977	1.5	1.9	<0.1	0.1	11.5	11.6	1.3	4.4
1978	3.0	3.2	0.1	0.3	11.3	11.4	3.6	3.2
1979	1.3	5.7	0.2	1.3	3.5	11.5	8.4	3.6
1980	4.7	11.4	0.2	0.9	12.7	13.5	8.1	2.7
1981	3.9	10.1	0.1	0.2	4.0	10.7	6.4	2.0
1982	4.5	9.1	0.1	0.7	16.4	17.6	6.1	2.1
1983	3.9	4.9	0.8	1.2	10.5	18.3	2.6	9.3
1984	5.3	6.0	0.4	1.0	9.9	14.3	2.4	8.4
1985	4.6	2.7	0.2	1.8	13.4	8.0	2.3	6.6
1986	4.3	7.6	0.1	0.6	14.8	7.6	1.4	4.7
1987	5.0	9.5	0.2	1.4	11.3	10.1	1.5	4.3
1988	5.9	9.1	0.3	1.8	16.2	11.7	0.9	4.7
1989	6.7	14.6	0.2	1.4	8.2	7.9	0.7	3.9
1990	3.6	9.2	0.6	0.9	11.2	7.8	3.8	4.7
1991	1.0	0.3	0.1	0.8	7.7	1.4	1.8	2.4
1992	-	-	-	-	-	0.1	-	0.7
	3L				Total			
1975	10.4	7.5	1.6	3.1	15.8	18.3	2.2	4.7
1976	18.4	9.1	2.9	4.8	25.9	22.1	3.6	7.2
1977	21.0	8.9	3.6	6.9	34.0	22.4	4.9	11.4
1978	23.2	9.0	5.1	7.8	37.5	23.6	8.8	11.3
1979	20.8	13.5	7.0	9.1	25.6	30.7	15.6	14.0
1980	12.9	11.2	9.4	8.8	30.3	36.1	17.7	12.4
1981	10.2	13.6	11.4	7.6	18.1	34.4	17.9	9.8
1982	24.2	20.3	5.7	6.2	45.1	47.0	11.9	9.0
1983	25.7	16.4	3.8	9.0	40.1	39.6	7.2	19.5
1984	23.0	14.9	3.8	7.4	38.2	35.2	6.6	16.8
1985	21.8	8.8	2.6	5.7	39.8	19.5	5.1	14.1
1986	15.8	8.9	2.4	4.1	34.9	24.2	3.9	9.4
1987	11.4	17.4	2.1	4.6	27.7	37.0	3.8	10.3
1988	22.2	18.1	2.7	6.7	44.3	38.9	4.1	13.2
1989	24.0	22.2	4.7	8.4	38.8	44.7	5.6	13.7
1990	32.1	26.7	2.2	9.7	46.9	43.7	6.7	15.3
1991	26.4	10.9	1.2	5.8	35.1	12.6	3.1	9.0
1992	1.2	1.0	-	3.6	1.2	1.1	-	4.4

Table 3. Cod landings (t) in 1992 for Divisions 2J, 3K AND 3L by country gear and month.

	CAN (SF)			CAN (N)			FRANCE		
	OT	GN	OT	GN	TRAP	HL	LL	OT	TOTAL
<b>2J</b>									
JUN									0
JUL						3	0		3
AUG						5	1		6
SEP						7	1		8
OCT						2	0		2
NOV									0
DEC									0
<b>TOTAL</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>2</b>	<b>0</b>	<b>19</b>
<b>3K</b>									
JAN	16		469	0		5		273	763
FEB	78		20						98
MAR									0
APR			1						1
MAY			0	7					7
JUN			0	18	12	13	0		43
JUL			0	8	16	33	3		60
AUG			0	2		123	0		125
SEP				30		237	3		270
OCT				28		194	3		225
NOV				22		131			153
DEC				2		9			11
<b>TOTAL</b>	<b>94</b>		<b>490</b>	<b>117</b>	<b>28</b>	<b>745</b>	<b>9</b>	<b>273</b>	<b>1756</b>
<b>3L</b>									
JAN	938		5287	1				310	6536
FEB	1660		5390	3		2			7055
MAR	85		58	12		1			156
APR	104		25	92		0			221
MAY	2788	19		240	155				3202
JUN			28	508	468	8	1		1013
JUL			22	128	515	59	1		725
AUG			24	5		568	4		601
SEP			6	26		1557	6		1595
OCT			3	12	24	892	2		933
NOV				8	3	427	0		438
DEC				1		127	1		129
<b>TOTAL</b>	<b>5575</b>	<b>19</b>	<b>10843</b>	<b>1036</b>	<b>1165</b>	<b>3641</b>	<b>15</b>	<b>310</b>	<b>22604</b>
<b>2J3KL</b>									
<b>TOTAL</b>	<b>5669</b>	<b>19</b>	<b>11333</b>	<b>1153</b>	<b>1193</b>	<b>4403</b>	<b>26</b>	<b>583</b>	<b>24379</b>

Notes:

1. Other Foreign catch in 3L = 14300 t (10750 t. EEC)
2. Additional Recreational fishery = 5000 t.

2J3KL Total all fisheries = 43679

Table 4. Commercial sampling for cod in Div. 2J3KL during 1992.

Div.	Qtr.	Gear	No. aged	Mo.	No. meas.	Month	Total
3K	1	OT	257	Jan	6851	506	506
				Feb	224	98	98
				Feb (Fra)	2011	273	273
			275		9086		857
3L	1	OT	726	Jan	33353	6225	6225
				Jan (Fra)	1169	310	310
				Feb	11932	7050	7050
3KL	1		726		46454		14585
3L	3	OT	395	Aug	219	24	23
				Sep (GN)	325	56 (3KL)	183
					544		266
3KL	1-4	Offs.	1378		56084		17768
3L	2	Trap	497	May	5750	155	155
		GN		May	56	240	348
	3	Trap	480	Jun	6599	468	1010
		GN		Jun	246	508	641
							1651
3KL	1-4	Ins.	977		12651		11611 <sup>a</sup>
2J3KL	1-4		2355		68735		29379
2J3KL	1-4	All countries					43679 <sup>b</sup>

<sup>a</sup>Includes additional estimate of 5000 t from the recreational fishery.<sup>b</sup>Age compositions of foreign catch (14300 t) was estimated using 3L, Qtr. 1, data from Canada and France.

Table 5. Estimated catch, Average Weight and Average Length at Age from the Commercial Fishery for Cod in NAFO Divisions 2J3KL during 1992.

Age	Average		Catch		
	Weight	Length	Mean	Std. Err.	C.V.
2					
3	0.292	32.377	430	47.49	0.11
4	0.577	40.271	3860	232.95	0.06
5	0.808	44.967	14535	460.92	0.03
6	1.192	51.060	12211	456.19	0.04
7	1.731	57.640	4526	250.16	0.06
8	2.050	60.812	1372	128.32	0.09
9	2.657	66.149	376	44.48	0.12
10	2.243	62.410	199	47.98	0.24
11	2.676	66.641	104	19.17	0.18
12	4.952	81.110	18	8.67	0.47
13	5.343	83.618	9	0.99	0.11
14	7.022	89.457	4	1.21	0.29
15	10.112	103.000	0.00	0	

Table 6. Offshore (mobile and fixed gear) and inshore (fixed gear) catch-at-age (Nos.  $\times 10^3$ ) and mean weights at age (kg), by NAFO Division for the fisheries in Divisions 2J+3KL during 1992.

Age	Offshore		Inshore	
	<u>Mobile gear</u>	<u>Fixed (GN)</u>	<u>Inshore</u>	<u>Fixed gear</u>
	3K	3L	3KL	2J3KL
<u>Catch numbers</u>				
3	17	354		58
4	93	2158	7	1602
5	505	10482	34	3513
6	319	9891	60	1941
7	97	3163	17	1250
8	19	1104	1	248
9	13	313		49
10	4	187		8
11	4	100		
12	11		7	
13		2		7
14		4		
15				
#				
Wt.	857	31028	183	11611
<u>Mean wts.</u>				
3	0.33	0.27		0.41
4	0.43	0.49	0.83	0.71
5	0.64	0.76	1.25	0.98
6	0.84	1.13	1.52	1.57
7	1.17	1.59	1.83	2.14
8	1.77	1.89	2.23	2.78
9	1.79	2.44	3.60	4.24
10	1.89	2.23		2.56
11	2.38	2.69		
12		4.23		6.22
13		4.70		5.55
14		7.04		
15				

7. CATCH NUMBERS AT AGE (THOUSANDS) FROM THE COMMERCIAL COD FISHERY IN NAFO  
DIVISIONS 233KL FOR THE YEARS 1962-92

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
2	301	1446	2872	85	819	790	288	59	6819	33	236	0	473	420	15	108	0
3	8666	5746	19338	5177	14057	15262	6142	4330	18104	12876	6737	3963	3231	3968	13767	7128	1323
4	26194	27577	27603	28709	65992	77873	94291	39626	60102	71557	79809	40785	13201	14101	33727	65510	17556
5	64337	60234	57757	46800	93687	100339	205805	100858	82357	95384	116562	94844	34927	25370	28049	40462	39206
6	58163	118112	60681	66946	62812	96759	150541	163228	101249	98111	76196	59503	74403	34426	20898	12107	20319
7	47314	58996	100147	64360	59312	54996	83808	107509	85696	57865	55984	35464	60539	39105	16811	5397	7711
8	27521	29349	50865	68176	30423	38691	39443	52661	29218	25055	29553	27351	35687	36485	16022	3396	3078
9	20142	15520	20892	33819	23844	17146	23171	19651	10857	11732	11750	14153	18854	13421	10931	2730	1530
10	18036	11612	12264	14913	8762	16084	10984	12370	3825	4470	6393	7566	10492	7514	4637	1381	1083
11	10444	8248	8698	6945	4528	5949	5591	6389	2000	2223	2987	3815	5818	2315	1462	532	437
12	9468	4204	6352	3729	2280	3367	5249	4479	1200	1287	1660	2153	2934	1179	631	296	219
13	7778	3942	4989	3948	1825	2108	1939	3004	507	1140	1388	1173	1078	808	292	149	105
14	5785	2933	4036	3730	1186	1529	1334	1557	224	720	725	450	652	372	251	75	62
15	4669	2928	2703	2722	967	685	818	622	214	355	748	278	249	165	100	42	40
16	3888	1737	1456	1859	806	424	610	567	244	474	606	309	338	82	50	21	21
17	3955	1263	1918	575	416	193	127	319	124	124	452	85	162	5	40	20	7
18	2161	1352	1154	971	279	107	89	100	32	128	136	27	113	8	64	14	8
19	232	328	501	183	486	72	83	46	10	148	195	38	45	22	30	2	2
20	403	182	312	226	178	211	26	99	34	78	36	8	20	1	20	6	7
2+1	319457	355709	384538	353873	372659	432585	630339	517474	402816	383760	392153	291965	263216	179767	147797	139376	92714
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992			
2	0	92	0	0	18	3	0	1	42	25	8	58	35	0			
3	1152	2554	2185	1702	2585	782	650	831	2329	2779	1696	7693	3111	430			
4	12361	12025	7172	31286	13616	14871	14824	15219	9217	14651	17639	40557	31654	3860			
5	37493	28814	13191	19003	42602	31760	36614	44168	32340	20184	21150	36410	53805	14535			
6	29202	30016	24800	14397	19028	38624	33922	45869	49061	47917	25212	22695	29553	12211			
7	10982	18017	22014	25435	12044	12503	28006	26025	28469	45725	38708	16390	9064	4526			
8	3460	4830	11848	16930	14701	7246	7050	14722	19505	18608	28499	17940	6164	1372			
9	1300	1217	3175	11936	8934	8910	3836	3104	5818	9026	8696	9156	4745	376			
10	757	520	779	1923	6341	4227	5162	2000	1346	4337	3640	2865	1696	199			
11	560	232	309	338	1018	2536	2905	1977	676	774	1695	1084	641	104			
12	183	229	195	156	248	451	1681	1101	873	422	572	478	250	18			
13	116	56	125	90	146	254	574	391	366	244	103	88	9				
14	51	65	48	153	41	48	107	116	200	223	180	98	39	4			
15	43	37	14	40	29	41	39	29	37	100	94	36	21	0			
16	38	13	28	12	11	30	20	18	22	32	43	25	9	0			
17	7	10	20	13	9	7	17	11	3	5	4	8	3	0			
18	7	14	5	4	6	7	1	9	1	10	9	7	2	0			
19	4	4	5	0	2	4	3	2	4	5	0	1	2	0			
20	9	10	5	0	3	3	5	2	0	5	1	0	0	0			
2+1	97725	98755	85918	123418	121326	122199	135096	155778	150334	165194	148090	155604	140882	37644			

8. AVERAGE WEIGHTS AT AGE (KILOGRAMS) FROM THE COMMERCIAL COD FISHERY IN MAFO DIVISIONS 233KL FOR THE YEARS 1962-92

**Table 9. CATCH BIOMASS AT AGE (TONS) FROM THE COMMERCIAL COD FISHERY IN NAFO DIVISIONS 2J3KL FOR THE YEARS 1962-92**

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	
2	42	202	402	12	115	111	40	8	955	5	33	0	52	109	4	10	0	
3	2946	1954	6575	1760	4779	5189	2088	1472	6155	4378	2964	1268	1131	1786	6195	3208	529	
4	14407	15167	15182	15790	36296	42830	51860	21794	35056	39356	42299	19169	8977	8884	20573	39306	12640	
5	56617	53006	50826	41184	82445	88298	181108	88755	72474	83938	74600	67339	31784	24355	26086	39248	40774	
6	71540	145278	74638	82344	77259	119014	185165	200770	124536	120677	82292	57123	82587	40623	27585	20098	32104	
7	78541	97933	166244	106838	98458	91293	139121	178465	142255	96056	85096	46103	76885	54356	29419	12575	18969	
8	58345	62220	107834	144533	64497	82025	83619	111641	61942	53117	62948	49232	55672	63484	33166	9577	10034	
9	53175	40973	55155	89282	62948	45265	61171	51979	28662	30972	33605	31137	38651	29660	24485	9446	6197	
10	57354	36926	39000	47423	27863	51147	34929	39337	12164	14215	21033	21336	28853	19612	13865	5358	4830	
11	39269	31012	32704	26113	17025	22368	21022	24023	7520	8358	11799	12170	18210	7732	5366	2543	2194	
12	39292	17447	26361	15475	9462	13973	21783	18588	4980	5341	6839	8160	10005	4315	2877	1814	1472	
13	47135	23889	30233	23925	11059	12774	11750	18204	3072	6908	6940	5314	5304	3862	1805	1089	851	
14	32049	16249	22359	20664	6570	3471	7390	8626	1241	3989	6757	3119	2869	1934	2056	630	460	
15	28528	17890	16515	16631	5908	4185	4998	3800	1308	2169	7031	2007	1576	858	977	370	328	
16	22667	10127	8488	10838	4699	2472	3556	3306	1423	2763	4175	2178	1859	448	561	247	236	
17	25470	8134	12352	3703	2679	1243	818	2054	799	799	6631	803	1226	43	498	213	81	
18	13117	8207	7005	5894	1694	649	540	607	194	777	1637	301	1251	74	714	172	71	
19	1534	2168	3312	1210	3212	476	549	304	66	978	1486	290	343	168	229	15	21	
20	2898	1309	2243	1625	1280	1517	167	712	244	561	629	140	349	17	349	105	112	
21	644926	590090	677428	655244	518248	593302	811698	774346	503047	475357	458793	327188	367583	262319	196809	146023	131904	
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992				
2	0	38	0	0	6	1	0	0	13	7	2	17	6	0				
3	530	1354	1202	902	1603	461	312	424	1001	1362	814	3231	1120	125				
4	9147	9259	5594	26280	11846	13086	10822	10958	6083	10695	13053	27984	19309	2239				
5	42367	33424	15433	22804	56235	39112	40275	45935	33310	21799	21785	38595	52191	11773				
6	48767	51327	40672	25483	33299	69137	48508	70638	64761	66125	36305	34042	41670	14531				
7	27016	42880	49091	53414	27460	28507	57692	48146	53237	76361	70836	31797	17040	7830				
8	12352	17195	33885	45034	38370	19637	18753	34597	37645	41124	58993	39827	13992	2813				
9	5733	6097	12097	36882	28410	26374	12390	9126	16290	22655	22957	22341	12479	1000				
10	3974	2855	4144	8038	22193	15429	17138	6940	4724	13184	10993	8767	5325	446				
11	3248	1559	1944	2082	4876	10854	11794	7513	3245	3382	6712	3881	2436	279				
12	1286	1802	1377	1122	1924	2792	7649	4999	4051	2317	3095	2237	1240	89				
13	1039	469	915	720	816	1225	1786	3065	2244	2397	1830	642	483	48				
14	436	652	480	1279	375	492	1035	826	1226	1918	1663	884	297	28				
15	407	418	126	314	308	469	443	341	316	976	945	352	243	0				
16	407	180	323	95	116	348	225	202	297	311	402	315	99	0				
17	92	107	210	125	118	122	216	156	27	63	63	124	38	0				
18	94	225	56	52	96	91	12	145	22	160	168	95	26	0				
19	62	48	49	0	19	61	43	25	71	83	0	17	26	0				
20	133	114	63	0	48	38	97	31	0	55	18	0	0	0				
21	157091	170005	167661	224625	228118	227236	229191	244066	228564	264975	250632	215096	168021	41200				

Table 10. Cod abundance estimates (thousands of fish) from research vessel surveys in NAFO Division 2i (Fall).

Depth range (m)	Stratum number	area sq. mi.	Gadus	Gadus	Gadus	Gadus	Gadus										
		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	
101-200	201	1427	3071	1500	5749	8377	16492	16246	10633	15246	21638	6784	54	0	0	0	0
	205	1623	8039	1574	787	4550	21755	13547	25330	8159	9481	7841	13707	144	68	0	0
	206	2582	1634	1236	2104	6220	5848	8694	30077	1264	29985	4222	21638	9353	211	420	485
	207	2246	5100	2664	3406	5479	9094	13024	14210	27850	6310	9027	4504	711	1740	0	225
Total		8078	17944	6974	12046	24626	53419	51511	80050	64019	67414	21874	39903	10238	2019	420	710
201-300	212	440	462	396	5681	2378	1833	1866	750	7663	2626	(746)	0	0	0	0	0
	209	1608	3531	21485	3410	10099	7681	29567	3863	8599	28567	13594	6711	14318	583	1224	338
	210	774	4169	2740	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	10680	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	2069	337	255
	228	1428	(3509)	6780	8254	10701	2187	2269	1853	352	12702	1164	2272	3001	2358	20652	236
	234	508	563	267	1506	534	2250	4698	3005	2339	5415	1760	1125	0	0	0	25
Total		6924	76899	66171	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	24
	208	448	247	1480	202	303	1368	1749	224	1043	2051	3918	757	6356	1073	146	359
	211	330	5450	237	4659	1746	2415	1325	297	776	1090	1709	1647	12299	3109	10562	1181
	216	384	(152)	202	3603	86	14	10	331	115	94	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	530	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)	(118)	(163)	1342	142	540	1422	0	518	425	1860	13	13	0	18
	217	268	(1)	(1)	(1)	0	0	0	(5)	0	0	50	0	0	0	13	0
	223	180	(1)	(1)	(1)	0	0	0	0	0	0	0	14	7	68	32	5
	227	686	(98)	(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	238	567	1734	32
Total		1906	397	305	432	1500	269	1701	1493	32	569	820	2133	1402	5094	3116	149
501-750	Total	1591	nf	nf	nf	50	50	0	33*	12	249	125	218	100	936	6350	50
751-1000	Total	517	63.64	50.47	64.82	0*	0*	0*	0*	0	14	0	0	0*	0	0	48
Total **	mean no. per tow	102999	81632	104895	94961	117410	160291	139339	120092	301831	117446	137209	105601	35865	46264	4239	
Unadjusted total for all sampled strata		98643	81130	104461	95010	117459	180290	139366	120103	302093	117569	136882	105649	34801	52613	4336	
Upper limit		135651	129189	139530	162767	151075	744685	184179	154187	468811	163856	183268	149747	51757	126298	6077	
Lower limit		61634	32470	69392	27253	83843	-34105	94553	86020	135374	71282	90096	61651	21845	-21071	2595	

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

nf = not fished

\* not all strata fished

\*\* 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 11. Cod biomass estimates (t) from research vessel surveys in NAFO Division 2J (Fig.).

Depth range (m)	Stratum number	Stratum area sq.m.	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					
10-200	201	1427	4847	3256	1319	18085	16764	12033	14052	24712	9158	84	0	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	6533	1442	39133	13186	34327	5313	33617	13183	107	221	252
	207	2246	8209	482	7738	12284	12612	16136	27954	7864	11883	7613	445	1770	0	101	101
Total	8078	31330	12788	24582	51561	78446	58558	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	4369	12810	22275	18351	53925	7678	12245	37415	19297	11006	13957	228	746	154
	210	774	5572	5771	5810	823	10428	97578	9448	782	25147	360	4832	13175	2115	2932	161
	213	1725	34627	3100	34048	5622	8073	4748	9401	16121	27994	13819	20289	36317	6159	2227	83
	214	1171	20791	13231	25096	9669	10903	6944	33853	24715	61918	62937	62313	19424	4369	176	79
	216	12710	58780	19446	64301	9461	60996	12584	10471	10132	131984	14279	65032	40	3013	228	123
	228	4428	(5671)	12374	16972	23904	4357	2215	3012	299	15820	1749	4845	4562	3096	11877	121
	234	608	1030	553	3699	192	464	5310	3657	2402	7176	2790	2521	0	0	0	10
Total	8924	12380	124893	175720	166938	123493	97162	80468	68146	317789	119764	161974	87499	18980	18185	731	
301-400	203	480	(649)	(641)	7467	230	341	1349	2054	192	2982	2798	4396	0	0	10	17
	208	448	438	3341	631	908	3750	3853	454	1454	2589	6120	1816	5189	682	82	185
	211	330	10285	5685	9384	4747	6490	3016	954	1400	1462	3573	3412	262714	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	15	22	281	15	463	91	1199	656	84	28
	229	567	349	7394	3850	144	467	516	106	1397	816	96	786	2525	1641	916	116
Total	2650	14031	18198	33646	7764	13934	8183	4498	4904	8006	18512	11436	36543	5189	8074	964	
401-500	204	354	(261)	(256)	(397)	349	316	1506	2192	0	829	683	3514	2	3	0	9
	217	248	(3)	(3)	(7)	0	0	(7)	0	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	35	1584	121	24	0	497	334	410	465	925	16
Total	K908	704	695	1089	3496	667	329	2320	24	930	1377	4004	2899	6798	2031	92	
501-750	Total	1591	nf	nf	nf	137	140	0	58*	31	515	202	388	269	1097	3817	37
751-1000	Total	517	nf	nf	nf	0*	0	0	0	27	0	0	0*	0	0	0	28
Total**	172443	158574	235005	228757	216540	267123	181681	136693	404642	175466	249135	140229	32853	28511	2142		
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		
Upper limit	288826	255091	314420	424722	288881	1174856	241662	174398	667127	248495	336941	234034	51160	74147	3110		
Lower limit	101392	67384	163412	33067	144479	640615	121800	990448	143243	102841	169229	48162	16739	9493	1304		

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

nf = not fished

\*\* 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 12. 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	GADUS	GADUS	GADUS	GADUS											
101-200	610	1455	(2031)	(2855)	(1580)	(1699)	(1407)	(2063)	4806	6458	12975	2482	1074	680	673			
	619	1588	(521)	(751)	(396)	(429)	(348)	(530)	1243	1755	2593	6039	221	671	72			
Total	3043	2552	3606	1976	2128	1755	1983	1984	1985	1986	1987	1988	1989	1990	1991			
201-300	620	2709	17749	26203	15206	12689	4248	1750	22825	1728	31158	6449	4236	9468	606	378		
	621	2859	14555	25646	2739	7453	6477	4603	6070	1531	4654	930	2854	2512	441	129		
Total	13121	23166	627	3486	2470	978	652	602	234	769	520	2733	1128	100	117	186		
301-400	622	447	727	2265	5076	3171	2494	8321	(2236)	1029	1158	1879	12516	604	2684	1631		
	634	1648	4057	18157	13651	12455	1384	1486	6229	7112	99787	18660	4676	71314	625	21400	136	
Total	1274	3921	1492	3706	4743	3175	1227	3275	874	3727	629	1033	710	319	192	104		
401-500	635	1495	1820	2446	6051	3695	7001	2603	3413	928	3440	1482	2312	1136	109	36		
	636	132	2634	5778	3909	4744	6409	878	19052	3824	11939	3781	6936	3212	816	708	28	
Total	1262	58484	10653	50957	594336	43653	58398	64086	17578	156465	34244	35332	96376	8333	25675	953		
501-750	623	1027	642	2981	7693	876	1657	5769	11764	1015	1040	3855	1172	4877	360	642		
	625	850	1340	2488	156	1021	2169	2235	94	1276	574	1723	808	2760	1340	3238	85	
Total	3191	759	102	1433	2891	1008	1371	570	1955	1140	1626	624	10451	1173	317	116	69	
751-1000	626	1085	1433	2891	1008	1371	570	144	50	412	562	459	272	1348	237	425	1249	
	629	495	724	449	388	316	225	(172)	306	414	82	65	177	191	2151	425	655	37
Total	630	544	(255)	4283	3044	2944	306	3552	3748	5954	10059	26177	15375	3660	39354	204	82	27
1001-1250	633	2720	8081	3246	958	5699	13443	3323	9189	9080	7398	4437	41590	91652	46720	36933	1295	
	639	1463	1603	3075	741	1303	2921	4095	1304	2128	3423	1459	1977	2320	7264	41601	1084	
Total	10621	21691	2456	1858	19345	17983	32630	25702	27120	53576	32799	15826	92436	153187	101022	299	4110	
1251-2000	632	632	(306)	(234)	356	190	142	308	59	332	47	237	2499	1020	158	190		
	627	184	(478)	(686)	(365)	104	152	193	178	69	1262	341	284	1304	4977	403	266	
Total	631	202	(571)	(801)	(430)	162	0	523	18	103	68	752	1585	8185	3564	2587	211	
2001-3000	640	198	(24)	(37)	(18)	0	0	(25)	7	10	7	7	59	632	52	352	4414	
	645	204	(19)	(29)	(13)	0	6	15	15	(32)	31	15	505	103	0	16	110	
Total	3430	1388	1988	1050	622	347	891	526	276	1701	1178	2180	13125	9716	3500	5096		
Unadjusted total for all sampled strata	917	nf	nf	nf	nf	0	0	16	0	0	nf	44	nf	nf	25	33	44	
Upper limit	1340	nf	nf	nf	nf	0	0	nf	0*	0	nf	0*	nf	nf	23	10	0	
Total **	84311	134903	72521	81732	63717	29.01	43.04	43.88	23.52	102.75	32.58	24.99	95.497	8.29	59.34	4.71		
Mean no. per tow	38.39	61.43	33.02	37.22	43.04	43.88	23.52	102.75	32.58	24.99	95.497	8.29	59.34	4.71				

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

nf = not fished

\* not all strata fished

\*\* 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 3K (Fall).

Depth range (m)	Stratum number	Stratum area sq. mi.	GADUS	GADUS	GADUS	GADUS	GADUS	GADUS								
101-200	618	1465	(2016)	(3623)	(2319)	(2833)	(1891)	(2600)	9333	10318	18917	3979	97	209		
	619	1588	(681)	(1256)	(790)	(813)	(637)	(890)	3004	652	811	1164	469	202		
Total	3043	2696	4879	3109	3196	2528	1983	1983	101-100	117-118	132-133	146-147	160-161	175-176		
201-300	620	2709	32708	55286	33499	33403	9859	33248	41781	4190	46251	11244	2721	2293	174	
	621	2859	25889	63106	5939	10935	1764	6750	14149	2229	7283	887	4361	1401	59	
Total	3043	2696	4879	3109	3196	2528	1983	1983	10970	19728	6143	566	463	206	54	
301-400	622	1027	1293	7622	16746	2176	4849	12071	20190	2300	2182	7108	1041	3053	1665	
	623	650	1026	5538	4626	2640	4817	3499	1397	2935	1446	4490	2649	3446	657	
Total	3043	2696	4879	3109	3196	2528	1983	1983	3932	1653	1735	12331	1914	327	162	
401-500	624	668	29936	40534	1742	7973	5365	1586	959	1153	232	1112	284	1597	712	
	625	447	873	3896	1065	7866	5721	13992	(4163)	1667	2072	2726	16458	514	1726	1217
Total	3043	2696	4879	3109	3196	2528	1983	1983	2904	23573	11703	1161	163994	11699	432	112
501-750	626	1027	1293	7622	16746	2176	4849	12071	20190	2300	2182	7108	1041	3053	1665	
	627	650	1026	5538	4626	2640	4817	3499	1397	2935	1446	4490	2649	3446	657	
Total	3043	2696	4879	3109	3196	2528	1983	1983	3932	1653	1735	12331	1914	327	162	
751-1000	628	1027	1293	7622	16746	2176	4849	12071	20190	2300	2182	7108	1041	3053	1665	
	629	650	1026	5538	4626	2640	4817	3499	1397	2935	1446	4490	2649	3446	657	
Total	3043	2696	4879	3109	3196	2528	1983	1983	3932	1653	1735	12331	1914	327	162	
401-500	630	544	(531)	109	174	939	(498)	847	708	230	84	327	416	3726	191	
	631	279	6379	8073	8406	8482	6558	10861	16779	45140	26825	6307	40430	50281	39839	
Total	3043	2696	4879	3109	3196	2528	1983	1983	3932	1653	1735	12331	1914	327	162	
501-750	632	632	(457)	(830)	(527)	257	54	287	646	79	451	47	353	2249	416	
	633	632	(457)	(830)	(527)	257	54	287	646	79	451	47	353	2249	416	
Total	3043	2696	4879	3109	3196	2528	1983	1983	3932	1653	1735	12331	1914	327	162	
751-1000	634	204	(52)	(99)	(115)	714	17706	1043	2330	5511	13854	13234	12674	6547	126506	
	635	1463	2204	5734	1949	3225	8335	9295	2684	3349	5372	2526	3185	1589	5031	
Total	3043	2696	4879	3109	3196	2528	1983	1983	3932	1653	1735	12331	1914	327	162	
401-500	636	632	(457)	(830)	(527)	257	54	287	646	79	451	47	353	2249	416	
	637	632	(457)	(830)	(527)	257	54	287	646	79	451	47	353	2249	416	
Total	3043	2696	4879	3109	3196	2528	1983	1983	3932	1653	1735	12331	1914	327	162	
501-750	638	632	(457)	(830)	(527)	257	54	287	646	79	451	47	353	2249	416	
	639	632	(457)	(830)	(527)	257	54	287	646	79	451	47	353	2249	416	
Total	3043	2696	4879	3109	3196	2528	1983	1983	3932	1653	1735	12331	1914	327	162	
751-1000	640	632	(457)	(830)	(527)	257	54	287	646	79	451	47	353	2249	416	
	641	632	(457)	(830)	(527)	257	54	287	646	79	451	47	353	2249	416	
Total	3043	2696	4879	3109	3196	2528	1983	1983	3932	1653	1735	12331	1914	327	162	
Unadjusted total for all sampled strata	143132	259102	153728	175023	133310	172458	175308	86030	356120	12338	75437	290335	193130	125576	8974	
Upper limit	216442	423266	201839	237799	156091	216591	228070	107721	796817	180376	285967	542668	382515	125425	9040	
Lower limit	69822	91937	105616	112247	107629	128325	122545	643398	64576	66340	-136093	36386	3812	46418	29925	

Note: numbers in brackets are estimates for non-sampled strata and only 0-500 m strata are used in deriving these estimates.  
 nf = not fished  
 \* not all strata fished  
 \*\* total and mean wgt. per tow include sampled and estimated values for depths to 600 meters. Estimates were derived from a multiplicative model using survey data to 1991.

Table 14. 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 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
31-60	360	2071	4923	2332	6335	15455	13698	15197	4785	3902	3327	1498	1825	505
	363	1780	802	1960	13050	19374	40659	2439	6770	9193	12159	12259	1377	2517
	371	1121	106	1010	4679	8018	1058	151	1330	1963	106	2844	168	280
	372	2460	14256	8679	37532	27415	21453	6039	21406	5128	8956	54511	781	585
	384	1120	168	273	6025	20303	452	52	8589	336	67	19296	103	40
	Total	8552	20254	14254	67621	90565	77320	23878	42880	20622	24614	90407	4254	3927
61-100	328	1619	(299)	(375)	(554)	285	385	4598	257	928	309	114	76	274
	341	1574	1930	975	1359	1512	945	1287	144	266	74	217	236	79
	342	565	381	1039	274	439	205	219	176	132	44	417	66	29
	343	525	897	(223)	328	2089	236	617	131	210	13	236	53	158
	348	2120	1724	3310	1953	7002	1284	1999	1008	1194	1432	984	557	517
	349	2114	2184	1492	1622	8059	3047	2739	681	2267	730	1111	1587	32
	364	2817	963	1113	1629	8162	1774	964	1012	2145	442	2397	159	169
	365	1041	8693	2090	578	8400	684	1583	821	376	234	196	547	104
	370	1320	173	413	727	7799	861	248	380	256	66	357	66	166
	385	2366	44	309	318	1827	118	702	197	27	16	354	106	212
	390	1481	37	111	111	2483	48	241	764	125	79	111	0	37
	Total	17452	17295	11460	9453	48057	9287	15197	5271	7914	3439	6493	3453	1776
101-150	344	1494	2075	5047	803	3701	2978	2464	1654	977	881	2093	336	1009
	347	963	2706	295	204	2976	576	1290	553	2966	1476	7600	148	74
	366	1394	597	8022	4447	6221	18207	23099	9433	23992	6278	2703	5454	14704
	369	941	2669	1371	2525	2803	1960	21671	5194	3203	418	866	4408	334
	386	963	861	563	(1443)	1513	1269	5737	1107	1004	1550	2287	49	123
	389	821	(933)	1756	(1622)	811	961	985	3374	1017	1263	801	1335	0
	391	282	(72)	96	635	32	635	95	169	32	64	191	28	7
	Total	618	14513	19769	13816	18057	26586	55341	21484	33191	11930	16541	11758	16251
151-200	345	1432	2015	3637	2929	2300	4658	6105	3386	4208	2319	2826	618	242
	346	855	5822	2337	4389	1731	3441	5089	11834	10259	4091	4523	10631	10783
	368	334	136	1429	(2645)	602	2871	6168	1617	1580	928	4162	9540	10568
	387	718	808	3000	(1797)	3072	1263	10618	880	377	306	1590	1046	683
	388	381	(263)	253	(460)	628	461	(446)	149	339	935	420	271	135
	392	145	(20)	147	33	103	.60	16	5	38	16	65	47	4
	Total	3855	10244	10803	12263	8336	12744	27442	17871	16801	8594	13586	22153	22415
201-300	Total	1142	nf	20*	nf	410	90	0*	nf	nf	nf	180*	404	541
301-400	Total	804	nf	nf	0*	0*	0	0*	nf	nf	nf	0*	13	0
Total **		62303	56266	103140	165002	125933	121853	87504	78420	48577	127023	41616	44369	
Mean no. per tow		22.67	20.38	37.37	59.78	45.62	44.14	31.7	28.41	17.6	46.02	15.08	16.07	
Unadjusted total for all sampled strata		60719	55689	94623	166427	126027	121411	87505	78427	48578	127207	42036	44909	
Upper limit		63412	67092	123050	197373	176608	169896	109122	98525	68582	185198	53941	68984	
Lower limit		38025	44285	66196	133482	76446	72925	65889	58329	31575	69216	30131	20834	

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

nf = not fished

\* not all strata fished

\*\* 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 15. 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
31-50	360	2071	6244	3848	8463	16498	11219	21047	6486	8216	4815	3270	3165	964
	363	1780	852	2009	17993	20017	40414	4606	11261	15379	13532	14606	2065	2815
	371	112	137	1363	6126	11210	1304	89	2710	4404	231	4905	230	398
	372	2450	20737	6882	44364	27045	29915	11255	40873	9964	13626	99532	1636	778
	384	1120	112	1090	594	27463	583	53	13690	911	76	33264	293	47
	Total	8552	28082	15192	82887	102233	83435	37049	75020	38874	32280	155578	7389	5022
51-100	328	1519	(334)	(370)	(699)	299	656	3128	131	1215	437	130	84	930
	341	1574	2446	901	1949	1760	967	1793	309	561	69	582	463	87
	342	585	834	981	263	736	205	233	167	237	60	257	166	65
	343	525	1489	(237)	661	2261	99	690	194	269	39	234	30	138
	348	220	2681	4249	3125	11537	1996	2384	1512	1973	1312	1026	645	600
	349	284	3604	3174	2266	8267	3856	3211	1069	3835	1238	1681	2444	37
	364	2817	1932	1800	1946	4536	1419	1298	1521	3309	773	2536	482	256
	365	1041	17904	3702	961	3624	977	1612	1087	1035	316	205	1288	1589
	370	1920	300	446	184	7891	597	69	842	562	116	520	160	332
	386	2356	38	43	109	1886	94	1096	961	326	64	711	124	278
	390	1481	9	58	852	1130	9	35	277	204	108	65	0	26
	Total	17452	31171	15931	14925	43917	10864	15448	8080	13526	4532	7947	5906	4237
101-150	344	1494	3869	770	1682	6121	4010	3623	2019	897	854	1485	140	760
	347	983	4550	4805	367	5731	996	1833	701	3852	2332	5735	122	20
	366	1394	9313	1920	8999	7101	27549	34160	15868	39741	8412	3593	6226	15681
	369	961	7755	2290	5849	3962	4557	33585	12236	6341	2034	1683	6328	351
	386	983	1484	1430	(3892)	2546	4162	13630	2859	4044	4007	5653	49	143
	389	821	(1428)	3428	(2791)	2737	2521	1723	1733	704	2009	1875	907	0
	391	282	(63)	487	189	79	325	370	70	6	23	165	15	1
	Total	6918	28392	32061	26539	28277	44120	88924	35496	55585	19671	20189	13787	16966
151-200	345	1432	4703	7686	6443	3673	6104	9106	5375	7693	4028	3034	620	222
	346	855	12012	4212	7746	3003	5806	7670	19771	18031	7978	6309	10622	11524
	366	334	5948	3604	(7481)	1222	6011	12300	5353	4319	3165	7317	11827	12239
	387	718	1334	926	(5379)	7465	4066	20225	2740	1289	476	8644	1733	820
	388	341	(415)	46	(815)	616	1961	(692)	115	366	1362	1066	258	125
	392	145	(27)	220	109	68	106	11	8	41	22	120	30	1
	Total	3856	24439	26399	27973	16047	26033	49904	33362	31739	17031	26490	24990	24931
201-300	Total	1142	nf	20*	nf	1224	721	0*	nf	nf	nf	522*	647	787
301-400	Total	804	nf	nf	0*	0*	0	0*	nf	nf	nf	0*	32	0
Total **		112086	88586	152325	190480	164451	191326	151936	139727	73512	210203	52073	49718	
Mean wgt. per tow		40.6	32.09	55.18	69	59.57	69.31	55.04	60.61	26.63	76.14	18.86	18.01	
Unadjusted total		109619	87997	131268	191702	165169	190732	161936	139726	73514	210725	52750	50506	
Upper limit		153246	105967	176408	226109	213267	264592	191200	172522	92871	319223	67681	77416	
Lower limit		66392	70027	87127	167294	117071	116672	112672	106929	84156	102228	37820	23596	

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

nf = not fished

\* not all strata fished

\*\* total and mean wgt. 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 16. 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
31-50	360	2071	1373	7756	2798	829	1221	15883	5893	6685	32355	9836	2199	369	71
	363	1780	2378	7649	1817	3296	1924	7182	7429	11194	14621	3982	2119	363	59
	371	1121	477	1699	2917	0	189	8061	926	1647	1178	1501	996	16483	17
	372	2460	9022	6135	3293	5032	1477	27099	12451	9290	13346	4281	1794	203	18
	384	1120	56	2711	1555	28	42	98	1906	2174	387	280	84	147	0
	Total	8582	13306	25850	12380	9185	4853	68323	28605	30990	61887	19880	7192	16665	166
51-100	328	1519	(104)	296	(243)	0	342	257	443	794	285	0	1124	76	0
	341	1674	325	827	1024	1004	2150	3505	1661	2599	8330	1669	591	59	0
	342	685	922	132	417	(132)	278	586	454	307	176	454	176	0	29
	343	525	857	768	1399	887	2374	1103	719	381	801	1340	105	99	39
	348	2120	2361	3687	3455	887	2467	4986	5450	10702	8391	4367	1345	60	18
	349	2114	4628	4035	2997	895	3729	7016	6767	4616	5951	11148	1092	175	53
	364	2817	899	4705	2996	1128	1304	5821	3483	8054	5286	7250	2115	308	0
	365	1041	391	2481	1035	977	4689	1797	1516	5798	5236	2683	430	59	20
	370	1320	363	817	1486	0	248	7394	805	4742	2715	4013	212	11593	0
	385	2356	89	783	3139	59	0	2087	258	514	849	3493	611	4863	35
	390	1481	1056	2223	1223	389	139	358	97	79	0	125	22	67	19
	Total	17452	11676	20754	19415	6058	17720	34910	21663	38596	38020	36542	7823	17359	213
101-150	344	1494	11607	15901	7947	29001	9168	696	4864	449	841	5239	299	45	79
	347	983	6272	5737	10212	3247	10773	1688	5519	2410	5003	1439	221	92	18
	366	1394	(9200)	11118	5232	56749	18521	41420	20339	13214	4133	10215	3645	(4238)	52
	369	961	677	2813	6757	7286	1876	10950	9534	6810	10929	5134	1890	(1206)	36
	386	983	615	2749	2066	2693	812	5372	1783	3011	3320	6924	14920	6911	37
	389	821	1130	1464	5259	1140	2712	8677	1380	1150	1335	1430	447	760	41
	391	282	201	1117	1767	688	191	476	603	286	127	191	2593	445	0
	Total	6918	29602	40979	39230	100804	44053	69258	44022	27330	25688	30572	24015	13696	263
151-200	345	1432	6321	1800	6385	15264	2714	2107	13160	21498	7820	12860	2069	(1496)	125
	346	865	(1676)	1380	1126	2727	801	714	16999	6324	4058	3360	52513	(760)	276
	368	334	(374)	56	113	1880	639	1492	4250	5382	238	1270	14491	(167)	2269
	387	718	198	266	108	296	1419	24226	5686	189	652	2878	43939	17660	8192
	388	361	257	190	41	393	989	486	2520	14	244	289	13603	1805	601
	392	145	44	178	5	195	218	1818	403	5	234	98	2961	528	11
	Total	3855	7870	3860	7777	20766	6780	30845	43018	33412	13146	20755	129576	22416	11374
201-300 301-400	Total	1142	nf	nf	nf	204*	nf	329	nf	nf	nf	nf	nf	3498*	26821
	Total	804	nf	nf	nf	nf	nf	0	nf	nf	nf	nf	nf	144*	26
Total**		62452	91444	78804	136800	73406	193336	137303	130329	138742	107747	168602	70035	12016	
Mean no. per tow		22.62	33.12	28.84	49.65	26.59	70.03	49.74	47.21	50.26	39.03	61.07	25.37	4.35	
Unadjusted total for all sampled strata		51099	91444	76561	136875	73406	193665	137300	130329	138741	107747	168604	65810	38863	
Upper Limit		72936	113863	93294	267984	94173	265913	161283	179958	177848	126081	263989	110424	360848	
Lower Limit		29262	69024	63828	8766	52638	131418	113317	80599	99933	89414	73220	21196	-283142	

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

nf = not fished

\* not all strata fished

\*\* 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 17. Cod biomass estimates ( $t$ ) from research vessel surveys in NAFO Division 3L (Spring).

Depth range (fath)	Stratum number	Stratum area sq mi.	ATC 276 1978	ATC 290 1979	ATC 304-305 1980	ATC 317-318 1981	ATC 329 1982	WT 28-30 1985	WT 48 1986	WT 59-60 1987	WT 70-71 1988	WT 83 1989	WT 96 1990	WT 105-107 1991	WT 119-122 1992
31-60	360	2071	2108	13837	7124	2539	4775	31785	16344	19008	56567	22760	8359	1059	170
	363	1780	3923	11237	4182	7082	6721	14881	12152	19419	23096	8070	8270	1433	343
	371	1121	1492	2439	8148	0	789	15647	3184	4122	4005	4080	3282	25696	6
	372	2450	7015	8342	7448	7155	3978	44792	19171	22017	27917	12397	8961	883	69
	384	1120	19	3521	2480	308	231	284	3667	3681	844	549	578	381	0
	Total	8552	14557	39176	29382	17084	16494	107389	54518	68247	112429	47856	29470	29452	588
51-100	328	1619	(106)	518	(396)	0	893	74	838	1897	456	0	3577	59	0
	341	1574	1007	2468	3291	2038	8495	4735	8022	12076	16947	4772	3291	167	0
	342	585	3014	409	961	(277)	871	429	1639	604	307	483	509	0	2
	343	526	1791	1190	2936	946	4768	795	1602	1064	1346	1511	92	31	2
	348	2120	3551	7129	7856	1966	5709	7904	11590	33966	23118	9796	3956	229	3
	349	2114	8890	8800	7282	1321	10182	16006	27730	14008	17961	28008	1622	673	34
	364	2817	929	7884	7154	2361	3938	9837	9223	20326	13765	16200	10496	709	0
	366	1041	533	2953	2442	2090	6056	2160	3329	9791	8361	6262	1373	66	61
	370	1320	368	1046	2807	0	99	7064	3511	7679	5896	6663	980	12956	0
	388	2356	80	1118	6278	413	0	2064	424	1066	2133	3088	792	6810	41
	390	1481	796	2126	2798	500	217	261	406	503	0	197	63	367	37
	Total	17482	21054	35640	44202	11912	41228	51338	68214	102982	90270	77980	26752	21699	170
101-150	344	1494	20390	19398	10172	50712	19683	648	8032	1023	1121	5808	183	6	15
	347	963	8502	7705	16019	8043	21435	3416	10419	4919	8818	2386	312	15	22
	366	1394	(7733)	11509	5912	81497	21817	45178	30705	19201	7551	13832	5895	(4074)	35
	369	961	1000	2448	7406	9378	4959	19297	11488	11564	16889	9252	3960	(1318)	31
	386	983	252	2881	2351	4593	1279	3877	1906	4388	3274	6748	38420	6640	92
	389	821	1065	1098	6923	478	1664	6169	900	647	692	616	513	226	64
	391	282	356	1048	2054	1212	96	429	826	201	41	96	621	283	0
	Total	6918	39298	46087	50867	155913	70832	79014	64276	41923	38386	38737	49904	12562	269
151-200	345	1432	10700	4844	11674	29493	6060	2939	17444	28741	11340	18456	2048	(2323)	167
	346	865	(1660)	2137	2154	4307	1223	341	20427	8298	5203	4496	57484	(865)	213
	366	334	(542)	239	796	1761	809	1536	6412	7166	652	2603	18601	(281)	1407
	387	718	184	459	256	243	2353	21491	6665	195	520	2506	28531	9249	8121
	388	361	182	349	108	190	1321	346	1572	10	179	122	14910	1006	241
	392	145	66	189	0	128	256	2237	435	3	98	57	1162	179	10
	Total	3856	13334	8217	14988	36122	12022	28890	52845	44413	17992	28140	122736	13900	10169
201-300	Total	1142	nf	nf	nf	225*	nf	887	nf	nf	nf	nf	nf	3434*	16712
301-400	Total	804	nf	nf	nf	nf	nf	0	nf	nf	nf	nf	nf	258*	30
Total**		88251	129116	139428	221031	140580	266632	239860	257668	259082	192713	228864	77583	11177	
Mean wt. per tow		31.97	46.77	80.51	80.07	50.92	96.58	86.89	93.3	93.85	69.81	82.9	28.1	4.05	
Unadjusted total for all sampled strata		78212	129117	139030	220979	140678	267516	239857	257566	259080	192713	228865	72416	27919	
Upper limit		102912	165668	166966	407989	171827	338672	278798	321060	326467	226139	335403	141984	227097	
Lower limit		83613	102649	111095	33969	109329	196360	200917	194071	192693	156288	122327	2847	-171269	

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

mf =not fished

\* not all strata fished

\*\* total and mean wgt. 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 18. Biomass estimates ('000 t) of cod from the autumn research vessel surveys in NAFO Division 2J, 3K, and 3L.

**Table 19. MEAN NUMBERS PER TOW OF COD AT AGE FROM AUTUMN RV SURVEYS IN DIVISION 2J.**

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.00	0.00	0.00	0.36	0.00	1.06	1.99	0.52	0.06	0.03	0.08	0.75	0.24	0.12	0.01	0.00
2	3.34	0.50	0.31	1.54	4.16	3.09	14.10	5.30	1.51	2.28	0.41	2.55	12.85	1.39	1.29	0.06
3	9.66	7.45	1.37	1.32	3.06	18.26	16.83	16.75	9.06	8.49	1.93	2.63	8.09	8.64	3.35	0.85
4	29.14	13.75	11.46	4.48	2.29	6.42	25.91	16.55	22.07	31.24	4.43	4.62	5.87	4.06	16.09	0.47
5	13.33	27.80	16.81	20.37	4.22	4.47	16.46	26.70	13.65	70.31	24.93	7.74	5.69	2.14	5.48	1.07
6	2.93	9.52	16.19	20.80	17.01	4.28	8.85	10.19	16.54	41.29	25.16	25.28	7.85	1.50	0.99	0.14
7	1.36	2.11	2.31	12.34	15.23	13.24	4.54	2.46	7.32	21.61	7.37	29.34	13.26	1.07	0.56	0.01
8	1.23	0.77	0.73	1.79	9.63	11.65	12.34	1.55	1.26	8.71	5.29	5.49	9.01	1.96	0.35	0.00
9	0.96	0.61	0.50	0.52	2.00	7.91	5.61	3.50	0.86	0.72	2.21	3.91	1.28	0.97	0.26	0.00
10	0.53	0.44	0.28	0.38	0.51	1.33	3.56	1.50	1.18	0.66	0.38	1.92	0.67	0.21	0.14	0.00
11	0.20	0.24	0.28	0.24	0.08	0.36	0.74	0.66	0.43	0.60	0.05	0.31	0.33	0.06	0.02	0.00
12	0.10	0.11	0.11	0.29	0.14	0.17	0.24	0.32	0.22	0.35	0.18	0.14	0.11	0.04	0.03	0.00
13	0.04	0.13	0.04	0.09	0.15	0.10	0.11	0.05	0.03	0.11	0.08	0.08	0.00	0.00	0.01	0.00
14	0.06	0.21	0.08	0.31	0.21	0.22	0.13	0.02	0.02	0.11	0.09	0.02	0.00	0.00	0.01	0.00
1+1	62.88	63.64	50.47	64.82	58.68	72.55	111.40	86.10	74.21	186.50	72.57	84.78	65.25	22.16	28.59	2.60
2+1	62.88	63.64	50.47	64.46	58.68	71.49	109.41	85.58	74.15	186.47	72.49	84.03	65.01	22.04	28.58	2.60
3+1	59.54	63.14	50.16	62.92	54.52	68.40	95.31	80.27	72.65	184.19	72.08	81.49	52.16	20.65	27.29	2.54
4+1	49.88	55.68	48.79	61.61	51.46	50.14	78.49	63.52	63.59	175.70	70.16	78.85	44.07	12.02	23.94	1.65
5+1	20.74	41.93	37.33	57.12	49.17	43.72	52.57	46.97	41.52	144.46	65.72	74.23	38.20	7.96	7.84	1.22
6+1	7.41	14.13	20.52	36.76	44.95	39.25	36.12	20.26	27.87	74.15	40.80	66.49	32.51	5.82	2.36	0.15

**Table 20. MEAN NUMBERS PER TOW (ADJUSTED FOR MISSING STRATA) OF COD AT AGE FROM AUTUMN RV SURVEYS IN DIVISION 3K.**

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.00	0.00	0.18	0.01	0.22	0.83	0.26	0.01	0.35	0.38	1.14	1.79	1.08	0.02	0.03
2	0.25	0.13	1.01	1.25	1.71	3.36	3.23	0.65	2.41	0.90	2.43	14.36	3.82	2.05	0.34
3	2.59	2.13	1.37	5.14	1.66	7.29	5.58	2.96	4.84	2.15	4.12	15.80	18.77	5.59	0.95
4	11.29	14.46	1.98	3.22	4.72	6.17	9.64	4.56	24.10	3.88	3.18	15.91	18.07	24.42	0.78
5	13.76	23.80	11.16	3.51	4.65	10.88	7.77	6.21	29.07	9.38	3.91	11.98	12.00	17.25	1.78
6	6.31	14.15	12.19	11.72	2.61	3.33	7.98	3.09	20.18	7.26	5.36	10.53	8.75	5.92	0.66
7	2.02	3.63	2.64	8.48	5.50	2.25	2.96	2.98	10.33	3.48	2.89	11.60	6.01	2.32	0.13
8	0.94	1.82	1.27	2.63	5.36	3.96	1.48	0.92	6.22	2.44	0.97	6.62	6.65	0.93	0.03
9	0.59	0.44	0.47	0.48	1.56	3.07	2.37	0.69	2.37	1.25	0.46	3.00	2.17	0.55	0.00
10	0.46	0.38	0.32	0.23	0.60	1.07	1.43	0.64	0.79	0.62	0.27	2.18	0.66	0.25	0.00
11	0.03	0.26	0.03	0.19	0.16	0.38	0.59	0.54	0.98	0.32	0.07	0.94	0.24	0.01	0.00
12	0.09	0.06	0.19	0.19	0.07	0.16	0.28	0.16	0.68	0.17	0.09	0.35	0.06	0.02	0.00
13	0.03	0.04	0.07	0.06	0.07	0.10	0.06	0.25	0.11	0.03	0.26	0.00	0.01	0.00	0.00
14	0.03	0.12	0.13	0.11	0.12	0.23	0.21	0.05	0.18	0.23	0.07	0.17	0.00	0.01	0.00
1+1	38.39	61.43	33.02	37.22	29.01	43.04	43.88	23.52	102.75	32.58	24.99	95.49	78.29	59.34	4.70
2+1	38.39	61.43	32.84	37.21	28.79	42.21	43.62	23.51	102.40	32.20	23.85	93.70	77.21	59.32	4.67
3+1	38.14	61.30	31.83	35.96	27.08	38.85	40.39	22.87	99.99	31.30	21.41	79.35	73.39	57.27	4.33
4+1	35.56	59.18	30.46	30.83	25.42	31.56	34.82	19.90	95.15	29.15	17.30	63.54	54.62	51.68	3.38
5+1	24.27	44.71	28.48	27.60	20.70	25.38	25.17	15.34	71.05	25.27	14.12	47.63	36.55	27.26	2.60
6+1	10.51	20.91	17.32	24.09	16.05	14.51	17.40	9.13	41.98	15.89	10.22	35.65	24.54	10.01	0.82

**Table 21. MEAN NUMBERS PER TOW (ADJUSTED FOR MISSING STRATA) OF COD AT AGE FROM AUTUMN RV SURVEYS IN DIVISION 3L.**

I	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1 I	0.37	0.41	0.64	0.36	0.01	0.04	0.16	0.05	0.02	0.03	0.05	0.01
2 I	0.36	2.74	3.52	7.58	1.22	1.15	2.77	1.68	0.70	0.69	0.80	0.39
3 I	6.31	1.97	13.43	11.43	9.65	2.53	2.02	4.54	4.08	6.03	1.58	2.99
4 I	2.62	6.58	5.18	18.89	12.84	11.81	3.91	2.38	3.68	14.08	4.41	4.58
5 I	2.50	2.80	7.49	5.18	10.91	10.18	9.43	4.96	1.89	9.71	4.49	4.43
6 I	3.73	2.07	1.39	10.52	5.17	10.44	7.13	6.09	2.56	5.60	2.59	2.78
7 I	5.26	1.72	1.33	1.69	3.43	3.27	3.33	4.62	2.60	3.88	0.46	0.73
8 I	0.98	1.56	2.32	1.18	0.71	2.47	1.31	2.16	0.99	3.05	0.25	0.06
9 I	0.20	0.29	1.25	1.03	0.81	0.95	1.00	1.03	0.71	1.69	0.25	0.04
10 I	0.07	0.09	0.44	1.08	0.40	0.38	0.10	0.54	0.21	0.67	0.09	0.03
11 I	0.04	0.05	0.12	0.43	0.29	0.48	0.13	0.13	0.08	0.31	0.07	0.01
12 I	0.03	0.06	0.06	0.25	0.11	0.26	0.22	0.10	0.04	0.20	0.02	0.02
13 I	0.12	0.06	0.18	0.18	0.07	0.18	0.18	0.13	0.03	0.10	0.01	0.00
1+I	22.57	20.38	37.37	59.78	45.62	44.14	31.70	28.41	17.60	46.04	15.08	16.07
2+I	22.20	19.97	36.73	59.42	45.61	44.10	31.54	28.36	17.58	46.01	15.03	16.06
3+I	21.84	17.23	33.20	51.85	44.39	42.95	28.77	26.68	16.89	45.32	14.22	15.67
4+I	15.54	15.26	19.77	40.42	34.74	40.42	26.75	22.15	12.80	39.29	12.65	12.68
5+I	12.92	8.68	14.59	21.53	21.90	28.61	22.83	19.77	9.12	25.21	8.24	8.10
6+I	10.42	5.88	7.10	16.35	10.99	18.43	13.41	14.81	7.23	15.50	3.75	3.67

**Table 22. MEAN NUMBERS PER TOW (ADJUSTED FOR MISSING STRATA) OF COD AT AGE FROM SPRING RV SURVEYS IN DIVISION 3L.**

I	1977	1978	1979	1980	1981	1982	1985	1986	1987	1988	1989	1990	1991	1992
1 I	0.00	0.00	0.06	0.09	0.17	0.03	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00
2 I	0.91	0.08	0.08	1.90	0.50	1.73	1.39	0.25	0.42	0.28	0.30	0.46	0.22	0.08
3 I	4.15	3.65	0.84	0.88	8.98	1.57	12.17	3.44	2.39	5.15	4.17	7.74	2.47	0.97
4 I	5.96	6.82	9.19	3.42	7.19	9.28	18.23	12.62	5.24	4.50	8.25	18.52	7.26	3.93
5 I	4.63	5.43	13.94	10.46	6.40	2.35	16.44	12.73	13.43	7.48	3.51	13.17	7.27	5.94
6 I	2.16	3.51	6.50	8.44	10.96	2.97	8.25	9.27	12.62	16.68	3.31	4.79	4.12	1.79
7 I	0.65	1.58	1.54	2.13	11.17	4.17	8.16	4.39	6.68	8.03	8.88	4.61	1.22	0.47
8 I	0.67	0.51	0.46	0.77	2.97	3.09	1.72	3.49	2.34	4.10	6.64	5.76	1.00	0.10
9 I	0.44	0.43	0.12	0.15	0.77	0.93	0.76	0.77	1.83	1.47	1.85	3.30	0.97	0.02
10 I	0.15	0.25	0.19	0.07	0.25	0.20	1.08	0.65	0.67	1.21	0.76	1.35	0.36	0.05
11 I	0.10	0.19	0.08	0.12	0.08	0.07	1.20	1.11	0.48	0.34	0.64	0.59	0.34	0.00
12 I	0.06	0.13	0.04	0.07	0.08	0.05	0.40	0.70	0.61	0.40	0.15	0.34	0.10	0.00
13 I	0.05	0.03	0.03	0.02	0.04	0.12	0.16	0.23	0.38	0.35	0.21	0.26	0.04	0.00
14 I	0.02	0.02	0.04	0.04	0.00	0.03	0.06	0.08	0.10	0.27	0.35	0.17	0.01	0.00
1+I	19.96	22.62	33.12	28.55	49.55	26.59	70.03	49.74	47.21	50.26	39.03	61.07	25.37	13.35
2+I	19.96	22.62	33.06	28.46	49.38	26.56	70.03	49.74	47.20	50.26	39.03	61.06	25.37	13.35
3+I	19.05	22.54	32.98	26.56	48.88	24.83	68.64	49.49	46.78	49.98	38.73	60.60	25.15	13.27
4+I	14.90	18.89	32.14	25.68	39.90	23.27	56.47	46.05	44.39	44.83	34.56	52.86	22.68	12.30
5+I	8.93	12.07	22.94	22.27	32.72	13.98	38.23	33.43	39.15	40.33	26.31	34.34	15.42	8.37
6+I	4.30	6.65	9.00	11.81	26.32	11.63	21.79	20.70	25.72	32.85	22.79	21.17	8.15	2.43

Table 23. MEAN NUMBERS PER TOW OF COD FROM AUTUMN RV SURVEYS IN DIV. 2J3KL.

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.02	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
2	0.40	0.32	3.00	1.59	2.48	6.07	5.57	1.10	1.85	1.56	2.14	8.25	1.91	1.34	0.29
3	5.39	1.94	2.48	5.12	5.87	12.22	10.79	7.27	4.77	2.04	3.93	8.98	10.93	3.35	1.78
4	11.51	11.78	3.83	2.74	5.92	10.62	15.23	12.35	20.70	4.03	3.20	8.30	12.95	13.97	2.30
5	13.95	16.79	13.23	3.26	3.83	10.83	11.34	10.01	31.29	13.23	5.29	6.20	8.61	9.00	2.72
6	5.51	10.53	13.31	9.67	2.79	3.87	9.59	7.28	21.28	11.61	10.57	6.52	5.64	3.31	1.42
7	1.62	2.27	4.99	8.79	5.82	2.43	2.50	4.24	10.14	4.38	10.13	8.23	3.90	1.10	0.35
8	0.63	0.92	1.19	3.66	5.31	5.33	1.37	0.92	5.26	2.67	2.58	4.84	3.98	0.50	0.04
9	0.47	0.31	0.37	0.74	2.59	2.93	2.09	0.78	1.37	1.38	1.55	1.62	1.68	0.35	0.02
10	0.33	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
11	0.12	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
12	0.09	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
13	0.06	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
1+1	40.11	45.80	43.21	36.26	36.01	57.38	60.87	45.25	98.67	41.96	41.11	55.29	50.93	33.18	8.96
2+1	40.09	45.39	42.94	36.10	35.50	56.34	60.51	45.23	98.53	41.74	40.53	54.62	50.53	33.15	8.94
3+1	39.69	45.07	39.94	34.51	33.02	50.27	54.94	44.13	96.68	40.18	38.38	46.37	48.62	31.81	8.65
4+1	34.30	43.13	37.47	29.40	27.14	38.05	44.15	36.86	91.91	38.14	34.46	37.39	37.70	28.46	6.87
5+1	22.79	31.35	33.64	26.66	21.22	27.43	28.93	24.52	71.21	34.11	31.26	29.09	24.75	14.49	4.57
6+1	8.84	14.57	20.41	23.39	17.39	16.61	17.59	14.50	39.93	20.88	25.97	22.89	16.14	5.49	1.85

COEFFICIENTS OF VARIATION - PERCENT

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	25	18	33	34	23	46	26	64	28	38	33	22	25	56	53
2	27	22	39	22	23	28	17	16	18	24	12	15	16	24	19
3	21	17	53	22	18	19	16	20	16	15	17	23	17	28	18
4	21	22	38	20	14	23	16	18	24	13	21	36	21	29	29
5	24	26	27	24	17	26	20	16	31	16	19	44	31	27	34
6	26	32	28	29	19	28	15	14	35	18	18	37	38	25	32
7	24	33	24	29	20	24	15	12	36	18	17	32	40	28	31
8	22	32	21	32	18	25	14	9	33	18	14	31	41	27	31
9	21	25	22	28	16	22	13	9	32	16	14	36	37	26	50
10	20	26	24	26	11	25	12	9	29	17	14	47	35	29	33
11	27	23	33	23	15	26	12	10	25	16	13	46	30	26	0
12	32	28	26	23	26	24	13	11	30	15	14	54	32	43	100
13	43	27	32	20	15	7	13	13	23	13	13	71	29	97	100

Table 24. Average Weight at Age (Kg) for Cod in Division 2J.  
Autumn Research Vessel Survey.

Age	Year	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2		0.21	0.23	0.24	0.22	0.22	0.15	0.17	0.16	0.19	0.21	0.24	0.19	0.17	0.19	0.15
3		0.48	0.6	0.52	0.5	0.47	0.5	0.34	0.32	0.38	0.41	0.44	0.46	0.35	0.32	0.32
4		0.83	0.93	1.06	0.9	0.92	0.84	0.75	0.55	0.59	0.7	0.75	0.72	0.62	0.5	0.51
5		1.38	1.5	1.4	1.42	1.32	1.36	1.14	0.99	0.93	1.02	0.98	1.07	0.87	0.71	0.63
6		1.88	2.02	1.99	1.75	1.83	1.92	1.6	1.31	1.28	1.25	1.33	1.37	1.29	1.19	0.86
7		2.61	2.79	2.35	2.19	2.02	2.22	2.26	1.69	1.6	1.65	1.53	1.6	1.55	1.65	1.86
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	0
9		4.51	2.99	4.94	3.54	2.93	2.9	2.68	2.74	2.81	2.05	2.27	2.05	1.99	2.19	0
10		4.6	4.18	5.17	5.45	4.13	3.61	3.3	3.1	2.82	2.78	2.51	2.05	2.03	2.42	0
11		6.11	6.07	5.84	6.69	5.71	3.75	4.3	3.46	3.33	4.2	3.63	2.95	3.23	3.69	0
12		6.78	5.75	5.96	6.46	7.8	7.93	5.27	3.94	4.04	3.84	4.56	2.72	3.07	2.42	0

Table 25. Average Weight at Age (Kg) for Cod in Division 3K.  
Autumn Research Vessel Survey

Age	Year	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2		0.18	0.24	0.24	0.25	0.21	0.19	0.15	0.2	0.22	0.22	0.17	0.18	0.2	0.23	0.21
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	0.43	0.42
4		0.89	1.05	0.9	1.11	1.09	0.96	0.82	0.72	0.73	0.79	0.74	0.77	0.74	0.69	0.67
5		1.47	1.48	1.42	1.55	1.38	1.57	1.42	1.19	1.07	1.16	1.19	1.2	1.09	0.96	0.92
6		2.14	2.18	2.09	1.95	1.92	2.16	1.92	1.64	1.54	1.4	1.53	1.56	1.56	1.43	1.22
7		3	3.04	3.04	2.45	2.35	2.67	2.29	2.16	1.78	1.9	1.76	1.91	1.79	1.91	1.74
8		3.66	4.07	4	2.97	2.93	2.74	2.9	2.99	2.34	2.21	2.57	2.25	2.11	2.17	2.24
9		4	5.15	5.75	5.04	3.77	3.38	3.35	3.04	2.69	2.96	3.49	2.77	2.44	2.49	2.33
10		5.04	4.17	6.15	6.78	4.51	4	3.7	3.45	4.1	3.67	4.35	3.63	2.77	2.9	0
11		6.29	5.67	10.57	7.02	6.6	5.49	6.18	4.46	3.91	4.76	4.94	3.78	3.4	4.37	0
12		7.02	4.1	7.67	7.09	8.29	5.53	6.69	6.05	3.61	5.86	6.35	5	3.43	2.96	0

Table 26. Average Weight at Age (Kg) for Cod In Division 3L.  
Autumn Research Vessel Survey

Age	Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2		0.2	0.2	0.21	0.14	0.16	0.18	0.17	0.18	0.2	0.17	0.23	0.18
3		0.54	0.47	0.52	0.31	0.39	0.37	0.35	0.44	0.45	0.36	0.44	0.5
4		0.78	1.1	1.01	0.72	0.72	0.72	0.75	0.78	0.75	0.79	0.75	0.77
5		1.28	1.59	1.63	1.17	1.25	1.11	1.25	1.31	1.27	1.25	1.14	1.11
6		1.97	2.26	2.16	1.85	1.72	1.74	1.81	1.74	1.8	1.82	1.57	1.4
7		2.63	3.04	2.49	2.5	2.49	2.17	2.46	2.13	2.32	2.59	1.93	1.55
8		3.49	3.64	2.99	2.83	3.48	3.05	2.91	2.66	2.9	3.21	2.74	2.55
9		5.17	5.27	3.51	4.04	3.43	3.54	3.81	2.99	3.64	3.91	3.16	3.4
10		7.62	7.33	3.92	4.25	5.1	4.22	4.87	3.64	5.27	4.05	3.39	2.95
11		9.9	7.78	6.83	5.67	5.88	4.98	6.18	6.31	6.15	5.15	3.51	4.23
12		15.39	12.99	6.33	4.47	8.43	6.09	5.65	8.24	7.38	5.96	4.91	7.67

Table 27. Average Weight at Age (Kg) for Cod In Division 3L.  
Spring Research Vessel Survey

Age	Year	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
2		0.07	0.11	0.12	0.1	0.09	0	0	0.08	0.08	0.1	0.09	0.06	0.08	0.07	0.08
3		0.22	0.3	0.36	0.32	0.33	0	0	0.22	0.27	0.28	0.29	0.25	0.23	0.26	0.3
4		0.52	0.66	0.76	0.63	0.74	0	0	0.5	0.52	0.6	0.59	0.54	0.57	0.46	0.54
5		0.97	1.15	1.33	1.17	1.25	0	0	0.98	0.94	0.97	1.04	0.91	0.98	0.94	0.76
6		1.74	1.79	1.99	1.74	1.92	0	0	1.67	1.54	1.56	1.55	1.35	1.45	1.42	1.21
7		2.57	2.99	3	2.42	2.7	0	0	2.33	2.34	2.04	2.13	1.94	1.83	2.03	1.68
8		3.33	4.25	4.6	2.95	3.38	0	0	3.32	3.01	3.32	2.48	2.19	2.46	2.61	2.3
9		4.23	4.98	6.83	3.91	5.13	0	0	4.55	3.89	3.88	3.75	3.19	3.11	3.21	2.87
10		5.57	5.98	8.56	6.4	7.11	0	0	5.1	5.08	4.35	3.81	4.2	3.64	3.99	4.34
11		7.04	7.7	10.17	7.48	10.23	0	0	6.09	5.86	6.42	6.55	4.6	4.67	3.77	4.46
12		6.99	8.59	11.11	8.29	8.86	0	0	8.64	8.4	7.98	6.8	7.96	7.33	8.43	11.05

Table 28. Hydroacoustics Survey Results for Cod 1991–1993  
Density (kg/m<sup>2</sup>)

Division	Block	Area	1991	1992	1993
2J	A	980		0.03	
	B	1436	0.23	0.03	
	C	128			
	D	104	1.19	0.11	
	E	1140	0.17	0.07	0.04
	F	548			0.13
	G	2263	0.08	0.03	0.02
	H	1518	0.12	0.03	0.10
Weighted Mean			0.16	0.04	0.06
3K	I	1031	0.38	0.01	0.18
	J	771	0.88	0.66	0.10
	K	195		0.07	
	L	544	1.28	1.32	0.11
	M	126		0.04	
	N	1365	0.62	0.64	0.11
Weighted Mean			0.75	0.54	0.17
3L	O	1079	0.83	0.33	0.01
	P	235		0.10	
	Q	1100	0.71	0.44	0.03
	R	2340		0.10	0.01
	S	1239			0.00
	T	1092			
	U	2700			
Weighted Mean			0.77	0.23	0.01

Weighted means are derived as the average density for the total area sampled for each year.

Table 29. Results from ADAPT using Autumn Research Vessel Index.

LOG RESIDUALS FROM RV

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	-0.267	-0.606	-0.399	-0.487	-0.233	0.412	0.071	-0.079	0.264	-0.376	0.026	0.557	0.717	0.400	0.000
4	-0.010	0.111	-0.280	-0.694	-0.681	-0.043	0.232	-0.206	0.569	-0.284	-0.227	0.464	0.729	0.699	-0.379
5	0.051	0.249	0.074	-0.596	-0.462	-0.160	-0.121	-0.321	0.581	-0.030	-0.090	0.483	0.699	0.762	-1.119
6	0.070	-0.185	0.073	-0.222	-0.683	-0.282	-0.123	-0.466	0.627	-0.291	-0.034	0.485	1.112	0.807	-0.887
7	-0.054	-0.357	-0.633	0.026	-0.298	-0.368	-0.275	-0.380	0.339	-0.408	0.222	0.564	1.060	1.168	-0.608
8	-0.259	-0.106	-0.636	-0.647	0.001	0.076	0.422	-0.595	0.459	-0.281	-0.162	0.582	1.184	1.263	-0.457
9	-0.098	-0.426	-0.584	-0.640	-0.435	-0.018	-0.251	-0.357	0.463	-0.262	0.135	0.508	1.161	1.427	-0.623
10	-0.402	-0.042	-0.186	-0.511	-0.282	-0.333	-0.184	-0.542	0.139	-0.215	0.258	1.004	1.016	0.949	-0.670
11	-0.153	-0.276	-0.296	-0.366	-0.248	0.035	-0.555	-0.404	0.386	-0.296	-0.086	1.162	1.314	0.468	-0.686
12	-0.374	-0.502	-0.200	0.041	-0.166	-0.113	0.105	-1.327	0.133	-0.349	-0.313	1.126	1.256	1.234	-0.550

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.000354  
 MEAN SQUARE RESIDUALS ..... 0.347139

PARAMETER	AGE	ESTIMATE	STD. ERR.	T-STAT	C.V.	BIAS
NUMBERS						
	3	77115	46855	1.646	0.608	18.90
	4	79106	33352	2.372	0.422	9.41
	5	125204	44763	2.797	0.358	6.74
	6	42938	14436	2.974	0.336	7.02
	7	9583	2586	3.706	0.270	6.84
	8	1874	225	8.327	0.120	3.72
	9	615	121	5.089	0.197	5.65
	10	327	65	5.056	0.198	5.68
	11	248	74	3.339	0.299	7.50
	12	122	49	2.479	0.403	8.92
INDEX 1: RV						
	3	2.79E-5	4.53E-6	6.165	0.162	0.98
	4	5.38E-5	8.48E-6	6.349	0.158	0.99
	5	9.10E-5	1.42E-5	6.398	0.156	1.04
	6	1.37E-4	2.15E-5	6.389	0.157	1.07
	7	1.61E-4	2.52E-5	6.385	0.157	1.08
	8	1.90E-4	3.00E-5	6.339	0.158	0.97
	9	2.08E-4	3.28E-5	6.348	0.158	0.97
	10	2.04E-4	3.24E-5	6.313	0.158	1.02
	11	1.72E-4	2.73E-5	6.297	0.159	1.28
	12	2.03E-4	3.16E-5	6.409	0.156	1.34

Table 29. (Continued)

POPULATION NUMBERS (000S)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	304268	154217	161270	360082	320780	350578	432986	338885	158242	130172	167458	222950	237277	99809	76979
4	277312	247916	125219	129726	292833	261092	284690	353791	276867	128806	104468	134588	181002	187305	78902
5	215059	211159	191792	91640	99721	211443	201444	219629	276247	212909	97117	72275	94231	111494	124710
6	65839	140600	138957	130954	63093	64450	134567	136191	146687	186207	145053	61250	40036	44205	42599
7	20767	35519	88690	86609	84776	38629	35550	75226	80810	78593	108061	75402	27334	12244	9451
8	8381	10025	19143	56311	50990	46394	20729	17793	36249	42613	38587	47099	26709	7549	1823
9	4599	4077	5077	11303	35383	26428	24682	10415	8188	16357	17240	14755	12775	5635	603
10	4018	2381	2161	3056	6381	18169	13554	12146	5056	3895	8128	5948	4212	2174	320
11	1398	2310	1265	1299	1797	3484	9138	7272	5274	2330	1971	2730	1576	856	245
12	1022	750	1385	825	784	1165	1932	5187	3325	2529	1296	914	701	309	121
13	517	639	448	926	499	501	730	1173	2726	1726	1281	679	230	142	27
3+1	903180	809592	735408	872732	957038	1022335	1160002	1177708	999670	806137	690659	638590	626084	471722	335781

FISHING MORTALITY

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	0.005	0.008	0.018	0.007	0.006	0.008	0.002	0.002	0.006	0.020	0.019	0.008	0.036	0.035	0.006
4	0.073	0.057	0.112	0.063	0.126	0.059	0.059	0.047	0.063	0.082	0.168	0.156	0.285	0.207	0.055
5	0.225	0.218	0.182	0.173	0.236	0.252	0.191	0.204	0.194	0.184	0.261	0.391	0.557	0.762	0.137
6	0.417	0.261	0.273	0.235	0.291	0.395	0.382	0.322	0.424	0.344	0.454	0.607	0.985	1.343	0.377
7	0.528	0.418	0.254	0.330	0.403	0.422	0.492	0.530	0.440	0.511	0.630	0.838	1.087	1.705	0.738
8	0.521	0.480	0.327	0.265	0.457	0.431	0.488	0.576	0.596	0.705	0.761	1.105	1.356	2.327	1.656
9	0.458	0.435	0.308	0.372	0.467	0.468	0.509	0.523	0.543	0.499	0.864	1.054	1.571	2.668	1.125
10	0.354	0.433	0.309	0.331	0.405	0.487	0.423	0.634	0.575	0.481	0.891	1.128	1.393	1.981	1.119
11	0.424	0.312	0.227	0.305	0.233	0.390	0.366	0.582	0.535	0.387	0.569	1.159	1.428	1.757	0.621
12	0.270	0.314	0.202	0.303	0.248	0.268	0.298	0.443	0.456	0.480	0.446	1.177	1.399	2.237	0.179
13	0.253	0.223	0.148	0.161	0.221	0.220	0.248	0.271	0.263	0.286	0.376	0.499	0.669	1.117	0.453

**Table 30.** Laurec-Shepherd calibration analysis for 2J3KL cod survey abundance at age.

VPA Version 3.0 (MSDOS)  
Cod in Divisions 2J3KL

Disaggregated Qs

Log transformation

No trend in Q (seen used)

Terminal F's estimated using Laurec-Shepherd

Regression weights:  
, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000

Oldest age F = .500\*average of 5 younger ages.

Fishing mortalities:

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	.005	.008	.010	.007	.006	.008	.002	.006	.020	.020	.020	.010	.075	.055	.007
4	.073	.057	.113	.061	.116	.060	.060	.048	.063	.084	.127	.158	.166	.167	.089
5	.125	.118	.182	.175	.186	.193	.183	.196	.196	.265	.339	.601	.167	.456	
6	.417	.261	.272	.239	.293	.396	.324	.426	.426	.459	.617	.104	.144	.955	
7	.513	.418	.255	.327	.326	.402	.494	.532	.515	.637	.848	.117	.177	.1527	
8	.509	.458	.420	.288	.266	.452	.430	.693	.578	.598	.767	.118	.138	.599	.4423
9	.427	.390	.387	.395	.304	.467	.459	.506	.531	.546	.871	.105	.142	.2.962	.2.626
10	.338	.394	.196	.286	.208	.404	.410	.625	.591	.487	.896	.1.142	.1.432	.2.351	.2.830
11	.390	.280	.187	.148	.176	.300	.208	.399	.368	.419	.480	.1.298	.1.479	.1.279	
12	.231	.280	.187	.148	.176	.300	.208	.273	.269	.257	.355	.570	.735	.1.268	.1.141
13	.189	.184	.129	.148	.176	.300	.208	.273	.269	.257	.355	.570	.735	.1.268	.1.141

Log catchability residuals

Fleet : Canadian RV

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	.37	.71	.50	.59	.33	.31	.31	.17	.47	.03	.55	.73	.00		
4	.11	.02	.39	.80	.90	.13	.15	.28	.49	.37	.39	.42	.00		
5	.04	.16	.00	.66	.56	.19	.40	.51	.09	.18	.34	.53	.00		
6	.02	.16	.08	.19	.67	.32	.16	.47	.58	.30	.09	.16	.02	.00	
7	.10	.31	.51	.67	.67	.32	.26	.38	.40	.18	.12	.02	.00		
8	.21	.06	.47	.45	.09	.19	.32	.54	.50	.29	.19	.87	.49	.00	
9	.06	.33	.47	.32	.07	.16	.16	.16	.07	.35	.75	.45	.00		
10	.32	.06	.09	.47	.17	.26	.12	.56	.19	.16	.77	.66	.44	.00	
11	.14	.21	.28	.28	.12	.11	.45	.46	.38	.19	.09	.88	.94	.01	
12	.39	.42	.06	.07	.01	.06	.28	.12	.13	.33	.11	.88	.46	.00	

SUMMARY STATISTICS FOR AGE 3

Fleet	Pred.	SE(q), Partial, Raised,	SLOPE	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT
1	.15.07	.560	.0065	.884E-01	.24E-01	.15.070	.145	.000	.430	.0001	.4330	.0001	.430	.000	.430
Pbar	.007	.580	SIGMA(int.)	SIGMA(ext.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.500	Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.430	.000

SUMMARY STATISTICS FOR AGE 4

Fleet	Pred.	SE(q), Partial, Raised,	SLOPE	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT
1	.14.45	.604	.0001	.00691	.745E-01	.14.449	.151	.000	.430	.0001	.4330	.0001	.430	.000	.430
Pbar	.089	.604	SIGMA(int.)	SIGMA(ext.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.000	Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.430	.000

SUMMARY STATISTICS FOR AGE 5

Fleet	Pred.	SE(q), Partial, Raised,	SLOPE	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT
1	.14.00	.633	.0001	.4462	.440E-01	.14.449	.151	.000	.430	.0001	.4330	.0001	.430	.000	.430
Pbar	.446	.424	SIGMA(int.)	SIGMA(ext.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.000	Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.430	.000

SUMMARY STATISTICS FOR AGE 6

Fleet	Pred.	SE(q), Partial, Raised,	SLOPE	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT
1	.11.71	.124	.0001	.9549	.519E-01	.13.711	.106	.000	.430	.0001	.5252	.0001	.5252	.000	.5252
Pbar	.955	.425	SIGMA(int.)	SIGMA(ext.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.000	Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.430	.000

SUMMARY STATISTICS FOR AGE 7

Fleet	Pred.	SE(q), Partial, Raised,	SLOPE	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT
1	.13.65	.125	.0001	.5265	.519E-01	.13.649	.106	.000	.430	.0001	.5252	.0001	.5252	.000	.5252
Pbar	1.527	.425	SIGMA(int.)	SIGMA(ext.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.000	Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.430	.000

SUMMARY STATISTICS FOR AGE 8

Fleet	Pred.	SE(q), Partial, Raised,	SLOPE	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT
1	.13.48	.13.61	.0001	.5252	.519E-01	.13.609	.110	.000	.430	.0001	.5252	.0001	.5252	.000	.5252
Pbar	1.279	.439	SIGMA(int.)	SIGMA(ext.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.000	Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.430	.000

SUMMARY STATISTICS FOR AGE 9

Fleet	Pred.	SE(q), Partial, Raised,	SLOPE	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT
1	.13.46	.13.63	.0001	.5252	.519E-01	.13.479	.138	.000	.430	.0001	.5252	.0001	.5252	.000	.5252
Pbar	1.279	.439	SIGMA(int.)	SIGMA(ext.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.000	Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.430	.000

SUMMARY STATISTICS FOR AGE 10

Fleet	Pred.	SE(q), Partial, Raised,	SLOPE	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT
1	.13.46	.13.63	.0001	.5252	.519E-01	.13.481	.097	.000	.430	.0001	.5252	.0001	.5252	.000	.5252
Pbar	1.279	.439	SIGMA(int.)	SIGMA(ext.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.000	Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.430	.000

SUMMARY STATISTICS FOR AGE 11

Fleet	Pred.	SE(q), Partial, Raised,	SLOPE	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT
1	.13.46	.13.63	.0001	.5252	.519E-01	.13.609	.110	.000	.430	.0001	.5252	.0001	.5252	.000	.5252
Pbar	1.279	.439	SIGMA(int.)	SIGMA(ext.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.000	Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio	.430	.000

SUMMARY STATISTICS FOR AGE 12

Fleet	Pred.	SE(q), Partial, Raised,	SLOPE	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT	SE	INTRCPT
1	.13.46	.13.63	.0001	.5252	.519E-01	.13.479	.138	.000	.430	.0001	.5252	.0001	.5252	.000	.5252
Pbar	1.279	.439</td													

Table 30. (continued).

Relative F at age

YEAR,	1978,	1979,	1980,	1981,	1982,							MEAN 90-92
3,	.0120,	.0238,	.0686,	.0242,	.0169,							.0302,
4,	.1802,	.1621,	.4361,	.2264,	.3592,							.1906,
5,	.5600,	.6210,	.7017,	.6225,	.6752,							
6,	1.0352,	.7448,	1.0480,	.8385,	.8318,							
7,	1.2734,	1.1903,	.9838,	1.1682,	1.1429,							
8,	1.2634,	1.3055,	1.2615,	.9473,	1.2832,							
9,	1.0593,	1.1956,	1.1116,	1.3250,	1.3272,							
10,	.8399,	1.1063,	1.1366,	1.0787,	1.1495,							
11,	.9689,	.8365,	.7567,	1.0198,	.5900,							
12,	.5730,	.7992,	.7220,	.8965,	.6495,							
13,	.4704,	.5243,	.4988,	.5267,	.5000,							
REFMEAN,	.4027,	.3509,	.2592,	.2804,	.3519,							
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,		MEAN 90-92
3,	.0204,	.0050,	.0045,	.0125,	.0453,	.0307,	.0113,	.0610,	.0263,	.0034,		.0302,
4,	.1475,	.1475,	.1003,	.1337,	.1859,	.2688,	.1830,	.2899,	.2378,	.0443,		.1906,
5,	.6237,	.4739,	.4290,	.4137,	.4130,	.4149,	.4397,	.4879,	.5600,	.2217,		.4232,
6,	.9765,	.9419,	.6772,	.8982,	.7719,	.7187,	.6796,	.8208,	.7892,	.4746,		.6948,
7,	1.0491,	1.2138,	1.1114,	.9326,	1.1433,	.9965,	.9337,	.9046,	.8977,	.7588,		.8537,
8,	1.0591,	1.2134,	1.2084,	1.2592,	1.5729,	1.2001,	1.2303,	1.1216,	1.2475,	2.1981,		1.5224,
9,	1.1300,	1.2436,	1.1112,	1.1508,	1.1173,	1.3618,	1.1727,	1.3091,	1.4217,	1.3050,		1.3453,
10,	1.2024,	1.0086,	1.3071,	1.2449,	1.0805,	1.4019,	1.2572,	1.1589,	1.1281,	1.4063,		1.2311,
11,	.9593,	.9047,	1.1557,	1.1006,	.9011,	.9062,	1.2868,	1.1971,	.9558,	.6356,		.9295,
12,	.5706,	.7334,	.9317,	.8828,	1.0273,	.7511,	1.3301,	1.1595,	1.3347,	.1253,		.8732,
13,	.4921,	.5104,	.5714,	.5638,	.5699,	.5621,	.6277,	.5946,	.6088,	.5670,		.5901,
REFMEAN,	.4058,	.4066,	.4783,	.4747,	.4505,	.6393,	.9085,	1.2353,	2.0836,	2.0122,		

Stock number at age (start of year)

Numbers x 10-3

YEAR,	1978,	1979,	1980,	1981,	1982,							GMST 78-89	AMST 78-89
3,	302414,	152608,	159796,	356800,	317483,							231344,	251632,
4,	276455,	246401,	123904,	128524,	290150,							197694,	215192,
5,	213468,	210503,	190580,	90602,	98754,							159214,	173090,
6,	65311,	139489,	138599,	130084,	62298,							108418,	116447,
7,	21027,	35244,	87939,	86483,	84188,							60204,	66585,
8,	8445,	10309,	19003,	55792,	51028,							27675,	32497,
9,	4827,	4157,	5338,	11219,	35023,							11990,	14778,
10,	4141,	2580,	2237,	3276,	6335,							5742,	7076,
11,	1483,	2417,	1432,	1364,	1982,							2761,	3398,
12,	1168,	822,	1476,	964,	839,							1513,	1819,
13,	669,	759,	508,	1002,	614,							919,	1054,
TOTAL,	899408,	805289,	730814,	866111,	948695,								
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	GMST 78-89	AMST 78-89
3,	346690,	427178,	333792,	155306,	127270,	157850,	182395,	116764,	64376,	69069,	0,	231344,	251632,
4,	258396,	281511,	349038,	272699,	126403,	102097,	126727,	147800,	88658,	49889,	56161,	197694,	215192,
5,	203532,	199269,	217062,	272388,	209534,	95176,	70393,	87866,	84589,	44226,	37372,	159214,	173090,
6,	63755,	133081,	134550,	144753,	183244,	142428,	59770,	38653,	39373,	21562,	23176,	108418,	116447,
7,	38063,	35122,	74288,	79682,	77371,	105964,	73653,	26392,	11481,	6226,	6794,	60204,	66585,
8,	46104,	20360,	17553,	35744,	41900,	37847,	45883,	25819,	7068,	1448,	1107,	27675,	32497,
9,	26599,	24561,	10177,	8063,	16097,	16890,	14388,	12284,	5289,	430,	14,	11990,	14778,
10,	17975,	13768,	12127,	4897,	3823,	7967,	5790,	4059,	1996,	224,	25,	5742,	7076,
11,	3461,	9035,	7480,	5314,	2220,	1924,	2662,	1513,	794,	156,	11,	2761,	3398,
12,	1319,	1920,	5120,	3524,	2580,	1211,	882,	677,	282,	89,	35,	1513,	1819,
13,	547,	857,	1167,	2685,	1897,	1330,	614,	216,	132,	14,	56,	919,	1054,
TOTAL,	1012261,	1146663,	1162354,	985054,	792339,	670683,	583157,	462044,	304040,	193343,	124752,		

Stock biomass at age (start of year)

Tonnes

YEAR,	1978,	1979,	1980,	1981,	1982,							
3,	120966,	70200,	84692,	196240,	168266,							
4,	199048,	182336,	95406,	100248,	243726,							
5,	222006,	237868,	221073,	106005,	118505,							
6,	103192,	232947,	237004,	213338,	110267,							
7,	51727,	86700,	209295,	192857,	176796,							
8,	27531,	36802,	67652,	159565,	135735,							
9,	19549,	18333,	26744,	42745,	108221,							
10,	18468,	13542,	12283,	17431,	26481,							
11,	7444,	14020,	9626,	8582,	12211,							
12,	7850,	5777,	11614,	6805,	6034,							
13,	5420,	6803,	4260,	7335,	4910,							
TOTALBIO,	783200,	905330,	979651,	1051151,	1111152,							
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,		
3,	214948,	252035,	160220,	79206,	54726,	77346,	87549,	49041,	23175,	20030,		
4,	224805,	247730,	254798,	196343,	83426,	74530,	93778,	101982,	54081,	28941,		
5,	276345,	239123,	238768,	283283,	215820,	102790,	72504,	93137,	82051,	35823,		
6,	111571,	238215,	192406,	222920,	241882,	196551,	86069,	57980,	55517,	25659,		
7,	86783,	80078,	153033,	147411,	144683,	176960,	134786,	51200,	21585,	10771,		
8,	120332,	55175,	46691,	83999,	80868,	83642,	94977,	57318,	16045,	2969,		
9,	84584,	72701,	32871,	23706,	45071,	42394,	37984,	29974,	13911,	1144,		
10,	62914,	50253,	40263,	16994,	13418,	24220,	17487,	12422,	6268,	502,		
11,	16579,	38670,	30368,	20193,	10658,	8407,	10542,	5416,	3018,	417,		
12,	10233,	11886,	23298,	15997,	11972,	6650,	4774,	3169,	1400,	439,		
13,	4959,	7186,	8202,	14337,	10880,	8710,	4602,	1344,	727,	76,		
TOTALBIO,	1214053,	1293052,	1180918,	1104389,	913413,	802200,	645053,	462984,	277778,	126772,		

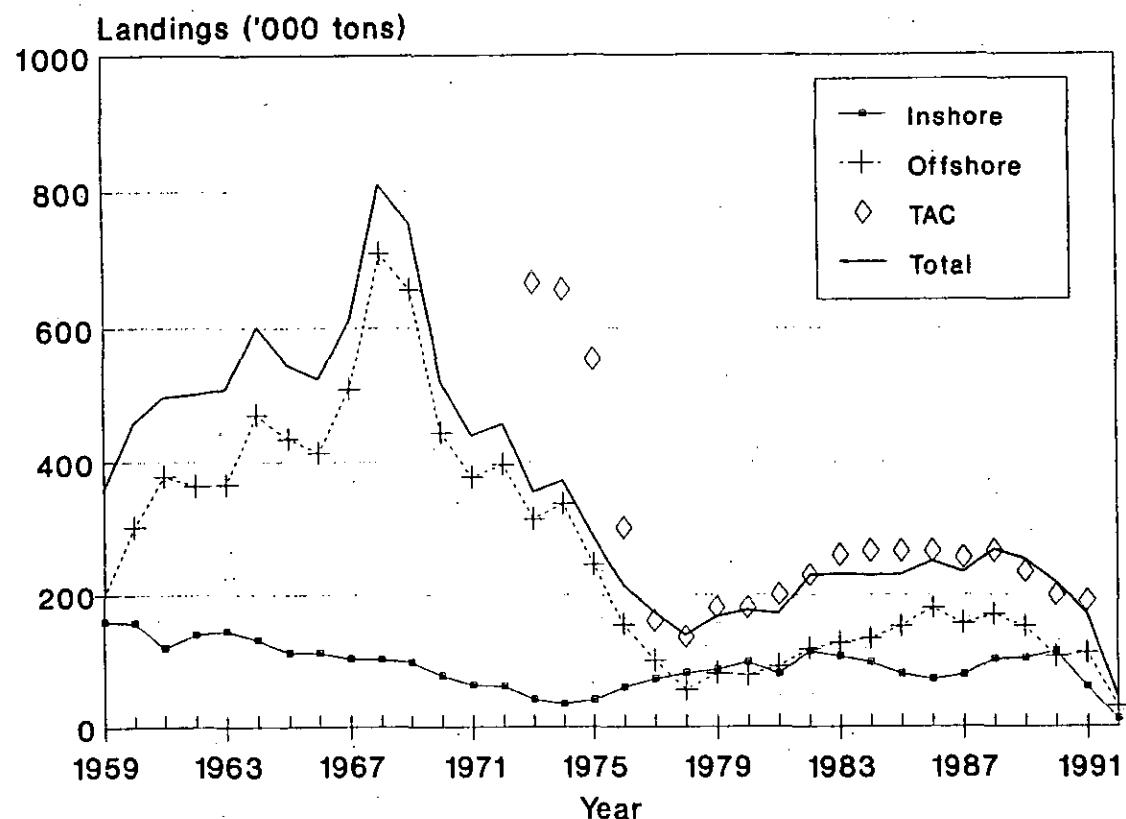


Figure 1. Cod in Divisions 2J3KL:  
Inshore and offshore landings and TAC's.

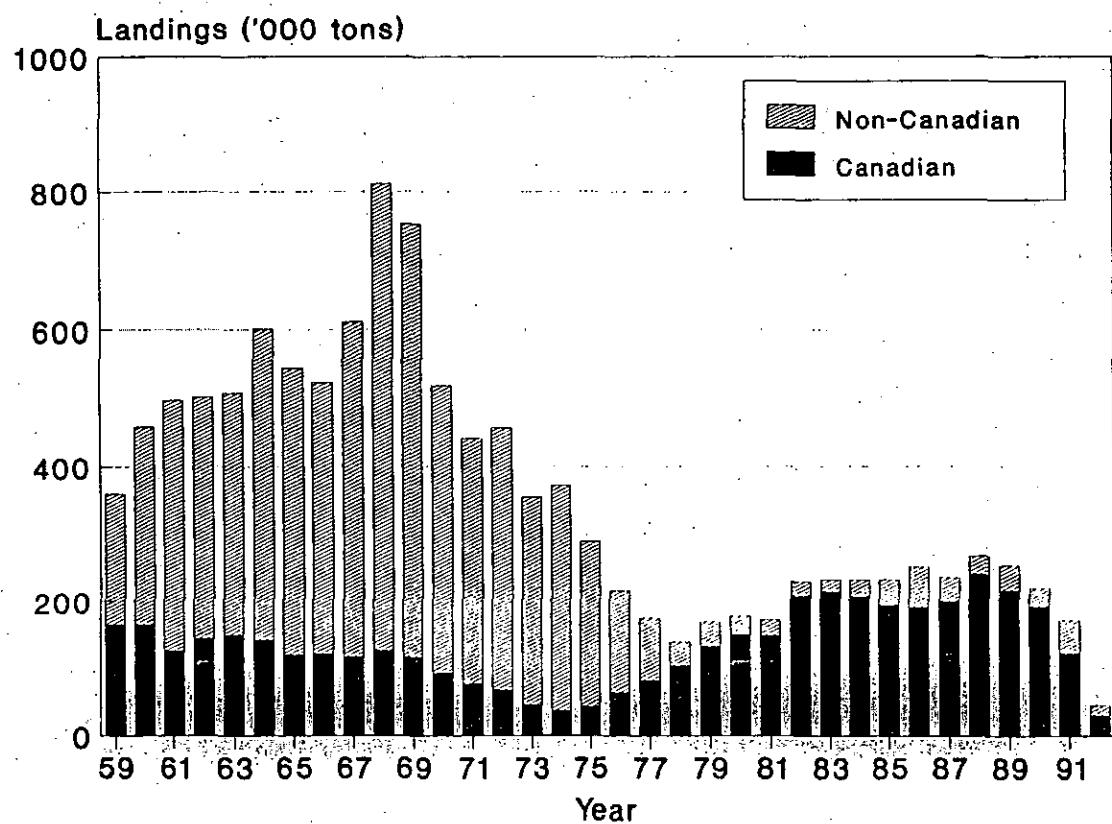


Figure 2. Landings of cod in Divisions  
2J3KL by Canadian and other vessels.

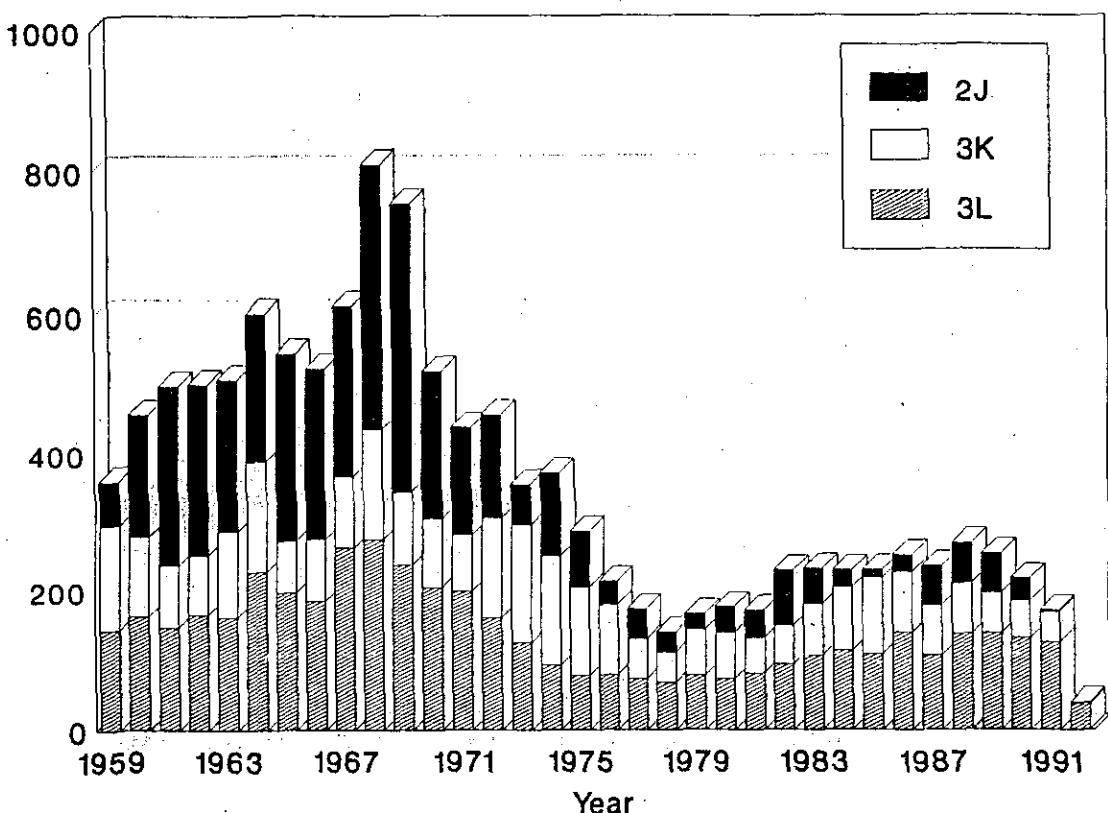


Figure 3. Cod in Divisions 2J3KL:  
Landings by Division.

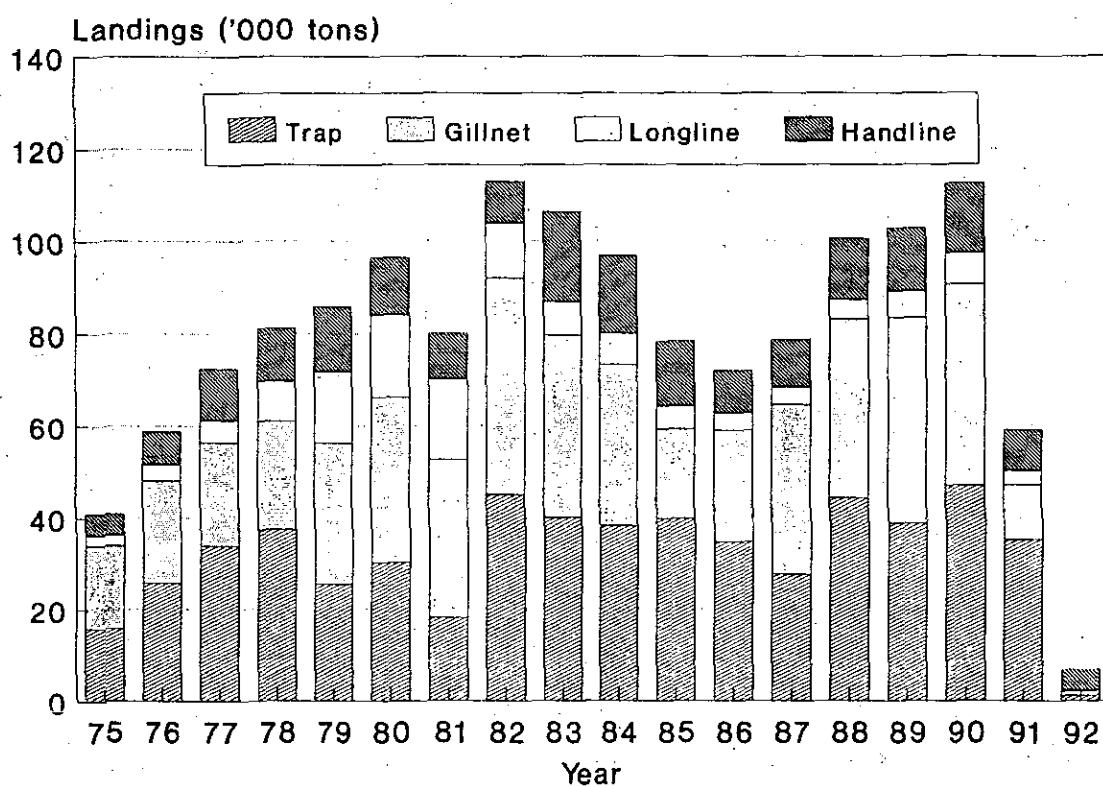


Figure 4. Cod in 2J3KL: Inshore  
landings by gear. An additional 5000t  
from Recreational Fishery is not shown

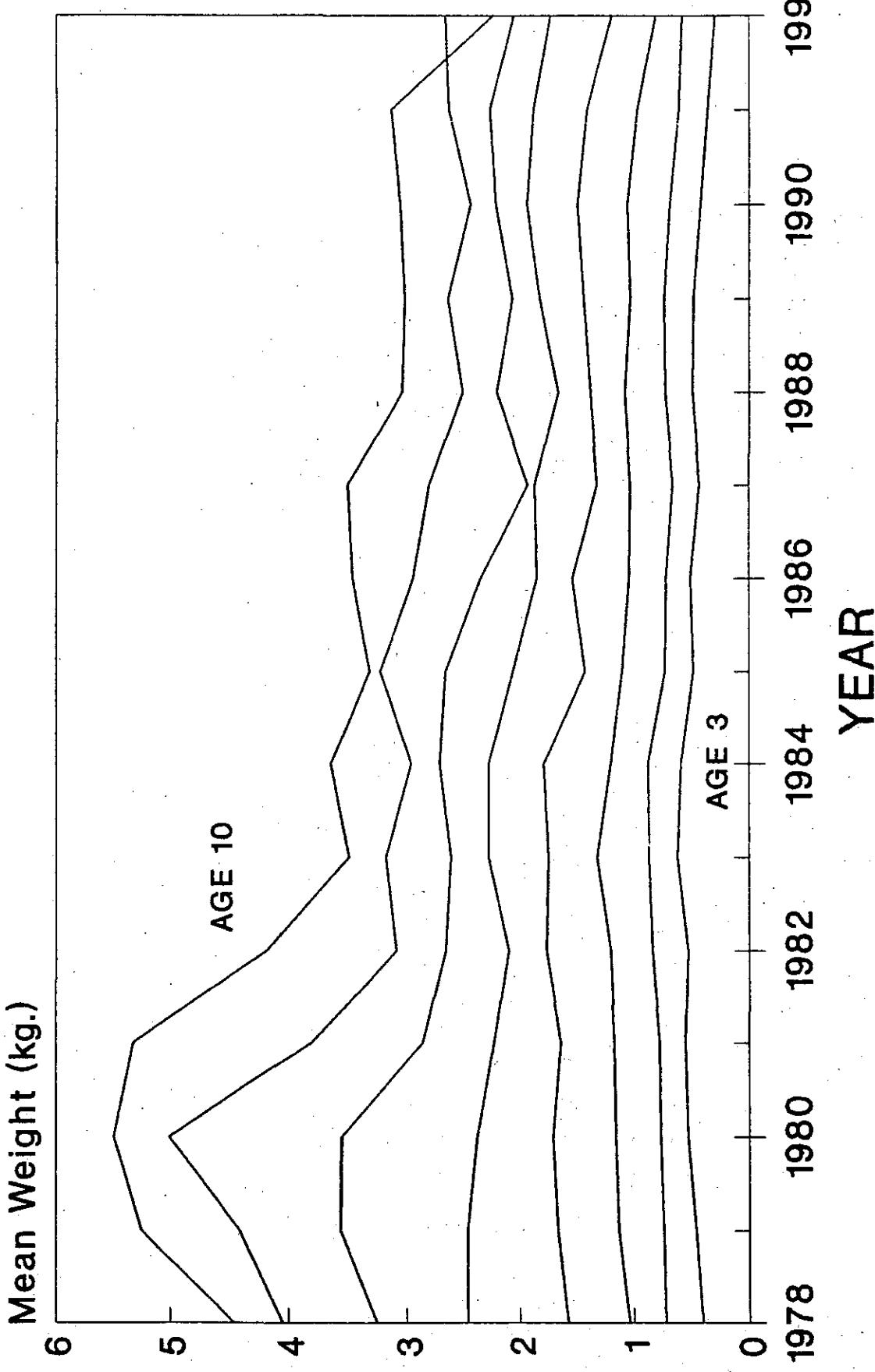
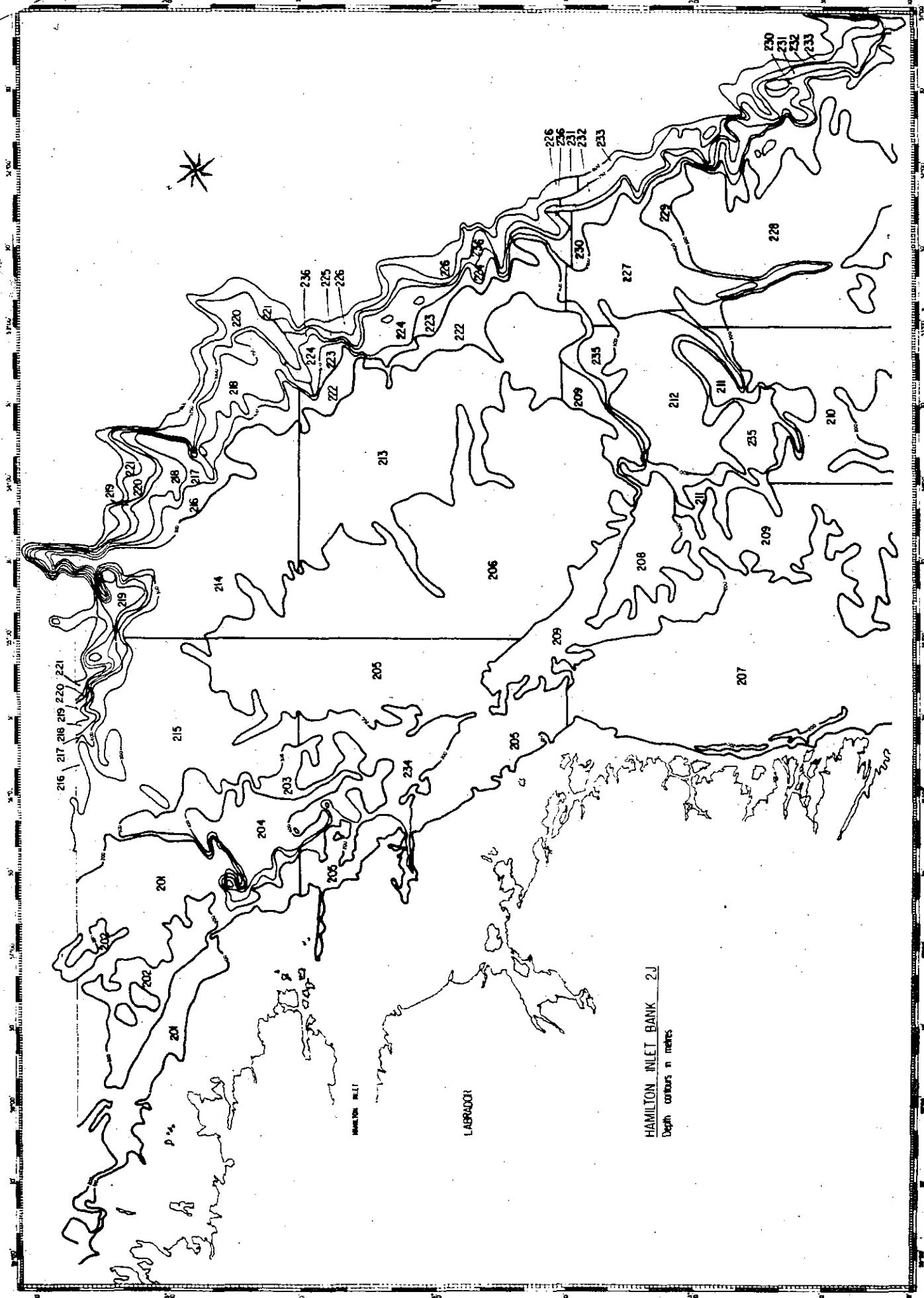
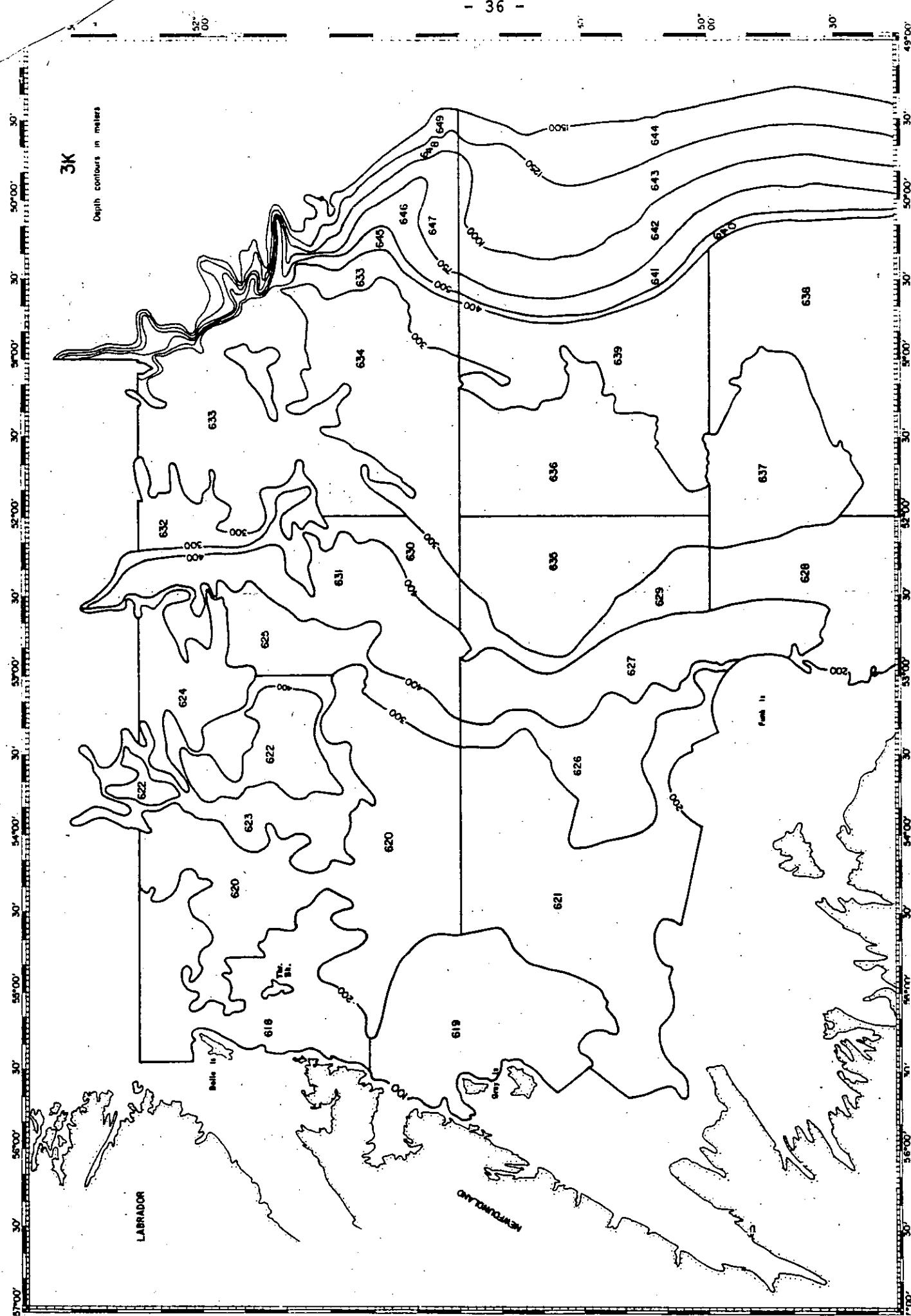


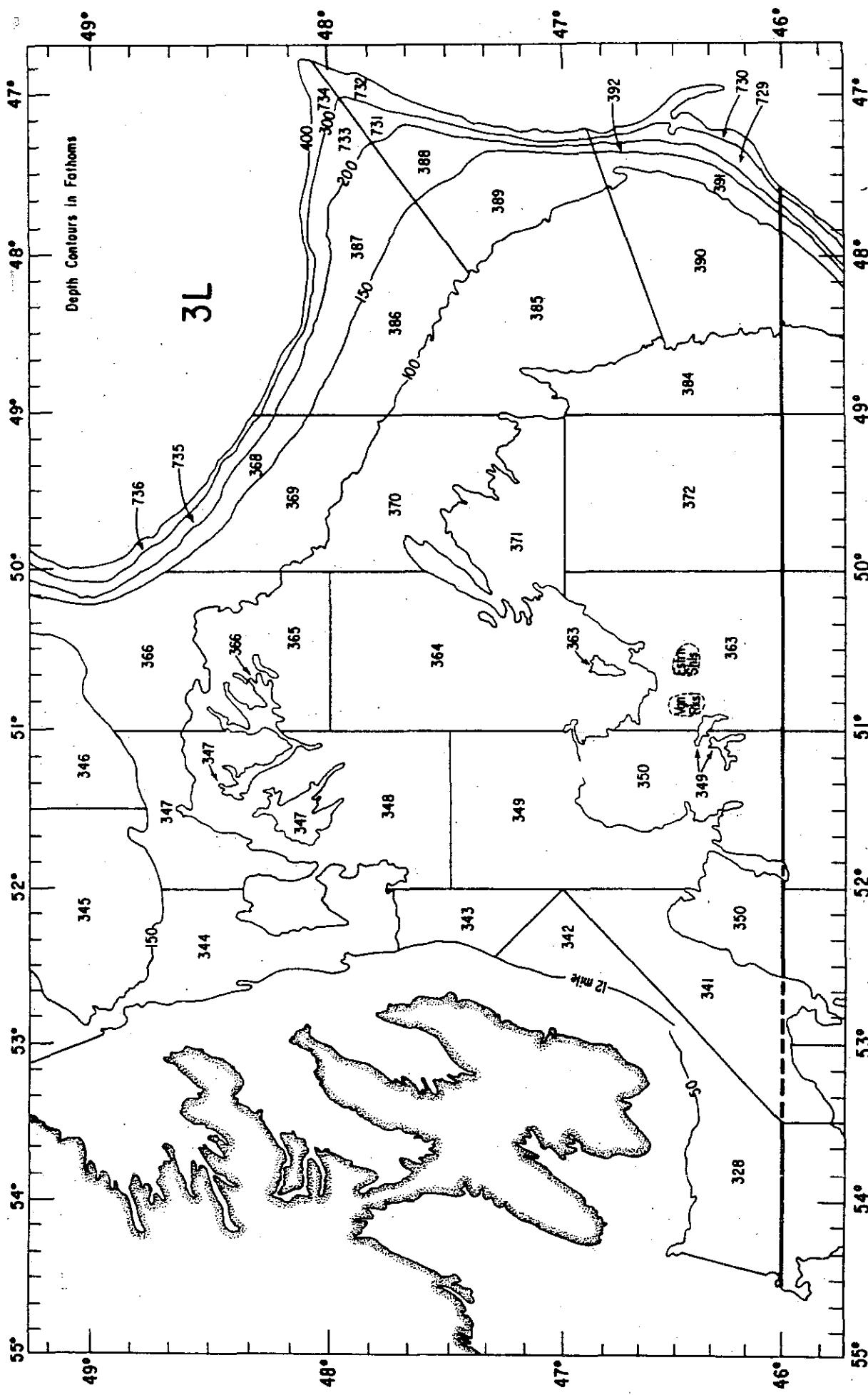
Figure 5. Commercial fishery mean weights for 2J3KL cod.



**Figure 6.** Area of stratification for Research Vessel surveys in NAAO division 2J.



**Figure 7.** Area of stratification for Research Vessel surveys in NAFO division 3K.



**Figure 8.** Area of stratification for Research Vessel surveys in NAFO Division 3L.

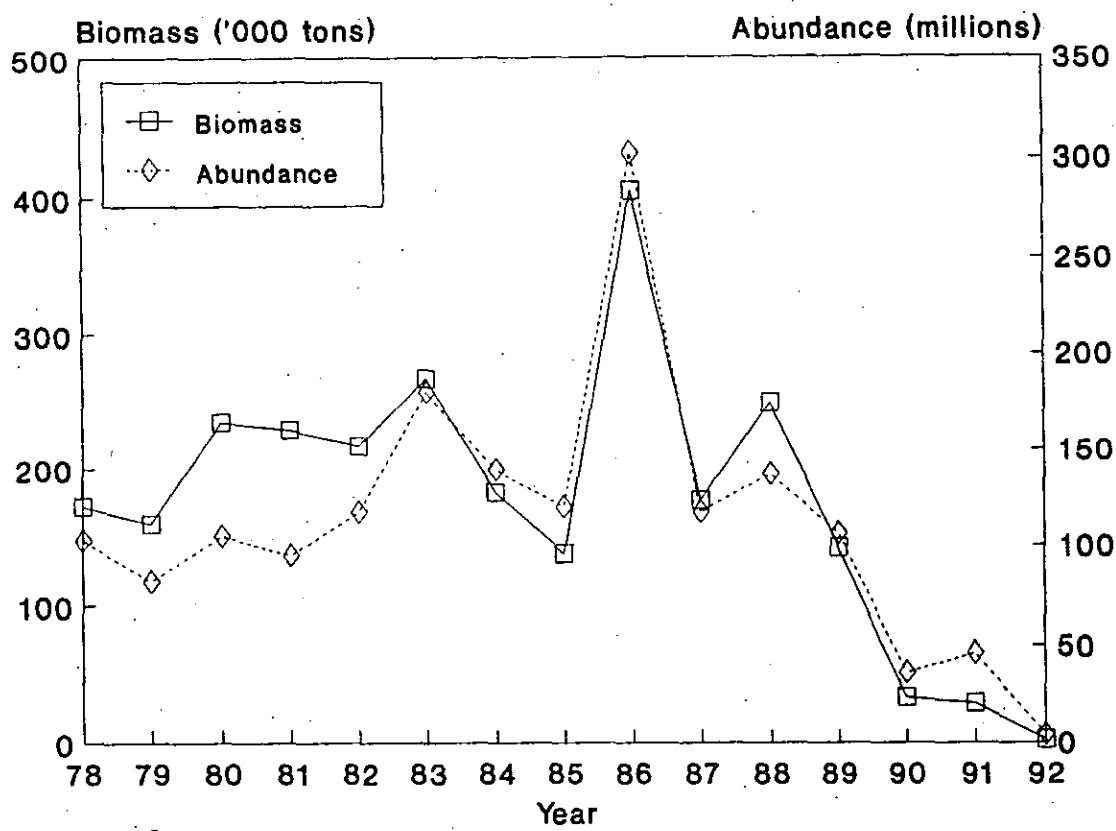


Figure 9. Biomass and abundance of cod from autumn RV surveys in Division 2J.

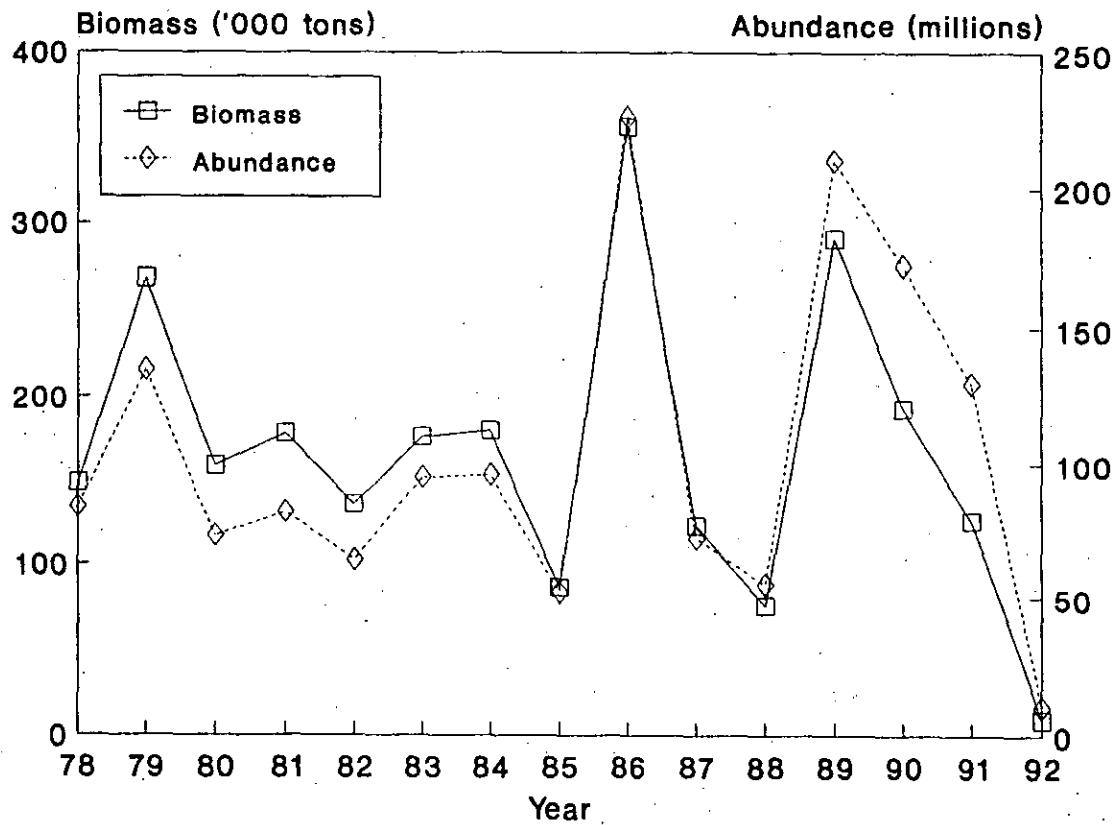


Figure 14. Biomass and abundance of cod from autumn RV surveys in Division 3K.

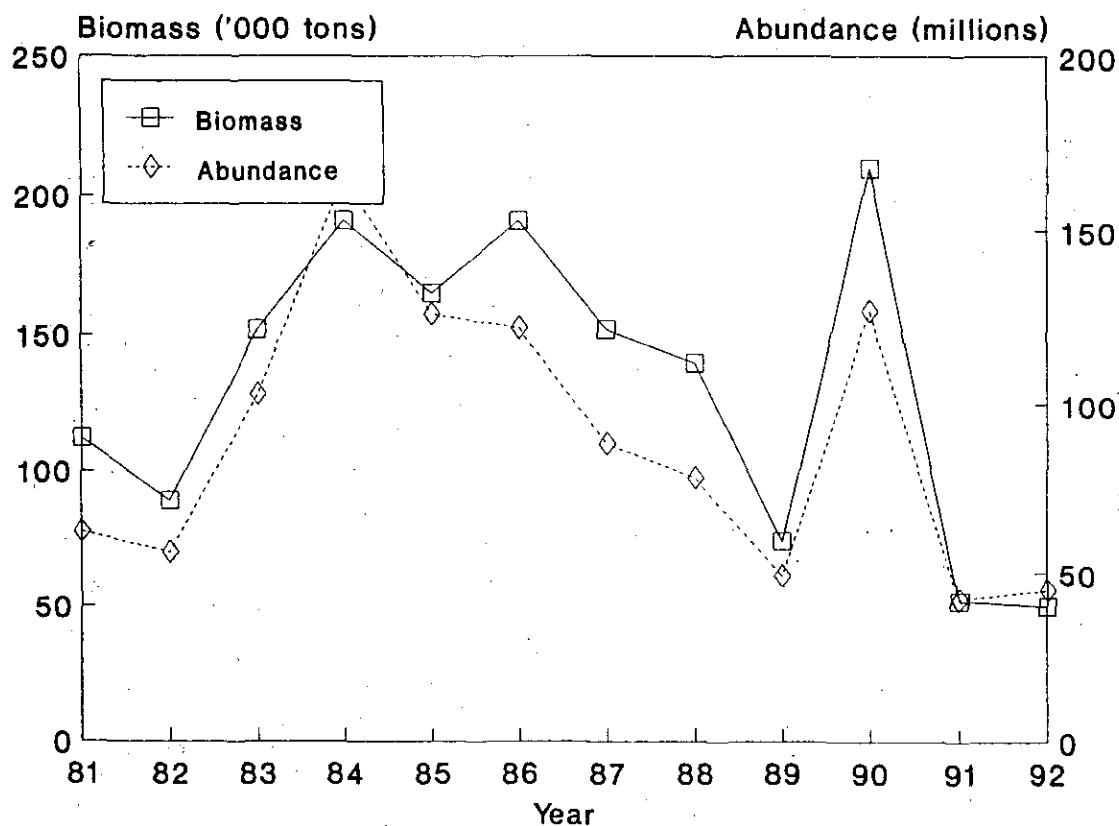


Figure 18. Biomass and abundance of cod from autumn RV surveys in Division 3L.

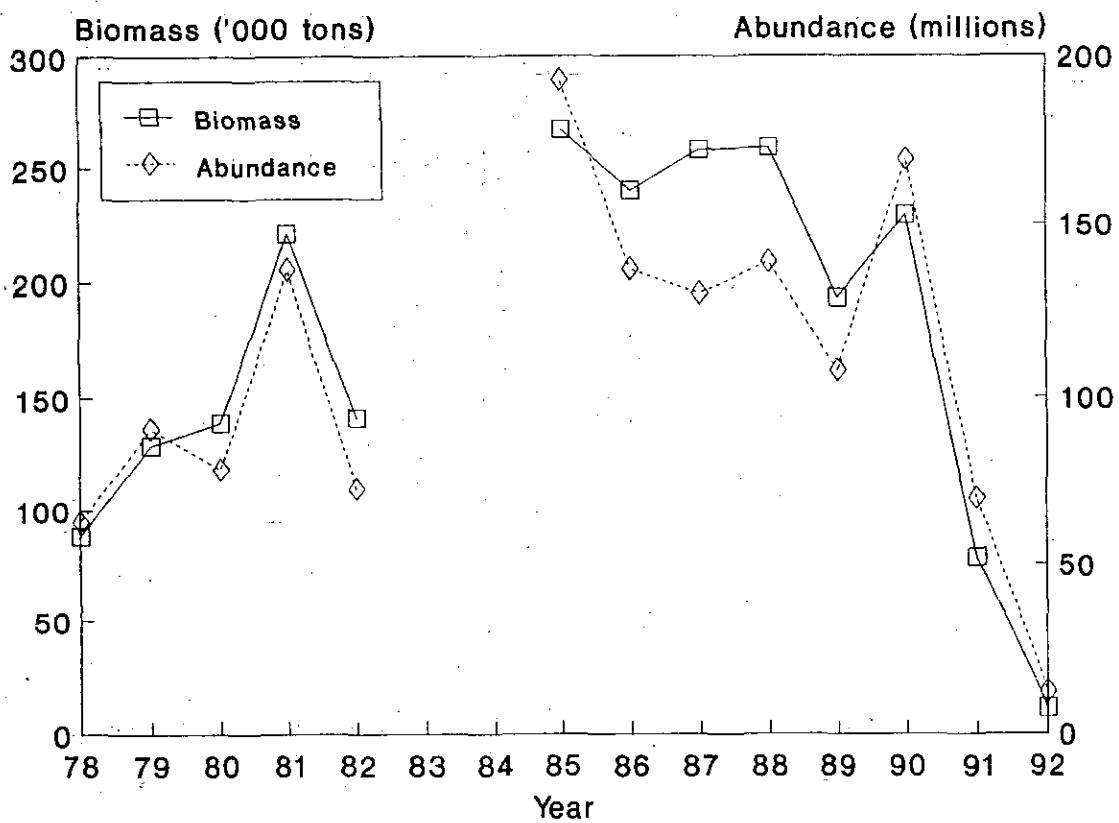


Figure 19. Biomass and abundance of cod from spring RV surveys in Division 3L.

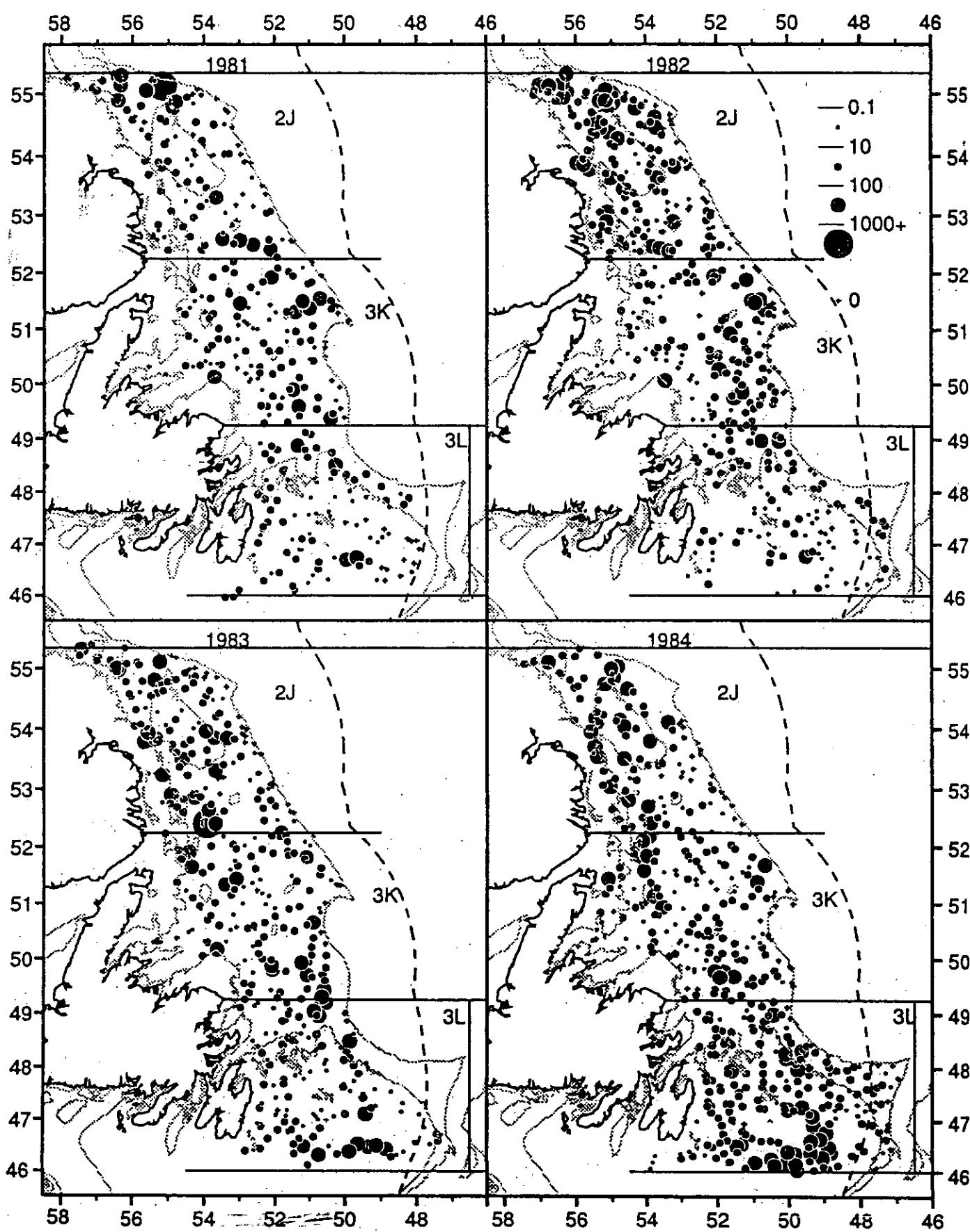


Figure 13. Cod Distribution 1981-84 from Autumn 2J3KL RV Surveys, Numbers per Tow.

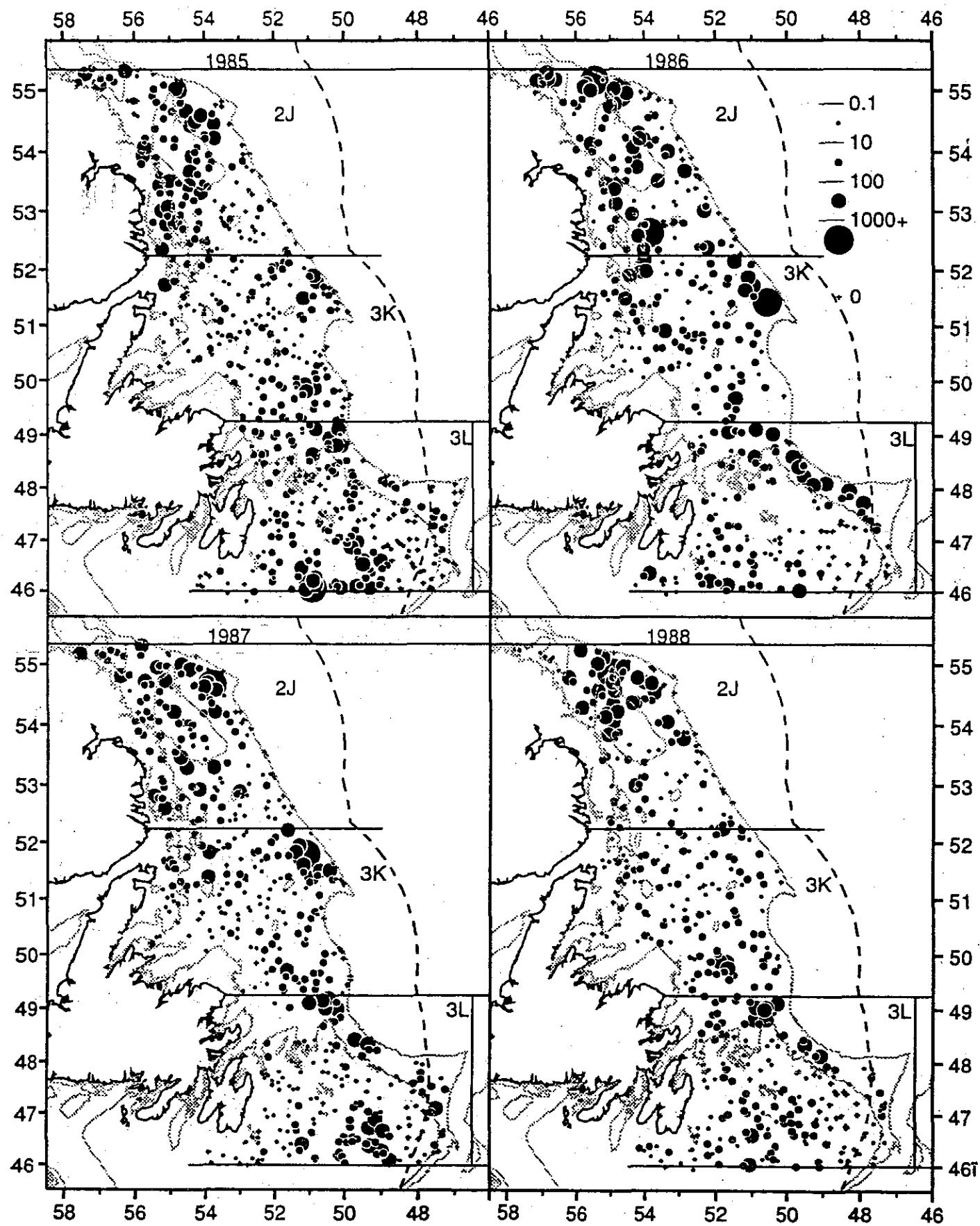


Figure 14. Cod Distribution 1985-88 from Autumn RV Surveys, Numbers per Tow.

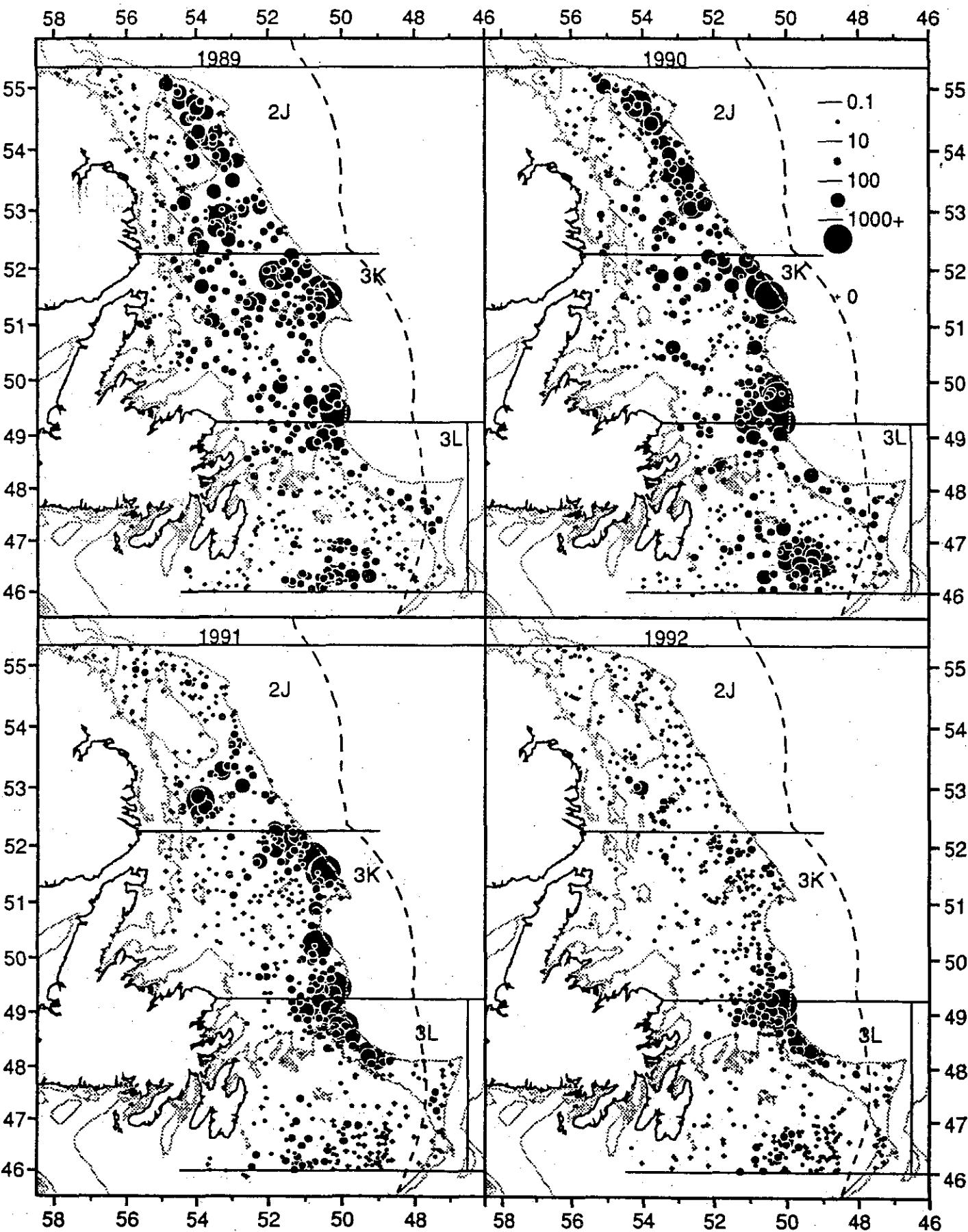


Figure 15. Cod Distribution 1989-1992 from Autumn 2J3KL RV Surveys, Numbers per Tow.

Figure 16. Div. 2J abundance: total and deeper than 300 meters.

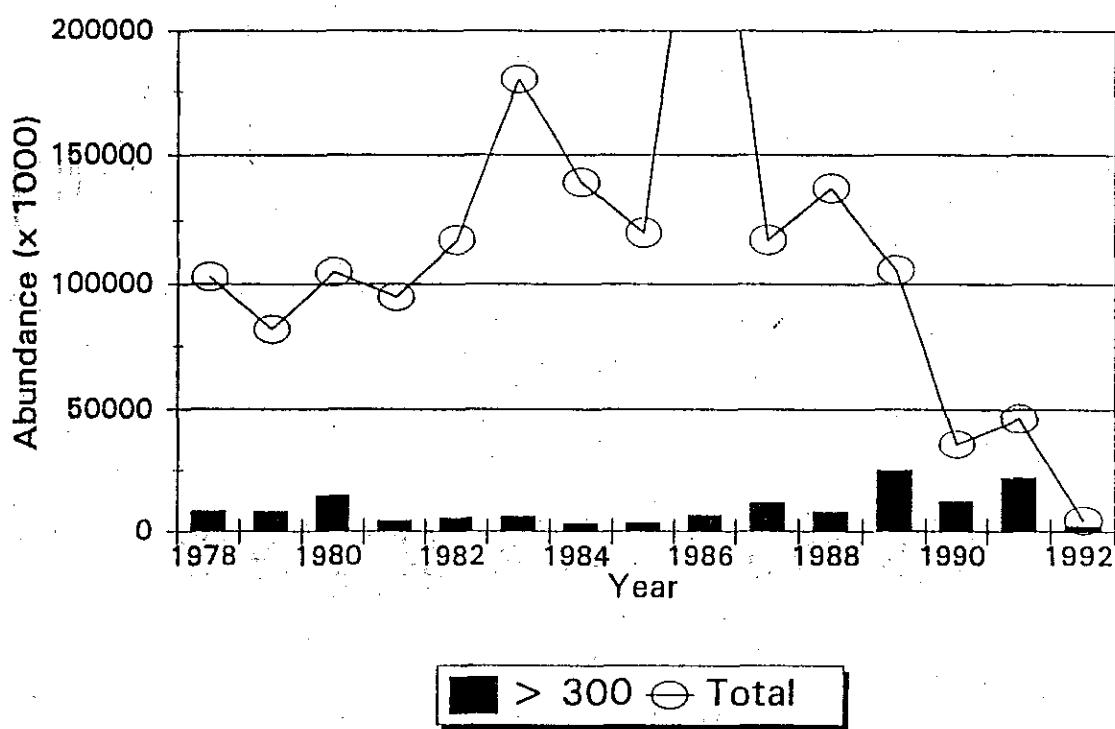


Figure 17. Div. 3K abundance: total and deeper than 300 meters.

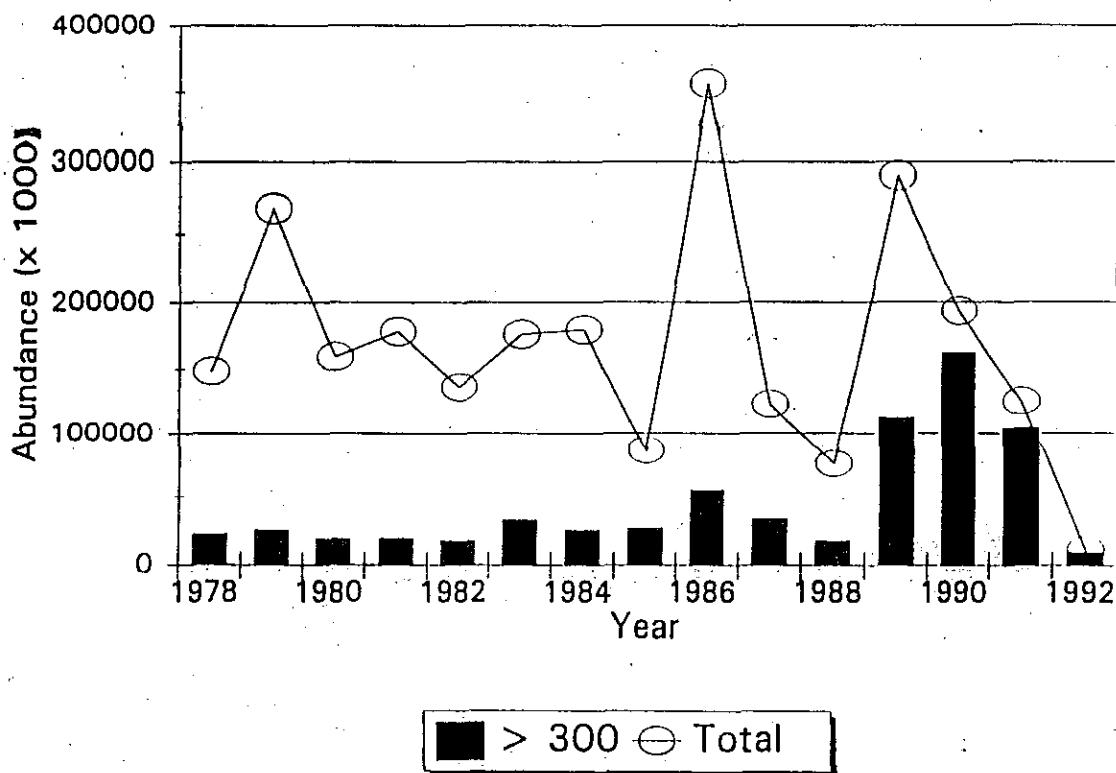


Figure 18. Division 3L autumn abundance:  
total and deeper than 150 fathoms.

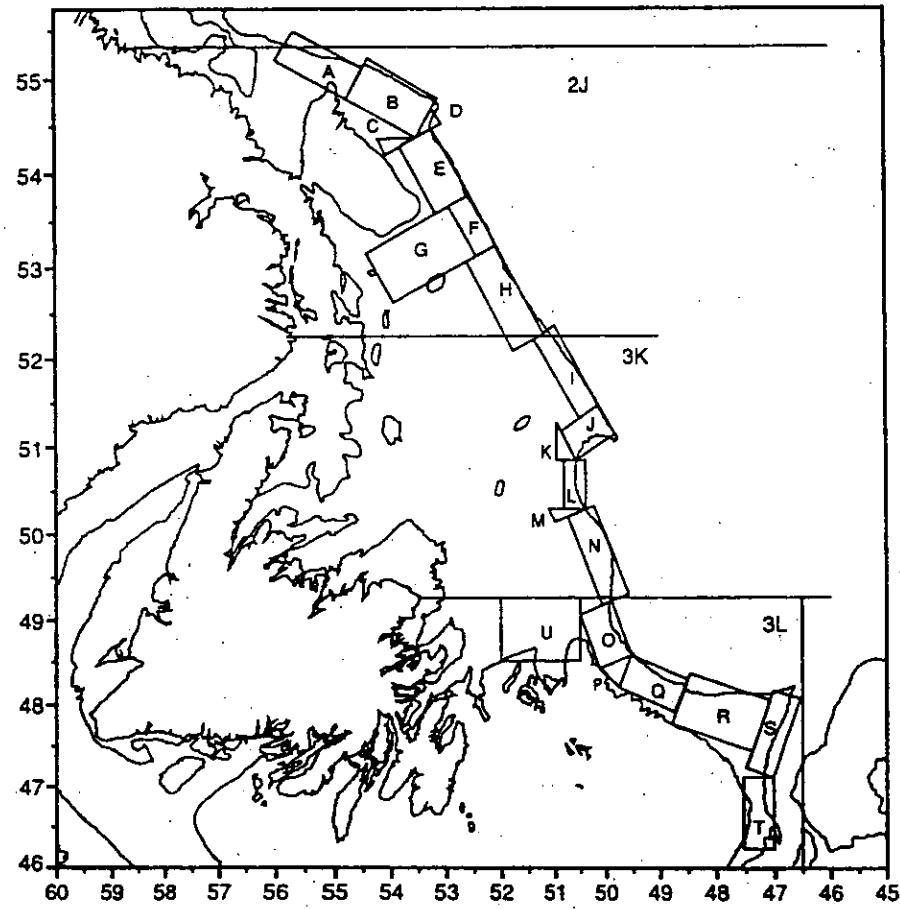
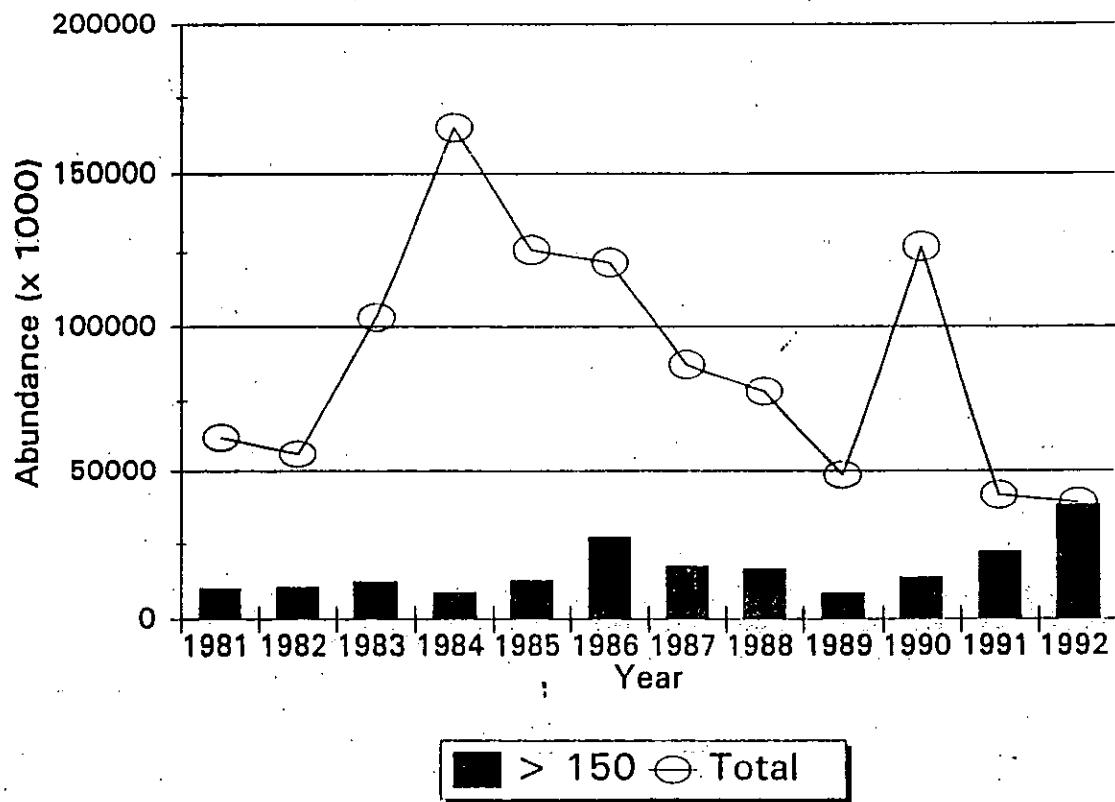


Figure 19. Survey area (blocks) for winter hydroacoustic surveys  
in Div. 2J, 3K and 3L.

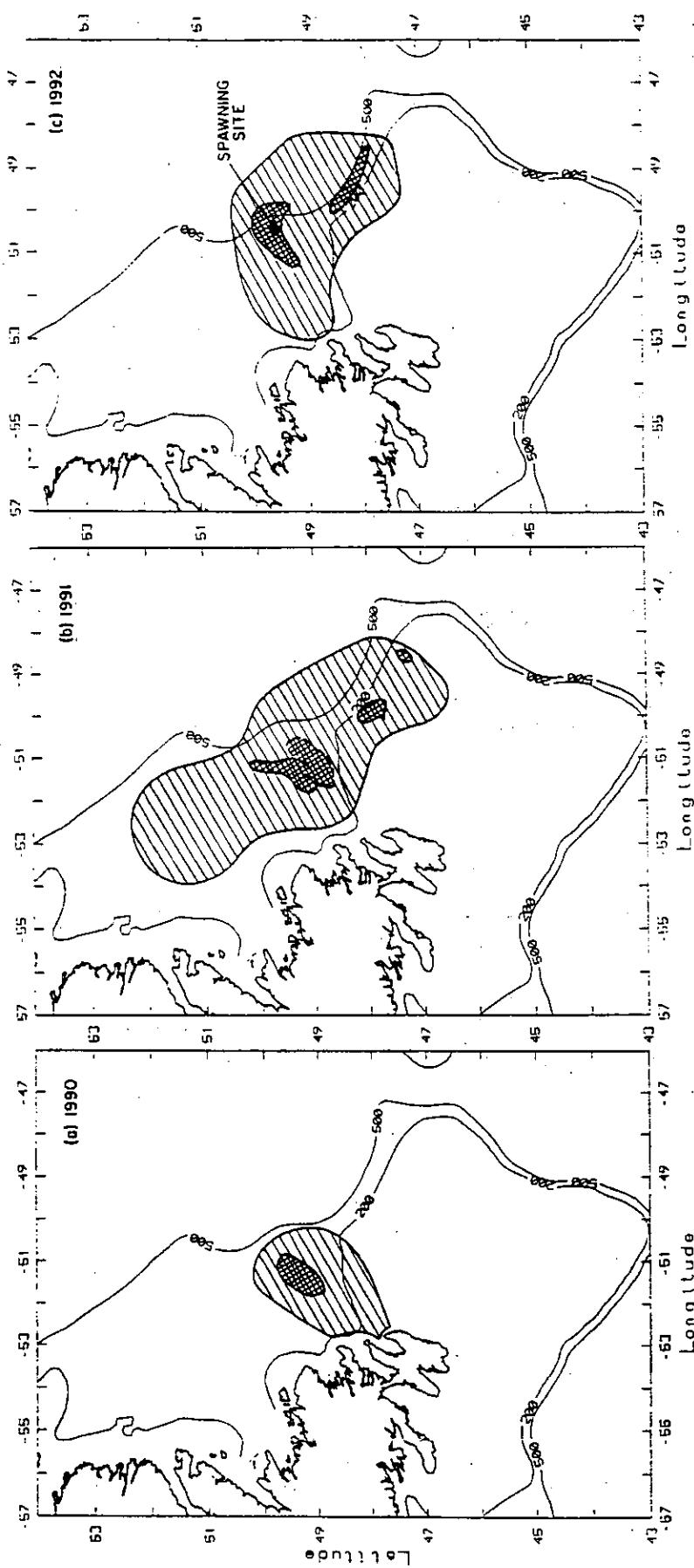
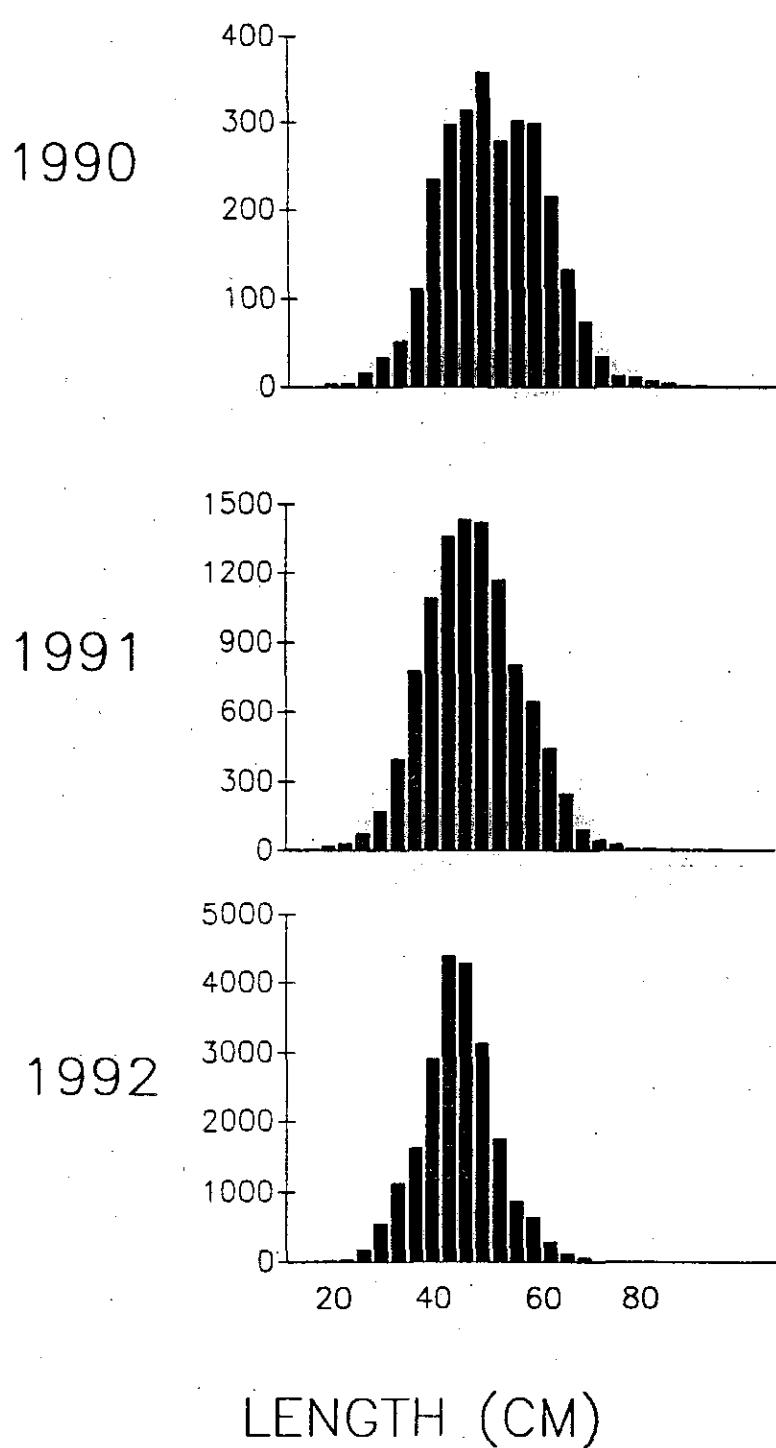


Fig. 20. Area surveyed with echosounders (a) from June 1-20, 1990, (b) May 20-July 1, 1991, and (c) June 1-July 15, 1992. Crosshatched area represents distribution of cod. Major spawning site marked in 1992.



**Fig. 21. Size-frequency distribution of cod in 1990, 1991, and 1992 from bottom and midwater trawls.**

## PERCENT OF MATURE FEMALES SPENT

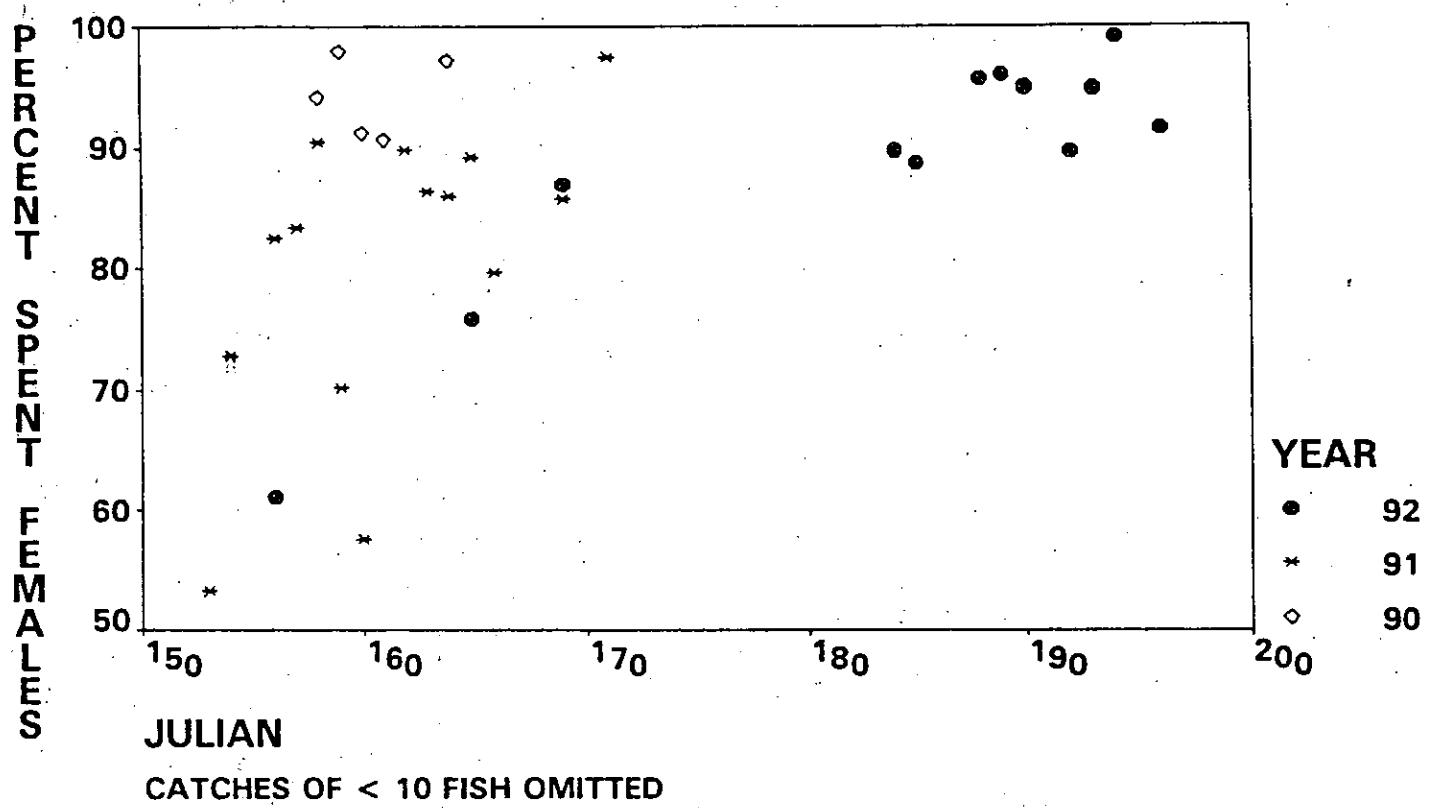


Fig. 22. Percent of mature females that were in spent condition over the study periods in 1990, 1991, and 1992.

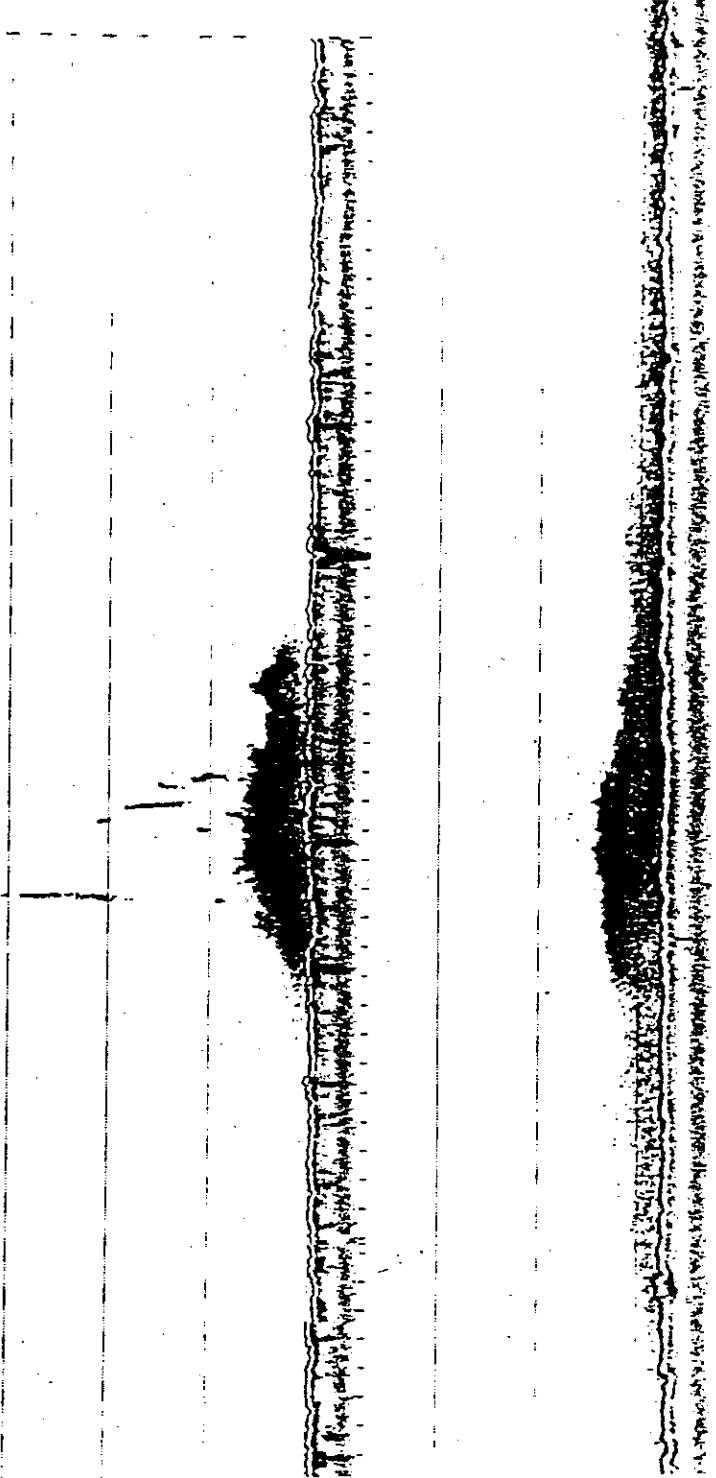
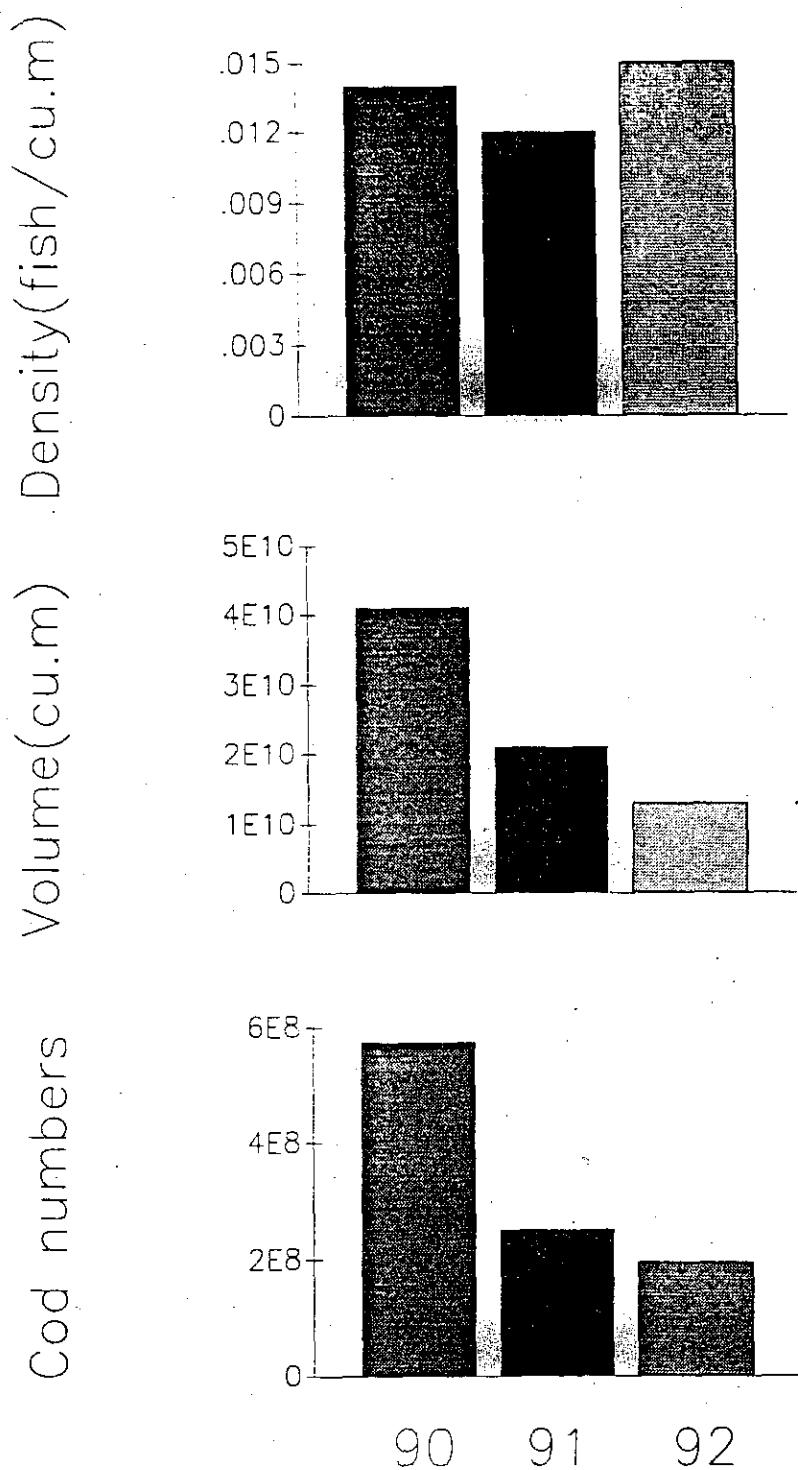


Fig. 23. Spawning school of cod encountered in 1992. Panel width is 7.5 km; each vertical grid is 50 m. Top panel shows cod when spawning was at the peak observed; bottom panel shows school beginning to break up prior to migration.



**Fig. 24. Top:** density of fish per cubic metre assessed by integration scaled by and estimate of the mean target strength based on in situ and experimental values (see text). **Middle:** Volume occupied by cod aggregations. **Bottom:** total cod numbers. These data are based on acoustic grids across cod aggregations judged to be moving slowly relative to the vessel (ratio 25:1). Estimates of volume were made by interpolating aggregation edges between transects across aggregations. Density estimates are transect averages (no weighting was applied because all transects cross the centre of the rather regular density field of the aggregation and were judged not to be biased).

Figure 25. Cod in Div. 2J3KL mean fishing mortality.

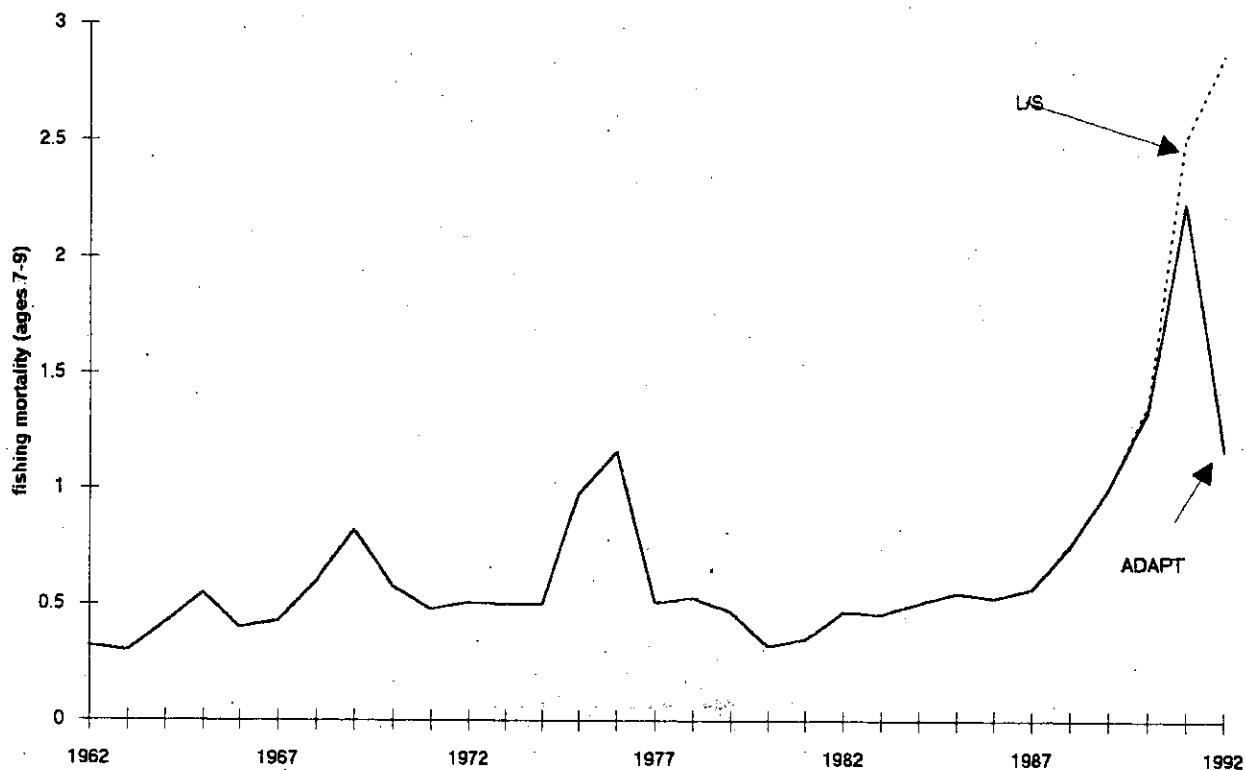


Figure 26. Cod in Divisions 2J3KL January 1 Population biomass.

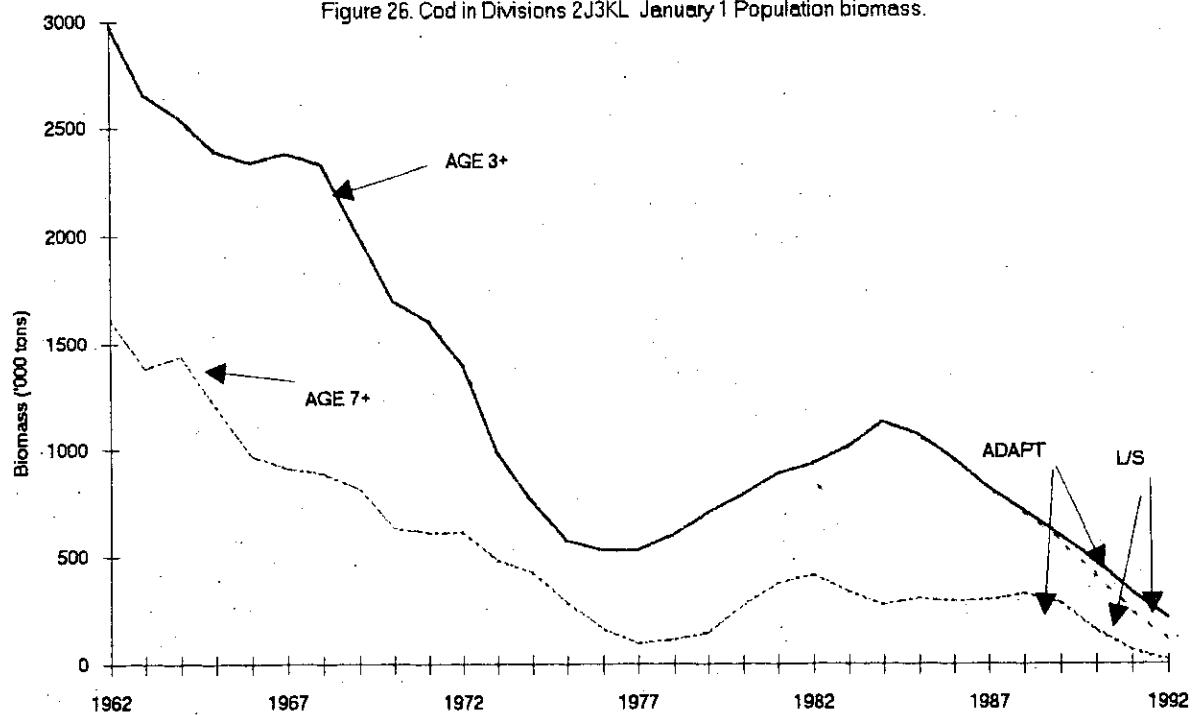


Figure 27. Cod in Divisions 2J3KL: Age 3 population Numbers.

