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An assessment of the cod stock in NAFO Divisions 2J3KL

by

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Abstract

Catches of cod from NAFO Divisions 2J3KL have declined from a high of about 800,000 t in 1968 to a low of about 140,000 t in 1978. Since 1982 catches have been between 219,000 and 269,000 t. Two indices of abundance, research vessel surveys and commercial catch rates, were used on an age-disaggregated basis in a single formulation of the ADAPT calibration analysis to estimate fishing mortality and stock size for 1990. This assessment indicated that fully recruited (ages 7-9) fishing mortality in 1990 is about 0.52. The age 3+ biomass at the beginning of 1990 is estimated to be about one million tons with the population (age 3+) numbering about 1.5 billion fish. About 47% of the biomass and over 70% of the abundance in 1990 is represented by the 1986 and 1987 yearclasses. Under the current management regime for this stock, it is expected that fishing mortalities will approach $F_{0.1}$ by the mid 1990s.

Résumé

Après avoir culminé à environ 800 000 tonnes en 1968, les prises de morue de la division 2J3KL de l'OPANO sont tombées à 140 000 t en 1978. Depuis 1982, les prises se sont situées entre 219 000 et 269 000 t. On s'est servi de deux indices d'abondance, des données des campagnes d'évaluation et des taux de prises commerciales, désagrés selon l'âge, pour estimer la mortalité due à la pêche et la grosseur du stock en 1990 au moyen d'une seule analyse d'étalonnage ADAPT. Il s'avère que la mortalité du à la pêche dans les stocks pleinemente recrutés (âges 7-9 ans) est d'environ 0,52 pour 1990. On estimait à 1,5 milliards de poissons la biomasse de la population d'âge 3 + au début de 1990. Les classes d'âge de 1986 et de 1987 représentent environ 47 % de la biomasse et plus de 70 % de l'abondance en 1990. Dans le régime de gestion actuel du stock, on s'attend à ce que la mortalité due à la pêche approche de $F_{0.1}$ d'ici le milieu des années 90.

Nominal catch

Nominal catches for this stock increased during the late 1950's and early 1960's and peaked at just over 800,000 t in 1968 (Table 1, Figure 1). Catches rapidly declined thereafter and were at a low of 139,000 t in 1978. During 1982 to 1989 catches were in the range of 230,000 to 270,000 t, however, a reduction to 219,000 t occurred during 1990. Reduced allocations to the Canadian offshore fleet, comprised mainly of TC-5 otter trawlers, was the main reason for this decline. The total catch by offshore fleets of 106,000 t in 1990 was the lowest since 1982.

Total allowable catches (TAC's) were first introduced for this stock in 1973 (Table 1) and during the 1973-1976 period were ineffective in restricting catches. During 1977 Canada extended fisheries jurisdiction to 200 nautical miles and TAC's were reduced to more restrictive levels.

During the 1960's, when the fishery was dominated by non-Canadian fleets, most of the catch occurred in Divisions 2J and 3L with 2J generally predominating (Figure 2). Since that time catches have been mainly from Divisions 2J and 3K. Canadian landings by TC-5 otter trawlers have shown considerable fluctuation between these divisions during the 1977-1986 period. In 1987 a management plan was put in place to distribute otter trawl catches equally among all 3 divisions. As a result catches were more evenly distributed during 1987-1989.

In 1990 severe ice conditions prohibited the otter trawl fleet from fishing in Division 2J during the winter months and during other months catch rates were low. This resulted in a shortfall in the offshore allocation in this division. The Canadian catch distribution for large otter trawlers by division during 1990 was 23% in Division 2J, 34% in Division 3K, and 43% in Division 3L.

Information from Canadian surveillance and NAFO circular letters indicate that the catch by foreign fleets, mainly Spain and Portugal, outside 200 miles in Division 3L, was about 26,000 t in 1990. This is in the range of non-Canadian cod catches reported in this area during the past five years.

The catch by fixed gears (traps, gillnets, handlines, and longlines) increased from a low of 35,000 t in 1974 to 113,000 t in 1982 (Table 2, Figure 3). Catches subsequently decreased to about 75,000 t between 1985 and 1987 but increased to about 100,000 t in 1988-1989. The catch of 112,500 t on 1990 was the highest since 1982 and the second highest since 1964. The predominant gears in this fishery are traps and gillnets. The 1990 trap catch of 46,900 t was the highest in the 1975-1990 period. Catches in the other three fixed gear fisheries were also among recent highs. The largest increase in the fixed gear catch occurred in Division 3L. During the past 3 years a gillnet fishery in the offshore area of Division 3L has developed. This fishery primarily occurred in unit area 3Lr. In 1990 this fishery contributed about 20,000 t of the total 27,000 t gillnet catch for this division.

Catches by month for all gears for 1990 are presented in Table 3. In Divisions 2J and 3K catches by otter trawlers occurred primarily in winter and autumn while catches by fixed gears

occurred mainly in summer. In Division 3L otter trawl catch occurred throughout the year while fixed gear catches occurred mainly in summer, but extended into autumn. Catches by month for 1989 have been revised substantially from those reported in Baird et al., 1990. Revised monthly catches for 1989 for Canada are presented in Table 4a with those for foreign fleets given in Table 4b.

Catch and weight at age

A summary of the sampling used to derive the catch at age in 1990 is given in Table 5. Sampling was spread spatially and temporally over all gears with a total of about 6000 fish aged and 280,000 fish measured. The following relationship was applied in deriving average weight at age: log weight = 3.0879 log length - 5.2106. Sampling of the Canadian commercial catch in 1990 also included information on the developing offshore gillnet fishery in Division 3L. Coefficients of variation on the estimated catch were less than 10% for ages 3 to 12 (Table 6). The 1985 and 1986 yearclasses were the most abundant in the commercial catch in 1990. These same two yearclasses dominated the fixed gear fishery in 1990 while ages 5 to 8 (1982-85 yearclasses) were dominant in the offshore mobile gear fishery (Table 7, Figure 5).

Catch at age for the 1962-90 period is shown in Table 8 with the respective average weight at age given in Table 9. The 1986 yearclass was estimated to be above average in the previous assessment of this stock (Baird et al., 1990) and the catch of this yearclass in 1990 was larger than any other yearclass at age 4 since 1982 (the 1978 yearclass). On the other hand, the catches of cod at age 6 and 7 in 1990 (the 1984 and 1983 yearclasses) are among the lowest in recent years, indicating that these yearclasses are weak.

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 1970s to the early 1980s and subsequently declined. Since 1987 average weights have been relatively stable.

Research vessel survey data

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 Division 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 Division 3L for the years 1971-82 and 1985-90. Surveys in Divisions 2J3K have been conducted by *R.V. GADUS ATLANTICA* while those in Division 3L have been conducted by *R.V. A.T.CAMERON* (1971-82) and *R.V. WILFRED TEMPLEMAN* (1983-90). 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. Stratification charts used for the surveys in the three NAFO Divisions are presented in Figures 6-8.

Divisional survey estimates of biomass and abundance have shown large annual fluctuations, especially in recent years. The Division 2J estimate for 1990 is the lowest in that 14 year time series (Tables 10-11, Figure 9), however the 3K and 3L (autumn) estimates for 1990 are among the highest in their respective divisions (Tables 12-15, Figures 10-11). The 1990 estimates for Division 3L (spring) are also among the highest for that time series (Tables 16-17, Figure 12). It is not clear how much of this variation is due to movements of cod between the three divisions or to changes in availability of cod at the time the survey takes place. The divisional survey results also indicate that cod biomass has moved to deeper water during the time of the survey. This is especially true in the more northern areas (2J and 3K). This same observation has been made for other cod stocks in the Northwest Atlantic (Bishop et al., 1991; Fréchet et al., 1991).

Percent biomass by division (Table 18) was fairly stable for a period in the early 1980s and averaged about one third in each of the three divisions. In recent years the percentages have become quite variable with the highest and lowest percents for each of the three divisions occurring in the past three years (1988-90). The average percentages for the 1981-90 period are 38% in Division 2J, 33% in Division 3K, and 29% in Division 3L.

In an attempt to minimize variance in the autumn survey estimates, an adaptive survey design was used in 1989 and 1990. An additional 69 sets in 1989 and 103 in 1990 (Table 19) were allocated based on a design described by Francis (1984). Francis states that this design results in a small bias in survey estimates. Subsequent to the completion of these two surveys, simulation studies were conducted and presented at the CAFSACs Statistics, Sampling, and Surveys Subcommittee in March, 1991. Results indicated the size of the bias for over-dispersed distributions (log-normal or negative-binomial) may be as large as the coefficient of variation of the survey means. The SSS Subcommittee considered this amount of bias to be unacceptable and therefore recommended that the use of the adaptive survey strategy be discontinued. It was noted that allocation schemes based on previous years data do not yield biased estimates, but, may result in gains in precision. These techniques will be explored for this stock.

Tables 20-23 give the mean numbers per tow at age for the surveys conducted in all divisions. The values include adjustments to account for strata omitted during some surveys. In Divisions 2J and 3K the 1987 yearclass (age 3) dominated in 1990. In Division 3L during spring and autumn the 1986 yearclass (age 4) dominated in 1990 followed closely by the 1987 yearclass.

There were no autumn surveys in Division 3L for the years 1978-80, so an index for these years was estimated by averaging yearclass estimates in successive spring surveys in Division 3L for 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 divisions. The surveyed area, in square nautical miles, used as weights for this average are: 2J - 21,560; 3K - 29,256; 3L - 36,777. This 2J3KL index (Table 24, Figures 13-14) indicated that the 1986 and 1987 yearclasses, ages 3 and 4 in 1990, were above average with the 1987 yearclass the highest at that age in the 13 year time series. Coefficients of variation for the age-by age means are also presented in Table 24.

Commercial catch rates

Offshore catch and effort data are analyzed using a multiplicative model (Gavaris, 1980) to account for country/gear, seasonal, and divisional differences. Data are available in two time periods: 1962-79 and 1978-90. There is not sufficient overlap in country/gear categories to include data from both periods in a single analysis. For the early period data was obtained from NAFO and included Canadian (TC 4 and 5), Portuguese (TC 6 and 7), and Spanish (TC 6) otter trawler catch rates. For the latter period data was obtained from DFO and included Canadian (TC 4, 5, and 6) and Portuguese (TC 6 and 7) otter trawl catch rates, with the Portuguese data being obtained from observer records. Plots of residuals indicate that data with greater catch and effort were less variable, therefore, estimated weights calculated according to Judge et al. (1980, p. 132) were applied in a weighted regression of the multiplicative model. To reduce the possible effects of truncation and rounding, data with less than 10 tons catch or 10 hours effort were excluded from the analysis.

The regression of ln catch rate of cod for the 1962-79 period explained about 60% of the variation in the data (Table 25). Regression coefficients for this period (Table 26) indicate that Portuguese TC 7 otter trawlers were the most effective and the highest catch rates overall occurred in the first quarter of the year. The time series of catch rates display a declining trend throughout the period (Table 27, Figure 15).

The regression of ln catch rates for the 1978-90 period explained about 66% of the variation in the data (Table 28). For the fleets included in this analysis Canadian (M) TC 6 otter trawlers were the most effective (Table 29), and the best catch rates overall, again, occurred during the first quarter of the year. C/E for this period increased steadily until 1985 and has been relatively stable in subsequent years (Table 30, Figure 16). The C/E for 1978-1982 are not considered comparable to those of 1983-1990 because of learning by the Canadian fleet during the earlier period and the introduction of enterprise allocation and dockside grading at the beginning of the 1980's.

Results of an analysis of catch rate data, by NAFO Division for the 1978-90 period, are given in Tables 31-36. These analyses indicated that while trends in C/E were similar between Divisions 3K and 3L they were both different from Division 2J. The index for Division 2J increases from 1978 to 1983 with a subsequent decline (Table 37, Figure 17) while the indices for Divisions 3K and 3L show a general increase throughout the time period (Tables 38-39, Figures 18-19). It was noted that these dissimilar trends violated the assumptions of the multiplicative model when all data are included, but, the impact of this violation is uncertain.

A C/E index at age for 1978-90 was derived using the catch at age from the offshore fleet along with the calculated fishing effort from the C/E standardization (Table 40). The 1990 index confirms the conclusions of the previous assessment of this stock, that the 1985 yearclass was average while those of 1983 and 1984 are weak. This index in not considered reliable for cod ages four and less.

Estimation of stock parameters

The adaptive framework (Gavaris, 1988) used in this assessment included RV catch per tow and commercial catch rate, both disaggregated by age. Several formulations of the adaptive framework were reviewed including:

(1) Same as last years accepted formulation with ages 3-12 RV and ages 5-8 C/E.

(2) A comparison of (1) using the now unused phase-2 research survey results.

(3) Same as (1), but, including age 2 research vessel results as was recommended last year.

(4) Same as (1) above, but, incorporating additional ages for the C/E index (ages 9-12 also included). This is the accepted formulation for the current assessment.

For first formulation, the same as used last year, CVs on estimated abundance were in the range of 15% to 31% while those on estimated slopes were between 8% and 11% (Table 41). Residual patterns for the both the RV and C/E indicated some year effects (Table 42) as was the case for the previous assessment of this stock. The age 3+ population numbered 1.4 billion animals and the fully recruited fishing mortality (ages 7-9) was about 0.54 (Table 43). This formulation was rejected because it was felt that extra information from additional data at older ages for the C/E index would be useful for estimating abundance at these ages.

Formulations of ADAPT using RV estimates from both the traditional design and the now unacceptable 2-phase survey design were examined to determine the impact on ADAPT results derived from the two RV designs. Although variances were minimized and bias could be potentially introduced with the 2-phase design, all parameters were estimated with about the same precision (Table 44) and the resulting age 3+ population estimates differed by only 5% (Table 45) from the first formulation.

When age two was introduced in the ADAPT formulation the CV of the age 3 abundance improved, but, the CV's for the older ages increased (Table 46). As well, about one third of the residuals for this index were considered outliers, which is an indication of the variability of the age 2 index (Table 47). The age 3 population estimate from this formulation was also unrealistically high at about 1 billion fish (Table 48). Therefore, the results based on the age 2 RV index were considered to be unreliable and were not used further. A plot of the RV age 2 numbers versus the age 3 SPA numbers from this formulation is presented in Figure 20.

The accepted formulation is described as follows:

Parameters estimated by ADAPT:

- Yearclass estimates
  $N_{i,1990}$ i = 3 to 12

- Catchabilities for RV and C/E numbers
  K_{1i} i = 3 to 12 (RV)

  K_{2i} i = 5 to 12 (C/E)

Additional structure imposed:

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

Input data:

- $C_{i,t}$ i = 3 to 13 t = 1978-90

- $RV_{i,t}$ i = 3 to 12 t = 1978-90

- $C/E_{i,t}$ i = 5 to 12 t = 1983-90

- Fall RV related to population at end of November.
- C/E related to population at the beginning of the year.

Objective function:

- Minimize

$$\sum_{age}\sum_{year}\{obs(\ln RV_{i,t})-pred(\ln RV_{i,t})\}^2 + \sum_{age}\sum_{year}\{obs(\ln C/E_{i,t})-pred(\ln C/E_{i,t})\}^2$$

Summary:

- Number of observations = 194
- Number of parameters estimated = 28

In previous assessments it had been established that intercepts were not significant and hence were not included in this analysis. The CV's on abundance ranged from 16% to 33% while those on estimated slopes were in the range of 9% to 11% (Table 49). Correlations between estimated parameters were low (Table 50). Residuals for both time series displayed some patterns (Table 51). For the RV index there was a positive year effect for 1986 and negative effects for 1985, 1987, and 1988. For the C/E index virtually all residuals for 1987-88 were negative while the opposite was true for 1989-90. Plots of RV ages 3-12 numbers and C/E ages 5-12 numbers versus SPA for their respective age groups are shown in Figures 21 and 22.

Assessment Results

The numbers at age 3 in 1989 (1986 yearclass) and 1990 (1987 yearclass) were estimated by the accepted ADAPT formulation to be 505 and 645 million fish respectively (Table 52). The estimate of the 1986 yearclass is within 10% of what it was estimated to be last year. Both the 1986 and 1987 yearclasses are estimated to be higher than any yearclasses since those of the late 1960's (Figure 23).

The current analysis indicates that the age 3+ population biomass at the beginning of the year has increased from 525,000 t in 1976 to about 1.2 million tons in 1984 with a subsequent decline to 900,000 t in 1988. The current biomass is estimated to be just over 1 million tons (Table 53, Figure 24). The age 3+ biomass for 1989 from this assessment is about 10% higher than the 1989 estimate from the previous assessment of this stock. This analysis also implies that the age 7-9 mean fishing mortality in 1990 is about 0.52. Fishing mortality has increased from 0.29 in 1980 to 0.59 in 1989 (Table 54, Figure 25).

Prognosis

The parameters used for the projections of biomass and fishing mortality for the current management plan are presented in Table 55. The weights at age are averages of values for 1988-1990. The partial recruitment values were derived from the 1990 fishing mortalities with full recruitment at age 7-9 years. Natural mortality was assumed to be 0.20. The 1988-1990 yearclasses at age 3 in 1991-1993 were set at 300 million fish, the geometric mean of the age 3 population numbers from 1978-1990. The sizes of all other yearclasses were determined by the calibration.

The current management plan for this stock includes TAC's for 1991 to 1993 of 190,000 t, 185,000 t, and 180,000 t respectively. It is expected that the catch by non-Canadian fleets outside the 200-mile fishery zone in Division 3L will be about 25,000 t for each of these three years. This would imply total catches for the duration of the plan of 215,000 t, 210,000 t, and 205,000 t. These catch levels were used for the projection of biomass and fishing mortality.

The results of the projections are:

Year	Catch (000 t)	Fishing mortality (ages 7-9)	January 1 Age 3+ biomass (000 t)
1991	215	.44	1,085
1992	210	.34	1,129
1993	205	.28	1,163
1994	-	-	1,182

Under the current multi-year management fully recruited fishing mortality is likely to decrease to a level just above the $F_{0.1}$ reference for this stock by 1993. The beginning of the year age 3+ population biomass is expected to increase from just over 1 million tons in 1990 to about 1.2 million tons in 1994.

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Table 1. Historical catches of cod from NAFO Divisions 2J3KL for the period 1959-90.

	2J					3K				
	Offshore mobile gear			Fixed		Offshore mobile gear			Fixed	
Year	Can.	Other	Total	gear	Total	Can.	Other	Total	gear	Total
1959	-	46372	46372	17533	63905	-	97678	97678	56264	153942
1960	1	164036	164037	15418	179455	53	69855	69908	47676	117584
1961	1	243147	243148	17545	260693	-	60574	60574	31159	91733
1962	-	226841	226841	23424	250265	-	45554	45554	42816	88370
1963	1	197868	197869	23767	221636	-	79331	79331	47486	126817
1964	13	197359	197372	14787	212159	-	121423	121423	40735	162158
1965	-	246650	246650	25117	271767	21	50097	50118	26467	76585
1966	39	226244	226283	22645	248928	13	58907	58920	32208	91128
1967	28	217255	217283	27721	245004	114	78687	78801	24905	103706
1968	4650	355108	359758	12937	372695	1849	119778	121627	40768	162395
1969	30	405231	405261	4328	409589	56	80949	81005	24923	105928
1970	-	212961	212961	1963	214924	92	78274	78366	21512	99878
1971	-	154700	154700	3313	158013	31	61506	61537	21111	82648
1972	-	149435	149435	1725	151160	7	133369	133376	14054	147430
1973	1123	52985	54108	3619	57727	108	159653	159761	13190	172951
1974	-	119463	119463	1804	121267	19	149189	149208	10747	159955
1975	410	78578	78988	3000	81988	189	112678	112867	15518	128385
1976	94	30691	30785	3851	34636	771	79540	80311	20879	101190
1977	525	39584	40109	3523	43632	1051	26776	27827	28818	56645
1978	4682	17546	22228	6638	28866	7027	6373	13400	29623	43023
1979	9194	6537	15731	8445	24176	21579	16890	38469	27018	65487
1980	13592	7437	21029	17210	38239	21920	6830	28750	37015	65765
1981	22125	4760	26885	14215	41100	23112	3847	26959	23002	49961
1982	58384	8923	67307	14429	81736	8881	4074	12955	42141	55096
1983	37281	4158	41439	10743	52182	31623	2815	34438	40681	75119
1984	10754	1259	12013	13150	25163	48114	11059	59173	35143	94316
1985	1541	5	1546	10209	11755	72111	9714	81825	30368	112193
1986	4627	7373	12011	12567	24578	58239	2226	60465	28539	89004
1987	38216	3620	41836	16139	57975	39240	6119	45359	27141	72500
1988	41468	9	41477	17112	58589	40260	50	40310	33820	74130
1989	33584	1014	34598	22920	57518	37280	1194	38474	20711	59185
1990	17863	689	18493	14332	32884	26893	883	27691	27577	55353

Table 1 (Cont'd.).

	3L					2J3KL			
	Offshore mobile gear			Fixed		Total fixed	Total offshore mobile		
Year	Can.	Other	Total	gear	Total	gear	gear	Total	TAC
1959	4515	51515	56030	85695	141725	159492	200080	359572	-
1960	7355	60213	67568	94192	161760	157286	301513	458799	-
1961	4675	70318	74993	70659	145652	119363	378715	498078	-
1962	4383	87463	91846	72271	164117	138511	364241	502752	-
1963	4446	83015	87461	73295	160756	144548	364661	509209	-
1964	10158	142370	152528	75806	228334	131328	471323	602651	-
1965	7353	130387	137740	58943	196683	110527	434508	545035	-
1966	8253	120206	128459	55990	184449	110843	413662	524505	-
1967	13478	200343	213821	49233	263054	101859	509905	611764	-
1968	15784	211808	227592	47332	274924	101037	708977	810014	-
1969	18255	151945	170200	67973	238173	97224	656466	753690	-
1970	14471	137840	152311	53113	205424	76588	443638	520226	-
1971	11976	148766	160742	38115	198857	62539	376979	439518	-
1972	4380	109052	113432	46273	159705	62052	396243	458295	-
1973	1258	97734	98992	24839	123831	41648	312861	354509	666000
1974	880	67918	68798	22630	91428	35181	337469	372650	657000
1975	670	53770	54440	22695	77135	41213	246295	287508	554000
1976	2187	40998	43185	35209	78394	59939	154281	214220	300000
1977	5362	26799	32161	40282	72443	72623	100097	172720	160000
1978	9213	12263	21476	45194	66670	81455	57104	138559	135000
1979	14184	12693	26877	50359	77236	85822	81077	166899	180000
1980	15523	13963	29486	42298	71784	96523	79265	175788	180000
1981	21760	15070	36830	42821	79651	80038	90674	170712	200000
1982	27192	9271	36463	56479	92942	113049	116725	229774	230000
1983	39125	10920	50044	54999	105043	106423	125922	232345	260000
1984	49620	13944	63564	49428	112992	97721	134750	232471	266000
1985	39112	28927	68039	39306	107345	79883	151410	231293	266000
1986	55117	51555	106672	31263	137935	72369	179137	251506	266000
1987	43185	25883	69068	35467	104535	78747	156263	235010	256000
1988	59107	26748	85855	50103	135958	101035	167642	268677	266000
1989	40943	36540	77483	59238	136721	102869	150555	253424	235000
1990	33371	26456[a]	59827	70624	130451	112533	106155	218688	199262

[a]Includes EEC catch of 23513 t as reported to NAFO.

Table 2. Fixed gear cod catches (000't) by division and gear in NAFO Divisions 2J, 3K, and 3L from 1975 to 1990.

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
	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

Table 3. Cod landings (t) in 1990 by Canada from Divisions 2J, 3K, and 3L by month and gear.

Gear	Can-M OT	Can-N OT	GN	TRAP	LT	HL	Other[a]	Total
				2J				
Jan								
Feb								
Mar		625						625
Apr	1004	2771						3775
May	18	28						46
Jun	291		1					292
Jul			310	83		6		399
Aug	22	24	4933	3136	392	501		9008
Sep		12	3084	387	222	324		4029
Oct		447	715		35	26		1223
Nov	192	5328	176			1	689	6386
Dec	883	6218						7101
Total	2410	15453	9219	3606	649	858	689	32884
				3K				
Gear	Can-M OT	Can-N OT	GN	TRAP	LT	HL	Other[a]	Total
Jan	1566	7291	1			1	883	9724
Feb	599	9397						9996
Mar	267	2840						3107
Apr	996	1409	2					2407
May	273	167	16	130				586
Jun	450	63	27	154		12		706
Jul		104	4345	2081	17	40		6587
Aug		8	2948	8478	1371	2563		15368
Sep		214	199	337	2013	1734		4497
Oct		307	125	12	385	334		1163
Nov		164	104		52	59		379
Dec	68	710	37					815
Total	4219	22674	7804	11192	3838	4743	883	55353

Table 3. (Cont'd.)

Gear	Can-M		Can-N							Other[b]	Total
	OT	LL	OT	SCS	GN([a])		TRAP	LT	HL		
					Ins.	Off.					
						3L					
Jan	150	189	1308		15			1	1	743	2408
Feb	748	30	1445		1			71			2295
Mar	584	658	2964					63			4269
Apr	245	67	4303		15	125	115	4			4873
May	750	178	2459		158	307	525	12	10		4409
Jun	844	210	2478		350	3388	2739	17	103		10133
Jul		166	2211	116	4826	6140	23513	78	1186		38278
Aug	12	487	1513	160	1327	3520	5141	561	4371		17072
Sep	1	254	2369	147	217	2293	82	963	3005		9344
Oct		49	2343	164	122	1306		362	898		5239
Nov		15	2811	35	30	2135		46	71		5101
Dec	75	58	775		74	(320)		8	9		1317
Total	3409	2361	26979	622	7135	19534	32115	2186	9654	743	104738

[a]Ins. catches are those from unit areas (Fig. 4) 3LA, 3LB, 3LF, 3LJ, and 3LQ. Off. catches are those from all other unit areas.

[b]From NAFO + surveillance = 25713 t. Total 3L = 130451 t.

Total 2J3KL = 218688.

Table 4a. Cod landings (t) by Canada in 1989 from Divisions 2J, 3K and 3L by month and gear.

Month	OT			GN	TRAP	LT	HL	Total
	Can N	Can M	Other					
				2J				
J	4561	3235						7796
F	730							730
M	2	186						188
A	3639	333						3972
M	688	71						759
J	423			22	27		8	480
J				2063	1065	9	69	3206
A	107			7741	5174	32	750	13804
S	4			3898	297	164	542	4905
O	1150	42	171	856	89	31	76	2415
N	12161	1101	839	7				14108
D	4971	180	4					5155
Total	28436	5148	1014	14587	6652	236	1445	57518
				3K				
J	1206	3184		165				4555
F	1137	2566		59				3762
M	4708	3189						7897
A	7686	1324		4				9014
M	8487	149	75	178	197			9086
J	780		940	526	757	4	185	3192
J	48	41	28	4792	3509	3	178	8599
A	322	23		1704	3053	315	1875	7292
S	52	2	23	276	657	259	1237	2506
O	173		4	122	16	82	396	793
N	8		28	57		24	27	144
D	1431	764	96	38		13	3	2345
Total	26038	11242	1194	7921	8189	700	3901	59185

Table 4a. (Cont'd.)

Month	CAN N					CAN M			
	OT	GN	TRAP	LT	HL	OT	GN	LT	Total
					3L				
J	1927	36			1	650		38	2652
F	1055	168				4010		236	5469
M	398	204		15		1182		414	2213
A	4381	590	144	115	1	1775		97	7103
M	4437	3106	998	103	36	994		215	9889
J	4191	4029	9347	281	1557	228	9	212	19854
J	3411	8145	12259	225	1497	50		302	25889
A	2379	2814	1120	905	3285			73	10576
S	2784	528	70	879	1448	274		121	6104
O	3234	952	22	342	479	77			5106
N	2348	1356	4	40	56	51		20	3875
D	1090	294		3	7	17		40	1451
Total	31635	22222	23964	2908	8367	9308	9	1768	100181

Table 4b. Landings of cod (t) by foreign fleets in 1989 from Division 2J, 3K, and 3L by month and gear.

Month	2J	3K			
	France	France	Japan	USSR	Total
J					
F					
M					
A					
M		75			75
J		921		19	940
J				28	28
A					
S			3	20	23
O	171		4		4
N	839	27	1		28
D	4	83		13	96
Total	1014	1106	8	80	1194

	3L								
	FRG	GDR	Japan	Port(OT)	Port(GN)	Spain(OT)	Spain(PT)	USSR	France	Total
J						3	715			718
F							1368			1368
M				72		38	1161			1271
A	287					3	182	2		474
M				2037	234		163	13		2447
J				3510	166	6	951		121	4754
J				2554	99	19	2118		21	4811
A	198	33		1921	304	9	642			3107
S				1688	112	99	623			2522
O			2	3717	224	13	1104			5060
N				4390	99	6	1492		837	6824
D				1920			1264			3184
Total	485	33	2	21809	1238	196	11783	15	979	36540

Table 5. Commercial sampling for cod in Divisions 2J+3KL in 1990.

Div.	Gear	Qtr.	Country	No. aged	Month	No. meas.	Landings (t) Country/month	Landings (t) Total
2J	OT	1	Can(N)	124	Mar	4847	625	625
		2		326	Apr	10549	2771	4112
		3+4		497	Oct	3164	447	447
					Nov	17719	5328	5520
					Dec	5878	6218	7101
			France	141	Nov	1471	689	689
		3+4		638				13815
		1-4		1088		43628		18552
	TRAP	3	Can(N)	386	Aug	7908	3136	3606
	GN	3			Jul	3243	310	9219
					Aug	7234	4933	
	HL	3			Aug	126	501	1507[a]
	Fixed gear			386		18511		14332
	OT+Fixed			1474		62139		32884
3K	OT	1	Can(N)	681	Jan	21808	8857	8857
					Feb	31188	9996	9996
					Mar	7921	3107	3107
			Fra(M)	32	Jan	399	442	442
			(SP)	39	Jan	730	441	441
				752		62046		22843
		2	Can(N)	180[b]	Apr	4645	2405	2405
					May	270	440	440
					Jun	327	513	513
						5242		3358
		3	Can(N)	84[b]	Jul	275	104	326
					Sep	511	214	
						786		
		4	Can(N)		Oct	233	307	1249
		1-4		1016		68307		27776
3K	TRAP	3	Can(N)	951	Jul	2432	2081	10843
					Aug	8438	8478	
	GN				Jul	9520	4345	7339
					Aug	1090	2948	
	LL				Aug	4408	1371	1388
	HL				Jul	211	40	2616
					Aug	5397	2563	
				951		31496		22186

Table 5. (Cont'd.)

Div.	Gear	Qtr.	Country	No. aged	Month	No. meas.	Landings (t) Country/month	Landings (t) Total
3K	TRAP	4	Can(N)	790	Sep	383	337	349
	GN				Sep	495	199	465
	LL				Sep	3172	2013	2450
	HL				Sep	6522	1734	2127
				790		10572		5391
	Fixed gear	1-4		1741		42068		27577
	OT+Fixed	1-4		2757		110375		55353
3L	OT	1	Can(N)	323	Jan	3906	1308	1647
					Feb	4069	1445	2223
					Mar	1896	2964	4206
			Fra(M)	99	Jan	1312	371	371
			(SP)		Jan	478	372	372
				422		11661		8819
		2	Can(N)	660	Apr	5039	4303	4615
					May	4421	2459	3387
					Jun	3971	2478	3532
				660		13431		11534
		3	Can(N)	546	Jul	1517	2211	2377
					Aug	1310	1513	2012
					Sep	4150	2369	2624
				546		6977		7013
		4	Can(N)	518	Oct	5412	2343	2392
					Nov	2839	2811	2826
					Dec			908
				518		8251		6126
	SSc	3	Can(N)		Sep	591	147	622
	OT+SSc	1-4		2146		40991		34114
	TRAP	2	Can(N)	198	May	1567	525	640
	GN(I)				May	247	158	189
				198		1814		829
	TRAP	3	Can(N)	1269	Jun	11783	2739	2739
					Jul	9707	23513	23513
					Aug	1395	5141	5223
	GN(I)				Jun	119	350	
					Jul	4321	4826	6946
					Aug	242	1327	

Table 5. (Cont'd.)

Div.	Gear	Qtr.	Country	No. aged	Month	No. meas.	Landings (t) Country/month	Total
3L	GN(O)	3	Can(N)		Jun	1008	3388	
					Jul	1388	6140	13480
					Aug	1564	3520	
	HL				Jun	1896	103	114
					Jul	356	1186	1186
					Aug	9989	4371	4371
	LL				Aug	3411	561	807
				1269		47179		58379
	GN(O)	4	Can(N)	944	Sep	1707	2293	
					Oct	845	1306	6054
					Nov	514	2135	
	LL				Sep	2275	963	1379
	HL				Sep	10617	3005	3983
				944		15658		11339
	Fixed gear	1-4		2411		64651		70624
	OT+Fixed			4557		105642		104738
			Other[c]					25713
2J3KL	All	1-4		6256		278156		218688

[a]Includes longline catch.
[b]Qtrs 2-3 A/G were combined to adjust Qtrs 2-4 catches.
[c]Catch by other countries adjusted using total 3L OT age composition.

TABLE 6. ESTIMATED CATCH, AVERAGE WEIGHT AND AVERAGE LENGTH AT AGE ALONG WITH ASSOCIATED VARIANCES FOR THE COMMERCIAL FISHERY FOR COD IN NAFO DIVISIONS 2J3KL DURING 1990.

	AVERAGE		CATCH		
AGE	WEIGHT	LENGTH	MEAN	STD. ERR.	C. V.
2	0.224	29.864	4	1.93	0.45
3	0.456	37.481	2101	161.04	0.08
4	0.708	43.298	29034	680.13	0.02
5	1.058	49.172	36943	853.13	0.02
6	1.479	54.771	24421	713.87	0.03
7	1.892	59.342	17446	573.56	0.03
8	2.207	62.252	19108	555.27	0.03
9	2.446	64.170	9855	412.70	0.04
10	3.075	69.021	3183	222.36	0.07
11	3.620	72.525	1190	110.55	0.09
12	4.745	78.951	551	50.43	0.09
13	6.599	87.874	126	14.28	0.11
14	8.081	93.379	101	14.39	0.14
15	10.373	101.325	49	8.16	0.17
16	12.805	109.645	35	6.64	0.19
17	16.234	118.919	11	2.84	0.25
18	14.179	113.554	9	2.59	0.29
19	17.258	121.987	2	1.24	0.76

Table 7. Offshore (mobile and fixed gear) and inshore (fixed gear) catch-at-age (Nos. x 10^{-3}) and mean weights at age (kg), by NAFO division, for the commercial cod fishery in Divisions 2J+3KL during 1990.

	Offshore				Inshore		
	Mobile gear			Fixed (GN)	Fixed gear		
	2J	3K	3L	3L	2J	3K	3L
			Catch numbers				
2	2						2
3	192	14	103	7	1	580	1204
4	1764	705	2921	207	252	6959	16226
5	2557	2020	10035	788	895	6163	14484
6	2294	3678	6370	1825	948	3261	6044
7	1803	2838	5130	1856	1162	1807	2850
8	2572	4393	4230	1815	1809	2363	1926
9	1322	2188	2093	844	1466	1257	685
10	225	727	884	295	626	253	173
11	92	241	291	80	352	81	52
12	21	105	206	89	34	49	46
13	5	16	53	16	14	16	6
14		15	43	16	17	4	5
15	2	6	30	8		1	3
16		4	25	5		1	
17		1	8	2			
18			5			2	1
19			2				
20							
21+							
Catch (t)	18552	27776	59827	19534	14332	27577	51090
			Mean weights				
2	.21						.25
3	.48	.40	.39	.47	.43	.53	.42
4	.77	.67	.74	.74	.70	.72	.69
5	1.03	.91	1.14	1.52	1.01	.94	1.05
6	1.36	1.22	1.52	2.02	1.38	1.34	1.57
7	1.66	1.48	2.08	2.43	1.66	1.73	1.95
8	1.83	1.89	2.64	2.81	2.12	1.98	2.28
9	1.90	2.03	3.20	3.08	2.21	2.24	2.60
10	2.38	2.70	3.70	3.78	2.60	2.73	3.39
11	2.68	3.36	4.80	4.62	2.75	3.57	4.25
12	3.54	4.08	5.64	4.73	4.40	3.33	4.62
13	3.18	5.09	8.26	6.98	4.45	5.30	6.09
14		5.89	9.82	9.72	4.81	5.97	7.66
15	4.37	5.72	12.06	9.98		5.97	8.97
16		8.83	13.31	14.45		5.34	17.93
17		9.23	17.92	12.76			10.11
18		16.63	16.05	9.23		9.37	15.40
19			17.26				
20							
21+							

TABLE 8. CATCH NUMBERS AT AGE (THOUSANDS) FROM THE COMMERCIAL COD FISHERY IN NAFO DIVISIONS 2J3KL FOR THE YEARS 1962-90.

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
2	301	1446	2872	85	819	790	288	59	6819	33	236	0	473	420	15
3	8666	5746	19338	5177	14057	15262	6142	4330	18104	12876	6737	3963	3231	3968	13767
4	26194	27577	27603	28709	65992	77873	94291	39626	60102	71557	79809	40785	13201	14101	33727
5	64337	60234	57757	46800	93687	100339	205805	100858	82357	95384	116562	94844	34927	25370	28049
6	58163	118112	60681	66946	62812	96759	150541	163228	101249	98111	76196	59503	74403	34426	20898
7	47314	58996	100147	64360	59312	54996	83808	107509	85696	57865	55984	35464	60539	39105	16811
8	27521	29349	50865	68176	30423	38691	39443	52661	29218	25055	29553	27351	35687	36485	16022
9	20142	15520	20892	33819	23844	17146	23171	19651	10857	11732	11750	14153	18854	13421	10931
10	18036	11612	12264	14913	8762	16084	10984	12370	3825	4470	6393	7566	10492	7514	4637
11	10444	8248	8698	6945	4528	5949	5591	6389	2000	2223	2987	3815	5818	2315	1462
12	9468	4204	6352	3729	2280	3367	5249	4479	1200	1287	1660	2153	2934	1179	631
13	7778	3942	4989	3948	1825	2108	1939	3004	507	1140	1388	1173	1078	808	292
14	5785	2933	4036	3730	1186	1529	1334	1557	224	720	725	450	652	372	251
15	4669	2928	2703	2722	967	685	818	622	214	355	748	278	249	165	100
16	3888	1737	1456	1859	806	424	610	567	244	474	606	309	338	82	50
17	3955	1263	1918	575	416	193	127	319	124	124	452	85	162	5	40
18	2161	1352	1154	971	279	107	89	100	32	128	136	27	113	8	64
19	232	328	501	183	486	72	83	46	10	148	195	38	45	22	30
20	403	182	312	226	178	211	26	99	34	78	36	8	20	1	20
2+	319457	355709	384538	353873	372659	432585	630339	517474	402816	383760	392153	291965	263216	179767	147797

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
2	108	0	0	92	0	0	18	3	0	1	42	25	8	4
3	7128	1323	1152	2554	2185	1702	2585	782	650	831	2329	2779	1696	2101
4	65510	17556	12361	12025	7172	31286	13616	14871	14824	15219	9217	14651	17639	29034
5	40462	39206	37493	28814	13191	19003	42602	31760	36614	44168	32340	20184	21150	36944
6	12107	20319	29202	30016	24800	14397	19028	38624	33922	45869	49061	47917	25212	24421
7	5397	7711	10982	18017	22014	25435	12044	12503	28006	26025	28469	45725	38708	17447
8	3396	3078	3460	4830	11848	16930	14701	7246	7050	14722	19505	18608	28499	19109
9	2730	1530	1300	1217	3175	11936	8934	8910	3836	3104	5818	9026	8696	9854
10	1381	1083	757	520	779	1923	6341	4227	5162	2000	1346	4337	3640	3183
11	532	437	560	232	309	338	1018	2536	2905	1977	676	774	1695	1188
12	296	219	183	229	195	156	248	451	1681	1101	873	422	572	551
13	149	105	116	56	125	90	90	146	254	574	391	366	244	128
14	75	62	51	65	48	153	41	48	107	116	200	223	180	101
15	42	40	43	37	14	40	29	41	39	29	37	100	94	50
16	21	21	38	13	28	12	11	30	20	18	22	32	43	36
17	20	7	7	10	20	13	9	7	17	11	3	5	4	11
18	14	8	7	14	5	4	6	7	1	9	1	10	9	9
19	2	2	4	4	5	0	2	4	3	2	4	5	0	2
20	6	7	9	10	5	0	3	3	5	2	0	5	1	0
2+	139376	92714	97725	98755	85918	123418	121326	122199	135096	155778	150334	165194	148090	144173

TABLE 9. AVERAGE WEIGHT AT AGE FROM THE COMMERCIAL COD FISHERY IN NAFO DIVISIONS 2J3KL FOR THE YEARS 1962-90.

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
2	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.00	0.11	0.26	0.25
3	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.44	0.32	0.35	0.45	0.45
4	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.53	0.47	0.68	0.63	0.61
5	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.64	0.71	0.91	0.96	0.93
6	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.08	0.96	1.11	1.18	1.32
7	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.52	1.30	1.27	1.39	1.75
8	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.13	1.80	1.56	1.74	2.07
9	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.86	2.20	2.05	2.21	2.24
10	3.18	3.18	3.18	3.18	3.18	3.18	3.18	3.18	3.18	3.18	3.29	2.82	2.75	2.61	2.99
11	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.95	3.19	3.13	3.34	3.67
12	4.15	4.15	4.15	4.15	4.15	4.15	4.15	4.15	4.15	4.15	4.12	3.79	3.41	3.66	4.56
13	6.06	6.06	6.06	6.06	6.06	6.06	6.06	6.06	6.06	6.06	5.00	4.53	4.92	4.78	6.18
14	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	9.32	6.93	4.40	5.20	8.19
15	6.11	6.11	6.11	6.11	6.11	6.11	6.11	6.11	6.11	6.11	9.40	7.22	6.33	5.20	9.77
16	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	6.89	7.05	5.50	5.46	11.23
17	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	14.67	9.45	7.57	8.51	12.44
18	6.07	6.07	6.07	6.07	6.07	6.07	6.07	6.07	6.07	6.07	12.04	11.16	11.07	9.24	11.16
19	6.61	6.61	6.61	6.61	6.61	6.61	6.61	6.61	6.61	6.61	7.62	7.62	7.62	7.62	7.62
20	7.19	7.19	7.19	7.19	7.19	7.19	7.19	7.19	7.19	7.19	17.46	17.46	17.46	17.46	17.46

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
2	0.09	0.00	0.00	0.41	0.00	0.00	0.31	0.34	0.00	0.21	0.32	0.29	0.26	0.22
3	0.45	0.40	0.46	0.53	0.55	0.53	0.62	0.59	0.48	0.51	0.43	0.49	0.48	0.46
4	0.60	0.72	0.74	0.77	0.78	0.84	0.87	0.88	0.73	0.72	0.66	0.73	0.74	0.71
5	0.97	1.04	1.13	1.16	1.17	1.20	1.32	1.20	1.10	1.04	1.03	1.08	1.03	1.06
6	1.66	1.58	1.67	1.71	1.64	1.77	1.75	1.79	1.43	1.54	1.32	1.38	1.44	1.48
7	2.33	2.46	2.46	2.38	2.23	2.10	2.28	2.28	2.06	1.85	1.87	1.67	1.83	1.89
8	2.82	3.26	3.57	3.56	2.86	2.66	2.61	2.71	2.66	2.35	1.93	2.21	2.07	2.21
9	3.46	4.05	4.41	5.01	3.81	3.09	3.18	2.96	3.23	2.94	2.80	2.51	2.64	2.45
10	3.88	4.46	5.25	5.49	5.32	4.18	3.50	3.65	3.32	3.47	3.51	3.04	3.02	3.08
11	4.78	5.02	5.80	6.72	6.29	6.16	4.79	4.28	4.06	3.80	4.80	4.37	3.96	3.62
12	6.13	6.72	7.03	7.87	7.06	7.19	7.76	6.19	4.55	4.54	4.64	5.49	5.41	4.75
13	7.31	8.10	8.96	8.38	7.32	8.00	9.07	8.39	7.03	5.34	5.74	6.55	7.50	6.60
14	8.40	7.42	8.54	10.03	10.01	8.36	9.14	10.26	9.67	7.12	6.13	8.60	9.24	8.08
15	8.81	8.20	9.46	11.31	8.99	7.86	10.62	11.44	11.37	11.77	8.53	9.76	10.05	10.37
16	11.75	11.26	10.70	13.87	11.54	7.91	10.57	11.61	11.27	11.24	13.51	9.73	9.34	12.81
17	10.63	11.61	13.12	10.68	10.48	9.58	13.13	17.47	12.68	14.15	9.10	12.58	15.74	16.23
18	12.27	8.92	13.49	16.09	11.15	12.95	15.97	12.94	12.42	16.14	21.77	16.01	18.66	14.18
19	7.62	10.57	15.51	12.04	9.82	0.00	9.73	15.21	14.38	12.30	17.66	16.60	0.00	17.26
20	17.46	16.00	14.77	11.37	12.59	0.00	15.88	12.81	19.49	15.72	0.00	11.03	17.64	0.00

Table 10. Cod abundance estimates (No. x 10^3) from research vessel surveys in NAFO Division 2J (Fall). Numbers in brackets are estimates for non-sampled[b] strata.

Depth range (m)	Stratum number	Stratum area (mi^2)	Gadus 3 1977	Gadus 15 1978	Gadus 29 1979	Gadus 44 1980	Gadus 58 1981	Gadus 71 1982	Gadus 86-88 1983	Gadus 101-102 1984	Gadus 116-118 1985	Gadus 131-132 1986	Gadus 145-146 1987	Gadus 159-160 1988	Gadus 174-176 1989	Gadus 190-191 1990
101-200	201	1427	13336	3071	1500	5749	8377	16692	16246	10533	15246	21638	6784	54	0	0
	205	1823	2894	8039	1574	787	4550	21765	13547	25230	8159	9481	7841	13707	164	68
	206	2582	6889	1634	1236	2104	6220	5868	8694	30077	12764	29985	4222	21638	9363	211
	207	2246	9778	5100	2664	3406	5479	9094	13024	14210	27850	6310	9027	4504	711	1740
Total		8078	32897	17844	6974	12046	24626	53419	51511	80050	64019	67414	27874	39903	10238	2019
201-300	202	440	2097	462	396	5681	2378	2378	1833	1866	760	7663	2626	(888)	0	0
	209	1608	10174	3531	21485	3410	10099	7681	29567	3863	8599	28567	13594	6711	14318	583
	210	774	6166	4169	2760	2982	445	4703	59785	4953	299	21187	145	2401	8686	3776
	213	1725	6944	19714	18516	19811	2158	5807	12806	6915	14028	23624	10316	12334	30271	10278
	214	1171	16716	10680	6527	10958	3956	5900	4659	25667	19030	43496	40024	31805	13844	3621
	215	1270	19281	34281	9986	25692	35768	27583	7233	8040	7424	85617	8593	32304	111	2069
	228	1428	2948	(2546)	6780	8254	10701	2187	2269	1853	352	12702	1164	2272	3001	2358
	234	508	1258	553	267	1506	534	2250	4698	3005	2339	5415	1760	1125	0	0
Total		8924	65584	75936	66717	78294	66039	58489	122850	56162	52831	228271	78222	89840	70231	22685
301-400	203	480	883	(304)	(247)	3081	81	1117	462	703	156	1784	1405	2090	0	0
	208	448	1017	247	1480	202	303	1368	1749	224	1043	2051	3918	757	6356	1073
	211	330	632	5450	2737	4659	1746	2415	1325	297	776	1090	1709	1647	12299	3109
	216	384	0	(131)	202	3603	86	14	10	331	115	94	3127	476	749	86
	222	441	50	1479	149	1258	132	0	11	11	182	17	281	66	2847	712
	229	567	415	234	2873	1319	447	298	670	71	936	539	85	440	1475	1085
Total		2650	2997	7845	7688	14122	2795	5212	4227	1637	3208	5575	10525	5476	23726	6065
401-500	204	354	199	(157)	(127)	(175)	1342	142	540	1422	0	518	425	1860	13	13
	217	268	0	(0)	(0)	(0)	0	0	0	(2)	0	0	50	0	0	0
	223	180	0	(0)	(0)	(0)	0	0	0	0	0	0	0	14	7	68
	227	686	51	(55)	(41)	(64)	0	21	26	0	0	51	77	86	1146	4446
	235	420	32	(91)	(72)	(103)	158	126	1135	63	32	0	268	173	236	567
Total		1908	282	303	240	342	1500	289	1701	1487	32	569	820	2133	1402	5094
501-750	Total	1591	60				50	50	0	33[a]	12[a]	249	125	218	100	936
751-1000	Total	517	0[a]				0[a]	0[a]	0	0[a]	0	14	0	0	0[a]	0
Total			101761	101928	81619	104805	94961	117410	180291	139336	120092	301831	117446	137350	105601	35865
Mean no. per tow			62.88	62.98	50.43	64.76	58.68	72.55	111.40	86.10	74.21	186.50	72.57	84.87	65.25	22.16
Unadjusted total			101820	98643	81130	104461	95010	117459	180290	139366	120103	302093	117569	136682	105699	36801
Upper limit			150718	135651	129789	139530	162767	151075	744685	184179	154187	468811	163856	183268	149747	51757
Lower limit			52921	61634	32470	69392	27253	83843	384105	94553	86020	135374	71282	90096	61651	21845

[a]All strata not fished.

[b]0-500 m strata used to estimate non-sampled strata.

Table 11. Cod biomass estimates (t) from research vessel surveys in NAFO Division 2J (Fall). Numbers in brackets are estimates for non-sampled[b] strata.

Depth range (m)	Stratum number	Stratum area (mi²)	Gadus 3 1977	Gadus 15 1978	Gadus 29 1979	Gadus 44 1980	Gadus 58 1981	Gadus 71 1982	Gadus 86-88 1983	Gadus 101-102 1984	Gadus 116-118 1985	Gadus 131-132 1986	Gadus 145-146 1987	Gadus 159-160 1988	Gadus 174-176 1989	Gadus 190-191 1990
101-200	201	1427	12366	4847	3256	11319	15998	18085	16764	12033	14952	24712	9158	84	0	0
	205	1823	2759	16200	2669	1676	10126	39216	17742	25093	7526	11016	9456	27403	240	11
	206	2582	5323	2074	2671	3849	13153	8533	11442	39133	13186	34327	5313	36617	13183	107
	207	2246	16794	8209	4192	7738	12284	12612	12608	18136	27954	7864	11883	7613	465	1770
Total		8078	37242	31330	12788	24582	51561	78446	58556	94395	63618	77919	35810	71717	13888	1888
201-300	202	440	3701	525	749	12964	6292	5681	3798	2948	850	10363	4533	(1667)	0	0
	209	1608	15322	5384	43569	12810	22275	18351	53925	7678	12245	37475	19297	11006	13957	228
	210	774	10472	5572	5771	5810	823	10428	97578	9448	782	25147	360	4532	13125	2115
	213	1725	6520	31627	31100	34068	5622	8073	14748	9401	16121	27904	13819	20289	36371	6159
	214	1171	24348	20791	13231	25096	9669	10993	6944	33853	24715	61918	62937	52313	19424	4369
	215	1270	31729	55780	19546	64301	96161	60996	12584	10471	10732	131984	14279	65032	40	3013
	228	1428	3926	(4202)	12374	16972	23904	4357	2215	3012	299	15820	1749	4845	4582	3096
	234	508	2854	1030	553	3699	1192	4614	5370	3657	2402	7178	2790	2521	0	0
Total		8924	98872	124911	126893	175720	165938	123493	197162	80468	68146	317789	119764	162205	87499	18980
301-400	203	480	1929	(659)	(668)	7467	230	3141	1369	2054	192	2982	2798	4396	0	0
	208	448	1960	438	3341	631	908	3750	3153	454	1454	2589	6120	1816	5189	682
	211	330	1736	10285	5685	9384	4747	6490	3016	954	1400	1462	3573	3412	26274	2162
	216	384	0	(278)	484	10204	454	86	24	908	180	142	5462	937	1356	48
	222	441	43	2029	653	2780	281	0	105	22	281	15	463	91	1199	656
	229	567	1008	319	7394	3150	1144	467	516	106	1397	816	96	786	2525	1641
Total		2650	6676	14008	18225	33616	7764	13934	8183	4498	4904	8006	18512	11438	36543	5189
401-500	204	354	307	(264)	(267)	(411)	3149	316	1506	2192	0	829	683	3514	2	3
	217	268	0	(0)	(0)	(5)	0	0	0	(3)	0	0	80	0	0	0
	223	180	0	(0)	(0)	(3)	0	0	0	0	0	0	0	19	4	39
	227	686	131	(113)	(115)	(186)	0	36	129	0	0	101	117	137	2483	6291
	235	420	75	(167)	(169)	(264)	347	315	1584	121	24	0	497	334	410	465
Total		1908	513	544	551	869	3496	667	3219	2316	24	930	1377	4004	2899	6798
501-750	Total	1591	161				137	140	0	58a	31	515	202	388	269	1097
751-1000	Total	517	0[a]				0[a]	0[a]	0	0[a]	0	27	0	0	0[a]	0
Total			142686	170791	158457	234785	228757	216540	267123	181677	136693	404642	175466	249365	140829	32853
Mean wt. per tow			88.17	105.53	97.91	145.07	141.35	133.80	165.06	112.26	84.46	250.03	108.42	154.08	87.02	20.30
Unadjusted total			142834	165109	157237	233916	228894	216680	267121	181731	136723	405185	175668	248085	141098	33950
Upper limit			206112	228826	255091	314420	424722	288881	1174856	241662	174398	667127	248495	336941	234034	51160
Lower limit			79556	101392	59384	153412	33067	144479	-640615	121800	99048	143243	102841	159229	48162	16739

[a]All strata not fished.

[b]0-500 m strata used to estimate non-sampled strata.

Table 12. Cod abundance estimates (No. x 10^{-3}) from research vessel surveys in NAFO Division 3K. (Fall). Numbers in brackets are estimates for non-sampled[b] strata.

Depth range (m)	Stratum number	Stratum area (mi²)	Gadus 15 1978	Gadus 29 1979	Gadus 44 1980	Gadus 58-59 1981	Gadus 71-72 1982	Gadus 87-88 1983	Gadus 101-103 1984	Gadus 117-118 1985	Gadus 131-132 1986	Gadus 146-147 1987	Gadus 160-161 1988	Gadus 175-176 1989	Gadus 191-192 1990
101-200	618	1455	(2659)	(3730)	(2072)	(2266)	(1818)	(2740)	4806	6458	12975	2652	1074	560	573
	619	1588	(612)	(878)	(467)	(515)	(420)	(633)	1243	221	930	671	460	1430	72
Total		3043	3271	4608	2539	2781	2238	3373	6049	6679	13905	3323	1534	1990	645
201-300	620	2709	17749	26203	15206	12689	4248	17610	22825	1728	31158	6449	4236	9368	606
	621	2859	14655	25646	2739	7453	6472	4603	6070	1531	4654	930	2854	2512	441
	624	668	13121	23166	627	3686	2470	1128	978	552	602	234	769	520	2733
	632	447	727	2265	5078	3171	2494	8321	(2164)	1029	1158	1879	12516	604	2684
	634	1618	4057	18157	13651	19455	11384	14186	6229	7112	99787	18660	4676	77314	625
	635	1274	3921	1492	3706	4743	3175	1227	3275	874	3727	829	1033	710	319
	636	1455	1820	2446	6051	3695	7001	2603	3413	928	3440	1482	2312	1136	109
	637	1132	2634	5778	3909	4744	6409	8718	19062	3824	11939	3781	6936	3212	816
Total		12162	58684	105153	50967	59636	43653	58396	64016	17578	156465	34244	35332	95376	8333
301-400	623	1027	6142	2981	7593	876	1557	5769	11764	1015	1060	3855	1172	6877	4390
	625	850	1340	2488	1515	1021	2169	1276	574	1723	808	2760	1340	3238	1308
	626	919	3191	759	1012	2235	911	1276	770	826	10451	1173	317	1628	310
	628	1085	1433	2891	1008	1371	570	1955	1140	1826	624	375	2101	1853	684
	629	495	724	449	144	50	412	562	459	272	1348	237	431	425	655
	630	544	(261)	388	315	225	(181)	306	414	82	65	177	191	2151	204
	633	2179	4283	3044	2944	3106	3552	3748	5954	10059	26717	15375	3660	39354	46720
	638	2059	2720	8081	3246	9158	5699	13643	3323	9189	9080	7388	4637	41590	91652
	639	1463	1603	3075	741	1303	2921	4095	1304	2128	3423	1459	1977	2320	7264
Total		10621	21697	24156	18518	19345	17972	32630	25702	27120	53576	32799	15826	99436	153187
401-500	622	632	(300)	(427)	(230)	356	190	142	308	59	332	47	237	2499	1020
	627	1194	(442)	(635)	(337)	104	152	193	178	89	1262	341	284	1304	4977
	631	1202	(435)	(625)	(331)	162	0	523	18	103	68	752	1585	8185	3564
	640	198	(16)	(25)	(11)	0	0	(17)	7	10	7	7	59	632	52
	645	204	(22)	(33)	(15)	0	5	8	15	15	(35)	31	15	505	103
Total		3430	1215	1745	924	622	347	883	526	276	1704	1178	2180	13125	9716
501-750	Total	917				0	0	15	0	0		44			25
751-1000	Total	1340				0	0		0[a]	0		0[a]			23
Total			84863	135662	72947	82385	64271	95279	96283	51652	225652	71544	54871	209692	171919
Mean no. per tow			38.64	61.77	33.22	37.52	29.27	43.39	43.84	23.52	102.75	32.58	24.99	95.49	78.29
Unadjusted total			80120	129310	69485	79602	61791	91908	94131	51653	225616	71587	54871	209925	171930
Upper limit			118124	219416	93324	104929	75262	119956	125238	65202	498233	101570	207965	360927	287775
Lower limit			42115	39204	45645	54276	48320	63859	63023	38104	-47002	41603	-98223	58923	56085

[a]All strata not fished.
[b]Only 0-500 m strata used in estimating non-sampled strata.

Table 13. Cod biomass estimates (t) from research vessel surveys in NAFO Division 3K (Fall). Numbers in brackets are estimates for non-sampled[b] strata.

Depth range (m)	Stratum number	Stratum area (mi^2)	Gadus 15 1978	Gadus 29 1979	Gadus 44 1980	Gadus 58-59 1981	Gadus 71-72 1982	Gadus 87-88 1983	Gadus 101-103 1984	Gadus 117-118 1985	Gadus 132-133 1986	Gadus 146-147 1987	Gadus 160-161 1988	Gadus 175-176 1989	Gadus 191-192 1990
101-200	618	1455	(2496)	(4473)	(2867)	(2996)	(2383)	(3259)	9363	10318	18917	3979	97	209	202
	619	1588	(754)	(1384)	(872)	(913)	(718)	(997)	3004	652	811	1164	469	254	4
Total		3043	3250	5857	3739	3909	3101	4256	12367	10970	19728	5143	566	463	206
201-300	620	2709	32708	55286	33699	33603	9851	33248	41781	4190	46251	11244	2721	2293	263
	621	2859	25889	63106	5939	10935	11764	6750	14149	2229	7283	887	4361	1401	59
	624	668	29936	40531	1742	7973	5365	1586	959	953	1153	232	1112	284	1597
	632	447	873	3896	10165	7566	5721	13992	(4013)	1667	2072	2726	16458	514	1726
	634	1618	6907	29309	29404	40573	23579	22967	11703	11161	163994	32997	7054	116699	432
	635	1274	3702	2551	7902	10271	7249	3236	5457	1619	7900	1404	1423	745	195
	636	1455	2248	5040	11959	8428	14144	6335	7065	1884	4489	3011	4087	649	142
	637	1132	3540	10613	7871	9829	13256	17317	34548	6209	17860	7109	11429	4815	579
Total		12162	105803	210332	108681	129178	90929	105431	119675	29912	251002	59610	48645	127400	4993
301-400	623	1027	11293	7522	15746	2175	4849	12071	20190	2303	2182	7108	1041	3353	1665
	625	850	1825	5538	4626	2640	4817	3499	1397	2935	1446	4490	2549	3446	657
	626	919	6976	1940	3242	4781	2076	3932	1653	1735	12331	1914	327	1696	31
	628	1085	2729	6206	2739	3848	1480	3841	2112	3000	842	658	2329	1739	397
	629	495	1145	1070	337	150	1255	1167	832	346	2066	322	270	443	273
	630	544	(560)	1019	1174	939	(534)	847	708	230	84	327	415	3726	191
	633	2179	6947	6379	8073	8406	8482	6558	10861	16779	45140	26825	6307	40630	50281
	638	2059	4210	13362	7161	17706	10143	23310	5511	13854	13234	12674	6547	92164	125506
	639	1463	2204	5734	1949	3225	8335	9295	2684	3349	5372	2526	3185	1589	5031
Total		10621	37889	48770	45047	43870	41971	64520	45948	44351	82697	56844	22970	148786	184032
401-500	622	632	(451)	(819)	(520)	1257	561	287	646	79	451	47	353	2249	416
	627	1194	(643)	(1176)	(743)	267	330	601	318	127	2121	350	446	1580	1319
	631	1202	(683)	(1247)	(789)	451	0	1489	72	220	113	1200	2165	9010	1930
	640	198	(44)	(84)	(51)	0	0	(59)	119	59	11	45	216	841	97
	645	204	(59)	(110)	(68)	0	54	42	176	130	(88)	47	77	197	123
Total		3430	1880	3436	2171	1975	945	2478	1331	615	2784	1689	3257	13877	3885
501-750	Total	917				0	0	88	0	0		73			28
751-1000	Total	1340				0	0		0[a]	0		0[a]			16
Total			148812	268387	159637	178933	136935	176681	179318	86029	356212	123283	75437	290535	193130
Mean wt. per tow			67.76	122.21	72.69	81.48	62.35	80.45	81.65	39.17	162.20	56.14	34.35	132.30	87.94
Unadjusted total			143132	259102	153728	175023	133310	172458	175308	86030	356120	123358	75437	290526	193164
Upper limit			216442	426266	201839	237799	159091	216591	228070	107721	796817	180376	285967	542668	382515
Lower limit			69822	91937	105616	112247	107529	128325	122545	64338	-84576	66340	-135093	38385	3812

[a] All strata not fished.
[b] Only 0-500 m strata used in estimating non-sampled strata.

Table 14. Cod abundance estimates (No. x 10^{-3}) from research vessel surveys in NAFO Division 3L (Fall). Numbers in brackets are estimates for non-sampled[b] strata.

Depth range	Stratum number	Stratum area (mi^2)	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
31-50	350	2071	4923	2332	6335	15455	13698	15197	4785	3902	3327	1498
	363	1780	802	1960	13050	19374	40659	2439	6770	9193	12159	12259
	371	1121	105	1010	4679	8018	1058	151	1330	1963	105	2844
	372	2460	14256	8679	37532	27415	21453	6039	21406	5128	8956	54511
	384	1120	168	273	6025	20303	452	52	8589	336	67	19295
Total		8552	20254	14254	67621	90565	77320	23878	42880	20522	24614	90407
51-100	328	1519	(304)	(383)	(563)	285	385	4598	257	928	309	114
	341	1574	1930	975	1359	1512	945	1287	144	266	74	217
	342	585	381	1039	274	439	205	219	176	132	44	417
	343	525	897	(229)	328	2089	236	617	131	210	13	236
	348	2120	1724	3310	1953	7002	1284	1999	1008	1194	1432	984
	349	2114	2154	1492	1622	8059	3047	2739	681	2257	730	1111
	364	2817	963	1113	1629	8162	1774	964	1012	2145	442	2397
	365	1041	8693	2090	578	8400	684	1583	521	375	234	195
	370	1320	173	413	727	7799	561	248	380	255	66	357
	385	2356	44	309	318	1827	118	702	197	27	16	354
	390	1481	37	111	111	2483	48	241	764	125	79	111
Total		17452	17300	11464	9462	48057	9287	15197	5271	7914	3439	6493
101-150	344	1494	2075	5047	1103	3701	2978	2464	1654	977	881	2093
	347	983	2706	2915	2041	2976	576	1290	553	2966	1476	7600
	366	1394	5197	8022	4447	6221	18207	23099	9433	23992	6278	2703
	369	961	2669	1371	2525	2803	1960	21671	5194	3203	418	866
	386	983	861	553	(1694)	1513	1269	5737	1107	1004	1550	2287
	389	821	(794)	1756	(1385)	811	961	985	3374	1017	1263	801
	391	282	(71)	95	635	32	635	95	169	32	64	191
Total		6918	14373	19759	13830	18057	26586	55341	21484	33191	11930	16541
151-200	345	1432	2015	3637	2929	2300	4658	5105	3386	4208	2319	2826
	346	865	5822	2337	4389	1731	3441	5089	11834	10259	4091	4523
	368	334	1316	1429	(2024)	602	2871	6168	1617	1580	928	4162
	387	718	808	3000	(1624)	3072	1253	10618	880	377	305	1590
	388	361	(229)	253	(403)	528	461	(391)	149	339	935	420
	392	145	(16)	147	33	103	60	16	5	38	16	65
Total		3855	102206	10803	11435	8336	12744	27387	17871	16801	8594	13586
201-300	Total	1142		20[a]		410	90	0[a]				180
301-400	Total	804			0[a]	0[a]	0	0[a]				0
Total			62174	56324	102313	165036	126025	121988	87554	78472	48606	127221
Mean no. per tow			22.52	20.40	37.05	59.77	45.64	44.18	31.71	28.42	17.60	46.07
Unadjusted total			60719	55689	94623	165427	126027	121411	87505	78427	48578	127207
Upper limit			83412	67092	123050	197373	175608	169896	109122	98525	65582	185198
Lower limit			38025	44285	66195	133482	76446	72925	65889	58329	31575	69216

[a]All strata not fished.
[b]Only 0-200 fathom strata used to fill non-sampled strata.

Table 15. Cod biomass (t) from research vessel cruises in NAFO Division 3L (Fall). Numbers in brackets are estimates from non-sampled[b] strata.

Depth range	Stratum number	Stratum area (mi^2)	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
31-50	350	2071	6244	3848	8463	16498	11219	21047	6486	8216	4815	3270
	363	1780	852	2009	17993	20017	40414	4605	11261	15379	13532	14606
	371	1121	137	1363	6126	11210	1304	89	2710	4404	231	4906
	372	2460	20737	6882	44364	27045	29915	11255	40873	9964	13626	99532
	384	1120	112	1090	5941	27463	583	53	13690	911	76	33264
Total		8552	28082	15192	82887	102233	83435	37049	75020	38874	32280	155578
51-100	328	1519	(337)	(375)	(709)	299	656	3128	131	1215	437	130
	341	1574	2146	901	1949	1760	957	1793	309	561	69	582
	342	585	834	951	263	736	205	233	167	237	60	257
	343	525	1419	(255)	661	2261	99	690	194	269	39	234
	348	2120	2651	4249	3125	11537	1995	2384	1512	1973	1312	1026
	349	2114	3604	3174	2266	8257	3856	3211	1069	3835	1238	1681
	364	2817	1932	1800	1946	4536	1419	1298	1521	3309	773	2536
	365	1041	17904	3702	961	3624	977	1512	1087	1035	316	205
	370	1320	300	446	1184	7891	597	69	842	562	116	520
	385	2356	38	43	1019	1886	94	1095	951	326	64	711
	390	1481	9	58	852	1130	9	35	277	204	108	65
Total		17452	31174	15954	14935	43917	10864	15448	8060	13526	4532	7947
101-150	344	1494	3869	7701	1682	6121	4010	3623	2019	897	854	1485
	347	983	4550	4805	3167	5731	996	1833	701	3852	2332	5735
	366	1394	9313	11920	8999	7101	27549	34160	15868	39741	8412	3593
	369	961	7755	2290	5849	3962	4557	33585	12236	6341	2034	1683
	386	983	1414	1430	(4996)	2546	4162	13630	2869	4044	4007	5653
	389	821	(1335)	3428	(2623)	2737	2521	1723	1733	704	2009	1875
	391	282	(64)	487	159	79	325	370	70	6	23	165
Total		6918	28300	32061	27475	28277	44120	88924	35496	55585	19671	20189
151-200	345	1432	4703	7686	6443	3673	8104	9106	5375	7693	4028	3034
	346	865	12012	4212	7746	3003	5805	7670	19771	18031	7978	6309
	368	334	5948	3604	(6165)	1222	6011	12300	5353	4319	3165	7317
	387	718	1334	9216	(5105)	7465	4056	20225	2740	1289	476	8644
	388	361	(385)	461	(760)	616	1951	(550)	115	366	1362	1066
	392	145	(23)	220	109	68	106	11	8	41	22	120
Total		3855	24405	25399	26328	16047	26033	49862	33362	31739	17031	26490
201-300	Total	1142		20[a]		1224	721	0[a]				522
301-400	Total	804			0[a]	0[a]	0	0[a]				0
Total			112142	88717	151627	190517	164631	191652	152097	139856	73607	210422
Mean wt. per tow			40.61	32.13	54.91	68.99	59.62	69.40	55.08	50.65	26.66	76.20
Unadjusted total			109819	87997	131268	191702	165169	190732	151936	139726	73514	210725
Upper limit			153245	105967	175408	226109	213267	264592	191200	172522	92871	319223
Lower limit			66392	70027	87127	157294	117071	116872	112672	106929	54156	102228

[a]All strata not fished.
[b]Only 0-200 fathom strata used to fill non-sampled strata.

Table 16. Cod abundance estimates (No. x 10^{-3}) from research vessel surveys in NAFO Division 3L (Spring). Numbers in brackets are estimates for non-sampled[b] strata.

Depth range (fath)	Stratum number	Stratum area (mi²)	ATC 262 1977	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
31-50	350	2071	2993	1373	7756	2798	829	1221	15883	5893	6685	32355	9836	2199
	363	1780	4783	2378	7649	1817	3296	1924	7182	7429	11194	14621	3982	2119
	371	1121	112	477	1599	2917	0	189	8061	926	1647	1178	1501	996
	372	2460	2247	9022	6135	3293	5032	1477	27099	12451	9290	13346	4281	1794
	384	1120	42	56	2711	1555	28	42	98	1906	2174	387	280	84
Total		8552	10177	13306	25850	12380	9185	4853	58323	28605	30990	61887	19880	7192
51-100	328	1519	72	(96)	296	(228)	0	342	257	443	794	285	0	1124
	341	1574	3161	325	827	1024	1004	2150	3505	1661	2599	8330	1669	591
	342	585	768	922	132	417	(155)	278	586	454	307	176	454	176
	343	525	335	867	768	1399	887	2374	1103	719	381	801	1340	105
	348	2120	875	2361	3687	3456	887	2467	4986	5450	10702	8391	4367	1345
	349	2114	3385	4628	4035	2997	595	3729	7016	6767	4616	5951	11148	1092
	364	2817	967	599	4705	2996	1128	1304	5821	3483	8064	5286	7250	2115
	365	1041	781	391	2481	1035	977	4689	1797	1516	5798	5236	2683	430
	370	1320	66	363	817	1486	0	248	7394	805	4742	2715	4013	212
	385	2356	383	59	783	3139	59	0	2087	258	514	849	3493	611
	390	1481	1223	1056	2223	1223	389	139	358	97	79	0	125	22
Total		17452	12016	11667	20754	19400	6081	17720	34910	21653	38596	38020	36542	7823
101-150	344	1494	7327	11607	15981	7947	29001	9168	695	4864	449	841	5239	299
	347	983	861	6272	5737	10212	3247	10773	1668	5519	2410	5003	1439	221
	366	1394	10461	(9234)	11118	5232	56749	18521	41420	20339	13214	4133	10215	3645
	369	961	1915	577	2813	6757	7286	1876	10950	9534	6810	10929	5134	1890
	386	983	1599	615	2749	2066	2693	812	5372	1783	3011	3320	6924	14920
	389	821	2178	1130	1464	5259	1140	2712	8677	1380	1150	1335	1430	447
	391	282	921	201	1117	1757	688	191	476	603	286	127	191	2593
Total		6918	25262	29636	40979	39230	100804	44053	69258	44022	27330	25688	30572	24015
151-200	345	1432	5505	5321	1800	6385	15264	2714	2107	13160	21498	7820	12860	2069
	346	865	782	(1692)	1380	1125	2727	801	714	16999	6324	4058	3360	52513
	368	334	319	(394)	56	113	1880	639	1492	4250	5382	238	1270	14491
	387	718	108	198	256	108	296	1419	24226	5686	189	552	2878	43939
	388	361	881	257	190	41	393	989	488	2520	14	244	289	13603
	392	145	44	44	178	5	196	218	1818	403	5	234	98	2961
Total		3855	7639	7906	3860	7777	20756	6780	30845	43018	33412	13146	20755	129576
201-300	Total	1142					204[a]		329					
301-400	Total	804							0					
Total			55103	62516	91446	78793	136880	73426	193381	137430	130490	138749	107785	169036
Mean no. per tow			19.96	22.64	33.12	28.53	49.57	26.59	70.03	49.77	47.26	50.25	39.03	61.21
Unadjusted total			55092	51099	91444	78561	136875	73406	193665	137300	130329	138741	107747	168604
Upper Limit			69846	72936	113863	93294	267984	94173	255913	161283	179958	177548	126081	263989
Lower Limit			40338	29262	69024	63828	5766	52638	131418	113317	80699	99933	89414	73220

[a]All strata not fished.
[b]0-500 m strata used to estimate non-sampled strata.

Table 17. Cod biomass estimates (t) from research vessel surveys in NAFO Division 3L (Spring). Numbers in brackets are estimates for non-sampled[b] strata.

Depth range (fath)	Stratum number	Stratum area (mi^2)	ATC 262 1977	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
31-50	350	2071	5183	2108	13637	7124	2539	4775	31785	16344	19008	56567	22760	8359
	363	1780	5394	3923	11237	4182	7082	6721	14881	12152	19419	23096	8070	8270
	371	1121	534	1492	2439	8148	0	789	15647	3184	4122	4005	4080	3282
	372	2460	1864	7015	8342	7448	7155	3978	44792	19171	22017	27917	12397	8981
	384	1120	10	19	3521	2480	308	231	284	3667	3681	844	549	578
Total		8552	12985	14557	39176	29382	17084	16494	107389	54518	68247	112429	47856	29470
51-100	328	1519	38	(102)	518	(389)	0	893	74	838	1897	456	0	3577
	341	1574	3912	1007	2468	3291	2038	8495	4735	8022	12076	16947	4772	3291
	342	585	1195	3014	409	961	(339)	871	429	1639	604	307	483	509
	343	525	438	1791	1190	2936	946	4768	795	1502	1064	1346	1511	92
	348	2120	1700	3551	7129	7855	1966	5709	7904	11590	33966	23118	9796	3958
	349	2114	10737	8890	8800	7282	1321	10182	16005	27730	14008	17951	28008	1622
	364	2817	1100	929	7884	7154	2361	3938	9837	9223	20328	13755	18200	10495
	365	1041	1111	533	2953	2442	2090	6056	2160	3329	9791	8361	5262	1373
	370	1320	330	368	1046	2807	0	99	7054	3511	7679	5896	6663	980
	385	2356	421	80	1118	6278	413	0	2084	424	1066	2133	3088	792
	390	1481	504	796	2125	2798	500	217	261	406	503	0	197	63
Total		17452	21486	21061	35640	44193	11974	41228	51338	68214	102982	90270	77980	26752
101-150	344	1494	7777	20390	19398	10172	50712	19583	648	8032	1023	1121	5808	183
	347	983	1127	8502	7705	16019	8043	21435	3416	10419	4919	8818	2386	312
	366	1394	6206	(7763)	11509	5912	81497	21817	45178	30705	19201	7551	13832	5895
	369	961	2048	1000	2448	7406	9378	4959	19297	11488	11564	16889	9252	3960
	386	983	1227	252	2881	2361	4593	1279	3877	1906	4368	3274	6748	38420
	389	821	1342	1065	1098	6923	478	1664	6169	900	647	692	616	513
	391	282	634	356	1048	2064	1212	95	429	826	201	41	95	621
Total		6918	20361	39328	46087	50857	155913	70832	79014	64276	41923	38386	38737	49904
151-200	345	1432	13259	10700	4844	11674	29493	6060	2939	17444	28741	11340	18456	2048
	346	865	989	(1679)	2137	2154	4307	1223	341	20427	8298	5203	4496	57484
	368	334	404	(572)	239	796	1761	809	1536	6412	7166	652	2503	18601
	387	718	122	184	459	256	243	2353	21491	6555	195	520	2506	28531
	388	361	1180	182	349	108	190	1321	346	1572	10	179	122	14910
	392	145	30	66	189	0	128	256	2237	435	3	98	57	1162
Total		3855	15984	13383	8217	14988	36122	12022	28890	52845	44413	17992	28140	122736
201-300	Total	1142					225[a]		887					
301-400	Total	804							0					
Total			70826	88326	129123	139444	221146	140604	266678	240052	257782	259102	192788	229421
Mean wt. per tow			25.65	31.99	46.76	50.50	80.09	50.92	96.57	86.93	93.35	93.83	69.82	83.08
Unadjusted total			70815	78212	129117	139030	220979	140578	267516	239857	257566	259080	192713	228865
Upper limit			97038	102912	155685	166966	407989	171827	338672	278798	321060	325467	226139	335403
Lower limit			44592	53513	102549	111095	33969	109329	196360	200917	194071	192693	159288	122327

[a] All strata not fished.
[b] 0-500 m strata used to estimate non-sampled strata.

Table 18. Biomass estimates (000 t) of cod from autumn research vessel surveys in NAFO Division 2J, 3K and 3L.

Biomass											
Division	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	
2J	229	217	267	182	137	405	176	249	141	33	
3K	179	137	177	179	86	356	123	75	291	193	
3L	112	89	152	191	165	192	152	140	74	210	
Total	520	443	596	552	388	953	451	464	506	436	
Percentage											Ave.
2J	44	49	45	33	35	43	39	54	28	8	38
3K	34	31	30	32	22	37	27	16	58	44	33
3L	22	20	25	35	43	20	34	30	14	48	29
Total	100	100	100	100	100	100	100	100	100	100	100

Table 19. Evaluation of 2-stage survey results for Divisions 2J3KL cod for 1989 and 1990.

Number of sets						
	1989			1990		
Division	Survey	Stage-2	Total	Survey	Stage-2	Total
2J	125	20	145	103	40	143
3K	151	28	179	132	36	168
3L	174	21	195	161	27	188
2J3KL	450	69	519	396	103	499

Parameter estimates and precision					
		Mean		Standard Error	
Division	Survey	1989	1990	1989	1990
2J	Stage-1	60.3	20.7	11.4	3.9
	Stage-2	62.5	43.0	8.5	10.1
3K	Stage-1	95.6	72.7	31.3	22.0
	Stage-2	73.3	74.6	16.1	16.6
3L	Stage-1	17.6	44.3	3.0	8.6
	Stage-2	19.1	32.7	2.2	4.2
2J3KL	Stage-1	54.2	48.0	14.5	11.9
	Stage-2	47.9	49.2	8.4	9.8
Difference		-11%	+3%	-42%	-18%

TABLE 20. MEAN NUMBERS PER TOW (ADJUSTED FOR MISSING STRATA) 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
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
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
3	9.66	7.37	1.36	1.31	3.06	18.26	16.83	16.75	9.06	8.49	1.93	2.64	8.09	8.64
4	29.14	13.61	11.46	4.48	2.29	6.42	25.91	16.55	22.07	31.24	4.43	4.62	5.87	4.06
5	13.33	27.52	16.80	20.35	4.22	4.47	16.46	26.70	13.65	70.31	24.93	7.75	5.69	2.14
6	2.93	9.42	16.18	20.78	17.01	4.28	8.85	10.19	16.54	41.29	25.16	25.31	7.85	1.50
7	1.36	2.09	2.30	12.33	15.23	13.24	4.54	2.46	7.32	21.61	7.37	29.37	13.26	1.07
8	1.23	0.76	0.73	1.78	9.63	11.65	12.34	1.55	1.26	8.71	5.29	5.50	9.01	1.96
9	0.96	0.60	0.50	0.52	2.00	7.91	5.61	3.50	0.86	0.72	2.21	3.91	1.28	0.97
10	0.53	0.43	0.28	0.38	0.51	1.33	3.56	1.50	1.18	0.66	0.38	1.93	0.67	0.21
11	0.20	0.23	0.28	0.24	0.08	0.36	0.74	0.66	0.43	0.60	0.05	0.31	0.33	0.06
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
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
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
1+	62.88	62.98	50.43	64.76	58.68	72.55	111.40	86.10	74.21	186.50	72.57	84.87	65.25	22.16
2+	62.88	62.98	50.43	64.40	58.68	71.49	109.41	85.58	74.15	186.47	72.49	84.12	65.01	22.04
3+	59.54	62.48	50.12	62.86	54.52	68.40	95.31	80.27	72.65	184.19	72.08	81.57	52.16	20.65
4+	49.88	55.11	48.76	61.55	51.46	50.14	78.49	63.52	63.59	175.70	70.16	78.93	44.07	12.02
5+	20.74	41.50	37.30	57.07	49.17	43.72	52.57	46.97	41.52	144.46	65.72	74.31	38.20	7.96
6+	7.41	13.98	20.50	36.72	44.95	39.25	36.12	20.26	27.87	74.15	40.80	66.56	32.51	5.82

TABLE 21. 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
1	0.00	0.00	0.18	0.01	0.22	0.84	0.26	0.01	0.35	0.38	1.14	1.79	1.08
2	0.25	0.13	1.02	1.26	1.73	3.39	3.23	0.65	2.41	0.90	2.43	14.36	3.82
3	2.60	2.14	1.38	5.18	1.67	7.35	5.57	2.96	4.84	2.15	4.12	15.80	18.77
4	11.36	14.54	1.99	3.25	4.76	6.22	9.63	4.56	24.10	3.88	3.18	15.91	18.07
5	13.85	23.93	11.23	3.54	4.70	10.96	7.76	6.21	29.07	9.38	3.91	11.98	12.00
6	6.35	14.23	12.27	11.82	2.63	3.35	7.97	3.09	20.18	7.26	5.36	10.53	8.75
7	2.03	3.65	2.65	8.55	5.55	2.27	2.96	2.98	10.33	3.48	2.89	11.60	6.01
8	0.95	1.83	1.28	2.65	5.41	3.99	1.48	0.92	6.22	2.44	0.97	6.62	6.65
9	0.59	0.45	0.47	0.49	1.58	3.09	2.37	0.69	2.37	1.25	0.46	3.00	2.17
10	0.46	0.38	0.32	0.23	0.61	1.08	1.43	0.64	0.79	0.62	0.27	2.18	0.66
11	0.03	0.26	0.03	0.19	0.16	0.38	0.58	0.54	0.98	0.32	0.07	0.94	0.24
12	0.10	0.06	0.20	0.19	0.07	0.16	0.28	0.16	0.68	0.17	0.09	0.35	0.06
13	0.03	0.04	0.07	0.06	0.06	0.07	0.10	0.06	0.25	0.11	0.03	0.26	0.00
14	0.03	0.12	0.14	0.11	0.12	0.23	0.21	0.05	0.18	0.23	0.07	0.17	0.00
1+	38.64	61.77	33.22	37.52	29.27	43.39	43.84	23.52	102.75	32.58	24.99	95.49	78.29
2+	38.64	61.77	33.04	37.51	29.05	42.55	43.58	23.51	102.40	32.20	23.85	93.70	77.21
3+	38.39	61.64	32.02	36.25	27.32	39.17	40.36	22.87	99.99	31.30	21.41	79.35	73.39
4+	35.79	59.50	30.64	31.07	25.65	31.81	34.78	19.90	95.15	29.15	17.30	63.54	54.62
5+	24.43	44.96	28.65	27.83	20.89	25.59	25.15	15.34	71.05	25.27	14.12	47.63	36.55
6+	10.57	21.03	17.42	24.29	16.19	14.63	17.39	9.13	41.98	15.89	10.22	35.65	24.54

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

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.37	0.41	0.55	0.36	0.01	0.04	0.16	0.05	0.02	0.03
2	0.36	2.74	3.02	7.57	1.22	1.15	2.77	1.68	0.70	0.69
3	6.29	1.97	11.52	11.43	9.65	2.53	2.02	4.54	4.08	6.03
4	2.62	6.59	4.45	18.89	12.84	11.82	3.91	2.38	3.68	14.09
5	2.49	2.80	6.42	5.17	10.91	10.19	9.43	4.96	1.89	9.72
6	3.73	2.07	1.19	10.52	5.18	10.45	7.14	6.10	2.56	5.60
7	5.25	1.72	1.14	1.69	3.43	3.27	3.33	4.62	2.60	3.88
8	0.97	1.56	1.99	1.18	0.71	2.47	1.31	2.16	0.99	3.05
9	0.20	0.29	1.07	1.03	0.81	0.96	1.00	1.03	0.71	1.69
10	0.07	0.09	0.38	1.08	0.40	0.38	0.10	0.54	0.21	0.67
11	0.04	0.05	0.11	0.43	0.29	0.48	0.13	0.13	0.08	0.31
12	0.03	0.06	0.05	0.25	0.11	0.26	0.22	0.10	0.04	0.20
13	0.12	0.06	0.16	0.18	0.07	0.18	0.18	0.13	0.03	0.10
1+	22.52	20.40	32.05	59.77	45.64	44.18	31.71	28.42	17.60	46.07
2+	22.15	19.99	31.50	59.41	45.63	44.14	31.55	28.37	17.58	46.04
3+	21.80	17.25	28.48	51.84	44.41	42.99	28.78	26.69	16.89	45.35
4+	15.50	15.27	16.96	40.41	34.75	40.45	26.76	22.15	12.80	39.32
5+	12.89	8.69	12.51	21.52	21.91	28.63	22.84	19.77	9.12	25.23
6+	10.39	5.89	6.09	16.35	11.00	18.45	13.41	14.81	7.23	15.51

TABLE 23. MEAN NUMBERS PER TOW (ADJUSTED FOR MISSING STRATA) OF COD AT AGE FROM SPRING RV SURVEYS IN DIVISION 3L.

	1977	1978	1979	1980	1981	1982	1985	1986	1987	1988	1989	1990
1	0.00	0.00	0.06	0.09	0.17	0.03	0.00	0.00	0.01	0.00	0.00	0.01
2	0.91	0.08	0.08	1.89	0.50	1.72	1.39	0.25	0.42	0.28	0.30	0.46
3	4.13	3.63	0.84	0.88	8.97	1.56	12.16	3.43	2.39	5.13	4.20	7.78
4	5.94	6.78	9.16	3.41	7.19	9.25	18.21	12.60	5.23	4.48	8.33	18.61
5	4.61	5.40	13.89	10.42	6.40	2.34	16.42	12.71	13.42	7.45	3.54	13.24
6	2.15	3.49	6.48	8.41	10.95	2.96	8.24	9.26	12.61	16.60	3.34	4.82
7	0.64	1.57	1.53	2.13	11.17	4.15	8.15	4.38	6.68	8.00	8.96	4.64
8	0.66	0.50	0.46	0.77	2.97	3.08	1.72	3.48	2.34	4.08	6.70	5.79
9	0.44	0.43	0.12	0.15	0.77	0.93	0.76	0.77	1.83	1.46	1.87	3.31
10	0.15	0.25	0.19	0.07	0.25	0.20	1.08	0.65	0.67	1.21	0.76	1.35
11	0.10	0.19	0.08	0.12	0.08	0.07	1.20	1.11	0.48	0.34	0.65	0.60
12	0.06	0.13	0.04	0.07	0.08	0.05	0.40	0.70	0.61	0.40	0.15	0.34
13	0.05	0.03	0.03	0.02	0.04	0.12	0.16	0.23	0.38	0.35	0.21	0.26
14	0.02	0.02	0.04	0.04	0.00	0.03	0.06	0.08	0.10	0.27	0.35	0.17
1+	19.87	22.50	33.01	28.45	49.53	26.48	69.93	49.67	47.18	50.04	39.38	61.38
2+	19.87	22.50	32.95	28.36	49.36	26.45	69.93	49.67	47.17	50.04	39.38	61.37
3+	18.96	22.43	32.87	26.46	48.86	24.73	68.54	49.42	46.75	49.76	39.07	60.90
4+	14.83	18.79	32.03	25.59	39.89	23.17	56.38	45.99	44.36	44.63	34.87	53.13
5+	8.89	12.01	22.87	22.18	32.70	13.92	38.18	33.38	39.12	40.15	26.54	34.51
6+	4.28	6.61	8.97	11.77	26.31	11.59	21.76	20.67	25.70	32.71	22.99	21.27

TABLE 24. MEAN NUMBERS PER TOW OF COD AND COEFFICIENTS OF VARIATION FROM AUTUMN RV SURVEYS IN DIVISIONS 2J3KL.

MEAN NUMBERS PER TOW

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.02	0.41	0.27	0.16	0.51	1.00	0.36	0.02	0.14	0.21	0.59	0.66	0.40
2	0.40	0.32	3.00	1.59	2.49	5.87	5.56	1.10	1.85	1.57	2.14	8.25	1.91
3	5.37	1.94	2.48	5.12	5.88	11.43	10.78	7.27	4.77	2.04	3.93	8.98	10.93
4	11.48	11.79	3.83	2.75	5.94	10.32	15.22	12.35	20.70	4.03	3.20	8.30	12.95
5	13.89	16.81	13.24	3.27	3.84	10.41	11.34	10.02	31.29	13.23	5.30	6.20	8.62
6	5.50	10.54	13.32	9.70	2.80	3.80	9.59	7.28	21.29	11.62	10.58	6.52	5.64
7	1.62	2.27	4.99	8.81	5.84	2.35	2.30	4.24	10.14	4.38	10.14	8.23	3.90
8	0.63	0.92	1.19	3.67	5.33	5.21	1.37	0.92	5.26	2.67	2.58	4.84	3.98
9	0.47	0.31	0.37	0.74	2.59	2.86	2.09	0.78	1.37	1.38	1.55	1.62	1.68
10	0.33	0.26	0.23	0.23	0.57	1.39	1.30	0.67	0.58	0.34	0.79	0.98	0.55
11	0.12	0.19	0.11	0.10	0.16	0.35	0.54	0.41	0.68	0.17	0.15	0.43	0.23
12	0.09	0.06	0.16	0.11	0.09	0.13	0.28	0.15	0.42	0.19	0.11	0.16	0.12
13	0.06	0.04	0.05	0.10	0.07	0.12	0.12	0.06	0.19	0.13	0.08	0.10	0.04
1+	39.98	45.86	43.24	36.34	36.10	55.26	60.85	45.26	98.69	41.96	41.14	55.29	50.95
2+	39.97	45.45	42.97	36.18	35.59	54.26	60.49	45.24	98.54	41.75	40.55	54.62	50.54
3+	39.57	45.13	39.97	34.59	33.10	48.39	54.92	44.14	96.69	40.18	38.41	46.37	48.64
4+	34.20	43.19	37.49	29.47	27.22	36.95	44.14	36.87	91.93	38.14	34.48	37.39	37.71
5+	22.71	31.40	33.67	26.72	21.29	26.63	28.92	24.52	71.22	34.11	31.28	29.09	24.76
6+	8.82	14.59	20.42	23.45	17.44	16.22	17.58	14.50	39.93	20.88	25.99	22.89	16.14

COEFFICIENTS OF VARIATION - PERCENT

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

TABLE 25. ANALYSIS OF VARIANCE FROM THE REGRESSION OF LN CATCH RATE FOR COD IN DIVISIONS 2J3KL FOR THE YEARS 1962-79.

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.773
MULTIPLE R SQUARED..... 0.598

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	4.687E0	4.687E0	
REGRESSION	34	3.925E2	1.154E1	66.194
TYPE 1	4	6.528E1	1.632E1	93.587
TYPE 2	2	1.767E1	8.834E0	50.660
TYPE 3	11	1.182E2	1.075E1	61.639
TYPE 4	17	2.010E2	1.182E1	67.803
RESIDUALS	1515	2.642E2	1.744E-1	
TOTAL	1550	6.613E2		

TYPE 1 - CATEGORY 1 - COUNTRY/GEAR/TONNAGE CLASS
TYPE 2 - CATEGORY 2 - NAFO DIVISIONS
TYPE 3 - CATEGORY 3 - MONTHS
TYPE 4 - CATEGORY 4 - YEARS

NOTE: SEE TABLE OF REGRESSION COEFFICIENTS FOR CATEGORY NUMBERS

TABLE 26. REGRESSION COEFFICIENTS FROM THE REGRESSION OF LN CATCH RATE FOR COD IN NAFO DIVISIONS 2J3KL FOR THE YEARS 1962-79.

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
1	3125	INTERCEPT	0.793	0.079	1550
2	23				
3	2				
4	62				
1	3124	1	-0.333	0.065	94
	17126	2	0.333	0.043	555
	17127	3	0.663	0.047	307
	19126	4	0.244	0.045	436
2	31	5	-0.161	0.029	471
	32	6	-0.275	0.027	674
3	1	7	-0.052	0.060	94
	3	8	-0.222	0.051	155
	4	9	-0.108	0.050	165
	5	10	-0.322	0.051	150
	6	11	-0.546	0.052	147
	7	12	-0.751	0.057	105
	8	13	-0.752	0.056	106
	9	14	-0.761	0.054	119
	10	15	-0.776	0.053	127
	11	16	-0.706	0.053	135
	12	17	-0.569	0.057	119
4	63	18	0.046	0.070	63
	64	19	-0.021	0.069	68
	65	20	-0.184	0.069	75
	66	21	-0.128	0.066	98
	67	22	-0.037	0.065	112
	68	23	-0.089	0.065	113
	69	24	-0.289	0.065	111
	70	25	-0.435	0.067	99
	71	26	-0.613	0.067	109
	72	27	-0.731	0.068	108
	73	28	-0.740	0.071	85
	74	29	-0.629	0.074	73
	75	30	-0.583	0.071	92
	76	31	-0.804	0.081	52
	77	32	-1.329	0.073	92
	78	33	-1.310	0.079	70
	79	34	-0.653	0.077	76

CODE 03124 - CAN-N/OTTER TRAWL/TC 4
CODE 03125 - CAN-N/OTTER TRAWL/TC 5
CODE 17126 - PORTUGAL/OTTER TRAWL/TC 6
CODE 17127 - PORTUGAL/OTTER TRAWL/TC 7
CODE 19126 - SPAIN/OTTER TRAWL/TC 6

TABLE 27. COMMERCIAL CATCH RATE INDEX FOR COD IN DIV 2J3KL FOR 1962-79.

	PREDICTED CATCH RATE					
	LN TRANSFORM		RETRANSFORMED			
YEAR	MEAN	S.E.	MEAN	S.E.	CATCH	EFFORT
1962	0.7408	0.0067	2.281	0.187	364241	159680
1963	0.7867	0.0064	2.389	0.190	364661	152656
1964	0.7194	0.0062	2.233	0.176	471323	211027
1965	0.5564	0.0060	1.898	0.147	434508	228953
1966	0.6129	0.0056	2.008	0.150	413662	205957
1967	0.7033	0.0052	2.199	0.159	509905	231895
1968	0.6518	0.0048	2.089	0.145	708977	339416
1969	0.4517	0.0050	1.710	0.120	656466	383905
1970	0.3057	0.0052	1.477	0.106	443638	300276
1971	0.1279	0.0052	1.237	0.089	376979	304808
1972	0.0093	0.0054	1.098	0.081	396243	360757
1973	0.0007	0.0060	1.089	0.085	312861	287388
1974	0.1114	0.0065	1.216	0.098	337469	277582
1975	0.1578	0.0059	1.274	0.098	246295	193341
1976	-0.0629	0.0076	1.021	0.089	154281	151147
1977	-0.5887	0.0056	0.604	0.045	100097	165731
1978	-0.5693	0.0063	0.616	0.049	57104	92764
1979	0.0876	0.0058	1.188	0.091	81077	68267

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.076

TABLE 28. ANALYSIS OF VARIANCE FROM THE REGRESSION OF LN CATCH RATE FOR COD IN DIVISIONS 2J3KL FOR THE YEARS 1978-90.

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.815
MULTIPLE R SQUARED..... 0.664

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	5.198E1	5.198E1	
REGRESSION	32	1.266E2	3.955E0	54.086
TYPE 1	7	1.455E1	2.078E0	28.423
TYPE 2	2	1.074E1	5.372E0	73.463
TYPE 3	11	4.088E1	3.716E0	50.822
TYPE 4	12	1.359E1	1.133E0	15.492
RESIDUALS	876	6.405E1	7.312E-2	
TOTAL	909	2.426E2		

TYPE 1 - CATEGORY 1 - COUNTRY/GEAR/TONNAGE CLASS
TYPE 2 - CATEGORY 2 - NAFO DIVISIONS
TYPE 3 - CATEGORY 3 - MONTHS
TYPE 4 - CATEGORY 4 - YEARS

NOTE - SEE TABLE OF REGRESSION COEFFICIENTS FOR CATEGORY NUMBERS

TABLE 29. REGRESSION COEFFICIENTS FROM THE REGRESSION OF LN CATCH RATE FOR COD IN DIVISIONS 2J3KL FOR THE YEARS 1978-90.

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
1	27124	INTERCEPT	0.462	0.166	909
2	23				
3	1				
4	78				
1	3124	1	-0.190	0.127	147
	3125	2	0.048	0.118	330
	3126	3	0.293	0.190	19
	17126	4	-0.145	0.134	86
	17127	5	-0.376	0.207	16
	27125	6	0.424	0.121	202
	27126	7	0.773	0.136	73
2	31	8	-0.193	0.053	303
	32	9	-0.577	0.051	422
3	2	10	0.127	0.080	102
	3	11	-0.254	0.081	93
	4	12	-0.286	0.078	110
	5	13	-0.724	0.079	110
	6	14	-0.972	0.085	88
	7	15	-1.207	0.102	44
	8	16	-1.222	0.118	32
	9	17	-1.183	0.114	35
	10	18	-1.232	0.100	52
	11	19	-0.960	0.096	60
	12	20	-0.800	0.084	96
4	79	21	0.318	0.123	60
	80	22	0.520	0.126	50
	81	23	0.745	0.122	61
	82	24	0.679	0.117	80
	83	25	0.865	0.115	84
	84	26	0.984	0.114	85
	85	27	1.126	0.117	80
	86	28	1.006	0.117	70
	87	29	0.886	0.116	83
	88	30	0.888	0.115	87
	89	31	0.992	0.117	76
	90	32	1.043	0.122	59

CODE 27124 - CAN-M/OTTER TRAWL/TC 4
27125 - CAN-M/OTTER TRAWL/TC 5
27126 - CAN-M/OTTER TRAWL/TC 6
03124 - CAN-N/OTTER TRAWL/TC 4
03125 - CAN-N/OTTER TRAWL/TC 5
03126 - CAN-N/OTTER TRAWL/TC 6
17126 - PORTUGAL/OTTER TRAWL/TC 6
17127 - PORTUGAL/OTTER TRAWL/TC 7

TABLE 30. COMMERCIAL CATCH RATE INDEX FOR COD IN DIVISIONS 2J3KL FOR THE YEARS 1978-90.

PREDICTED CATCH RATE

	LN TRANSFORM		RETRANSFORMED			
YEAR	MEAN	S.E.	MEAN	S.E.	CATCH	EFFORT
1978	0.3166	0.0138	1.414	0.166	57104	40391
1979	0.6344	0.0099	1.946	0.193	81077	41653
1980	0.8362	0.0112	2.380	0.251	79265	33301
1981	1.0612	0.0089	2.984	0.281	90674	30383
1982	0.9951	0.0085	2.794	0.257	116725	41777
1983	1.1816	0.0077	3.368	0.295	125922	37388
1984	1.3004	0.0075	3.794	0.327	134750	35521
1985	1.4431	0.0081	4.374	0.393	151410	34619
1986	1.3223	0.0077	3.877	0.340	179137	46208
1987	1.2023	0.0081	3.438	0.308	156263	45453
1988	1.2045	0.0078	3.446	0.303	167642	48651
1989	1.3086	0.0081	3.823	0.343	150555	39376
1990	1.3594	0.0094	4.020	0.389	106155	26407

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.094

TABLE 31. ANALYSIS OF VARIANCE FROM THE REGRESSION OF LN CATCH RATE FOR COD IN DIVISION 2J FOR THE YEARS 1978-90.

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.897
MULTIPLE R SQUARED..... 0.804

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	1.909E1	1.909E1	
REGRESSION	30	1.553E1	5.178E-1	20.925
TYPE 1	7	1.558E0	2.226E-1	8.998
TYPE 2	11	3.296E0	2.997E-1	12.111
TYPE 3	12	2.940E0	2.450E-1	9.900
RESIDUALS	153	3.786E0	2.474E-2	
TOTAL	184	3.841E1		

TYPE 1 - CATEGORY 1 - COUNTRY/GEAR/TONNAGE CLASS
TYPE 2 - CATEGORY 3 - MONTHS
TYPE 3 - CATEGORY 4 - YEARS

NOTE - SEE TABLE OF REGRESSION COEFFICIENTS FOR CATEGORY NUMBERS

TABLE 32. REGRESSION COEFFICIENTS FROM THE REGRESSION OF LN CATCH RATE FOR COD IN DIVISION 2J FOR THE YEARS 1978-90.

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
1	27124	INTERCEPT	-0.730	0.478	184
3	1				
4	78				
1	3124	1	0.694	0.464	17
	3125	2	0.790	0.431	66
	3126	3	0.886	0.484	9
	17126	4	-0.017	0.445	22
	17127	5	0.232	0.540	5
	27125	6	1.077	0.432	45
	27126	7	1.123	0.450	17
3	2	8	0.019	0.142	27
	3	9	-0.100	0.143	24
	4	10	0.121	0.134	31
	5	11	-0.448	0.163	18
	6	12	-0.738	0.177	16
	7	13	-1.284	0.234	5
	8	14	-1.430	0.533	2
	9	15	-1.958	0.746	1
	10	16	-1.518	0.254	5
	11	17	-0.931	0.218	11
	12	18	-0.793	0.175	20
4	79	19	0.797	0.259	11
	80	20	0.845	0.227	13
	81	21	1.541	0.246	11
	82	22	1.376	0.214	26
	83	23	1.828	0.212	23
	84	24	1.515	0.228	16
	85	25	1.385	0.312	7
	86	26	1.642	0.299	8
	87	27	1.111	0.217	18
	88	28	1.135	0.219	19
	89	29	1.373	0.242	16
	90	30	0.938	0.256	11

CODE 27124 - CAN-M/OTTER TRAWL/TC 4
27125 - CAN-M/OTTER TRAWL/TC 5
27126 - CAN-M/OTTER TRAWL/TC 6
03124 - CAN-N/OTTER TRAWL/TC 4
03125 - CAN-N/OTTER TRAWL/TC 5
03126 - CAN-N/OTTER TRAWL/TC 6
17126 - PORTUGAL/OTTER TRAWL/TC 6
17127 - PORTUGAL/OTTER TRAWL/TC 7

TABLE 33. ANALYSIS OF VARIANCE FROM THE REGRESSION OF LN CATCH RATE FOR COD IN DIVISION 3K FOR THE YEARS 1978-90.

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.887
MULTIPLE R SQUARED..... 0.788

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	2.413E1	2.413E1	
REGRESSION	30	3.095E1	1.032E0	33.600
TYPE 1	7	1.495E0	2.136E-1	6.956
TYPE 2	11	9.565E0	8.696E-1	28.318
TYPE 3	12	7.376E0	6.146E-1	20.016
RESIDUALS	272	8.353E0	3.071E-2	
TOTAL	303	6.344E1		

TYPE 1 - CATEGORY 1 - COUNTRY/GEAR/TONNAGE CLASS
TYPE 2 - CATEGORY 3 - MONTHS
TYPE 3 - CATEGORY 4 - YEARS

NOTE - SEE TABLE OF REGRESSION COEFFICIENTS FOR CATEGORY NUMBERS

TABLE 34. REGRESSION COEFFICIENTS FROM THE REGRESSION OF LN CATCH RATE FOR COD IN DIVISION 3K FOR THE YEARS 1978-90.

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
1	27124	INTERCEPT	-0.001	0.292	303
3	1				
4	78				
1	3124	1	-0.008	0.260	37
	3125	2	0.138	0.243	119
	3126	3	0.148	0.349	5
	17126	4	-0.044	0.265	29
	17127	5	-0.446	0.350	7
	27125	6	0.335	0.246	63
	27126	7	0.686	0.258	35
3	2	8	-0.013	0.103	44
	3	9	-0.471	0.108	36
	4	10	-0.471	0.107	42
	5	11	-0.722	0.106	45
	6	12	-0.893	0.124	28
	7	13	-1.464	0.204	8
	8	14	-1.672	0.246	6
	9	15	-1.704	0.250	8
	10	16	-1.834	0.180	15
	11	17	-1.376	0.203	11
	12	18	-1.163	0.131	28
4	79	19	0.594	0.168	25
	80	20	0.733	0.183	14
	81	21	1.094	0.180	20
	82	22	0.860	0.182	19
	83	23	1.010	0.170	24
	84	24	1.595	0.160	31
	85	25	1.640	0.158	36
	86	26	1.198	0.161	26
	87	27	1.504	0.168	27
	88	28	1.476	0.175	27
	89	29	1.611	0.172	22
	90	30	1.739	0.181	18

CODE 27124 - CAN-M/OTTER TRAWL/TC 4
27125 - CAN-M/OTTER TRAWL/TC 5
27126 - CAN-M/OTTER TRAWL/TC 6
03124 - CAN-N/OTTER TRAWL/TC 4
03125 - CAN-N/OTTER TRAWL/TC 5
03126 - CAN-N/OTTER TRAWL/TC 6
17126 - PORTUGAL/OTTER TRAWL/TC 6
17127 - PORTUGAL/OTTER TRAWL/TC 7

TABLE 35. ANALYSIS OF VARIANCE FROM THE REGRESSION OF LN CATCH RATE FOR COD IN DIVISION 3L FOR THE YEARS 1978-90.

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.809
MULTIPLE R SQUARED..... 0.654

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	2.511E-1	2.511E-1	
REGRESSION	30	1.449E1	4.829E-1	24.611
TYPE 1	7	3.570E0	5.100E-1	25.992
TYPE 2	11	8.052E0	7.320E-1	37.303
TYPE 3	12	1.192E0	9.930E-2	5.061
RESIDUALS	391	7.672E0	1.962E-2	
TOTAL	422	2.241E1		

TYPE 1 - CATEGORY 1 - COUNTRY/GEAR/TONNAGE CLASS
TYPE 2 - CATEGORY 3 - MONTHS
TYPE 3 - CATEGORY 4 - YEARS

NOTE - SEE TABLE OF REGRESSION COEFFICIENTS FOR CATEGORY NUMBERS

TABLE 36. REGRESSION COEFFICIENTS FROM THE REGRESSION OF LN CATCH RATE FOR COD IN DIVISION 3L FOR THE YEARS 1978-90.

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
1	27124	INTERCEPT	0.405	0.194	422
3	1				
4	78				
1	3124	1	-0.363	0.137	93
	3125	2	-0.106	0.125	145
	3126	3	0.674	0.300	5
	17126	4	-0.061	0.152	35
	17127	5	-0.482	0.329	4
	27125	6	0.458	0.132	94
	27126	7	0.868	0.176	21
3	2	8	0.415	0.125	31
	3	9	-0.094	0.116	33
	4	10	-0.308	0.108	37
	5	11	-0.808	0.104	47
	6	12	-1.115	0.105	44
	7	13	-1.072	0.115	31
	8	14	-1.032	0.121	24
	9	15	-1.011	0.117	26
	10	16	-0.985	0.112	32
	11	17	-0.758	0.106	38
	12	18	-0.500	0.103	48
4	79	19	-0.049	0.161	24
	80	20	0.117	0.163	23
	81	21	0.202	0.154	30
	82	22	0.111	0.151	35
	83	23	0.256	0.149	37
	84	24	0.244	0.149	38
	85	25	0.483	0.150	37
	86	26	0.565	0.147	36
	87	27	0.347	0.150	38
	88	28	0.337	0.148	41
	89	29	0.359	0.148	38
	90	30	0.527	0.152	30

CODE 27124 - CAN-M/OTTER TRAWL/TC 4
27125 - CAN-M/OTTER TRAWL/TC 5
27126 - CAN-M/OTTER TRAWL/TC 6
03124 - CAN-N/OTTER TRAWL/TC 4
03125 - CAN-N/OTTER TRAWL/TC 5
03126 - CAN-N/OTTER TRAWL/TC 6
17126 - PORTUGAL/OTTER TRAWL/TC 6
17127 - PORTUGAL/OTTER TRAWL/TC 7

TABLE 37. COMMERCIAL CATCH RATE INDEX FOR COD IN DIVISION 2J FOR THE YEARS 1978-90.

PREDICTED CATCH RATE

	LN TRANSFORM		RETRANSFORMED			
YEAR	MEAN	S.E.	MEAN	S.E.	CATCH	EFFORT
1978	0.0599	0.0497	1.049	0.232	22228	21199
1979	0.8573	0.0447	2.333	0.489	15731	6742
1980	0.9048	0.0302	2.465	0.426	21029	8532
1981	1.6005	0.0287	4.946	0.835	26885	5436
1982	1.4361	0.0241	4.206	0.651	67307	16004
1983	1.8875	0.0194	6.621	0.920	41439	6259
1984	1.5748	0.0302	4.816	0.834	12013	2494
1985	1.4450	0.0729	4.140	1.102	1546	373
1986	1.7021	0.0491	5.419	1.190	12011	2217
1987	1.1706	0.0229	3.227	0.487	41836	12965
1988	1.1951	0.0208	3.310	0.476	41477	12529
1989	1.4329	0.0274	4.185	0.690	34598	8267
1990	0.9983	0.0381	2.696	0.523	18493	6861

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.183

TABLE 38. COMMERCIAL CATCH RATE INDEX FOR COD IN DIVISION 3K FOR THE YEARS 1978-90.

PREDICTED CATCH RATE

	LN TRANSFORM		RETRANSFORMED			
YEAR	MEAN	S.E.	MEAN	S.E.	CATCH	EFFORT
1978	0.1369	0.0258	1.150	0.184	13400	11657
1979	0.7314	0.0172	2.092	0.274	38469	18388
1980	0.8694	0.0226	2.395	0.359	28750	12003
1981	1.2308	0.0193	3.444	0.477	26959	7828
1982	0.9967	0.0209	2.723	0.392	12955	4758
1983	1.1474	0.0165	3.172	0.407	34438	10856
1984	1.7323	0.0130	5.704	0.650	59173	10374
1985	1.7769	0.0128	5.965	0.673	81825	13717
1986	1.3351	0.0128	3.835	0.433	60465	15767
1987	1.6412	0.0150	5.202	0.635	45359	8719
1988	1.6130	0.0164	5.054	0.647	40310	7976
1989	1.7479	0.0162	5.785	0.735	38474	6651
1990	1.8763	0.0191	6.567	0.906	27691	4217

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.131

TABLE 39. COMMERCIAL CATCH RATE INDEX FOR COD IN DIVISION 3L FOR THE YEARS 1978-90.

PREDICTED CATCH RATE

	LN TRANSFORM		RETRANSFORMED			
YEAR	MEAN	S.E.	MEAN	S.E.	CATCH	EFFORT
1978	0.2994	0.0241	1.346	0.208	21476	15955
1979	0.2506	0.0159	1.287	0.162	26877	20881
1980	0.4167	0.0168	1.519	0.196	29486	19411
1981	0.5015	0.0127	1.657	0.187	36830	22228
1982	0.4105	0.0114	1.514	0.161	36463	24086
1983	0.5557	0.0112	1.751	0.185	50044	28586
1984	0.5436	0.0111	1.730	0.182	63564	36753
1985	0.7828	0.0128	2.195	0.247	68039	30995
1986	0.8643	0.0113	2.383	0.252	106672	44758
1987	0.6461	0.0128	1.915	0.216	69068	36073
1988	0.6363	0.0119	1.897	0.206	85855	45263
1989	0.6587	0.0113	1.940	0.206	77483	39931
1990	0.8260	0.0123	2.293	0.254	59827	26095

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.115

TABLE 40. COMMERCIAL CATCH RATE INDEX AT AGE FOR COD IN NAFO DIVISIONS 2J3KL FOR THE YEARS 1978-90.

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	0.35	0.13	0.08	0.35	0.09	0.48	0.22	0.29	0.02	0.02	0.08	0.10	0.33
4	4.98	4.11	1.47	1.55	4.13	2.30	3.64	3.86	2.83	0.66	0.51	3.01	5.83
5	12.51	14.20	13.69	5.78	4.36	14.83	12.36	15.84	14.22	12.15	3.96	5.53	15.81
6	6.95	11.95	15.97	15.75	4.60	7.50	19.28	19.30	21.89	23.32	19.20	10.48	13.35
7	2.07	3.14	6.55	13.17	11.89	4.67	5.94	16.32	12.54	12.54	19.47	18.20	10.57
8	0.88	0.64	1.22	5.16	7.09	7.14	3.27	3.87	7.22	9.37	7.49	14.54	12.11
9	0.39	0.24	0.27	1.07	5.49	4.46	5.21	2.13	1.43	2.11	3.66	4.41	6.06
10	0.31	0.15	0.15	0.22	0.59	3.81	2.21	3.30	1.00	0.52	1.79	1.77	1.99
11	0.14	0.10	0.06	0.10	0.10	0.46	1.44	1.84	0.99	0.28	0.23	0.87	0.68
12	0.05	0.03	0.05	0.06	0.05	0.08	0.25	1.16	0.56	0.37	0.16	0.30	0.36
13	0.02	0.02	0.02	0.05	0.03	0.04	0.06	0.17	0.30	0.18	0.14	0.13	0.08
3+	28.65	34.72	39.53	43.26	38.42	45.78	53.86	68.08	63.02	61.52	56.70	59.34	67.18

TABLE 41. PARAMETER ESTIMATES FROM ADAPT USING RV AGES 3-12 AND C/E AGES 5-8 (1983-90). THIS FORMULATION IS SIMILAR TO THAT USED IN 1990. THE 1989-90 RV INDEX VALUES WERE DERIVED FROM PHASE 1 SURVEY RESULTS.

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.000334
MEAN SQUARE RESIDUALS 0.089233

AGE	PARAMETER	ESTIMATE	STD. ERR.	T-STATISTIC	C.V.
3	ABUNDANCE	6.39009E5	1.99515E5	3.20281E0	0.31
4	ABUNDANCE	4.11142E5	9.10160E4	4.51725E0	0.22
5	ABUNDANCE	1.89283E5	3.10529E4	6.09550E0	0.16
6	ABUNDANCE	6.87810E4	1.05943E4	6.49227E0	0.15
7	ABUNDANCE	4.80997E4	7.43775E3	6.46697E0	0.15
8	ABUNDANCE	5.38909E4	8.74476E3	6.16265E0	0.16
9	ABUNDANCE	2.32320E4	5.35604E3	4.33753E0	0.23
10	ABUNDANCE	6.91764E3	1.80291E3	3.83694E0	0.26
11	ABUNDANCE	3.33417E3	8.87168E2	3.75822E0	0.27
12	ABUNDANCE	1.62290E3	4.31934E2	3.75729E0	0.27
3	RV SLOPE	1.71319E-5	1.55736E-6	1.10006E1	0.09
4	RV SLOPE	3.29597E-5	2.86948E-6	1.14863E1	0.09
5	RV SLOPE	5.38026E-5	4.59446E-6	1.17103E1	0.09
6	RV SLOPE	7.07304E-5	6.00318E-6	1.17822E1	0.08
7	RV SLOPE	7.12836E-5	6.04606E-6	1.17901E1	0.08
8	RV SLOPE	7.59905E-5	6.47519E-6	1.17356E1	0.09
9	RV SLOPE	8.34641E-5	7.24208E-6	1.15249E1	0.09
11	RV SLOPE	8.59973E-5	7.52559E-6	1.14273E1	0.09
11	RV SLOPE	7.72343E-5	6.77596E-6	1.13983E1	0.09
12	RV SLOPE	8.76069E-5	7.65415E-6	1.14457E1	0.09
5	C/E SLOPE	5.51981E-5	6.10684E-6	9.03874E0	0.11
6	C/E SLOPE	1.31344E-4	1.43952E-5	9.12417E0	0.11
7	C/E SLOPE	1.64072E-4	1.79664E-5	9.13216E0	0.11
8	C/E SLOPE	1.91034E-4	2.10600E-5	9.07094E0	0.11

TABLE 42. RESIDUALS FROM ADAPT USING RV AGES 3-12 AND C/E AGES 5-8 (1983-90). THIS FORMULATION IS SIMILAR TO THAT USED IN 1990. THE 1989-90 RV INDEX VALUES WERE DERIVED FROM PHASE 1 SURVEY RESULTS.

LOG RESIDUALS FOR RV SURVEY INDEX 4/ 5/91

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	0.02	-0.32	-0.13	-0.20	0.04	0.61	0.30	0.03	0.31	-0.42	-0.29	0.04	0.00
4	0.23	0.36	-0.09	-0.46	-0.50	0.16	0.45	-0.02	0.63	-0.30	-0.41	0.01	-0.04
5	0.18	0.39	0.24	-0.43	-0.35	-0.11	0.02	-0.20	0.67	-0.06	-0.26	0.08	-0.16
6	0.16	0.05	0.30	0.04	-0.49	-0.21	-0.01	-0.31	0.68	-0.22	-0.21	0.07	0.16
7	0.08	-0.12	-0.25	0.35	-0.05	-0.19	-0.13	-0.27	0.52	-0.31	0.14	0.07	0.14
8	-0.01	0.18	-0.21	-0.17	0.31	0.37	-0.18	-0.44	0.59	-0.27	-0.22	0.07	-0.02
9	0.20	-0.10	-0.15	-0.26	-0.15	0.25	-0.02	-0.17	0.60	-0.08	-0.06	0.08	-0.13
10	-0.06	0.23	0.20	-0.15	0.01	-0.15	0.09	-0.49	0.18	-0.13	-0.03	0.35	-0.06
11	0.02	0.03	0.09	-0.04	0.13	0.25	-0.33	-0.35	0.42	-0.23	-0.24	0.38	-0.12
12	0.00	-0.21	0.23	0.40	0.24	0.24	0.45	-1.16	0.32	-0.28	-0.34	0.30	-0.20

SUM OF RV RESIDUALS : 0.0000000719 MEAN RESIDUAL : 0.0000000006

LOG RESIDUALS FOR COMMERCIAL C/E INDEX 4/ 5/91

	1983	1984	1985	1986	1987	1988	1989	1990
5	0.22	0.08	0.24	-0.15	-0.17	-0.57	-0.06	0.42
6	-0.14	0.06	0.04	0.09	-0.14	-0.23	-0.08	0.40
7	-0.33	-0.02	0.25	-0.10	-0.09	-0.04	0.03	0.30
8	-0.23	-0.24	0.08	-0.01	0.07	-0.08	0.25	0.17

SUM OF C/E RESIDUALS : 0.0000000655 MEAN RESIDUAL : 0.0000000020

TABLE 43. JANUARY 1 POPULATION NUMBERS AND FISHING MORTALITY FROM ADAPT USING RV AGES 3-12 AND C/E AGES 5-8 (1983-90). THIS FORMULATION IS SIMILAR TO THAT USED IN 1990. THE 1989-90 RV INDEX VALUES WERE DERIVED FROM PHASE 1 SURVEY RESULTS.

POPULATION NUMBERS (000S) 4/ 5/91

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	306659	156729	163986	365564	329325	361178	466778	411329	203376	181313	307652	502531	637906
4	278205	249874	127277	131949	297322	268089	293369	381458	336180	165759	146339	249370	409903
5	216774	211889	193395	93325	101541	215118	207172	226734	298898	261470	127372	106555	188206
6	66110	142004	139555	132266	64472	65941	137576	140881	152504	204752	184811	86020	68103
7	20866	35741	89840	87099	85851	39758	36770	77689	84649	83356	123245	107953	47614
8	8423	10106	19325	57253	51391	47274	21654	18792	38265	45757	42486	59531	53360
9	4638	4111	5144	11452	36154	26757	25403	11172	9006	18008	19814	17948	22953
10	4100	2413	2189	3110	6503	18800	13823	12736	5676	4565	9479	8055	6826
11	1471	2377	1290	1322	1841	3584	9655	7492	5756	2837	2520	3837	3301
12	1051	809	1440	847	803	1202	2013	5610	3506	2924	1711	1363	1608
13	510	662	497	971	517	516	760	1240	3072	1874	1604	1019	598
3+	908806	816716	743938	885158	975720	1048216	1214972	1295133	1140890	972615	967033	1144181	1440378

FISHING MORTALITY 4/ 5/91

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	0.005	0.008	0.017	0.007	0.006	0.008	0.002	0.002	0.005	0.014	0.010	0.004	0.004
4	0.072	0.056	0.110	0.062	0.124	0.058	0.058	0.044	0.051	0.063	0.117	0.081	0.081
5	0.223	0.218	0.180	0.170	0.232	0.247	0.186	0.197	0.178	0.147	0.193	0.248	0.243
6	0.415	0.258	0.271	0.232	0.283	0.384	0.371	0.309	0.404	0.308	0.338	0.391	0.498
7	0.525	0.415	0.251	0.328	0.397	0.408	0.471	0.508	0.415	0.474	0.528	0.505	0.512
8	0.517	0.475	0.323	0.260	0.453	0.421	0.462	0.535	0.554	0.637	0.662	0.753	0.497
9	0.453	0.430	0.303	0.366	0.454	0.460	0.490	0.477	0.479	0.442	0.700	0.767	0.633
10	0.345	0.426	0.304	0.324	0.396	0.466	0.412	0.594	0.493	0.394	0.704	0.692	0.710
11	0.398	0.302	0.222	0.299	0.227	0.377	0.343	0.560	0.477	0.306	0.415	0.670	0.501
12	0.262	0.288	0.193	0.294	0.242	0.259	0.284	0.402	0.426	0.400	0.318	0.623	0.470
13	0.256	0.214	0.133	0.153	0.213	0.213	0.237	0.255	0.230	0.260	0.288	0.305	0.268

TABLE 44. PARAMETER ESTIMATES FROM ADAPT USING RV AGES 3-12 AND C/E AGES 5-8 (1983-90). THIS FORMULATION IS SIMILAR TO THAT USED IN 1990. THE 1989-90 RV INDEX VALUES WERE DERIVED FROM 2-PHASE SURVEY RESULTS.

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.000365
MEAN SQUARE RESIDUALS 0.087241

AGE	PARAMETER	ESTIMATE	STD. ERR.	T-STATISTIC	C.V.
3	ABUNDANCE	7.39592E5	2.28319E5	3.23928E0	0.31
4	ABUNDANCE	3.81116E5	8.34175E4	4.56878E0	0.22
5	ABUNDANCE	1.79933E5	2.92320E4	6.15532E0	0.16
6	ABUNDANCE	6.63920E4	1.01524E4	6.53955E0	0.15
7	ABUNDANCE	4.65239E4	7.15658E3	6.50086E0	0.15
8	ABUNDANCE	5.32736E4	8.56511E3	6.21984E0	0.16
9	ABUNDANCE	2.30925E4	5.26866E3	4.38298E0	0.23
10	ABUNDANCE	6.49403E3	1.68885E3	3.84523E0	0.26
11	ABUNDANCE	2.96799E3	7.92869E2	3.74336E0	0.27
12	ABUNDANCE	1.42078E3	3.80308E2	3.73588E0	0.27
3	RV SLOPE	1.72243E-5	1.54738E-6	1.11312E1	0.09
4	RV SLOPE	3.30240E-5	2.84149E-6	1.16221E1	0.09
5	RV SLOPE	5.35244E-5	4.51788E-6	1.18472E1	0.08
6	RV SLOPE	7.04866E-5	5.91383E-6	1.19189E1	0.08
7	RV SLOPE	7.10817E-5	5.95942E-6	1.19276E1	0.08
8	RV SLOPE	7.62144E-5	6.41665E-6	1.18776E1	0.08
9	RV SLOPE	8.36070E-5	7.16220E-6	1.16734E1	0.09
11	RV SLOPE	8.58948E-5	7.42189E-6	1.15732E1	0.09
11	RV SLOPE	7.71292E-5	6.68366E-6	1.15400E1	0.09
12	RV SLOPE	8.71580E-5	7.52921E-6	1.15760E1	0.09
5	C/E SLOPE	5.60149E-5	6.12490E-6	9.14544E0	0.11
6	C/E SLOPE	1.32729E-4	1.43791E-5	9.23067E0	0.11
7	C/E SLOPE	1.65533E-4	1.79161E-5	9.23935E0	0.11
8	C/E SLOPE	1.92489E-4	2.09615E-5	9.18299E0	0.11

TABLE 45. JANUARY 1 POPULATION NUMBERS AND FISHING MORTALITY FROM ADAPT USING RV AGES 3-12 AND C/E AGES 5-8 (1983-90). THIS FORMULATION IS SIMILAR TO THAT USED IN 1990. THE 1989-90 RV INDEX VALUES WERE DERIVED FROM 2-PHASE SURVEY RESULTS.

POPULATION NUMBERS (000S) 4/ 5/91

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	306545	156657	163860	364341	327510	359454	466314	409650	199866	176956	293719	465916	738322
4	278041	249780	127217	131846	296320	266602	291957	381078	334805	162885	142772	237962	379925
5	216601	211755	193318	93276	101457	214298	205955	225578	298587	260344	125019	103635	178866
6	66077	141863	139445	132204	64432	65871	136904	139884	151558	204498	183889	84094	65712
7	20862	35714	89725	87009	85799	39726	36714	77139	83834	82581	123036	107199	46037
8	8421	10103	19303	57158	51318	47232	21627	18745	37815	45089	41852	59360	52743
9	4636	4109	5141	11434	36076	26696	25368	11150	8968	17640	19267	17428	22813
10	4098	2411	2188	3108	6488	18737	13773	12708	5658	4534	9178	7607	6401
11	1470	2375	1289	1321	1840	3572	9603	7452	5733	2823	2494	3590	2935
12	1050	808	1438	846	802	1200	2003	5567	3473	2905	1699	1342	1405
13	510	661	496	970	516	515	758	1232	3037	1847	1589	1009	581
3+	908310	816237	743420	883511	972558	1043903	1210977	1290184	1133335	962101	944514	1089142	1495740

FISHING MORTALITY 4/ 5/91

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	0.005	0.008	0.017	0.007	0.006	0.008	0.002	0.002	0.005	0.015	0.011	0.004	0.003
4	0.072	0.056	0.110	0.062	0.124	0.058	0.058	0.044	0.052	0.065	0.120	0.085	0.088
5	0.223	0.218	0.180	0.170	0.232	0.248	0.187	0.198	0.179	0.148	0.197	0.256	0.257
6	0.415	0.258	0.272	0.232	0.284	0.385	0.374	0.312	0.407	0.308	0.340	0.402	0.522
7	0.525	0.415	0.251	0.328	0.397	0.408	0.472	0.513	0.420	0.480	0.529	0.509	0.535
8	0.517	0.476	0.324	0.260	0.454	0.422	0.462	0.537	0.563	0.650	0.676	0.756	0.505
9	0.454	0.430	0.303	0.367	0.455	0.462	0.491	0.478	0.482	0.453	0.729	0.802	0.638
10	0.345	0.426	0.305	0.324	0.397	0.468	0.414	0.596	0.495	0.398	0.739	0.753	0.780
11	0.398	0.302	0.222	0.299	0.227	0.378	0.345	0.564	0.480	0.307	0.420	0.738	0.584
12	0.262	0.288	0.194	0.294	0.242	0.259	0.286	0.406	0.431	0.404	0.321	0.637	0.560
13	0.257	0.214	0.133	0.153	0.213	0.213	0.238	0.257	0.233	0.265	0.292	0.308	0.277

TABLE 46. PARAMETER ESTIMATES FROM ADAPT USING RV AGES 3-12, C/E AGES 5-8 (1983-90) AND RV AGE 2 RELATED TO SPA AGE 3 IN THE NEXT YEAR.

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.000374
MEAN SQUARE RESIDUALS 0.109444

AGE	PARAMETER	ESTIMATE	STD. ERR.	T-STATISTIC	C.V.
3	ABUNDANCE	9.46648E5	2.32641E5	4.06913E0	0.25
4	ABUNDANCE	3.68996E5	7.42371E4	4.97050E0	0.20
5	ABUNDANCE	1.84483E5	3.03680E4	6.07490E0	0.16
6	ABUNDANCE	7.50018E4	1.20090E4	6.24547E0	0.16
7	ABUNDANCE	4.79283E4	7.97058E3	6.01314E0	0.17
8	ABUNDANCE	5.83372E4	1.01347E4	5.75620E0	0.17
9	ABUNDANCE	2.51670E4	6.24989E3	4.02679E0	0.25
10	ABUNDANCE	7.06578E3	2.02940E3	3.48172E0	0.29
11	ABUNDANCE	3.35929E3	9.88412E2	3.39867E0	0.29
12	ABUNDANCE	1.66119E3	4.88061E2	3.40365E0	0.29
3	RV SLOPE	1.66507E-5	1.63243E-6	1.02000E1	0.10
4	RV SLOPE	3.30161E-5	3.15674E-6	1.04589E1	0.10
5	RV SLOPE	5.34142E-5	5.03919E-6	1.05997E1	0.09
6	RV SLOPE	6.99314E-5	6.56574E-6	1.06510E1	0.09
7	RV SLOPE	7.08264E-5	6.65191E-6	1.06475E1	0.09
8	RV SLOPE	7.51602E-5	7.09095E-6	1.05995E1	0.09
9	RV SLOPE	8.26863E-5	7.93904E-6	1.04152E1	0.10
11	RV SLOPE	8.55296E-5	8.29125E-6	1.03156E1	0.10
11	RV SLOPE	7.67483E-5	7.46146E-6	1.02860E1	0.10
12	RV SLOPE	8.68433E-5	8.40585E-6	1.03313E1	0.10
5	C/E SLOPE	5.45885E-5	6.66211E-6	8.19388E0	0.12
6	C/E SLOPE	1.29018E-4	1.56299E-5	8.25456E0	0.12
7	C/E SLOPE	1.62417E-4	1.96904E-5	8.24853E0	0.12
8	C/E SLOPE	1.87711E-4	2.29070E-5	8.19451E0	0.12
2	AG2 SLOPE	6.06274E-6	6.21739E-7	9.75127E0	0.10

TABLE 47. RESIDUALS FROM ADAPT USING RV AGES 3-12, C/E AGES 5-8 (1983-90)
AND RV AGE 2 RELATED TO SPA AGE 3 IN THE NEXT YEAR

LOG RESIDUALS FOR RV SURVEY INDEX 4/ 5/91

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	0.05	-0.30	-0.10	-0.17	0.07	0.64	0.31	0.03	0.34	-0.45	-0.24	0.18	-0.36
4	0.22	0.36	-0.10	-0.46	-0.50	0.15	0.45	-0.03	0.59	-0.30	-0.47	0.03	0.06
5	0.18	0.40	0.25	-0.42	-0.35	-0.10	0.02	-0.19	0.66	-0.08	-0.25	0.02	-0.13
6	0.17	0.06	0.31	0.05	-0.48	-0.20	-0.00	-0.30	0.69	-0.23	-0.24	0.08	0.08
7	0.09	-0.11	-0.24	0.36	-0.04	-0.18	-0.13	-0.26	0.53	-0.30	0.13	0.02	0.15
8	0.00	0.19	-0.20	-0.16	0.32	0.38	-0.18	-0.44	0.60	-0.26	-0.22	0.04	-0.09
9	0.21	-0.09	-0.14	-0.25	-0.14	0.26	-0.01	-0.18	0.60	-0.08	-0.06	0.08	-0.21
10	-0.06	0.24	0.21	-0.14	0.02	-0.14	0.10	-0.49	0.17	-0.14	-0.03	0.35	-0.08
11	0.02	0.03	0.10	-0.04	0.14	0.25	-0.32	-0.35	0.42	-0.25	-0.25	0.37	-0.12
12	0.01	-0.20	0.24	0.41	0.25	0.25	0.45	-1.15	0.33	-0.28	-0.37	0.28	-0.21

SUM OF RV RESIDUALS : 0.0000000940 MEAN RESIDUAL : 0.0000000007

LOG RESIDUALS FOR COMMERCIAL C/E INDEX 4/ 5/91

	1983	1984	1985	1986	1987	1988	1989	1990
5	0.23	0.09	0.25	-0.15	-0.19	-0.56	-0.12	0.46
6	-0.13	0.08	0.06	0.10	-0.14	-0.25	-0.06	0.33
7	-0.33	-0.01	0.26	-0.09	-0.08	-0.05	-0.01	0.32
8	-0.22	-0.23	0.09	0.00	0.09	-0.07	0.22	0.11

SUM OF C/E RESIDUALS : 0.0000000507 MEAN RESIDUAL : 0.0000000016

LOG RESIDUALS FOR RV AGE 2 VERSUS SPA AGE 3 (LAG=1) 4/ 5/91

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
	-0.87	-1.14	0.30	-0.23	0.13	0.72	0.77	-0.11	0.46	-0.15	-0.24	0.36

SUM OF RV AGE 2 RESIDUALS : 0.0000000091 MEAN RESIDUAL : 0.0000000008

TABLE 48. JANUARY 1 POPULATION NUMBERS AND FISHING MORTALITY FROM ADAPT USING RV AGES 3-12, C/E AGES 5-8 (1983-90) AND RV AGE 2 VERSUS SPA AGE 3 IN THE NEXT YEAR.

POPULATION NUMBERS (000S) 4/ 5/91

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	306887	157109	164226	365796	329450	361781	473214	423420	202995	192652	300499	451135	945033
4	278238	250061	127588	132146	297511	268191	293862	386727	346079	165446	155622	243513	367824
5	216803	211917	193548	93579	101702	215273	207256	227138	303212	269574	127116	114156	183411
6	66127	142028	139578	132391	64680	66072	137703	140949	152835	208284	191446	85810	74326
7	20877	35754	89860	87117	85953	39929	36878	77793	84705	83627	126136	113386	47443
8	8426	10115	19336	57268	51406	47358	21793	18880	38351	45802	42708	61898	57808
9	4639	4114	5151	11461	36167	26769	25471	11286	9079	18078	19851	18129	24891
10	4101	2413	2192	3116	6511	18811	13833	12792	5769	4624	9537	8086	6974
11	1471	2378	1291	1324	1846	3590	9663	7501	5802	2914	2568	3884	3326
12	1051	809	1440	847	804	1206	2018	5617	3512	2962	1774	1402	1646
13	511	663	497	972	517	517	763	1244	3078	1879	1635	1071	630
3+	909130	817360	744705	886017	976548	1049496	1222454	1313347	1155417	995843	978893	1102471	1713313

FISHING MORTALITY 4/ 5/91

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	0.005	0.008	0.017	0.007	0.006	0.008	0.002	0.002	0.005	0.013	0.010	0.004	0.002
4	0.072	0.056	0.110	0.062	0.124	0.058	0.058	0.043	0.050	0.064	0.110	0.083	0.091
5	0.223	0.218	0.180	0.169	0.231	0.247	0.186	0.196	0.176	0.142	0.193	0.229	0.250
6	0.415	0.258	0.271	0.232	0.282	0.383	0.371	0.309	0.403	0.302	0.324	0.393	0.446
7	0.525	0.415	0.250	0.327	0.396	0.406	0.470	0.507	0.415	0.472	0.512	0.474	0.515
8	0.517	0.475	0.323	0.260	0.453	0.420	0.458	0.532	0.552	0.636	0.657	0.711	0.449
9	0.453	0.430	0.303	0.366	0.454	0.460	0.489	0.471	0.475	0.440	0.698	0.755	0.567
10	0.345	0.426	0.304	0.323	0.395	0.466	0.412	0.591	0.483	0.388	0.698	0.688	0.689
11	0.398	0.302	0.221	0.298	0.226	0.376	0.343	0.559	0.472	0.296	0.405	0.658	0.496
12	0.262	0.288	0.193	0.294	0.241	0.258	0.284	0.402	0.425	0.394	0.305	0.599	0.457
13	0.256	0.214	0.133	0.153	0.212	0.212	0.236	0.254	0.229	0.259	0.282	0.288	0.252

TABLE 49. PARAMETER ESTIMATES FROM ADAPT USING RV AGES 3-12 AND C/E AGES 5-12 (1983-90).

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.000211
MEAN SQUARE RESIDUALS 0.092162

AGE	PARAMETER	ESTIMATE	STD. ERR.	T-STATISTIC	C.V.
3	ABUNDANCE	6.43392E5	2.04136E5	3.15178E0	0.32
4	ABUNDANCE	4.13895E5	9.31019E4	4.44561E0	0.22
5	ABUNDANCE	1.90727E5	3.17794E4	6.00160E0	0.17
6	ABUNDANCE	6.94090E4	1.08463E4	6.39934E0	0.16
7	ABUNDANCE	4.84797E4	7.53130E3	6.43710E0	0.16
8	ABUNDANCE	5.20168E4	8.44918E3	6.15643E0	0.16
9	ABUNDANCE	2.64455E4	4.88878E3	5.40943E0	0.18
10	ABUNDANCE	8.97379E3	1.71337E3	5.23751E0	0.19
11	ABUNDANCE	4.08663E3	7.86084E2	5.19871E0	0.19
12	ABUNDANCE	2.14774E3	4.05957E2	5.29055E0	0.19
3	RV SLOPE	1.70152E-5	1.57036E-6	1.08352E1	0.09
4	RV SLOPE	3.27461E-5	2.89455E-6	1.13130E1	0.09
5	RV SLOPE	5.34507E-5	4.63420E-6	1.15340E1	0.09
6	RV SLOPE	7.02055E-5	6.04823E-6	1.16076E1	0.09
7	RV SLOPE	7.06059E-5	6.07400E-6	1.16243E1	0.09
8	RV SLOPE	7.49207E-5	6.46484E-6	1.15889E1	0.09
9	RV SLOPE	8.08648E-5	7.03046E-6	1.15021E1	0.09
10	RV SLOPE	8.26320E-5	7.19962E-6	1.14773E1	0.09
11	RV SLOPE	7.45018E-5	6.50429E-6	1.14543E1	0.09
12	RV SLOPE	8.46465E-5	7.37072E-6	1.14842E1	0.09
5	C/E SLOPE	5.46762E-5	6.13955E-6	8.90558E0	0.11
6	C/E SLOPE	1.29943E-4	1.44486E-5	8.99342E0	0.11
7	C/E SLOPE	1.61796E-4	1.79522E-5	9.01258E0	0.11
8	C/E SLOPE	1.86994E-4	2.08373E-5	8.97401E0	0.11
9	C/E SLOPE	1.77338E-4	1.99828E-5	8.87450E0	0.11
10	C/E SLOPE	1.82317E-4	2.06082E-5	8.84681E0	0.11
11	C/E SLOPE	1.46773E-4	1.66384E-5	8.82130E0	0.11
12	C/E SLOPE	1.32783E-4	1.49930E-5	8.85630E0	0.11

TABLE 50. PARAMETER CORRELATION MATRIX FROM ADAPT USING RV AGES 3-12 AND C/E AGES 5-12 (1983-90).

3/ 5/91

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1.00	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01	-0.29	-0.03	-0.02	-0.01
2	0.06	1.00	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01	-0.22	-0.22	-0.02	-0.02
3	0.05	0.07	1.00	0.08	0.06	0.05	0.03	0.03	0.02	0.02	-0.17	-0.16	-0.17	-0.02
4	0.04	0.05	0.08	1.00	0.08	0.06	0.04	0.03	0.03	0.03	-0.13	-0.13	-0.13	-0.16
5	0.03	0.04	0.06	0.08	1.00	0.02	0.03	0.05	0.05	0.06	-0.10	-0.10	-0.10	-0.11
6	0.02	0.03	0.05	0.06	0.02	1.00	0.03	0.07	0.09	0.10	-0.08	-0.08	-0.08	-0.08
7	0.02	0.02	0.03	0.04	0.03	0.03	1.00	0.10	0.10	0.11	-0.06	-0.05	-0.05	-0.06
8	0.01	0.02	0.03	0.03	0.05	0.07	0.10	1.00	0.11	0.10	-0.04	-0.04	-0.04	-0.05
9	0.01	0.01	0.02	0.03	0.05	0.09	0.10	0.11	1.00	0.12	-0.03	-0.03	-0.04	-0.04
10	0.01	0.01	0.02	0.03	0.06	0.10	0.11	0.10	0.12	1.00	-0.03	-0.03	-0.03	-0.04
11	-0.29	-0.22	-0.17	-0.13	-0.10	-0.08	-0.06	-0.04	-0.03	-0.03	1.00	0.09	0.06	0.04
12	-0.03	-0.22	-0.16	-0.13	-0.10	-0.08	-0.05	-0.04	-0.03	-0.03	0.09	1.00	0.05	0.04
13	-0.02	-0.02	-0.17	-0.13	-0.10	-0.08	-0.05	-0.04	-0.04	-0.03	0.06	0.05	1.00	0.04
14	-0.01	-0.02	-0.02	-0.16	-0.11	-0.08	-0.06	-0.05	-0.04	-0.04	0.04	0.04	0.04	1.00
15	-0.01	-0.01	-0.02	-0.02	-0.15	-0.11	-0.07	-0.06	-0.05	-0.05	0.03	0.03	0.03	0.03
16	-0.01	-0.01	-0.01	-0.02	-0.02	-0.18	-0.12	-0.09	-0.07	-0.06	0.02	0.02	0.02	0.03
17	-0.01	-0.01	-0.01	-0.02	-0.03	-0.05	-0.21	-0.13	-0.10	-0.08	0.02	0.02	0.02	0.02
18	-0.01	-0.01	-0.01	-0.02	-0.04	-0.08	-0.08	-0.22	-0.14	-0.10	0.02	0.02	0.02	0.02
19	-0.01	-0.01	-0.01	-0.02	-0.05	-0.10	-0.10	-0.08	-0.22	-0.15	0.02	0.02	0.02	0.03
20	-0.01	-0.01	-0.02	-0.02	-0.06	-0.12	-0.12	-0.09	-0.08	-0.22	0.03	0.02	0.02	0.03
21	-0.02	-0.03	-0.21	-0.17	-0.12	-0.09	-0.06	-0.05	-0.04	-0.04	0.07	0.07	0.07	0.05
22	-0.01	-0.02	-0.03	-0.20	-0.14	-0.10	-0.07	-0.05	-0.05	-0.04	0.05	0.05	0.05	0.05
23	-0.01	-0.01	-0.02	-0.03	-0.19	-0.13	-0.09	-0.07	-0.06	-0.05	0.04	0.03	0.03	0.04
24	-0.01	-0.01	-0.02	-0.02	-0.02	-0.22	-0.14	-0.10	-0.08	-0.07	0.03	0.03	0.03	0.03
25	-0.01	-0.01	-0.02	-0.02	-0.04	-0.06	-0.26	-0.17	-0.12	-0.10	0.03	0.03	0.03	0.03
26	-0.01	-0.01	-0.02	-0.02	-0.05	-0.09	-0.09	-0.27	-0.18	-0.12	0.03	0.03	0.03	0.03
27	-0.01	-0.01	-0.02	-0.02	-0.06	-0.12	-0.12	-0.09	-0.27	-0.19	0.03	0.03	0.03	0.03
28	-0.01	-0.01	-0.02	-0.02	-0.08	-0.15	-0.14	-0.10	-0.09	-0.27	0.03	0.03	0.03	0.03

CONTINUED.....

TABLE 50. CONTINUED.

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	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
2	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.03	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
3	-0.02	-0.01	-0.01	-0.01	-0.01	-0.02	-0.21	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
4	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.17	-0.20	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02
5	-0.15	-0.02	-0.03	-0.04	-0.05	-0.06	-0.12	-0.14	-0.19	-0.02	-0.04	-0.05	-0.06	-0.08
6	-0.11	-0.18	-0.05	-0.08	-0.10	-0.12	-0.09	-0.10	-0.13	-0.22	-0.06	-0.09	-0.12	-0.15
7	-0.07	-0.12	-0.21	-0.08	-0.10	-0.12	-0.06	-0.07	-0.09	-0.14	-0.26	-0.09	-0.12	-0.14
8	-0.06	-0.09	-0.13	-0.22	-0.08	-0.09	-0.05	-0.05	-0.07	-0.10	-0.17	-0.27	-0.09	-0.10
9	-0.05	-0.07	-0.10	-0.14	-0.22	-0.08	-0.04	-0.05	-0.06	-0.08	-0.12	-0.18	-0.27	-0.09
10	-0.05	-0.06	-0.08	-0.10	-0.15	-0.22	-0.04	-0.04	-0.05	-0.07	-0.10	-0.12	-0.19	-0.27
11	0.03	0.02	0.02	0.02	0.02	0.03	0.07	0.05	0.04	0.03	0.03	0.03	0.03	0.03
12	0.03	0.02	0.02	0.02	0.02	0.02	0.07	0.05	0.03	0.03	0.03	0.03	0.03	0.03
13	0.03	0.02	0.02	0.02	0.02	0.02	0.07	0.05	0.03	0.03	0.03	0.03	0.03	0.03
14	0.03	0.03	0.02	0.02	0.03	0.03	0.05	0.05	0.04	0.03	0.03	0.03	0.03	0.03
15	1.00	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.05	0.04	0.04	0.04	0.04	0.04
16	0.03	1.00	0.04	0.04	0.04	0.04	0.03	0.03	0.04	0.06	0.05	0.05	0.05	0.05
17	0.03	0.04	1.00	0.05	0.05	0.05	0.02	0.03	0.04	0.05	0.08	0.06	0.06	0.06
18	0.03	0.04	0.05	1.00	0.06	0.05	0.02	0.03	0.04	0.05	0.06	0.09	0.07	0.06
19	0.03	0.04	0.05	0.06	1.00	0.06	0.03	0.03	0.04	0.05	0.06	0.07	0.09	0.07
20	0.04	0.04	0.05	0.05	0.06	1.00	0.03	0.03	0.04	0.05	0.06	0.06	0.07	0.09
21	0.03	0.03	0.02	0.02	0.03	0.03	1.00	0.06	0.04	0.03	0.03	0.03	0.03	0.03
22	0.04	0.03	0.03	0.03	0.03	0.03	0.06	1.00	0.05	0.04	0.03	0.03	0.04	0.04
23	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.05	1.00	0.05	0.04	0.04	0.05	0.05
24	0.04	0.06	0.05	0.05	0.05	0.05	0.03	0.04	0.05	1.00	0.06	0.06	0.06	0.07
25	0.04	0.05	0.08	0.06	0.06	0.06	0.03	0.03	0.04	0.06	1.00	0.08	0.07	0.07
26	0.04	0.05	0.06	0.09	0.07	0.06	0.03	0.03	0.04	0.06	0.08	1.00	0.08	0.07
27	0.04	0.05	0.06	0.07	0.09	0.07	0.03	0.04	0.05	0.06	0.07	0.08	1.00	0.08
28	0.04	0.05	0.06	0.06	0.07	0.09	0.03	0.04	0.05	0.07	0.07	0.07	0.08	1.00

TABLE 51. RESIDUALS FROM ADAPT USING RV AGES 3-12 AND C/E AGES 5-12 (1983-89).

LOG RESIDUALS FOR RV SURVEY INDEX 4/ 5/91

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	0.03	-0.32	-0.12	-0.20	0.04	0.60	0.28	0.05	0.32	-0.42	-0.29	0.04	0.00
4	0.23	0.36	-0.09	-0.45	-0.50	0.15	0.44	-0.03	0.64	-0.30	-0.41	0.01	-0.04
5	0.18	0.39	0.25	-0.42	-0.35	-0.11	0.01	-0.22	0.65	-0.04	-0.26	0.08	-0.16
6	0.17	0.05	0.30	0.04	-0.48	-0.20	-0.02	-0.32	0.66	-0.24	-0.19	0.07	0.16
7	0.09	-0.11	-0.24	0.36	-0.04	-0.18	-0.12	-0.28	0.51	-0.34	0.11	0.10	0.14
8	0.00	0.19	-0.20	-0.16	0.32	0.38	-0.17	-0.43	0.58	-0.28	-0.28	0.02	0.03
9	0.23	-0.07	-0.12	-0.23	-0.12	0.27	0.01	-0.15	0.63	-0.10	-0.09	-0.02	-0.23
10	-0.03	0.27	0.24	-0.11	0.05	-0.12	0.12	-0.46	0.21	-0.10	-0.07	0.28	-0.28
11	0.05	0.06	0.12	-0.01	0.17	0.27	-0.31	-0.33	0.44	-0.21	-0.22	0.26	-0.29
12	0.04	-0.18	0.26	0.43	0.27	0.27	0.47	-1.14	0.32	-0.28	-0.33	0.31	-0.45

SUM OF RV RESIDUALS : 0.0000000297 MEAN RESIDUAL : 0.0000000002

LOG RESIDUALS FOR COMMERCIAL C/E INDEX 4/ 5/91

	1983	1984	1985	1986	1987	1988	1989	1990
5	0.22	0.07	0.22	-0.16	-0.15	-0.57	-0.06	0.42
6	-0.13	0.06	0.04	0.07	-0.16	-0.21	-0.07	0.40
7	-0.32	-0.00	0.24	-0.11	-0.12	-0.06	0.06	0.31
8	-0.22	-0.22	0.09	-0.02	0.06	-0.13	0.20	0.23
9	-0.07	0.14	0.07	-0.12	-0.47	-0.01	0.20	0.27
10	0.10	-0.14	0.34	-0.04	-0.49	-0.04	0.08	0.20
11	-0.14	0.00	0.50	0.13	-0.40	-0.50	0.28	0.13
12	-0.71	-0.10	0.43	0.16	-0.09	-0.39	0.47	0.24

SUM OF C/E RESIDUALS : 0.0000000473 MEAN RESIDUAL : 0.0000000007

TABLE 52. POPULATION NUMBERS FROM ADAPT USING RV AGES 3-12 AND C/E AGES 5-12 (1983-90).

	1962	1963	1964	1965	1966	1967	1968	1969	1970
3	725671	641022	880287	1040258	1196084	864855	729970	669877	740095
4	579058	586288	519625	703220	847007	966551	694274	592091	544531
5	700547	450391	455059	400457	549771	633758	720883	483105	448908
6	373786	515345	314247	320310	285520	365343	428087	403989	304273
7	201431	253402	315056	202377	201672	176929	211566	214273	183063
8	111308	122107	154086	167329	107457	111448	95095	97383	78154
9	76929	66229	73416	80131	75310	60451	56237	42168	32081
10	64034	44759	40181	41204	35005	40083	33978	25077	16743
11	51238	36107	26139	21800	20241	20731	18264	17880	9338
12	42190	32500	22099	13530	11565	12475	11590	9894	8858
13	30301	25975	22805	12346	7704	7405	7167	4740	4048
14	34182	17770	17700	14157	6535	4656	4156	4114	1163
3+	2990675	2791895	2840700	3017120	3343870	3264686	3011267	2564591	2371255

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
3	596868	255047	141536	138367	233186	413382	342994	302814	154556	164185
4	589557	477023	202719	112294	110362	187326	325991	274370	246726	125497
5	391442	417941	318340	129069	79994	77598	122852	207623	208750	190818
6	293015	234178	236712	174816	74069	42538	38152	63972	134513	136985
7	157504	151126	122784	139963	75805	29493	15918	20281	33990	83707
8	72339	76595	73075	68438	59814	26680	8935	8149	9628	17892
9	37549	36555	35970	35081	23741	15958	7346	4243	3887	4752
10	16442	20127	19297	16644	11662	7294	3175	3544	2089	2006
11	10247	9417	10694	8953	4133	2749	1776	1350	1922	1026
12	5836	6378	5007	5304	2066	1289	928	973	710	1067
13	6167	3613	3720	2151	1687	625	484	492	598	415
14	2856	4017	1702	1984	786	650	247	262	308	385
3+	2179821	1692019	1171556	833063	677305	805582	868799	888073	797676	728734

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	368739	333054	369529	477463	406225	204215	182459	309795	505863	645037
4	132112	299921	271142	300206	390206	332001	166445	147277	251124	412631
5	91868	101675	217246	209672	232332	306060	258049	127934	107323	189642
6	130156	63279	66050	139318	142927	157088	210616	182010	86480	68732
7	84994	84123	38782	36860	79116	86325	87108	128046	105660	47991
8	52231	49668	45860	20854	18865	39433	47129	45559	63461	51483
9	10278	32042	25346	24245	10517	9066	18964	20937	20463	26171
10	2789	5542	15434	12668	11788	5140	4614	10262	8974	8885
11	1172	1579	2798	6899	6547	4980	2399	2560	4478	4054
12	630	680	987	1369	3353	2731	2289	1352	1396	2132
13	666	339	415	583	713	1225	1240	1084	725	625
14	289	432	196	259	346	354	483	661	556	373
3+	875925	972336	1053784	1230395	1302935	1148618	981794	977476	1156504	1457756

TABLE 53. JANUARY 1 POPULATION BIOMASS FROM ADAPT USING RV AGES 3-12 AND C/E AGES 5+12 (1983-90).

	1962	1963	1964	1965	1966	1967	1968	1969	1970
3	193989	171360	235321	278085	319741	231196	195138	179074	197845
4	251782	253531	224704	304097	366275	417971	300228	256041	235474
5	521445	313338	316585	278598	382476	440906	501519	336097	312306
6	395755	536156	326938	333246	297051	380097	445375	420304	316561
7	295884	362090	450189	289180	288173	252817	302310	306178	261582
8	211460	229066	289059	313902	201585	209071	178394	182686	146612
9	185048	156682	173685	189570	178164	143011	133042	99759	75896
10	187266	129687	116422	119388	101424	116139	98451	72658	48512
11	183379	124854	90384	75383	69992	71686	63155	61828	32290
12	144891	128381	87295	53447	45682	49279	45784	39085	34992
13	184845	130261	114363	61912	38632	37136	35943	23770	20301
14	205944	106974	106549	84649	39506	27839	24721	24513	6999
3+	2961689	2642381	2531494	2381457	2328703	2377150	2324061	2001993	1689370

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
3	162539	108580	31070	36097	90127	161100	122022	89053	54951	71730
4	254945	202496	92187	52383	51823	98145	169390	156174	134234	74689
5	272326	247963	195280	84409	64632	59397	94501	164009	188292	176792
6	304848	228297	185543	155193	76754	47885	47404	79196	177271	190419
7	225060	206640	145487	154543	94160	42381	27916	40984	67011	166881
8	135704	144027	120873	97461	88916	45256	19850	22459	28531	52948
9	88832	90012	77865	67388	44082	31506	19661	14339	14737	20096
10	47639	59317	54802	40938	26975	18750	9360	13924	9634	9870
11	35433	33375	34645	26599	12526	8508	6714	5957	9776	6092
12	23052	25104	19373	17492	6992	5031	4400	5513	4216	7208
13	30926	16460	16071	9290	6813	2970	2797	3465	4642	3189
14	17132	30928	10356	10345	4055	4429	1916	2113	2803	3889
3+	1598438	1393198	983552	752137	567854	525357	525930	597186	696098	783803

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	164106	137775	192307	253254	159207	91553	60215	123524	199648	243969
4	84943	203858	184117	221746	256083	195176	96567	82515	151217	240886
5	87197	98368	228759	214235	228584	266677	222222	108011	93063	167959
6	179521	91063	95715	214151	187229	204455	246771	216997	107847	84861
7	165974	156116	77908	73627	151922	140408	147823	190112	167910	79172
8	136269	120968	107364	51837	46459	86763	89053	92616	117992	103534
9	37853	95255	73716	67388	31117	25354	48646	46081	49427	58936
10	14400	22117	50756	43158	36953	17208	14823	29941	24709	25336
11	6886	9038	12518	26700	25202	17689	9789	10026	15536	13404
12	4338	4571	6822	7456	14799	11727	9610	6941	6785	9248
13	5057	2549	3354	4708	4704	6036	6330	5975	4653	3735
14	2709	3391	1815	2652	3288	2851	3025	4856	4465	3265
3+	889253	945068	1035153	1180913	1145546	1065895	954874	917595	943253	1034306

TABLE 54. FISHING MORTALITY FROM ADAPT USING RV AGES 3-12 AND C/E AGES 5-12 (1983-90).

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
3	0.013	0.010	0.025	0.006	0.013	0.020	0.009	0.007	0.027	0.024	0.030	0.031	0.026	0.019
4	0.051	0.053	0.061	0.046	0.090	0.093	0.163	0.077	0.130	0.144	0.204	0.251	0.139	0.152
5	0.107	0.160	0.151	0.138	0.209	0.192	0.379	0.262	0.227	0.314	0.368	0.399	0.355	0.432
6	0.189	0.292	0.240	0.263	0.279	0.346	0.492	0.592	0.458	0.462	0.446	0.325	0.636	0.721
7	0.301	0.297	0.433	0.433	0.393	0.421	0.576	0.809	0.728	0.521	0.527	0.385	0.650	0.844
8	0.319	0.309	0.454	0.598	0.375	0.484	0.613	0.910	0.533	0.483	0.556	0.534	0.859	1.121
9	0.342	0.300	0.378	0.628	0.431	0.376	0.608	0.724	0.468	0.424	0.439	0.571	0.901	0.980
10	0.373	0.338	0.411	0.511	0.324	0.586	0.442	0.788	0.291	0.357	0.432	0.568	1.193	1.245
11	0.255	0.291	0.458	0.434	0.284	0.381	0.413	0.502	0.270	0.274	0.432	0.501	1.266	0.965
12	0.285	0.154	0.382	0.363	0.246	0.354	0.694	0.694	0.162	0.279	0.339	0.645	0.945	0.996
13	0.334	0.184	0.277	0.436	0.304	0.378	0.355	1.205	0.149	0.229	0.553	0.428	0.807	0.753
14	0.322	0.304	0.430	0.528	0.389	0.449	0.578	0.824	0.629	0.489	0.518	0.471	0.779	1.000

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	0.038	0.023	0.005	0.008	0.017	0.007	0.006	0.008	0.002	0.002	0.005	0.014	0.010	0.004	0.004
4	0.222	0.251	0.073	0.057	0.112	0.062	0.122	0.057	0.056	0.043	0.052	0.063	0.116	0.081	0.081
5	0.510	0.453	0.234	0.221	0.183	0.173	0.231	0.244	0.183	0.191	0.174	0.149	0.192	0.246	0.241
6	0.783	0.432	0.432	0.274	0.277	0.236	0.290	0.383	0.366	0.304	0.390	0.298	0.344	0.389	0.492
7	0.994	0.470	0.545	0.442	0.272	0.337	0.407	0.420	0.470	0.496	0.405	0.448	0.502	0.519	0.507
8	1.090	0.545	0.540	0.506	0.354	0.289	0.473	0.437	0.485	0.533	0.532	0.611	0.600	0.686	0.521
9	1.415	0.529	0.508	0.461	0.333	0.418	0.530	0.494	0.521	0.516	0.475	0.414	0.647	0.634	0.531
10	1.213	0.655	0.412	0.512	0.338	0.369	0.484	0.605	0.460	0.662	0.562	0.389	0.629	0.595	0.498
11	0.886	0.402	0.443	0.389	0.288	0.345	0.270	0.514	0.521	0.674	0.578	0.373	0.407	0.542	0.388
12	0.779	0.435	0.286	0.335	0.271	0.419	0.293	0.325	0.453	0.807	0.590	0.547	0.423	0.603	0.333
13	0.727	0.415	0.269	0.241	0.161	0.232	0.347	0.274	0.324	0.500	0.730	0.428	0.467	0.465	0.255
14	1.163	0.536	0.256	0.214	0.132	0.152	0.211	0.212	0.236	0.250	0.224	0.247	0.270	0.294	0.255

Table 55. Input data used for the projections of biomass and fishing mortality for the current management plan for cod in Divisions 2j3KL.

Age	January 1, 1991 population numbers (000)	Weight at age (kg)	Partial Recruitment
3	300,000	0.48	.007
4	526,214	0.73	.158
5	311,642	1.06	.472
6	122,026	1.43	.965
7	34,392	1.80	1.000
8	23,663	2.16	1.000
9	25,037	2.53	1.000
10	12,603	3.05	.976
11	4,423	3.98	.760
12	2,253	5.22	.654
13	1,251	6.88	.500
14	397	8.64	.500
15	119	10.06	.500
16	0	10.63	.500

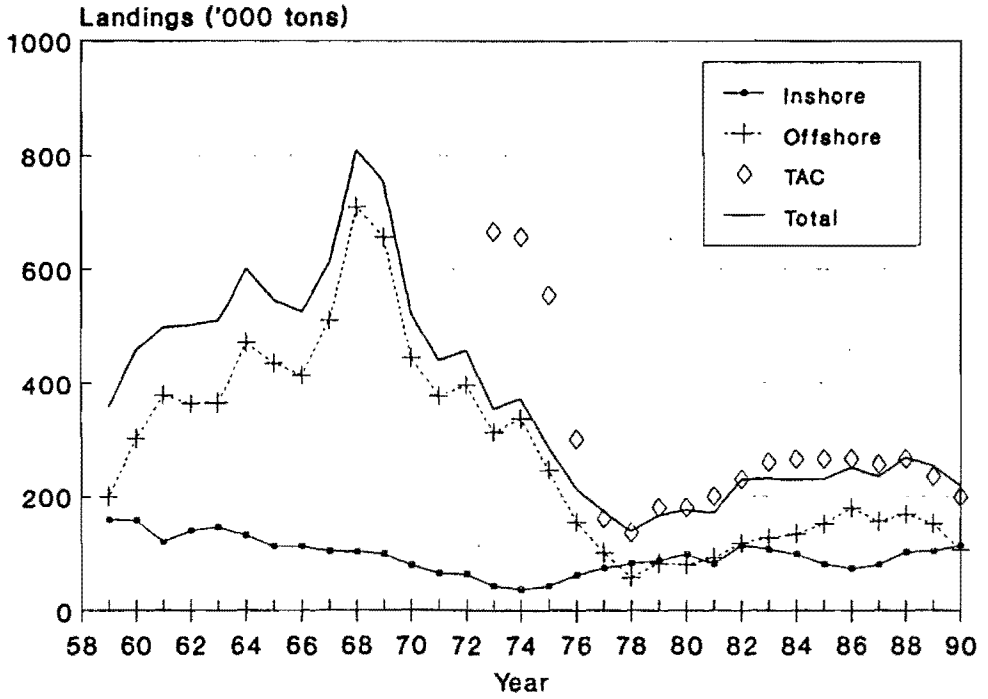

Figure 1. Cod in Divisions 2J3KL:
Inshore and offshore landings and TAC's.

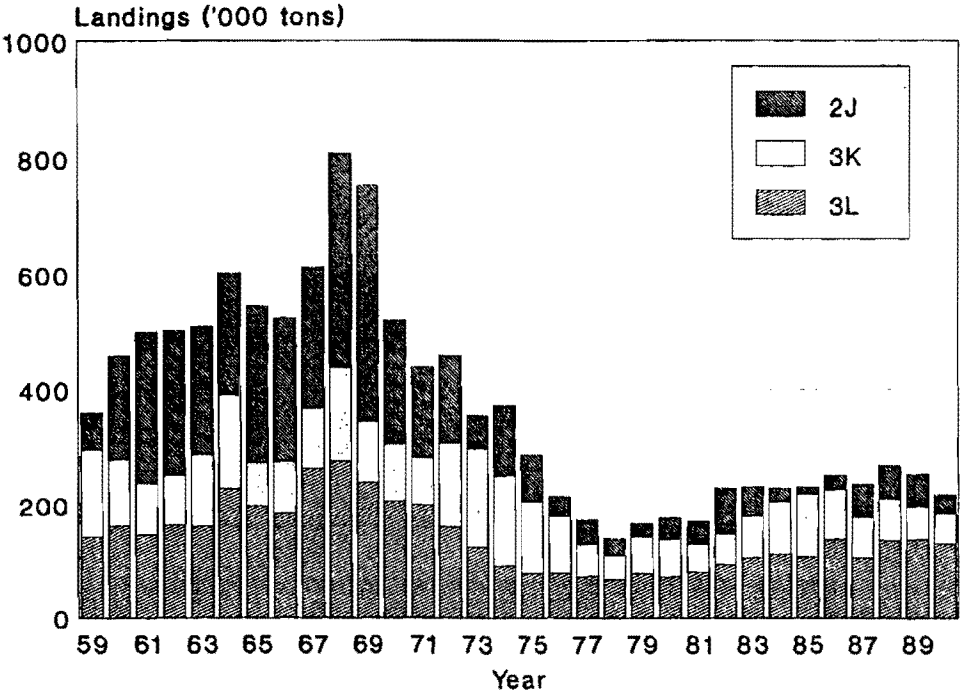

Figure 2. Cod in Divisions 2J3KL:
Landings by NAFO Division.

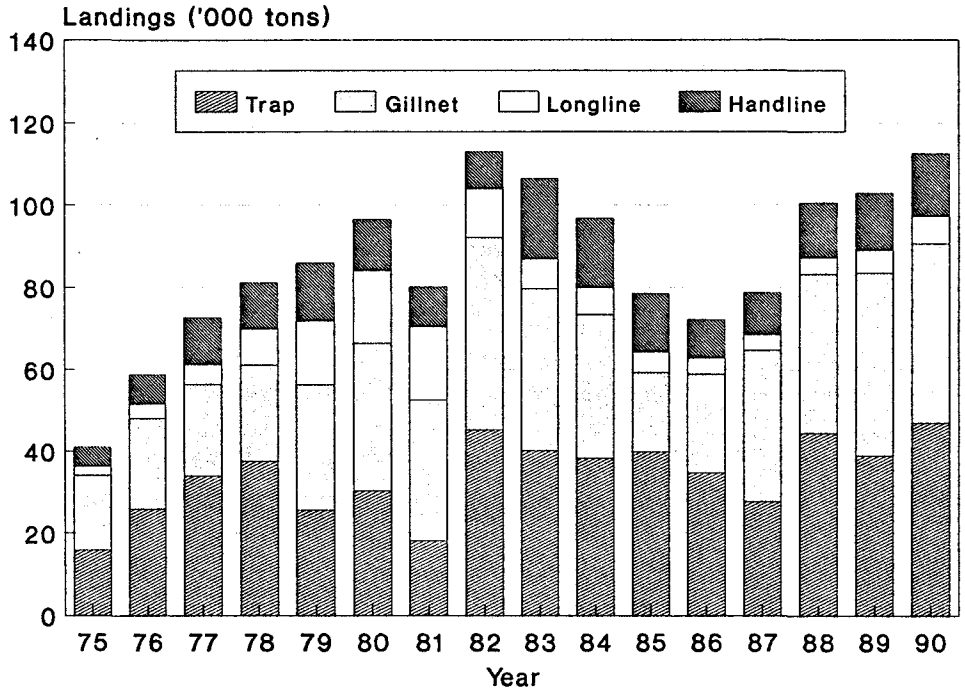

Figure 3. Cod in Divisions 2J3KL:
Inshore landings by gear.

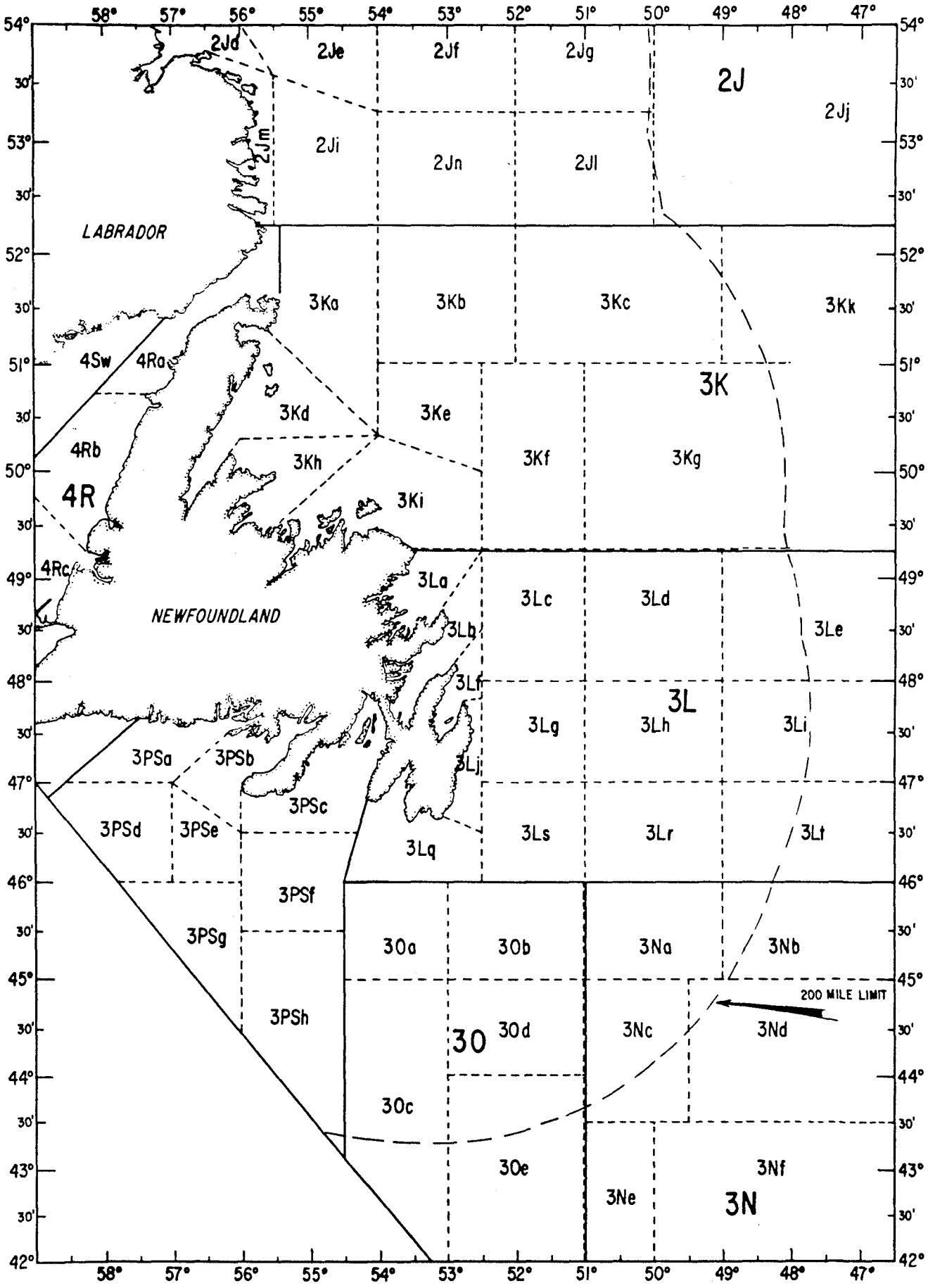

Figure 4. Commercial fishery unit areas.

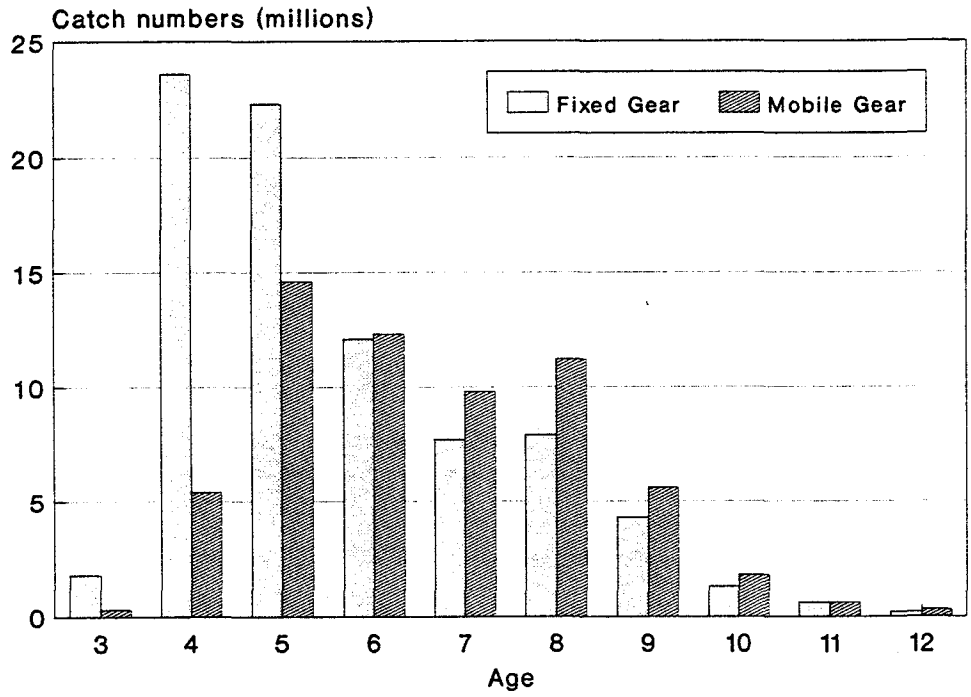

Fig 5. Age composition of the commercial cod catch for Div 2J3KL during 1990.

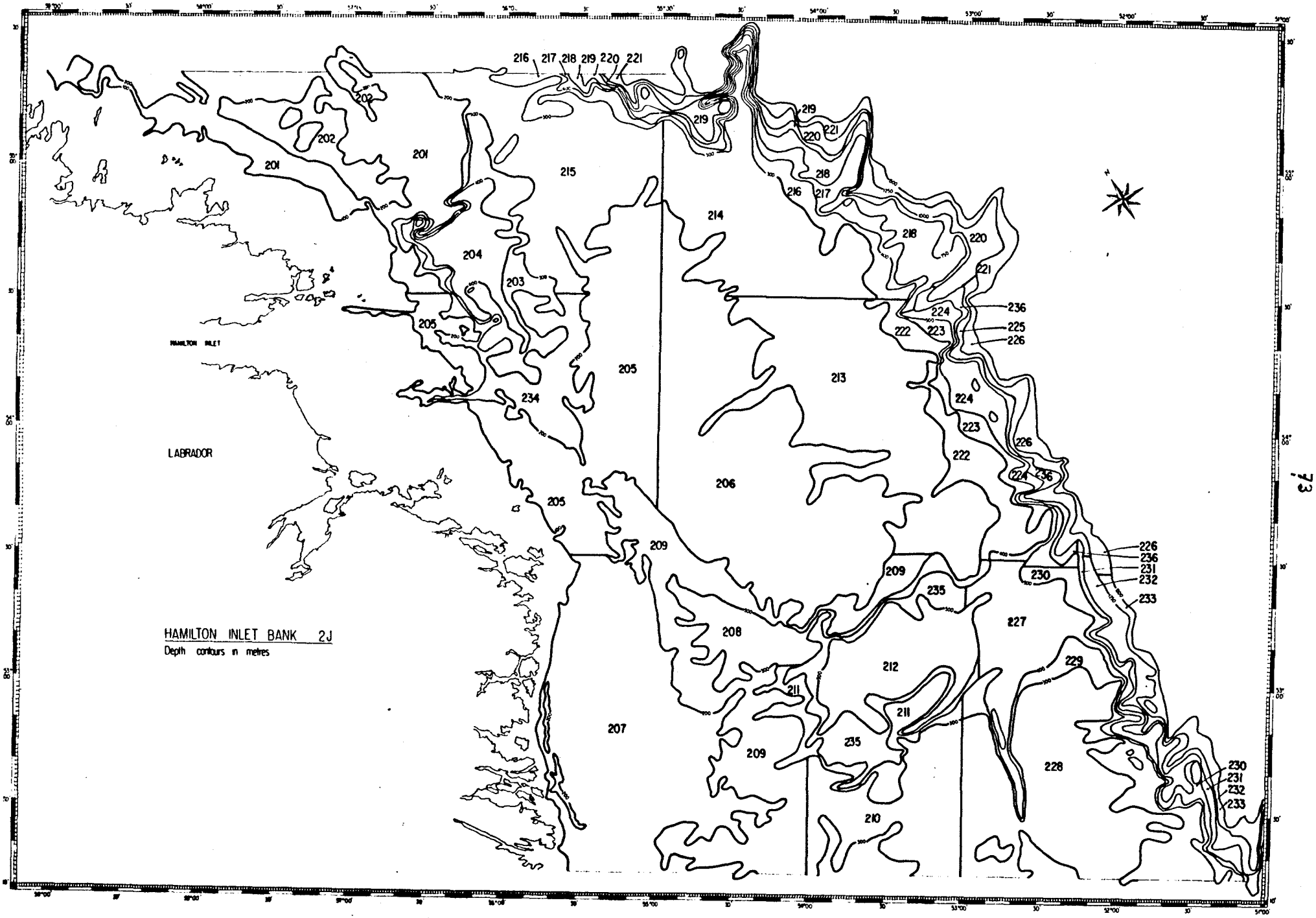

Figure 6. Area of stratification for RV surveys in Div. 2J.

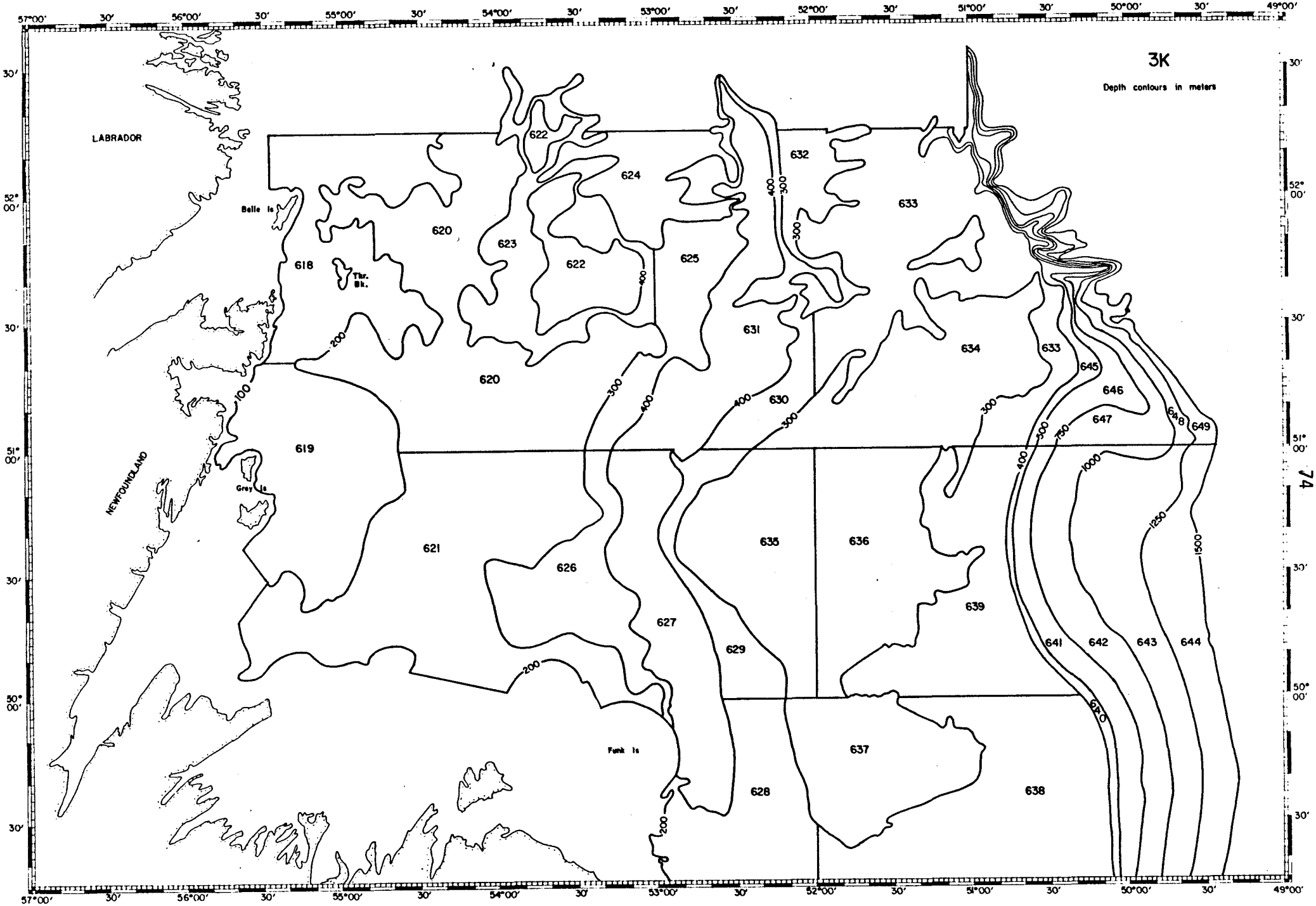

Figure 7. Area of stratification for RV surveys in Div. 3K.

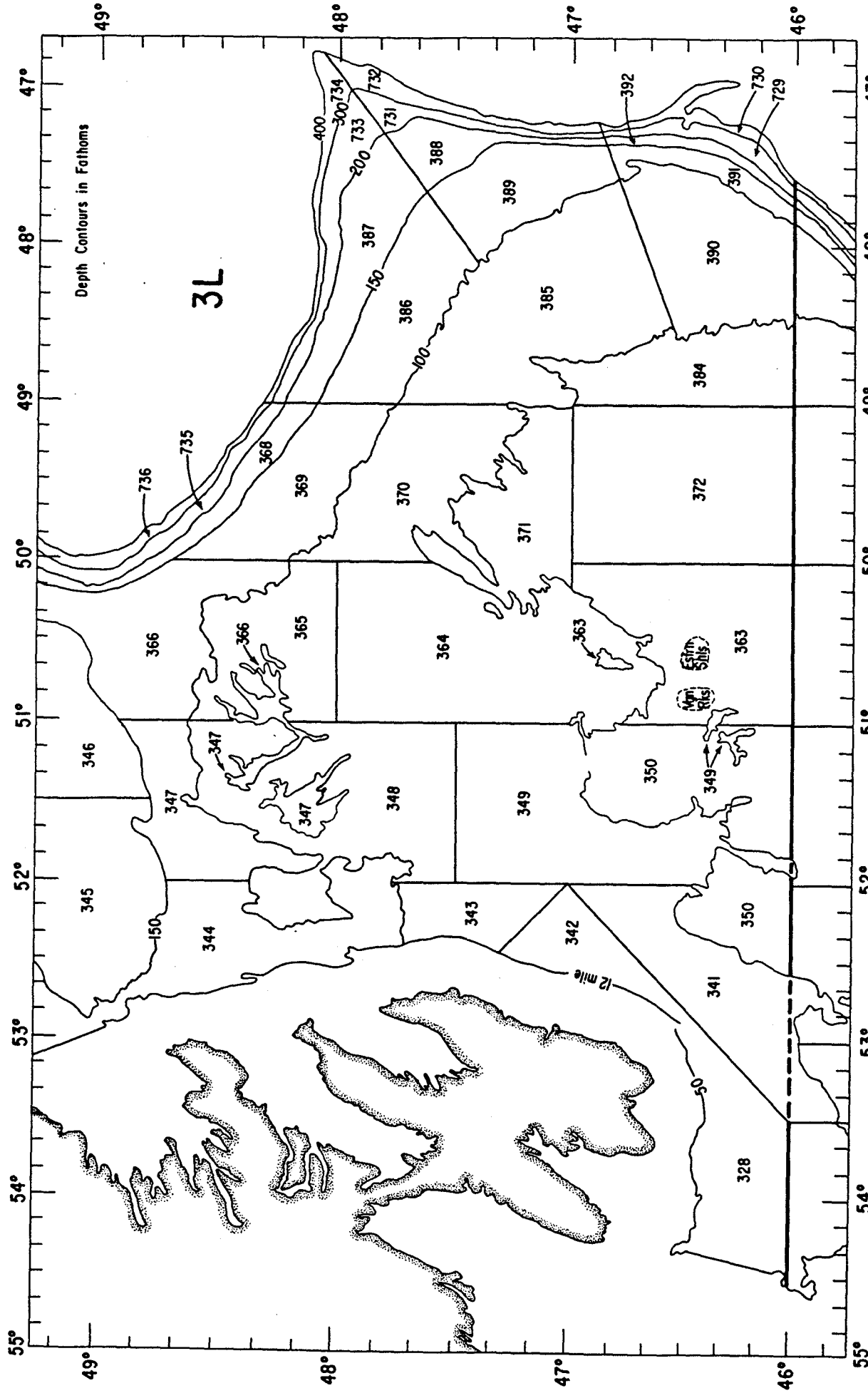

Figure 8. Area of stratification for RV surveys in Div. 3L.

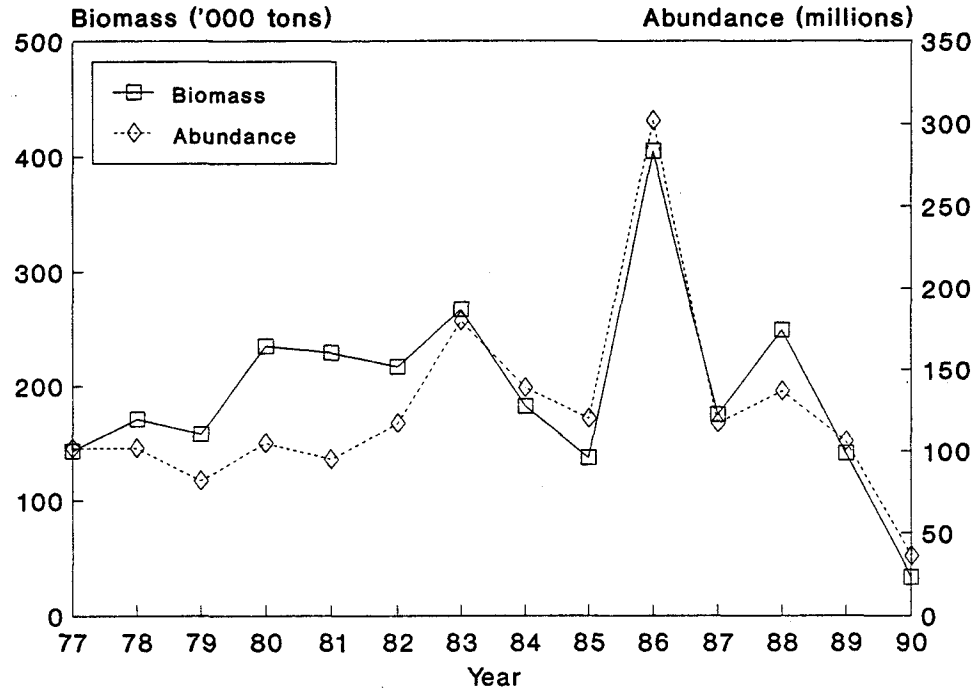

Figure 9. Biomass and abundance of cod from autumn RV surveys in Division 2J.

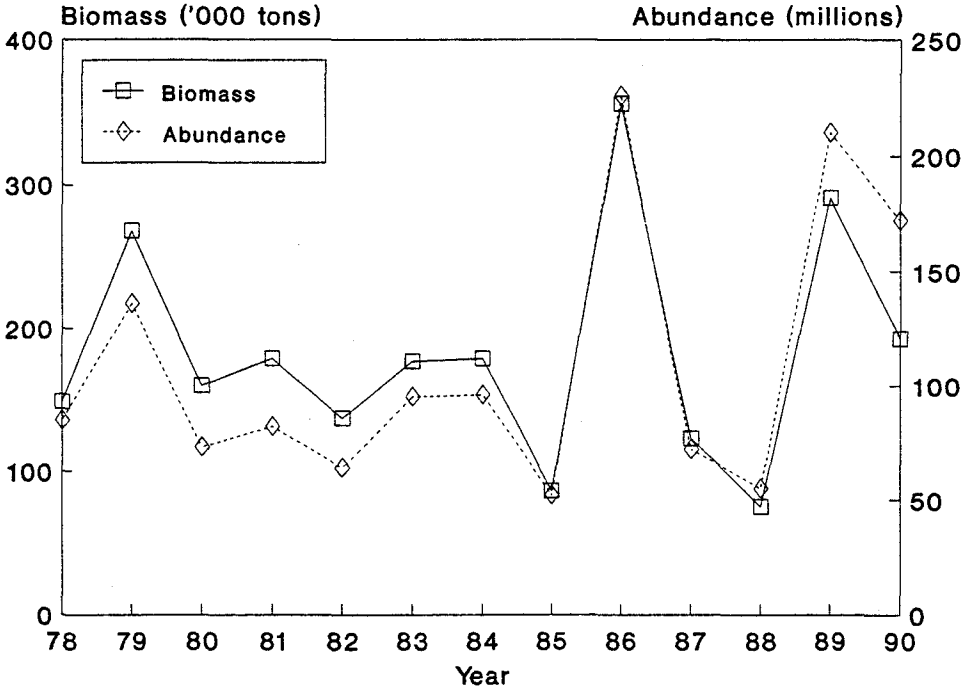

Figure 10. Biomass and abundance of cod from autumn RV surveys in Division 3K.

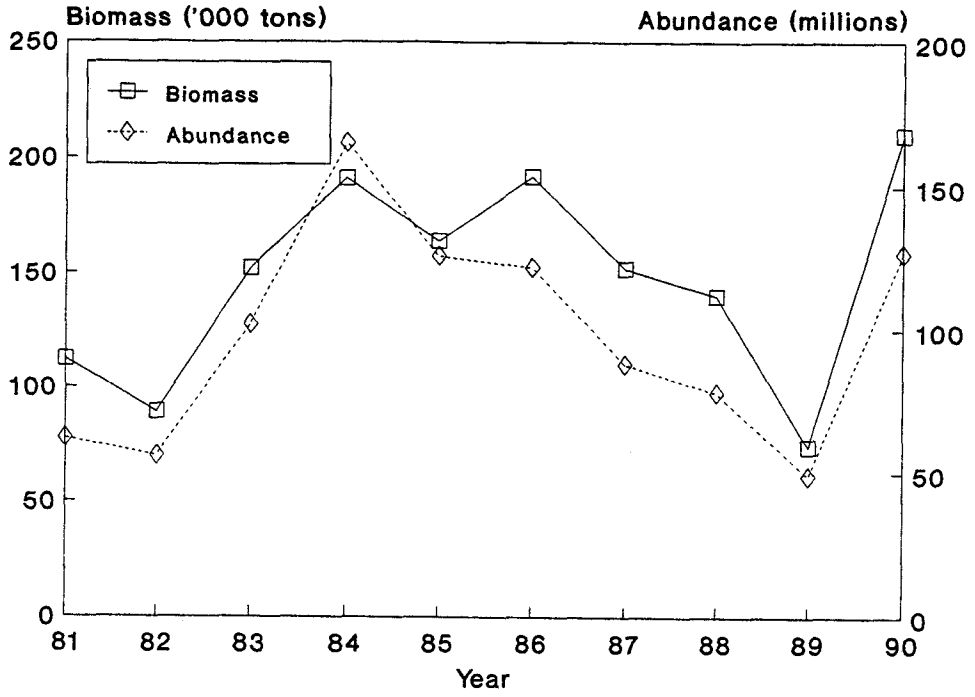

Figure 11. Biomass and abundance of cod from autumn RV surveys in Division 3L.

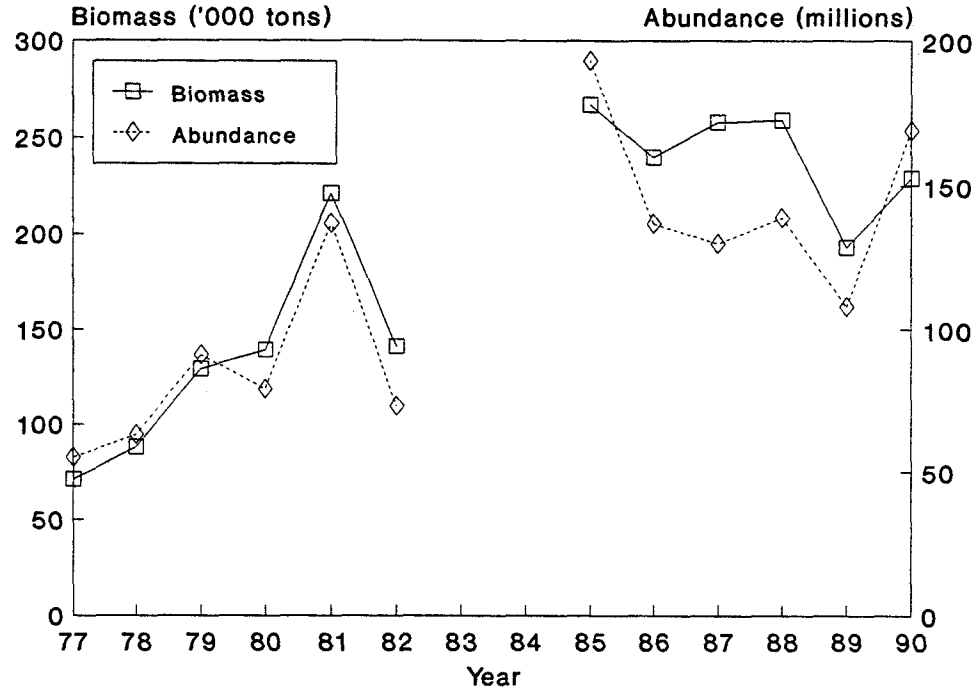

Figure 12. Biomass and abundance of cod from spring RV surveys in Division 3L.

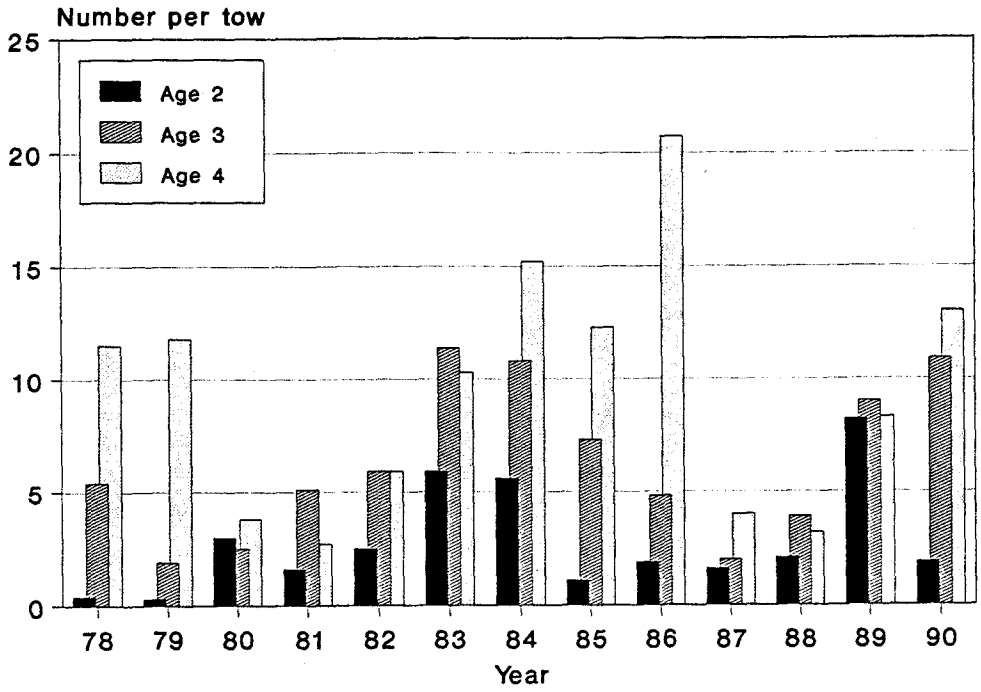

Figure 13. Results of RV surveys for cod in Divisions 2J3KL (Ages 2, 3, 4).

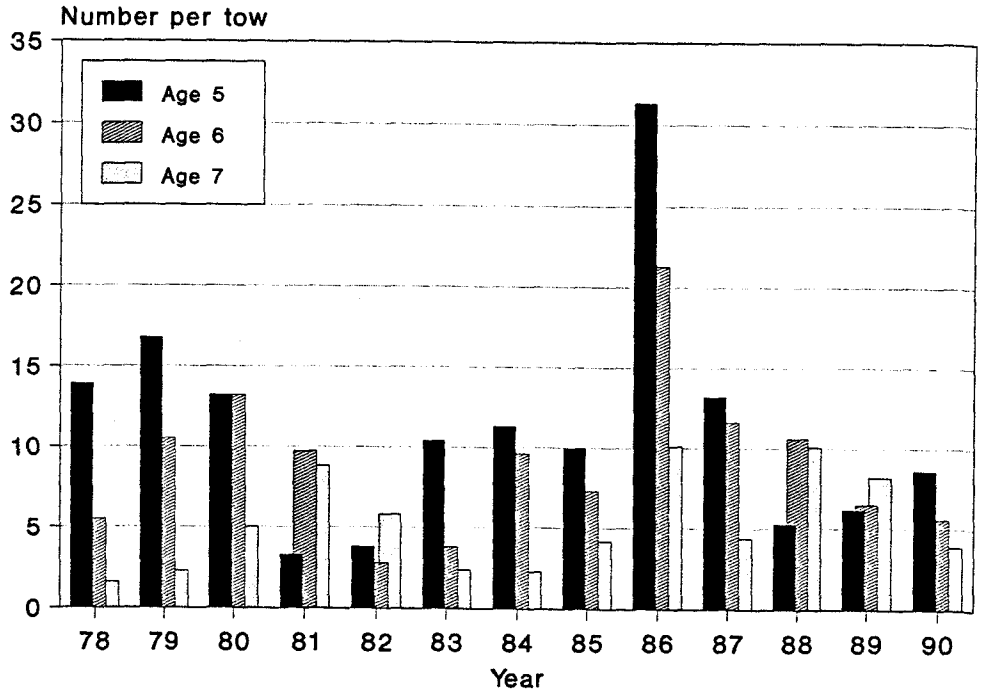

Figure 14. Results of RV surveys for cod in Divisions 2J3KL (Ages 5, 6, 7).

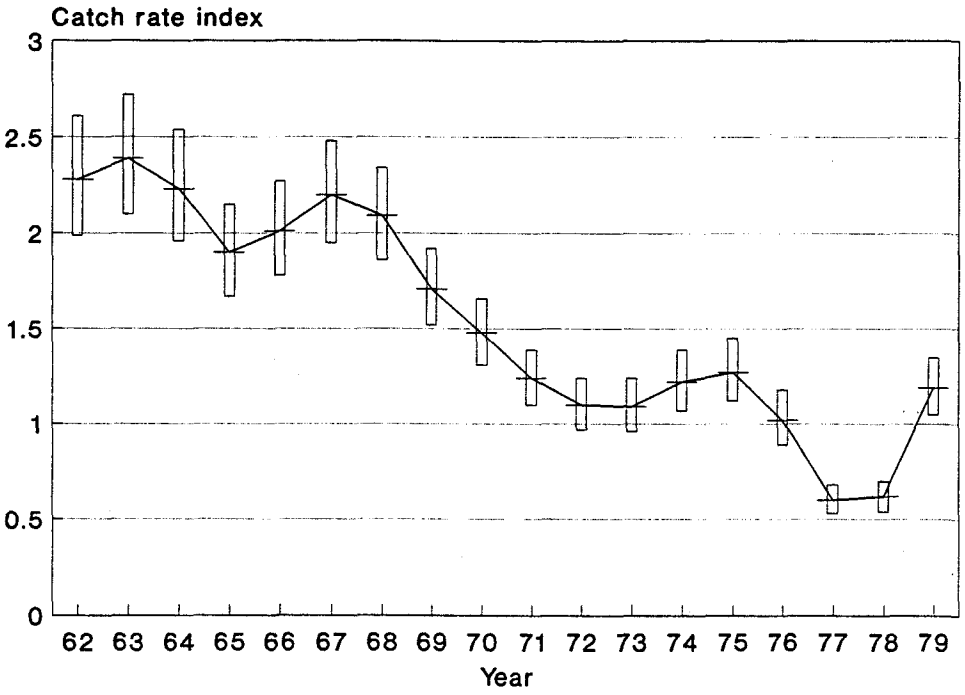

Figure 15. Catch rate index for 2J3KL cod with 90% C.I. for the years 1962-792

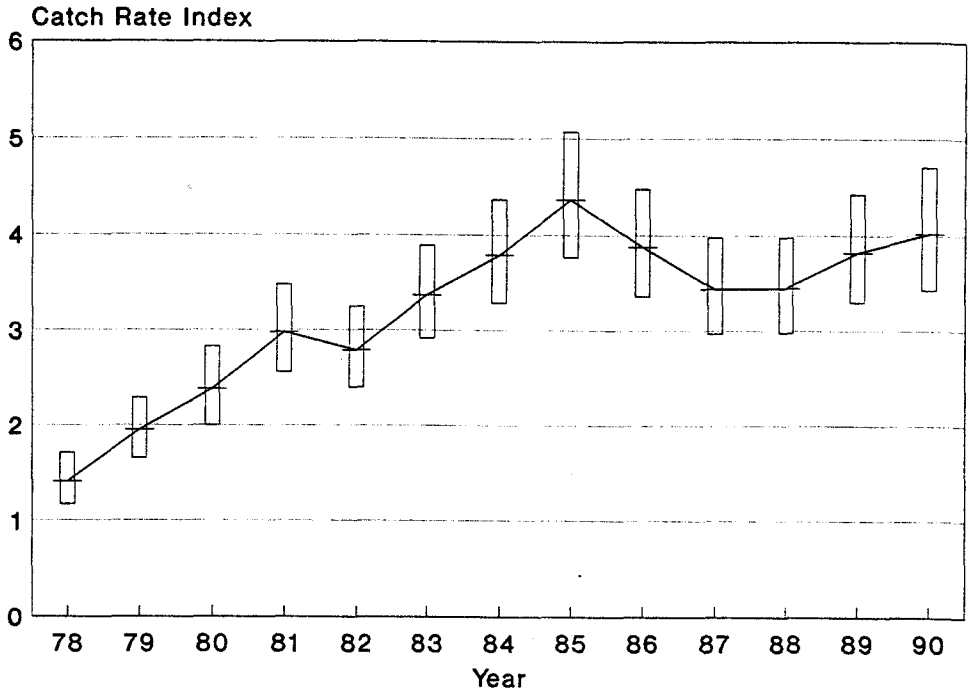

Figure 16. Catch rate index for 2J3KL cod with 90% C.I. for the years 1978-90.

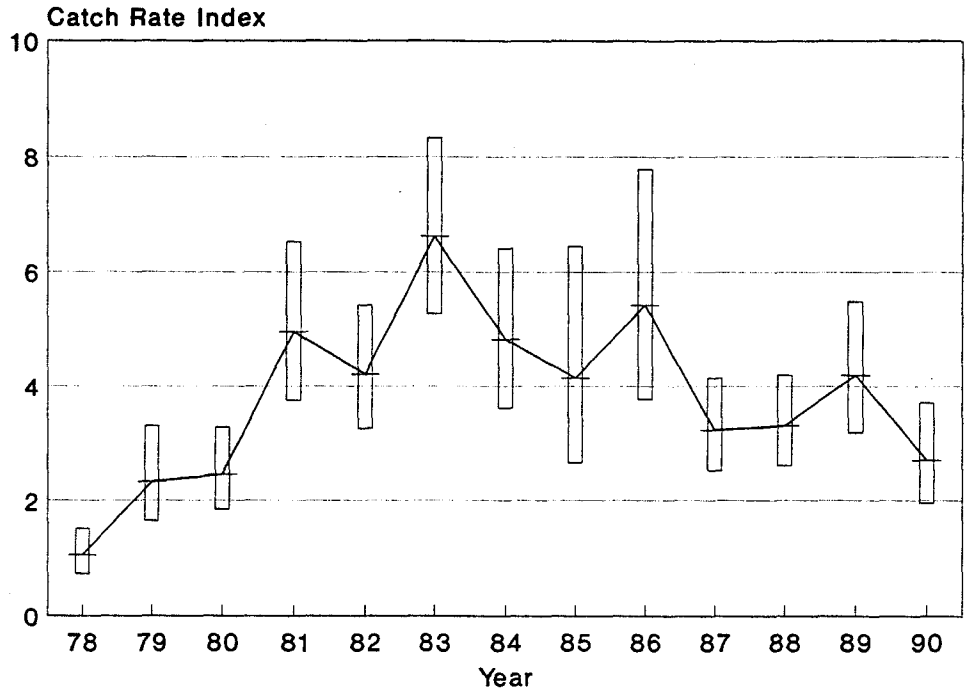

Figure 17. Catch rate index for Division 2J cod with approximate 90% C.I.

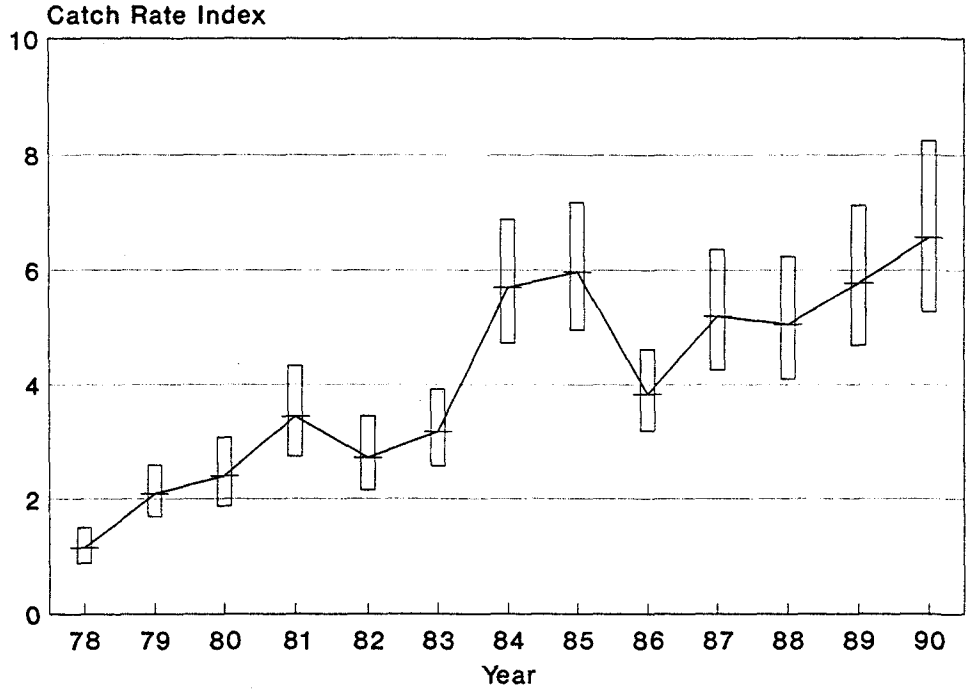

Figure 18. Catch rate index for Division 3K cod with approximate 90% C.I.

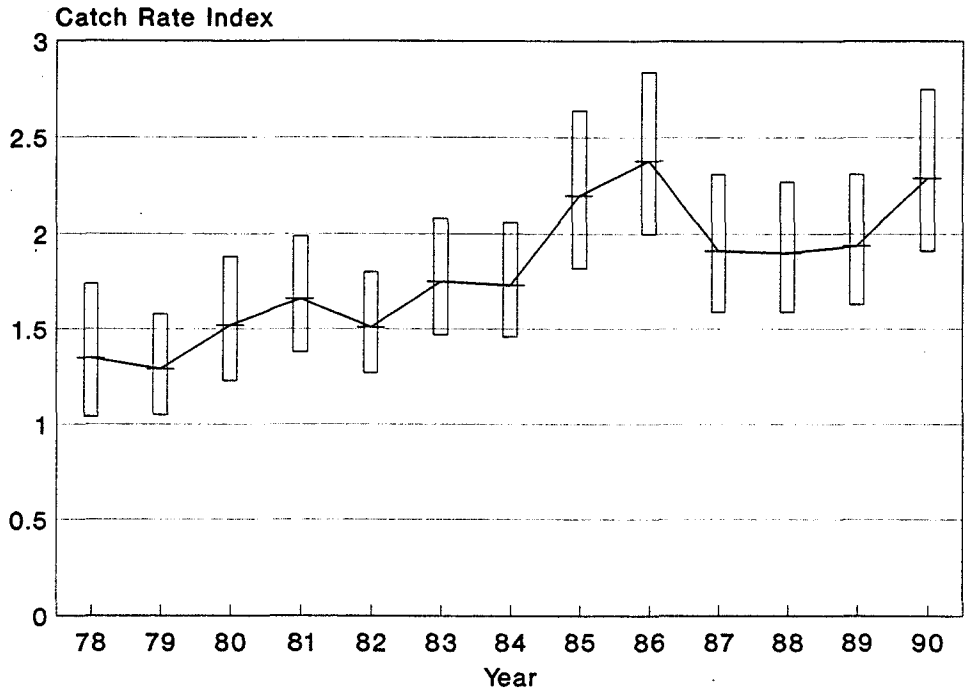

Figure 19. Catch rate index for Division 3L cod with approximate 90% C.I.

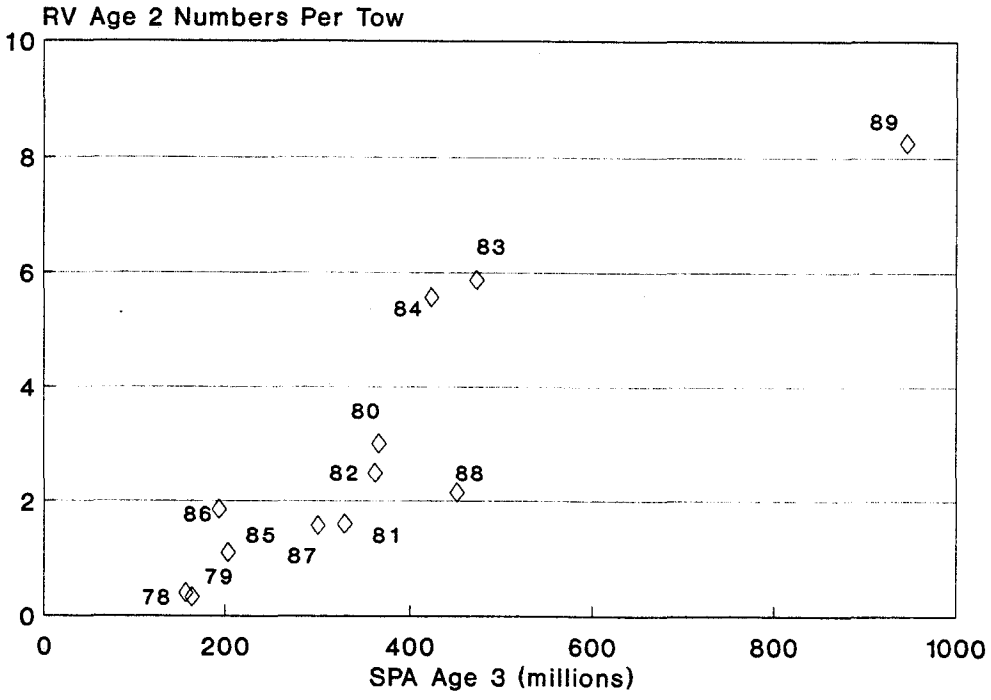

Figure 20. RV age 2 in year t versus SPA age 3 in year t+1 for cod in Div 2J3KL.

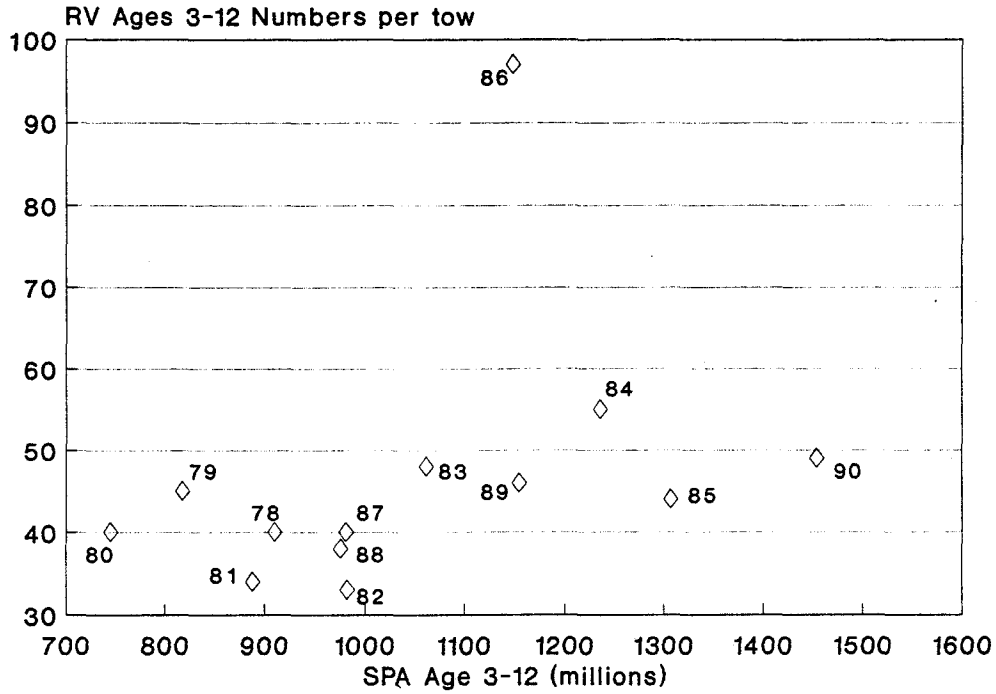

Figure 21. RV versus SPA for ages 3 to 12 for cod in Div 2J3KL.

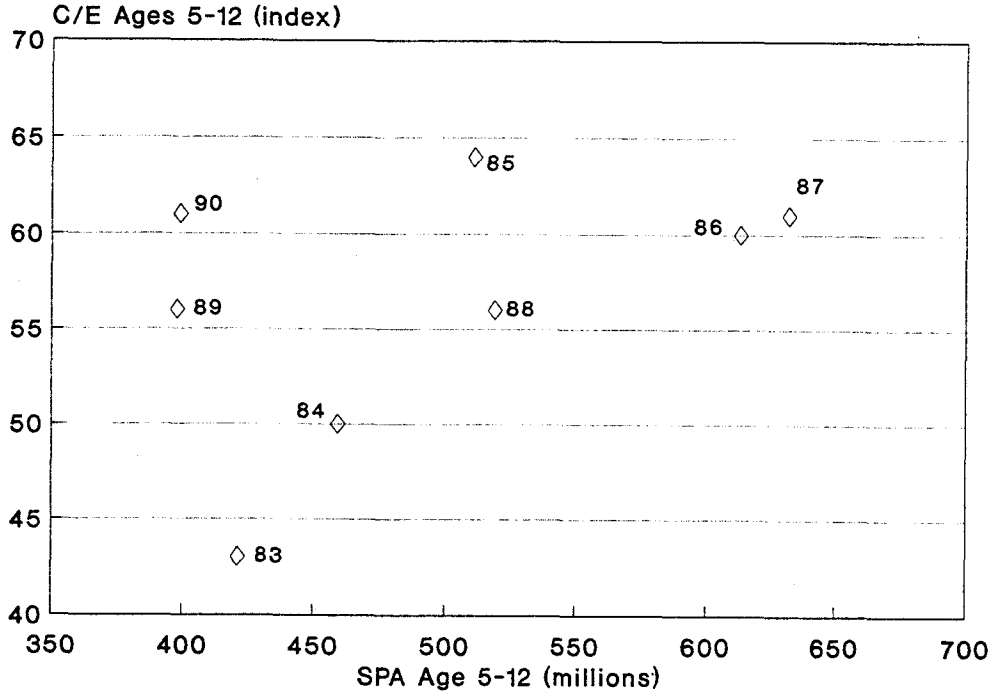

Figure 22. C/E versus SPA for ages 5 to 12 for cod in Div 2J3KL.

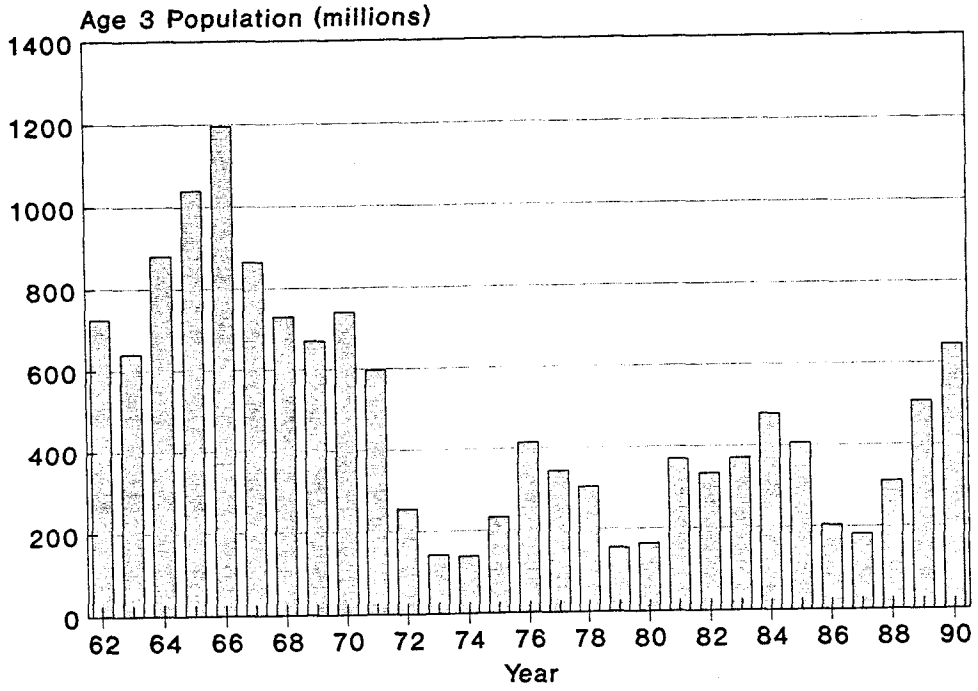

Figure 23. Age 3 population numbers (recruitment) for cod in Div 2J3KL.

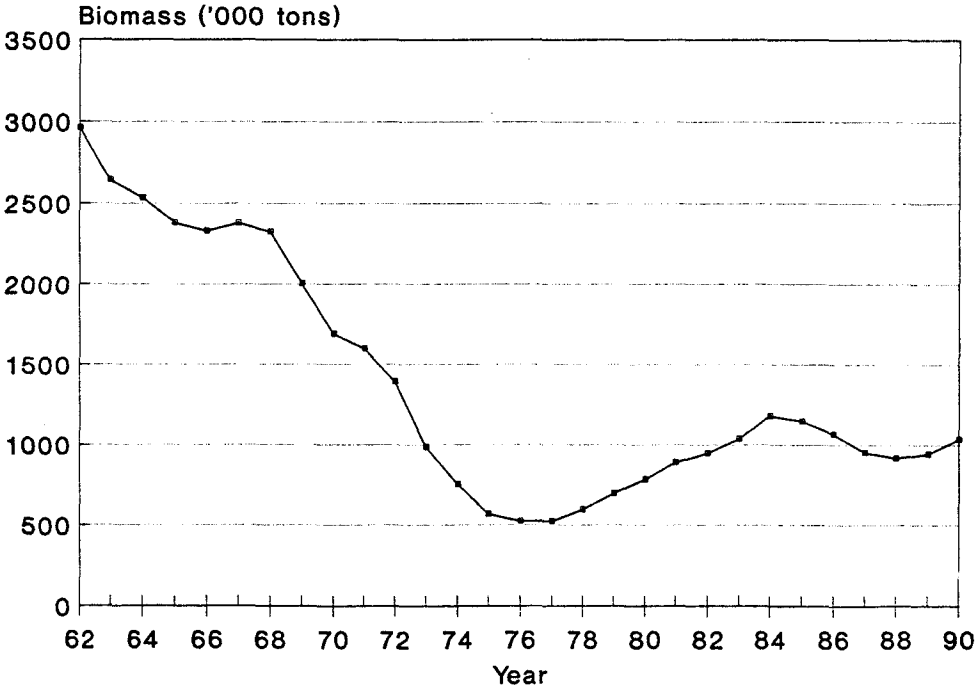

Figure 24. January 1 population biomass for cod in Divisions 2J3KL.

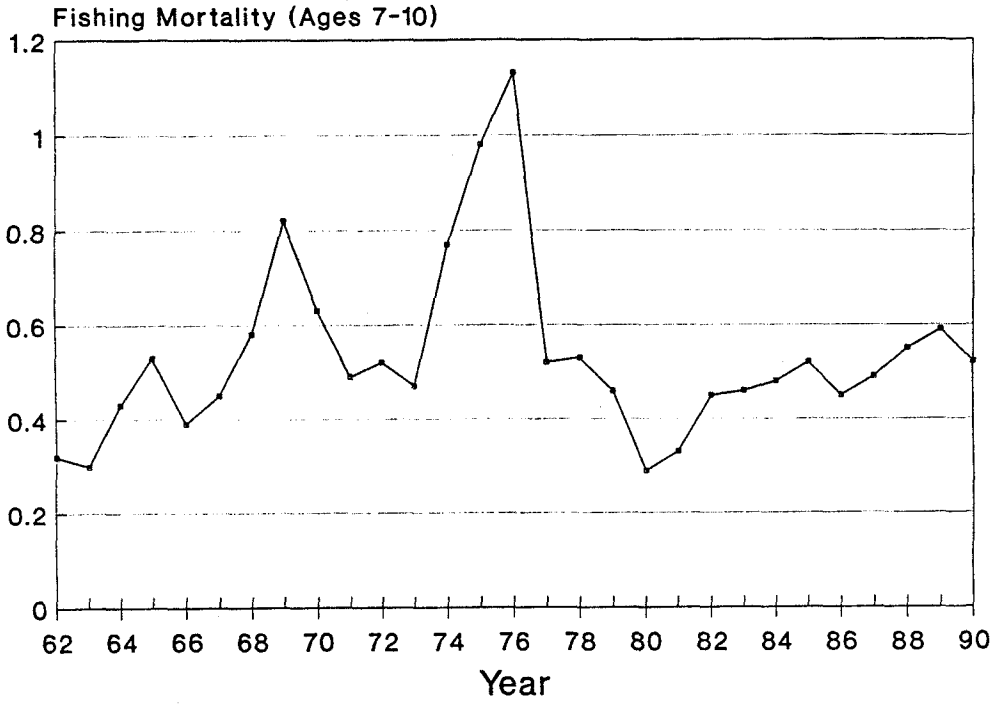

Figure 25. Fishing mortality weighted by population numbers for cod in Div 2J3KL.