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

by

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## Abstract

Nominal catches for this stock declined from a peak of about 800,000 t in 1968 to a low of about 140,000 t in 1978. Catches for the period 1982-85 have been about 230,000 t while the catch for 1986 was about 250,000 t. This assessment indicates that the age 4+ biomass has increased from about 280,000 t in 1976 to the 1986 estimate of about 1.5 million tons. The 1980-82 year-class contributes about 80% of the 1986 age 4+ biomass. Assuming that the 256,000 t TAC for 1987 will be taken, the 1988 $F_{0.1}$ catch is estimated to be 293,000 t. The expected contribution of the 1980-82 year-classes to the projected 1988 catch is about 63% by weight.



## Résumé

Les prises de ce stock ont diminué depuis un sommet d'environ 800 000 t en 1968 pour s'établir à un minimum d'environ 140 000 t en 1978. Pour la période de 1982 à 1985 les prises ont été d'environ 230 000 t alors qu'en 1986 elles s'établissaient à environ 250 000 t. Cette évaluation indique pour la biomasse des âges de 4 et plus un accroissement d'environ 280 000 t qu'elle était en 1976 jusqu'à environ 1,5 million de t qui est la valeur estimée pour 1986. Les classes d'âge de 1980 à 1982 constituent environ 80 % de la biomasse pour les âges de 4 et plus en 1986. En supposant que soit atteint le TPA de 256 000 t pour 1987, on estime à 293 000 t le $F_{0,1}$ pour 1988. La contribution attendue des classes d'âge de 1980 à 1982 aux prises projetées en 1988 s'établit à environ 63 % en poids.

# Introduction

## Nominal catch

Catches of cod from this stock declined from a peak of about 800,000 t in 1968 to a low of about 140,000 t in 1978. Quota regulations came into effect in 1973. Inshore and offshore historical catches are given in Table 1. While the inshore catch has declined from a 22 year high of 113,000 t in 1982 to 72,000 t in 1986 (Fig. 1), the offshore catch during 1986 was an eleven year high at 179,000 t. It can be seen in Table 2 that the decline in the inshore catch since 1982 was due mainly to declines in the catches by gillnets and line trawls. Recent nominal catches along with associated TAC's are as follows ('000't):

| Year | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|---|
| Catch | 176 | 171 | 230 | 232 | 230 | 232 | 252 | |
| TAC | 180 | 200 | 230 | 260 | 266 | 266 | 266 | 256 |

Nominal catches in 1986 by country, month, and division are given in Table 3. These were obtained from the Department of Fisheries and Oceans for Canadian based vessels and from NAFO circular letters, the NAFO Secretariat, FLASH data base, and Department of Fisheries and Oceans surveillance estimates for others. Surveillance estimates, calculated by country, are based on calculating catch rate information from logbooks on inspected vessels and applying this catch rate to the uninspected portion of the foreign fleet. As in recent years the Canadian fishery took the major portion of the 1986 catch (about 75%), but the foreign catch in NAFO Div. 3L was at a twelve year high (52,000 t). This catch was almost entirely taken by Spain and Portugal on the nose of the bank outside the Canadian 200 mile fishery zone.

## Catch and average weight at age

Catch numbers, average weight, and average length at age for 1986 are given in Table 5. The 1980-81 year-classes dominated the commercial fishery in 1986. A summary of the sampling used to derive the catch at age is given in Table 4. Sampling coverage was well distributed and data were available to treat each NAFO division separately. The following relationship was applied in deriving average weight at age: log weight = 3.0879 log length - 5.2106. The discrepancy between reported catch and catch calculated from these average weights for 1986 was about 3%. The percentage catch-at-age during 1986 agrees quite well (Fig. 18) with the percentage catch-at-age projected during last year's assessment. A breakdown of the catch at age during 1986 by inshore and offshore components and by division is presented in Table 6. Historical catch and average weights at age used as inputs to sequential population analysis are given in Table 7.

## Research vessel surveys

Research vessel surveys were conducted in the fall by the GADUS ATLANTICA in Div. 2J and Div. 3K since 1977 and 1978 respectively. Fall surveys for Div. 3L were

conducted by the A. T. CAMERON during 1981-82 and by the WILFRED TEMPLEMAN in 1983-86. The 1984 fall survey was conducted earlier than in other years (August-September as opposed to October-November). Biomass and abundance from these surveys are shown in Tables 8-13. Spring surveys were conducted IN Div. 3L from 1971 to 1982 by the A. T. CAMERON and in 1985-86 by the WILFRED TEMPLEMAN. Tables 14-15 give abundance and biomass for the latter period (1977-86) of this survey. The earlier time period was not presented because survey coverage was poor and thus estimates unreliable. Biomass and abundance tables presented in tables for all three divisions may also include estimates from depths greater than 500 meters. In some cases these depths were not surveyed. Mean numbers and weights per tow along with associated confidence limits for selected strata for fall and spring surveys are given in Tables 16-19. Selected strata were chosen as those common to all years in a particular survey series. Stratification charts used for these research vessel surveys are shown in Fig. 2-4. The biomass and abundance estimates for 1986 in Div. 2J and 3K are by far the highest in the series while those for Div. 3L (fall and spring) are close to the highest. Percentage biomass by division for 1981-86 fall surveys is given in Table 20. The relative distribution of cod biomass among divisions during 1986 was quite similar to the estimates for the 1981-83 period. During 1984 and 1985 the percentages of divisional biomass are higher than those of 1981-83 and 1986 in Div. 3L.

Tables 21-23 give mean bottom temperature and depth by depth zone for all three divisions from fall surveys. For Div. 2J and 3K the considerable cooling trend observed in 1984-85 appears to have stopped with bottom water temperatures warming to levels observed in the earlier parts of the time series.

Tables 24-27 give mean numbers per tow at age for surveys in all divisions. These values were estimated from coverage of all depths fished in a particular survey series. A survey abundance index for ages 6+ was obtained by averaging results from Div. 2J, 3K, and 3L autumn surveys weighted by the surveyed area in each division (Table 28, Fig. 12). There were no fall surveys in Div. 3L for 1978-80 and values for these years were estimated from the ratio (1.21) of ages 6+ autumn values to ages 7+ spring Div. 3L values in the following year for three overlapping years (1981, 84-85). The ages 7+ spring Div. 3L values for 1979-81 were adjusted by this ratio to give age 6+ autumn Div. 3L estimates for 1978-80. Table 29 gives recruitment indices using survey abundance estimates for ages 3-5 as indicators of year-class strength. The indices at each age were estimated using the same procedure used to estimate the age 6+ abundance index. The 1980-81 year-classes dominated at age 3 while the 1982 and 1981 year-classes dominated at ages 4 and 5 respectively.

Commercial catch-effort

Offshore catch and effort are available by division, month, country and gear, and a multiplicative model (Gavaris 1980) was used to account for the country/gear, seasonal and divisional differences. Data was obtained from NAFO Statistical Bulletins for the 1962-79 period and from the Department of Fisheries and Oceans for the latter period (1978-86). The analysis is done separately for both these series and a resultant catch rate index is derived by using 1978-79 as a reference in both time periods. As in previous assessments plots of residuals showed 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 errors, data with less than 10 t catch or 10 hrs effort were excluded from the analysis. Results from the regression are given in Tables 30 and 31 with the catch rates given in Tables 32-33 and 46 and Fig. 5 and 11. Catch and effort information was

also analyzed by division. The results of these divisional regressions are given in Tables 34-39 with the resultant catch rates given in Tables 40-46 and Fig. 6-8. The catch rates by division for the latter time period (1978-86) were combined (weighted by average survey biomass) to derive an index for the stock area. This index, given in Table 47 relates (Fig. 13) quite well with the standardized 2J3KL index ($r^2$ = 0.83).

To examine the problem of catch rates being inflated due to fishing on spawning concentrations, the multiplicative analysis was conducted without first quarter data (Tables 48-51, Fig. 9) and first and second quarter data (Tables 53-55, Fig. 10). The relationships of these catch rate indices (normalized to their respective means) to those obtained from the analysis for the entire year for both time periods (1962-79, 1978-86) are given in Table 56 and displayed in Fig. 14-17. The resultant catch rate series were similar to those obtained in the original analysis with $r^2$ values for these relationships ranging from 0.80 to 0.98.

Table 57 gives catch, effort, and associated catch rate for first quarter Canada-Newfoundland tonnage class 5 vessels for the period 1978-87. While the 1987 first quarter 2J and 3L catch rates are down from 1986 values the 1987 first quarter Div. 3K catch rate is the highest in the time series. Catch rate values estimated by observers for the period 1983-87 for the first quarter Can-N tonnage class 5 vessels are presented in Table 58. The conclusion derived from these observer data are similar to those derived from Table 57, although the amount of observed effort from which catch rates are estimated is minimal in some cases.

Information on catch per purchase slip for the inshore fishery for the period 1981-86 is presented for Div. 2J, 3K, and 3L in Tables 59-61 respectively. Gear types examined include trap, gillnet, line trawl, and handline. The data was also disaggregated into vessel size categories with vessels less than 35' classified as inshore, while vessels between 35 and 64' were classified as nearshore. In general, no trends in catch per slip were observed for vessels between 35 and 64 feet in all three divisions, while the catch per slip has declined in Div. 3K and 2J and remained stable in Div. 3L for vessels less than 35 feet. The catch in Div. 3L declined as effort declined while the catch in Div. 2J and 3K declined as effort remained stable. The procedure of recording catch data on purchase slips was changed in 1986 in that a single landing could be ascribed to several purchase slips. This would result in an underestimate of the catch per slip for this year, but the degree of this bias is not quantified.

## Sequential Population Analysis

Assuming a natural mortality of 0.2, cohort analysis was performed over a range of fully recruited fishing mortalities in 1986. Partial recruitment values, used in the calibration of the cohort analysis were estimated as the average of the pattern in the years 1980-84. Partial recruitment patterns (selectivity coefficients) for the period 1962-86 are presented in Table 62.

Age 7+ population numbers at the beginning of the following year as derived from cohort analysis were regressed on the age 6+ survey abundance index. This relationship yielded the highest $r^2$ value with fishing mortality in 1986 between 0.25 and 0.30 and the intercept was at the origin for fishing mortalities between 0.20 and 0.25 (Table 63). A large residual for the 1986 point was not unexpected because the severe environmental conditions in this year may have caused abundance to be underestimated. This relationship at a fishing mortality in 1986 of 0.25 is displayed in Fig. 19.

Offshore exploitable biomass was regressed on standardized catch rates for the period 1962-86. Calibration of SPA with this relationship indicated the highest $r^2$ value with a terminal F of 0.15 in 1986 (Table 64, Fig. 20). With uncertainty in relating the two time periods for which catch rates were analyzed (1962-79, 1978-86) the relationship between catch rate and offshore exploitable biomass for the 1978-86 period was used to calibrate the cohort analysis. Due to the high 1984 and 1985 values and the somewhat lower values for 1986 in the catch rate series, this relationship yields higher $r^2$ values as fishing mortality in 1986 decreases (Table 65). However, the intercept was at the origin for a fully recruited fishing mortality in 1986 of 0.17 (Fig. 21).

Calibrations using research vessel survey and commercial catch rate indices implied F values in 1986 of 0.25 and 0.17 respectively. The midpoint of these values is 0.21 and results of cohort analysis at this level, including population biomass (average), beginning year population numbers and fishing mortality are presented in Table 68.

## Recruitment

The relationship of the age 3 survey index with SPA age 4 values at the beginning of the following year, for the 1975-79 year-classes (Table 66, Fig. 22), predicted the size of the 1982 year-class to be 473 million fish. As the values of the 1980 and 1981 year-class indices were outside the range of the values used in the relationship, these year-classes were also set equal to the 1982 estimate of 473 million. This level of recruitment is the largest since the 1968 year-class and is about 20% higher than the 1962-83 geometric mean (365 million). Although the survey indices at ages 4 and 5 did not relate significantly with SPA, the 1980-82 year-classes in the survey age 4 index and the 1980-81 year-classes in the survey age 5 index were among the highest in their respective time series.

Partial recruitment values were adjusted to give approximate values estimated from the recruitment index for the 1980-82 year-classes. The values of these year-classes and the partial recruitment vectors used are given in Table 67.

## Catch projections

The parameters used in stock and catch projections are given in Table 69. The size of the 1983 year-class was estimated to be about 300 million fish from the age 3 survey abundance index described earlier. The 1984 year-class was set at the 1977-83 geometric mean of 265 million fish. Average weight-at-age values declined from 1984 to 1986 with a decline from 1985 to 1986 occurring at older ages (7+). With the uncertainties associated with the change in weights at age in recent years the weight-at-age values used for catch projections are averages of the values for 1984-86. Assuming that the 256,000 t TAC for 1987 will be taken, the 1988 $F_{0.1}$ catch is estimated to be 293,000 t (Table 70). This represents an increase of about 15% over the 1987 TAC.

## References

Gavaris, S. 1980. Use of a multiplicative model to estimate catch rate and effort from commercial data. Can. J. Fish. Aquat. Sci. 37: 2272-2275.

Judge, C. C., W. E. Griffiths, R. C. Hills, and T. C. Lee. 1980. The theory and practice of econometrics. John Wiley and Sons, New York. 793 p.

Table 1. Historical catches of cod from NAFO Divisions 2J3KL for the period 1959-86.

| | 2J | | | | 3K | | | | 3L | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Offshore | | | | Offshore | | | | Offshore | | | Total | Total | | |
| Year | Inshore | Can. | Other | Total | Inshore | Can. | Other | Total | Inshore | Can. | Other | Total | inshore | offshore | Total | TAC |
| 1959 | 17533 | - | 46372 | 46372 | 56264 | - | 97678 | 97678 | 85695 | 4515 | 51515 | 56030 | 159492 | 200080 | 359572 | - |
| 1960 | 15418 | 1 | 164036 | 164037 | 47676 | 53 | 69855 | 69908 | 94192 | 7355 | 60213 | 67568 | 157286 | 301513 | 458799 | - |
| 1961 | 17545 | 1 | 243147 | 243148 | 31159 | - | 60574 | 60574 | 70659 | 4675 | 70318 | 74993 | 119363 | 378715 | 498078 | - |
| 1962 | 23424 | - | 226841 | 226841 | 42816 | - | 45554 | 45554 | 72271 | 4383 | 87463 | 91846 | 138511 | 364241 | 502752 | - |
| 1963 | 23767 | 1 | 197868 | 197869 | 47486 | - | 79331 | 79331 | 73295 | 4446 | 83015 | 87461 | 144548 | 364661 | 509209 | - |
| 1964 | 14787 | 13 | 197359 | 197372 | 40735 | - | 121423 | 121423 | 75806 | 10158 | 142370 | 152528 | 131328 | 471323 | 602651 | - |
| 1965 | 25117 | - | 246650 | 246650 | 26467 | 21 | 50097 | 50118 | 58943 | 7353 | 130387 | 137740 | 110527 | 434508 | 545035 | - |
| 1966 | 22645 | 39 | 226244 | 226283 | 32208 | 13 | 58907 | 58920 | 55990 | 8253 | 120206 | 128459 | 110843 | 413662 | 524505 | - |
| 1967 | 27721 | 28 | 217255 | 217283 | 24905 | 114 | 78687 | 78801 | 49233 | 13478 | 200343 | 213821 | 101859 | 509905 | 611764 | - |
| 1968 | 12937 | 4650 | 355108 | 359758 | 40768 | 1849 | 119778 | 121627 | 47332 | 15784 | 211808 | 227592 | 101037 | 708977 | 810014 | - |
| 1969 | 4328 | 30 | 405231 | 405261 | 24923 | 56 | 80949 | 81005 | 67973 | 18255 | 151945 | 170200 | 97224 | 656466 | 753690 | - |
| 1970 | 1963 | - | 212961 | 212961 | 21512 | 92 | 78274 | 78366 | 53113 | 14471 | 137840 | 152311 | 76588 | 443638 | 520226 | - |
| 1971 | 3313 | - | 154700 | 154700 | 21111 | 31 | 61506 | 61537 | 38115 | 11976 | 148766 | 160742 | 62539 | 376979 | 439518 | - |
| 1972 | 1725 | - | 149435 | 149435 | 14054 | 7 | 133369 | 133376 | 46273 | 4380 | 109052 | 113432 | 62052 | 396243 | 458295 | - |
| 1973 | 3619 | 1123 | 52985 | 54108 | 13190 | 108 | 159653 | 159761 | 24839 | 1258 | 97734 | 98992 | 41648 | 312861 | 354509 | 666000 |
| 1974 | 1804 | - | 119463 | 119463 | 10747 | 19 | 149189 | 149208 | 22630 | 880 | 67918 | 68798 | 35181 | 337469 | 372650 | 657000 |
| 1975 | 3000 | 410 | 78578 | 78988 | 15518 | 189 | 112678 | 112867 | 22695 | 670 | 53770 | 54440 | 41213 | 246295 | 287508 | 554000 |
| 1976 | 3851 | 94 | 30691 | 30785 | 20879 | 771 | 79540 | 80311 | 35209 | 2187 | 40998 | 43185 | 59939 | 154281 | 214220 | 300000 |
| 1977 | 3523 | 525 | 39584 | 40109 | 28818 | 1051 | 26776 | 27827 | 40282 | 5362 | 26799 | 32161 | 72623 | 100097 | 172720 | 160000 |
| 1978 | 6638 | 4682 | 17546 | 22228 | 29623 | 7027 | 6373 | 13400 | 45194 | 9213 | 12263 | 21476 | 81455 | 57104 | 138559 | 135000 |
| 1979 | 8445 | 9194 | 6537 | 15731 | 27018 | 21579 | 16890 | 38469 | 50359 | 14184 | 12693 | 26877 | 85822 | 81077 | 166899 | 180000 |
| 1980 | 17210 | 13592 | 7437 | 21029 | 37015 | 21920 | 6830 | 28750 | 42298 | 15523 | 13963 | 29486 | 96523 | 79265 | 175788 | 180000 |
| 1981 | 14215 | 22125 | 4760 | 26885 | 23002 | 23112 | 3847 | 26959 | 42821 | 21760 | 15070 | 36830 | 80038 | 90674 | 170712 | 200000 |
| 1982 | 14429 | 58384 | 8923 | 67307 | 42141 | 8881 | 4074 | 12955 | 56479 | 27192 | 9271 | 36463 | 113049 | 116725 | 229774 | 230000 |
| 1983 | 10743 | 37281 | 4158 | 41439 | 40681 | 31623 | 2815 | 34438 | 54999 | 39125 | 10920 | 50044 | 106423 | 125922 | 232345 | 260000 |
| 1984 | 12772 | 10994 | 1523 | 12517 | 35100 | 47866 | 10127 | 57993 | 49428 | 49603 | 12974 | 62577 | 97300 | 133087 | 230387 | 266000 |
| 1985 | 10076 | 1472 | 11 | 1483 | 30337 | 68507 | 9714 | 78221 | 39309 | 37748 | 34394 | 72142 | 79722 | 151846 | 231568 | 266000 |
| 1986 | 12567 | 4627 | 7373 | 12011 | 28539 | 58239 | 2226 | 60465 | 31263 | 55117 | 51555 | 106672 | 72369 | 179137 | 251506 | 266000 |

Table 2. Cod catches (000't) by division and gear in NAFO Divisions 2J, 3K, and 3L from 1975 to 1986.

| Year | 2J Trap | 2J GN | 2J LL | 2J HL | 3K Trap | 3K GN | 3K LL | 3K 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 |
| | 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 |

Table 3. Cod landings (t) from Divisions 2J, 3K, and 3L by country during 1986.

| Month | Can(N) Ins. | Can(N) Off. | Can(M) | FRG | France | GDR | Poland | UK | USSR | Japan | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2J | | | | | | |
| Jan. | | 2,311 | 1,235 | 6,131 | 386 | | | | | | 10,063 |
| Feb. | | | | | | | | | | | |
| Mar. | | 145 | | | | | | | | | 145 |
| Apr. | | | 138 | | | | | | | | 138 |
| May | 2 | 5 | 8 | | | | | | | | 15 |
| June | 255 | 2 | 1 | | | | | | | | 258 |
| July | 2,990 | 6 | | | | | | | | 6 | 3,002 |
| Aug. | 7,123 | 100 | 4 | | | | | | 6 | 1 | 7,234 |
| Sept. | 1,918 | 120 | 8 | | | | | | 5 | 1 | 2,052 |
| Oct. | 256 | 297 | | | | | | | | | 553 |
| Nov. | 23 | 159 | | | | | | 235 | | 1 | 418 |
| Dec. | | 35 | 53 | | | | | 542 | | 59 | 689 |
| | 12,567 | 3,180 | 1,447 | 6,131 | 386 | | | 777 | 11 | 68 | 24,567 |
| | | | | | 3K | | | | | | |
| Jan. | 2 | 8,154 | 1,658 | 794 | 1,153 | | | | | | 11,761 |
| Feb. | | 13,396 | 3,994 | | | | | | | | 17,390 |
| Mar. | 2 | 10,435 | 1,052 | | | | | | | | 11,489 |
| Apr. | 1 | 3,180 | 3,940 | | | | | | | | 7,121 |
| May | 1,441 | 5,410 | 2,479 | | | | | | | | 9,330 |
| June | 2,532 | 370 | 870 | | | | | | | | 3,772 |
| July | 13,385 | 32 | 355 | | | | | | | | 13,772 |
| Aug. | 7,880 | 101 | 564 | | | | | | 34 | | 8,579 |
| Sept. | 2,530 | 74 | 2 | | | | | | 38 | 20 | 2,664 |
| Oct. | 685 | 158 | 3 | | | | 2 | | 4 | | 852 |
| Nov. | 78 | 72 | 42 | | | | | 1 | | 10 | 203 |
| Dec. | 3 | 1,575 | 323 | | | 2 | | 154 | 1 | 13 | 2,071 |
| | 28,539 | 42,957 | 15,282 | 794 | 1,153 | 2 | 2 | 155 | 77 | 43 | 89,004 |

. . . (Cont'd.)

Table 3 (Cont'd.)

| Month | Can(N) Ins. | Can(N) Off. | Can(M) | GDR | USSR | Port[a] | Spain[a] | Mexico/Chile[b] |
|---|---|---|---|---|---|---|---|---|
| | | | | 3L | | | | |
| Jan. | 60 | 1,173 | 744 | | | | | |
| Feb. | 28 | 866 | | | | | | |
| Mar. | 19 | 3,832 | 212 | | | | | |
| Apr. | 159 | 14,282 | 1,633 | | | | | |
| May | 1,827 | 2,009 | 267 | | | | | |
| June | 7,933 | 3,615 | 1,470 | | | | | |
| July | 10,538 | 3,178 | 1,724 | | | | | |
| Aug. | 5,711 | 1,803 | 154 | | 1 | | | |
| Sept. | 3,334 | 3,144 | 210 | | | | | |
| Oct. | 1,346 | 3,330 | | 3 | | | | |
| Nov. | 226 | 5,186 | 1,662 | 4 | | | | |
| Dec. | 82 | 2,567 | 2,056 | | | | | |
| UK | | | | | | 29,903 | 21,109 | 535 |
| | 31,263 | 44,985 | 10,132 | 7 | 1 | 29,903 | 21,109 | 535 |

Total = 137,935

Total 2J3KL = 251,506 t

[a]Landings as reported to NAFO.

[b]Landings estimated from Canadian surveillance.

Table 4 . Commercial sampling for Divisions 2J+3KL cod in 1986.

| Div. | Gear | Qtr. | Country | No. aged | Month | No. meas. | Landings, (t) Country/month | Total |
|---|---|---|---|---|---|---|---|---|
| 2J | OT | 1-2 | Can(N) | 56 | Jan. | 1,873 | 2,311 | 3,845 |
| | | | France(M) | 73 | " | 567 | 386 | 386 |
| | | | FRG | 286 | " | 9,670 | 6,131 | 6,131 |
| | | | | 415 | | 12,110 | | 10,362 |
| | OT | 3-4 | UK | 88 | Nov. | 2,790 | 235 | 235 |
| | | | UK | | Dec. | 634 | 542 | 542 |
| | | | Japan | 25 | Dec. | 258 | 59 | 59 |
| | | | Other | | | | | 189 |
| | | | | 113 | | 3,682 | | 1,025 |
| | GN | 3-4 | Port[a] | 65 | Aug. | 373 | 101 | 168 |
| | | | " | 59 | Sept. | 761 | 297 | 297 |
| | | | " | | Nov. | 580 | 159 | 159 |
| | | | | 124 | | 1,714 | | 624 |
| | Trap | 3 | Can(N) | 440 | Aug. | 7,458 | 2,331 | 4,340 |
| | GN | 3 | " | | July | 104 | 1,120 | 1,282 |
| | | | " | | Aug. | 9,030 | 4,560 | 4,560 |
| | HL | 3 | " | | Aug. | 146 | 620 | 620 |
| | | | | 440 | | 16,738 | | 10,802 |
| | GN | 4 | " | 200 | Sept. | 618 | 1,551 | 1,765 |
| | | | | 200 | | 618 | | 1,765 |
| 2J | Total | | | 1,292 | | 34,862 | | 24,578 |
| 3K | OT | 1 | Can(N) | | Jan. | 12,857 | 8,154 | 9,812 |
| | | | " | 655 | Feb. | 13,671 | 13,396 | 17,390 |
| | | | " | | Mar. | 7,284 | 10,435 | 11,487 |
| | | | France(M) | 68 | Jan. | 1,000 | 1,153 | 1,153 |
| | | | FRG | 40 | Jan. | 1,116 | 794 | 794 |
| | | | | 763 | | 35,928 | | 40,636 |
| | | 2 | Can(N) | 499 | Apr. | 2,437 | 3,180 | 7,120 |
| | | | " | | May | 4,122 | 5,410 | 9,031 |
| | | | | 499 | | 6,559 | | 16,151 |
| | | 3+4 | Can(N) | 172 | Dec. | 821 | 1,575 | 1,898 |
| | | | UK | | Dec. | 246 | 154 | 155 |
| | | | Other | | | | | 1,625 |
| | | | | 172 | | 1,067 | | 3,678 |

. . . (Cont'd.)

Table 4 (Cont'd.)

| Div. | Gear | Qtr. | Country | No. aged | Month | No. meas. | Landings, (t) Country/month | Landings, (t) Total |
|---|---|---|---|---|---|---|---|---|
| 3K | Trap | 3 | Can(N) | 1,052 | June | 1,792 | 1,112 | 1,312 |
| | | | " | | July | 6,801 | 8,911 | 8,911 |
| | | | " | | Aug. | 1,602 | 3,931 | 4,580 |
| | GN | 3 | " | | July | 2,564 | 3,849 | 5,859 |
| | | | | | Aug. | 910 | 1,279 | 1,777 |
| | HL | 3 | " | | June | 886 | 496 | 501 |
| | | | | | July | 1,004 | 566 | 566 |
| | | | " | | Aug. | 2,212 | 2,274 | 2,274 |
| | LT | 3 | " | | June | 484 | 144 | 155 |
| | | | " | | Aug. | 2,895 | 396 | 396 |
| | | | " | | Other | | | 59 |
| | HL | 4 | " | 379 | Sept. | 4,837 | 1,123 | 1,343 |
| | LT | | " | | Sept. | 1,971 | 536 | 806 |
| | | | | 1,431 | | 27,958 | | 28,539 |
| 3K | Total | | | 2,865 | | 71,512 | | 89,004 |
| 3L | OT | 1 | Can(N) | 487 | Jan. | 771 | 1,173 | 1,917 |
| | | | | | Mar. | 9,784 | 3,832 | 4,044 |
| | | | | | Other | | | 866 |
| | | | | 487 | | 10,555 | | 6,827 |
| | | 2 | Can(N) | 495 | April | 9,106 | 14,282 | 15,915 |
| | | | | | May | 1,395 | 2,009 | 2,276 |
| | | | | | June | 765 | 3,615 | 5,085 |
| | | | | 495 | | 11,266 | | 23,276 |
| | | 3 | Can(N) | 363 | July | 2,643 | 3,178 | 4,902 |
| | | | | | Aug. | 1,172 | 1,803 | 1,958 |
| | | | | | Sept. | 1,614 | 3,144 | 3,354 |
| | | | | 363 | | 5,429 | | 10,214 |
| | | 4 | Can(N) | 471 | Oct. | 2,949 | 3,330 | 3,333 |
| | | | | | Nov. | 5,156 | 5,186 | 6,852 |
| | | | | | Dec. | 1,470 | 2,567 | 2,567 |
| | | | Can(M) | | Dec. | 536 | 2,056 | 2,056 |
| | | | | 471 | | 10,111 | | 14,808 |
| | OT | 1-4 | Can(N) | 1,816 | | 37,361 | | 55,125 |
| | | | Other | | | | | 51,547[b] |
| | OT | Total | | 1,816 | | 37,361 | | 106,672 |

. . . (Cont'd.)

Table 4 (Cont'd.)

| Div. | Gear | Qtr. | Country | No. aged | Month | No. meas. | Landings, (t) Country/month | Landings, (t) Total |
|---|---|---|---|---|---|---|---|---|
| 3L | Trap | 2 | Can(N) | 856 | May | 1,779 | 844 | 966 |
| | GN | | " | | May | 4,457 | 968 | 1,110 |
| | | | | 856 | | 6,236 | | 2,076 |
| | Trap | 3 | Can(N) | 1,378 | June | 6,485 | 5,895 | 5,895 |
| | | | " | | July | 6,019 | 6,927 | 8,922 |
| | GN | 3 | " | | June | 1,982 | 1,714 | 1,714 |
| | | | | | July | 3,136 | 3,093 | 3,093 |
| | | | | | Aug. | 1,859 | 1,788 | 1,788 |
| | HL | 3 | Can(N) | | June | 2,420 | 175 | 180 |
| | | | " | | July | 1,519 | 398 | 398 |
| | | | " | | Aug. | 4,343 | 1,630 | 1,630 |
| | LT | 3 | " | | Aug. | 743 | 510 | 791 |
| | | | | 1,378 | | 28,506 | | 24,411 |
| | GN | 4 | Can(N) | 691 | Sept. | 2,202 | 909 | 1,227 |
| | HL | | " | | " | 2,506 | 1,255 | 1,903 |
| | LT | | " | | " | 1,702 | 976 | 976 |
| | | | " | | Oct. | 1,094 | 567 | 670 |
| | | | | 691 | | 7,504 | | 4,776 |
| 3L | Total | | | 4,741 | | 79,607 | | 137,935 |
| **2J3KL** | **Total** | | | **8,898** | | **185,981** | | **251,517** |

[a]Charter on Canadian quota.

[b]Includes: Portugal - 29,903 t - as reported to NAFO.
Spain - 21,109 t - from Canadian surveillance estimates.
Mexico/Chile - 535 t - from Canadian surveillance estimates.

Table 5. Estimated catch, average weight, and average length at age, along with associated variances for the commercial cod fishery in NAFO Divisions 2J3KL during 1986.

| | AVERAGE | | CATCH | | |
|---|---|---|---|---|---|
| AGE | WEIGHT | LENGTH | MEAN | STD. ERR. | C. V. |
| 2 | 0.211 | 29.353 | 1 | 0.47 | 0.47 |
| 3 | 0.509 | 38.713 | 832 | 118.08 | 0.14 |
| 4 | 0.724 | 43.415 | 15218 | 572.71 | 0.04 |
| 5 | 1.045 | 48.882 | 44168 | 1041.27 | 0.02 |
| 6 | 1.535 | 55.436 | 45870 | 1136.32 | 0.02 |
| 7 | 1.847 | 58.672 | 26025 | 843.38 | 0.03 |
| 8 | 2.349 | 63.316 | 14720 | 614.19 | 0.04 |
| 9 | 2.945 | 67.955 | 3103 | 277.55 | 0.09 |
| 10 | 3.469 | 71.696 | 2001 | 170.47 | 0.09 |
| 11 | 3.796 | 73.779 | 1976 | 138.68 | 0.07 |
| 12 | 4.536 | 77.526 | 1101 | 111.49 | 0.10 |
| 13 | 5.337 | 81.862 | 574 | 58.64 | 0.10 |
| 14 | 7.116 | 89.222 | 119 | 23.15 | 0.19 |
| 15 | 11.773 | 107.178 | 30 | 5.74 | 0.19 |
| 16 | 11.244 | 105.926 | 18 | 4.79 | 0.26 |
| 17 | 14.149 | 113.716 | 12 | 3.65 | 0.31 |
| 18 | 16.142 | 118.686 | 10 | 2.31 | 0.23 |
| 19 | 12.296 | 108.703 | 2 | 1.25 | 0.78 |
| 20 | 15.723 | 118.811 | 2 | 1.57 | 0.63 |
| 21 | 11.049 | 106.000 | 2 | 1.63 | 1.03 |
| 22 | 16.628 | 121.000 | 1 | | |
| 23 | 20.751 | 130.000 | 1 | | 0.01 |

Table 6. Offshore and inshore catch at age by NAFO Division for the commercial cod fishery in Divisions 2J3KL during 1986. (Numbers X $10^{-3}$).

| | Offshore | | | Inshore | | | |
|---|---|---|---|---|---|---|---|
| Age | 2J | 3K | 3L | 2J | 3K | 3L | TOTAL |
| 2 | | | | | | 1 | 1 |
| 3 | 10 | 1 | 29 | 3 | 218 | 570 | 831 |
| 4 | 308 | 77 | 4185 | 305 | 3695 | 6648 | 15218 |
| 5 | 2389 | 2772 | 17844 | 2196 | 10030 | 8937 | 44168 |
| 6 | 1723 | 9181 | 24505 | 1151 | 4642 | 4667 | 45869 |
| 7 | 3058 | 10779 | 6440 | 2085 | 1792 | 1871 | 26025 |
| 8 | 1245 | 6405 | 4031 | 1231 | 1069 | 739 | 14720 |
| 9 | 69 | 1380 | 868 | 288 | 311 | 188 | 3104 |
| 10 | 93 | 1176 | 354 | 142 | 127 | 108 | 2000 |
| 11 | 151 | 1123 | 322 | 208 | 103 | 69 | 1976 |
| 12 | 49 | 685 | 177 | 56 | 90 | 44 | 1101 |
| 13 | 53 | 338 | 100 | 33 | 39 | 12 | 575 |
| 14 | 4 | 65 | 12 | 15 | 15 | 6 | 117 |
| 15 | | 12 | 6 | | 8 | 4 | 30 |
| 16 | | 10 | 2 | 4 | 1 | 1 | 18 |
| 17 | | 5 | 3 | 2 | 1 | | 11 |
| 18 | | 2 | 2 | | 6 | | 10 |
| 19 | | 1 | | | 1 | | 2 |
| 20 | | - | | | 2 | | 2 |
| > 20 | | 4 | | | | | 4 |
| Catch weight | 12011 | 60465 | 106672 | 12567 | 28539 | 31263 | 251517 |

Table 7. Catch numbers ($X10^{-5}$) and average weight (kg) at age from the commercial cod fishery in Divisions 2J3KL over the period 1962-86.

CATCH AT AGE

| AGE | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 267 | 271 | 267 | 280 | 663 | 785 | 916 | 381 | 572 | 690 | 798 | 407 | 145 | 140 | 337 | 656 | 176 | 124 | 120 | 70 | 325 | 137 | 149 | 152 | 152 |
| 5 | 658 | 592 | 563 | 456 | 942 | 1009 | 1990 | 964 | 773 | 921 | 1166 | 945 | 352 | 253 | 279 | 403 | 391 | 375 | 288 | 133 | 187 | 427 | 318 | 372 | 442 |
| 6 | 600 | 1159 | 590 | 655 | 632 | 972 | 1450 | 1534 | 940 | 944 | 767 | 592 | 731 | 344 | 208 | 121 | 203 | 292 | 300 | 249 | 145 | 190 | 386 | 336 | 459 |
| 7 | 486 | 579 | 981 | 629 | 598 | 553 | 809 | 1006 | 788 | 557 | 560 | 353 | 604 | 391 | 168 | 54 | 77 | 110 | 180 | 219 | 254 | 120 | 125 | 277 | 260 |
| 8 | 284 | 288 | 498 | 671 | 307 | 388 | 379 | 493 | 269 | 241 | 296 | 273 | 353 | 365 | 160 | 34 | 31 | 35 | 48 | 117 | 169 | 147 | 72 | 70 | 147 |
| 9 | 207 | 152 | 202 | 334 | 240 | 172 | 224 | 184 | 100 | 113 | 118 | 142 | 186 | 134 | 109 | 27 | 15 | 13 | 12 | 32 | 119 | 89 | 89 | 37 | 31 |
| 10 | 186 | 114 | 118 | 147 | 88 | 161 | 76 | 115 | 36 | 43 | 64 | 76 | 104 | 75 | 46 | 13 | 11 | 8 | 5 | 8 | 19 | 63 | 42 | 50 | 20 |
| 11 | 108 | 81 | 84 | 68 | 47 | 60 | 54 | 60 | 19 | 21 | 30 | 38 | 58 | 23 | 15 | 5 | 5 | 6 | 2 | 3 | 3 | 10 | 25 | 29 | 20 |
| 12 | 98 | 41 | 61 | 37 | 23 | 34 | 34 | 42 | 11 | 12 | 17 | 22 | 29 | 12 | 6 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 5 | 16 | 11 |
| 13 | 80 | 39 | 48 | 39 | 18 | 21 | 19 | 28 | 5 | 11 | 14 | 12 | 11 | 8 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 6 |
| 4+ | 2974 | 3316 | 3412 | 3316 | 3558 | 4155 | 5951 | 4807 | 3513 | 3553 | 3830 | 2860 | 2573 | 1745 | 1331 | 1317 | 912 | 966 | 958 | 834 | 1224 | 1186 | 1212 | 1342 | 1548 |
| 5+ | 2707 | 3045 | 3145 | 3036 | 2895 | 3370 | 5035 | 4426 | 2941 | 2863 | 3032 | 2453 | 2428 | 1605 | 994 | 661 | 736 | 842 | 838 | 764 | 899 | 1049 | 1063 | 1190 | 1396 |
| 6+ | 2049 | 2453 | 2582 | 2580 | 1953 | 2361 | 3045 | 3462 | 2168 | 1942 | 1866 | 1508 | 2076 | 1352 | 715 | 258 | 345 | 467 | 550 | 631 | 712 | 622 | 745 | 818 | 954 |
| 7+ | 1449 | 1294 | 1992 | 1925 | 1321 | 1389 | 1595 | 1928 | 1228 | 998 | 1099 | 916 | 1345 | 1008 | 507 | 137 | 142 | 175 | 250 | 382 | 567 | 432 | 359 | 482 | 495 |

AVERAGE WEIGHT AT AGE

| AGE | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 0.60 | 0.72 | 0.74 | 0.77 | 0.78 | 0.84 | 0.87 | 0.88 | 0.73 | 0.72 |
| 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 | 0.97 | 1.04 | 1.13 | 1.16 | 1.17 | 1.20 | 1.32 | 1.20 | 1.10 | 1.04 |
| 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 | 1.66 | 1.58 | 1.67 | 1.71 | 1.64 | 1.77 | 1.75 | 1.79 | 1.43 | 1.54 |
| 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 | 2.33 | 2.46 | 2.46 | 2.38 | 2.23 | 2.10 | 2.28 | 2.28 | 2.06 | 1.85 |
| 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 | 2.82 | 3.26 | 3.57 | 3.56 | 2.86 | 2.66 | 2.61 | 2.71 | 2.66 | 2.35 |
| 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 | 3.46 | 4.05 | 4.41 | 5.01 | 3.81 | 3.09 | 3.18 | 2.96 | 3.23 | 2.94 |
| 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 | 3.88 | 4.46 | 5.25 | 5.49 | 5.32 | 4.18 | 3.50 | 3.65 | 3.32 | 3.47 |
| 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 | 4.78 | 5.02 | 5.80 | 6.72 | 6.29 | 6.16 | 4.79 | 4.28 | 4.06 | 3.80 |
| 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 | 6.13 | 6.72 | 7.03 | 7.87 | 7.06 | 7.19 | 7.76 | 6.19 | 4.55 | 4.54 |
| 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 | 7.31 | 8.10 | 8.96 | 8.38 | 7.32 | 8.00 | 9.07 | 8.39 | 7.03 | 5.34 |

Table 8. Cod abundance estimates (No. x $10^3$) from research vessel surveys in NAFO Division 2J (Fall).

| Depth Range (mtrs) | 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 116-115 1985 | Gadus 131-132 1986 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 101-200 | 201 | 1427 | 13336 | 3071 | 1500 | 5749 | 8355 | 16692 | 16246 | 10533 | 15246 | 21638 |
| | 205 | 1823 | 2894 | 8039 | 1574 | 787 | 4550 | 21765 | 13547 | 25230 | 8159 | 9481 |
| | 206 | 2582 | 6889 | 1634 | 1236 | 2104 | 6220 | 5868 | 8694 | 30077 | 12764 | 29985 |
| | 207 | 2246 | 9745 | 5100 | 2664 | 3406 | 5479 | 9094 | 13024 | 14210 | 27849 | 6310 |
| Total | | 8078 | 32864 | 17844 | 6974 | 12046 | 24604 | 53419 | 51511 | 80050 | 64018 | 67414 |
| 201-300 | 202 | 440 | 2097 | 462 | 396 | 5681 | 2378 | 2378 | 1833 | 1866 | 760 | 7663 |
| | 209 | 1608 | 10174 | 3531 | 21485 | 3410 | 10099 | 7681 | 29567 | 3862 | 8599 | 28567 |
| | 210 | 774 | 6166 | 4154 | 2760 | 2982 | 445 | 4713 | 59785 | 4953 | 299 | 21187 |
| | 213 | 1725 | 6944 | 19617 | 18516 | 19811 | 2158 | 5807 | 12806 | 6915 | 14028 | 23624 |
| | 214 | 1171 | 16716 | 10658 | 6527 | 10958 | 3956 | 5900 | 4659 | 25667 | 19030 | 43496 |
| | 215 | 1270 | 19281 | 34205 | 9986 | 25692 | 35768 | 27583 | 7233 | 8040 | 7424 | 85617 |
| | 228 | 1428 | 2948 | - | 6780 | 8254 | 10701 | 2187 | 2269 | 1853 | 352 | 12702 |
| | 234 | 508 | 1258 | 553 | 267 | 1506 | 534 | 2250 | 4698 | 3005 | 2339 | 5415 |
| Total | | 8924 | 65584 | 73180 | 66717 | 78294 | 66039 | 58499 | 122850 | 56161 | 52831 | 228271 |
| 301-400 | 203 | 480 | 883 | - | - | 3081 | 81 | 1117 | 462 | 703 | 156 | 1784 |
| | 208 | 448 | 1017 | 247 | 1480 | 202 | 303 | 1368 | 1749 | 224 | 1043 | 2051 |
| | 211 | 330 | 632 | 5450 | 2737 | 4659 | 1746 | 2415 | 1325 | 297 | 776 | 1090 |
| | 216 | 384 | 0 | - | 202 | 3603 | 86 | 14 | 10 | 331 | 115 | 94 |
| | 222 | 441 | 50 | 1479 | 149 | 1258 | 132 | 0 | 11 | 11 | 182 | 17 |
| | 229 | 567 | 415 | 234 | 2873 | 1319 | 447 | 298 | 670 | 71 | 936 | 539 |
| Total | | 2650 | 2997 | 7410 | 7441 | 14122 | 2795 | 5212 | 4227 | 1637 | 3208 | 5575 |
| 401-500 | 204 | 354 | 199 | - | - | - | 1342 | 142 | 540 | 1422 | 0 | 518 |
| | 217 | 268 | 0 | - | - | - | 0 | 0 | 0 | - | 0 | 0 |
| | 223 | 180 | 0 | - | - | - | 0 | 0 | 0 | 0 | 0 | 0 |
| | 227 | 686 | 51 | - | - | - | 0 | 21 | 26 | 0 | 0 | 51 |
| | 235 | 420 | 32 | - | - | - | 158 | 126 | 1135 | 63 | 32 | 0 |
| Total | | 1908 | 282 | - | - | - | 1500 | 289 | 1701 | 1485 | 32 | 569 |
| 101-200 | | 8078 | 32864 | 17844 | 6974 | 12046 | 24604 | 53419 | 51511 | 80050 | 64018 | 67414 |
| 201-300 | | 8924 | 65584 | 73180 | 66717 | 78294 | 66039 | 58499 | 122850 | 56161 | 52831 | 228271 |
| 301-400 | | 2650 | 2997 | 7410 | 7441 | 14122 | 2795 | 5212 | 4227 | 1637 | 3208 | 5575 |
| 401-500 | | 1908 | 282 | - | - | - | 1500 | 289 | 1701 | 1485 | 32 | 569 |
| Total | | | 101786 | 98432 | 81130 | 104461 | 94988 | 117469 | 180290 | 139366 | 120103 | 302092 |
| Upper limit | | | 149969 | 131104 | 128646 | 139530 | 162744 | 151085 | 744785 | 184179 | 154186 | 468810 |
| Lower limit | | | 53602 | 65761 | 33613 | 69392 | 27234 | 83853 | -384206 | 94552 | 86020 | 135374 |

Table 9. Cod biomass estimates (t) from research vessel surveys in NAFO Division 2J (Fall).

| Depth Range (mtrs) | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 101-200 | 201 | 1427 | 12377 | 4847 | 3256 | 11319 | 15998 | 18085 | 16764 | 12033 | 14952 | 24712 |
| | 205 | 1823 | 2761 | 16200 | 2669 | 1676 | 10126 | 39216 | 17742 | 25093 | 7526 | 11016 |
| | 206 | 2582 | 5328 | 2074 | 2671 | 3849 | 13153 | 8533 | 11442 | 39133 | 13186 | 34327 |
| | 207 | 2246 | 16809 | 8209 | 4192 | 7738 | 12284 | 12612 | 12608 | 18136 | 27954 | 7864 |
| Total | | 8078 | 37275 | 31330 | 12788 | 24582 | 51561 | 78446 | 58556 | 94395 | 63618 | 77919 |
| 201-300 | 202 | 440 | 3074 | 525 | 749 | 12964 | 6292 | 5681 | 3798 | 2948 | 850 | 10363 |
| | 209 | 1608 | 15336 | 5384 | 43569 | 12810 | 22275 | 18351 | 53925 | 7678 | 12245 | 37475 |
| | 210 | 774 | 10481 | 5572 | 5771 | 5810 | 823 | 10428 | 97578 | 9448 | 782 | 25147 |
| | 213 | 1725 | 6525 | 31627 | 31100 | 34068 | 5622 | 8073 | 14748 | 9401 | 16121 | 27904 |
| | 214 | 1171 | 24370 | 20791 | 13231 | 25095 | 9669 | 10993 | 6944 | 33853 | 24715 | 61918 |
| | 215 | 1270 | 31757 | 55780 | 19546 | 64301 | 96161 | 60996 | 12584 | 10471 | 10732 | 131984 |
| | 228 | 1428 | 3930 | - | 12374 | 16972 | 23904 | 4357 | 2215 | 3012 | 299 | 15820 |
| | 234 | 508 | 2857 | 1030 | 553 | 3699 | 1192 | 4614 | 5370 | 3657 | 2402 | 7178 |
| Total | | 8924 | 98330 | 120709 | 126893 | 175719 | 165938 | 123493 | 197162 | 80468 | 68146 | 317789 |
| 301-400 | 203 | 480 | 1930 | - | - | 7467 | 230 | 3141 | 1369 | 2054 | 192 | 2982 |
| | 208 | 448 | 1962 | 438 | 3341 | 631 | 908 | 3750 | 3153 | 454 | 1454 | 2589 |
| | 211 | 330 | 1738 | 10285 | 5685 | 9384 | 4747 | 6490 | 3016 | 954 | 1400 | 1462 |
| | 216 | 384 | 0 | - | 484 | 10204 | 454 | 86 | 24 | 908 | 180 | 142 |
| | 222 | 441 | 43 | 2029 | 653 | 2780 | 281 | 0 | 105 | 22 | 281 | 15 |
| | 229 | 567 | 1009 | 319 | 7394 | 3150 | 1144 | 467 | 516 | 106 | 1397 | 816 |
| Total | | 2650 | 6682 | 13071 | 17557 | 33616 | 7764 | 13934 | 8183 | 4498 | 4904 | 8006 |
| 401-500 | 204 | 354 | 308 | - | - | - | 3149 | 316 | 1506 | 2192 | 0 | 829 |
| | 217 | 268 | 0 | - | - | - | 0 | 0 | 0 | - | 0 | 0 |
| | 223 | 180 | 0 | - | - | - | 0 | 0 | 0 | 0 | 0 | 0 |
| | 227 | 686 | 131 | - | - | - | 0 | 36 | 129 | 0 | 0 | 101 |
| | 235 | 420 | 75 | - | - | - | 347 | 315 | 1584 | 121 | 24 | 0 |
| Total | | 1908 | 514 | - | - | - | 3496 | 667 | 3219 | 2312 | 24 | 930 |
| 101-200 | | 8078 | 37275 | 31330 | 12788 | 24582 | 51561 | 78446 | 58556 | 94395 | 63618 | 77919 |
| 201-300 | | 8924 | 98330 | 120709 | 126893 | 175719 | 165938 | 123493 | 197162 | 80468 | 68146 | 317789 |
| 301-400 | | 2650 | 6682 | 13071 | 17557 | 33616 | 7764 | 13934 | 8183 | 4498 | 4904 | 8006 |
| 401-500 | | 1908 | 514 | - | - | - | 3496 | 667 | 3219 | 2312 | 24 | 930 |
| Total | | | 142961 | 165109 | 157237 | 233916 | 228894 | 216679 | 267120 | 181731 | 136723 | 405184 |
| Upper limit | | | 199808 | 222301 | 253553 | 314419 | 424737 | 288880 | 1175017 | 241662 | 174398 | 667126 |
| Lower limit | | | 86113 | 107917 | 60921 | 153412 | 33051 | 144478 | -640777 | 121800 | 99048 | 143243 |

Table 10. Cod abundance estimates (No. x $10^{-3}$) from research vessel surveys in NAFO Division 3K. (Fall).

| Depth Range (mtrs) | Stratum Number | Stratum area ($mi^2$) | Gadus 15 1978 | Gadus 29 1979 | Gadus 44 1980 | Gadus 58,59 1981 | Gadus 71,72 1982 | Gadus 86-88 1983 | Gadus 101-103 1984 | Gadus 116-118 1985 | Gadus 132-133 1986 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101-200 | 618 | 1455 | - | - | - | - | - | - | 4806 | 6458 | 12975 |
| | 619 | 1588 | - | - | - | - | - | - | 1243 | 221 | 930 |
| | | 3043 | | | | | | | 6049 | 6679 | 13905 |
| 201-300 | 620 | 2709 | 17720 | 26203 | 15206 | 12689 | 4248 | 17610 | 22825 | 1728 | 31158 |
| | 621 | 2859 | 14563 | 25646 | 2739 | 7453 | 6471 | 4603 | 6070 | 1531 | 4654 |
| | 624 | 668 | 13121 | 23166 | 627 | 3686 | 2470 | 1128 | 965 | 552 | 602 |
| | 632 | 447 | 727 | 2265 | 5078 | 3171 | 2494 | 8321 | - | 1029 | 1158 |
| | 634 | 1618 | 4105 | 18157 | 13651 | 19455 | 11384 | 14186 | 6229 | 7112 | 99786 |
| | 635 | 1274 | 3825 | 1492 | 3706 | 4743 | 3175 | 1227 | 3275 | 874 | 3727 |
| | 636 | 1455 | 1820 | 2446 | 6051 | 3695 | 7001 | 2603 | 3413 | 928 | 3440 |
| | 637 | 1132 | 2528 | 5778 | 3909 | 4744 | 6409 | 8718 | 19062 | 3824 | 11939 |
| Total | | 12162 | 58409 | 105153 | 50967 | 59636 | 43652 | 58396 | 61839 | 17578 | 156464 |
| 301-400 | 623 | 1027 | 6167 | 2981 | 7593 | 876 | 1557 | 5769 | 11764 | 1015 | 1060 |
| | 625 | 850 | 1340 | 2488 | 1515 | 1021 | 2169 | 1276 | 574 | 1723 | 808 |
| | 626 | 919 | 3191 | 759 | 1012 | 2235 | 911 | 1276 | 770 | 826 | 10451 |
| | 628 | 1085 | 1433 | 2891 | 1008 | 1371 | 570 | 1955 | 1140 | 1826 | 672 |
| | 629 | 495 | 718 | 446 | 144 | 50 | 412 | 562 | 459 | 272 | 1348 |
| | 630 | 544 | - | 388 | 315 | 225 | - | 306 | 414 | 82 | 65 |
| | 633 | 2179 | 4283 | 3044 | 2944 | 3106 | 3552 | 3748 | 5954 | 10059 | 26717 |
| | 638 | 2059 | 2720 | 8081 | 3246 | 9158 | 5699 | 13643 | 3323 | 9189 | 9080 |
| | 639 | 1463 | 1603 | 3075 | 741 | 1303 | 2921 | 4095 | 1304 | 2128 | 3423 |
| Total | | 10621 | 21455 | 24153 | 18518 | 19345 | 17791 | 32630 | 25702 | 27120 | 53624 |
| 401-500 | 622 | 632 | - | - | - | 356 | 190 | 142 | 308 | 59 | 332 |
| | 627 | 1194 | - | - | - | 104 | 152 | 193 | 178 | 89 | 1262 |
| | 631 | 1202 | - | - | - | 162 | 0 | 523 | 18 | 103 | 68 |
| | 640 | 198 | - | - | - | 0 | 0 | | 7 | 10 | 7 |
| | 645 | 204 | - | - | - | 0 | 5 | 8 | 15 | 15 | - |
| Total | | 3430 | - | - | - | 622 | 347 | 866 | 526 | 276 | 1669 |
| 101-200 | | 3043 | | | | | | | 6049 | 6679 | 13905 |
| 201-300 | | 12162 | 58409 | 105153 | 50967 | 59636 | 43652 | 58396 | 61839 | 17578 | 156464 |
| 301-400 | | 10621 | 21455 | 24153 | 18518 | 19345 | 17791 | 32630 | 25702 | 27120 | 53624 |
| 401-500 | | 3430 | | | | 622 | 347 | 866 | 526 | 276 | 1669 |
| Total | | | 79865 | 129306 | 69484 | 79602 | 61791 | 91907 | 94118 | 51653 | 225663 |
| Upper limit | | | 113311 | 218233 | 93324 | 104928 | 75262 | 119955 | 125225 | 65201 | 498301 |
| Lower limit | | | 46420 | 40380 | 45645 | 54276 | 48320 | 63859 | 63010 | 38104 | -46976 |

Table 11. Cod biomass estimates (t) from research vessel surveys in NAFO Division 3K (Fall).

| Depth Range (mtrs) | Stratum Number | Stratum area ($mi^2$) | Gadus 15 1978 | Gadus 29 1979 | Gadus 44 1980 | Gadus 58,59 1981 | Gadus 71,72 1982 | Gadus 86-88 1983 | Gadus 101-102 1984 | Gadus 116-118 1985 | Gadus 132-133 1986 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101-200 | 618 | 1455 | - | - | - | - | - | - | 9363 | 10318 | 18917 |
| | 619 | 1588 | - | - | - | - | - | - | 3004 | 652 | 811 |
| Total | | 3043 | | | | | | | 12367 | 10970 | 19728 |
| 201-300 | 620 | 2709 | 32708 | 55286 | 33699 | 33603 | 9851 | 33248 | 41781 | 4190 | 46251 |
| | 621 | 2859 | 25889 | 63106 | 5939 | 10935 | 11764 | 6750 | 14149 | 2229 | 7283 |
| | 624 | 668 | 29936 | 40531 | 1742 | 7973 | 5365 | 1586 | 959 | 953 | 1153 |
| | 632 | 447 | 873 | 3896 | 10165 | 7566 | 5721 | 13992 | | 1667 | 2072 |
| | 634 | 1618 | 6907 | 29309 | 29404 | 40573 | 23579 | 22967 | 11703 | 11161 | 163994 |
| | 635 | 1274 | 3702 | 2551 | 7902 | 10271 | 7249 | 3236 | 5457 | 1619 | 7900 |
| | 636 | 1455 | 2248 | 5040 | 11959 | 8428 | 14144 | 6335 | 7065 | 1884 | 4489 |
| | 637 | 1132 | 3540 | 10613 | 7871 | 9829 | 13256 | 17317 | 34548 | 6209 | 17860 |
| Total | | 12162 | 105803 | 210332 | 108681 | 129178 | 90929 | 105431 | 115662 | 29912 | 251002 |
| 301-400 | 623 | 1027 | 11293 | 7522 | 15746 | 2175 | 4849 | 12071 | 20190 | 2303 | 2182 |
| | 625 | 850 | 1825 | 5538 | 4626 | 2640 | 4817 | 3499 | 1397 | 2935 | 1446 |
| | 626 | 919 | 6976 | 1940 | 3242 | 4781 | 2076 | 3932 | 1653 | 1735 | 12331 |
| | 628 | 1085 | 2729 | 6206 | 2739 | 3848 | 1480 | 3841 | 2112 | 3000 | 1038 |
| | 629 | 495 | 1136 | 1062 | 337 | 150 | 1255 | 1167 | 832 | 346 | 2066 |
| | 630 | 544 | - | 1019 | 1174 | 939 | - | 847 | 708 | 230 | 84 |
| | 633 | 2179 | 6947 | 6379 | 8073 | 8406 | 8482 | 6558 | 10861 | 16779 | 45140 |
| | 638 | 2059 | 4210 | 13362 | 7161 | 17706 | 10143 | 23310 | 5511 | 13854 | 13234 |
| | 639 | 1463 | 2204 | 5734 | 1949 | 3225 | 8335 | 9295 | 2684 | 3349 | 5372 |
| Total | | 10621 | 37320 | 48762 | 45047 | 43870 | 41437 | 64520 | 45948 | 44351 | 82893 |
| 401-500 | 622 | 632 | - | - | - | 1297 | 561 | 289 | 646 | 79 | 451 |
| | 627 | 1194 | - | - | - | 267 | 330 | 601 | 318 | 127 | 2121 |
| | 631 | 1202 | - | - | - | 451 | 0 | 1489 | 72 | 220 | 113 |
| | 640 | 198 | - | - | - | 0 | 0 | | 119 | 59 | 11 |
| | 645 | 204 | - | - | - | 0 | 54 | 42 | 176 | 130 | - |
| Total | | 3430 | - | - | - | 2015 | 945 | 2419 | 1331 | 615 | 2696 |
| 101-200 | | 3430 | | | | | | | 12367 | 10970 | 19728 |
| 201-300 | | 12162 | 105803 | 210332 | 108681 | 129178 | 90929 | 105431 | 115662 | 29912 | 251002 |
| 301-400 | | 10621 | 37320 | 48762 | 45047 | 43870 | 41437 | 64520 | 45948 | 44351 | 82893 |
| 401-500 | | 3430 | | | | 2015 | 945 | 2419 | 1331 | 615 | 2696 |
| Total | | | 143123 | 259093 | 153728 | 175023 | 133310 | 172458 | 175307 | 86029 | 356316 |
| Upper limit | | | 215048 | 421005 | 201839 | 237798 | 159091 | 216590 | 228070 | 107721 | 797048 |
| Lower limit | | | 71198 | 97181 | 105619 | 112247 | 107529 | 128325 | 122544 | 64338 | -84415 |

Table 12. Cod abundance (No. x $10^{-3}$) from stratified random cruises in Division 3L (Fall).

| Depth Range | Stratum No. | Stratum Area | ATC 323-325 1981 | ATC 333-334 1982 | W. T. 7-9 1983 | W. T. 16-18 1984 | W. T. 37-39 1985 | A. Needler 72 1986 |
|---|---|---|---|---|---|---|---|---|
| 31-50 | 350 | 2071 | 4923 | 2332 | 6335 | 15455 | 13698 | 15197 |
| | 363 | 1780 | 802 | 1960 | 13050 | 19374 | 40659 | 2439 |
| | 371 | 1121 | 105 | 1010 | 4679 | 8018 | 1058 | 151 |
| | 372 | 2460 | 14256 | 8679 | 37532 | 27415 | 21453 | 6039 |
| | 384 | 1120 | - | 273 | 6025 | 20303 | 452 | 52 |
| Total | | 8552 | 20086 | 14254 | 67621 | 90565 | 77320 | 23878 |
| 51-100 | 328 | 1519 | - | - | - | 285 | 385 | 4598 |
| | 341 | 1574 | 1930 | 975 | 1359 | 1512 | 945 | 1287 |
| | 342 | 585 | 381 | 1039 | 274 | 439 | 205 | 219 |
| | 343 | 525 | 897 | - | 328 | 2089 | 263 | 617 |
| | 348 | 2120 | 1724 | 3310 | 1953 | 7002 | 1284 | 1999 |
| | 349 | 2114 | 2154 | 1492 | 1622 | 8059 | 3047 | 2739 |
| | 364 | 2817 | 963 | 1113 | 1629 | 8162 | 1774 | 964 |
| | 365 | 1041 | 8693 | 2090 | 578 | 8400 | 684 | 1583 |
| | 370 | 1320 | 173 | 413 | 727 | 7799 | 561 | 248 |
| | 385 | 2356 | 44 | 309 | 318 | 1827 | 118 | 702 |
| | 390 | 1481 | 37 | 111 | 111 | 2483 | 48 | 241 |
| Total | | 17452 | 16996 | 10852 | 8899 | 48057 | 9364 | 15197 |
| 101-150 | 344 | 1494 | 2075 | 5047 | 1103 | 3701 | 2978 | 2464 |
| | 347 | 983 | 2706 | 2915 | 2041 | 2976 | 719 | 1290 |
| | 366 | 1394 | 5197 | 8022 | 4473 | 6221 | 18207 | 23099 |
| | 369 | 961 | 2669 | 1371 | 2525 | 2803 | 1960 | 21671 |
| | 386 | 983 | 861 | 553 | - | 1513 | 1269 | 5737 |
| | 389 | 821 | - | 1756 | - | 811 | 961 | 985 |
| | 391 | 282 | - | 95 | 635 | 32 | 635 | 95 |
| | Total | 6918 | 13508 | 19759 | 10777 | 18057 | 26729 | 55341 |
| 151-200 | 345 | 1432 | 2015 | 3637 | 2929 | 2300 | 4658 | 5105 |
| | 346 | 865 | 5822 | 2337 | 4389 | 1731 | 3441 | 5089 |
| | 368 | 334 | 1316 | 1429 | - | 602 | 2871 | 6168 |
| | 387 | 718 | 808 | 3000 | - | 3072 | 1253 | 10618 |
| | 388 | 361 | - | 253 | - | 528 | 461 | - |
| | 392 | 145 | - | 147 | 33 | 103 | 60 | 16 |
| | Total | 3855 | 9961 | 10803 | 7351 | 8336 | 12744 | 26996 |
| 31-50 | | 8552 | 20086 | 14254 | 67621 | 90565 | 77320 | 23878 |
| 51-100 | | 17452 | 16996 | 10852 | 8899 | 48057 | 9364 | 15197 |
| 101-150 | | 6918 | 13508 | 19759 | 10777 | 18057 | 26729 | 55341 |
| 151-200 | | 3855 | 9961 | 10803 | 7351 | 8336 | 12744 | 26996 |
| Total | | | 60550 | 55688 | 94649 | 165427 | 125937 | 121410 |
| Upper limit | | | 83240 | 67092 | 123077 | 197373 | 175516 | 169896 |
| Lower limit | | | 37860 | 44285 | 66220 | 133481 | 76355 | 72925 |

Table 13. Cod biomass (t) from stratified random cruises in Division 3L (Fall).

| Depth Range | Stratum No. | Stratum Area | ATC 323-325 1981 | ATC 333-334 1982 | W. T. 7-9 1983 | W. T. 16-18 1984 | W. T. 37-39 1985 | A. Needler 72 1986 |
|---|---|---|---|---|---|---|---|---|
| 31-50 | 350 | 2071 | 6244 | 3849 | 8463 | 16498 | 11218 | 21047 |
| | 363 | 1780 | 852 | 2009 | 17993 | 20017 | 40414 | 4605 |
| | 371 | 1121 | 137 | 1363 | 6126 | 11210 | 1304 | 89 |
| | 372 | 2460 | 20737 | 6882 | 44364 | 27045 | 29915 | 11255 |
| | 384 | 1120 | - | 1090 | 5941 | 27463 | 583 | 53 |
| | Total | 8552 | 27970 | 15193 | 82887 | 102233 | 83434 | 37049 |
| 51-100 | 328 | 1519 | - | - | - | 299 | 656 | 3128 |
| | 341 | 1574 | 2146 | 901 | 1949 | 1760 | 957 | 1793 |
| | 342 | 585 | 834 | 951 | 263 | 736 | 205 | 233 |
| | 343 | 525 | 1419 | - | 661 | 2261 | 99 | 690 |
| | 348 | 2120 | 2651 | 4249 | 3125 | 11537 | 1995 | 2384 |
| | 349 | 2114 | 3604 | 3174 | 2266 | 8257 | 3856 | 3211 |
| | 364 | 2817 | 1932 | 1800 | 1946 | 4536 | 1419 | 1298 |
| | 365 | 1041 | 17904 | 3702 | 961 | 3624 | 977 | 1512 |
| | 370 | 1320 | 300 | 446 | 1184 | 7891 | 597 | 69 |
| | 385 | 2356 | 38 | 43 | 1019 | 1886 | 94 | 1095 |
| | 390 | 1481 | 9 | 58 | 852 | 1130 | 9 | 35 |
| Total | | 17452 | 30837 | 15324 | 14226 | 43917 | 10864 | 15448 |
| 101-150 | 344 | 1494 | 3869 | 7701 | 1682 | 6121 | 4010 | 3623 |
| | 347 | 983 | 4550 | 4805 | 3167 | 5731 | 1245 | 1833 |
| | 366 | 1394 | 9313 | 11920 | 8999 | 7101 | 27549 | 34160 |
| | 369 | 961 | 7755 | 2290 | 5849 | 3962 | 4557 | 33585 |
| | 386 | 983 | 1414 | 1430 | - | 2546 | 4162 | 13630 |
| | 389 | 821 | - | 3428 | - | 2737 | 2521 | 1723 |
| | 391 | 282 | - | 487 | 159 | 79 | 325 | 370 |
| Total | | 6918 | 26901 | 32061 | 19856 | 28277 | 44369 | 88924 |
| 151-200 | 345 | 1432 | 4703 | 7686 | 6443 | 3673 | 8104 | 9106 |
| | 346 | 865 | 12012 | 4212 | 7746 | 3003 | 5805 | 7670 |
| | 368 | 334 | 5948 | 3604 | - | 1222 | 6011 | 12300 |
| | 387 | 718 | 1334 | 9216 | - | 7465 | 4056 | 20225 |
| | 388 | 361 | - | 461 | - | 616 | 1951 | - |
| | 392 | 145 | - | 220 | 109 | 68 | 106 | 11 |
| Total | | 3855 | 23997 | 25399 | 14298 | 16047 | 26033 | 49312 |
| 31-50 | | 8552 | 27970 | 15193 | 82887 | 102233 | 83434 | 37049 |
| 51-100 | | 17452 | 30837 | 15324 | 14226 | 43917 | 10864 | 15448 |
| 101-150 | | 6918 | 26901 | 32061 | 19856 | 28277 | 44369 | 88924 |
| 151-200 | | 3855 | 23997 | 25399 | 14298 | 16047 | 26033 | 49312 |
| Total | | | 109706 | 87997 | 131267 | 191701 | 164448 | 190731 |
| Upper limit | | | 153131 | 105967 | 175407 | 226108 | 212703 | 264591 |
| Lower limit | | | 66281 | 70027 | 87127 | 157294 | 116193 | 116872 |

Table 14. Cod abundance estimates (No. x $10^{-3}$) from research vessel surveys in NAFO Division 3L (Spring).

| Depth range (fath) | Stratum number | Stratum area ($mi^2$) | ATC 262 1977 | ATC 276 1978 | ATC 290 1979 | ATC 304-5 1980 | ATC 317-8 1981 | ATC 329 1982 | W.T. 28-30 1985 | WT 48 1986 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31-50 | 350 | 2,071 | 2,993 | 1,373 | 7,756 | 2,798 | 829 | 1,221 | 15,883 | 5,893 |
| | 363 | 1,780 | 4,783 | 2,352 | 7,616 | 1,817 | 3,296 | 1,924 | 7,182 | 7 429 |
| | 371 | 1,121 | 112 | 477 | 1,599 | 2,917 | 0 | 189 | 8,061 | 926 |
| | 372 | 2,460 | 2,247 | 8,969 | 6,135 | 3,293 | 5,032 | 1,477 | 27,099 | 12,451 |
| | 384 | 1,120 | 42 | 56 | 2,711 | 1,555 | 42 | 42 | 98 | 1,906 |
| Total | | 8,552 | 10,177 | 13,227 | 25,817 | 12,380 | 9,199 | 4,853 | 58,323 | 28,605 |
| 51-100 | 328 | 1,519 | 72 | - | 296 | - | 0 | 342 | 257 | 443 |
| | 341 | 1,574 | 3,161 | 325 | 827 | 1,024 | 1,004 | 2,150 | 3,505 | 1,661 |
| | 342 | 585 | 768 | 747 | 132 | 417 | - | 278 | 586 | 454 |
| | 343 | 525 | 335 | 867 | 768 | 1,399 | 867 | 2,374 | 1,103 | 719 |
| | 348 | 2,120 | 875 | 2,361 | 3,687 | 3,456 | 887 | 2,467 | 4,986 | 5,450 |
| | 349 | 2,114 | 3,385 | 4,337 | 4,035 | 2,997 | 595 | 3,729 | 7,016 | 6,767 |
| | 364 | 2,817 | 967 | 599 | 4,705 | 2,996 | 952 | 1,304 | 5,821 | 3,483 |
| | 365 | 1,041 | 781 | 391 | 2,481 | 1,035 | - | 4,689 | 1,797 | 1,516 |
| | 370 | 1,320 | 66 | 330 | 817 | 1,486 | 0 | 248 | 7,394 | 805 |
| | 385 | 2,356 | 383 | 59 | 783 | 3,139 | 59 | 0 | 2,087 | 258 |
| | 390 | 1,481 | 1,223 | 1,056 | 2,223 | 1,223 | 389 | 139 | 358 | 97 |
| Total | | 17,452 | 12,016 | 11,072 | 20,754 | 19,172 | 4,753 | 17,720 | 34,910 | 21,653 |
| 101-150 | 344 | 1,494 | 7,327 | 11,635 | 15,981 | 7,947 | 29,001 | 9,196 | 695 | 4,864 |
| | 347 | 983 | 861 | 6,254 | 5,737 | 10,212 | 3,247 | 10,773 | 1,668 | 5,519 |
| | 366 | 1,394 | 10,461 | - | 11,118 | 5,232 | 56,749 | 18,521 | 41,420 | 20,339 |
| | 369 | 961 | 761 | 577 | 2,813 | 6,757 | 7,286 | 1,876 | 10,950 | 9,534 |
| | 386 | 983 | 1,599 | 639 | 2,749 | 2,066 | 2,693 | 812 | 5,371 | 1,783 |
| | 389 | 821 | 2,178 | 1,130 | 1,464 | 5,259 | 1,140 | 2,712 | 8,677 | 1,380 |
| | 391 | 282 | 921 | 201 | 1,117 | 1,757 | 688 | 191 | 476 | 603 |
| Total | | 6,918 | 24,108 | 20,436 | 40,979 | 39,230 | 100,804 | 44,081 | 69,257 | 44,022 |
| 151-200 | 345 | 1,432 | 5,505 | 5,321 | 1,800 | 6,385 | 15,264 | 2,714 | 2,107 | 13,160 |
| | 346 | 865 | 782 | - | 1,380 | 1,125 | 2,727 | 801 | 714 | 16,999 |
| | 368 | 334 | 319 | - | 56 | 113 | 1,880 | 639 | 1,492 | 4,250 |
| | 387 | 718 | 108 | 198 | 256 | 108 | 296 | 1,419 | 24,226 | 5,686 |
| | 388 | 361 | 881 | 257 | 190 | 41 | 393 | 989 | 488 | 2,520 |
| | 392 | 145 | 44 | 44 | 178 | 5 | 196 | 218 | 1,818 | ,403 |
| Total | | 3,855 | 7,639 | 5,820 | 3,860 | 7,777 | 20,756 | 6,780 | 30,845 | 43,018 |
| 31-50 | | 8,551 | 10,177 | 13,227 | 25,817 | 12,380 | 9,199 | 4,853 | 58,323 | 28,605 |
| 51-100 | | 17,452 | 12,016 | 11,072 | 20,754 | 19,172 | 4,753 | 17,720 | 34,910 | 21,653 |
| 101-200 | | 6,918 | 24,108 | 20,436 | 40,979 | 39,230 | 100,804 | 44,081 | 69,257 | 44,022 |
| 151-200 | | 3,855 | 7,639 | 5,820 | 3,860 | 7,777 | 20,756 | 6,780 | 30,845 | 43,018 |
| Total | | | 53,938 | 50,554 | 91,410 | 78,560 | 135,716 | 73,433 | 193,335 | 137,299 |
| Upper Limit | | | 67,857 | 70,457 | 112,937 | 93,294 | 266,824 | 94,202 | 255,581 | 161,282 |
| Lower Limit | | | 40,018 | 30,651 | 69,883 | 63,827 | 4,608 | 52,665 | 131,090 | 113,317 |

Table 15. Cod biomass estimates (t) from research vessel surveys in NAFO Division 3L (Spring).

| Depth range (fath) | Stratum number | Stratum area ($mi^2$) | ATC 262 1977 | ATC 276 1978 | ATC 290 1979 | ATC 304-5 1980 | ATC 317-8 1981 | ATC 329 1982 | WT 28-30 1985 | WT 48 1986 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31-50 | 350 | 2,071 | 5,187 | 2,106 | 13,637 | 7,124 | 2,539 | 4,775 | 31,785 | 16,344 |
| | 363 | 1,780 | 5,399 | 3,919 | 11,237 | 4,182 | 7,082 | 6,721 | 14,881 | 12,152 |
| | 371 | 1,121 | 535 | 1,490 | 2,439 | 8,148 | 0 | 789 | 15,647 | 3,184 |
| | 372 | 2,460 | 1,865 | 7,006 | 8,342 | 7,448 | 7,155 | 3,978 | 44,792 | 19,171 |
| | 384 | 1,120 | 10 | 19 | 3,521 | 2,480 | 462 | 231 | 284 | 3,667 |
| Total | | 8,552 | 12,996 | 14,540 | 39,176 | 29,382 | 17,238 | 16,494 | 107,389 | 54,518 |
| 51-100 | 328 | 1,519 | 38 | - | 518 | - | 0 | 893 | 74 | 838 |
| | 341 | 1,574 | 3,916 | 1,006 | 2,468 | 3,291 | 2,038 | 8,495 | 4,735 | 8,022 |
| | 342 | 585 | 1,196 | 3,010 | 409 | 961 | - | 871 | 429 | 1,639 |
| | 343 | 525 | 438 | 1,789 | 1,190 | 2,936 | 946 | 4,768 | 795 | 1,502 |
| | 348 | 2,120 | 1,701 | 3,546 | 7,128 | 7,855 | 1,966 | 5,709 | 7,904 | 11,590 |
| | 349 | 2,114 | 10,746 | 8,879 | 8,800 | 7,282 | 1,321 | 10,182 | 16,005 | 27,730 |
| | 364 | 2,817 | 1,101 | 928 | 7,884 | 7,154 | 1,533 | 3,938 | 9,837 | 9,223 |
| | 365 | 1,041 | 1,112 | 532 | 2,953 | 2,442 | - | 6,056 | 2,160 | 3,324 |
| | 370 | 1,320 | 330 | 367 | 1,046 | 2,807 | 0 | 99 | 7,054 | 3,511 |
| | 385 | 2,356 | 422 | 80 | 1,118 | 6,278 | 413 | 0 | 2,084 | 424 |
| | 390 | 1,481 | 505 | 795 | 2,125 | 2,798 | 500 | 217 | 261 | 406 |
| Total | | 17,452 | 21,505 | 20,932 | 35,639 | 43,804 | 8,717 | 41,228 | 51,338 | 68,214 |
| 101-150 | 344 | 1,494 | 7,784 | 20,366 | 19,398 | 10,172 | 50,712 | 19,583 | 648 | 8,032 |
| | 347 | 983 | 1,128 | 8,492 | 7,705 | 16,019 | 8,043 | 21,435 | 3,416 | 10,419 |
| | 366 | 1,394 | 6,211 | - | 11,509 | 5,912 | 81,497 | 21,817 | 45,178 | 30,705 |
| | 369 | 961 | 2,050 | 999 | 2,448 | 7,406 | 9,378 | 4,959 | 19,297 | 11,488 |
| | 386 | 983 | 1,228 | 251 | 2,881 | 2,361 | 4,593 | 1,279 | 3,877 | 1,906 |
| | 389 | 821 | 1,343 | 1,063 | 1,098 | 6,923 | 478 | 1,664 | 6,169 | 900 |
| | 391 | 282 | 634 | 356 | 1,048 | 2,064 | 1,212 | 95 | 429 | 826 |
| Total | | 6,918 | 20,378 | 31,527 | 46,087 | 50,857 | 155,913 | 70,832 | 79,014 | 64,276 |
| 151-200 | 345 | 1,432 | 13,271 | 10,687 | 4,844 | 11,674 | 29,493 | 6,060 | 2,939 | 17,444 |
| | 346 | 865 | 990 | - | 2,137 | 2,154 | 4,307 | 1,223 | 341 | 20,427 |
| | 368 | 334 | 404 | - | 239 | 796 | 1,761 | 809 | 1,536 | 6,412 |
| | 387 | 718 | 122 | 184 | 459 | 256 | 243 | 2,353 | 21,491 | 6,555 |
| | 388 | 361 | 1,181 | 181 | 349 | 108 | 190 | 1,321 | 346 | 1,572 |
| | 392 | 145 | 30 | 66 | 189 | 0 | 128 | 256 | 2,237 | 435 |
| Total | | 3,855 | 15,998 | 11,118 | 8,217 | 14,988 | 36,122 | 12,022 | 28,890 | 52,845 |
| 31-50 | | 8,552 | 12,996 | 14,540 | 39,176 | 29,382 | 17,238 | 16,494 | 107,389 | 54,518 |
| 51-100 | | 17,452 | 21,505 | 20,932 | 35,639 | 43,804 | 8,717 | 41,228 | 51,338 | 68,214 |
| 101-150 | | 6,918 | 20,378 | 31,527 | 46,087 | 50,857 | 155,913 | 70,832 | 79,014 | 64,276 |
| 151-200 | | 3,855 | 15,998 | 11,118 | 8,217 | 14,988 | 36,122 | 12,022 | 28,890 | 52,845 |
| Total | | | 70,877 | 78,118 | 129,117 | 139,030 | 218,214 | 140,578 | 266,628 | 239,857 |
| Upper limit | | | 93,640 | 100,261 | 154,966 | 166,965 | 405,205 | 171,826 | 337,779 | 278,797 |
| Lower limit | | | 48,114 | 55,974 | 103,267 | 111,094 | 31,224 | 109,329 | 195,476 | 200,916 |

Table 16. Mean numbers and weights per tow of cod from research vessel surveys in Division 2J for strata surveyed in all years (fall surveys).

| Year | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|
| Numbers | | | | | | | | | | |
| Mean | 74.91 | 75.68 | 56.90 | 68.70 | 63.36 | 87.34 | 134.94 | 103.57 | 91.65 | 220.00 |
| Upper | 112.36 | 104.08 | 94.09 | 95.06 | 118.77 | 113.11 | 567.98 | 137.91 | 117.81 | 347.47 |
| Lower | 37.45 | 47.28 | 19.71 | 42.34 | 7.96 | 61.57 | -298.09 | 69.22 | 65.50 | 92.52 |
| Weights | | | | | | | | | | |
| Mean | 104.60 | 126.70 | 110.80 | 152.92 | 154.00 | 159.84 | 199.75 | 133.06 | 104.36 | 295.27 |
| Upper | 153.79 | 175.60 | 185.66 | 212.54 | 302.83 | 215.17 | 896.24 | 178.95 | 133.27 | 495.49 |
| Lower | 55.41 | 77.81 | 35.94 | 93.30 | 5.17 | 104.51 | -496.75 | 87.16 | 75.45 | 95.05 |

Table 17. Mean numbers and weights per tow of cod from research vessel surveys in Division 3K for strata surveyed in all years (fall surveys).

| Year | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|
| Numbers | | | | | | | | | |
| Mean | 48.54 | 77.41 | 39.17 | 46.20 | 36.03 | 50.36 | 53.26 | 26.64 | 127.66 |
| Upper | 71.77 | 132.49 | 52.66 | 61.60 | 44.23 | 65.59 | 71.94 | 34.01 | 293.22 |
| Lower | 25.31 | 22.34 | 25.69 | 30.79 | 27.84 | 35.14 | 34.58 | 19.27 | -37.90 |
| Weights | | | | | | | | | |
| Mean | 86.95 | 155.36 | 87.03 | 100.57 | 77.41 | 94.81 | 98.34 | 44.34 | 202.76 |
| Upper | 131.76 | 257.53 | 113.99 | 138.67 | 93.15 | 116.93 | 129.84 | 56.49 | 470.92 |
| Lower | 42.14 | 53.20 | 60.07 | 64.47 | 61.66 | 72.68 | 66.85 | 32.19 | -65.40 |

Table 18. Mean numbers and weights per tow of cod from research vessel fall surveys in Division 3L for strata common to all years and less than 366 meters.

| Year | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|
| Numbers | | | | | | |
| Mean | 25.19 | 21.41 | 38.94 | 60.31 | 52.23 | 41.13 |
| Upper | 35.26 | 26.36 | 51.37 | 72.40 | 74.21 | 62.15 |
| Lower | 15.12 | 16.46 | 26.51 | 48.23 | 30.25 | 20.11 |
| Weights | | | | | | |
| Mean | 44.27 | 30.25 | 55.30 | 64.78 | 64.11 | 61.61 |
| Upper | 63.92 | 37.47 | 74.90 | 75.72 | 85.34 | 94.34 |
| Lower | 24.62 | 23.02 | 35.70 | 53.83 | 42.88 | 28.89 |

Table 19. Mean numbers and weights per tow of cod from research vessel spring surveys in Division 3L for strata less than 366 meters.

| Year | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|
| Numbers | | | | | | | | |
| Mean | 19.54 | 20.62 | 33.11 | 29.68 | 51.04 | 26.60 | 69.70 | 49.73 |
| Upper | 24.58 | 28.73 | 40.91 | 35.25 | 100.35 | 34.12 | 92.14 | 58.42 |
| Lower | 14.50 | 12.50 | 25.31 | 24.12 | 1.73 | 19.08 | 47.26 | 41.05 |
| Weights | | | | | | | | |
| Mean | 25.67 | 31.86 | 46.77 | 52.33 | 82.07 | 50.92 | 96.12 | 86.88 |
| Upper | 33.92 | 40.89 | 56.13 | 63.09 | 152.39 | 62.24 | 121.78 | 100.99 |
| Lower | 17.43 | 22.83 | 37.41 | 41.98 | 11.74 | 39.60 | 70.47 | 72.78 |

Table 20. Biomass estimates (000't) of cod from autumn research vessel surveys in NAFO Div. 2J, 3K and 3L.

| Div. | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | |
|---|---|---|---|---|---|---|---|
| 2J | 228.8 | 216.5 | 267.1 | 181.7 | 136.7 | 405.2 | |
| 3K | 175.0 | 133.3 | 172.5 | 175.3 | 86.0 | 356.3 | |
| 3L | 109.7 | 88.0 | 131.3 | 191.7 | 164.4 | 190.7 | |
| Total | 513.5 | 437.8 | 570.9 | 548.7 | 387.1 | 952.2 | |
| Percentage | | | | | | | Average |
| 2J | 45 | 49 | 47 | 33 | 35 | 43 | 42 |
| 3K | 34 | 31 | 30 | 32 | 23 | 37 | 31 |
| 3L | 21 | 20 | 23 | 35 | 42 | 20 | 27 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Table 21 . Number of sets, mean bottom temperatures and mean depths by depth zone from fall research vessel surveys in NAFO Division 2J.

| Depth range (m) | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of sets | | | | | | | | | | |
| 101-200 | 22 | 18 | 17 | 19 | 33 | 51 | 38 | 29 | 41 | 30 |
| 201-300 | 43 | 23 | 27 | 22 | 35 | 59 | 46 | 34 | 46 | 40 |
| 301-400 | 18 | 12 | 11 | 13 | 12 | 17 | 17 | 15 | 16 | 13 |
| 401-500 | 15 | - | - | - | 10 | 16 | 13 | 10 | 12 | 11 |
| Mean temperature | | | | | | | | | | |
| 101-200 | 2.53 | 0.78 | 1.27 | 0.59 | 1.04 | 0.13 | -0.48 | -0.70 | -0.32 | 1.23 |
| 201-300 | 2.87 | 1.87 | 2.42 | 2.04 | 2.14 | 1.25 | 1.14 | 0.27 | 0.33 | 2.42 |
| 301-400 | 3.51 | 3.15 | 3.38 | 2.58 | 3.09 | 2.36 | 2.88 | 2.13 | 1.83 | 3.05 |
| 401-500 | 3.75 | - | - | - | 2.92 | 3.27 | 3.68 | 3.38 | 3.32 | 3.42 |
| Mean depth | | | | | | | | | | |
| 101-200 | 175 | 175 | 173 | 168 | 165 | 166 | 167 | 173 | 170 | 160 |
| 201-300 | 241 | 265 | 253 | 269 | 236 | 255 | 255 | 252 | 239 | 241 |
| 301-400 | 346 | 347 | 341 | 339 | 343 | 339 | 339 | 349 | 342 | 343 |
| 401-500 | 452 | - | - | - | 433 | 419 | 463 | 456 | 450 | 439 |

Table 22. Number of sets, mean bottom temperatures and mean depths by depth zone from fall research vessel surveys in NAFO Division 3K.

| Depth range (m) | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|
| No. of sets | | | | | | | | | |
| 101-200 | - | - | - | - | - | - | 11 | 13 | 10 |
| 201-300 | 37 | 39 | 41 | 49 | 63 | 51 | 62 | 67 | 46 |
| 301-400 | 33 | 30 | 37 | 46 | 52 | 54 | 58 | 61 | 38 |
| 401-500 | - | - | - | 17 | 17 | 15 | 21 | 24 | 13 |
| Mean temperature | | | | | | | | | |
| 101-200 | - | - | - | - | - | - | -1.14 | -1.11 | 0.55 |
| 201-300 | 2.61 | 1.91 | 1.73 | 1.64 | 1.26 | 0.98 | 0.79 | 0.64 | 2.06 |
| 301-400 | 3.51 | 3.06 | 1.70 | 2.96 | 2.84 | 2.82 | 2.46 | 2.03 | 2.75 |
| 401-500 | - | - | - | 3.30 | 3.13 | 3.34 | 3.20 | 2.65 | 3.01 |
| Mean depth | | | | | | | | | |
| 101-200 | - | - | - | - | - | - | 178 | 170 | 157 |
| 201-300 | 256 | 258 | 258 | 251 | 255 | 256 | 254 | 257 | 250 |
| 301-400 | 328 | 340 | 332 | 332 | 329 | 330 | 340 | 340 | 341 |
| 401-500 | - | - | - | 454 | 444 | 447 | 452 | 452 | 453 |

Table 23. Number of sets, mean bottom temperatures, and mean depth by depth zone from fall research vessel surveys in NAFO Div. 3L.

| Depth range (fath) | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|
| No. of sets | | | | | | |
| 31-50 | 22 | 21 | 23 | 46 | 51 | 35 |
| 51-100 | 51 | 51 | 80 | 76 | 111 | 59 |
| 101-150 | 15 | 27 | 39 | 46 | 53 | 28 |
| 151-200 | 11 | 20 | 24 | 22 | 30 | 13 |
| Mean temperature | | | | | | |
| 31-50 | 0.18 | 1.24 | -0.17 | -0.67 | -0.12 | 0.40 |
| 51-100 | -0.43 | -0.67 | -1.16 | -0.96 | -1.14 | -0.61 |
| 101-150 | 0.63 | 0.46 | -0.31 | -0.22 | 0.15 | 0.89 |
| 151-200 | 2.66 | 2.39 | 2.18 | 2.26 | 1.66 | 2.53 |
| Mean depth | | | | | | |
| 31-50 | 77 | 76 | 79 | 76 | 76 | 77 |
| 51-100 | 133 | 142 | 147 | 139 | 136 | 139 |
| 101-150 | 214 | 233 | 221 | 225 | 220 | 231 |
| 151-200 | 317 | 322 | 315 | 319 | 311 | 318 |

Table 24. Mean number per tow of cod at age from research vessel surveys in Division 2J for strata surveyed in all years (fall surveys).

| Age | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 0.0 | 0.0 | 0.38 | 0.0 | 1.28 | 2.41 | 0.63 | 0.07 | 0.04 |
| 2 | 3.98 | 0.60 | 0.35 | 1.64 | 4.50 | 3.72 | 17.08 | 6.38 | 1.86 | 2.69 |
| 3 | 11.50 | 8.86 | 1.54 | 1.40 | 3.31 | 21.98 | 20.39 | 20.15 | 11.19 | 10.01 |
| 4 | 34.69 | 16.35 | 12.93 | 4.77 | 2.48 | 7.73 | 31.40 | 19.91 | 27.25 | 36.85 |
| 5 | 15.87 | 33.06 | 18.96 | 21.67 | 4.57 | 5.38 | 19.94 | 32.12 | 16.85 | 82.93 |
| 6 | 3.49 | 11.32 | 18.26 | 22.13 | 18.41 | 5.15 | 10.72 | 12.26 | 20.43 | 48.70 |
| 7 | 1.62 | 2.51 | 2.60 | 13.13 | 16.48 | 15.94 | 5.50 | 2.96 | 9.04 | 25.49 |
| 8 | 1.46 | 0.91 | 0.82 | 1.90 | 10.42 | 14.02 | 14.95 | 1.87 | 1.56 | 10.27 |
| 9 | 1.14 | 0.72 | 0.56 | 0.55 | 2.16 | 9.52 | 6.80 | 4.21 | 1.06 | .85 |
| 10 | 0.63 | 0.52 | 0.32 | 0.40 | 0.55 | 1.60 | 4.31 | 1.81 | 1.46 | .78 |
| 11 | 0.24 | 0.28 | 0.32 | 0.26 | 0.09 | 0.43 | 0.90 | 0.79 | 0.53 | .71 |
| 12 | 0.12 | 0.13 | 0.12 | 0.31 | 0.15 | 0.20 | 0.29 | 0.38 | 0.27 | .41 |
| 13 | 0.05 | 0.16 | 0.05 | 0.10 | 0.16 | 0.12 | 0.13 | 0.06 | 0.04 | .13 |
| 14+ | 0.07 | 0.25 | 0.09 | 0.33 | 0.23 | 0.27 | 0.16 | 0.03 | 0.03 | .13 |
| Total | 74.91 | 75.68 | 56.90 | 68.70 | 63.36 | 87.34 | 134.94 | 103.57 | 91.65 | 220.00 |

Table 25 . Mean number per tow of cod at age from research vessel surveys in Division 3K for strata surveyed in all years (fall surveys).

| Age | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 0.0 | 0.21 | 0.01 | 0.27 | 0.97 | 0.31 | 0.01 | .43 |
| 2 | 0.31 | 0.16 | 1.20 | 1.55 | 2.13 | 3.93 | 3.92 | 0.73 | 3.00 |
| 3 | 3.27 | 2.68 | 1.63 | 6.38 | 2.06 | 8.53 | 6.77 | 3.35 | 6.01 |
| 4 | 14.27 | 18.23 | 2.35 | 4.00 | 5.86 | 7.22 | 11.70 | 5.16 | 29.94 |
| 5 | 17.40 | 30.00 | 13.24 | 4.36 | 5.78 | 12.72 | 9.43 | 7.03 | 36.12 |
| 6 | 7.98 | 17.84 | 14.47 | 14.56 | 3.24 | 3.89 | 9.68 | 3.50 | 25.07 |
| 7 | 2.55 | 4.58 | 3.13 | 10.53 | 6.83 | 2.63 | 3.59 | 3.37 | 12.83 |
| 8 | 1.19 | 2.30 | 1.51 | 3.27 | 6.66 | 4.63 | 1.80 | 1.04 | 7.73 |
| 9 | 0.74 | 0.56 | 0.56 | 0.60 | 1.94 | 3.59 | 2.88 | 0.78 | 2.95 |
| 10 | 0.58 | 0.48 | 0.38 | 0.28 | 0.75 | 1.25 | 1.74 | 0.72 | .98 |
| 11 | 0.04 | 0.33 | 0.03 | 0.23 | 0.20 | 0.44 | 0.71 | 0.61 | 1.22 |
| 12 | 0.12 | 0.07 | 0.23 | 0.24 | 0.09 | 0.19 | 0.34 | 0.18 | .85 |
| 13 | 0.04 | 0.05 | 0.08 | 0.07 | 0.07 | 0.08 | 0.12 | 0.07 | .31 |
| 14+ | 0.04 | 0.15 | 0.16 | 0.14 | 0.15 | 0.27 | 0.26 | 0.06 | .22 |
| Total | 48.54 | 77.41 | 39.17 | 46.20 | 36.03 | 50.36 | 53.26 | 26.64 | 127.66 |

Table 26. Mean number per tow of cod at age from research vessel surveys in Division 3L for strata surveyed in all years (fall surveys).

| Age | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|
| 1 | 0.41 | 0.43 | 0.67 | 0.36 | 0.01 | .04 |
| 2 | 0.40 | 2.85 | 3.67 | 7.64 | 1.40 | 1.07 |
| 3 | 7.04 | 2.05 | 13.99 | 11.53 | 11.04 | 2.36 |
| 4 | 2.93 | 6.85 | 5.40 | 19.05 | 14.69 | 11.01 |
| 5 | 2.79 | 2.91 | 7.80 | 5.22 | 12.48 | 9.49 |
| 6 | 4.17 | 2.15 | 1.45 | 10.61 | 5.92 | 9.73 |
| 7 | 5.87 | 1.79 | 1.39 | 1.70 | 3.92 | 3.05 |
| 8 | 1.09 | 1.62 | 2.42 | 1.19 | .81 | 2.30 |
| 9 | 0.22 | 0.30 | 1.30 | 1.04 | .93 | .89 |
| 10 | 0.08 | 0.09 | 0.46 | 1.09 | .46 | .35 |
| 11 | 0.04 | 0.05 | 0.13 | 0.43 | .33 | .45 |
| 12 | 0.03 | 0.06 | 0.06 | 0.25 | .13 | .24 |
| 13+ | 0.13 | 0.06 | 0.19 | 0.18 | .08 | .17 |
| Total | 25.19 | 21.41 | 38.94 | 60.31 | 52.23 | 41.13 |

Table 27. Mean number of cod per tow of cod at age from research vessel surveys in Division 3L for strata ≤200 ftm.

| Age | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 0.0 | 0.06 | 0.09 | 0.18 | 0.03 | 0.0 | 0.0 |
| 2 | 0.89 | 0.07 | 0.08 | 1.97 | 0.51 | 1.72 | 1.38 | 0.25 |
| 3 | 4.05 | 3.31 | 0.84 | 0.91 | 9.24 | 1.56 | 12.10 | 3.43 |
| 4 | 5.82 | 6.18 | 9.16 | 3.54 | 7.40 | 9.25 | 18.12 | 12.59 |
| 5 | 4.52 | 4.92 | 13.89 | 10.83 | 6.59 | 2.34 | 16.34 | 12.70 |
| 6 | 2.11 | 3.18 | 6.48 | 8.74 | 11.28 | 2.96 | 8.20 | 9.25 |
| 7 | 0.63 | 1.43 | 1.53 | 2.21 | 11.50 | 4.15 | 8.11 | 4.38 |
| 8 | 0.65 | 0.46 | 0.46 | 0.80 | 3.06 | 3.08 | 1.71 | 3.48 |
| 9 | 0.43 | 0.39 | 0.12 | 0.16 | 0.79 | 0.93 | 0.76 | 0.77 |
| 10 | 0.15 | 0.23 | 0.19 | 0.07 | 0.26 | 0.20 | 1.07 | 0.65 |
| 11 | 0.10 | 0.17 | 0.08 | 0.12 | 0.08 | 0.07 | 1.19 | 1.11 |
| 12 | 0.06 | 0.12 | 0.04 | 0.07 | 0.08 | 0.05 | 0.40 | 0.70 |
| 13+ | 0.16 | 0.17 | 0.18 | 0.15 | 0.08 | 0.26 | 0.32 | 0.41 |
| Total | 19.54 | 20.62 | 33.11 | 29.68 | 51.04 | 26.60 | 69.70 | 49.73 |

Table 28. Age 6+ abundance index for cod in Div. 2J3KL for the period 1978-86 derived from Canadian research vessel surveys.

| Year | 2J | 3K | 3L | Ave. |
|---|---|---|---|---|
| 1978 | 16.80 | 13.28 | (3.16) | 9.78 |
| 1979 | 23.14 | 26.36 | (4.35) | 16.01 |
| 1980 | 39.11 | 20.55 | (19.24) | 24.64 |
| 1981 | 48.65 | 29.92 | 11.63 | 26.69 |
| 1982 | 47.25 | 19.93 | 6.12 | 20.80 |
| 1983 | 43.76 | 16.97 | 7.40 | 19.55 |
| 1984 | 24.37 | 21.12 | 16.49 | 19.93 |
| 1985 | 34.42 | 10.33 | 12.58 | 17.36 |
| 1986 | 87.47 | 52.16 | 17.18 | 45.86 |
| Area | 17360 | 21792 | 29969 | |

| | 3L Spring 7+ | | 3L FALL 6+ | | 7+/6+ |
|---|---|---|---|---|---|
| 1982 | 8.74 | 1981 | 11.63 | | 1.331 |
| 1985 | 13.56 | 1984 | 16.49 | | 1.216 |
| 1986 | 11.50 | 1985 | 12.58 | | 1.094 |
| | | | | Ave. | 1.214 |
| 1979 | 2.60 | 1978 | (3.16) | | |
| 1980 | 3.58 | 1979 | (4.35) | | |
| 1981 | 15.85 | 1980 | (19.24) | | |

Table 29. Recruitment indices from Fall surveys for the period 1978-86.

| Year-class | Age 3 | | | Age 4 | | | Age 5 | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2J | 3K | 3L | 2J | 3K | 3L | 2J | 3K | 3L |
| 1973 | | | | | | | 33.06 | 17.40 | (5.79) |
| 1974 | | | | 16.35 | 14.27 | (16.54) | 18.96 | 30.00 | (7.80) |
| 1975 | 8.86 | 3.27 | (6.83) | 12.93 | 18.23 | (12.89) | 21.67 | 13.24 | (10.07) |
| 1976 | 1.54 | 2.68 | (2.64) | 4.77 | 2.35 | (7.85) | 4.57 | 4.36 | 2.79 |
| 1977 | 1.40 | 1.63 | (5.51) | 2.48 | 4.00 | 2.93 | 5.38 | 5.78 | 2.91 |
| 1978 | 3.31 | 6.38 | 7.04 | 7.73 | 5.86 | 6.85 | 19.94 | 12.72 | 7.80 |
| 1979 | 21.98 | 2.08 | 2.05 | 31.40 | 7.22 | 5.40 | 32.12 | 9.43 | 5.22 |
| 1980 | 20.39 | 8.53 | 13.99 | 19.91 | 11.70 | 19.05 | 16.85 | 7.03 | 12.48 |
| 1981 | 20.15 | 6.77 | 11.53 | 27.25 | 5.16 | 14.69 | 82.93 | 36.12 | 9.49 |
| 1982 | 11.19 | 3.35 | 11.04 | 36.85 | 29.94 | 11.01 | | | |
| 1983 | 10.01 | 6.01 | 2.36 | | | | | | |
| Survey area ($mi^2$) | 17360 | 21792 | 29969 | | | | | | |

| | 2J3KL Age | | |
|---|---|---|---|
| | 3 | 4 | 5 |
| 1973 | | | 16.30 |
| 1974 | | 15.78 | 17.60 |
| 1975 | 6.22 | 14.58 | 13.98 |
| 1976 | 2.38 | 5.34 | 3.73 |
| 1977 | 3.25 | 3.15 | 4.44 |
| 1978 | 5.90 | 6.76 | 12.40 |
| 1979 | 7.06 | 12.50 | 13.30 |
| 1980 | 13.88 | 16.95 | 11.86 |
| 1981 | 12.19 | 14.84 | 36.33 |
| 1982 | 8.65 | 24.77 | |
| 1983 | 5.43 | | |

Table30 . Analysis of variance and regression coefficients from the regression of ln catch rate for cod in Div. 2J3KL for the years 1962-79.

| Country/Gear | ln Power | Month | ln Power |
|---|---|---|---|
| Can-N OTB-4 | -0.333 | Jan | 0.0000 |
| Can-N OTB-5 | 0.000 | Feb | 0.052 |
| ESP OTB-6 | 0.244 | Mar | -0.170 |
| PRT OTB-6 | 0.333 | Apr | -0.056 |
| PRT OTB-7 | 0.663 | May | -0.270 |
| | | June | -0.494 |
| | | July | -0.699 |
| **Division** | **ln Power** | Aug | -0.699 |
| 2J | 0.000 | Sept | -0.709 |
| 3K | -0.161 | Oct | -0.724 |
| 3L | -0.275 | Nov | -0.654 |
| | | Dec | -0.516 |

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 | 11 | 1.182E2 | 1.075E1 | 61.639 |
| TYPE 3 | 2 | 1.767E1 | 8.834E0 | 50.660 |
| TYPE 4 | 17 | 2.010E2 | 1.182E1 | 67.803 |
| RESIDUALS | 1515 | 2.642E2 | 1.744E-1 | |
| TOTAL | 1550 | 6.613E2 | | |

Table 31 . Analysis of variance and regression coefficients from the regression of ln catch rate for cod in Div. 2J3KL for the years 1978-86.

| Country/Gear | ln Power | Month | ln Power |
|---|---|---|---|
| PRT OTB-7 | -0.493 | Jan | 0.000 |
| PRT OTB-6 | -0.276 | Feb | 0.048 |
| Can-N OTB-4 | -0.217 | Mar | -0.264 |
| Can-N OTB-5 | -0.053 | Apr | -0.258 |
| Can-M OTB-4 | 0.000 | May | -0.688 |
| Can-M OTB-5 | 0.398 | June | -0.942 |
| | | July | -1.048 |
| | | Aug. | -1.187 |
| Division | ln Power | Sept | -1.147 |
| 2J | 0.000 | Oct | -1.026 |
| 3K | -0.385 | Nov | -0.887 |
| 3L | -0.736 | Dec | -0.600 |

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 | 8.182E1 | 8.182E1 | |
| REGRESSION | 26 | 2.485E2 | 9.558E0 | 39.256 |
| TYPE 1 | 5 | 3.048E1 | 6.097E0 | 25.041 |
| TYPE 2 | 11 | 8.022E1 | 7.292E0 | 29.952 |
| TYPE 3 | 2 | 3.793E1 | 1.896E1 | 77.891 |
| TYPE 4 | 8 | 4.615E1 | 5.768E0 | 23.693 |
| RESIDUALS | 539 | 1.312E2 | 2.435E-1 | |
| TOTAL | 566 | 4.616E2 | | |

Table 32. Commercial catch rate index for cod in Div. 2J3KL for the period 1962-79.

PREDICTED CATCH RATE

| YEAR | LN TRANSFORM MEAN | LN TRANSFORM S.E. | RETRANSFORMED MEAN | RETRANSFORMED S.E. | CATCH | EFFORT |
|---|---|---|---|---|---|---|
| 1962 | 0.7408 | 0.0067 | 2.281 | 0.187 | 502572 | 220324 |
| 1963 | 0.7867 | 0.0064 | 2.389 | 0.190 | 509209 | 213168 |
| 1964 | 0.7194 | 0.0062 | 2.233 | 0.176 | 602651 | 269827 |
| 1965 | 0.5564 | 0.0060 | 1.898 | 0.147 | 545035 | 287192 |
| 1966 | 0.6129 | 0.0056 | 2.008 | 0.150 | 524505 | 261144 |
| 1967 | 0.7033 | 0.0052 | 2.199 | 0.159 | 611764 | 278218 |
| 1968 | 0.6518 | 0.0048 | 2.089 | 0.145 | 810014 | 387786 |
| 1969 | 0.4517 | 0.0050 | 1.710 | 0.120 | 753690 | 440762 |
| 1970 | 0.3057 | 0.0052 | 1.477 | 0.106 | 520226 | 352114 |
| 1971 | 0.1279 | 0.0052 | 1.237 | 0.089 | 439518 | 355374 |
| 1972 | 0.0093 | 0.0054 | 1.098 | 0.081 | 458295 | 417252 |
| 1973 | 0.0007 | 0.0060 | 1.089 | 0.085 | 354509 | 325645 |
| 1974 | 0.1114 | 0.0065 | 1.216 | 0.098 | 372650 | 306519 |
| 1975 | 0.1578 | 0.0059 | 1.274 | 0.098 | 287508 | 225693 |
| 1976 | -0.0629 | 0.0076 | 1.021 | 0.089 | 214220 | 209868 |
| 1977 | -0.5887 | 0.0056 | 0.604 | 0.045 | 172720 | 285973 |
| 1978 | -0.5693 | 0.0063 | 0.616 | 0.049 | 138559 | 225085 |
| 1979 | 0.0876 | 0.0058 | 1.188 | 0.091 | 166899 | 140529 |

Table 33. Commercial catch rate index for cod in Div. 2J3KL for the period 1978-86.

PREDICTED CATCH RATE

| YEAR | LN TRANSFORM MEAN | LN TRANSFORM S.E. | RETRANSFORMED MEAN | RETRANSFORMED S.E. | CATCH | EFFORT |
|---|---|---|---|---|---|---|
| 1978 | 0.6412 | 0.0130 | 2.131 | 0.242 | 138559 | 65016 |
| 1979 | 0.9682 | 0.0098 | 2.960 | 0.293 | 166899 | 56381 |
| 1980 | 1.1409 | 0.0099 | 3.518 | 0.349 | 175788 | 49967 |
| 1981 | 1.3638 | 0.0095 | 4.397 | 0.428 | 170712 | 38820 |
| 1982 | 1.2891 | 0.0082 | 4.084 | 0.369 | 229774 | 56268 |
| 1983 | 1.4603 | 0.0081 | 4.846 | 0.436 | 232345 | 47942 |
| 1984 | 1.5908 | 0.0089 | 5.520 | 0.520 | 230387 | 41740 |
| 1985 | 1.7620 | 0.0099 | 6.547 | 0.652 | 231568 | 35371 |
| 1986 | 1.6440 | 0.0103 | 5.817 | 0.590 | 251517 | 43238 |

Table 34. Analysis of variance and regression coefficients from the regression of ln catch rate for cod in Div. 2J for the years 1962-79.

| Country/Gear | | ln Power | Month | ln Power |
|---|---|---|---|---|
| ESP | OTB-6 | -0.286 | Jan | 0.000 |
| PRT | OTB-6 | -0.130 | Feb | 0.003 |
| Can-N | OTB-4 | -0.056 | Mar | -0.287 |
| Can-N | OTB-5 | 0.000 | Apr | -0.147 |
| PRT | OTB-7 | 0.220 | May | -0.356 |
| | | | June | -0.562 |
| | | | July | -1.107 |
| | | | Aug. | -0.910 |
| | | | Sept. | -0.896 |
| | | | Oct | -0.959 |
| | | | Nov | -0.880 |
| | | | Dec | -0.468 |

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.851
MULTIPLE R SQUARED..... 0.725

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DF | SUMS OF SQUARES | MEAN SQUARES | F-VALUE |
|---|---|---|---|---|
| INTERCEPT | 1 | 5.108E1 | 5.108E1 | |
| REGRESSION | 32 | 1.197E2 | 3.740E0 | 30.605 |
| TYPE 1 | 4 | 1.134E1 | 2.835E0 | 23.201 |
| TYPE 2 | 11 | 4.903E1 | 4.458E0 | 36.481 |
| TYPE 3 | 17 | 7.647E1 | 4.498E0 | 36.811 |
| RESIDUALS | 372 | 4.546E1 | 1.222E-1 | |
| TOTAL | 405 | 2.162E2 | | |

Table 35. Analysis of variance and regression coefficients from the regression of ln catch rate for cod in Div. 2J for the years 1978-86.

| Country/Gear | ln Power | Month | ln Power |
|---|---|---|---|
| Can-M OTB-4 | 0.000 | Jan | 0.000 |
| PRT OTB-6 | 0.237 | Feb | -0.232 |
| PRT OTB-7 | 0.399 | Mar | -0.317 |
| Can-N OTB-5 | 0.774 | Apr | -0.051 |
| Can-N OTB-4 | 0.971 | May | -0.640 |
| Can-M OTB-5 | 1.112 | June | -1.065 |
| | | July | -1.473 |
| | | Aug. | -2.196 |
| | | Sept. | -2.012 |
| | | Oct | -2.916 |
| | | Nov | -1.725 |
| | | Dec | -1.305 |

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.902
MULTIPLE R SQUARED..... 0.814

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DF | SUMS OF SQUARES | MEAN SQUARES | F-VALUE |
|---|---|---|---|---|
| INTERCEPT | 1 | 7.505E1 | 7.505E1 | |
| REGRESSION | 24 | 6.408E1 | 2.670E0 | 15.631 |
| TYPE 1 | 5 | 8.351E0 | 1.670E0 | 9.778 |
| TYPE 2 | 11 | 3.194E1 | 2.904E0 | 17.000 |
| TYPE 3 | 8 | 1.819E1 | 2.274E0 | 13.312 |
| RESIDUALS | 86 | 1.469E1 | 1.708E-1 | |
| TOTAL | 111 | 1.538E2 | | |

Table 36 . Analysis of variance and regression coefficients from the regression of ln catch rate for cod in Div. 3K for the years 1962-79.

| Country/Gear | ln Power | Month | ln Power |
|---|---|---|---|
| ESP OTB-6 | -0.098 | Jan | 0.000 |
| PRT OTB-6 | -0.094 | Feb | 0.032 |
| Can-N OTB-5 | 0.000 | Mar | -0.156 |
| Can-N OTB-4 | 0.103 | Apr | -0.086 |
| PRT OTB-7 | 0.247 | May | -0.218 |
| | | June | -0.416 |
| | | July | -0.785 |
| | | Aug. | -0.822 |
| | | Sept. | -0.740 |
| | | Oct. | -0.696 |
| | | Nov | -0.656 |
| | | Dec. | -0.439 |

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.765
MULTIPLE R SQUARED..... 0.585

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DF | SUMS OF SQUARES | MEAN SQUARES | F-VALUE |
|---|---|---|---|---|
| INTERCEPT | 1 | 9.429E-1 | 9.429E-1 | |
| REGRESSION | 32 | 9.591E1 | 2.997E0 | 19.317 |
| TYPE 1 | 4 | 7.231E0 | 1.808E0 | 11.651 |
| TYPE 2 | 11 | 3.675E1 | 3.341E0 | 21.532 |
| TYPE 3 | 17 | 7.222E1 | 4.248E0 | 27.380 |
| RESIDUALS | 438 | 6.796E1 | 1.552E-1 | |
| TOTAL | 471 | 1.648E2 | | |

Table 37 . Analysis of variance and regression coefficients from the regression of ln catch rate for cod in Div. 3K for the years 1978-86.

| Country/Gear | ln Power | Month | ln Power |
|---|---|---|---|
| PRT OTB-7 | -0.455 | Jan | 0.000 |
| PRT OTB-6 | -0.150 | Feb | 0.128 |
| Can-M OTB-4 | 0.000 | Mar | -0.227 |
| Can-N OTB-4 | 0.071 | Apr | -0.315 |
| Can-N OTB-5 | 0.091 | May | -0.534 |
| Can-M OTB-5 | 0.451 | June | -0.856 |
| | | July | -1.086 |
| | | Aug. | -2.231 |
| | | Sept | -1.606 |
| | | Oct | -1.325 |
| | | Nov | -1.173 |
| | | Dec | -0.770 |

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.881
MULTIPLE R SQUARED..... 0.776

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DF | SUMS OF SQUARES | MEAN SQUARES | F-VALUE |
|---|---|---|---|---|
| INTERCEPT | 1 | 9.044E1 | 9.044E1 | |
| REGRESSION | 24 | 7.858E1 | 3.274E0 | 23.489 |
| TYPE 1 | 5 | 6.391E0 | 1.278E0 | 9.170 |
| TYPE 2 | 11 | 2.860E1 | 2.600E0 | 18.655 |
| TYPE 3 | 8 | 3.893E1 | 4.867E0 | 34.915 |
| RESIDUALS | 163 | 2.272E1 | 1.394E-1 | |
| TOTAL | 188 | 1.917E2 | | |

Table 38. Analysis of variance and regression coefficients from the regression of ln catch rate for cod in Div. 3L for the years 1962-79.

| Country/Gear | ln Power | Month | ln Power |
|---|---|---|---|
| Can-N OTB-4 | -0.268 | Jan | 0.000 |
| Can-N OTB-5 | 0.000 | Feb | 0.006 |
| ESP OTB-6 | 0.414 | Mar | -0.098 |
| PRT OTB-6 | 0.524 | Apr | 0.026 |
| PRT OTB-7 | 0.831 | May | -0.262 |
| | | June | -0.483 |
| | | July | -0.552 |
| | | Aug | -0.511 |
| | | Sept. | -0.566 |
| | | Oct | -0.625 |
| | | Nov | -0.493 |
| | | Dec | -0.496 |

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.752
MULTIPLE R SQUARED..... 0.566

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DF | SUMS OF SQUARES | MEAN SQUARES | F-VALUE |
|---|---|---|---|---|
| INTERCEPT | 1 | 1.680E1 | 1.680E1 | |
| REGRESSION | 32 | 1.496E2 | 4.674E0 | 26.105 |
| TYPE 1 | 4 | 5.910E1 | 1.477E1 | 82.516 |
| TYPE 2 | 11 | 3.652E1 | 3.320E0 | 18.541 |
| TYPE 3 | 17 | 7.262E1 | 4.272E0 | 23.859 |
| RESIDUALS | 641 | 1.148E2 | 1.791E-1 | |
| TOTAL | 674 | 2.811E2 | | |

Table 39. Analysis of variance and regression coefficients from the regression of ln catch rate for cod in Div. 3L for the years 1978-86.

| Country/Gear | ln Power | Month | ln Power |
|---|---|---|---|
| PRT OTB-7 | -0.548 | Jan | 0.000 |
| Can-N OTB-4 | -0.436 | Feb | 0.426 |
| Can-N OTB-5 | -0.191 | Mar | 0.034 |
| Prt OTB-6 | -0.159 | Apr | -0.142 |
| Can-M OTB-4 | 0.000 | May | -0.645 |
| Can-M OTB-5 | 0.354 | June | -0.852 |
| | | July | -0.777 |
| | | Aug. | -0.763 |
| | | Sept. | -0.683 |
| | | Oct. | -0.706 |
| | | Nov. | -0.520 |
| | | Dec. | -0.188 |

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.821
MULTIPLE R SQUARED..... 0.674

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DF | SUMS OF SQUARES | MEAN SQUARES | F-VALUE |
|---|---|---|---|---|
| INTERCEPT | 1 | 1.875E-1 | 1.875E-1 | |
| REGRESSION | 24 | 6.563E1 | 2.734E0 | 20.852 |
| TYPE 1 | 5 | 1.386E1 | 2.771E0 | 21.132 |
| TYPE 2 | 11 | 3.323E1 | 3.021E0 | 23.034 |
| TYPE 3 | 8 | 8.250E0 | 1.031E0 | 7.864 |
| RESIDUALS | 242 | 3.173E1 | 1.311E-1 | |
| TOTAL | 267 | 9.755E1 | | |

Table 40 . Commercial catch rate index for cod in Div. 2J for the period 1962-79.

PREDICTED CATCH RATE

| | LN TRANSFORM | | RETRANSFORMED | | | |
|---|---|---|---|---|---|---|
| YEAR | MEAN | S.E. | MEAN | S.E. | CATCH | EFFORT |
| 1962 | 1.3438 | 0.0106 | 4.054 | 0.417 | 250265 | 61729 |
| 1963 | 1.2571 | 0.0102 | 3.718 | 0.376 | 211693 | 56937 |
| 1964 | 1.1422 | 0.0101 | 3.315 | 0.333 | 195032 | 58837 |
| 1965 | 1.0878 | 0.0091 | 3.141 | 0.299 | 252323 | 80339 |
| 1966 | 1.0603 | 0.0084 | 3.057 | 0.280 | 243688 | 79724 |
| 1967 | 1.1648 | 0.0082 | 3.394 | 0.306 | 240076 | 70736 |
| 1968 | 1.1403 | 0.0077 | 3.313 | 0.291 | 340809 | 102884 |
| 1969 | 1.0190 | 0.0078 | 2.934 | 0.260 | 360901 | 123014 |
| 1970 | 0.7456 | 0.0084 | 2.232 | 0.204 | 198786 | 89082 |
| 1971 | 0.6349 | 0.0080 | 1.998 | 0.179 | 150216 | 75188 |
| 1972 | 0.4255 | 0.0098 | 1.619 | 0.160 | 149763 | 92499 |
| 1973 | 0.4190 | 0.0115 | 1.607 | 0.172 | 57727 | 35918 |
| 1974 | 0.7481 | 0.0133 | 2.231 | 0.257 | 121267 | 54344 |
| 1975 | 0.7860 | 0.0106 | 2.321 | 0.238 | 81988 | 35325 |
| 1976 | ¯0.2719 | 0.0709 | 0.782 | 0.205 | 34636 | 44302 |
| 1977 | ¯0.3338 | 0.0131 | 0.756 | 0.087 | 43632 | 57681 |
| 1978 | ¯0.5751 | 0.0130 | 0.594 | 0.068 | 28866 | 48571 |
| 1979 | 0.2380 | 0.0196 | 1.336 | 0.186 | 24175 | 18099 |

Table 41 . Commercial catch rate index for cod in Div. 2J for the period 1978-86.

PREDICTED CATCH RATE

| | LN TRANSFORM | | RETRANSFORMED | | | |
|---|---|---|---|---|---|---|
| YEAR | MEAN | S.E. | MEAN | S.E. | CATCH | EFFORT |
| 1978 | ¯0.1025 | 0.0410 | 0.964 | 0.194 | 28866 | 29949 |
| 1979 | 0.7620 | 0.0225 | 2.310 | 0.346 | 24175 | 10467 |
| 1980 | 0.8174 | 0.0265 | 2.436 | 0.396 | 38237 | 15695 |
| 1981 | 1.5665 | 0.0303 | 5.143 | 0.893 | 41136 | 7999 |
| 1982 | 1.2576 | 0.0203 | 3.795 | 0.541 | 81736 | 21537 |
| 1983 | 1.8503 | 0.0234 | 6.854 | 1.048 | 51619 | 7531 |
| 1984 | 1.5449 | 0.0303 | 5.033 | 0.874 | 25289 | 5025 |
| 1985 | 1.4250 | 0.0424 | 4.437 | 0.909 | 11559 | 2605 |
| 1986 | 1.2499 | 0.0574 | 3.696 | 0.878 | 24578 | 6650 |

Table 42 . Commercial catch rate index for cod in Div. 3K for the period 1962-79.

PREDICTED CATCH RATE

| | LN TRANSFORM | | RETRANSFORMED | | | |
|---|---|---|---|---|---|---|
| YEAR | MEAN | S.E. | MEAN | S.E. | CATCH | EFFORT |
| 1962 | 0.7894 | 0.0163 | 2.361 | 0.301 | 88370 | 37432 |
| 1963 | 0.9226 | 0.0145 | 2.700 | 0.324 | 122830 | 45498 |
| 1964 | 0.9064 | 0.0144 | 2.656 | 0.318 | 151622 | 57078 |
| 1965 | 0.7199 | 0.0142 | 2.205 | 0.262 | 72634 | 32946 |
| 1966 | 0.6561 | 0.0139 | 2.069 | 0.243 | 89764 | 43393 |
| 1967 | 0.8465 | 0.0136 | 2.503 | 0.291 | 101919 | 40719 |
| 1968 | 0.6914 | 0.0132 | 2.144 | 0.246 | 156740 | 73116 |
| 1969 | 0.5682 | 0.0114 | 1.897 | 0.202 | 99376 | 52387 |
| 1970 | 0.4384 | 0.0136 | 1.664 | 0.194 | 91000 | 54684 |
| 1971 | 0.1877 | 0.0130 | 1.296 | 0.147 | 79546 | 61401 |
| 1972 | 0.2435 | 0.0129 | 1.370 | 0.155 | 146183 | 106704 |
| 1973 | 0.1801 | 0.0126 | 1.286 | 0.144 | 172951 | 134494 |
| 1974 | 0.2192 | 0.0130 | 1.337 | 0.152 | 159955 | 119640 |
| 1975 | 0.3557 | 0.0110 | 1.534 | 0.161 | 128385 | 83688 |
| 1976 | 0.2380 | 0.0173 | 1.359 | 0.178 | 101190 | 74434 |
| 1977 | ¯0.6013 | 0.0119 | 0.589 | 0.064 | 56788 | 96427 |
| 1978 | ¯0.6963 | 0.0152 | 0.535 | 0.066 | 43023 | 80469 |
| 1979 | ¯0.0391 | 0.0152 | 1.031 | 0.127 | 65483 | 63484 |

Table 43 . Commercial catch rate index for cod in Div. 3K for the period 1962-79.

PREDICTED CATCH RATE

| | LN TRANSFORM | | RETRANSFORMED | | | |
|---|---|---|---|---|---|---|
| YEAR | MEAN | S.E. | MEAN | S.E. | CATCH | EFFORT |
| 1978 | 0.0133 | 0.0154 | 1.079 | 0.134 | 43023 | 39889 |
| 1979 | 0.6463 | 0.0105 | 2.036 | 0.209 | 65483 | 32157 |
| 1980 | 0.7439 | 0.0156 | 2.239 | 0.279 | 65763 | 29368 |
| 1981 | 1.1974 | 0.0129 | 3.529 | 0.401 | 49961 | 14157 |
| 1982 | 0.9627 | 0.0155 | 2.787 | 0.347 | 55096 | 19767 |
| 1983 | 1.0143 | 0.0109 | 2.941 | 0.307 | 74720 | 25403 |
| 1984 | 1.6157 | 0.0096 | 5.371 | 0.527 | 93093 | 17333 |
| 1985 | 1.7151 | 0.0097 | 5.932 | 0.585 | 108528 | 18296 |
| 1986 | 1.3046 | 0.0101 | 3.934 | 0.396 | 89004 | 22626 |

Table 44. Commercial catch rate index for cod in Div. 3L for the period 1962-79.

PREDICTED CATCH RATE

| | LN TRANSFORM | | RETRANSFORMED | | | |
|---|---|---|---|---|---|---|
| YEAR | MEAN | S.E. | MEAN | S.E. | CATCH | EFFORT |
| 1962 | 0.7300 | 0.0176 | 2.250 | 0.297 | 164117 | 72944 |
| 1963 | 0.8546 | 0.0153 | 2.551 | 0.314 | 156361 | 61287 |
| 1964 | 0.7576 | 0.0143 | 2.317 | 0.276 | 215099 | 92847 |
| 1965 | 0.5349 | 0.0137 | 1.855 | 0.216 | 185825 | 100191 |
| 1966 | 0.6300 | 0.0129 | 2.041 | 0.231 | 181474 | 88933 |
| 1967 | 0.7146 | 0.0116 | 2.222 | 0.239 | 258205 | 116199 |
| 1968 | 0.6319 | 0.0113 | 2.046 | 0.217 | 266112 | 130054 |
| 1969 | 0.4501 | 0.0117 | 1.706 | 0.184 | 229182 | 134373 |
| 1970 | 0.3557 | 0.0117 | 1.552 | 0.167 | 196559 | 126659 |
| 1971 | 0.1116 | 0.0122 | 1.215 | 0.134 | 190755 | 156941 |
| 1972 | -0.0093 | 0.0108 | 1.078 | 0.112 | 158644 | 147186 |
| 1973 | -0.0027 | 0.0126 | 1.084 | 0.121 | 123831 | 114232 |
| 1974 | 0.0308 | 0.0150 | 1.120 | 0.137 | 91428 | 81661 |
| 1975 | 0.0111 | 0.0121 | 1.099 | 0.121 | 77135 | 70165 |
| 1976 | -0.0881 | 0.0141 | 0.995 | 0.118 | 78394 | 78827 |
| 1977 | -0.3397 | 0.0118 | 0.774 | 0.084 | 72443 | 93572 |
| 1978 | -0.1430 | 0.0197 | 0.939 | 0.131 | 66670 | 71018 |
| 1979 | 0.1356 | 0.0161 | 1.243 | 0.157 | 77233 | 62155 |

Table 45. Commercial catch rate index for cod in Div. 3L for the period 1978-86.

PREDICTED CATCH RATE

| | LN TRANSFORM | | RETRANSFORMED | | | |
|---|---|---|---|---|---|---|
| YEAR | MEAN | S.E. | MEAN | S.E. | CATCH | EFFORT |
| 1978 | 0.5264 | 0.0212 | 1.789 | 0.260 | 66670 | 37271 |
| 1979 | 0.4717 | 0.0164 | 1.698 | 0.217 | 77233 | 45494 |
| 1980 | 0.6253 | 0.0170 | 1.979 | 0.257 | 71782 | 36272 |
| 1981 | 0.6665 | 0.0143 | 2.065 | 0.247 | 79651 | 38571 |
| 1982 | 0.6591 | 0.0139 | 2.050 | 0.241 | 92942 | 45333 |
| 1983 | 0.7413 | 0.0115 | 2.229 | 0.238 | 103874 | 46611 |
| 1984 | 0.8037 | 0.0116 | 2.372 | 0.255 | 112005 | 47218 |
| 1985 | 1.0177 | 0.0140 | 2.934 | 0.346 | 111451 | 37980 |
| 1986 | 1.0613 | 0.0130 | 3.067 | 0.349 | 137935 | 44979 |

Table 46. Catch rate indices for Div. 2J3KL cod analyzed in two time periods (1962-79, 1978-86) and combined using overlapping years (1978-79).

| Year | 2J | 3K | 3L | 2J3KL |
|---|---|---|---|---|
| 1962 | 4.20 | 3.02 | 2.06 | 2.53 |
| 1963 | 3.85 | 3.45 | 2.34 | 2.65 |
| 1964 | 3.44 | 3.39 | 2.12 | 2.48 |
| 1965 | 3.25 | 2.82 | 1.70 | 2.10 |
| 1966 | 3.17 | 2.64 | 1.87 | 2.23 |
| 1967 | 3.51 | 3.20 | 2.04 | 2.44 |
| 1968 | 3.43 | 2.74 | 1.88 | 2.32 |
| 1969 | 3.04 | 2.42 | 1.57 | 1.90 |
| 1970 | 2.31 | 2.13 | 1.42 | 1.63 |
| 1971 | 2.07 | 1.66 | 1.11 | 1.37 |
| 1972 | 1.68 | 1.75 | 0.99 | 1.22 |
| 1973 | 1.67 | 1.64 | 0.99 | 1.21 |
| 1974 | 2.31 | 1.71 | 1.03 | 1.35 |
| 1975 | 2.40 | 1.96 | 1.01 | 1.41 |
| 1976 | 0.81 | 1.74 | 0.91 | 1.13 |
| 1977 | 0.78 | 0.75 | 0.71 | 0.67 |
| 1978 | 0.59 | 0.69 | 1.03 | 0.84 |
| 1979 | 1.41 | 1.31 | 0.97 | 1.16 |
| 1980 | 1.49 | 1.44 | 1.14 | 1.38 |
| 1981 | 3.14 | 2.27 | 1.18 | 1.73 |
| 1982 | 2.32 | 1.79 | 1.18 | 1.60 |
| 1983 | 4.19 | 1.89 | 1.28 | 1.90 |
| 1984 | 3.07 | 3.45 | 1.36 | 2.17 |
| 1985 | 2.71 | 3.81 | 1.68 | 2.57 |
| 1986 | 2.26 | 2.53 | 1.76 | 2.29 |

Table 47. NAFO Div. 2J3KL catch rates of cod analyzed by division and combined using survey biomass estimates compared with catch rates standardized using the multiplicative model.

| Year | 2J | 3K | 3L | 2J3KL | Standardized 2J3KL |
|---|---|---|---|---|---|
| 1978 | 0.964 | 1.079 | 1.789 | 1.222 | 2.131 |
| 1979 | 2.310 | 2.036 | 1.698 | 2.060 | 2.960 |
| 1980 | 2.436 | 2.239 | 1.979 | 2.252 | 3.518 |
| 1981 | 5.143 | 3.529 | 2.065 | 3.811 | 4.397 |
| 1982 | 3.795 | 2.787 | 2.050 | 3.011 | 4.084 |
| 1983 | 6.854 | 2.941 | 2.229 | 4.392 | 4.846 |
| 1984 | 5.033 | 5.371 | 2.372 | 4.419 | 5.520 |
| 1985 | 4.437 | 5.932 | 2.934 | 4.495 | 6.547 |
| 1986 | 3.696 | 3.934 | 3.067 | 3.600 | 5.817 |
| % Biomass [a] | 42 | 31 | 27 | 100 | |

a)% Biomass averaged over the period 1981-86 (From Fall Surveys)

Relationship

| | |
|---|---|
| Slope | 0.758 |
| Intercept | -0.103 |
| $r^2$ | 0.83 |

Table 48. Analysis of variance and regression coefficients from the regression of ln catch rate for cod in Div. 2J3KL for the years 1962-79 and excluding data from the first quarter.

| Country/Gear | | ln Power | Month | ln Power |
|---|---|---|---|---|
| Can-N | OTB-4 | -0.357 | Apr | 0.000 |
| Can-N | OTB-5 | 0.000 | May | -0.225 |
| ESP | OTB-6 | 0.257 | June | -0.441 |
| PRT | OTB-6 | 0.367 | July | -0.648 |
| PRT | OTB-7 | 0.705 | Aug | -0.640 |
| | | | Sept | -0.653 |
| | | | Oct | -0.683 |
| **Division** | | **ln Power** | Nov | -0.612 |
| 2J | | 0.000 | Dec | -0.455 |
| 3K | | -0.133 | | |
| 3L | | -0.230 | | |

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.767
MULTIPLE R SQUARED..... 0.588

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DF | SUMS OF SQUARES | MEAN SQUARES | F-VALUE |
|---|---|---|---|---|
| INTERCEPT | 1 | 4.072E-1 | 4.072E-1 | |
| REGRESSION | 31 | 2.507E2 | 8.089E0 | 52.446 |
| TYPE 1 | 4 | 5.333E1 | 1.333E1 | 86.445 |
| TYPE 2 | 8 | 6.352E1 | 7.939E0 | 51.479 |
| TYPE 3 | 2 | 9.126E0 | 4.563E0 | 29.585 |
| TYPE 4 | 17 | 1.303E2 | 7.666E0 | 49.709 |
| RESIDUALS | 1141 | 1.760E2 | 1.542E-1 | |
| TOTAL | 1173 | 4.271E2 | | |

Table 49 . Analysis of variance and regression coefficients from the regression of ln catch rate for cod in Div. 2J3KL for the years 1978-86 and excluding data from the first quarter.

| Country/Gear | ln Power | Month | ln Power |
|---|---|---|---|
| Can-N OTB-4 | -0.332 | Apr | 0.000 |
| PRT OTB-7 | -0.295 | May | -0.460 |
| PRT OTB-6 | -0.166 | June | -0.659 |
| Can-N OTB-5 | -0.109 | July | -0.758 |
| Can-M OTB-4 | 0.000 | Aug. | -0.912 |
| Can-M OTB-5 | 0.404 | Sept | -0.829 |
| | | Oct | -0.754 |
| | | Nov. | -0.574 |
| **Division** | **ln Power** | Dec | -0.343 |
| 2J | 0.000 | | |
| 3K | -0.378 | | |
| 3L | -0.704 | | |

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.777
MULTIPLE R SQUARED..... 0.604

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DF | SUMS OF SQUARES | MEAN SQUARES | F-VALUE |
|---|---|---|---|---|
| INTERCEPT | 1 | 9.653E0 | 9.653E0 | |
| REGRESSION | 23 | 1.124E2 | 4.886E0 | 24.983 |
| TYPE 1 | 5 | 2.125E1 | 4.250E0 | 21.729 |
| TYPE 2 | 8 | 2.675E1 | 3.344E0 | 17.099 |
| TYPE 3 | 2 | 2.093E1 | 1.047E1 | 53.520 |
| TYPE 4 | 8 | 1.696E1 | 2.120E0 | 10.838 |
| RESIDUALS | 377 | 7.373E1 | 1.956E-1 | |
| TOTAL | 401 | 1.958E2 | | |

Table 50. Commercial catch rate index for cod in Div. 2J3KL for the period 1962-79 (Analysis conducted excluding data from the first quarter).

PREDICTED CATCH RATE

| | LN TRANSFORM | | RETRANSFORMED | | | |
|---|---|---|---|---|---|---|
| YEAR | MEAN | S.E. | MEAN | S.E. | CATCH | EFFORT |
| 1962 | 0.5292 | 0.0042 | 1.830 | 0.118 | 502572 | 274631 |
| 1963 | 0.6090 | 0.0037 | 1.982 | 0.121 | 509209 | 256858 |
| 1964 | 0.4882 | 0.0036 | 1.757 | 0.105 | 602651 | 343022 |
| 1965 | 0.3233 | 0.0037 | 1.490 | 0.091 | 545035 | 365864 |
| 1966 | 0.4413 | 0.0034 | 1.677 | 0.098 | 524505 | 312820 |
| 1967 | 0.5910 | 0.0032 | 1.948 | 0.110 | 611764 | 314106 |
| 1968 | 0.4935 | 0.0033 | 1.767 | 0.101 | 810014 | 458532 |
| 1969 | 0.1837 | 0.0032 | 1.296 | 0.073 | 753690 | 581519 |
| 1970 | 0.1331 | 0.0032 | 1.232 | 0.070 | 520226 | 422239 |
| 1971 | ¯0.0924 | 0.0033 | 0.983 | 0.057 | 439518 | 447019 |
| 1972 | ¯0.1688 | 0.0035 | 0.911 | 0.054 | 458295 | 503171 |
| 1973 | ¯0.1477 | 0.0036 | 0.930 | 0.056 | 354509 | 381088 |
| 1974 | ¯0.0331 | 0.0046 | 1.043 | 0.071 | 372650 | 357397 |
| 1975 | ¯0.1125 | 0.0047 | 0.963 | 0.066 | 287508 | 298541 |
| 1976 | ¯0.2903 | 0.0066 | 0.805 | 0.065 | 214220 | 265991 |
| 1977 | ¯0.5737 | 0.0051 | 0.607 | 0.043 | 172720 | 284505 |
| 1978 | ¯0.7341 | 0.0069 | 0.517 | 0.043 | 138559 | 268197 |
| 1979 | ¯0.1537 | 0.0055 | 0.924 | 0.069 | 166899 | 180667 |

Table 51. Commercial catch rate index for cod in Div. 2J3KL for the period 1978-86 (Analysis conducted excluding data from the first quarter).

PREDICTED CATCH RATE

| | LN TRANSFORM | | RETRANSFORMED | | | |
|---|---|---|---|---|---|---|
| YEAR | MEAN | S.E. | MEAN | S.E. | CATCH | EFFORT |
| 1978 | ¯0.5601 | 0.0132 | 0.626 | 0.072 | 138559 | 221397 |
| 1979 | ¯0.4709 | 0.0092 | 0.686 | 0.066 | 166899 | 243428 |
| 1980 | ¯0.2555 | 0.0089 | 0.851 | 0.080 | 175788 | 206680 |
| 1981 | ¯0.2536 | 0.0090 | 0.852 | 0.081 | 170712 | 200351 |
| 1982 | ¯0.1624 | 0.0070 | 0.934 | 0.078 | 229774 | 245902 |
| 1983 | ¯0.1378 | 0.0075 | 0.957 | 0.083 | 232345 | 242672 |
| 1984 | ¯0.0225 | 0.0075 | 1.074 | 0.093 | 230387 | 214424 |
| 1985 | 0.1636 | 0.0070 | 1.295 | 0.108 | 231568 | 178885 |
| 1986 | 0.1243 | 0.0083 | 1.244 | 0.113 | 251517 | 202210 |

Table 52. Analysis of variance and regression coefficients from the regression of ln catch rate for cod in Div. 2J3KL for the years 1962-79 and excluding data from the first and second quarters.

| Country/Gear | | ln Power | Month | ln Power |
|---|---|---|---|---|
| Can-N | OTB-4 | -0.122 | July | 0.000 |
| Can-N | OTB-5 | 0.000 | Aug | 0.024 |
| ESP | OTB-6 | 0.299 | Sept | 0.013 |
| PRT | OTB-6 | 0.372 | Oct | -0.017 |
| PRT | OTB-7 | 0.656 | Nov | 0.049 |
| | | | Dec | 0.201 |

| Division | ln Power |
|---|---|
| 2J | 0.000 |
| 3K | -0.128 |
| 3L | -0.197 |

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.686
MULTIPLE R SQUARED..... 0.471

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DF | SUMS OF SQUARES | MEAN SQUARES | F-VALUE |
|---|---|---|---|---|
| INTERCEPT | 1 | 1.320E1 | 1.320E1 | |
| REGRESSION | 28 | 9.152E1 | 3.269E0 | 21.682 |
| TYPE 1 | 4 | 1.894E1 | 4.735E0 | 31.406 |
| TYPE 2 | 5 | 2.902E0 | 5.803E-1 | 3.850 |
| TYPE 3 | 2 | 4.067E0 | 2.033E0 | 13.487 |
| TYPE 4 | 17 | 6.550E1 | 3.853E0 | 25.557 |
| RESIDUALS | 682 | 1.028E2 | 1.508E-1 | |
| TOTAL | 711 | 2.075E2 | | |

Table 53 . Analysis of variance and regression coefficients from the regression of ln catch rate for cod in Div. 2J3KL for the years 1978-86 and excluding data from the first and second quarters.

| Country/Gear | ln Power | Month | ln Power |
|---|---|---|---|
| PRT OTB-7 | -0.701 | July | 0.000 |
| Can-N OTB-4 | -0.523 | Aug. | -0.202 |
| PRT OTB-6 | -0.359 | Sept | -0.125 |
| Can-N OTB-5 | -0.352 | Oct | -0.084 |
| Can-M OTB-4 | 0.000 | Nov | 0.071 |
| Can-M OTB-5 | 0.328 | Dec | 0.383 |
| **Division** | **ln Power** | | |
| 2J | 0.000 | | |
| 3K | -0.170 | | |
| 3L | -0.236 | | |

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.720
MULTIPLE R SQUARED..... 0.518

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DF | SUMS OF SQUARES | MEAN SQUARES | F-VALUE |
|---|---|---|---|---|
| INTERCEPT | 1 | 5.997E-1 | 5.997E-1 | |
| REGRESSION | 20 | 2.937E1 | 1.469E0 | 9.570 |
| TYPE 1 | 5 | 1.194E1 | 2.388E0 | 15.562 |
| TYPE 2 | 5 | 7.538E0 | 1.508E0 | 9.824 |
| TYPE 3 | 2 | 7.971E-1 | 3.986E-1 | 2.597 |
| TYPE 4 | 8 | 3.837E0 | 4.797E-1 | 3.125 |
| RESIDUALS | 178 | 2.732E1 | 1.535E-1 | |
| TOTAL | 199 | 5.729E1 | | |

Table 54. Commercial catch rate index for cod in Div. 2J3KL for the period 1962-79 (Analysis conducted excluding data from the first and second quarters).

PREDICTED CATCH RATE

| | LN TRANSFORM | | RETRANSFORMED | | | |
|---|---|---|---|---|---|---|
| YEAR | MEAN | S.E. | MEAN | S.E. | CATCH | EFFORT |
| 1962 | 0.0413 | 0.0054 | 1.121 | 0.082 | 502572 | 448389 |
| 1963 | 0.0761 | 0.0052 | 1.161 | 0.084 | 509209 | 438734 |
| 1964 | -0.0285 | 0.0051 | 1.045 | 0.075 | 602651 | 576449 |
| 1965 | -0.1036 | 0.0050 | 0.970 | 0.068 | 545035 | 561989 |
| 1966 | 0.1012 | 0.0046 | 1.191 | 0.080 | 524505 | 440561 |
| 1967 | 0.2524 | 0.0040 | 1.385 | 0.087 | 611764 | 441627 |
| 1968 | 0.2080 | 0.0045 | 1.325 | 0.089 | 810014 | 611460 |
| 1969 | -0.1474 | 0.0045 | 0.929 | 0.062 | 753690 | 811717 |
| 1970 | -0.1887 | 0.0044 | 0.891 | 0.059 | 520226 | 583858 |
| 1971 | -0.4034 | 0.0047 | 0.719 | 0.050 | 439518 | 611553 |
| 1972 | -0.5408 | 0.0052 | 0.626 | 0.045 | 458295 | 731700 |
| 1973 | -0.5957 | 0.0055 | 0.593 | 0.044 | 354509 | 598047 |
| 1974 | -0.4645 | 0.0095 | 0.675 | 0.065 | 372650 | 552463 |
| 1975 | -0.5202 | 0.0054 | 0.639 | 0.047 | 287508 | 449734 |
| 1976 | -0.7136 | 0.0092 | 0.526 | 0.050 | 214220 | 407388 |
| 1977 | -0.8043 | 0.0101 | 0.480 | 0.048 | 172720 | 359804 |
| 1978 | -0.9310 | 0.0147 | 0.422 | 0.051 | 138559 | 328371 |
| 1979 | -0.5092 | 0.0096 | 0.645 | 0.063 | 166899 | 258752 |

Table 55. Commercial catch rate index for cod in Div. 2J3KL for the period 1978-86 (Analysis conducted excluding data from the first and second quarters).

PREDICTED CATCH RATE

| | LN TRANSFORM | | RETRANSFORMED | | | |
|---|---|---|---|---|---|---|
| YEAR | MEAN | S.E. | MEAN | S.E. | CATCH | EFFORT |
| 1978 | -0.1702 | 0.0243 | 0.900 | 0.140 | 138559 | 153932 |
| 1979 | -0.0200 | 0.0149 | 1.051 | 0.128 | 166899 | 158805 |
| 1980 | -0.0048 | 0.0182 | 1.065 | 0.144 | 175788 | 165017 |
| 1981 | -0.0096 | 0.0105 | 1.064 | 0.109 | 170712 | 160409 |
| 1982 | -0.0940 | 0.0118 | 0.978 | 0.106 | 229774 | 235058 |
| 1983 | 0.0706 | 0.0087 | 1.154 | 0.108 | 232345 | 201306 |
| 1984 | 0.1556 | 0.0091 | 1.256 | 0.120 | 230387 | 183379 |
| 1985 | 0.2691 | 0.0090 | 1.407 | 0.133 | 231568 | 164535 |
| 1986 | 0.3258 | 0.0097 | 1.489 | 0.146 | 251517 | 168911 |

Table 56. Relationships of standardized catch rates excluding first quarter and first and second quarters with standardized catch for the entire year for cod in Div. 2J3KL in two time periods (1962-79, 1978-86).

| Year | 2J3KL Jan.-Dec. | 2J3KL Apr.-Dec. | 2J3KL Jul.-Dec. |
|---|---|---|---|
| 1962 | 1.486 | 1.454 | 1.316 |
| 1963 | 1.556 | 1.575 | 1.362 |
| 1964 | 1.455 | 1.395 | 1.227 |
| 1965 | 1.236 | 1.183 | 1.138 |
| 1966 | 1.308 | 1.332 | 1.397 |
| 1967 | 1.432 | 1.547 | 1.626 |
| 1968 | 1.361 | 1.403 | 1.555 |
| 1969 | 1.114 | 1.029 | 1.090 |
| 1970 | 0.962 | 0.979 | 1.046 |
| 1971 | 0.806 | 0.781 | 0.844 |
| 1972 | 0.716 | 0.723 | 0.735 |
| 1973 | 0.709 | 0.739 | 0.696 |
| 1974 | 0.792 | 0.828 | 0.792 |
| 1975 | 0.832 | 0.765 | 0.750 |
| 1976 | 0.665 | 0.640 | 0.617 |
| 1977 | 0.393 | 0.482 | 0.563 |
| 1978 | 0.401 | 0.410 | 0.495 |
| 1979 | 0.774 | 0.734 | 0.757 |
| Slope | | 0.989 | 0.885 |
| Intercept | | 0.011 | 0.116 |
| $r^2$ | | 0.98 | 0.89 |
| 1978 | 0.482 | 0.661 | 0.781 |
| 1979 | 0.669 | 0.724 | 0.912 |
| 1980 | 0.795 | 0.898 | 0.925 |
| 1981 | 0.994 | 0.900 | 0.924 |
| 1982 | 0.923 | 0.987 | 0.849 |
| 1983 | 1.095 | 1.011 | 1.002 |
| 1984 | 1.248 | 1.135 | 1.091 |
| 1985 | 1.480 | 1.367 | 1.222 |
| 1986 | 1.315 | 1.313 | 1.293 |
| Slope | | 0.725 | 0.474 |
| Intercept | | 0.275 | 0.523 |
| $r^2$ | | 0.94 | 0.80 |

Table 57. Catch rates of cod in Div. 2J3KL for first quarter for Can-N tonnage class 5 vessels for the period 1978-87.

| Year | 2J | | 3K | | 3L | |
|---|---|---|---|---|---|---|
| | C | E | C | E | C | E |
| 1978 | 3864 | 2920 | 2147 | 2959 | 239 | 400 |
| 1979 | 5379 | 2319 | 9508 | 5193 | 827 | 805 |
| 1980 | 6337 | 3289 | 4461 | 3556 | 4569 | 3253 |
| 1981 | 15776 | 2726 | 13986 | 3467 | 4699 | 3051 |
| 1982 | 22146 | 5929 | 2471 | 1296 | 3337 | 2527 |
| 1983 | 17430 | 1989 | 6522 | 3154 | 8629 | 4950 |
| 1984 | 2506 | 402 | 15508 | 3132 | 18298 | 10403 |
| 1985 | 14 | 11 | 16890 | 3440 | 906 | 223 |
| 1986 | 2385 | 471 | 30354 | 9232 | 5455 | 2212 |
| 1987 | 9641 | 3533 | 18645 | 3727 | 587 | 261 |

Catch Rate

| Year | 2J | 3K | 3L |
|---|---|---|---|
| 1978 | 1.323 | 0.726 | 0.598 |
| 1979 | 2.320 | 1.831 | 1.027 |
| 1980 | 1.927 | 1.255 | 1.405 |
| 1981 | 5.787 | 4.034 | 1.540 |
| 1982 | 3.735 | 1.907 | 1.321 |
| 1983 | 8.763 | 2.068 | 1.743 |
| 1984 | 6.234 | 4.952 | 1.759 |
| 1985 | - | 4.910 | 4.063 |
| 1986 | 5.064 | 3.288 | 2.466 |
| 1987 | 2.729 | 5.003 | 2.215 |

Table 58 . Catch rates of cod in Div. 2J3KL for first quarter for Can-N tonnage class 5 vessels for the period 1983-87. Included are the number of hours of observed effort from which catch rates are calculated.

A) Catch rates (t/hr)

| | 2J | | | 3K | | | 3L | | |
|---|---|---|---|---|---|---|---|---|---|
| | Jan. | Feb. | Mar. | Jan. | Feb. | Mar. | Jan. | Feb. | Mar. |
| 1983 | 16.3 | 11.3 | 3.4 | 2.3 | 1.6 | 3.2 | 1.6 | 1.6 | 1.9 |
| 1984 | - | - | - | 4.5 | 3.9 | 3.9 | 2.7 | 3.4 | 1.3 |
| 1985 | - | - | - | 23.6 | 6.4 | 5.0 | - | 6.0 | - |
| 1986 | 7.9 | - | 1.4 | 3.8 | 5.9 | 2.4 | 1.8 | 1.4 | 2.6 |
| 1987 | 2.5 | 2.6 | 3.3 | 7.2 | 4.2 | 2.0 | 3.4 | 0.0 | 0.2 |

B) Observed effort (hrs)

| | 2J | | | 3K | | | 3L | | |
|---|---|---|---|---|---|---|---|---|---|
| | Jan. | Feb. | Mar. | Jan. | Feb. | Mar. | Jan. | Feb. | Mar. |
| 1983 | 73 | 128 | 100 | 100 | 47 | 243 | 125 | 145 | 208 |
| 1984 | - | - | - | 32 | 156 | 167 | 174 | 135 | 175 |
| 1985 | - | - | - | 4 | 83 | 298 | - | 25 | - |
| 1986 | 11 | - | 25 | 495 | 383 | 674 | 19 | 13 | 478 |
| 1987 | 1155 | 1423 | 2789 | 960 | 1832 | 214 | 44 | 1 | 62 |

Table 59. Number of purchase slips along with inshore and nearshore catches by gear for cod in NAFO Div. 2J.

| | Inshore (<35') | | | | Nearshore (35-64') | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Trap | GN | Jigger +HL | LT | Trap | GN | Jigger +HL | LT |
| **Purchase Slips** | | | | | | | | |
| 1979 | - | - | - | - | 10 | 1591 | 5 | 10 |
| 1980 | - | - | - | - | 22 | 2962 | 7 | 15 |
| 1981 | 418 | 1630 | 511 | 96 | 78 | 3354 | 10 | 66 |
| 1982 | 679 | 1811 | 824 | 115 | 56 | 2884 | 28 | 20 |
| 1983 | 721 | 1115 | 940 | 99 | 107 | 1545 | 66 | 7 |
| 1984 | 1505 | 2644 | 1664 | 269 | 107 | 2104 | 53 | 32 |
| 1985 | 1771 | 1180 | 2585 | 353 | 152 | 944 | 206 | 27 |
| 1986 | 1822 | 5567 | 1541 | 151 | 110 | 1298 | 46 | 19 |
| **Catches** | | | | | | | | |
| 1979 | | | | | 9 | 3734 | 1 | 18 |
| 1980 | | | | | 53 | 6817 | 6 | 19 |
| 1981 | 3715 | 1379 | 179 | 32 | 178 | 8303 | 4 | 40 |
| 1982 | 4127 | 2508 | 713 | 101 | 136 | 6129 | 24 | 13 |
| 1983 | 3675 | 1444 | 1144 | 293 | 171 | 3316 | 32 | 4 |
| 1984 | 5331 | 2265 | 978 | 108 | 285 | 3771 | 60 | 24 |
| 1985 | 4620 | 1200 | 1774 | 148 | 317 | 1750 | 175 | 32 |
| 1986 | 4210 | 4822 | 539 | 39 | 131 | 2760 | 22 | 19 |
| **Catch per slip** | | | | | | | | |
| 1979 | | | | | .90 | 2.35 | .20 | 1.80 |
| 1980 | | | | | 2.41 | 2.30 | .86 | 1.27 |
| 1981 | 8.89 | .85 | .35 | .33 | 2.28 | 2.48 | .40 | .61 |
| 1982 | 6.08 | 1.38 | .87 | .88 | 2.43 | 2.13 | .86 | .65 |
| 1983 | 5.10 | 1.30 | 1.22 | 2.96 | 1.60 | 2.15 | .48 | .57 |
| 1984 | 3.54 | .86 | .59 | .40 | 2.66 | 1.79 | 1.13 | .75 |
| 1985 | 2.61 | 1.02 | .69 | .42 | 2.09 | 1.85 | .85 | 1.19 |
| 1986 | 2.31 | .87 | .35 | .26 | 1.19 | 2.13 | .48 | 1.00 |

Table 60. Number of purchase slips along with inshore and nearshore catches by gear for cod in NAFO Div. 3K

| | Inshore ( 35') | | | | Nearshore (35-64') | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Trap | GN | Jigger +HL | LT | Trap | GN | Jigger +HL | LT |
| Purchase Slips | | | | | | | | |
| 1979 | - | - | - | - | 832 | 9872 | 240 | 753 |
| 1980 | - | - | - | - | 1187 | 9194 | 43 | 621 |
| 1981 | 3953 | 12262 | 5937 | 23533 | 771 | 8244 | 65 | 647 |
| 1982 | 12288 | 16679 | 4590 | 18498 | 1881 | 7838 | 38 | 453 |
| 1983 | 10679 | 21418 | 33405 | 6256 | 1396 | 7472 | 962 | 90 |
| 1984 | 10373 | 22076 | 35202 | 6432 | 1021 | 6356 | 559 | 104 |
| 1985 | 18833 | 18555 | 28562 | 5760 | 1152 | 3711 | 416 | 61 |
| 1986 | 20391 | 19108 | 24868 | 5128 | 1329 | 3635 | 235 | 107 |
| Catch | | | | | | | | |
| 1979 | - | - | - | - | 1241 | 5688 | 138 | 576 |
| 1980 | - | - | - | - | 2029 | 5378 | 25 | 816 |
| 1981 | 3440 | 4634 | 1991 | 5992 | 819 | 5117 | 21 | 365 |
| 1982 | 12538 | 10016 | 2043 | 5660 | 3885 | 7342 | 11 | 406 |
| 1983 | 8950 | 9987 | 8601 | 2142 | 2696 | 8125 | 713 | 83 |
| 1984 | 7764 | 7997 | 8066 | 3341 | 2192 | 6192 | 275 | 154 |
| 1985 | 10924 | 5448 | 6088 | 2143 | 2380 | 2603 | 224 | 122 |
| 1986 | 11624 | 5288 | 4545 | 1382 | 2965 | 2325 | 134 | 35 |
| Catch per slip | | | | | | | | |
| 1979 | - | - | - | - | 1.49 | .58 | .58 | .76 |
| 1980 | - | - | - | - | 1.71 | .58 | .58 | 1.31 |
| 1981 | 0.87 | 0.38 | 0.34 | 0.25 | 1.06 | .62 | .32 | .56 |
| 1982 | 1.02 | 0.60 | 0.45 | 0.31 | 2.07 | .94 | .29 | .90 |
| 1983 | 0.84 | 0.47 | 0.26 | 0.34 | 1.93 | 1.09 | .74 | .92 |
| 1984 | 0.75 | 0.36 | 0.23 | 0.52 | 2.15 | .97 | .49 | 1.48 |
| 1985 | 0.58 | 0.29 | 0.21 | 0.37 | 2.07 | .70 | .54 | 2.00 |
| 1986 | 0.57 | 0.28 | 0.18 | 0.27 | 2.18 | .64 | .57 | .33 |

Table 61. Numbers of purchase slips along with inshore and nearshore catches by gear for cod in NAFO Div. 3L.

| | (Inshore ( 35') | | | | Nearshore (35-64') | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Trap | GN | Jigger +HL | LT | Trap | GN | Jigger +HL | LT |
| Purchase Slips | | | | | | | | |
| 1979 | - | - | - | - | 1901 | 6664 | 126 | 1082 |
| 1980 | - | - | - | - | 1405 | 7016 | 184 | 1712 |
| 1981 | 10911 | 15796 | 18350 | 15965 | 1783 | 8481 | 321 | 2783 |
| 1982 | 19007 | 20722 | 13836 | 10290 | 2815 | 8156 | 221 | 1214 |
| 1983 | 21382 | 17850 | 20116 | 5339 | 3059 | 6032 | 760 | 879 |
| 1984 | 23152 | 18248 | 20402 | 4332 | 2698 | 5084 | 527 | 647 |
| 1985 | 16518 | 12475 | 15582 | 2583 | 2049 | 3370 | 373 | 439 |
| 1986 | 12983 | 11235 | 11228 | 3151 | 1272 | 2881 | 275 | 225 |
| Catch | | | | | | | | |
| 1979 | - | - | - | - | 4390 | 6343 | 59 | 2139 |
| 1980 | - | - | - | - | 2751 | 4262 | 109 | 2599 |
| 1981 | 8092 | 6053 | 7453 | 7390 | 2086 | 6055 | 189 | 3906 |
| 1982 | 19178 | 10674 | 6150 | 4390 | 4929 | 9586 | 145 | 1256 |
| 1983 | 19413 | 8242 | 8421 | 2696 | 6269 | 7890 | 605 | 1126 |
| 1984 | 18732 | 8290 | 7106 | 2544 | 4400 | 6663 | 334 | 1030 |
| 1985 | 16483 | 5176 | 5511 | 1717 | 5048 | 3574 | 137 | 506 |
| 1986 | 12115 | 4853 | 3972 | 1764 | 3487 | 3287 | 141 | 312 |
| Catch per slip | | | | | | | | |
| 1979 | - | - | - | - | 2.31 | 0.95 | 0.47 | 1.98 |
| 1980 | - | - | - | - | 1.96 | 0.61 | 0.59 | 1.52 |
| 1981 | .74 | .38 | .41 | .46 | 1.17 | 0.71 | 0.59 | 1.40 |
| 1982 | 1.01 | .52 | .44 | .43 | 1.75 | 1.18 | 0.66 | 0.97 |
| 1983 | .91 | .46 | .42 | .50 | 2.05 | 1.31 | 0.80 | 1.28 |
| 1984 | .81 | .45 | .35 | .59 | 1.63 | 1.31 | 0.63 | 1.59 |
| 1985 | 1.00 | .41 | .35 | .66 | 2.46 | 1.06 | 0.37 | 1.15 |
| 1986 | .93 | .43 | .35 | .56 | 2.74 | 1.14 | 0.51 | 1.39 |

Table 62. Selectivity coefficients for cod in NAFO Div. 2J3KL for the period 1962-86.

SELECTIVITY COEFFICIENTS

| AGE | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 0.16 | 0.17 | 0.13 | 0.08 | 0.22 | 0.20 | 0.28 | 0.09 | 0.21 | 0.30 | 0.40 | 0.32 | 0.19 | 0.15 | 0.19 | 0.46 | 0.13 | 0.11 |
| 5 | 0.32 | 0.54 | 0.33 | 0.24 | 0.51 | 0.41 | 0.66 | 0.32 | 0.37 | 0.65 | 0.71 | 0.84 | 0.45 | 0.43 | 0.45 | 0.84 | 0.41 | 0.45 |
| 6 | 0.56 | 0.95 | 0.57 | 0.46 | 0.68 | 0.74 | 0.86 | 0.73 | 0.75 | 0.96 | 0.87 | 0.68 | 0.79 | 0.71 | 0.67 | 0.86 | 0.75 | 0.57 |
| 7 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 8 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 9 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 11 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 12 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 13 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

| AGE | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|
| 4 | 0.35 | 0.18 | 0.25 | 0.11 | 0.11 | 0.13 | 0.17 |
| 5 | 0.60 | 0.50 | 0.50 | 0.49 | 0.38 | 0.42 | 0.67 |
| 6 | 0.94 | 0.71 | 0.62 | 0.85 | 0.72 | 0.67 | 0.97 |
| 7 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 8 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 9 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 11 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 12 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 13 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

Table 63. Results of calibration of fall age 6+ survey abundance (1978-86) with the abundance ($X10^{-5}$) in the following year of 7+ Cod as estimated from cohort analysis.

| Year | Survey age 6+ | $F_t$ = 0.20 Obs. | Res. | $F_t$ = 0.25 Obs. | Res. | $F_t$ = 0.30 Obs. | Res. | $F_t$ = 0.35 Obs. | Res. |
|---|---|---|---|---|---|---|---|---|---|
| 1978 | 9.78 | 533 | -318 | 533 | -378 | 533 | -420 | 533 | -450 |
| 1979 | 16.01 | 1170 | -267 | 1170 | -178 | 1170 | -118 | 1170 | -76 |
| 1980 | 24.64 | 1683 | -567 | 1650 | -302 | 1629 | -123 | 1613 | 3 |
| 1981 | 26.69 | 2026 | -417 | 1951 | -144 | 1900 | 38 | 1864 | 167 |
| 1982 | 20.80 | 1656 | -232 | 1554 | -129 | 1486 | -60 | 1438 | -10 |
| 1983 | 19.55 | 1476 | -294 | 1342 | -253 | 1252 | -227 | 1188 | -207 |
| 1984 | 19.93 | 2277 | 470 | 1970 | 348 | 1765 | 266 | 1619 | 208 |
| 1985 | 17.36 | 2998 | 1433 | 2460 | 1018 | 2103 | 742 | 1848 | 545 |
| 1986 | 45.86 | 4441 | 193 | 3455 | 19 | 2794 | -98 | 2326 | -180 |
| | $r^2$ | 0.70 | | 0.7237 | | 0.7249 | | 0.69 | |
| | slope | 94 | | 70 | | 54 | | 42 | |
| | intercept | -70 | | 228 | | 428 | | 570 | |

Table 64. Results of calibration of cohort analysis using standardized catch rate versus offshore exploitable biomass (000't) for the years 1962-86.

| Year | Catch rate | $F_t$ = 0.10 Obs. | $F_t$ = 0.10 Res. | $F_t$ = 0.15 Obs. | $F_t$ = 0.15 Res. | $F_t$ = 0.20 Obs. | $F_t$ = 0.20 Res. |
|---|---|---|---|---|---|---|---|
| 1962 | 2.53 | 13619 | -15 | | | | |
| 1963 | 2.65 | 15978 | 1550 | | | | |
| 1964 | 2.48 | 12846 | -456 | | | | |
| 1965 | 2.10 | 9486 | -1300 | | | | |
| 1966 | 2.23 | 11374 | -272 | | | | |
| 1967 | 2.44 | 10981 | -2057 | | | | |
| 1968 | 2.32 | 12725 | 483 | | | | |
| 1969 | 1.90 | 8535 | -925 | | | | |
| 1970 | 1.63 | 9035 | 1363 | | | | |
| 1971 | 1.37 | 10025 | 4075 | | | | |
| 1972 | 1.22 | 8427 | 3470 | | | | |
| 1973 | 1.21 | 5674 | 783 | | | | |
| 1974 | 1.35 | 3592 | -2226 | | | | |
| 1975 | 1.41 | 2206 | -4009 | | | | |
| 1976 | 1.13 | 1325 | -3035 | | | | |
| 1977 | 0.67 | 2710 | 1397 | | | | |
| 1978 | 0.84 | 2720 | 280 | | | | |
| 1979 | 1.16 | 4804 | 245 | | | | |
| 1980 | 1.38 | 7013 | 996 | 6804 | 1028 | 6700 | 1050 |
| 1981 | 1.73 | 6772 | -1563 | 6485 | -1297 | 6225 | -1276 |
| 1982 | 1.60 | 5394 | -2079 | 4930 | -2107 | 4696 | -2117 |
| 1983 | 1.90 | 6242 | -2818 | 5601 | -3155 | 5078 | -3321 |
| 1984 | 2.17 | 9660 | -1589 | 7519 | -2785 | 6444 | -3382 |
| 1985 | 2.57 | 12190 | -1709 | 8698 | -3898 | 6950 | -4990 |
| 1986 | 2.29 | 21455 | 9411 | 14348 | 3357 | 10793 | 333 |
| | $r^2$ | 0.66 | | 0.67 | | 0.61 | |
| | slope | 6624 | | 5731 | | 5285 | |
| | intercept | -3124 | | -2134 | | -1644 | |

Table 65. Results of calibration of cohort analysis using standardized catch rate versus offshore exploitable biomass for the years 1978-86.

| Year | Catch rate | $F_t$ = 0.15 Obs. | Res. | $F_t$ = 0.17 Obs. | Res. | $F_t$ = 0.20 Obs. | Res. |
|---|---|---|---|---|---|---|---|
| 1978 | 2.13 | 2720 | -222 | 2720 | -489 | 2720 | -790 |
| 1979 | 2.96 | 4805 | 440 | 4805 | 411 | 4805 | 378 |
| 1980 | 3.52 | 6804 | 1479 | 6755 | 1562 | 6700 | 1655 |
| 1981 | 4.40 | 6485 | -350 | 6362 | -88 | 6225 | 207 |
| 1982 | 4.08 | 4930 | -1356 | 4820 | -1173 | 4696 | -968 |
| 1983 | 4.85 | 5601 | -2006 | 5355 | -1738 | 5078 | -1437 |
| 1984 | 5.52 | 7519 | -1237 | 7014 | -1036 | 6444 | -811 |
| 1985 | 6.55 | 8698 | -1825 | 7876 | -1645 | 6950 | -1442 |
| 1986 | 5.82 | 14348 | 5077 | 12676 | 4197 | 10793 | 3207 |
| | $r^2$ | 0.55 | | 0.54 | | 0.50 | |
| | slope | 1715 | | 1428 | | 1105 | |
| | intercept | -713 | | 167 | | 1156 | |

Table 66. Relationship of age 3 survey recruitment index to age 4 cohort abundance at the beginning of the following year for the 1975-79 year-classes.

| Year-class | Age 3 survey | Age 4 cohort |
|---|---|---|
| 75 | 6.22 | 273 |
| 76 | 2.38 | 147 |
| 77 | 3.25 | 156 |
| 78 | 5.90 | 403 |
| 79 | 7.06 | 389 |
| Slope | | 54.12 |
| Intercept | | 5.05 |
| $r^2$ | | 0.80 |
| Estimates for the 80-83 year-classes | | |
| 1980 | 13.88 | 473[a] |
| 1981 | 12.19 | 473[a] |
| 1982 | 8.65 | 473 |
| 1983 | 5.43 | 299 |

[a]Outside the range of observations set at the 1982 level.

Table 67. Comparison of year-class sizes from cohort analyses using average partial recruitment and partial recruitment adjusted to reconcile year-class strengths.

| Year-class | Year-class size estimated by Average PR | Adjusted PR |
|---|---|---|
| 1980 | 583.8 | 475.2 |
| 1981 | 613.3 | 469.6 |
| 1982 | 407.5 | 477.9 |

| Age | Partial recruitment vectors Average PR | Adjusted PR |
|---|---|---|
| 3 | | |
| 4 | 0.20 | 0.17 |
| 5 | 0.50 | 0.67 |
| 6 | 0.75 | 0.97 |
| 7 | 1.00 | 1.00 |
| 8 | 1.00 | 1.00 |
| 9 | 1.00 | 1.00 |
| 10 | 1.00 | 1.00 |
| 11 | 1.00 | 1.00 |
| 12 | 1.00 | 1.00 |
| 13 | 1.00 | 1.00 |

Table 68. Results of cohort analysis for cod in NAFO Div. 2J3KL using fully recruited fishing mortality of 0.21. (Population numbers x $10^{-5}$, Population biomass x $10^{-2}$ tons)

POPULATION NUMBERS

| AGE | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 5405 | 5771 | 5081 | 6874 | 8160 | 9250 | 6674 | 5753 | 5342 | 5863 | 4729 | 2029 | 1133 |
| 5 | 6781 | 4184 | 4480 | 3919 | 5374 | 6081 | 6863 | 4635 | 4366 | 3856 | 4176 | 3150 | 1293 |
| 6 | 3683 | 4957 | 2890 | 3158 | 2796 | 3548 | 4065 | 3818 | 2923 | 2875 | 2324 | 2364 | 1724 |
| 7 | 1928 | 2472 | 3009 | 1832 | 1993 | 1717 | 2025 | 2016 | 1738 | 1542 | 1500 | 1209 | 1400 |
| 8 | 1068 | 1139 | 1500 | 1576 | 931 | 1091 | 905 | 926 | 741 | 710 | 759 | 721 | 670 |
| 9 | 723 | 618 | 672 | 778 | 683 | 484 | 542 | 398 | 312 | 363 | 363 | 353 | 343 |
| 10 | 595 | 404 | 368 | 367 | 334 | 342 | 241 | 241 | 160 | 165 | 195 | 191 | 161 |
| 11 | 394 | 319 | 228 | 195 | 168 | 194 | 135 | 129 | 93 | 98 | 96 | 102 | 87 |
| 12 | 302 | 224 | 188 | 111 | 98 | 95 | 105 | 61 | 51 | 59 | 61 | 52 | 49 |
| 13 | 295 | 158 | 147 | 99 | 57 | 59 | 47 | 55 | 12 | 32 | 38 | 35 | 22 |
| 4+ | 21173 | 20247 | 18563 | 18908 | 20594 | 22861 | 21602 | 18033 | 15737 | 15564 | 14241 | 10205 | 6882 |
| 5+ | 15768 | 14476 | 13482 | 12034 | 12435 | 13611 | 14928 | 12280 | 10395 | 9700 | 9512 | 8176 | 5749 |
| 6+ | 8987 | 10292 | 9002 | 8116 | 7060 | 7531 | 8065 | 7645 | 6030 | 5844 | 5335 | 5026 | 4456 |
| 7+ | 5304 | 5335 | 6112 | 4957 | 4265 | 3983 | 4000 | 3827 | 3107 | 2970 | 3012 | 2662 | 2733 |

| AGE | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 1084 | 1904 | 3363 | 2920 | 2731 | 1467 | 1556 | 4029 | 3885 | 4752 | 4696 | 4779 |
| 5 | 796 | 761 | 1254 | 2160 | 2231 | 2124 | 1092 | 1211 | 3004 | 3056 | 3756 | 3707 |
| 6 | 740 | 423 | 371 | 662 | 1415 | 1487 | 1478 | 774 | 822 | 2073 | 2215 | 2739 |
| 7 | 750 | 295 | 158 | 194 | 358 | 894 | 946 | 985 | 502 | 501 | 1348 | 1509 |
| 8 | 600 | 260 | 89 | 81 | 89 | 194 | 569 | 577 | 577 | 303 | 297 | 853 |
| 9 | 229 | 161 | 68 | 42 | 38 | 41 | 115 | 360 | 319 | 339 | 183 | 180 |
| 10 | 113 | 66 | 33 | 31 | 21 | 19 | 23 | 65 | 187 | 181 | 197 | 116 |
| 11 | 38 | 24 | 13 | 15 | 16 | 10 | 11 | 12 | 36 | 96 | 110 | 116 |
| 12 | 19 | 10 | 6 | 6 | 8 | 7 | 6 | 7 | 7 | 21 | 56 | 64 |
| 13 | 14 | 5 | 3 | 3 | 3 | 5 | 4 | 3 | 4 | 4 | 12 | 31 |
| 4+ | 4382 | 3909 | 5358 | 6113 | 6910 | 6248 | 5802 | 8022 | 9343 | 11326 | 12870 | 14095 |
| 5+ | 3298 | 2005 | 1995 | 3194 | 4179 | 4782 | 4246 | 3993 | 5458 | 6574 | 8175 | 9315 |
| 6+ | 2502 | 1244 | 741 | 1034 | 1948 | 2658 | 3154 | 2782 | 2454 | 3518 | 4418 | 5609 |
| 7+ | 1762 | 821 | 370 | 372 | 533 | 1170 | 1675 | 2008 | 1632 | 1444 | 2204 | 2870 |

Table 68. Continued.

POPULATION BIOMASS (AVERAGE)

| AGE | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 2623 | 2804 | 2461 | 3351 | 3888 | 4399 | 3076 | 2765 | 2507 | 2735 | 2060 | 768 | 649 |
| 5 | 5123 | 3078 | 3327 | 2926 | 3870 | 4405 | 4570 | 3268 | 3140 | 2662 | 2038 | 1680 | 902 |
| 6 | 3736 | 4800 | 2855 | 3113 | 2722 | 3340 | 3594 | 3251 | 2656 | 2599 | 1842 | 1766 | 1299 |
| 7 | 2489 | 3230 | 3679 | 2210 | 2485 | 2105 | 2332 | 2114 | 1907 | 1833 | 1616 | 1187 | 1199 |
| 8 | 1744 | 1876 | 2331 | 2265 | 1449 | 1663 | 1309 | 1197 | 1123 | 1097 | 1130 | 916 | 641 |
| 9 | 1447 | 1273 | 1332 | 1387 | 1303 | 920 | 980 | 689 | 609 | 714 | 766 | 538 | 424 |
| 10 | 1408 | 978 | 866 | 810 | 820 | 708 | 569 | 495 | 402 | 406 | 471 | 373 | 233 |
| 11 | 1132 | 931 | 610 | 529 | 481 | 545 | 351 | 315 | 282 | 294 | 283 | 230 | 140 |
| 12 | 923 | 759 | 575 | 336 | 320 | 282 | 320 | 126 | 168 | 197 | 193 | 133 | 94 |
| 13 | 1371 | 750 | 656 | 417 | 257 | 260 | 197 | 210 | 51 | 140 | 134 | 115 | 71 |
| 4+ | 21995 | 20479 | 18690 | 17344 | 17594 | 18627 | 17298 | 14431 | 12846 | 12678 | 10533 | 7706 | 5653 |
| 5+ | 19372 | 17675 | 16229 | 13993 | 13706 | 14229 | 14222 | 11666 | 10338 | 9943 | 8474 | 6938 | 5003 |
| 6+ | 14249 | 14598 | 12902 | 11067 | 9836 | 9824 | 9652 | 8398 | 7198 | 7281 | 6435 | 5258 | 4102 |
| 7+ | 10513 | 9798 | 10047 | 7953 | 7114 | 6484 | 6058 | 5147 | 4542 | 4682 | 4593 | 3492 | 2803 |

| AGE | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 575 | 949 | 1630 | 1843 | 1787 | 978 | 1073 | 2933 | 3005 | 3727 | 3053 | 3066 |
| 5 | 567 | 505 | 899 | 1831 | 2073 | 2067 | 1081 | 1205 | 3314 | 3136 | 3543 | 3267 |
| 6 | 571 | 356 | 453 | 781 | 1895 | 2046 | 1992 | 1112 | 1135 | 3016 | 2630 | 3470 |
| 7 | 643 | 301 | 268 | 332 | 658 | 1712 | 1664 | 1601 | 899 | 890 | 2229 | 2290 |
| 8 | 580 | 297 | 177 | 185 | 222 | 538 | 1306 | 1158 | 1168 | 644 | 622 | 1645 |
| 9 | 290 | 180 | 164 | 123 | 122 | 156 | 335 | 816 | 774 | 775 | 474 | 434 |
| 10 | 151 | 97 | 89 | 101 | 78 | 82 | 88 | 206 | 478 | 520 | 508 | 330 |
| 11 | 69 | 50 | 42 | 56 | 64 | 54 | 55 | 55 | 133 | 318 | 345 | 362 |
| 12 | 38 | 25 | 26 | 29 | 43 | 45 | 33 | 35 | 39 | 100 | 194 | 238 |
| 13 | 38 | 16 | 14 | 15 | 20 | 31 | 25 | 21 | 25 | 24 | 68 | 138 |
| 4+ | 3522 | 2776 | 3763 | 5296 | 6961 | 7709 | 7653 | 9143 | 10969 | 13149 | 13665 | 15240 |
| 5+ | 2947 | 1826 | 2132 | 3453 | 5174 | 6731 | 6580 | 6210 | 7964 | 9422 | 10613 | 12175 |
| 6+ | 2380 | 1322 | 1234 | 1622 | 3102 | 4665 | 5499 | 5005 | 4650 | 6287 | 7070 | 8908 |
| 7+ | 1809 | 966 | 781 | 840 | 1207 | 2619 | 3506 | 3893 | 3515 | 3271 | 4439 | 5438 |

Table 68. Continued.

FISHING MORTALITY

| AGE | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 0.036 | 0.053 | 0.060 | 0.046 | 0.094 | 0.098 | 0.165 | 0.076 | 0.126 | 0.139 | 0.206 | 0.251 | 0.152 | 0.154 |
| 5 | 0.113 | 0.170 | 0.150 | 0.138 | 0.215 | 0.203 | 0.386 | 0.261 | 0.218 | 0.306 | 0.369 | 0.403 | 0.358 | 0.432 |
| 6 | 0.199 | 0.299 | 0.256 | 0.260 | 0.287 | 0.361 | 0.501 | 0.587 | 0.439 | 0.451 | 0.454 | 0.324 | 0.632 | 0.721 |
| 7 | 0.326 | 0.300 | 0.447 | 0.477 | 0.403 | 0.440 | 0.582 | 0.802 | 0.695 | 0.509 | 0.532 | 0.390 | 0.648 | 0.859 |
| 8 | 0.348 | 0.328 | 0.457 | 0.636 | 0.453 | 0.499 | 0.621 | 0.888 | 0.513 | 0.470 | 0.564 | 0.542 | 0.873 | 1.117 |
| 9 | 0.381 | 0.317 | 0.404 | 0.644 | 0.491 | 0.498 | 0.610 | 0.714 | 0.437 | 0.422 | 0.445 | 0.587 | 0.913 | 1.039 |
| 10 | 0.424 | 0.373 | 0.437 | 0.584 | 0.344 | 0.733 | 0.429 | 0.749 | 0.287 | 0.340 | 0.451 | 0.580 | 1.235 | 1.328 |
| 11 | 0.361 | 0.329 | 0.523 | 0.488 | 0.370 | 0.418 | 0.586 | 0.726 | 0.255 | 0.270 | 0.422 | 0.533 | 1.322 | 1.131 |
| 12 | 0.445 | 0.225 | 0.443 | 0.462 | 0.301 | 0.503 | 0.445 | 1.413 | 0.273 | 0.234 | 0.366 | 0.636 | 1.067 | 1.189 |
| 13 | 0.384 | 0.315 | 0.444 | 0.566 | 0.424 | 0.490 | 0.585 | 0.809 | 0.392 | 0.477 | 0.523 | 0.473 | 0.767 | 0.996 |

| AGE | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 0.218 | 0.243 | 0.069 | 0.051 | 0.095 | 0.051 | 0.093 | 0.040 | 0.035 | 0.036 | 0.036 |
| 5 | 0.520 | 0.439 | 0.223 | 0.205 | 0.162 | 0.145 | 0.187 | 0.171 | 0.122 | 0.116 | 0.141 |
| 6 | 0.784 | 0.498 | 0.414 | 0.259 | 0.232 | 0.206 | 0.232 | 0.295 | 0.230 | 0.184 | 0.204 |
| 7 | 0.995 | 0.473 | 0.576 | 0.415 | 0.252 | 0.295 | 0.335 | 0.307 | 0.323 | 0.258 | 0.210 |
| 8 | 1.139 | 0.547 | 0.532 | 0.570 | 0.320 | 0.258 | 0.391 | 0.331 | 0.305 | 0.302 | 0.210 |
| 9 | 1.386 | 0.576 | 0.498 | 0.474 | 0.388 | 0.367 | 0.455 | 0.368 | 0.343 | 0.253 | 0.210 |
| 10 | 1.451 | 0.574 | 0.490 | 0.545 | 0.336 | 0.487 | 0.388 | 0.465 | 0.297 | 0.329 | 0.210 |
| 11 | 1.132 | 0.569 | 0.453 | 0.547 | 0.250 | 0.346 | 0.339 | 0.364 | 0.339 | 0.344 | 0.210 |
| 12 | 1.104 | 0.721 | 0.469 | 0.328 | 0.351 | 0.426 | 0.410 | 0.399 | 0.312 | 0.378 | 0.210 |
| 13 | 1.149 | 0.521 | 0.554 | 0.450 | 0.269 | 0.295 | 0.388 | 0.367 | 0.352 | 0.309 | 0.210 |

Table 69. Parameters used as imput for catch projections of NAFO Division 2J3KL cod.

| Age | Beginning year 1987 population abundance (millions) | Average weights (1984-86 ave.) (kg) | Partial recruitment |
|---|---|---|---|
| 4 | 300 | 0.78 | 0.17 |
| 5 | 378 | 1.11 | 0.67 |
| 6 | 264 | 1.59 | 0.97 |
| 7 | 183 | 2.06 | 1.00 |
| 8 | 100 | 2.57 | 1.00 |
| 9 | 57 | 3.04 | 1.00 |
| 10 | 12 | 3.48 | 1.00 |
| 11 | 8 | 4.05 | 1.00 |
| 12 | 8 | 5.09 | 1.00 |
| 13 | 4 | 6.92 | 1.00 |

Table 70. Results of stock and catch projections for cod in NAFO Div. 2J3KL showing A) population numbers, B) population biomass, C) catch biomass and D) fishing mortality.

Population numbers (millions)

| A | 1986 | 1987 | 1988 |
|---|---|---|---|
| 4 | 478 | 300 | 265 |
| 5 | 371 | 378 | 238 |
| 6 | 274 | 264 | 274 |
| 7 | 151 | 183 | 181 |
| 8 | 85 | 100 | 125 |
| 9 | 18 | 57 | 68 |
| 10 | 12 | 12 | 39 |
| 11 | 12 | 8 | 8 |
| 12 | 6 | 8 | 5 |
| 13 | 3 | 4 | 5 |
| 4+ | 1409 | 1312 | 1208 |
| 5+ | 931 | 1012 | 943 |
| 6+ | 561 | 635 | 705 |
| 7+ | 287 | 371 | 431 |

Population biomass (000't)

| B | 1986 | 1987 | 1988 |
|---|---|---|---|
| 4 | 332 | 209 | 184 |
| 5 | 349 | 358 | 225 |
| 6 | 358 | 349 | 359 |
| 7 | 255 | 313 | 307 |
| 8 | 180 | 214 | 264 |
| 9 | 45 | 143 | 171 |
| 10 | 33 | 35 | 111 |
| 11 | 39 | 26 | 27 |
| 12 | 27 | 33 | 22 |
| 13 | 17 | 24 | 30 |
| 4+ | 1635 | 1704 | 1701 |
| 5+ | 1303 | 1495 | 1516 |
| 6+ | 954 | 1137 | 1292 |
| 7+ | 595 | 787 | 932 |

Catch biomass (000't)

| C | 1986 | 1987 | 1988 |
|---|---|---|---|
| 4 | 12 | 6 | 6 |
| 5 | 49 | 44 | 30 |
| 6 | 73 | 62 | 70 |
| 7 | 54 | 57 | 61 |
| 8 | 38 | 39 | 53 |
| 9 | 9 | 26 | 34 |
| 10 | 7 | 6 | 22 |
| 11 | 8 | 5 | 5 |
| 12 | 6 | 6 | 4 |
| 13 | 4 | 4 | 6 |
| 4+ | 259 | 256 | 293 |
| 5+ | 248 | 250 | 286 |
| 6+ | 199 | 206 | 256 |
| 7+ | 126 | 144 | 186 |

Fishing Mortality

| D | 1986 | 1987 | 1988 |
|---|---|---|---|
| 4 | 0.036 | 0.031 | 0.034 |
| 5 | 0.141 | 0.122 | 0.134 |
| 6 | 0.204 | 0.177 | 0.194 |
| 7 | 0.210 | 0.183 | 0.200 |
| 8 | 0.210 | 0.183 | 0.200 |
| 9 | 0.210 | 0.183 | 0.200 |
| 10 | 0.210 | 0.183 | 0.200 |
| 11 | 0.210 | 0.183 | 0.200 |
| 12 | 0.209 | 0.183 | 0.200 |
| 13 | 0.239 | 0.183 | 0.200 |
| 4+ | 0.132 | 0.130 | 0.149 |

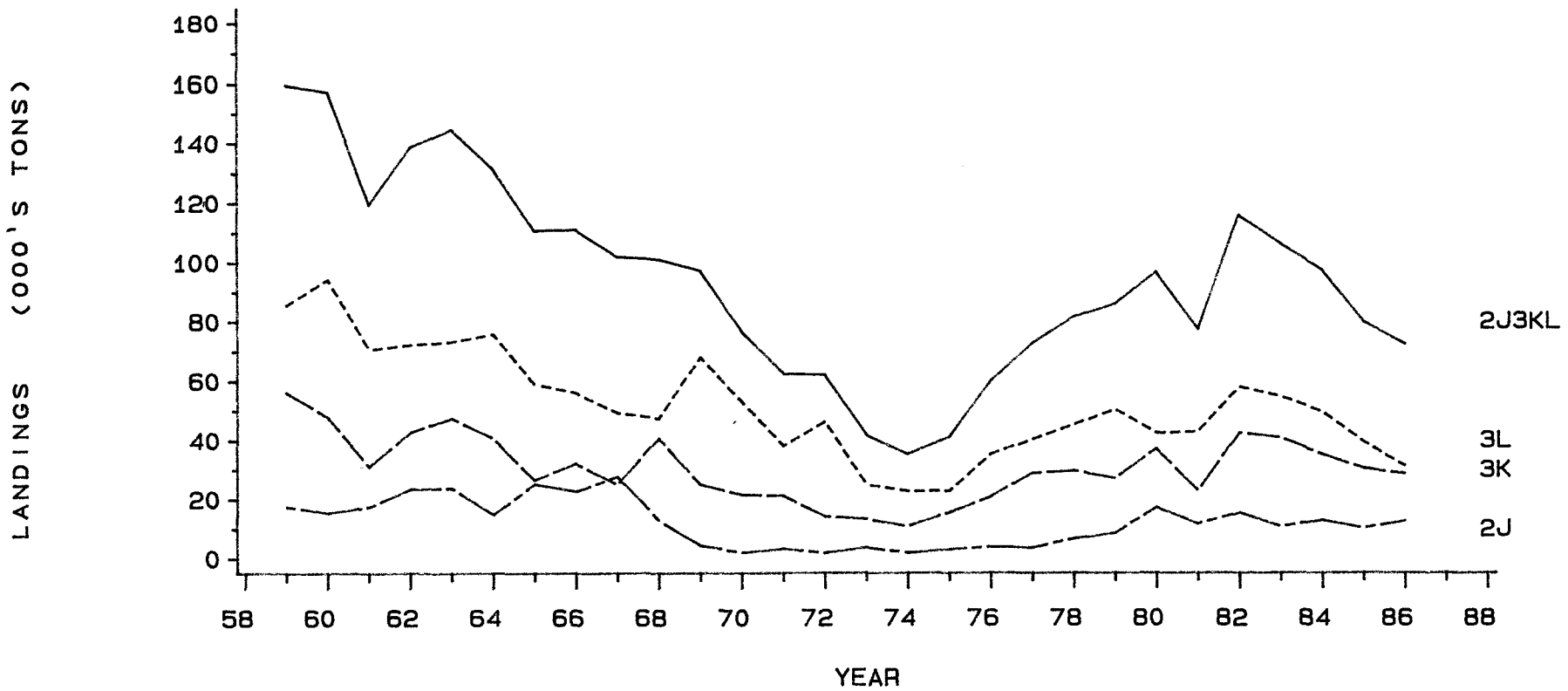


FIG. 1. INSHORE COD CATCHES FROM DIVISIONS 2J3KL FOR THE YEARS 1959-1986.

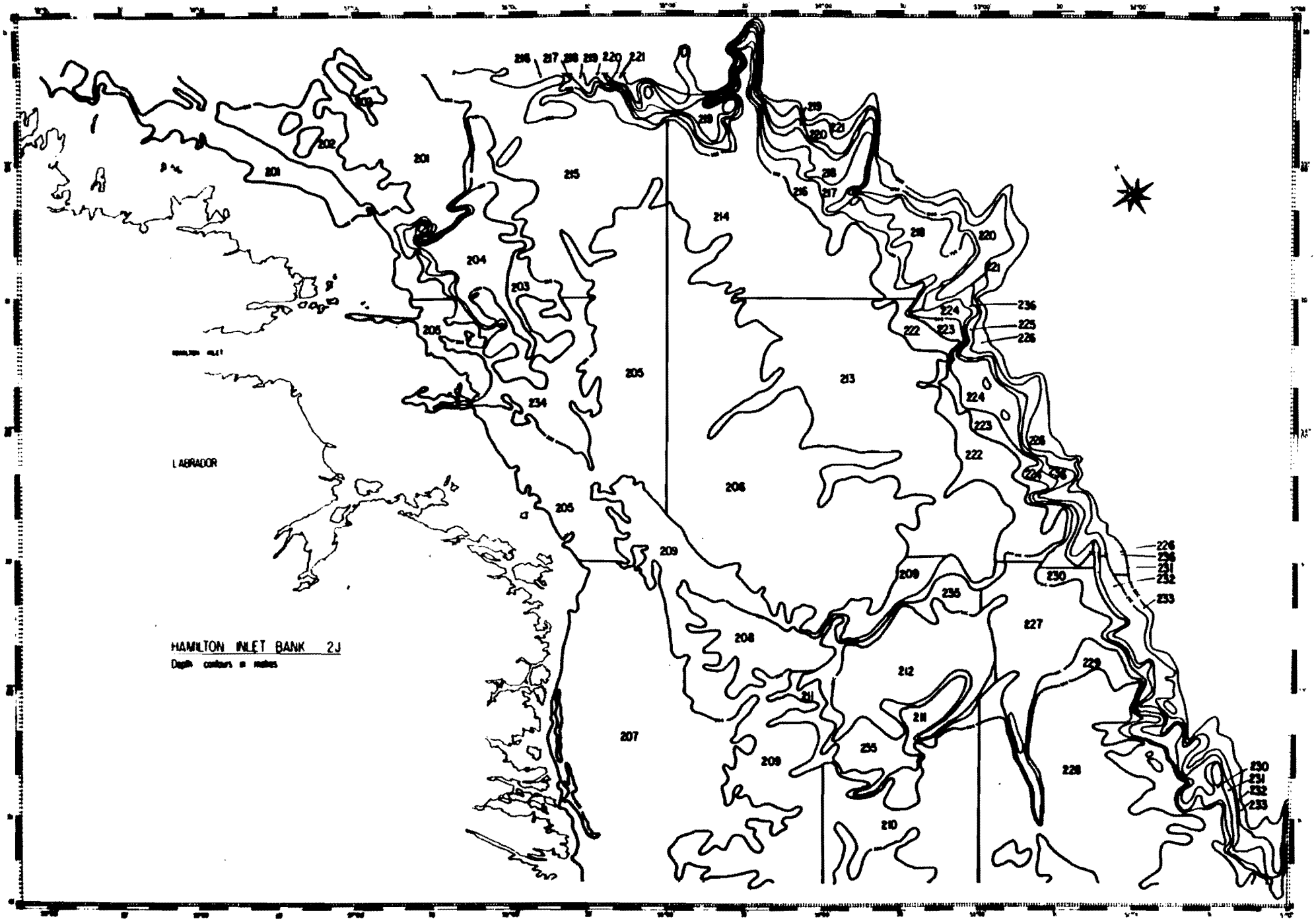


Fig. 2. Area of stratification in NAFO Division 2J used for research vessel surveys.

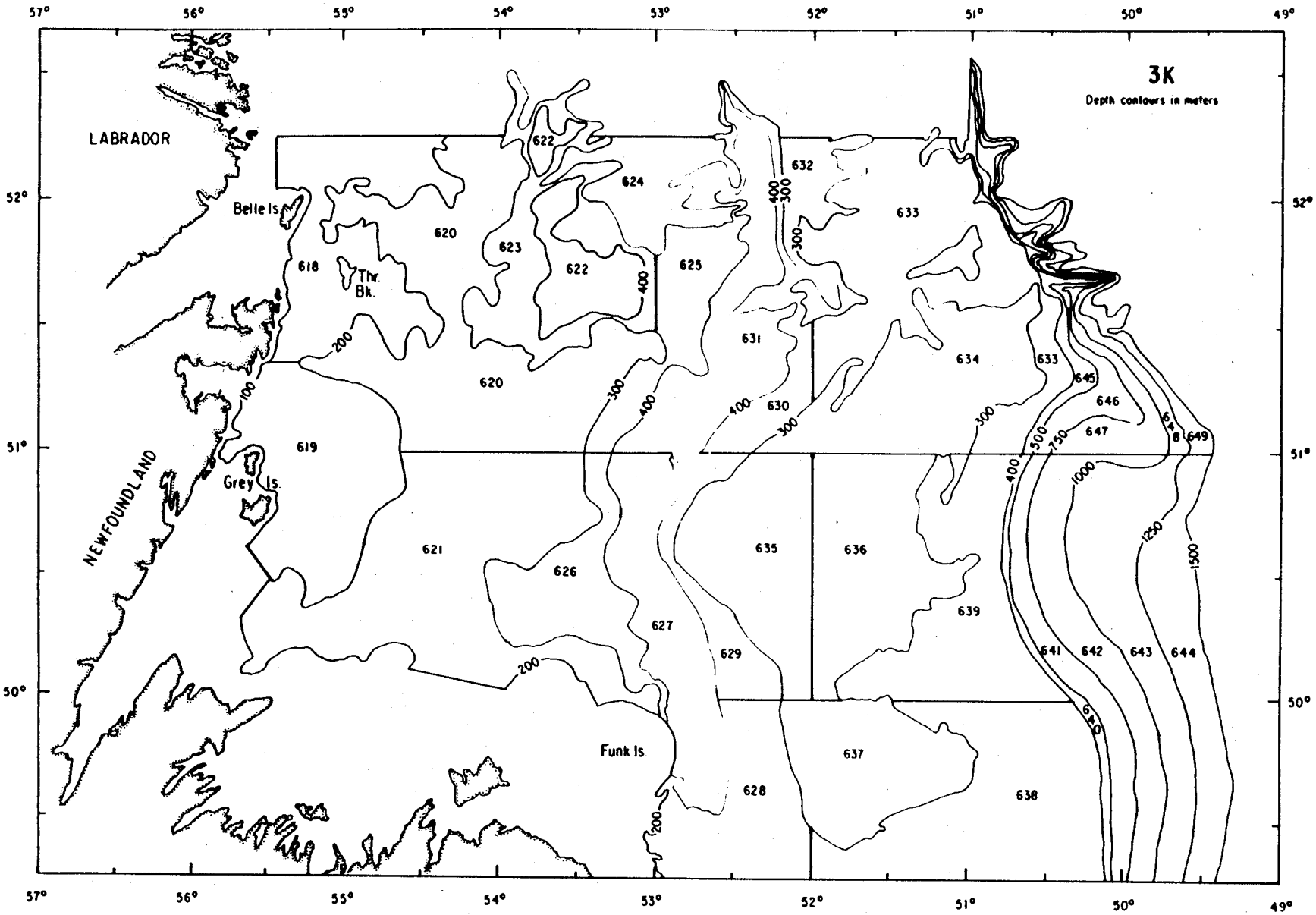


Fig. 3. Area of stratification in NAFO Division 3K used for research vessel surveys.

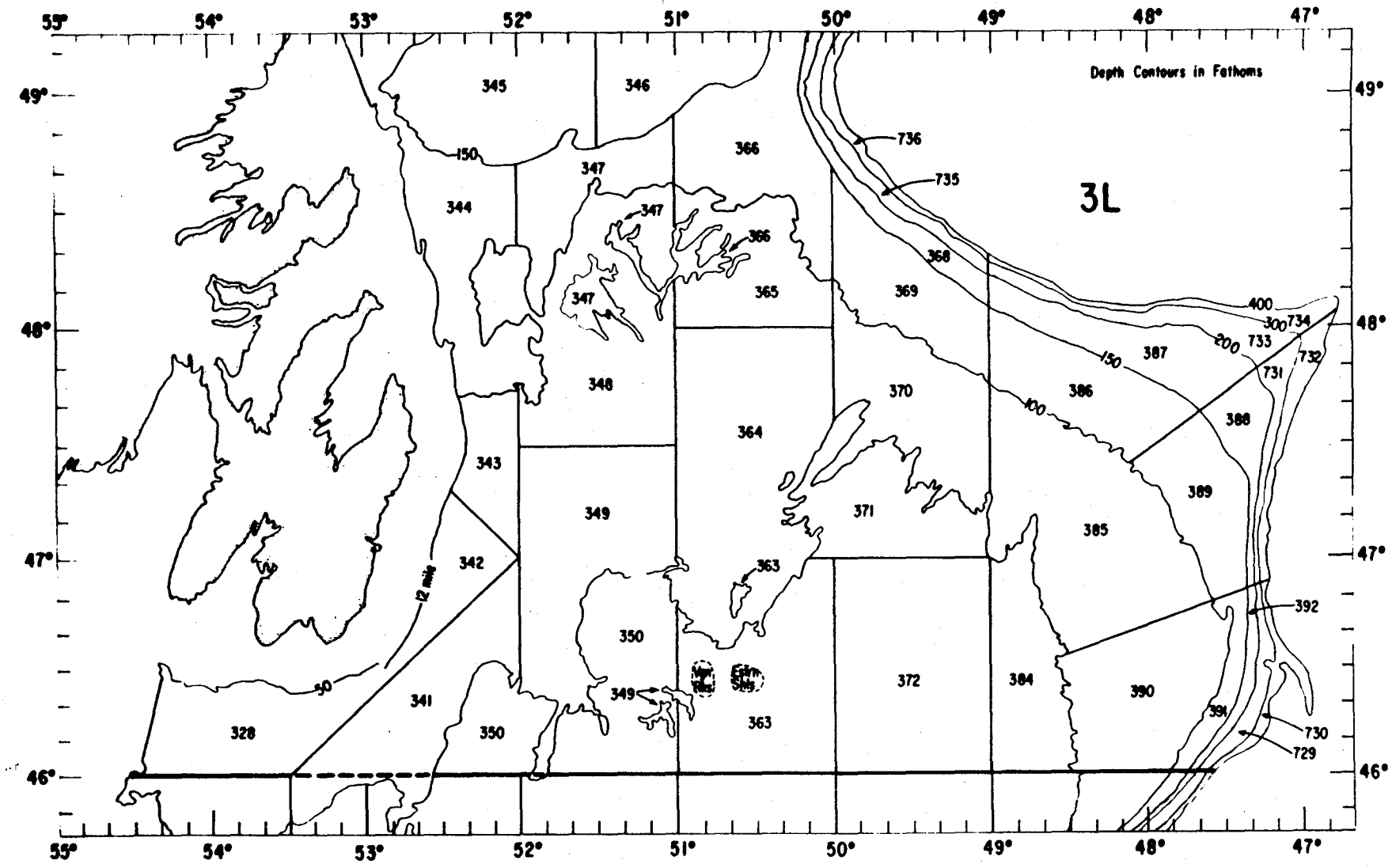


Fig. 4. Area of stratification in NAFO Division 3L used for research vessel surveys.


Fig. 5a. Commercial catch rate index for cod in Divisions 2J3KL for the period 1962-79.


Fig. 5b. Commercial catch rate index for cod in Divisions 2J3KL for the period 1978-86.


Fig. 6a. Commercial catch rate index for cod in Division 2J for the period 1962-79.


Fig. 6b. Commercial catch rate index for cod in Division 2J for the period 1978-86.

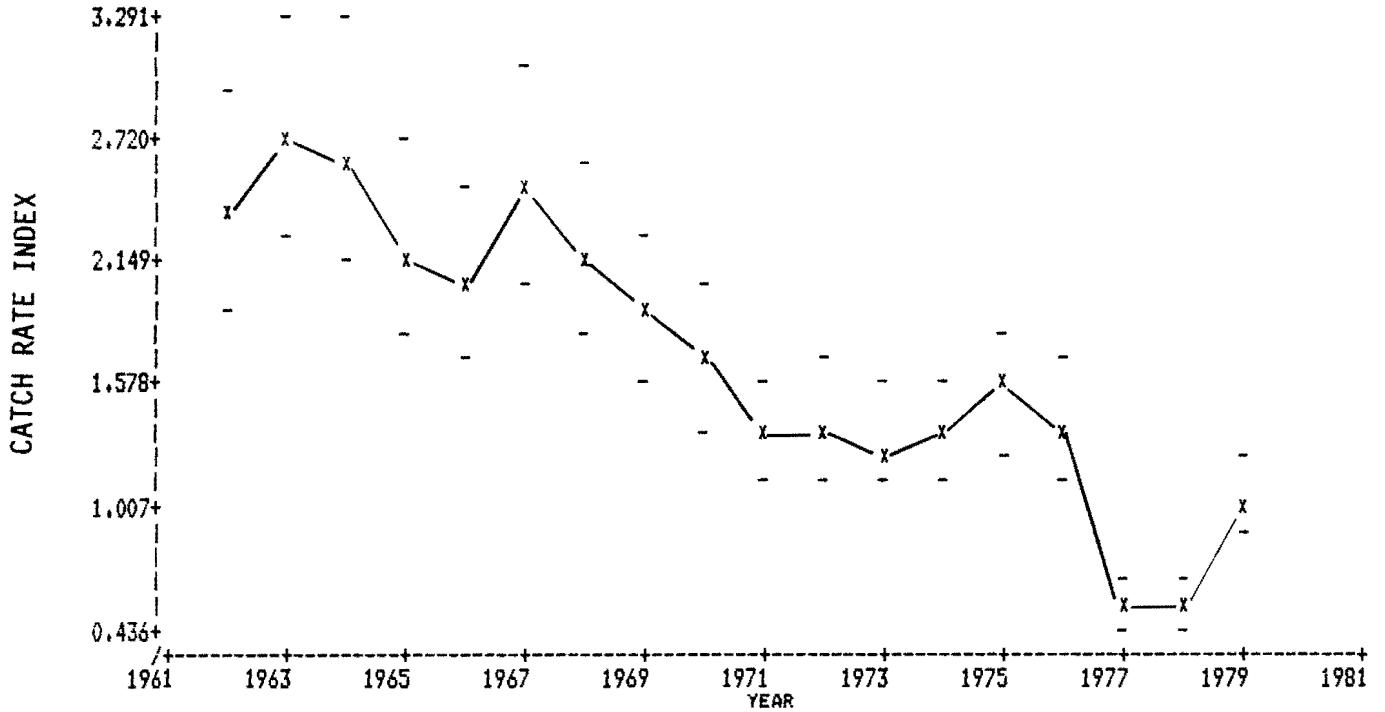


Fig. 7a. Commercial catch rate index for cod in Division 3K for the period 1962-79.


Fig. 7b. Commercial catch rate index for cod in Division 3K for the period 1978-86.


Fig. 8a. Commercial catch rate index for cod in Division 3L for the period 1962-79.


Fig. 8b. Commercial catch rate index for cod in Division 3L for the period 1978-86.


Fig. 9a. Commercial catch rate index for cod in Divisions 2J3KL for the period 1962-79 (analysis conducted excluding data from the first quarter).

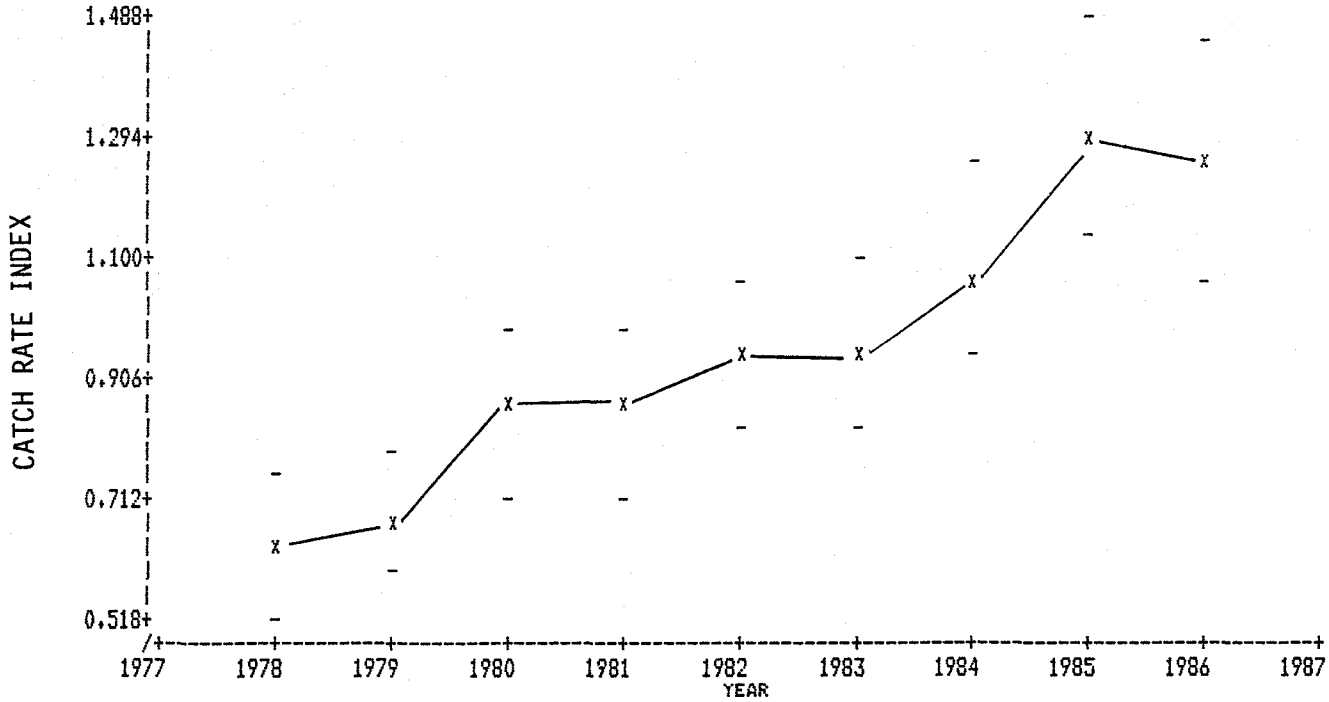


Fig. 9b. Commercial catch rate index for cod in Divisions 2J3KL for the period 1978-86 (analysis conducted excluding data from the first quarter).

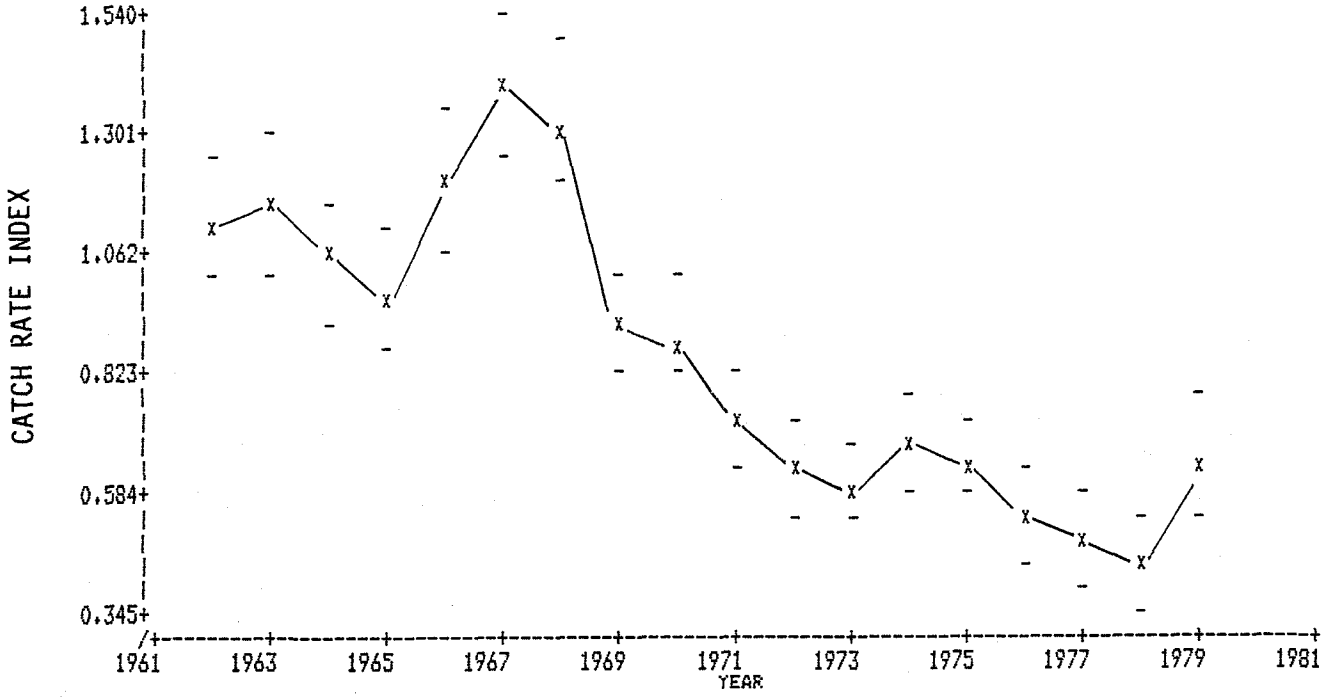


Fig. 10a. Commercial catch rate index for cod in Divisions 2J3KL for the period 1962-79 (analysis conducted excluding data from the first and second quarters).


Fig. 10b. Commercial catch rate index for cod in Divisions 2J3KL for the period 1978-86 (analysis conducted excluding data from the first and second quarters).

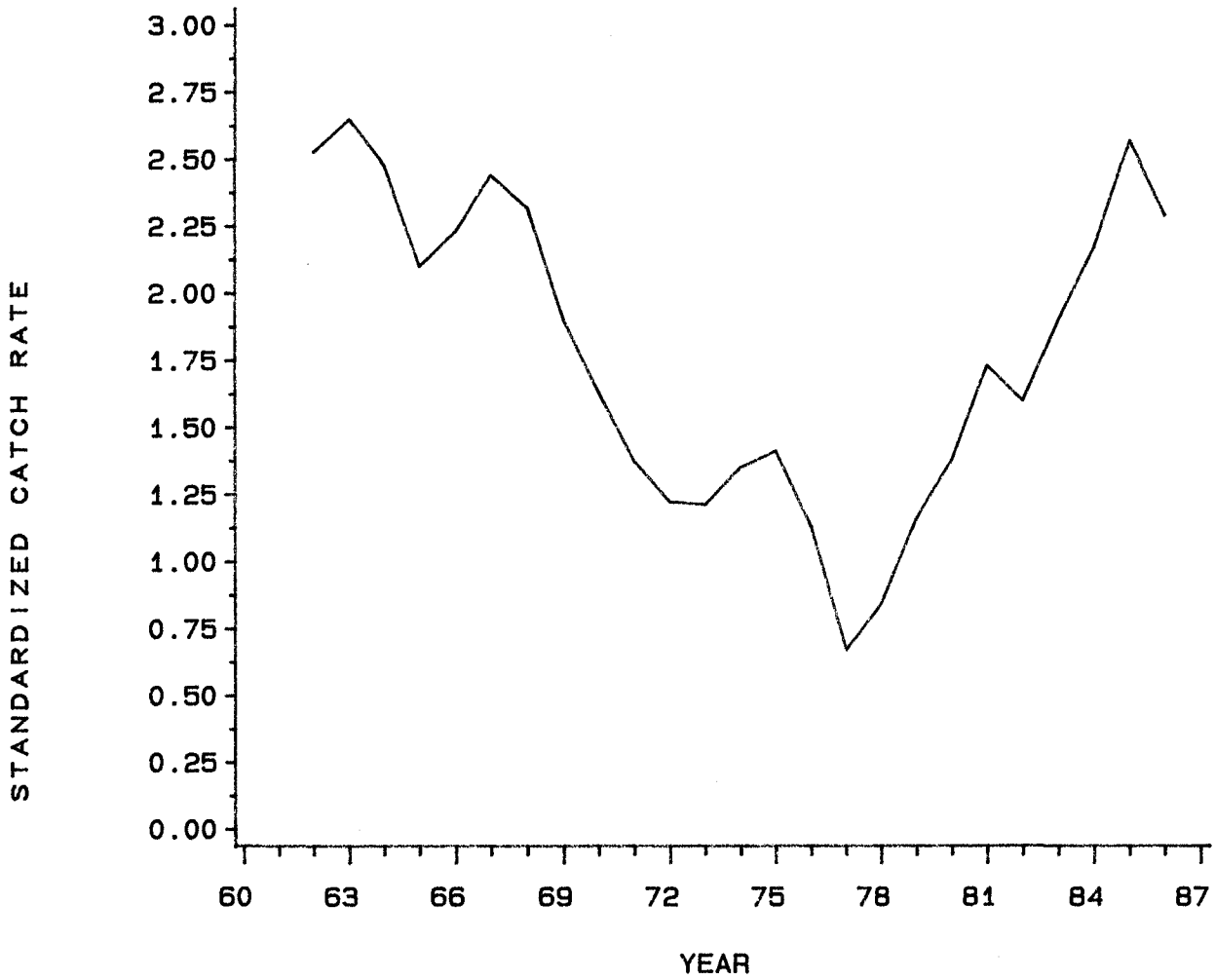


FIG.11. STANDARDIZED CATCH RATE FOR COD IN NAFO DIV 2J3KL FOR THE PERIOD 1962-86.

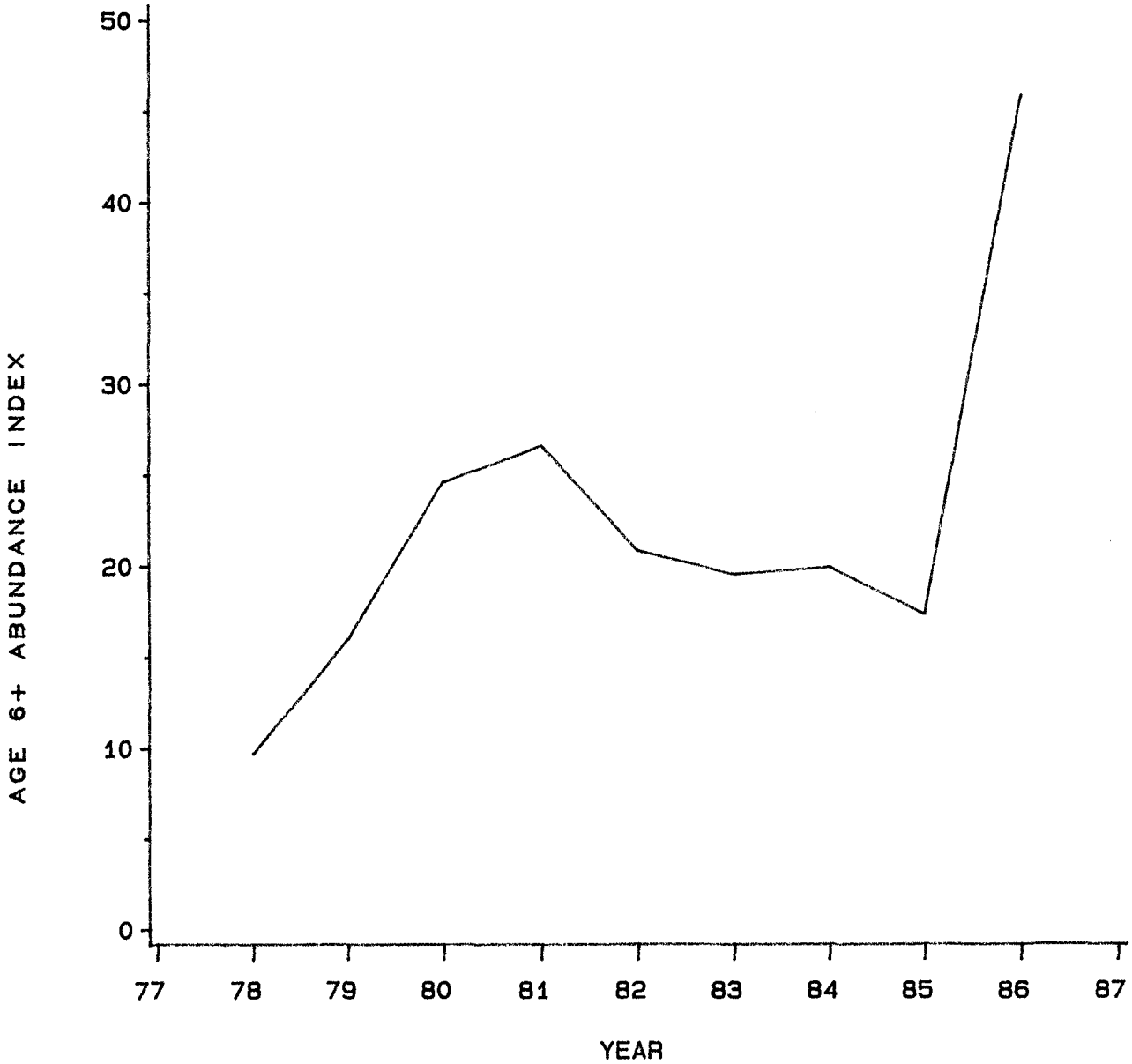


FIG. 12. AGE 6+ ABUNDANCE INDEX FOR COD IN DIV 2J3KL FOR THE PERIOD 1978-86 DERIVED FROM FALL R/V SURVEYS.

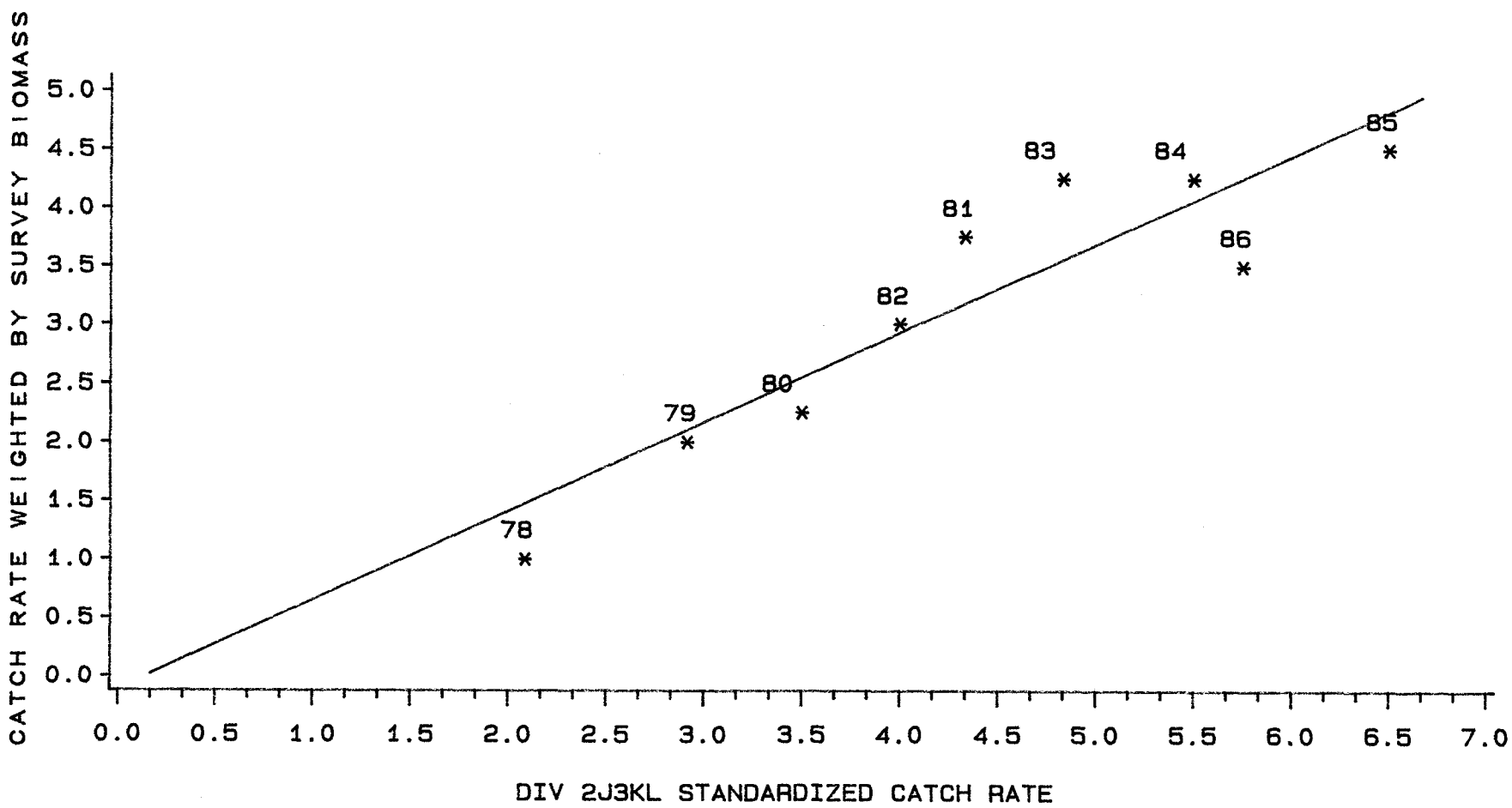


FIG 13 . RELATIONSHIP OF CATCH RATE WEIGHTED BY SURVEY BIOMASS WITH STANDARDIZED CATCH RATE FOR THE FOR THE PERIOD 1978-86.

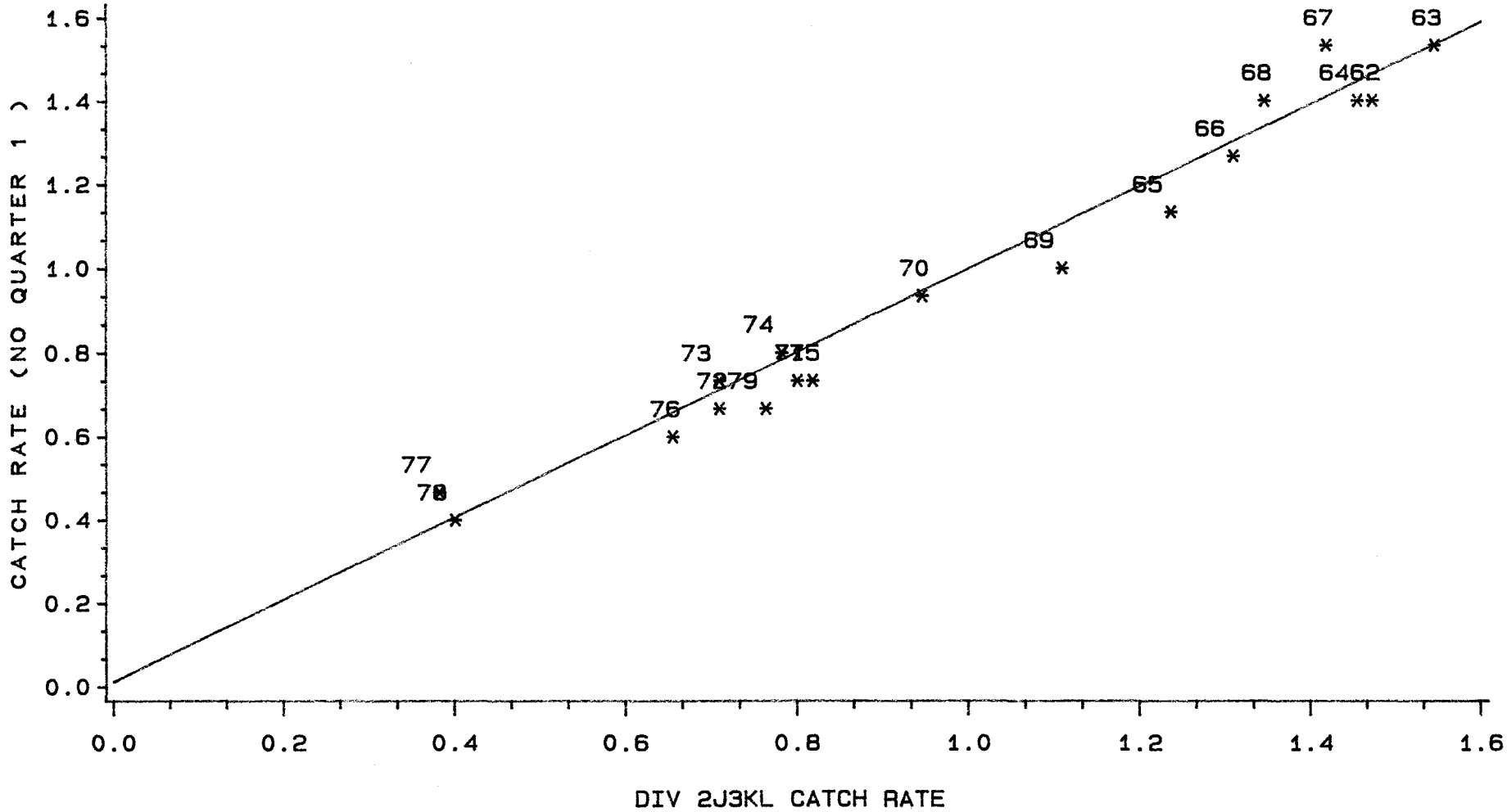


FIG 14 . RELATIONSHIP OF STANDARDIZED CATCH RATE EXCLUDING FIRST QUARTER DATA WITH STANDARDIZED CATCH RATE FOR THE ENTIRE YEAR FOR THE PERIOD 1962-79.

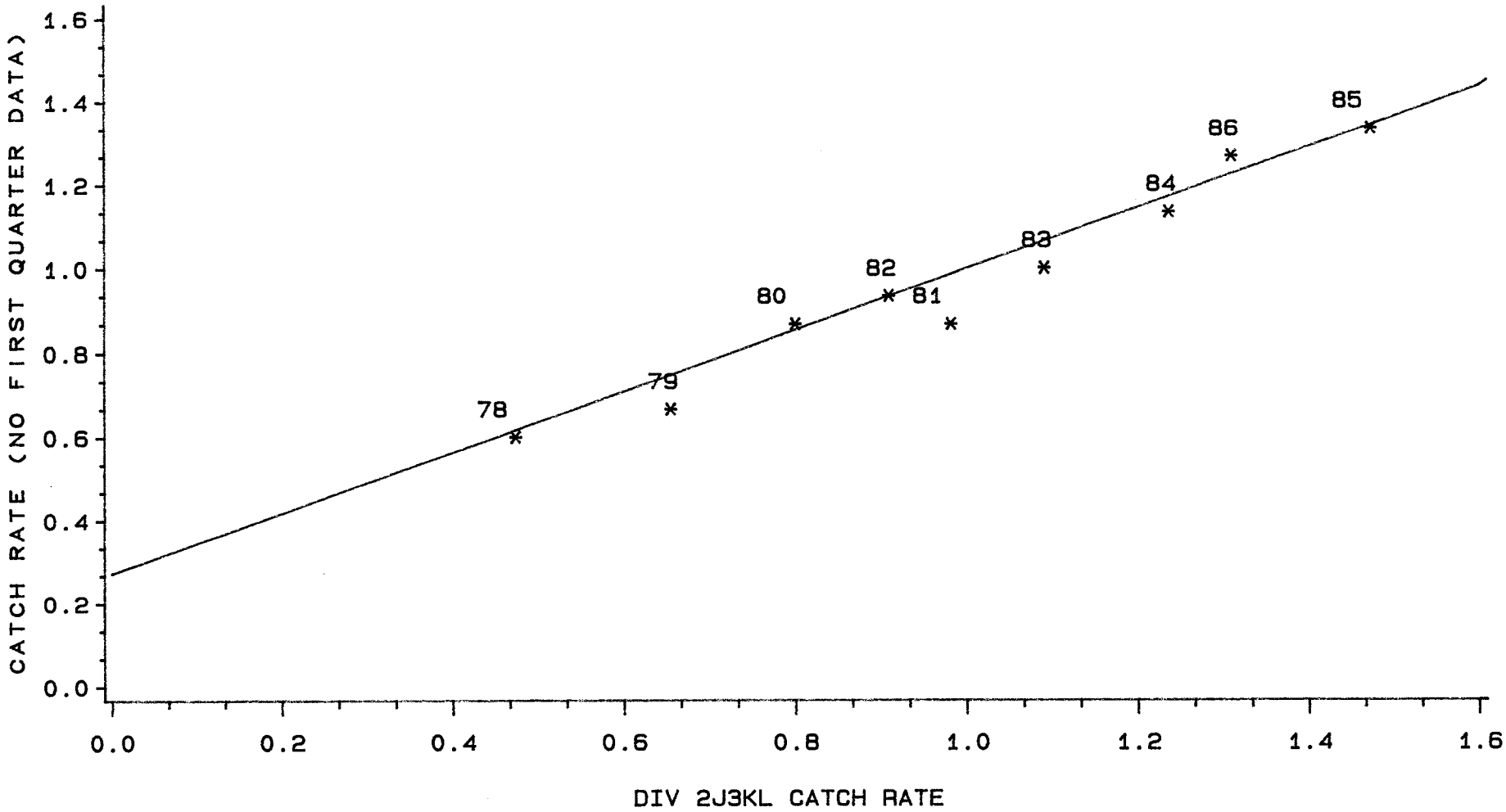


FIG 15. RELATIONSHIP OF STANDARDIZED CATCH RATE EXCLUDING FIRST QUARTER DATA WITH STANDARDIZED CATCH RATE FOR THE ENTIRE YEAR FOR THE PERIOD 1978-86

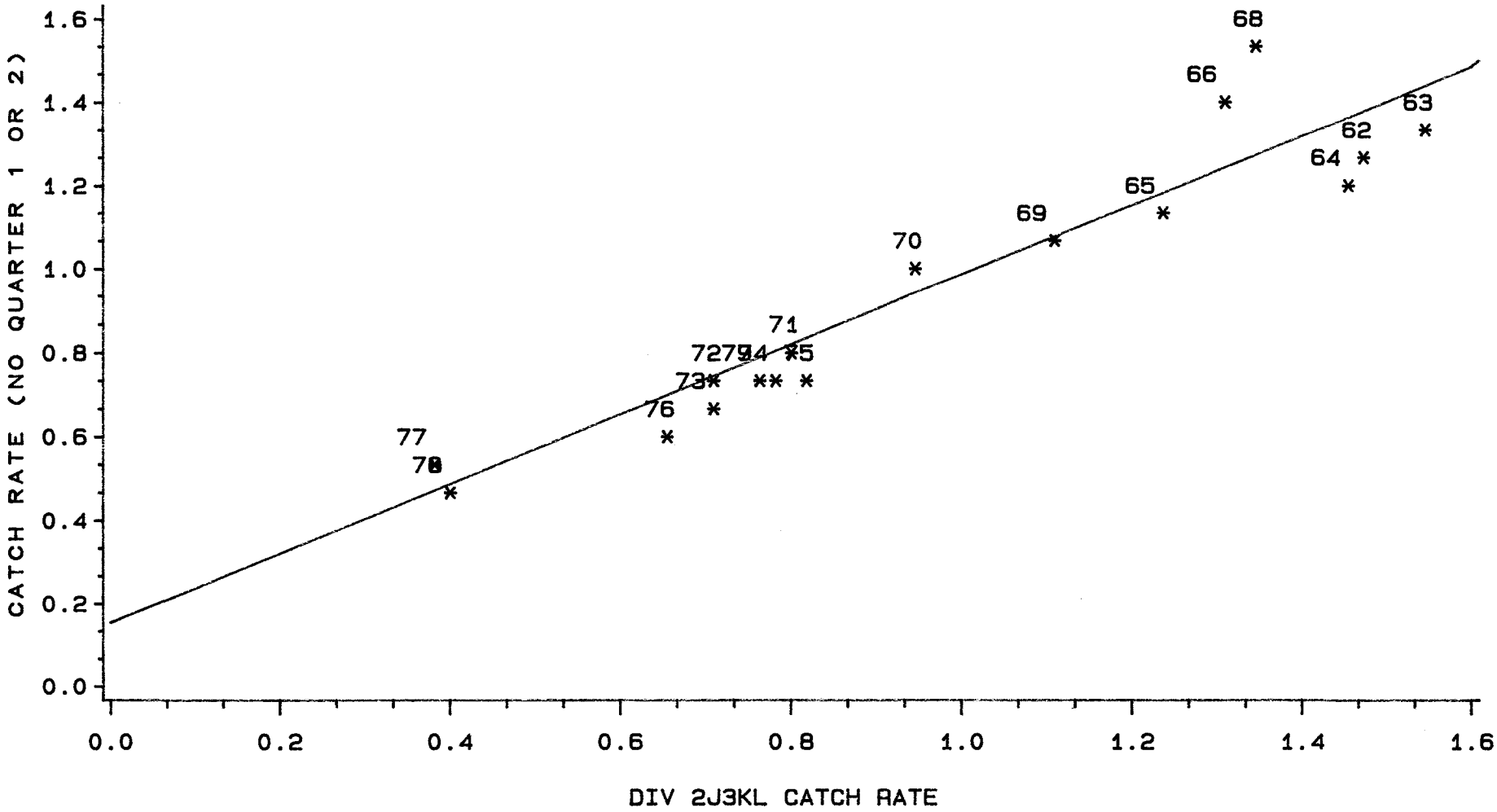


FIG 16. RELATIONSHIP OF STANDARDIZED CATCH RATE EXCLUDING FIRST AND SECOND QUARTER DATA WITH STANDARDIZED CATCH RATE FOR THE ENTIRE YEAR FOR THE PERIOD 1962-79.

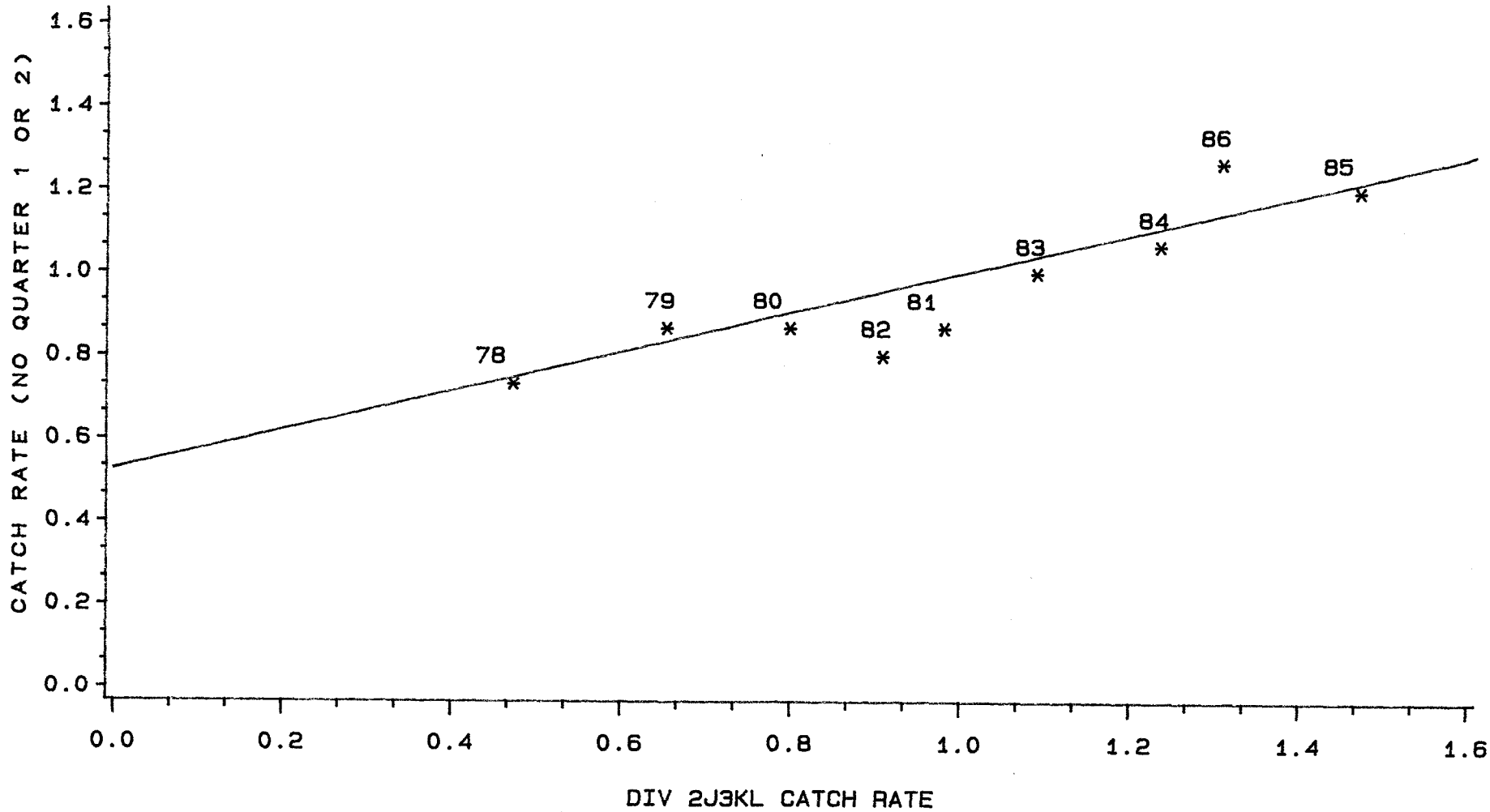


FIG 17 . RELATIONSHIP OF STANDARDIZED CATCH RATE EXCLUDING FIRST AND SECOND QUARTER DATA WITH STANDARDIZED CATCH RATE FOR THE ENTIRE YEAR FOR THE PERIOD 1978-86.

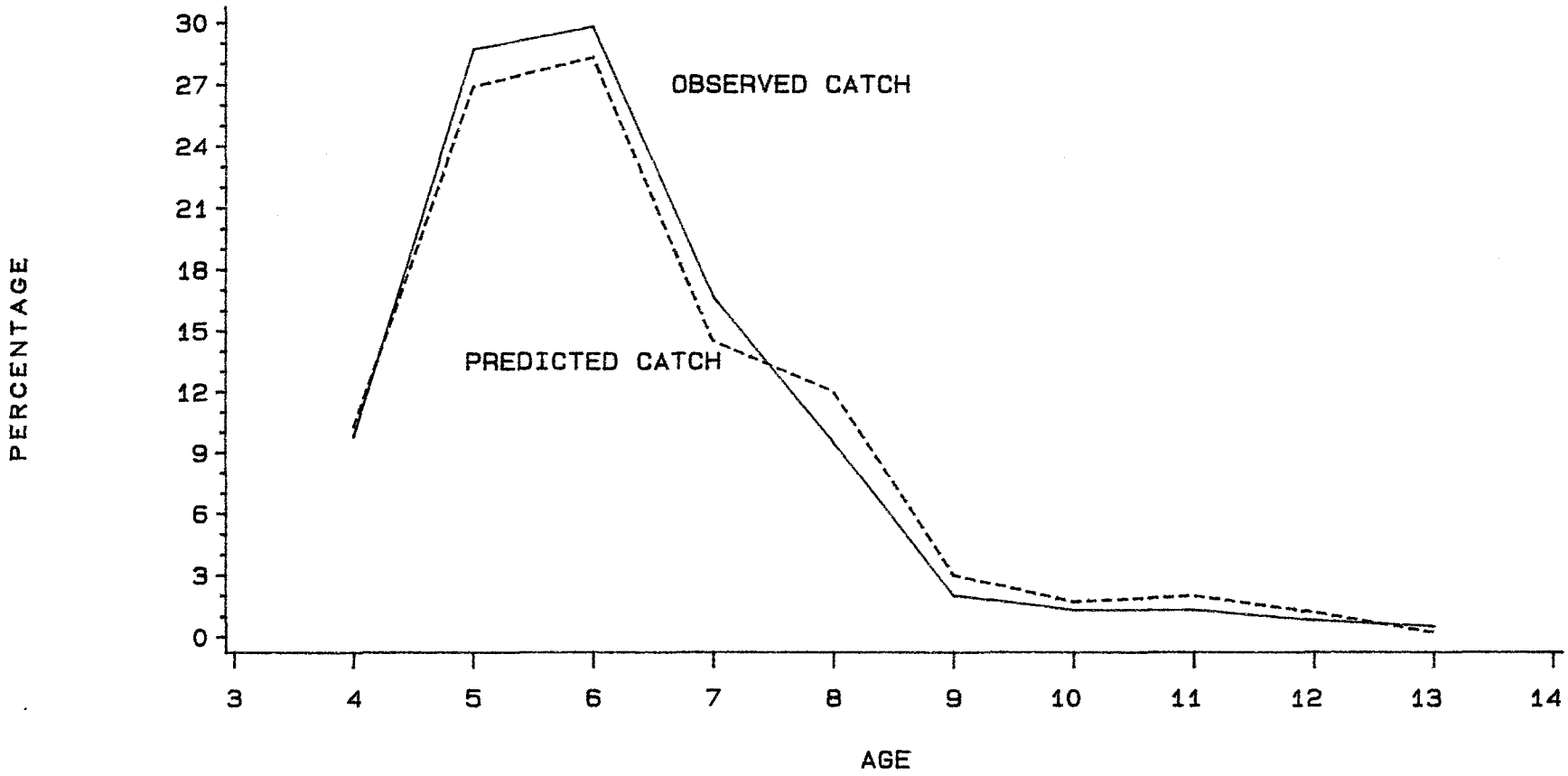


FIG. 18. COMPARISON OF THE 1986 OBSERVED AND PREDICTED CATCH AT AGE FOR THE COD FISHERY IN NAFO DIV 2J3KL.

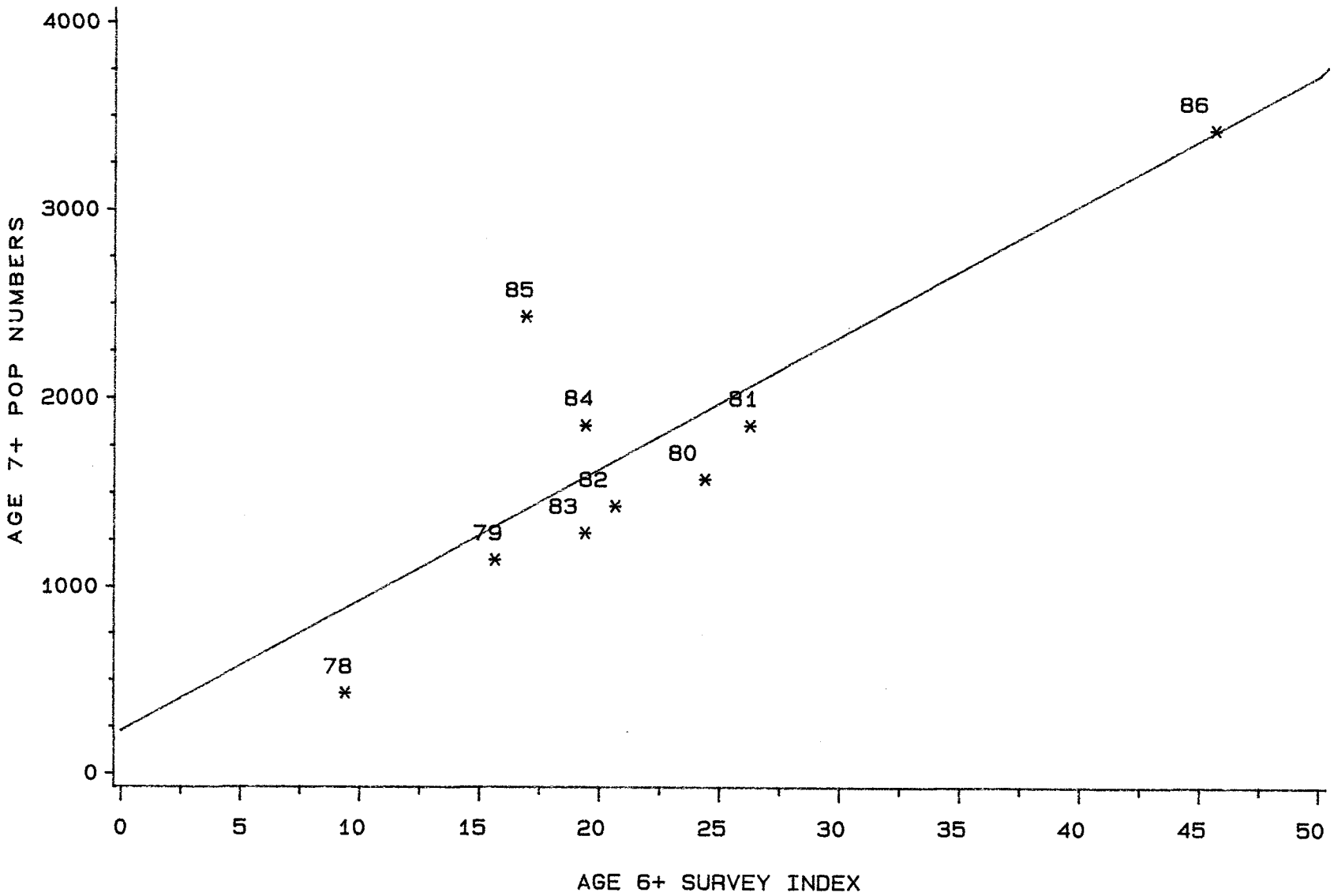


FIG 19. RELATIONSHIP OF AGE 6+ SURVEY INDEX WITH AGE 7+ POP. NUMBERS AT THE BEGINNING OF THE FOLLOWING YEAR FOR DIV 2J3KL COD WITH F-86 = 0.25 (1978-86).

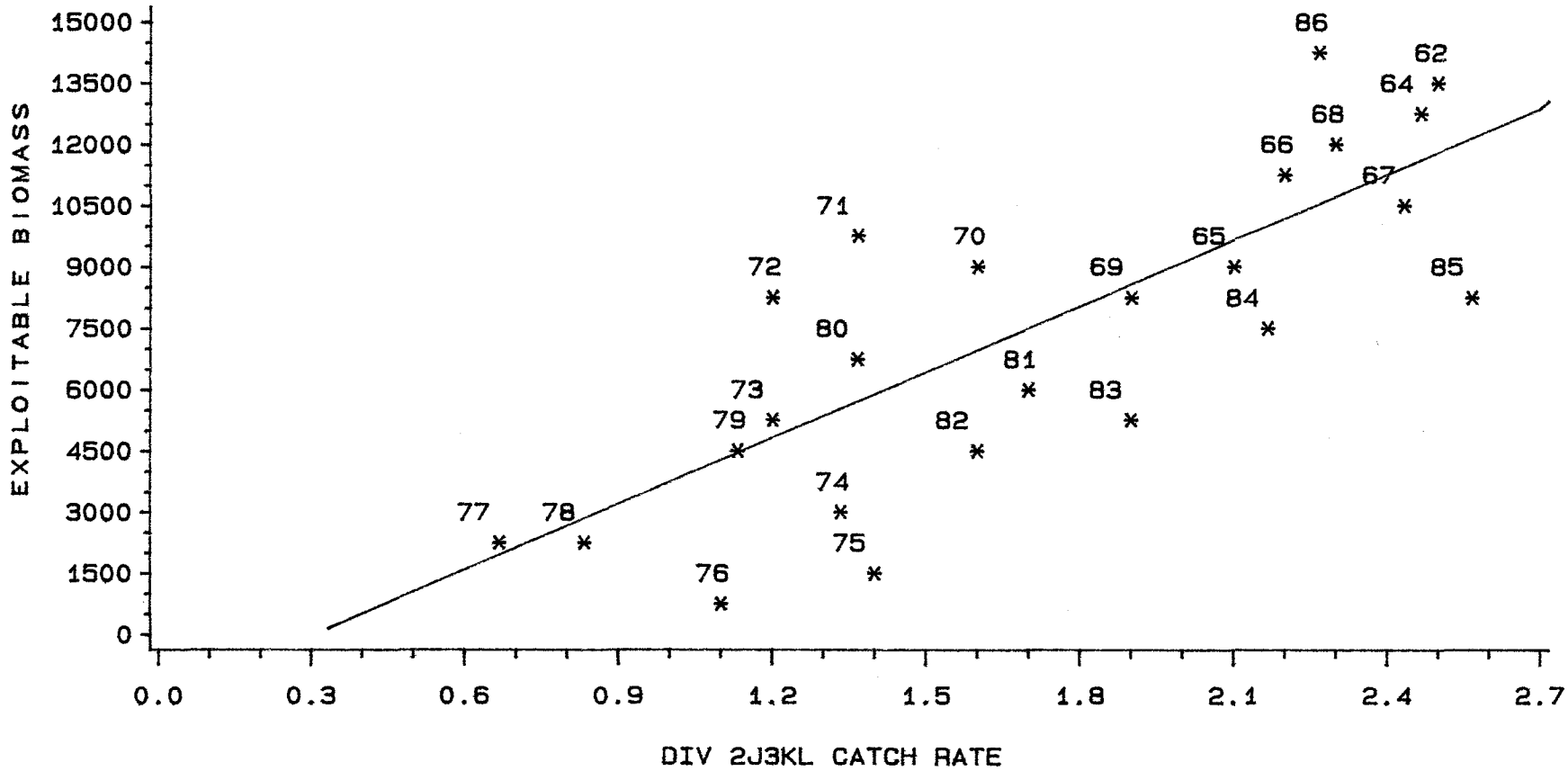


FIG 20. RELATIONSHIP OF STANDARDIZED CATCH RATE WITH COHORT EXPLOITABLE BIOMASS FOR DIV 2J3KL COD USING TERMINAL FISHING MORTALITY = 0.15 (1962-86).

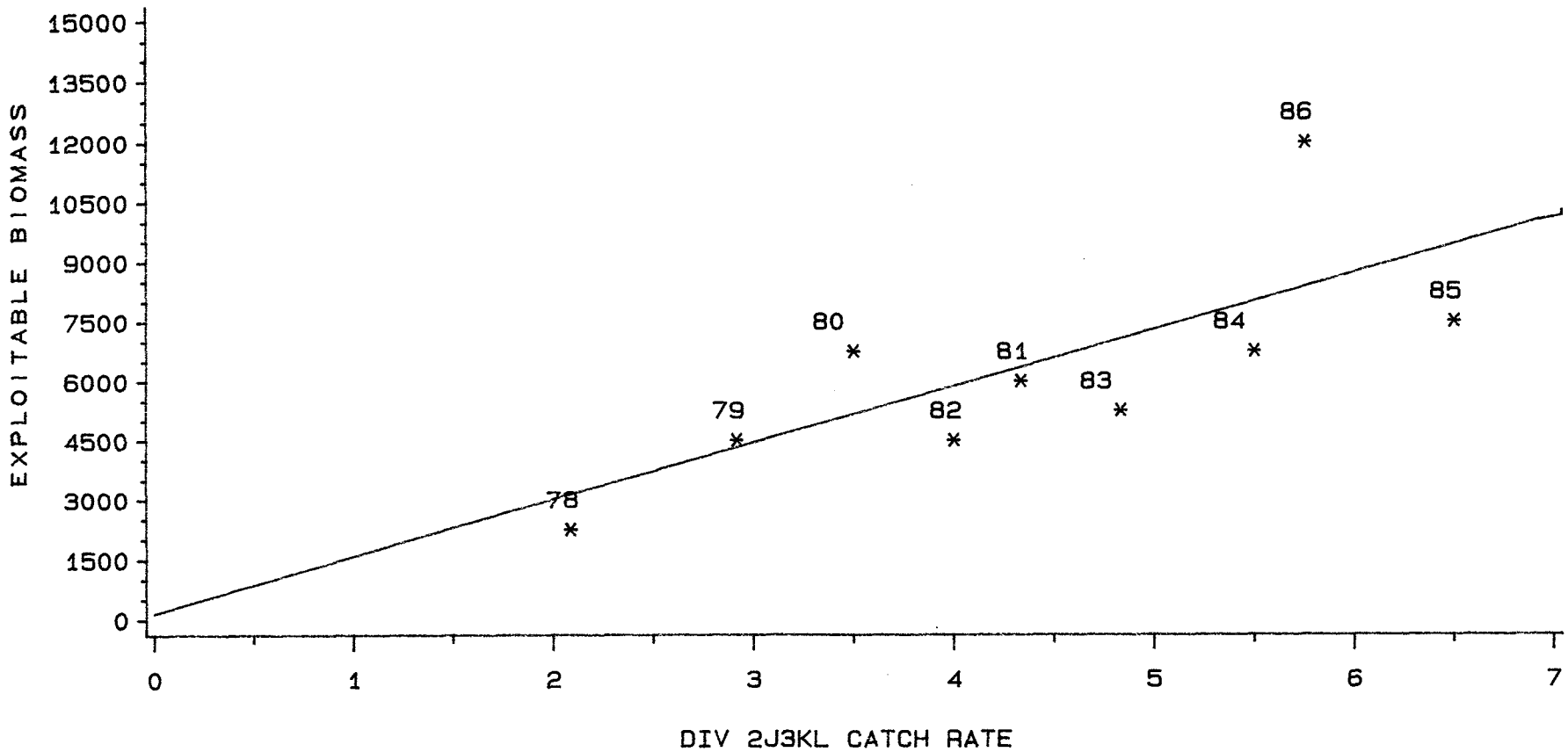


FIG 21. RELATIONSHIP OF STANDARDIZED CATCH RATE WITH COHORT EXPLOITABLE BIOMASS FOR DIV 2J3KL COD USING TERMINAL FISHING MORTALITY = 0.17 (1978-86).

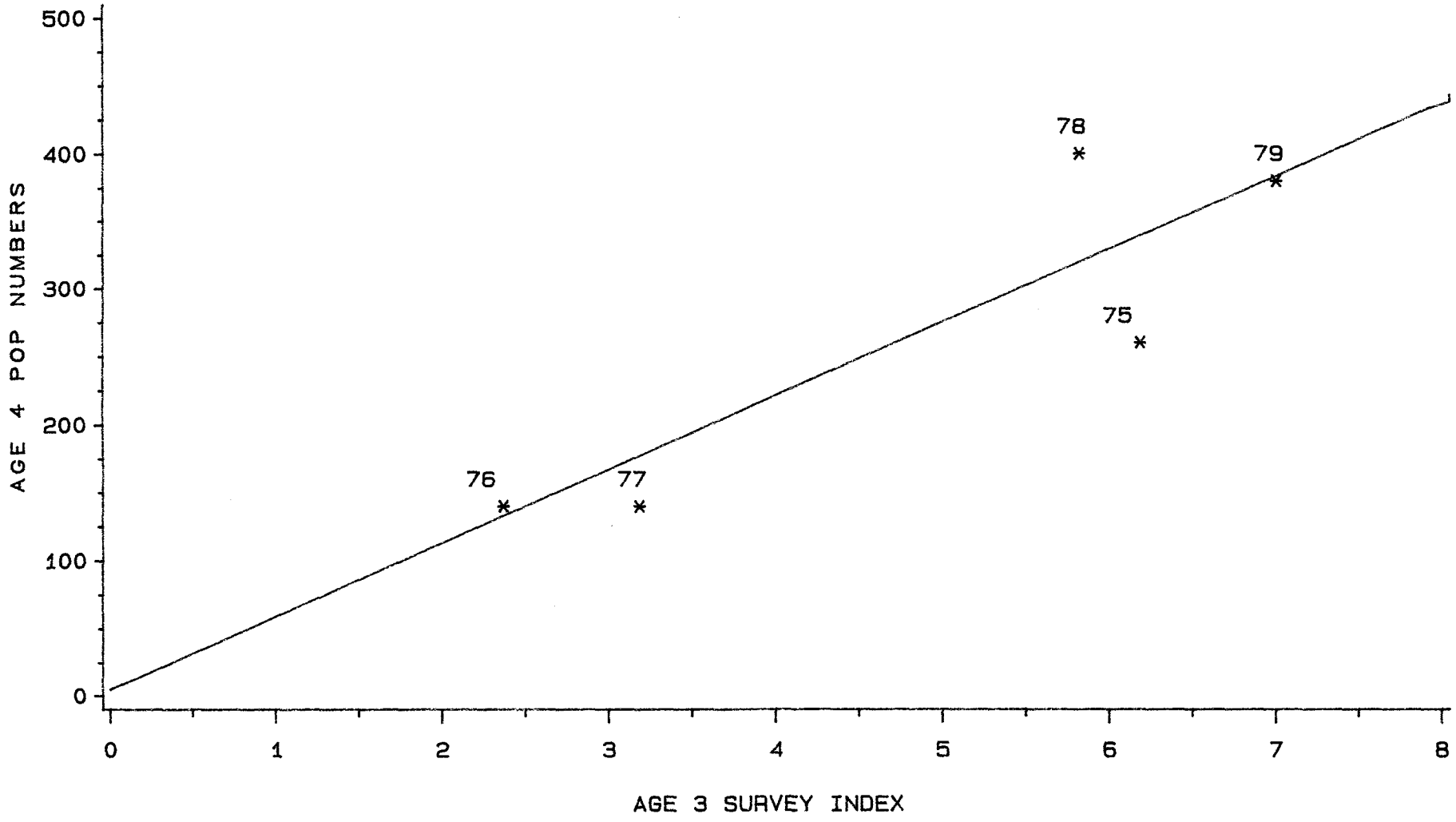


FIG 22. RELATIONSHIP OF AGE 3 SURVEY RECRUITMENT INDEX WITH AGE 4 COHORT ABUNDANCE AT THE BEGINNING OF THE FOLLOWING YEAR FOR THE 1975-79 YEAR-CLASSES.