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Status of the American Plaice Stock in NAFO Subarea 2 and Division 3K

by

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Abstract

After averaging about 6,000 t throughout the 1970's, the annual catches from this stock have declined from 7,500 t in 1981 to 700 t in 1985 because of a reduction in fishing effort. At present, the database for this stock is insufficient to permit an analytical assessment to be conducted. The fishery is largely by-catch, with virtually no directed trawler fishery conducted for this stock in 1984 and 1985. Research vessel abundance indices for Div. 2J and 3K combined showed an increase in the 1979-83 period, followed by declines in 1984 and 1985. However the decline in Div. 3K, where virtually all of the fishery occurs, was much less than that observed in Div. 2J, where recent catches have been negligible. No current biomass estimates are available for the portion of the stock in Div. 2G and Div. 2H. Continuation of the 10,000 t TAC is recommended for 1987.

Résumé

Après avoir atteint un niveau moyen de 6 000 t tout au long des années 1970, les prises annuelles de ce stock sont passées de 7 500 t en 1981 à 700 t en 1985, à cause d'une diminution de l'effort de pêche. En ce moment, la base de données sur ce stock de poisson est insuffisante pour permettre l'évaluation quantitative détaillée. La pêche est surtout composée de prises accessoires et il n'y a pratiquement pas eu de pêche spécifique au chalut en 1984 et 1985. Les indices d'abondance enregistrés par les navires de recherche pour les divisions 2J et 3K combinées montrent une hausse durant la période de 1979-1983, suivie de baisses en 1984 et 1985. Cependant, la baisse enregistrée dans la division 3K, où se concentre presque tout l'effort de pêche, était de beaucoup inférieure à celle observée dans la division 2J où les prises récentes ont été négligeables. On ne dispose pas d'estimation de la biomasse actuelle pour ce qui est de la portion du stock dans les divisions 2G et 2H. On recommande de poursuivre l'application d'un TPA de 10 000 t en 1987.

Introduction/Results

TAC - Catch History

This stock has been under TAC regulation since 1974 and the TAC's since that time have been between 6,000 and 10,000 t. The latter figure was determined from a sequential population analysis and has represented the TAC since 1982 (Table 1). Catches have declined from 7,500 t in 1981 to only 700 t in 1985, after averaging about 6,000 t through the 1970's (Table 1, Fig. 1). Prior to 1976, catches by foreign fleets comprised a significant part of the total landings, however, since that time, catches have been taken almost exclusively by Canadian vessels. The catch by Canadian offshore trawlers exceeded 1,000 t in each year from 1977 to 1982, but decreased to only 158 t in 1985. The catch by Canadian inshore vessels remained constant at about 500 t over the period 1982-85 (Table 1). The majority of the catch since 1973 has been taken in Div. 3K, and the catches from Div. 2G, 2H, or 2J have not exceeded 225 t since 1976 (Table 2). With the decline in catches in the offshore segment, peak catches in recent years occurred in the June-September period, largely in the inshore gillnet fishery (Table 3). The large catches in January-April of earlier years correspond to periods of significant effort by the offshore fleet in conjunction with the northern cod fishery, in the time before enterprise allocations affected the distribution of fishing effort.

Catch Rate Data

CPUE data are available from Canadian offshore trawlers for the period 1976-85 (Table 4). However, the catch in the directed (main species plaice) fishery has declined to only 21 and 14 tons in 1984 and 1985 respectively. Given the low directed catch in most years, little significance can be given to using this CPUE series as an adequate index of stock abundance.

Sampling Data

Table 5 lists the sampling information collected from the Canadian commercial fishery in 1985 and Table 6 shows the catch and weight at age, along with associated statistics, which were calculated from these sampling data. About 70% of the 1985 catch in numbers was comprised of the 1974-76 year-classes. The previous assessment of this stock (Brodie 1985) showed these 3 year-classes also were predominant in the 1984 catch, comprising 52% of the catch in numbers.

Research Vessel Survey Data

The mean catch per tow (kg/30 min), by stratum, from Canadian stratified random surveys in Div. 2J and 3K since 1977 is shown in Tables 7 and 8 respectively. Figures 2 and 3 show the stratification scheme used in these Divisions. So that results of surveys with different areas of coverage could be compared, strata common to virtually all surveys were selected for further

analysis (Tables 9-11). As pointed out by Brodie 1985, these selected strata account for over 90% of the total estimated biomass in Div. 2J and 3K, and should therefore be representative of the population in these areas. It should be noted that there are no biomass estimates at present for American plaice in Div. 2G and 2H.

Research vessel catches in 1985 were dominated by fish aged 7-9, as has been the case in most comparable surveys (Tables 9-10). The numbers at age from the selected strata (Tables 9-10) as well as biomass estimates (Table 11, Fig. 4) indicate a decline in abundance in both Div. 2J and 3K from 1984 to 1985. The biomass in Div. 2J increased steadily from 1979 to 1983, then declined in 1984 and 1985. The biomass in Div. 3K remained relatively stable between 1979 and 1984, then declined in 1985. The reason for these declines are unknown; with recent catches from the stock of approximately 1,000 t, it is unlikely that fishing mortality has played a significant role, particularly in Div. 2J. Considering studies of tagged American plaice on the Grand Banks (Div. 3LNØ), it is unlikely that there has been any major migration of a stock component (Pitt 1969). Poor survey coverage is also an unlikely explanation, given the number of stations fished in recent surveys (Tables 9-10).

Discussion/Conclusions

It was reported in the 1984 assessment of this stock (Brodie 1984) that a reliable SPA could not be produced because of questions with the catch at age in certain years. Given this, plus the fact that CPUE data for this stock is virtually non-existent in 1984 and 1985, the only usable index of abundance is the research vessel survey data. While the recent decline in abundance indicated by these data is a cause for some concern, the decline in Div. 3K, where virtually all of the fishery occurs, was not as significant as the decline noticed in Div. 2J, where catches of plaice have been extremely low. Although recent catches have been far below the TAC, there are insufficient data to suggest a change from the level of 10,000 t, in place since 1982.

References

- Brodie, W. B., 1984. American plaice in NAFO Subarea 2+Div. 3K - An assessment update. CAFSAC Res. Doc. 84/50, 9 p.
- Brodie, W. B. 1985. An assessment of American plaice in NAFO Subarea 2 and Division 3K. CAFSAC Res. Doc. 85/55, 15 p.
- Pitt, T. K. 1969. Migrations of American plaice on the Grand Bank and in St. Mary's Bay, 1954, 1959, and 1961. JFRB, Vol. 26, No. 5, p. 1301-1319.

Table 1. Nominal catches and TAC's (t), American plaice, NAFO Subarea 2 plus Division 3K, 1967-85.

| Year | [Inshore | Canada offshore | Total] | Poland | USSR | Other | Total | TAC |
|-------------------|----------|--------------------|--------|--------|-------|-------|--------|--------|
| 1967 | 395 | - | 395 | 1,134 | 1,701 | 414 | 3,644 | |
| 1968 | 1,023 | - | 1,023 | 1,889 | 2,911 | 128 | 5,951 | |
| 1969 | 1,689 | - | 1,689 | 867 | 4,129 | 217 | 6,902 | |
| 1970 | 3,751 | - | 3,751 | 378 | 8,160 | 397 | 12,686 | |
| 1971 | 2,486 | - | 2,486 | 233 | 2,597 | 32 | 5,348 | |
| 1972 | 1,188 | 9 | 1,197 | 849 | 6,760 | 315 | 9,121 | |
| 1973 | 1,368 | 16 | 1,384 | 225 | 3,011 | 520 | 5,140 | |
| 1974 | 462 | 106 | 568 | 91 | 4,643 | 318 | 5,620 | 10,000 |
| 1975 | 813 | 46 | 859 | 95 | 4,449 | 344 | 5,747 | 8,000 |
| 1976 | 1,741 | 736 | 2,477 | 118 | 3,373 | 139 | 6,107 | 8,000 |
| 1977 | 1,925 | 4,691 | 6,616 | 27 | 698 | 184 | 7,525 | 8,000 |
| 1978 | 1,723 | 1,452 | 3,175 | 138 | 123 | 86 | 3,522 | 6,000 |
| 1979 | 1,792 | 1,058 | 2,850 | 31 | 39 | 45 | 2,965 | 6,000 |
| 1980 | 1,140 | 3,746 | 4,886 | 39 | 26 | 89 | 5,040 | 6,000 |
| 1981 | 1,069 | 6,332 | 7,401 | 58 | 56 | 30 | 7,545 | 6,000 |
| 1982 | 576 | 1,265 | 1,841 | 13 | 8 | 38 | 1,900 | 10,000 |
| 1983 | 445 | 863 | 1,308 | 266 | 11 | 48 | 1,633 | 10,000 |
| 1984 ^a | 552 | 487 | 1,039 | 81 | 4 | 40 | 1,164 | 10,000 |
| 1985 ^a | 506 | 158 | 664 | 18 | 7 | 15 | 704 | 10,000 |
| 1986 | | | | | | | | 10,000 |

^aProvisional.

Table 2. Nominal catch by Division, American plaice in Subarea 2 plus Division 3K, 1972-85.

| | 2G | 2H | 2J | 3K | Unknown | Total |
|-------------------|----|-----|------|------|---------|-------|
| 1972 | 1 | 196 | 4818 | 4106 | | 9121 |
| 1973 | 0 | 26 | 1788 | 3326 | | 5140 |
| 1974 | 0 | 11 | 938 | 4671 | | 5620 |
| 1975 | 73 | 0 | 1101 | 4573 | | 5747 |
| 1976 | 24 | 43 | 645 | 5395 | | 6107 |
| 1977 | 0 | 0 | 224 | 7301 | | 7525 |
| 1978 | 1 | 49 | 145 | 3327 | | 3522 |
| 1979 | 0 | 11 | 221 | 2733 | | 2965 |
| 1980 | 0 | 36 | 142 | 4862 | | 5040 |
| 1981 | 0 | 38 | 96 | 7411 | | 7545 |
| 1982 | 0 | 108 | 204 | 1588 | | 1900 |
| 1983 | 0 | 124 | 168 | 1341 | | 1633 |
| 1984 ^a | 0 | 52 | 68 | 1009 | 35 | 1164 |
| 1985 ^a | 0 | 9 | 30 | 625 | 40 | 704 |

^aProvisional.

Table 3. Nominal catch by month, American plaice in Subarea 2 plus Division 3K, 1972-85.

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Unk. | Total |
|-------------------|------|------|------|------|------|------|------|------|-------|------|------|------|------|-------|
| 1972 | 1089 | 924 | 297 | 2688 | 321 | 423 | 849 | 1313 | 334 | 169 | 13 | 701 | | 9121 |
| 1973 | 1570 | 1133 | 106 | 519 | 232 | 347 | 491 | 403 | 181 | 30 | 20 | 108 | | 5140 |
| 1974 | 373 | 371 | 50 | 1 | 1425 | 1799 | 116 | 224 | 141 | 508 | 340 | 272 | | 5620 |
| 1975 | 555 | 768 | 648 | 331 | 26 | 161 | 867 | 847 | 181 | 124 | 342 | 897 | | 5747 |
| 1976 | 1517 | 579 | 30 | 156 | 382 | 657 | 592 | 549 | 429 | 413 | 274 | 529 | | 6107 |
| 1977 | 64 | 641 | 2778 | 1488 | 675 | 691 | 665 | 425 | 67 | 20 | 2 | 9 | | 7525 |
| 1978 | 469 | 748 | 259 | 119 | 394 | 534 | 479 | 401 | 63 | 22 | 5 | 29 | | 3522 |
| 1979 | 62 | 328 | 66 | 146 | 609 | 707 | 603 | 284 | 47 | 13 | 0 | 100 | | 2965 |
| 1980 | 3 | 137 | 796 | 2454 | 643 | 334 | 352 | 143 | 93 | 62 | 1 | 22 | | 5040 |
| 1981 | 717 | 524 | 4380 | 507 | 411 | 246 | 306 | 253 | 51 | 11 | 8 | 131 | | 7545 |
| 1982 | 36 | 298 | 178 | 327 | 377 | 204 | 147 | 148 | 143 | 7 | 2 | 33 | | 1900 |
| 1983 | 236 | 118 | 30 | 18 | 179 | 223 | 231 | 181 | 72 | 201 | 105 | 39 | | 1633 |
| 1984 ^a | 51 | 19 | 78 | 36 | 83 | 214 | 263 | 238 | 100 | 14 | 8 | 25 | 35 | 1164 |
| 1985 ^a | 15 | 3 | 8 | 22 | 51 | 65 | 123 | 211 | 156 | 37 | 7 | 6 | | 704 |

^aProvisional.

Table 4. Catch and effort, Can(N) offshore trawlers, American plaice, Subarea 2 plus Division 3K, 1976-85.

| Year | Total Catch (t) | Directed CPUE (t/hr) | Directed catch (t) |
|-------------------|-----------------|----------------------|--------------------|
| 1976 | 6,107 | 0.395 | 701 |
| 1977 | 7,525 | 0.402 | 3,628 |
| 1978 | 3,522 | 0.375 | 652 |
| 1979 | 2,965 | 0.467 | 315 |
| 1980 | 5,040 | 0.525 | 2,151 |
| 1981 | 7,545 | 0.970 | 4,998 |
| 1982 | 1,900 | 0.505 | 500 |
| 1983 | 1,633 | 0.480 | 310 |
| 1984 ^a | 1,164 | 0.419 | 21 |
| 1985 ^a | 704 | 0.172 | 14 |

^aProvisional.

Table 5. List of commercial sampling by quarter and division available for 1985, for American plaice in Subarea 2 and Division 3K as collected by the St. John's Commercial Sampling Section.

| | | Quarter | | | | Total |
|-----------|-----------|---------|-----|------|-----|-------|
| | | 1 | 2 | 3 | 4 | |
| Offshore | | | | | | |
| Can(N) | Catch (t) | 7 | 68 | 47 | 7 | 129 |
| Samples | | - | 1 | - | - | 1 |
| Measured | | - | 390 | - | - | 390 |
| Otoliths | | - | 87 | - | - | 87 |
| Inshore | | | | | | |
| Catch (t) | | - | 1 | 331 | 174 | 506 |
| Samples | | - | - | 3 | 2 | 5 |
| Measured | | - | - | 1012 | 863 | 1875 |
| Otoliths | | - | - | 167 | 229 | 396 |

Table 6. Average weights (kg) and lengths (cm) at age, and catch numbers ($\times 10^{-3}$) at age for American plaice in the commercial fishery in Subarea 2 plus Division 3K.

| AGE | AVERAGE | | CATCH | | |
|-----|---------|--------|-------|-----------|-------|
| | WEIGHT | LENGTH | MEAN | STD. ERR. | C. V. |
| 7 | 0.306 | 32.692 | 4 | 1.36 | 0.34 |
| 8 | 0.361 | 34.302 | 16 | 3.85 | 0.24 |
| 9 | 0.433 | 36.235 | 115 | 13.54 | 0.12 |
| 10 | 0.513 | 38.137 | 237 | 19.80 | 0.08 |
| 11 | 0.637 | 40.779 | 285 | 19.88 | 0.07 |
| 12 | 0.824 | 44.093 | 207 | 14.70 | 0.07 |
| 13 | 1.108 | 48.190 | 110 | 8.21 | 0.07 |
| 14 | 1.429 | 52.012 | 44 | 5.37 | 0.12 |
| 15 | 1.757 | 55.420 | 15 | 3.71 | 0.24 |
| 16 | 2.055 | 58.102 | 2 | 1.03 | 0.50 |
| 17 | | | | | |
| 18 | 2.687 | 63.000 | | | 0.01 |

Table 7. Mean weight of American plaice per tow, by stratum, from research vessel surveys in Division 2J. Numbers in parentheses are the number of successful 30 minute tows in each stratum. The stratified mean weight per tow and the approximate 95% confidence limits are given at the bottom of the table. Strata marked with an asterisk were used in the calculation of abundance and biomass in Tables 9-11. (GA = R/V GADUS ATLANTICA.)

| Depth (m) | Stratum | Year-survey | | | | | | | | |
|--------------|---------|-------------|----------|----------|----------|-----------|--------------|----------------------|-------------------------|-------------------------|
| | | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
| | | GA3 | GA15 | GA29 | GA44 | GA58 | GA71 GA72 | GA86 GA87 GA88 | GA101 GA102 GA103 | GA116 GA117 GA118 |
| 101-200 | 201* | 52.7(2) | 56.5(3) | 69.4(2) | 121.2(3) | 71.2(5) | 151.0(6) | 81.0(6) | 59.5(3) | 41.2(6) |
| 201-300 | 202* | 45.9(2) | 14.5(2) | 7.0(2) | 17.8(2) | 18.8(2) | 46.8(2) | 51.5(2) | 7.0(2) | 7.0(2) |
| 301-400 | 203 | 7.4(2) | - | - | 16.0(2) | 2.3(2) | 0.9(3) | 0.7(3) | 1.5(2) | 0.3(3) |
| 401-500 | 204 | 16.3(2) | - | - | - | 6.9(2) | 2.7(3) | 9.0(3) | 4.3(2) | 50.8(14) |
| 101-200 | 205* | 75.3(4) | 13.7(4) | 51.7(2) | 27.9(4) | 74.9(8) | 181.8(12) | 67.1(8) | 23.6(8) | 31.5(8) |
| 101-200 | 206* | 253.3(11) | 129.4(7) | 31.0(8) | 62.5(7) | 131.0(11) | 120.7(18) | 213.6(14) | 150.3(11) | 2.9(2) |
| 101-200 | 207* | 72.6(5) | 21.9(4) | 30.0(5) | 10.3(5) | 22.3(9) | 68.7(15) | 33.7(10) | 25.9(7) | 21.6(13) |
| 301-400 | 208* | 16.9(4) | 15.3(3) | 25.4(2) | 15.8(2) | 15.0(2) | 3.3(3) | 3.5(2) | 2.2(3) | 10.1(3) |
| 201-300 | 209* | 54.1(7) | 20.5(4) | 21.9(5) | 66.3(4) | 52.0(6) | 22.4(11) | 15.8(7) | 22.6(7) | 21.4(9) |
| 201-300 | 210* | 12.8(6) | 40.9(4) | 18.8(2) | 16.3(3) | 13.4(3) | 17.5(6) | 272.8(2) | 20.8(4) | 9.1(4) |
| 301-400 | 211 | 8.9(2) | 24.7(2) | 28.6(2) | 44.4(3) | 1.6(2) | 2.5(2) | 7.5(2) | 2.3(2) | 10.0(3) |
| 501-750 | 212 | 2.2(4) | - | - | - | 0.3(2) | 0.1(5) | 0.1(3) | 0.1(3) | 0.3(4) |
| 201-300 | 213* | 61.8(8) | 48.4(4) | 17.9(4) | 100.2(5) | 43.1(6) | 45.5(10) | 37.1(10) | 12.0(5) | 56.1(9) |
| 201-300 | 214* | 23.6(6) | 26.6(4) | 11.7(4) | 11.5(3) | 13.1(5) | 4.0(8) | 36.4(8) | 39.6(4) | 79.6(6) |
| 201-300 | 215* | 27.8(4) | 59.0(5) | 26.8(4) | 4.0(2) | 12.0(5) | 4.1(9) | 11.6(8) | 1.5(3) | 3.8(6) |
| 301-400 | 216 | 0.6(2) | - | 2.0(2) | 0.2(2) | 0.5(2) | 0.5(2) | 0.0(3) | 1.3(2) | 0.3(2) |
| 401-500 | 217 | 0.2(3) | - | - | - | 0.0(2) | 0.0(2) | 0.0(2) | - | 0.0(2) |
| 501-750 | 218 | 0.0(2) | - | - | - | 0.0(2) | 0.0(2) | 0.0(2) | - | 0.0(2) |
| 751-1000 | 219 | - | - | - | - | 0.0(2) | - | 0.0(2) | - | 0.0(2) |
| 1001-1250 | 220 | - | - | - | - | - | - | - | - | - |
| 1251-1500 | 221 | - | - | - | - | - | - | - | - | - |
| 301-400 | 222* | 3.2(4) | 2.7(3) | 4.1(2) | 8.0(2) | 0.4(2) | 2.3(3) | 0.0(3) | 0.2(3) | 0.5(2) |
| 401-500 | 223 | 0.0(2) | - | - | - | 0.1(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) |
| 501-750 | 224 | 0.0(2) | - | - | - | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) |
| 1001-1250 | 225 | 0.0(2) | - | - | - | - | - | - | - | - |
| 1251-1500 | 226 | - | - | - | - | - | - | - | - | - |
| 401-500 | 227 | 0.6(4) | - | - | - | 0.2(2) | 1.0(5) | 0.3(4) | 0.0(3) | 0.1(4) |
| 201-300 | 228 | 21.9(8) | - | 8.3(4) | 6.2(3) | 8.8(6) | 3.9(10) | 4.5(6) | 5.0(7) | 9.1(7) |
| 301-400 | 229* | 7.0(4) | 0.5(2) | 1.6(2) | 1.5(2) | 0.1(2) | 0.9(4) | 1.3(4) | 0.2(3) | 0.1(3) |
| 501-750 | 230 | 0.0(3) | - | - | - | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) |
| 751-1000 | 231 | 0.0(2) | - | - | - | - | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) |
| 1001-1250 | 232 | 0.0(2) | - | - | - | - | - | - | - | - |
| 1251-1500 | 233 | - | - | - | - | - | - | - | - | - |
| 201-300 | 234 | 23.6(2) | 9.8(2) | 6.4(2) | 32.8(2) | 5.0(2) | 3.5(3) | 14.5(3) | 14.7(2) | 1.7(3) |
| 401-500 | 235 | 14.3(4) | - | - | - | 16.8(2) | 1.3(3) | 2.3(2) | 1.2(3) | 0.0(2) |
| 751-1000 | 236 | 0.0(2) | - | - | - | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) | 0.0(2) |
| Upper | | 77.7 | 63.7 | 61.1 | 56.1 | 50.4 | 68.9 | 89.4 | 45.8 | 30.2 |
| Mean (#sets) | | 58.4(117) | 44.4(53) | 26.7(54) | 40.0(56) | 36.9(102) | 50.6(157) | 53.6(129) | 31.6(99) | 23.6(131) |
| Lower | | 39.0 | 25.2 | -7.7 | 23.9 | 23.5 | 32.2 | 17.8 | 17.3 | 17.0 |

Table 8. Mean weight of American plaice per tow, by stratum, from research vessel surveys in Division 3K. Numbers in parentheses are the number of successful 30 minute tows in each stratum. The stratified mean weight per tow and the approximate 95% confidence limits are given at the bottom of the table. Strata marked with an asterisk were used in the calculation of abundance and biomass in Tables 9-11.

| Depth (m) | Stratum | 1978 | 1979 | 1980 | Year-survey 1981 | 1982 | 1983 | 1984 | 1985 |
|--------------|---------|----------|----------|----------|---------------------|--------------|----------------------|-------------------------|-------------------------|
| | | GA15 | GA29 | GA44 | GA58 GA59 | GA71 GA72 | GA86 GA87 GA88 | GA101 GA102 GA103 | GA116 GA117 GA118 |
| 101-200 | 618 | - | - | - | - | - | - | 23.3(5) | 25.5(6) |
| 101-200 | 619 | - | - | - | - | - | - | 10.7(7) | 4.3(7) |
| 201-300 | 620* | 112.9(7) | 29.5(7) | 50.2(9) | 33.5(10) | 37.9(9) | 38.4(10) | 51.9(13) | 21.8(14) |
| 201-300 | 621* | 92.8(7) | 64.3(8) | 21.0(10) | 66.0(11) | 29.4(14) | 39.7(12) | 41.7(14) | 39.8(15) |
| 401-500 | 622 | - | - | - | 9.5(2) | 16.2(3) | 8.3(2) | 9.4(4) | 1.2(4) |
| 301-400 | 623* | 50.4(3) | 16.0(3) | 88.4(4) | 50.2(4) | 15.0(5) | 23.3(6) | 18.7(5) | 3.3(6) |
| 201-300 | 624* | 18.3(3) | 11.3(2) | 5.0(2) | 25.3(2) | 17.0(4) | 13.9(4) | 17.6(4) | 16.1(4) |
| 301-400 | 625* | 12.3(3) | 7.7(3) | 5.3(4) | 9.9(4) | 7.3(2) | 16.8(3) | 10.3(5) | 11.6(5) |
| 301-400 | 626* | 7.2(4) | 21.2(3) | 40.5(3) | 58.4(5) | 20.3(5) | 31.8(4) | 38.5(6) | 17.3(5) |
| 401-500 | 627 | - | - | - | 14.6(6) | 6.1(7) | 6.2(6) | 12.5(8) | 11.4(7) |
| 301-400 | 628* | 5.6(5) | 22.2(2) | 6.6(4) | 3.9(6) | 2.3(6) | 16.3(6) | 17.0(7) | 11.8(6) |
| 301-400 | 629* | 6.8(3) | 6.6(2) | 8.0(3) | 7.5(3) | 3.3(2) | 8.8(3) | 5.3(4) | 4.5(4) |
| 301-400 | 630* | - | 5.4(2) | 24.9(2) | 8.5(2) | - | 4.3(2) | 4.9(3) | 3.6(4) |
| 401-500 | 631 | - | - | - | 7.4(5) | 4.0(2) | 3.8(5) | 6.9(5) | 7.9(7) |
| 201-300 | 632* | 9.2(3) | 14.1(2) | 6.4(2) | 8.5(2) | 5.3(3) | 10.2(3) | - | 5.3(3) |
| 301-400 | 633* | 5.9(5) | 4.8(6) | 2.3(7) | 2.6(8) | 3.2(7) | 2.4(12) | 1.7(10) | 1.3(12) |
| 201-300 | 634* | 5.5(5) | 4.3(6) | 4.6(5) | 6.5(7) | 5.3(11) | 2.4(5) | 4.5(7) | 2.2(9) |
| 201-300 | 635* | 10.5(5) | 7.5(5) | 13.8(4) | 13.2(5) | 16.8(5) | 26.5(6) | 18.8(8) | 4.9(7) |
| 201-300 | 636* | 14.2(3) | 7.0(5) | 4.7(5) | 4.4(6) | 8.3(10) | 11.4(6) | 14.4(8) | 6.5(8) |
| 201-300 | 637* | 7.5(4) | 7.0(4) | 7.3(4) | 9.0(6) | 16.9(7) | 9.5(5) | 15.6(6) | 4.1(7) |
| 301-400 | 638* | 11.8(5) | 10.1(7) | 10.0(6) | 12.1(8) | 5.6(15) | 8.0(11) | 5.9(10) | 12.3(11) |
| 301-400 | 639* | 6.4(5) | 1.0(2) | 5.2(4) | 2.1(6) | 3.9(10) | 1.0(7) | 6.0(8) | 1.4(8) |
| 401-500 | 640 | - | - | - | 0.0(2) | 0.0(2) | - | 0.0(2) | 0.3(3) |
| 501-750 | 641 | - | - | - | 0.0(2) | 0.0(4) | 0.0(3) | 0.0(3) | 0.3(4) |
| 751-1000 | 642 | - | - | - | 0.0(3) | 0.0(6) | - | 0.0(6) | 0.0(5) |
| 1001-1250 | 643 | - | - | - | - | - | - | - | - |
| 1251-1500 | 644 | - | - | - | - | - | - | - | - |
| 401-500 | 645 | - | - | - | 0.0(2) | 0.0(3) | 0.1(2) | 0.0(2) | 0.1(3) |
| 501-750 | 646 | - | - | - | 0.0(2) | 0.0(2) | 0.3(2) | 0.0(2) | 0.0(3) |
| 751-1000 | 647 | - | - | - | 0.0(2) | 0.0(2) | - | - | 0.0(3) |
| 1001-1250 | 648 | - | - | - | - | - | - | - | - |
| 1251-1500 | 649 | - | - | - | - | - | - | - | - |
| Upper | | 50.1 | 23.8 | 25.9 | 24.5 | 15.9 | 21.0 | 21.0 | 13.9 |
| Mean (#sets) | | 34.3(70) | 18.3(69) | 19.0(78) | 18.8(121) | 12.6(146) | 15.9(125) | 17.4(162) | 11.2(180) |
| Lower | | 18.6 | 12.9 | 12.1 | 13.2 | 9.4 | 10.9 | 13.8 | 8.5 |

Table 9. Mean number of American plaice per tow (with approximate upper and lower 95% confidence intervals) from R.V. surveys in Division 2J. The same strata were used in the calculations for each year.

| Age | GA3 1977 | GA15 1978 | GA29 1979 | GA44 1980 | GA58-59 1981 | GA71,72 1982 | GA86-88 1983 | GA101-103 1984 | GA116-118 1985 |
|---------|-------------|--------------|--------------|--------------|-----------------|-----------------|-----------------|-------------------|-------------------|
| 1 | - | - | - | - | - | - | - | - | - |
| 2 | - | - | - | - | 0.01 | 0.01 | - | - | 0.01 |
| 3 | - | 0.03 | - | - | 0.01 | 0.17 | 0.06 | - | 0.05 |
| 4 | 0.20 | 0.57 | 0.32 | 0.07 | 0.81 | 0.38 | 0.85 | 0.34 | 0.16 |
| 5 | 8.54 | 5.24 | 2.20 | 0.66 | 3.41 | 3.86 | 1.88 | 1.34 | 1.65 |
| 6 | 17.56 | 15.90 | 9.45 | 5.42 | 21.19 | 10.83 | 10.32 | 4.62 | 6.50 |
| 7 | 34.54 | 24.24 | 16.99 | 27.48 | 29.15 | 33.06 | 32.13 | 16.20 | 15.24 |
| 8 | 48.43 | 20.35 | 17.62 | 21.65 | 22.98 | 38.34 | 41.28 | 23.38 | 19.11 |
| 9 | 27.63 | 15.47 | 10.64 | 13.08 | 8.92 | 38.63 | 23.81 | 18.76 | 17.34 |
| 10 | 12.77 | 9.80 | 5.89 | 8.69 | 5.99 | 17.06 | 17.09 | 8.04 | 5.99 |
| 11 | 8.13 | 5.50 | 2.66 | 4.82 | 2.15 | 6.81 | 8.80 | 4.17 | 2.24 |
| 12 | 5.62 | 4.42 | 3.55 | 4.41 | 0.87 | 4.18 | 2.50 | 1.36 | 1.40 |
| 13 | 3.71 | 3.71 | 2.11 | 1.96 | 0.07 | 2.56 | 1.62 | 1.14 | 0.69 |
| 14 | 2.10 | 1.70 | 0.62 | 1.16 | - | 1.13 | 0.42 | 0.21 | 0.11 |
| 15 | 0.87 | 1.22 | 0.16 | 0.34 | - | 0.22 | 0.16 | 0.08 | - |
| 16 | - | 0.58 | 0.06 | 0.15 | - | 0.11 | - | - | - |
| 17 | - | 0.20 | - | 0.05 | - | 0.02 | 0.01 | - | - |
| 18 | - | 0.01 | - | 0.02 | - | - | - | - | - |
| 19 | - | 0.01 | - | - | - | - | - | - | - |
| UNK | - | - | - | - | 0.08 | 0.03 | 0.01 | 0.01 | 0.01 |
| Upper | 229.08 | 151.72 | 264.181 | 21.63 | 129.57 | 215.11 | 216.53 | 115.58 | 92.24 |
| Mean | 170.10 | 108.95 | 72.27 | 89.96 | 95.64 | 157.40 | 140.94 | 79.65 | 70.50 |
| Lower | 111.09 | 66.15 | -119.64 | 58.25 | 61.73 | 99.68 | 65.35 | 43.73 | 48.77 |
| No.Sets | 67 | 49 | 44 | 44 | 66 | 107 | 84 | 63 | 85 |

Table 10. Mean number of American plaice per tow (with approximate upper and lower 95% confidence intervals) from R.V. surveys in Division 3K. The same strata were used in the calculations for each year.

| Age | GA15 1978 | GA29 1979 | GA44 1980 | GA58,59 1981 | GA71,72 1982 | GA86-88 1983 | GA101-103 1984 | GA116-118 1985 |
|----------|--------------|--------------|--------------|-----------------|-----------------|-----------------|-------------------|-------------------|
| 1 | - | 0.01 | - | - | - | - | 0.01 | - |
| 2 | - | - | 0.01 | - | 0.02 | 0.01 | 0.07 | 0.18 |
| 3 | 0.24 | 0.01 | 0.08 | 0.16 | 0.31 | 0.57 | 0.17 | 0.21 |
| 4 | 4.02 | 0.40 | 0.12 | 0.23 | 0.55 | 0.79 | 1.70 | 0.66 |
| 5 | 10.28 | 2.31 | 1.19 | 1.09 | 1.20 | 2.97 | 2.38 | 1.90 |
| 6 | 15.12 | 5.06 | 4.01 | 2.33 | 2.95 | 5.46 | 6.78 | 2.75 |
| 7 | 13.59 | 6.89 | 10.31 | 8.18 | 5.75 | 9.46 | 7.00 | 5.10 |
| 8 | 10.05 | 7.51 | 7.25 | 11.65 | 7.69 | 9.72 | 12.44 | 5.70 |
| 9 | 8.65 | 6.11 | 5.29 | 6.71 | 6.29 | 4.00 | 6.96 | 4.46 |
| 10 | 7.23 | 4.45 | 4.49 | 7.19 | 3.27 | 3.10 | 3.35 | 2.23 |
| 11 | 4.33 | 2.07 | 2.62 | 2.24 | 2.18 | 1.13 | 2.03 | 1.00 |
| 12 | 3.72 | 2.64 | 2.09 | 3.03 | 1.06 | 1.18 | 1.39 | 1.06 |
| 13 | 3.23 | 1.32 | 1.03 | 1.45 | 0.86 | 0.56 | 0.67 | 0.52 |
| 14 | 1.67 | 0.43 | 0.66 | 0.61 | 0.42 | 0.30 | 0.30 | 0.11 |
| 15 | 1.30 | 0.17 | 0.26 | 0.37 | 0.22 | 0.12 | 0.20 | 0.08 |
| 16 | 0.67 | 0.15 | 0.10 | 0.26 | 0.07 | 0.03 | 0.05 | 0.03 |
| 17 | 0.25 | 0.01 | 0.05 | - | 0.05 | - | 0.02 | - |
| 18 | 0.08 | 0.03 | 0.03 | 0.04 | 0.01 | - | - | - |
| 19 | 0.01 | - | - | - | - | - | - | - |
| UNK | 0.04 | 0.02 | - | 0.01 | 0.01 | 0.04 | - | - |
| Upper | 117.13 | 50.48 | 50.36 | 56.72 | 39.50 | 49.10 | 55.36 | 31.99 |
| Mean | 84.48 | 39.59 | 39.59 | 45.55 | 32.91 | 39.44 | 45.51 | 25.99 |
| Lower | 51.84 | 28.66 | 28.83 | 34.39 | 26.31 | 29.78 | 35.65 | 20.01 |
| No. Sets | 70 | 69 | 78 | 95 | 115 | 105 | 119 | 128 |

Table 11. Biomass estimates (t) for American plaice from random stratified surveys in Division 2J and 3K, 1978-85. The same strata were used in the calculations shown in the first three rows of the table. The last three rows give the total estimated biomass for all strata surveyed along with the approximate 95% confidence intervals.

| Division | Year | | | | | | | |
|---------------------------|---------|---------|---------|---------|---------|---------|---------------------|---------------------|
| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
| 2J | 56,881 | 36,487 | 55,398 | 63,101 | 88,164 | 93,685 | 52,549 | 40,524 |
| 3K | 57,314 | 31,354 | 32,480 | 37,807 | 24,787 | 30,873 | 34,022 | 21,459 |
| Total for selected strata | 114,195 | 67,841 | 87,878 | 100,908 | 112,951 | 124,558 | 86,571 | 61,983 |
| Upper 95% | 166,544 | 128,553 | 127,016 | 141,172 | 154,541 | 201,227 | 126,480 | 86,635 |
| Total for all strata | 115,181 | 69,737 | 91,469 | 105,331 | 115,451 | 127,426 | 93,968 ^a | 68,477 ^a |
| Lower 95% | 63,817 | 10,922 | 55,922 | 69,492 | 76,360 | 53,625 | 61,456 | 50,320 |

^a Includes strata 618 and 619 added in 1984.

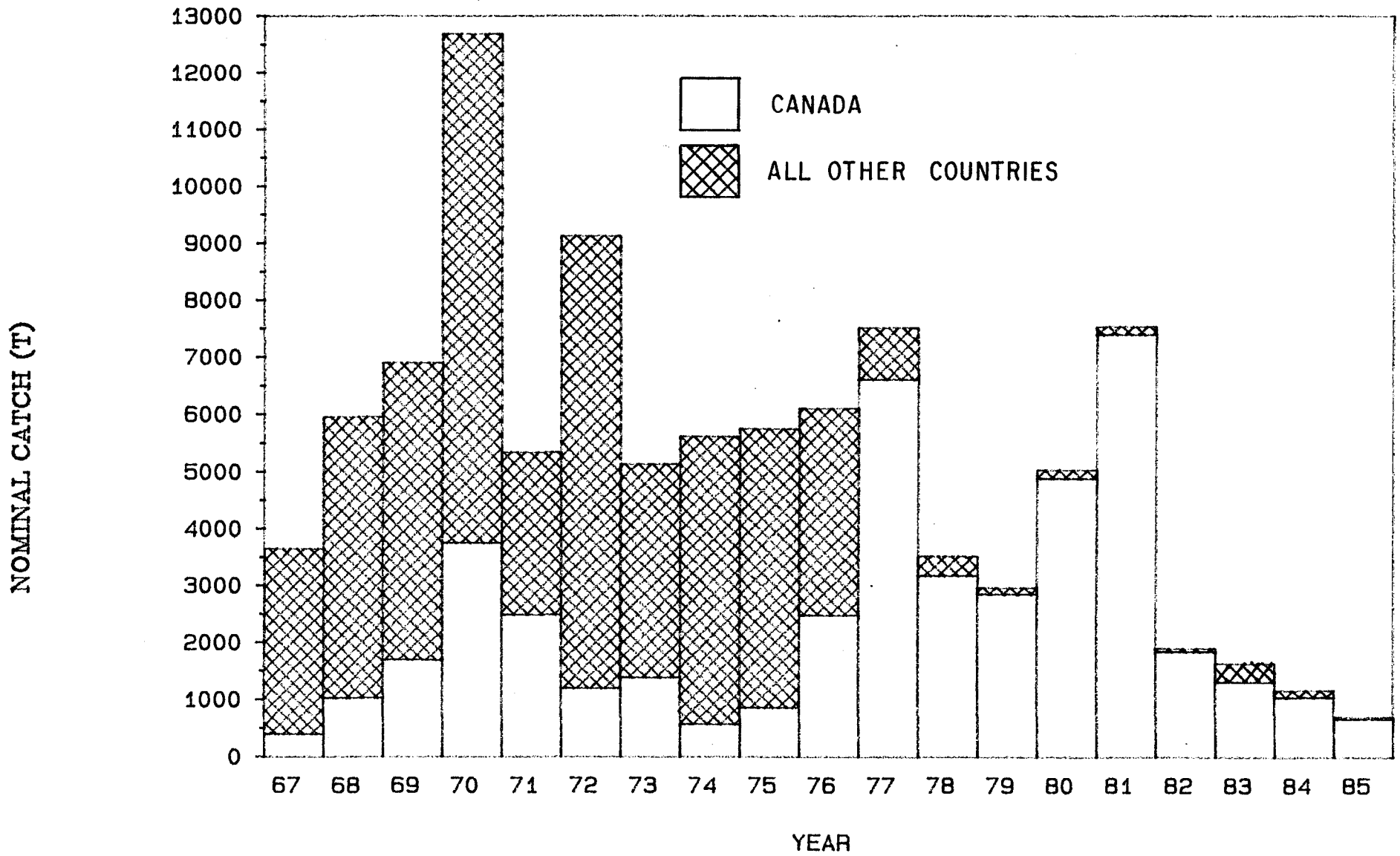


FIG.1 NOMINAL CATCHES OF AMERICAN PLAICE, NAFO SUBAREA 2 PLUS DIVISION 3K, 1967-85.

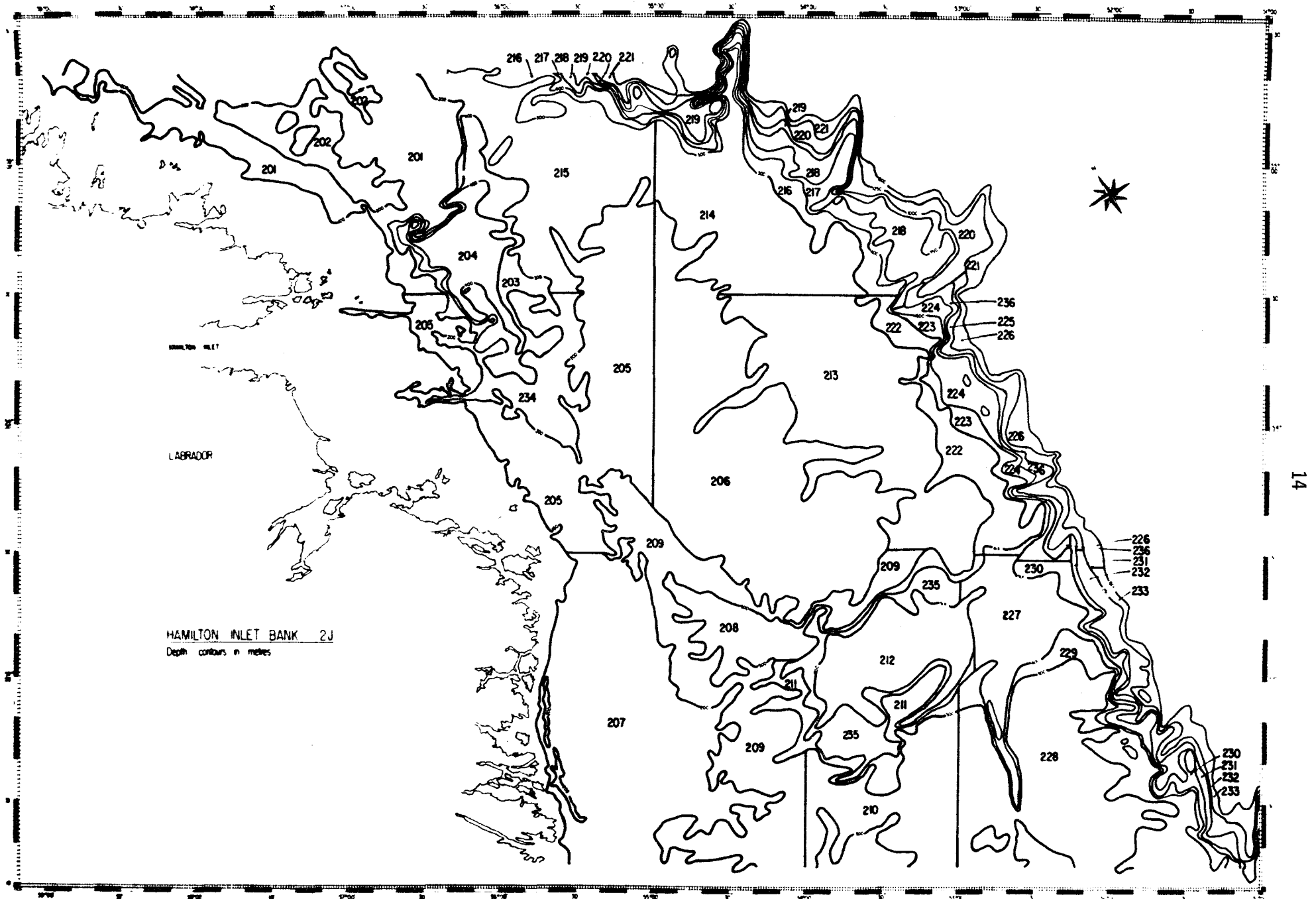


Fig. 2. Stratification scheme used for Canadian surveys in Division 2J.

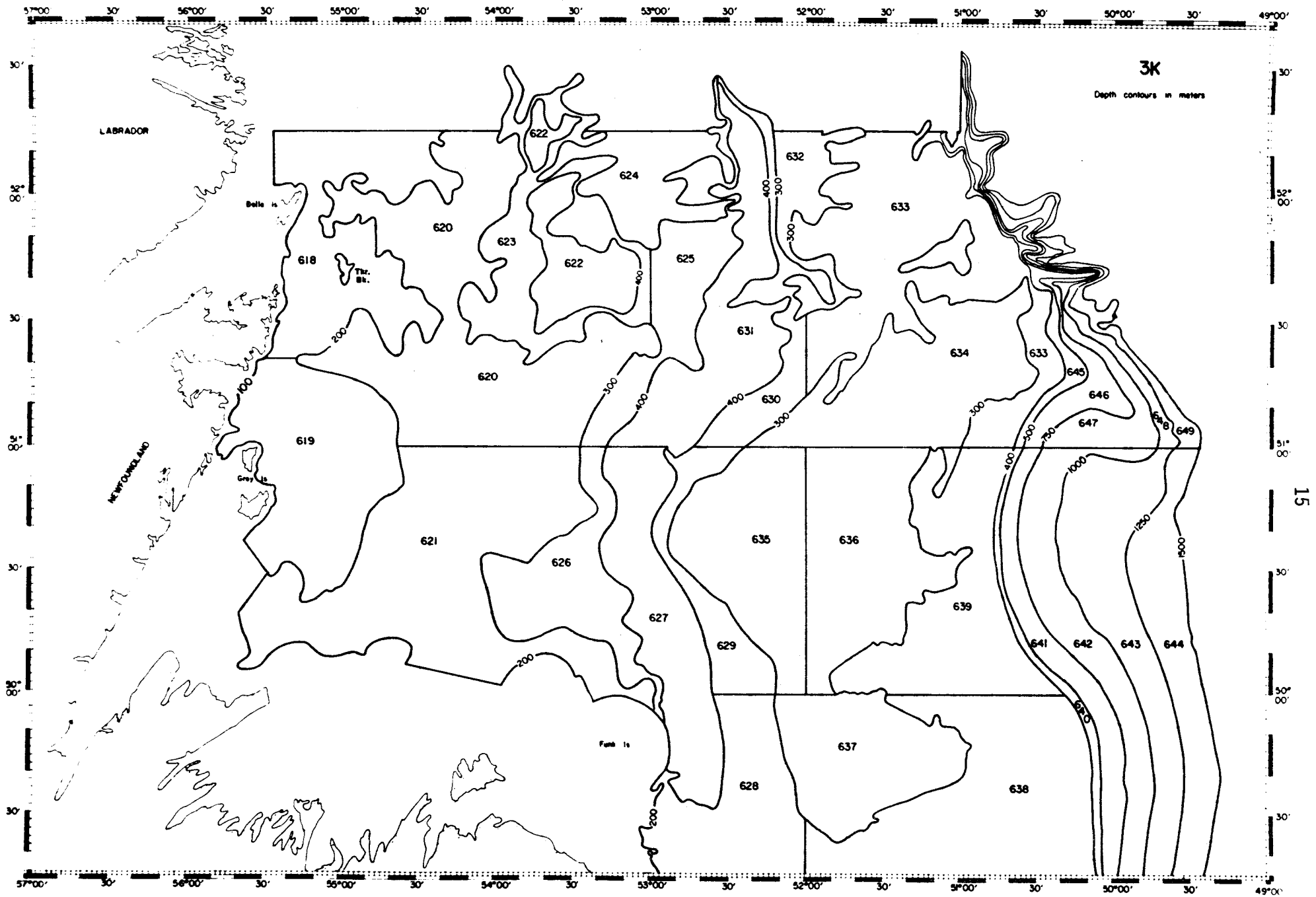


Fig. 3. Stratification scheme used for Canadian surveys in Division 3K.

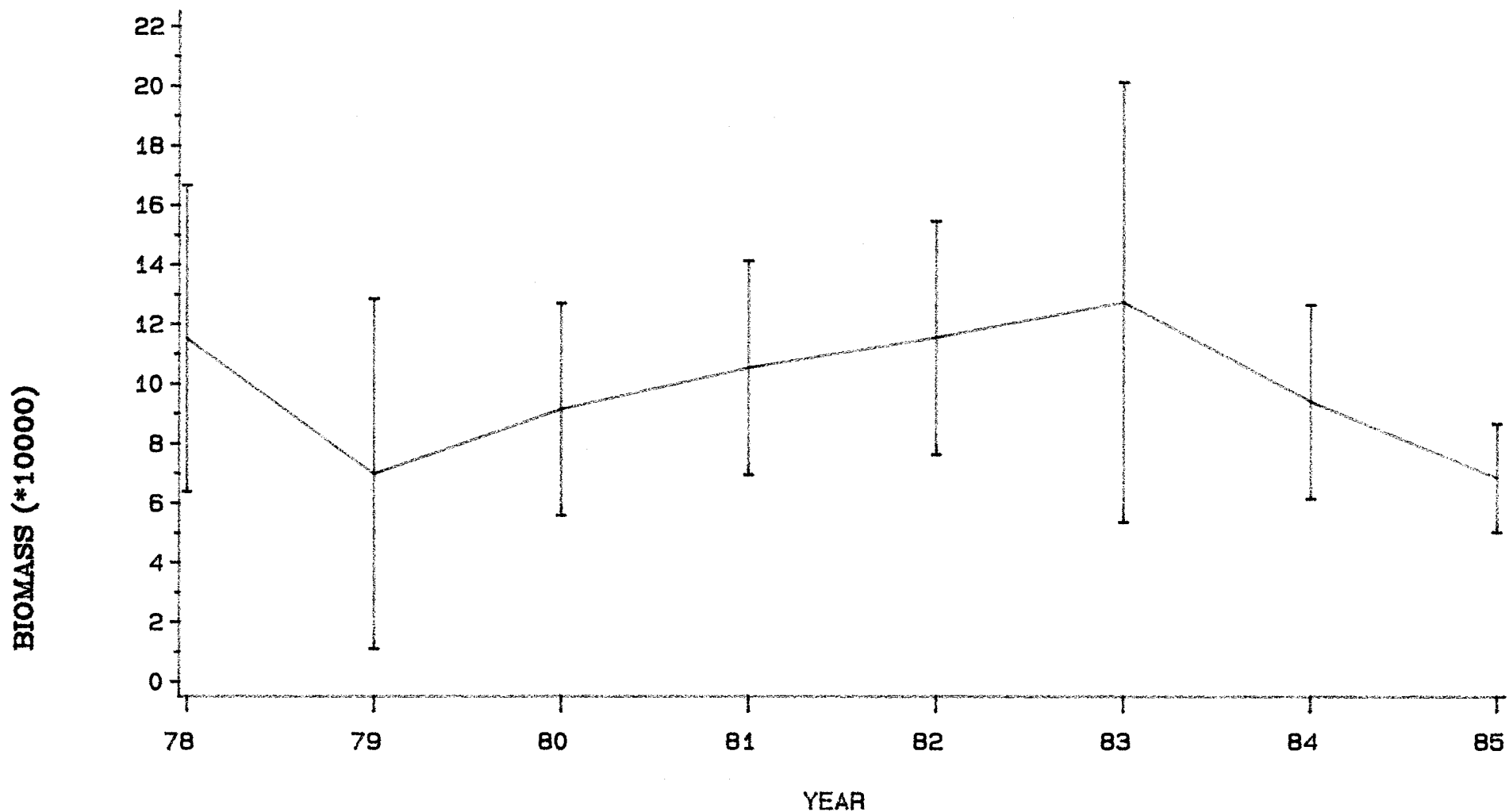


FIG 4. BIOMASS ESTIMATES OF AMERICAN PLAICE FOR ALL STRATA SURVEYED IN DIVISIONS 2J AND 3K, ALONG WITH 95% CONFIDENCE INTERVALS.