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American Plaice in Divisions 3LNO - An Assessment Update

by

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Introduction

TAC regulation

This stock has been under quota regulation since 1973, when a level of 60,000 t was established (Table 1a). Since then, the TAC has been set at between 47,000 and 60,000 t, with the 1987 value being 48,000 t.

Catch trends

The offshore fishery for this stock essentially began in the late 1940's and the nominal catch reached a peak of 94,000 t in 1967 (Table 1a, Fig. 1). After a period of considerable foreign involvement in the fishery in the 1960's and early 1970's, catches were almost exclusively Canadian in the late 1970's to early 1980's. Catches by non-Canadian vessels began increasing in 1983 and reached a level of over 27,000 t in 1986, about 45% of the nominal catch (Tables 1a, 1b). The catch by Canadian vessels has been between 33,000 and 40,000 t in the 1983-86 period. There is an inshore fishery for this stock in Div. 3L, and the catch of about 3,700 t in 1986 is within the range of recent catches, and up about 40% over the 1985 catch. Overall, the 1986 nominal catch from Divs. 3LNO of about 61,000 t was the highest since 1971.

In most recent years, the majority of the catch has been taken from Div. 3L, although increased effort by foreign vessels outside the Canadian 200-mile limit has caused the catch in Div. 3N to increase in 1985 and 1986 (Table 2, Fig. 2). In addition, there was a significant portion of the catch in 1986 for which division was not reported. Most of this catch was taken by Portugal, either on the Nose or Tail of the Bank (Fig. 6). Catches from Div. 3Ø have been relatively stable since 1981, averaging about 4,600 t.

Table 3 shows that the fishery in most years is conducted in all months, with catches in 1985 and 1986 being higher in the second half of these years. Again, it should be noted that monthly breakdowns were not available for over 16,000 t in 1986, and over 12,000 t in 1985.

Stock assessment

As has been the case for several years for this stock, only the portion of the stock in Div. 3LN is assessed, because a longer time series of acceptable data is available. In previous years, an amount for Div. 3O, usually equal to the recent average catch, has been added to the projected catch for Div. 3LN to produce a TAC for the entire stock.

Sampling

Length frequencies and otoliths from the Canadian catch in 1986 were used to calculate numbers and weights at age. Some length frequency information only was available from catches by U.S.A. vessels, and compared reasonably well to Canadian data. However, as these data are not yet in a comparable form with the Canadian data, they were not used in this assessment. Table 4 shows the excellent level of sampling from the Canadian fishery in 1986 for this stock.

Further assessment of this stock is contained in the Appendix. (see page 37)

Numbers caught at age

These were determined in the usual manner from quarterly age-length and monthly length frequencies, sexes separate. The catch at age for 1986 (Table 5) was obtained by combining male and female numbers at age for Div. 3LN, and was calculated based on a catch of 54,243 t in Div. 3LN. The 1986 values were added to the long-term series shown in Tables 6 and 7. No adjustments, based on revised catch estimates, were warranted for the 1984 and 1985 numbers at age.

The catch at age for 1986 was similar to that observed in 1985, with ages 9-12 comprising over 75% of the catch numbers. Ages 6-8 formed only a small portion of the catch in 1986, continuing a trend started in 1981 (Table 7). Kulka (1986) showed no trend in discard rates of A. plaice from Canadian trawlers in the 1981-85 period, although preliminary analysis of the 1986 data showed that the rate may be double the 1985 level. No estimates of discards by length or age group have been available from this stock since 1982 (Stevenson, 1983), at which time an increase was noted in the number of A. plaice aged 6-10 being discarded from 1980 to 1982. Given the belief that a constant discard rate is likely to cause fewer problems in stock assessment than one which varies over time, and the fact that discard estimates are neither added into catch estimates nor subtracted from projections in assessments, little can be done in the current analysis to address the problem. However, the apparent increase in 1986 in discards along with the problems in recent years for this stock in calculating partial recruitment probably warrant further investigation into the effect of discarding on the assessment of this stock.

A comparison of the 1986 catch projected in the 1986 assessment of this stock with the actual catch in 1986 is shown in Fig. 3. The contribution of fish aged 6-8 was not as great as that projected, with ages 10 and 11 forming more of the catch than indicated by the projection. The low value projected at age 9 was caused by an apparently low value of the population size at age 8 in 1985 calculated from SPA in last year's assessment. Among the explanations for the discrepancy shown in Fig. 3 is the possibility that the partial recruitment vector used to project the 1986 catch was too high at ages 6-8 and too low at ages 10-11. This possibility has been noted previously for this stock, and was thought to have been rectified in the 1985 assessment, where the projected and actual 1985 catch numbers at age showed relatively good agreement.

Weights at age

These were calculated (Table 5) in the usual manner from the 1986 fishery, using the method outlined in Brodie, 1985. The weights at age were lower than those calculated for 1985 (Table 8) although very similar to the average for 1984 and 1985. The recent increase in the weights at most ages may be attributed to the fact that a higher proportion of the catch in 1985 and 1986 has come from Div. 3N, where A. plaice tend to be larger at age than in Div. 3L. Table 9, which contains the catch biomass at age for 1965-86, reveals that the sum of products for 1986 was about 8% higher than the catch used to calculate the numbers and weights at age for Div. 3LN.

Natural mortality

The value of 0.2, re-examined for this stock by Pitt, 1982, was retained for this assessment.

Commercial CPUE data

At the recommendation of STACFIS in 1986, an analysis of the catch and effort data for Div. 3LN A. plaice was carried out using a multiplicative model (Gavaris, 1980). Because data were available from the NAFO Statistical Bulletins only from 1974 onward in a format identifying main species A. plaice data, it was decided to use Canadian (Newfoundland) trawler data from 1956 to 1986, from files maintained at the Northwest Atlantic Fisheries Centre in St. John's. A summary of this data, by year and division is given in Table 10, and it is interesting to note that in some years, particularly the late 1970's, the Canadian catch provides virtually the only source of CPUE for this stock.

As is the norm when using the multiplicative model quoted previously, values of catch and effort less than or equal to 10 tons were eliminated. Again, as is often the case, e.g. Baird and Bishop, 1986, plots of residuals indicated data with higher levels of catch and effort tended to be less variable. Therefore, a weighted regression (Judge et al., 1980), was conducted. Table 11 shows the results of the analysis, and Fig. 4 gives the points in the series from 1956 to 1986. A comparison of the multiplicative model series with the CPUE values calculated previously for this stock revealed that the two indices were very similar from 1967 to 1986 and showed the trends to be similar in 1960-66.

The regression coefficients in Table 11 show Div. 3L to have a higher catch rate than Div. 3N, TC 4 side trawlers to have lower CPUE values than TC 4 sterns, which are in turn lower than TC 5 sterns, and higher CPUE values to occur in the winter months of January-March.

It should be noted that catch data for TC 5 stern trawlers in Div. 3L, March 1985 were deleted from this analysis. This value was about 2,800 t per 650 hours, and while verifiably real, was far outside the range of other data used in the model, and shown clearly to be an influential outlier in the regression.

As was noted previously the CPUE series calculated here agreed with the index used in prior assessments, showing a decline through the 1960's to the mid 1970's, followed by an increase to 1985 (Fig. 4). However, the 1986 value declined sharply (30%) from the 18-year high point of 1985, to a level similar to that observed in the late 1970's. This decline was also indicated in the CPUE series calculated with the method used in previous assessments.

Although very little data are available, anecdotal information from the commercial fishery in 1987 indicates that catch rates for Newfoundland offshore trawlers have improved markedly in early 1987 over 1986.

Research vessel survey data

1) Spring series, 1971-87

Results from spring stratified-random surveys conducted by Canada from 1971 to 1987 are shown in Tables 12, 13, and 14 for Div. 3L, 3N, and 3Ø respectively. In Div. 3L the 1985 1986, and 1987 biomass estimates were virtually identical, representing a decline from the level of the late 1970's and early 1980's. Unfortunately, no survey data exist for 1983, and only a few strata were fished in 1984. As well the surveys from 1971 to 1982 were conducted by a different vessel-gear combination than was used from 1984 on and although conversion factors exist for age by age comparisons (Gavaris and Brodie, 1984), the biomass estimates are not directly comparable.

In Div. 3N, the biomass estimates have shown more fluctuation, but a decrease did occur from 1984 to 1986. The 1987 value, from a preliminary analysis of the recently conducted survey, indicates an increase over the 1986 level, but not quite back to the biomass observed in 1985. In Div. 3Ø (Table 14), biomass showed a sharp decline from 1985 to 1986, then increased in 1987 to the level observed in 1984-85.

The complete survey coverage in 1985 and 1986 by identical vessel-gear combinations allows a comparable calculation of abundance and biomass for Divs. 3LNO combined, and this is shown in Table 15. Overall, the abundance declined from 588 million fish in 1985 to 529 million in 1986, with the reduction coming in Divs. 3N and 3Ø. The total estimated biomass decreased from 311 thousand tons in 1985 to 266 thousand tons in 1986.

Table 16 shows the trends in the mean numbers and weight per tow of A. plaice from selected strata in Div. 3LN (Brodie, 1985). The decline from 1982 to 1985 in Div. 3L is evident in the mean no./tow (Fig. 5) and to a lesser extent in the mean wt./tow, this difference being due to the different catchability associated with the vessel-gear used in the surveys after 1983. Better indices are the population estimates from the selected strata in the spring surveys in Divs. 3L and 3N presented in Tables 17 and 18 respectively. In these tables, the estimates for 1971-82 have been adjusted to account for the differences in fishing power of the two vessel-gear types. Again, the declines in abundance are apparent for Div. 3L from 1982 to 1985, with 1985 and 1986 being equal. The decline in Div. 3N noted previously is also apparent in Table 18.

2) Fall series 1981-86

From 1981 to 1986, a series of stratified-random surveys has been conducted in Div. 3L in the autumn months. Mean weight per tow and biomass estimates from these surveys are in Table 19. The abundance estimates by age, from selected strata, are shown in Table 20. The decline in biomass from 1983-84 to 1986 is clearly shown, as is the decrease in abundance, although there is no decrease in abundance in the selected strata from 1985-86. This is due to the unusually large percentage of the population estimated to be outside the selected strata in 1985 (28%), compared to about 6% in 1984 and 9% in 1986 (Brodie, 1986).

3) Seasonal series, 1985-86

Tables 21 and 22 show the results of stratified-random surveys carried out in Div. 3L at various times in 1985 and 1986. Note that the spring and fall surveys are included in the two series of surveys discussed previously. The biomass estimate in 3 of the 4 surveys in 1985 was between 215 and 220 thousand tons, with the fourth value, spring 1985, being very close to the value observed in the spring of 1986 (175 thousand tons). The obvious anomaly is the 1986 winter estimate of only 46 thousand tons. The reason for this apparent anomaly is not known, but may be related to survey coverage. Several strata beyond 366 m were not surveyed at that time, and, given the levels of A. plaice

biomass usually found at these depths, this was not considered to be a problem. However, a survey in April, 1987 discovered a very large concentration of A. plaice in 520 m in Stratum 735 (Fig. 6), in the area not surveyed in winter 1986. There are also indications from several strata in the spring 1985 survey (Table 21) that A. plaice may be found in deeper water. Until this phenomenon can be examined further, it remains only as a possible explanation for the drastic and apparently short-lived decline in abundance observed in the winter 1986 survey in Div. 3L.

Possible effects of temperature on abundance indices of A. plaice in Div. 3L

Recent environmental conditions off the Newfoundland and Labrador area have been well documented, and it is generally accepted that 1984 and 1985 ranked among the coldest years in the past 40 in terms of water temperatures. To determine if these water temperatures were correlated with catches of A. plaice in Div. 3L, water temperatures from Station 27 (just off Cape Spear, Newfoundland, in Div. 3) were examined for the 1970-86 period. Yearly averages from the 150-175 m (bottom) layer of water were plotted against the stratified mean weight per tow of A. plaice from selected strata in the spring surveys in Div. 3L for the years 1971-86, excluding 1973 and 1983-84, when survey coverage was very poor or non-existent. A significant relationship existed for the unlagged data, but a better one (Fig. 7) existed when the survey value for year i+1 was plotted against the temperature in year i. It is interesting to note that 1973 and 1974 are the only years in the series with temperatures similar to those in 1984 and 1985 and that the surveys in 1975-76 and 1985-86 produced 4 of the 5 lowest estimates of catch per tow. It is also worth noting that the 1985-86 survey estimates used in Fig. 7 may be slight overestimates compared to the other points because of the different vessel-gear used in these surveys.

While there are obviously other physical and biological factors which affect estimates of abundance from surveys, the correlation noted here must be kept in mind, particularly when evaluating the apparent decline in abundance of this stock from 1982-86. The magnitude of some of the short-term changes in abundance in Div. 3L i.e. from a high in 1971 to a low in 1974 to a near-high in 1977 are not easily explained by exploitation alone for a stock such as this, with relatively stable recruitment and many age-groups in the fishery. From the evidence in Fig. 7 and data presented for many other stocks, it is highly likely that changing water temperatures played a role in causing fluctuations in A. plaice abundance estimates from surveys.

Correlations of the same temperature data with the commercial CPUE data for Div. 3LN for 1970-86 were not significant, both for lagged (1 year) and unlagged data. However, it is worth noting that CPUE data is for Div. 3LN combined, and temperature data may not adequately reflect conditions in Div. 3N, which are affected to a greater degree by the warmer Gulf Stream water. In any case, there are some trends in the data which coincide, e.g. a 15% decline in CPUE from 1973 to 1974, when the temperatures were extremely low, and the decline in CPUE in 1986 following two similarly cold years, to a level close to that observed in the 1974-75 period.

Partial recruitment (PR)

As has been the case for this stock in most of the recent assessments, this parameter again proved difficult to calculate. As noted previously, Fig. 3 indicates that the PR used for projections in the 1986 assessment (PR 86 in Table 23) may not have been accurate. An important criterion used in the selection of this PR in the 1986 assessment was that the same PR, when used in the 1985 projections, gave reasonably good agreement in the catch numbers with those observed in 1985. However, it was felt that this criterion was not met in the 1986 catch at age and the PR used in the 1986 projections was not used in this assessment, in that it appeared to be too high at ages 6-8 and too low at ages 10-12.

Several of the standard approaches were taken in an attempt to derive PR. Short-term averages from sequential population analysis (SPA) produced results not dissimilar to PR 85 in Table 23, i.e. much lower at ages 6-10 than PR 86. While the PR at ages 6-8 may be reasonable, it was felt that ages 9 and 10, which form a significant part of the catch at age, did not have PR values that much lower than those in PR 86, considering Fig. 3. Averaging PR values from periods where the catch pattern was similar to 1985-86 (i.e. 1972-75, when the catch in Div. 3N was about equal to that in Div. 3L) produced PR vectors close to PR 86. Therefore, it was decided to recalculate the long-term (1965-86) average PR from a preliminary SPA using F_T in 1986 of 0.4 and determine its usefullness. This vector, PR 87 in Table 23, is similar to PR 86 at ages 6-8, and higher at ages 9+. The age of full recruitment was determined to be 12, a year younger than previous assessments, because of the increased catch in Div. 3N, where fish are larger at age than in Div. 3L.

This PR vector is not considered ideal. It is much higher at ages 6-8 than indicated by short-term averages, and perhaps warrants some adjustment. However, it is considered to provide a better estimate of the PR at ages 9+.

It should be noted that in some past assessments of this stock (Brodie and Pitt, 1982, 1983) PR at ages 6-10 could not be calculated using so-called conventional methods, and adjustments were made based on catch ratios in the commercial catch at age. Perhaps some of the recent difficulties can be attributed to unknown changes in discarding practices, and changes in the area, time, and composition of the fishery.

In any case, it was decided to use PR 87 in SPA, acknowledging the potential problems with the PR at ages 6-8. The use of a long-term average is consistent with the practice chosen in the 1986 assessment.

Terminal fishing mortality (F_T) in 1986 in SPA

In 1986, only the relationship of average exploitable biomass from SPA versus commercial CPUE was used to determine F_T. The relationship of exploitable biomass (not average) vs CPUE, while significant, was rejected because it was not particularly strong. Because of several missing years, notably 1975-76 and 1983-84, in the spring survey series, STACFIS decided that these data could not be used to calibrate the SPA. Therefore, in keeping with last year's decisions, it was decided to present only the calibration using the first method above. The average exploitable biomass was calculated in the usual manner, by multiplying the average biomass at age in the SPA by the average selectivity coefficients (1965-86) as determined from the fishing mortality matrix. The CPUE values are those shown in Table 11 and Fig. 4, from the multiplicative model.

The results of the calibration indicate that F_T is between 0.5 and 0.6, depending on which criterion is used (Table 24). The highest correlation coefficient (r) is obtained at F_T= 0.50, although there is litle change in r over the range of F_T used. The intercept of the regression line passed through the origin at a value of F_T between 0.55 and 0.60. The sum of the 1986 and 1985 residuals, as well as the sum of the squares of these values, were closest to zero at F_T = 0.55. The plot of average exploitable biomass vs CPUE from the SPA at F_T = 0.55 is shown in Fig. 8. As was the case last year, there are noticeable trends in the residuals of this plot. Figure 9 shows the trends in catchability (q) from this relationship over the 1965-86 period, with the peaks in 1973 and 1981-84 corresponding to negative residuals in Fig. 8 and the troughs in 1968-70 and 1977-79 representing positive residuals in Fig. 8. The reasons for these changes in q are not known at present, nor is their potential affect on the calibration of SPA accounted for in the present analysis.

Results of SPA

The cohort analysis at F_T = 0.55 is shown in Table 25. The substantial drop in 1986 in the CPUE values used in calibration resulted in a very low population size from SPA in 1986. Obviously, the population numbers at ages 6-8 are anomalously low, and can be explained by the PR values used. However, the 9+ biomass of about 140,000 t is considerably lower than the 8+ biomass determined from the 1986 assessment (275,000 t), derived from SPA with F_T = 0.35. Given the recent events in the commercial CPUE and survey time series, caution must be used in interpreting the 1986 decline in CPUE as representing a similar decline in stock abundance.

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Table 1a. Nominal catches (t) of American plaice for NAFO Divisions 3LNØ, 1960-86 and TAC's from 1973 to 1987.

Year	Canada	France	Poland	USSR	South Korea[a]	Other	Total	TAC
1960	21,352	2,106	-	569	-	20	24,047	-
1961	14,903	1,473	286	1,248	-	3	17,913	-
1962	15,217	973	171	1,841	-	4	18,206	-
1963	24,591	93	558	72	-	132	25,446	-
1964	35,474	1,582	539	680	-	292	38,567	-
1965	45,365	2,056	977	4,544	-	319	53,261	-
1966	51,225	1,246	860	11,484	-	196	65,011	-
1967	54,190	1,326	3,234	35,139	-	524	94,413	-
1968	48,674	406	203	23,751	-	133	73,167	-
1969	64,815	43	34	14,493	-	52	79,437	-
1970	54,929	389	40	10,232	-	1,055	66,645	-
1971	49,394	323	370	17,173	-	628	67,888	-
1972	41,605	322	2,515	14,164	-	755	59,361	-
1973	38,586	310	1,116	12,516	-	315	52,843	60,000
1974	35,101	418	615	10,074	-	89	46,297	60,000
1975	34,015	442	537	7,682	-	545	43,221	60,000
1976	47,806	305	5	3,280	-	429	51,825	47,000
1977	42,579	31	-	1,023	-	348	43,981	47,000
1978	48,634	168	-	1,048	-	178	50,028	47,000
1979	47,131	113	-	1,190	-	135	48,569	47,000
1980	48,296	183	-	336	-	271	49,086	47,000
1981	48,177	210	-	847	-	924	50,158	55,000
1982	49,620	133	-	67	715	517	51,052	55,000
1983	35,907	41	-	170	815	1,602	38,535	55,000
1984	33,756	140	1	360	1,582	3,581	39,420	55,000
1985[b]	39,963	64	-	81	2,446	13,114	55,668	49,000
1986[b]	33,196	-	-	188	505	26,822	60,711	55,000
1987								48,000

[a]South Korean catches reported to NAFO in 1982-84 as unspecified flounder. The breakdown used for these catches is 60% yellowtail, 40% American plaice.

[b]Provisional. Catches for S. Korea and some others are estimated.

Table 1b. Breakdown of catches from Table 1a listed as "other" for 1984-86.

Year	Spain	Portugal	Panama[b]	U.S.A.	Cayman Islands[b]	Other	Total
1984	1,622	-	1,775	-	-	184	3,581
1985[a]	5,489	1,785[b]	3,760	1,298	750	32	13,114
1986[a]	11,882	9,241	3,515	1,605	571	8	26,882

[a]Provisional.

[b]Not reported to NAFO. Catches estimated from surveillance reports.

Table 2. Breakdown of plaice nominal catches (t) in Divisions 3LNØ by Division, for the years 1960-86.

Year	Division 3L	Division 3N	Division 3Ø	UNK	Total
1960	19,397	3,912	738	-	24,047
1961	13,398	3,498	1,017	-	17,913
1962	13,584	3,923	699	-	18,206
1963	16,512	7,465	1,469	-	25,446
1964	21,391	14,587	2,589	-	38,567
1965	25,034	26,270	1,957	-	53,261
1966	18,572	34,698	11,741	-	65,011
1967	38,515	24,364	31,534	-	94,413
1968	39,126	20,038	14,003	-	73,167
1969	52,880	14,442	12,115	-	79,437
1970	39,347	21,032	6,266	-	66,645
1971	37,851	22,873	7,164	-	67,888
1972	33,330	17,387	8,644	-	59,361
1973	20,103	20,883	11,857	-	52,843
1974	16,610	21,126	8,561	-	46,297
1975	15,171	21,308	6,742	-	43,221
1976	25,122	18,623	8,080	-	51,825
1977	23,763	16,543	3,675	-	43,981
1978	30,145	13,443	6,440	-	50,028
1979	28,708	14,712	5,149	-	48,569
1980	31,717	15,119	2,250	-	49,086
1981	37,269	10,628	2,261	-	50,158
1982[a]	32,761	13,101	5,190	-	51,052
1983[a]	22,964	11,107	4,464	-	38,535
1984[a],	20,307	13,527	3,811	1,775	39,420
1985[a,b]	22,458	24,088	4,227	3,778	55,668
1986[a,b]	23,742	20,635	5,292	11,041	60,711

[a]Includes breakdown of unspecified flounder catches by S. Korea.

[b]provisional. Includes estimates of non-reported catch on the Tail of the Bank outside Canadian 200 mile limit. These catches are attributed 90%:10% to Divisions 3N:3Ø.

Table 3. Breakdown of plaice nominal catches (t) by Division and month, for the years 1977-86. Does not include reported monthly catches where Division is unknown.

	1977	1978	1979	1980	1981	1982[a]	1983[a]	1984[a,b]	1985[a,b]	1986[a,b]
					3L					
Jan.	34	247	2,003	2	135	23	529	1,335	-	178
Feb.	1,140	143	543	658	50	317	166	380	25	124
Mar.	175	123	1,475	1,056	2,414	578	151	2,719	2,844	917
Apr.	279	389	1,576	565	5,590	1,627	1,540	2,135	804	505
May	2,986	3,309	4,110	7,391	8,986	5,228	4,535	2,890	1,676	2,325
June	3,899	5,974	4,359	8,632	6,887	5,296	4,207	3,643	2,477	2,799
July	3,418	5,775	5,321	2,934	3,104	6,106	2,895	3,912	1,868	2,747
Aug.	3,314	4,990	4,080	1,784	2,759	3,142	1,843	1,679	2,306	2,930
Sept.	2,465	3,269	2,289	679	2,373	2,948	2,270	536	3,228	2,415
Oct.	2,128	2,149	1,146	3,094	1,872	2,765	2,087	223	4,066	1,884
Nov.	2,317	1,212	1,117	1,540	2,251	2,877	1,447	380	1,791	3,326
Dec.	1,608	2,565	689	3,382	848	1,854	1,294	475	1,373	1,029
Unk.	-	-	-	-	-	-	-	-	-	2,563
Total	23,763	30,145	28,708	31,717	37,269	32,761	22,964	20,307	22,458	23,742
					3N					
Jan.	4	798	510	28	482	16	314	508	-	58
Feb.	798	268	350	376	105	6	259	153	1,190	28
Mar.	338	469	135	519	154	42	248	397	225	123
Apr.	200	525	668	15	406	77	418	1,217	753	194
May	1,246	502	773	526	880	398	800	1,384	1,260	736
June	2,416	1,593	1,363	1,836	1,227	641	779	2,443	2,144	1,343
July	2,431	1,432	1,947	1,574	2,563	2,681	1,446	2,796	1,795	864
Aug.	2,418	1,931	2,055	1,641	1,759	2,685	1,202	876	1,701	1,142
Sept.	1,659	1,196	1,809	1,349	1,219	1,796	495	296	1,023	1,633
Oct.	1,668	2,013	1,259	3,386	1,055	3,132	1,545	471	1,522	1,163
Nov.	1,849	1,601	2,516	2,495	679	748	1,039	1,373	1,131	560
Dec.	1,516	1,115	1,327	1,374	99	235	1,828	189	281	221
Unk.	-	-	-	-	-	644	734	1,424	12,068	12,570
Total	16,543	13,443	14,712	15,119	10,628	13,101	11,107	13,527	25,093	20,635
					3Ø					
Jan.	1	274	274	4	188	-	767	98	-	231
Feb.	359	434	93	17	72	107	147	1,090	562	85
Mar.	120	216	189	477	214	548	397	523	199	236
Apr.	118	452	260	23	98	49	452	99	566	149
May	341	1,223	221	91	64	2,071	687	298	712	390
June	516	450	339	288	200	1,317	607	210	372	855
July	494	288	341	95	352	63	263	412	78	319
Aug.	546	303	270	29	82	123	124	205	123	234
Sept.	372	322	340	66	204	158	296	293	330	166
Oct.	331	879	437	335	281	219	234	275	105	181
Nov.	378	955	1,564	283	354	258	338	105	195	411
Dec.	99	644	821	542	152	206	71	45	27	695
Unk.	-	-	-	-	-	71	81	158	1,070	1,340
Total	3,675	6,440	5,149	2,250	2,261	5,190	4,464	3,811	4,339	5,292

[a]Includes breakdown of unspecified flounder catches by S. Korea.

[b]Provisional. Includes estimates of non-reported catch on the Tail of the Bank outside Canadian 200 mile limit. These catches are attributed 90%:10% to Divisions 3N:3Ø.

Table 4. List of commercial sampling, by quarter and Division, from the Canadian catch in 1986, for American plaice in Divisions 3LN.

Division		Quarter 1	2	3	4	Total
3L (offshore)	Can. catch (t)	1,219	4,064	5,960	6,198	17,441
	Samples	8	12	15	26	61
	Measured	3,610	6,217	5,865	9,442	25,134
	Otoliths	590	698	751	725	2,764
3L (inshore)	Can. catch (t)	0	857	2,537	344	3,738
	Samples	-	16	16	2	34
	Measured	-	6,030	6,074	830	12,934
	Otoliths	-	1,178	1,049	191	2,418
3N	Can. catch (t)	209	2,273	3,639	1,944	8,065
	Samples	-	4	13	10	27
	Measured	-	1,216	4,979	3,530	9,725
	Otoliths	-	397	841	695	1,933

Table 5. Average weights and lengths, as well as catch-at-age, for American plaice in the fishery in Div. 3LN in 1986.

	AVERAGE		CATCH		
AGE	WEIGHT	LENGTH	MEAN	STD. ERR.	C. V.
* 6	0.274	31.550	127	24.26	0.19
* 7	0.352	34.086	1187	91.34	0.08
* 8	0.456	36.772	5571	221.65	0.04
* 9	0.554	38.892	10122	345.75	0.03
*10	0.654	40.740	14600	428.63	0.03
*11	0.762	42.627	17160	414.51	0.02
*12	0.977	46.018	11654	330.37	0.03
13	1.246	49.604	5860	211.36	0.04
*14	1.659	54.121	2637	116.69	0.04
*15	2.093	58.107	1324	72.78	0.06
*16	2.699	62.846	512	42.02	0.08
*17	3.235	66.468	104	20.09	0.19
*18	4.556	73.772	16	5.26	0.34
*19	5.236	77.000			0.91

TABLE 6. A,PLAICE, DIV 3LN, CATCH NUMBERS(x10^-3) AT AGE

AGE	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6	3041	5139	2228	1894	2079	1968	1565	2199	837	5222	2945	3400	6537	3538	6069	2924	538	271	937	99	254	127
7	6969	8224	7216	3347	6674	2314	7524	2023	4909	7305	6693	7388	8065	7874	12560	9110	2038	1576	2668	511	1748	1187
8	8964	9122	5093	7913	12023	9066	9354	6576	8158	8070	8266	15963	10827	9238	16872	11601	4330	4303	4492	1907	5081	5571
9	6789	7798	6330	9065	15409	12264	13868	9656	10096	6675	7802	15166	12653	11583	13242	13571	7134	7878	6698	4535	10270	10122
10	7285	5954	9133	9405	10830	10225	12670	10907	7789	7741	6445	10772	10303	12370	11329	13735	10761	11345	6399	9141	15086	14600
11	5521	5823	9106	6255	10793	10128	9833	10866	7741	5901	4524	6867	5954	8859	8075	10796	13178	14704	7757	12484	13590	17160
12	5578	4644	9700	11193	8811	7473	8074	9147	5245	3839	3880	4273	3750	5825	3406	7696	11622	13687	7135	8650	8622	11654
13	5023	4696	6324	7098	5978	5034	4647	5796	5111	2940	3110	2415	2014	2977	1640	3385	8553	7418	4428	4900	3759	5860
14	4174	4105	4377	5126	4496	4223	3328	3720	2996	1642	2175	1984	1311	1738	594	1460	5527	3836	2379	2406	1564	2637
15	1773	2959	3615	2558	2955	3851	2920	2151	1560	866	1091	1176	872	1161	294	619	2903	1718	1170	1037	928	1224
16	2054	1626	2501	2075	1586	2176	1753	1806	1828	595	595	448	308	469	148	244	1099	524	354	387	269	512
17	1270	1037	1314	1230	1051	1236	898	1239	802	187	393	193	161	152	57	79	383	146	122	89	91	104
18	556	933	1110	615	609	834	447	527	913	65	190	45	93	53	13	25	231	69	43	14	7	16
19	618	390	283	330	296	315	360	286	337	20	80	20	25	18	5	2	101	8	13	1	1	1
6+	59615	62450	68330	68104	83590	71107	77241	66899	58222	51068	48189	70110	62873	65855	74304	75247	68398	67483	44595	46161	61270	70775

TABLE 7. A,PLAICE, DIV 3LN, CATCH AT AGE AS YEARLY PERCENTAGES

AGE	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6	5.1	8.2	3.3	2.8	2.5	2.8	2.0	3.3	1.4	10.2	6.1	4.8	10.4	5.4	8.2	3.9	0.8	0.4	2.1	0.2	0.4	0.2
7	11.7	13.2	10.6	4.9	8.0	3.3	9.7	3.0	8.4	14.3	13.9	10.5	12.8	12.0	16.9	12.1	3.0	2.3	6.0	1.1	2.9	1.7
8	15.0	14.6	7.5	11.6	14.4	12.7	12.1	9.8	14.0	15.8	17.2	22.8	17.2	14.0	22.7	15.4	6.3	6.4	10.1	4.1	8.3	7.9
9	11.4	12.5	9.3	13.3	18.4	17.2	18.0	14.4	17.3	13.1	16.2	21.6	20.1	17.6	17.8	18.0	10.4	11.7	15.0	9.8	16.8	14.3
10	12.2	9.5	13.4	13.8	13.0	14.4	16.4	16.3	13.4	15.2	13.4	15.4	16.4	18.8	15.2	18.3	15.7	16.8	14.3	19.8	24.6	20.6
11	9.3	9.3	13.3	9.2	12.9	14.2	12.7	16.2	13.3	11.6	9.4	9.8	9.5	13.5	10.9	14.3	19.3	21.8	17.4	27.0	22.2	24.2
12	9.4	7.4	14.2	16.4	10.5	10.5	10.5	13.7	9.0	7.5	8.1	6.1	6.0	8.8	4.6	10.2	17.0	20.3	16.0	18.7	14.1	16.5
13	8.4	7.5	9.3	10.4	7.2	7.1	6.0	8.7	8.8	5.8	6.5	3.4	3.2	4.5	2.2	4.5	12.5	11.0	9.9	10.6	6.1	8.3
14	7.0	6.6	6.4	7.5	5.4	5.9	4.3	5.6	5.0	3.2	4.5	2.8	2.1	2.6	0.8	1.9	8.1	5.7	5.3	5.2	2.6	3.7
15	3.0	4.7	5.3	3.8	3.5	5.4	3.8	3.2	2.7	1.7	2.3	1.7	1.4	1.8	0.4	0.8	4.2	2.5	2.6	2.2	1.5	1.7
16	3.4	2.6	3.7	3.0	1.9	3.1	2.3	2.7	3.1	1.2	1.2	0.6	0.5	0.7	0.2	0.3	1.6	0.8	0.8	0.8	0.4	0.7
17	2.1	1.7	1.9	1.8	1.3	1.7	1.2	1.9	1.4	0.4	0.8	0.3	0.3	0.2	0.1	0.1	0.6	0.2	0.3	0.2	0.1	0.1
18	0.9	1.5	1.6	0.9	0.7	1.2	0.6	0.8	1.6	0.1	0.4	0.1	0.1	0.1	0.0	0.0	0.3	0.1	0.1	0.0	0.0	0.0
19	1.0	0.6	0.4	0.5	0.4	0.4	0.5	0.4	0.6	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0

TABLE 8. A.PLAICE, DIV 3LN, WEIGHTS AT AGE IN KG.

AGE	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6	0.289	0.277	0.287	0.276	0.290	0.275	0.259	0.278	0.244	0.252	0.248	0.261	0.264	0.266	0.320	0.328	0.381	0.313	0.401	0.309	0.396	0.274
7	0.365	0.369	0.383	0.348	0.332	0.330	0.331	0.372	0.292	0.339	0.347	0.345	0.359	0.363	0.374	0.410	0.408	0.375	0.506	0.365	0.434	0.352
8	0.498	0.499	0.469	0.450	0.412	0.397	0.404	0.484	0.380	0.416	0.418	0.403	0.431	0.414	0.448	0.483	0.453	0.444	0.589	0.436	0.476	0.456
9	0.625	0.640	0.610	0.602	0.564	0.536	0.494	0.527	0.519	0.568	0.578	0.548	0.623	0.515	0.546	0.537	0.480	0.512	0.694	0.523	0.561	0.554
10	0.703	0.788	0.788	0.697	0.670	0.680	0.612	0.629	0.629	0.694	0.706	0.658	0.676	0.618	0.594	0.570	0.523	0.550	0.717	0.558	0.669	0.654
11	0.827	0.976	0.847	0.851	0.785	0.795	0.772	0.753	0.816	0.917	0.922	0.841	0.884	0.773	0.683	0.653	0.542	0.609	0.698	0.665	0.829	0.762
12	0.869	0.988	1.030	0.991	0.982	0.841	0.909	0.867	1.041	1.108	1.099	1.029	1.013	0.928	0.906	0.742	0.670	0.752	0.756	0.873	1.114	0.977
13	0.932	0.984	1.064	1.075	1.050	1.043	1.034	0.935	1.243	1.360	1.339	1.152	1.199	1.199	1.188	0.989	0.786	0.995	0.967	1.161	1.487	1.246
14	1.258	1.287	1.369	1.397	1.401	1.166	1.132	1.175	1.334	1.567	1.536	1.327	1.389	1.389	1.659	1.352	1.000	1.299	1.219	1.483	1.921	1.659
15	1.377	1.413	1.631	1.597	1.602	1.311	1.279	1.380	1.524	1.922	1.813	1.658	1.768	1.768	1.886	1.739	1.300	1.602	1.560	2.042	2.415	2.093
16	1.614	1.656	1.890	1.881	1.870	1.673	1.600	1.654	1.816	2.387	2.319	2.137	2.196	2.196	2.118	1.770	1.762	2.054	2.170	2.629	3.015	2.699
17	1.905	1.922	2.166	2.197	2.240	1.854	1.911	1.854	1.939	2.458	2.578	2.318	2.324	2.324	2.302	2.140	2.099	2.211	2.423	2.912	3.573	3.235
18	1.943	1.917	2.305	2.297	2.348	2.073	2.117	1.915	2.104	2.871	2.880	2.716	2.546	2.546	3.199	2.700	2.368	2.677	2.805	3.839	4.018	4.556
19	1.957	2.025	2.527	2.488	2.595	2.283	2.285	2.129	2.294	3.004	2.942	2.864	3.072	3.072	3.243	3.000	2.558	3.437	3.085	3.029	4.018	5.236

TABLE 9. A.PLAICE, DIV 3LN, CATCH BIOMASS(T) AT AGE

AGE	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6	879	1424	639	523	603	541	405	611	204	1316	730	887	1726	941	1942	959	205	85	376	31	101	35
7	2544	3035	2764	1165	2216	764	2490	753	1433	2476	2322	2549	2895	2858	4697	3735	832	591	1350	187	759	418
8	4464	4552	2389	3561	4953	3599	3779	3183	3100	3357	3455	6433	4666	3825	7559	5603	1961	1911	2646	831	2419	2540
9	4243	4991	3861	5457	8691	6574	6851	5089	5240	3791	4510	8311	7883	5965	7230	7288	3424	4034	4648	2372	5761	5608
10	5121	4692	7197	6555	7256	6953	7754	6861	4899	5372	4550	7088	6965	7645	6729	7829	5628	6240	4588	5101	10093	9548
11	4566	5683	7713	5323	8473	8052	7591	8182	6317	5411	4171	5775	5263	6848	5515	7050	7142	8955	5414	8302	11266	13076
12	4847	4588	9991	11092	8652	6285	7339	7930	5460	4254	4264	4397	3799	5406	3086	5710	7787	10293	5394	7551	9605	11386
13	4681	4621	6729	7630	6277	5250	4805	5419	6353	3998	4164	2782	2415	3569	1948	3348	6723	7381	4282	5689	5590	7302
14	5251	5283	5992	7161	6299	4924	3767	4371	3863	2573	3341	2633	1821	2414	985	1974	5527	4983	2900	3568	3004	4375
15	2441	4181	5896	4085	4734	5049	3735	2968	2377	1664	1978	1950	1542	2053	554	1076	3774	2752	1825	2118	2241	2562
16	3315	2693	4727	3903	2966	3640	2805	2987	3320	1420	1380	957	676	1030	313	432	1936	1076	768	1017	811	1382
17	2419	1993	2846	2702	2354	2292	1716	2297	1555	460	1013	447	374	353	131	169	804	323	296	259	325	336
18	1080	1789	2559	1413	1430	1729	946	1009	1921	187	547	122	237	135	42	67	547	185	121	54	28	73
19	1209	790	715	821	768	719	823	609	773	60	235	57	77	55	16	6	258	27	40	3	4	5
6+	47062	50313	64017	61392	65672	56370	54807	52269	46816	36340	36662	44389	40339	43097	40750	45247	46549	48834	34648	37082	52006	58645

Table 10. Summary of catch (t) and effort (hrs) data used in the multiplicative model, the Divisions 3LNO A. plaice CPUE calculations.

Year	Division 3L		Division 3N		Division 3Ø	
	Catch	Effort	Catch	Effort	Catch	Effort
1956	3863	3824	2115	2493	8	30
1957	3020	3385	2288	2668	20	36
1958	5096	5154	3099	4435	-	-
1959	5758	6780	3645	4738	31	59
1960	9792	11004	2584	3700	45	124
1961	6930	8790	2329	3615	51	70
1962	8278	12524	3419	6280	4	18
1963	11452	15543	6051	8410	222	509
1964	10279	14401	9081	10737	571	981
1965	11219	14487	18082	23677	962	1806
1966	8544	11560	20947	27769	2995	5220
1967	22104	30236	12261	15830	2193	3071
1968	24582	40128	6743	11389	357	790
1969	32196	59051	7053	14310	1244	2778
1970	19979	39158	3932	8147	3137	5273
1971	19998	41637	4441	9926	1625	3106
1972	17259	35232	5878	13452	875	2250
1973	12548	24730	7477	14354	6363	13137
1974	11276	26785	9609	21436	6721	16568
1975	10267	25395	11769	28294	2586	7929
1976	20133	45254	15569	38003	5152	17091
1977	18027	42580	14084	35295	2559	7738
1978	23685	48906	9961	24719	5067	13477
1979	20518	40603	10096	21629	3595	8536
1980	22638	37118	11929	22841	1446	3398
1981	28056	48719	6066	11741	1332	2917
1982	23502	40865	9541	18585	2930	6420
1983	12169	20677	6036	8662	2797	5990
1984	10307	15180	6313	10494	2186	4192
1985	14941	21598	10599	17048	1991	4611
1986	12644	26061	4965	11602	2164	5632

Table 11. Results of the multiplicative analysis of CPUE data for A. plaice in Divisions 3LN, 1956-86.

Type 1			Type 2				Type 3		
Div.	Var #	ln power	Country - Gear - TC		Var #	ln power	Month	Var #	ln power
3L	-	0.000	Can(N)	Side OT 4	2	-0.396	Jan.	4	0.089
							Feb.	5	0.128
3N	1	-0.082	Can(N)	Stern OT 4	3	-0.131	Mar.	6	0.000
							Apr.	7	-0.078
			Can(N)	Stern OT 5	-	0.000	May	8	-0.076
							June	9	-0.011
							July	-	0.000
							Aug.	10	-0.030
							Sept.	11	-0.072
							Oct.	12	-0.078
							Nov.	13	-0.053
							Dec.	14	-0.015

Type 4: Variables 15-44 represent the years 1957-86.

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R,..... 0.802
MULTIPLE R SQUARED,.... 0.643

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	4.331E2	4.331E2	
REGRESSION	44	1.002E2	2.278E0	44.045
TYPE 1	1	1.806E0	1.806E0	34.930
TYPE 2	2	1.907E1	9.534E0	184.348
TYPE 3	11	2.980E0	2.709E-1	5.239
TYPE 4	30	9.247E1	3.082E0	59.598
RESIDUALS	1078	5.575E1	5.172E-2	
TOTAL	1123	5.891E2		

REGRESSION COEFFICIENTS

VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
INTERCEPT	0.394	0.067	1123
1	-0.082	0.014	558
2	-0.396	0.021	381
3	-0.131	0.021	253
4	0.089	0.039	51
5	0.128	0.038	61
6	0.000	0.037	61
7	-0.078	0.034	81
8	-0.076	0.030	101
9	-0.011	0.028	116
10	-0.030	0.029	120
11	-0.072	0.029	117
12	-0.078	0.029	103
13	-0.053	0.030	102
14	-0.015	0.032	85
15	-0.049	0.090	12
16	-0.109	0.082	16
17	-0.118	0.079	16
18	-0.150	0.078	16
19	-0.252	0.081	15
20	-0.433	0.077	19
21	-0.289	0.075	19
22	-0.275	0.075	27
23	-0.323	0.069	47
24	-0.350	0.068	51
25	-0.482	0.068	57
26	-0.752	0.069	51
27	-0.925	0.069	53
28	-1.027	0.071	41
29	-1.086	0.072	46
30	-1.066	0.071	48
31	-1.024	0.072	46
32	-1.185	0.072	42
33	-1.236	0.072	42
34	-1.226	0.071	47
35	-1.210	0.072	40
36	-1.194	0.071	46
37	-1.065	0.071	40
38	-0.897	0.071	45
39	-0.912	0.071	47
40	-0.913	0.072	42
41	-0.813	0.075	35
42	-0.850	0.077	32
43	-0.795	0.074	35
44	-1.149	0.075	36

Table 11 Cont'd.

PREDICTED CATCH RATE

YEAR	LN TRANSFORM MEAN	LN TRANSFORM S.E.	RETRANSFORMED MEAN	RETRANSFORMED S.E.	CATCH	EFFORT
1956	0.3937	0.0045	1.513	0.102	10000	6588
1957	0.3445	0.0055	1.444	0.107	10000	6923
1958	0.2843	0.0041	1.361	0.087	10000	7348
1959	0.2761	0.0036	1.350	0.081	10000	7407
1960	0.2441	0.0035	1.308	0.077	23309	17825
1961	0.1415	0.0038	1.180	0.073	16896	14320
1962	-0.0390	0.0033	0.985	0.056	17507	17767
1963	0.1050	0.0030	1.138	0.062	23977	21067
1964	0.1185	0.0028	1.154	0.062	35978	31184
1965	0.0706	0.0017	1.100	0.045	51304	46623
1966	0.0442	0.0016	1.072	0.042	53270	49704
1967	-0.0883	0.0014	0.939	0.035	62879	66976
1968	-0.3583	0.0015	0.717	0.028	59164	82555
1969	-0.5308	0.0014	0.603	0.023	67322	111628
1970	-0.6337	0.0017	0.544	0.022	60379	110979
1971	-0.6920	0.0017	0.513	0.021	60724	118309
1972	-0.6718	0.0016	0.524	0.021	50717	96832
1973	-0.6306	0.0017	0.546	0.023	40986	75100
1974	-0.7917	0.0017	0.465	0.019	37736	81229
1975	-0.8423	0.0018	0.442	0.019	36479	82604
1976	-0.8326	0.0015	0.446	0.017	43745	98090
1977	-0.8166	0.0017	0.453	0.019	40306	88952
1978	-0.7999	0.0015	0.461	0.018	43588	94588
1979	-0.6715	0.0015	0.524	0.021	43420	82871
1980	-0.5029	0.0015	0.620	0.024	46836	75521
1981	-0.5179	0.0016	0.611	0.025	47897	78402
1982	-0.5192	0.0017	0.610	0.025	45862	75173
1983	-0.4191	0.0020	0.674	0.030	34071	50536
1984	-0.4560	0.0022	0.650	0.031	35429	54531
1985	-0.4010	0.0019	0.687	0.030	50009	72840
1986	-0.7549	0.0020	0.482	0.022	53965	111988

Table 12. Mean weight (kg) of American plaice per tow, by stratum, from R. V. surveys in Division 3L. Numbers in parentheses are the number of successful 30 minute tows in each stratum. The stratified mean weight per tow (kg/30 min.) and the biomass estimates ($t \times 10^{-3}$), are given at the bottom of the table. Strata marked with an asterisk were used in the calculations of abundance and biomass in Tables 16-17. In this and all subsequent tables presenting R.V. survey data, ATC refers to the R.V. A. T. CAMERON, WT refers to the R.V. WILFRED TEMPLEMAN and AN refers to R.V. ALFRED NEEDLER.

		Year - Trip															
Depth (fm)	Stratum	1971 ATC 187	1972 ATC 199	1973 ATC 207, 208 209	1974 ATC 222	1975 ATC 233	1976 ATC 246	1977 ATC 262	1978 ATC 276	1979 ATC 289, 290, 291	1980 ATC 304, 305	1981 ATC 317 318, 319	1982 ATC 327 328, 329	1984 AN 28	1985 WT 28, 29, 30	1986 WT 48	1987[a] WT 58,59 60
51-100	328	-	-	-	-	-	-	26.9(3)	-	27.3(5)	-	52.5(2)	72.8(3)	12.5(2)	51.6(4)	51.2(9)	
51-100	341	-	-	48.4(3)	-	-	-	94.2(4)	43.8(4)	88.8(6)	47.0(6)	136.5(2)	146.6(5)	69.6(4)	40.3(9)	43.7(9)	
51-100	342	-	-	-	-	-	-	75.4(2)	72.6(2)	59.5(4)	77.0(4)	-	43.3(3)	60.1(4)	35.2(3)	53.5(3)	
51-100	343	-	-	-	-	-	-	103.1(2)	112.6(3)	90.2(4)	107.1(4)	177.5(2)	115.8(4)	-	12.7(3)	48.0(4)	
101-150	344	-	-	-	-	-	92.3(4)	100.5(4)	62.4(4)	28.6(2)	105.5(3)	105.8(5)	58.0(4)	-	41.6(5)	80.3(8)	
151-200	345	-	-	-	-	-	22.8(4)	27.1(4)	56.3(2)	8.4(4)	10.1(5)	32.5(4)	7.6(4)	-	23.3(5)	16.3(7)	
151-200	346	-	-	-	-	45.9(2)	22.3(2)	8.4(3)	-	4.8(4)	2.8(3)	29.8(3)	5.3(3)	-	26.3(2)	33.1(5)	
101-150	347	28.8(2)	-	-	24.5(2)	61.9(2)	151.5(3)	91.1(3)	59.3(4)	58.3(4)	102.3(5)	86.1(4)	93.0(2)	-	42.1(5)	50.4(5)	
51-100	348*	214.4(3)	92.3(3)	-	73.6(6)	47.5(4)	83.7(6)	211.6(6)	232.8(6)	150.2(6)	168.7(7)	89.5(7)	118.3(4)	-	65.1(18)	104.9(12)	
51-100	349*	281.2(3)	46.8(4)	-	17.0(4)	23.6(2)	66.6(3)	124.3(6)	65.1(6)	105.7(7)	110.8(9)	72.8(4)	125.6(6)	89.5(6)	49.8(14)	58.3(14)	
31-50	350*	77.9(3)	56.5(2)	33.5(4)	82.3(3)	78.1(3)	99.0(4)	40.5(4)	44.3(6)	45.5(9)	96.8(10)	114.5(3)	76.6(7)	108.2(6)	98.5(12)	99.5(11)	
31-50	363*	56.3(3)	111.7(3)	50.1(4)	69.8(4)	21.5(3)	90.4(4)	103.1(5)	96.8(5)	88.0(8)	77.2(5)	62.3(3)	168.0(5)	92.2(5)	107.8(8)	138.4(10)	
51-100	364*	155.7(4)	138.8(3)	-	92.3(4)	99.4(2)	164.6(3)	236.1(7)	172.4(6)	195.5(8)	166.9(6)	172.3(3)	195.5(6)	144.4(5)	102.3(17)	87.4(17)	
51-100	365	192.0(3)	158.5(2)	-	43.1(3)	79.0(2)	62.4(3)	243.7(3)	243.3(2)	161.6(4)	156.1(4)	141.5(2)	88.7(3)	-	54.1(7)	68.5(5)	
101-150	366	34.4(3)	-	-	63.0(3)	37.6(4)	40.8(4)	76.7(4)	-	7.2(4)	70.5(4)	20.2(3)	8.3(5)	-	37.6(6)	21.4(8)	
151-200	368	0.0(2)	-	-	4.8(2)	1.1(2)	29.0(3)	0.0(3)	-	0.7(4)	0.8(2)	6.3(2)	0.5(2)	-	30.5(2)	16.5(2)	
101-150	369	31.8(3)	-	-	14.2(3)	23.8(3)	52.9(4)	51.0(3)	18.6(2)	16.8(4)	13.7(3)	39.8(2)	20.5(2)	-	71.7(5)	16.1(6)	
51-100	370*	44.0(2)	82.5(3)	-	90.5(3)	43.3(3)	93.1(3)	162.1(3)	70.7(3)	211.7(4)	172.2(3)	54.0(2)	133.0(2)	-	56.6(8)	96.6(8)	
31-50	371	95.8(3)	91.9(2)	-	63.1(3)	-	-	93.4(3)	114.1(3)	175.8(3)	147.0(3)	177.0(2)	102.9(4)	-	107.5(7)	68.0(6)	
31-50	372*	27.1(4)	36.3(3)	124.1(3)	50.4(3)	36.1(3)	47.5(3)	35.0(6)	24.5(7)	38.4(9)	39.7(6)	95.8(4)	50.8(6)	63.7(5)	109.9(12)	69.6(14)	
31-50	384	87.9(3)	69.5(2)	12.4(3)	26.6(3)	-	-	54.0(2)	54.5(3)	79.0(4)	48.8(2)	60.5(2)	32.3(2)	-	100.3(6)	114.0(6)	
51-100	385*	139.5(4)	84.2(4)	34.5(3)	17.3(2)	72.1(4)	79.5(2)	168.0(6)	135.4(6)	102.2(7)	224.4(4)	87.3(3)	70.8(3)	-	48.8(15)	62.8(13)	
101-150	386	20.9(2)	-	-	24.1(3)	22.6(3)	51.7(2)	4.8(3)	19.5(3)	11.5(4)	7.2(3)	20.8(2)	9.2(3)	-	26.0(5)	9.7(6)	
151-200	387	1.2(3)	-	-	0.5(3)	0.0(2)	1.0(3)	2.5(2)	2.7(3)	1.0(4)	0.7(2)	1.0(2)	1.3(3)	-	20.8(6)	3.0(4)	
151-200	388	1.4(2)	-	12.2(2)	2.6(3)	0.2(2)	13.0(2)	0.7(2)	0.3(2)	0.6(3)	0.1(2)	0.1(2)	0.4(2)	-	25.5(2)	11.5(2)	
101-150	389*	17.4(3)	17.0(2)	13.4(2)	14.5(3)	22.7(2)	38.8(2)	7.0(3)	8.2(3)	2.3(4)	4.8(3)	23.9(2)	4.5(2)	-	27.2(5)	27.7(5)	
51-100	390	236.2(3)	30.1(3)	9.7(3)	1.6(3)	278.2(3)	-	68.1(2)	66.1(4)	93.8(5)	99.0(3)	18.5(2)	35.8(4)	-	15.0(9)	14.5(8)	
101-150	391	-	24.1(2)	12.2(2)	43.3(3)	16.8(2)	-	45.4(2)	15.4(2)	17.2(4)	11.0(2)	4.3(2)	10.3(2)	-	9.5(2)	61.0(2)	
151-200	392	-	-	291.9(3)	1.8(4)	2.4(2)	-	3.1(2)	1.9(3)	4.2(2)	1.5(2)	2.8(2)	0.8(2)	-	13.8(2)	9.5(2)	
201-300	729	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5(2)	-	
301-400	730	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3(2)	-	
201-300	731	-	-	-	-	-	-	-	-	-	-	-	-	-	326.0(2)	-	
301-400	732	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3(2)	-	
201-300	733	-	-	-	-	-	-	-	-	-	-	-	-	-	21.4(3)	-	
301-400	734	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5(3)	-	
201-300	735	-	-	-	-	-	-	-	-	-	-	0.0(2)	-	-	57.0(2)	-	
301-400	736	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0(2)	-	
Mean (#sets)		109.4(58)	79.0(38)	49.2(32)	47.1(70)	60.7(55)	76.8(64)	98.3(102)	87.1(94)	80.9(140)	95.3(115)	80.7(80)	80.4(103)	87.4(37)	60.3(221)	63.1(211)	-(186)
Biomass		232.8	135.8	53.3	101.7	124.8	163.9	271.3	213.7	223.4	252.1	221.0	222.0	97.9	175.1	174.1	180.7

[a] Preliminary analysis.

Table 13. Mean weight (kg) of American plaice per tow, by stratum, from R. V. surveys in Division 3N. Numbers in parentheses are the number of successful 30 minute tows in each stratum. The stratified mean weight per tow (kg/30 min.) and the biomass estimates ($t \times 10^{-3}$) are given at the bottom of the table. Strata marked with an asterisk were used in the calculations of abundance and biomass in Tables 16-18.

Depth (fm)	Stratum	1971 ATC 187	1972 ATC 199	1973 208 ATC 209	1974 ATC 222	1975 ATC 233	1976 ATC 245	1977 ATC 263	1978 276 ATC 277	1979 ATC 289	1980 ATC 304	1981 318 ATC 319	1982 327 ATC 328 329	1984 AN 27	1985 WT 29 AN 43	1986 WT 47	1987[a] WT 58,59, 60
151-200	357	-	-	0.0(2)	-	-	-	5.5(2)	-	2.4(3)	0.5(3)	0.0(2)	0.8(2)	0.0(2)	22.3(2)	0.0(2)	-
101-150	358	-	2.4(4)	6.5(3)	-	-	-	20.0(2)	-	2.1(2)	1.8(3)	0.0(3)	3.5(2)	3.5(2)	180.5(2)	2.8(2)	1.5(2)
51-100	359	-	46.3(3)	31.3(3)	-	-	66.3(3)	114.4(2)	-	60.3(4)	36.0(4)	25.4(3)	28.5(2)	51.8(2)	28.0(2)	27.0(2)	5.9(2)
31-50	360	-	34.1(4)	-	-	23.5(4)	44.3(4)	58.8(4)	106.7(4)	60.4(9)	39.9(11)	43.3(6)	37.8(7)	47.3(7)	38.2(16)	32.5(13)	15.3(15)
31-50	361*	17.3(2)	49.2(3)	25.2(4)	37.2(4)	46.3(4)	21.1(5)	22.1(3)	17.5(4)	20.3(8)	33.7(7)	-	45.5(6)	39.0(5)	47.0(7)	22.7(10)	47.6(9)
31-50	362*	89.0(2)	110.4(4)	58.0(5)	40.8(4)	18.6(3)	38.7(5)	27.4(5)	27.6(4)	37.3(12)	46.5(11)	75.8(5)	46.8(8)	89.9(7)	66.9(11)	82.6(14)	48.9(12)
31-50	373*	93.1(4)	55.6(4)	27.6(4)	12.1(4)	-	75.5(5)	70.5(4)	70.3(5)	35.2(11)	33.6(8)	83.4(5)	31.8(5)	66.1(7)	67.3(9)	26.4(14)	80.2(13)
31-50	374*	64.7(2)	66.7(2)	45.1(4)	30.4(2)	21.3(2)	-	68.1(3)	89.9(3)	46.3(4)	54.7(3)	170.0(3)	12.4(4)	112.1(3)	49.5(4)	15.0(6)	36.5(5)
< 30	375*	17.3(3)	15.7(3)	41.5(3)	35.6(3)	14.6(3)	-	61.3(4)	39.1(5)	17.7(5)	16.8(4)	10.5(4)	18.5(5)	46.2(5)	32.8(8)	45.6(8)	68.2(8)
< 30	376	-	16.3(2)	22.3(3)	-	23.6(2)	33.0(3)	59.0(3)	240.3(2)	25.4(4)	71.3(3)	22.0(4)	22.9(7)	10.6(4)	21.7(7)	22.4(9)	27.4(8)
51-100	377	-	24.5(2)	52.2(2)	19.7(3)	165.3(2)	-	236.1(2)	28.6(2)	15.9(3)	36.1(4)	215.3(3)	62.0(2)	319.5(2)	37.3(2)	34.0(2)	32.8(2)
101-150	378*	23.2(2)	22.3(2)	42.7(2)	21.0(3)	-	-	7.8(2)	10.0(2)	6.9(3)	10.0(2)	3.8(2)	6.5(2)	21.5(2)	36.5(2)	68.1(2)	7.0(2)
151-200	379	-	-	0.5(2)	12.0(3)	-	-	0.2(2)	0.3(2)	4.7(3)	9.7(3)	3.5(3)	2.0(2)	4.5(2)	5.8(2)	1.0(2)	7.8(2)
151-200	380	-	0.9(2)	15.7(3)	3.4(2)	-	-	2.3(2)	-	1.5(2)	2.7(3)	0.3(3)	-	1.3(2)	10.8(2)	3.6(3)	0.0(2)
101-150	381*	22.1(4)	3.6(4)	144.1(3)	19.5(4)	15.6(2)	-	15.3(2)	7.6(3)	19.1(3)	13.1(4)	5.8(3)	5.6(2)	53.8(2)	26.3(2)	15.3(3)	2.4(2)
51-100	382*	23.5(3)	4.5(4)	15.4(3)	6.1(3)	-	45.6(2)	39.0(3)	32.4(3)	174.9(3)	25.5(4)	103.5(2)	56.8(2)	2.8(3)	63.4(4)	6.5(4)	50.3(3)
51-100	382*	23.5(3)	4.5(4)	15.4(3)	6.1(3)	-	45.6(2)	39.0(3)	32.4(3)	174.9(3)	25.5(4)	103.5(2)	56.8(2)	2.8(3)	63.4(4)	6.5(4)	50.3(3)
31-50	383*	69.0(2)	59.9(2)	0.1(2)	51.8(2)	-	14.5(3)	62.7(3)	87.7(2)	25.6(3)	33.0(4)	241.7(3)	19.8(2)	61.5(3)	22.2(3)	19.9(4)	36.3(3)
201-300	723	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
301-400	724	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
201-300	725	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
301-400	726	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
201-300	727	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
301-400	728	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mean (#sets)		58.5(24)	48.3(45)	34.2(48)	29.5(37)	25.8(22)	43.9(30)	51.7(48)	75.6(41)	40.4(82)	37.8(81)	67.6(54)	32.7(60)	54.7(60)	47.8(85)	35.0(101)	-(90)
Biomass		48.6	59.5	35.1	25.2	22.6	43.1	64.5	89.4	50.6	47.4	75.3	40.7	68.4	59.9	43.8	53.3

[a]Preliminary analysis.

Table 14. Mean weight (kg) of American plaice per tow, by stratum, from R. V. surveys in Division 3Ø. Numbers in parentheses are the number of successful 30 minute tows in each stratum. The stratified mean weight per tow (kg/30 min.) and the biomass estimates ($tx10^{-3}$), are given at the bottom of the table.

Depth (fm)	Stratum	Year - Trip 1973 ATC 207 208 209	1975 ATC 233	1976 ATC 245	1977 ATC 263	1978 ATC 276 277	1979 ATC 289 290 291	1980 ATC 303	1981 ATC 318 319	1982 ATC 327 328 329	1984 AN 27	1985 AN 43	1986 WT 47	1987[a] WT 58,59 60
51-100	329	7.8(2)	-	91.7(2)	80.2(3)	16.6(5)	61.6(6)	45.8(2)	157.0(2)	54.9(6)	25.7(5)	30.5(8)	23.4(8)	49.3(9)
31-50	330	47.6(6)	25.7(3)	26.9(3)	101.1(3)	40.0(6)	78.4(7)	22.0(2)	54.6(4)	24.2(7)	48.0(4)	118.4(10)	44.5(9)	56.1(11)
31-50	331	28.6(2)	6.4(2)	41.2(2)	-	6.8(2)	28.9(3)	28.3(2)	-	24.0(4)	80.2(3)	98.8(3)	11.4(4)	46.8(2)
51-100	332	-	23.6(2)	13.5(3)	10.3(3)	14.9(3)	12.9(4)	18.9(2)	-	16.3(4)	6.0(2)	24.3(5)	38.8(6)	59.4(5)
101-150	333	-	5.7(2)	1.6(2)	4.3(2)	2.3(3)	5.3(2)	0.1(2)	-	1.3(4)	0.0(2)	0.0(2)	0.0(3)	0.0(2)
151-200	334	-	-	0.0(2)	0.0(2)	0.0(3)	0.6(3)	0.0(2)	-	0.1(4)	0.0(2)	1.5(2)	0.4(2)	0.8(2)
151-200	335	0.5(2)	-	13.3(3)	-	7.1(2)	4.1(2)	1.5(3)	-	0.7(2)	0.4(2)	0.7(2)	0.1(2)	0.2(2)
101-150	336	4.8(3)	7.6(2)	30.9(2)	10.4(2)	6.8(2)	8.1(4)	0.3(2)	-	2.5(2)	0.0(2)	1.3(2)	0.3(2)	0.0(2)
51-100	337	16.3(3)	3.0(3)	16.3(2)	21.8(2)	30.5(2)	1.3(4)	6.5(3)	-	22.3(3)	7.0(2)	15.8(5)	12.4(5)	11.9(5)
31-50	338	38.8(5)	20.0(2)	62.7(3)	22.9(4)	7.6(5)	19.9(7)	30.2(5)	-	13.2(5)	60.1(5)	59.6(9)	28.5(9)	26.6(10)
51-100	339	152.4(2)	47.2(2)	-	-	65.5(2)	262.4(3)	-	96.5(2)	27.0(4)	160.0(2)	13.9(3)	5.5(3)	68.5(3)
31-50	340	-	20.0(3)	81.2(6)	52.1(3)	18.0(3)	59.2(7)	85.8(2)	97.3(3)	35.3(6)	49.5(4)	43.9(9)	35.9(7)	93.7(9)
31-50	351	65.7(5)	73.5(4)	56.3(4)	62.7(5)	18.5(6)	46.8(11)	76.3(10)	180.0(4)	46.3(9)	92.9(6)	73.3(9)	80.3(14)	71.1(13)
31-50	352	25.8(5)	77.9(4)	61.1(4)	17.1(5)	8.4(4)	25.5(12)	38.0(11)	-	36.6(7)	27.0(7)	56.5(11)	34.2(14)	63.5(13)
31-50	353	42.0(3)	72.0(3)	46.3(2)	42.4(3)	41.5(3)	36.0(5)	75.9(4)	-	35.0(3)	48.5(2)	55.5(6)	29.2(7)	44.4(6)
51-100	354	49.0(3)	-	32.4(3)	34.5(2)	-	17.7(4)	101.8(3)	10.8(2)	34.8(2)	11.8(2)	73.2(3)	9.8(3)	17.3(2)
101-150	355	0.5(2)	3.6(2)	7.3(2)	-	-	16.8(4)	8.5(2)	28.5(2)	14.0(2)	4.8(2)	20.3(2)	1.0(2)	1.8(2)
151-200	356	0.9(2)	-	-	-	-	11.6(2)	4.8(2)	30.5(2)	-	4.3(2)	7.0(2)	0.0(2)	1.2(2)
201-300	717	-	-	-	-	-	-	-	-	-	-	-	-	-
301-400	718	-	-	-	-	-	-	-	-	-	-	-	-	-
201-300	719	-	-	-	-	-	-	-	-	-	-	-	-	-
301-400	720	-	-	-	-	-	-	-	-	-	-	-	-	-
201-300	721	-	-	-	-	-	-	-	-	-	-	-	-	-
301-400	722	-	-	-	-	-	-	-	-	-	-	-	-	-
Mean (#sets)		41.2(45)	42.9(34)	52.2(45)	47.4(39)	21.2(51)	46.5(90)	46.5(59)	115.1(21)	31.8(74)	48.0(56)	57.0(93)	35.9(102)	- (100)
Biomass		46.1	49.1	67.6	59.2	27.5	62.5	60.1	79.2	42.4	64.5	76.6	48.2	71.8

Table 15. A. plaice numbers at age ('000) from spring r.v. surveys, all strata in Divisions 3LNO.

		1985				1986			
		3L	3N	3Ø	Total	3L	3N	3Ø	Total
1		-	14	-	14	-	-	-	-
2		-	122	-	122	72	131	32	235
3		433	1,821	453	2,707	241	725	730	1,696
4		1,406	8,158	1,316	10,880	1,480	2,903	2,392	6,775
5		8,570	8,556	4,250	21,376	6,511	7,826	3,174	17,511
6		28,497	11,219	4,719	44,435	39,953	10,296	5,334	55,583
7		84,508	9,592	11,159	105,259	101,168	9,663	9,397	120,228
8		102,403	10,747	17,695	130,845	94,163	7,566	11,394	113,123
9		71,466	10,262	17,308	99,036	74,496	7,610	10,955	93,061
10		45,079	11,047	18,886	75,012	35,919	7,194	9,664	52,777
11		24,369	8,374	13,254	45,997	14,736	3,987	6,358	25,081
12		12,067	4,984	7,598	24,649	9,860	3,334	5,574	18,768
13		6,717	2,623	3,048	12,388	6,442	2,276	3,125	11,843
14		3,250	1,591	2,764	7,605	2,400	1,191	1,267	4,858
15		1,633	1,297	2,192	5,122	1,442	1,169	1,249	3,860
16		1,040	383	866	2,289	859	695	500	2,054
17		213	105	172	490	242	536	394	1,172
18		15	-	17	32	118	99	98	315
19		15	-	-	15	-	28	27	55
UK		45	14	51	110	40	13	-	53
Total	1+	391,681	91,195	105,244	588,273	390,102	67,229	71,664	528,995
	4+	391,248	89,238	104,791	585,430	389,789	66,373	70,902	527,064
	6+	381,272	72,524	99,225	553,174	381,798	55,644	65,336	502,778
	9+	165,864	40,966	65,652	272,635	146,514	27,819	39,211	213,844

Table 16. Mean numbers and weights (kg) per 30 min. tow of A. plaice from research vessel surveys (spring) in NAFO Divisions 3L and 3N. Estimates are for the same strata each year, but are not adjusted for the different vessel/gear combinations.

Year	3L Mean no./tow	3L Mean wt/tow	3N Mean no./tow	3N Mean wt/tow
1971	297.6	130.2	67.8	(104.2)
1972	213.8	75.3	62.3	(76.1)
1973[a]	-	-	49.0	(54.9)
1974	136.3	53.1	49.5	(39.7)
1975[b]	228.1	69.8	-	-
1976[b]	325.3	89.9	-	-
1977	495.2	124.1	99.8	(64.3)
1978	397.2	99.5	117.7	(62.9)
1979	393.8	106.5	94.0	(73.3)
1980	411.4	122.0	68.0	(44.7)
1981[c]	291.7	95.7	180.1	(127.3)
1982	365.7	111.7	52.3	(43.2)
1984[a,d]	-	-	77.2	(80.0)
1985	178.5	78.9	66.8	(62.7)
1986	184.8	84.7	42.9	39.4

[a]Coverage for 3L very poor.

[b]Coverage for 3N very poor.

[c]Stratum 361 (Div. 3N) omitted.

[d]No. 1983 survey. Different vessel - gear combination used in surveys from 1984 onward.

Table 17. American plaice population numbers ($x10^{-3}$) estimated from research vessel surveys in Division 3L (selected strata). Values for the trips by the A. T. CAMERON were adjusted by the appropriate conversion factors to make these estimates comparable with those from the W. TEMPLEMAN and the A. NEEDLER surveys.

Age (years)	1971 ATC 187	1972 ATC 199	1974 ATC 222	1975 ATC 233	1976 ATC 246	1977 ATC 262	1978 ATC 276	1979 ATC 290	1980 304 ATC 305	1981 317 ATC 318 319	1982 327 ATC 328 329	1985 28 WT 29 30	1986 WT 47,48
1	0.0	28.9	0.0	0.0	0.0	0.0	0.0	120.5	94.4	119.8	0.0	0.0	0.0
2	0.0	36.1	0.0	273.4	243.0	177.7	282.2	269.2	891.4	214.1	67.0	0.0	48.4
3	978.9	175.6	98.6	1,075.6	4,122.5	1,532.2	6,669.2	619.4	2,710.6	2,290.2	1,785.0	321.9	108.1
4	6,064.3	6,584.5	2,190.6	1,688.3	7,822.2	6,710.1	9,896.0	8,515.0	4,895.7	2,450.2	6,473.1	1,053.2	881.1
5	24,901.2	13,799.5	3,394.7	4,498.9	8,305.7	21,758.5	37,990.9	27,779.6	26,647.7	8,859.6	7,196.7	5,816.0	4,338.7
6	37,562.4	31,252.0	12,843.3	12,418.4	9,088.3	44,584.0	44,155.2	47,015.9	51,690.9	25,555.5	20,362.2	18,697.9	25,749.3
7	75,394.5	46,174.5	21,174.2	22,881.5	28,866.0	82,778.4	69,573.7	69,693.6	67,331.5	37,153.4	38,260.8	52,741.1	63,184.2
8	40,057.4	48,148.5	30,218.1	42,217.9	64,397.0	130,367.3	106,241.8	111,200.9	133,955.9	100,240.2	81,576.0	61,648.2	58,121.4
9	74,642.7	30,979.4	33,593.2	45,709.4	75,925.8	95,242.1	85,721.8	92,502.0	115,494.3	97,163.3	126,390.0	42,174.2	46,566.7
10	33,851.3	33,397.6	35,230.2	40,065.0	79,930.3	98,128.5	65,847.8	81,838.0	75,532.3	59,910.6	103,503.1	26,633.3	23,634.7
11	30,712.0	20,106.1	19,827.0	20,490.7	50,978.1	42,849.3	22,636.1	41,442.9	33,534.4	32,366.5	61,278.2	14,496.5	9,926.2
12	28,714.7	21,231.9	17,509.3	15,023.2	29,911.8	28,873.5	15,744.8	17,834.3	21,425.5	12,983.9	26,945.2	7,368.5	6,582.5
13	21,587.1	9,937.1	10,371.2	7,254.3	14,215.0	11,969.1	6,995.6	6,539.5	11,087.1	5,911.9	14,552.3	4,219.8	4,435.4
14	15,020.5	7,966.1	5,609.8	4,073.9	4,055.2	4,530.9	4,498.5	3,483.6	4,193.5	2,070.7	7,005.4	2,079.7	1,844.2
15	7,508.8	6,559.7	3,309.2	1,835.7	3,119.6	3,389.3	1,878.1	2,189.3	2,446.1	1,641.4	2,224.1	1,123.9	1,115.8
16	5,202.9	4,490.9	1,179.6	1,535.0	1,452.4	1,947.0	950.5	1,030.4	1,927.8	1,106.3	1,683.7	805.4	747.5
17	2,938.9	1,499.7	185.6	411.2	1,062.5	913.6	514.9	437.2	550.6	610.7	851.9	187.9	210.2
18	1,678.4	414.3	0.0	135.7	335.8	586.8	109.4	116.7	287.1	87.9	72.1	15.4	113.7
19	290.7	154.7	50.6	-	120.2	102.3	-	22.5	62.6	32.9	-	15.4	-
20	230.5	130.5	-	-	-	-	-	-	-	-	-	-	-
21	145.3	-	-	-	-	-	-	-	-	-	-	-	-
22	115.2	-	-	-	-	-	-	-	-	-	-	-	-
Unknown	434.5	0.0	0.0	360.1	0.0	0.0	84.9	77.0	18.9	185.3	68.7	32.5	12.4
Total	408,032.2	283,067.6	196,785.2	221,948.2	383,951.4	576,440.6	479,791.4	512,727.5	554,778.3	390,954.4	500,295.5	239,430.8	247,620.5
2+	407,597.7	283,038.7	196,785.2	221,588.1	383,951.4	576,440.6	479,706.5	512,530.0	554,665.0	390,649.3	500,226.8	239,398.3	247,608.1
4+	406,618.8	282,827.0	196,686.6	220,239.1	379,585.9	574,730.7	472,755.1	511,641.4	551,063.0	388,145.0	498,374.8	239,076.4	247,451.6
6+	375,653.3	262,443.0	191,101.3	214,051.9	363,458.0	546,262.1	424,868.2	475,346.8	519,519.6	376,835.2	484,705.0	232,207.2	242,231.8
8+	262,696.4	185,016.5	157,083.8	178,752.0	325,503.7	418,899.7	311,139.3	358,637.3	400,497.2	314,126.3	426,082.0	160,768.2	153,298.3
12+	83,433.0	52,384.9	38,215.3	30,269.0	54,272.5	52,312.5	30,691.8	31,653.5	41,980.3	24,445.7	53,334.7	15,816.0	15,049.3

Table 18. American plaice population numbers ($x10^{-3}$) estimated from research vessel surveys in Division 3N (selected strata). Values for the trips by the A. T. CAMERON were adjusted by the appropriate conversion factors to make these estimates comparable with those from the W. TEMPLEMAN and the A. NEEDLER surveys.

Age (years)	1971	1972	1973	1974	1977	1978	1979	1980	1981	1982	1984	1985	1986
	ATC 187	ATC 199	208 ATC 209	ATC 222	ATC 263	276 ATC 277	ATC 289	304 ATC 305	318 ATC 319	327 ATC 328 329	AN 27	AN 43 WT 29	WT 47,48
1	0.0	25.2	0.0	0.0	0.0	9.0	20.0	0.0	116.4	17.7	0.0	0.0	0.0
2	0.0	163.9	6.1	0.0	31.2	87.2	71.1	31.2	265.5	203.0	27.4	3.5	10.8
3	1,769.7	271.5	101.1	516.6	427.6	2,969.0	283.8	254.6	1,805.0	551.8	147.8	139.0	51.4
4	1,860.2	1,481.2	488.2	1,631.1	3,703.7	5,804.7	1,321.6	1,058.4	3,053.3	1,967.5	556.7	1,655.9	263.3
5	3,104.0	3,041.7	3,078.5	3,250.0	6,285.4	11,899.5	5,424.2	3,386.6	3,001.6	2,573.5	1,593.2	3,436.0	918.9
6	2,006.5	5,305.9	5,395.9	6,235.1	14,577.3	14,015.9	9,433.1	7,284.5	8,439.7	3,265.4	3,691.3	5,480.1	2,491.4
7	7,464.0	3,215.2	6,566.9	6,951.7	13,429.7	17,675.4	14,588.2	13,968.9	31,082.7	3,793.3	6,034.1	5,885.8	3,802.0
8	5,107.6	5,865.2	5,148.9	6,588.2	12,719.2	11,817.7	17,878.0	11,934.4	31,254.7	8,319.5	8,701.5	7,294.1	4,937.0
9	8,774.9	8,132.0	3,500.2	4,292.7	11,292.5	7,535.9	11,214.3	10,068.4	23,058.8	9,540.0	11,209.2	7,565.3	5,939.7
10	8,768.7	11,314.8	5,298.8	4,454.5	7,512.6	7,935.8	9,516.7	6,193.5	15,914.3	7,301.3	13,792.8	8,534.0	5,981.7
11	7,982.4	7,542.3	6,362.1	3,132.4	5,860.0	4,854.1	4,240.1	3,406.4	7,312.2	4,715.0	6,362.8	6,493.2	3,315.5
12	5,949.1	5,635.0	4,400.6	1,997.7	3,647.0	3,258.3	2,247.6	2,561.0	4,470.6	3,000.5	4,010.9	3,904.6	2,646.6
13	2,834.0	3,625.5	3,148.2	1,973.2	2,137.6	1,965.0	880.6	1,184.2	2,479.5	912.5	2,634.1	2,126.1	1,835.3
14	1,908.6	2,876.3	936.5	751.1	1,469.7	1,192.7	749.8	862.8	778.0	1,233.1	1,506.6	1,385.6	1,016.2
15	1,264.1	997.6	781.6	786.0	739.3	1,020.8	711.6	576.9	1,591.6	695.3	1,256.4	1,136.7	992.7
16	1,277.2	736.7	578.9	268.4	477.0	282.1	350.9	506.3	779.3	714.5	1,199.9	354.7	613.6
17	494.2	158.9	673.6	114.6	145.4	228.6	79.9	588.3	402.1	671.9	609.1	94.5	489.0
18	1,022.3	170.4	179.4	56.1	-	40.1	-	121.7	324.5	416.0	303.9	-	97.5
19	438.5	158.9	152.6	47.2	-	0.0	-	41.2	-	36.8	96.2	-	27.7
20	184.4	226.0	107.1	-	-	90.5	-	20.5	-	-	23.9	-	-
21	0.0	-	-	-	-	-	-	-	-	-	-	-	-
22	93.6	-	-	-	-	-	-	-	-	-	-	-	-
Unknown	731.1	60.3	0.0	23.6	0.0	18.9	0.0	53.1	91.1	0.0	-	0.0	0.0
Total	63,035.1	61,004.5	46,905.2	43,070.2	84,455.2	92,701.2	79,011.5	64,102.9	136,220.9	49,928.6	63,757.8	55,489.1	35,430.3
2+	62,304.0	60,919.0	46,905.2	43,046.6	84,455.2	92,673.3	78,991.5	64,049.8	136,013.4	49,910.9	63,757.8	55,489.1	35,430.3
4+	60,534.3	60,483.6	46,798.0	42,530.0	83,996.4	89,617.1	78,636.6	63,764.0	133,942.9	49,156.1	63,582.6	55,346.6	35,368.1
6+	55,570.1	55,960.7	43,231.3	37,648.9	74,007.3	71,912.9	71,890.8	59,319.0	127,888.0	44,615.1	61,432.7	50,254.7	34,185.9
8+	46,099.6	47,439.6	31,268.5	24,462.1	46,000.3	40,221.6	47,869.5	38,065.6	88,365.6	37,556.4	51,707.3	38,888.8	27,892.5
12+	15,466.0	14,585.3	10,958.5	5,994.3	8,616.0	8,078.1	5,020.4	6,462.9	10,825.6	7,680.6	11,641.0	9,002.2	7,718.6

Table 19. Mean weight (kg) of American plaice per tow, by stratum, from R. V. surveys (fall) in Division 3L. Numbers in parentheses are the number of successful 30 minute tows in each stratum. The stratified mean weight per tow (kg/30 min.) and the biomass estimates ($tx10^{-3}$) are given at the bottom of the table. Strata marked with a plus sign were omitted from the calculations at the bottom of this table and in Table 20.

Stratum	1981 323 ATC 324 325	1982 333 ATC 334	1983 7 WT 8 9	1984 16 WT 17 18	1985 37 WT 38 39	1986 AN 72
328+	-	-	-	50.1(4)	99.5(8)	90.1(6)
341	8.2(3)	18.2(4)	121.3(4)	110.8(5)	21.6(7)	16.7(7)
342	109.7(3)	44.8(3)	19.5(4)	162.5(2)	84.7(3)	4.4(3)
343+	50.9(4)	-	483.2(3)	53.3(4)	932.5(3)	17.2(3)
344	227.3(4)	106.2(3)	70.7(6)	193.0(6)	93.8(9)	28.2(7)
345	10.5(4)	17.4(6)	13.6(8)	48.4(7)	24.4(9)	12.5(4)
346	13.0(3)	4.3(4)	10.8(5)	11.5(6)	6.5(5)	20.9(3)
347	324.3(3)	235.9(4)	134.7(6)	216.5(6)	52.1(4)	30.7(4)
348	114.1(6)	126.8(5)	112.3(11)	201.4(11)	43.4(14)	64.1(5)
349	20.1(7)	27.5(5)	113.1(9)	81.7(14)	21.3(10)	16.8(9)
350	8.3(6)	4.3(2)	72.1(8)	128.9(12)	57.7(9)	11.5(11)
363	65.5(4)	34.3(3)	253.7(3)	54.9(8)	48.0(10)	44.3(7)
364	254.2(9)	114.7(11)	95.2(11)	254.6(10)	114.4(18)	86.0(5)
365	242.8(4)	284.0(4)	198.7(5)	67.9(4)	136.6(8)	123.5(5)
366	318.3(3)	19.3(6)	50.8(4)	39.7(11)	62.4(9)	205.5(4)
368	0.0(2)	1.5(2)	-	0.0(2)	1.4(2)	5.9(2)
369	218.5(2)	27.9(4)	129.4(6)	76.4(7)	67.3(6)	19.4(3)
370	121.0(4)	88.2(6)	121.0(6)	145.8(7)	34.3(9)	145.3(2)
371	149.9(4)	97.3(5)	180.4(5)	110.7(7)	156.9(7)	26.3(3)
372	20.3(5)	79.9(7)	102.5(4)	74.0(13)	68.3(17)	37.5(9)
384	63.2(3)	176.9(4)	105.0(3)	210.8(6)	92.6(8)	100.0(5)
385	78.5(8)	128.4(8)	107.1(5)	96.5(12)	30.0(12)	86.1(8)
386	121.8(3)	123.0(4)	-	99.0(8)	123.6(5)	31.4(4)
387	2.3(2)	0.3(3)	-	0.7(3)	0.7(4)	0.9(2)
388+	-	0.0(3)	-	0.0(2)	14.0(2)	-
389+	-	25.1(4)	-	103.1(6)	183.0(5)	3.9(4)
390	38.5(3)	87.8(4)	72.7(3)	89.5(3)	97.2(7)	26.8(6)
391+	-	37.0(2)	25.0(2)	233.8(2)	105.8(2)	37.3(2)
392+	-	5.1(2)	4.7(2)	10.5(2)	6.8(2)	0.9(2)
729+	-	-	-	3.3(2)	4.5(2)	0.0(2)
730+	-	-	-	0.0(2)	0.0(2)	-
731+	-	-	-	0.0(2)	1.0(2)	-
732+	-	-	-	0.0(2)	0.0(2)	-
733+	-	-	-	0.0(4)	0.7(3)	-
734+	-	-	-	0.0(3)	0.0(2)	-
735+	-	2.3(2)	-	0.0(3)	0.2(2)	20.6(2)
736+	-	-	0.0(2)	-	6.8(2)	2.1(2)
Mean (#sets)	108.2(99)	78.6(120)	110.8(125)	108.4(208)	75.7(231)	52.7(141)
Biomass (Total)	273.3	206.4	268.0	313.8	220.2	146.7
Selected Strata Mean wt/tow	109.1	82.0	106.4	118.4	63.5	54.0
Biomass	271.3	204.0	248.4	294.5	157.9	134.2

Table 20. American plaice population numbers ($x10^{-5}$) estimated from research vessel surveys (fall) in NAFO Division 3L. Estimates in each year are for the same strata[a]. Values for the trips by the A. T. Cameron were adjusted by the appropriate conversion factors to make these estimates comparable with those from the W. Templeman surveys.

	Survey-Year					
Age	ATC 323, 324, 325 Sept.-Nov. 1981	ATC 333, 334 Oct.-Dec. 1982	WT 7, 8, 9 Oct.-Nov. 1983	WT 16, 17, 18 July-Sept. 1984	WT 37, 38, 39 Oct. Nov. 1985	AN 72 Nov. 1986
1	8.3	1.3	0.0	0.0	0.0	1.7
2	11.0	16.8	2.0	0.0	1.3	8.5
3	80.0	53.1	22.8	2.4	1.9	18.4
4	119.9	187.1	89.2	27.7	13.8	102.6
5	214.2	343.0	474.7	175.7	108.4	327.4
6	431.1	771.0	1,024.5	617.6	480.2	888.0
7	1,682.7	1,370.6	1,732.6	1,683.8	921.9	864.9
8	1,567.7	1,826.6	1,535.7	1,943.7	807.0	838.9
9	1,333.3	1,067.9	784.2	1,155.5	683.8	474.8
10	1,303.1	588.5	436.2	772.3	305.3	200.7
11	557.8	297.2	187.2	306.6	139.1	84.6
12	404.5	130.6	140.2	178.0	99.0	46.0
13	155.1	47.3	83.2	84.6	51.3	23.2
14	42.7	17.5	12.8	40.4	9.2	10.1
15	11.9	19.1	14.9	26.4	4.5	4.0
16	2.8	7.6	6.9	10.6	0.8	1.1
17	-	3.2	2.0	2.9	0.3	0.8
18	-	0.4	-	-	0.3	0.6
UNK	-	-	-	-	0.2	0.2
Totals						
2+	7,917.8	6,747.5	6,549.1	7,028.2	3,643.1	3,894.6
4+	7,826.8	6,677.6	6,524.3	7,025.8	3,639.9	3,867.7
6+	7,492.7	6,147.5	5,960.4	6,822.4	3,517.7	3,347.7
8+	5,378.9	4,005.9	3,203.3	4,521.0	2,115.6	1,684.8
12+	617.0	225.7	260.0	342.9	180.4	85.8

[a]3 out of 23 strata not surveyed in 1983.

Table 21. Mean weight (kg) of American plaice per tow, by stratum, from seasonal R.V. surveys in Division 3L in 1985-86. Numbers in parentheses are the number of successful 30 minute tows in each stratum. The stratified mean weight per tow (kg/30 min.), and the biomass estimates ($tx10^{-3}$) are given at the bottom of the table.

Stratum	1985 (Winter) WT 22, 23, 24	1985 (Spring) WT 28, 29, 30	1985 (Summer) WT 32, 33, 34	1985 (Fall) WT 37, 38, 39	1986 (Winter) WT 42, 43 44
328	14.33(6)	51.63(4)	47.88(4)	99.50(8)	21.98(12)
341	3.59(8)	40.33(9)	48.00(4)	21.64(7)	13.40(9)
342	1.57(3)	35.17(3)	90.25(2)	84.67(3)	0.00(2)
343	4.83(3)	12.67(3)	60.25(2)	932.50(3)	0.15(2)
344	75.64(7)	41.60(5)	116.87(4)	93.78(9)	0.68(5)
345	19.50(3)	23.30(5)	28.07(7)	24.44(9)	1.13(3)
346	24.63(4)	26.25(2)	1.00(3)	6.50(5)	0.75(4)
347	13.26(5)	42.10(5)	197.50(3)	52.13(4)	0.62(4)
348	118.31(8)	65.14(18)	99.18(13)	43.39(14)	1.32(12)
349	6.60(10)	49.80(14)	64.19(7)	21.30(10)	16.41(9)
350	11.58(9)	98.46(12)	87.75(11)	57.67(9)	4.67(9)
363	83.81(8)	107.81(8)	84.20(10)	48.00(10)	30.61(14)
364	419.03(12)	102.29(17)	188.65(12)	114.43(18)	35.44(8)
365	247.11(4)	54.07(7)	115.14(7)	136.56(8)	0.55(2)
366	21.50(5)	37.58(6)	91.00(5)	62.39(9)	4.00(2)
368	5.25(2)	30.50(2)	5.50(2)	1.38(2)	-
369	11.86(5)	71.70(5)	59.67(6)	67.25(6)	2.43(3)
370	33.57(7)	56.56(8)	56.00(6)	34.28(9)	23.50(4)
371	98.83(6)	107.49(7)	73.33(6)	156.93(7)	39.50(8)
372	60.45(11)	109.92(12)	39.96(10)	68.26(17)	36.29(19)
384	53.63(4)	100.33(6)	69.00(2)	92.63(8)	47.50(9)
385	23.45(11)	48.83(15)	97.06(8)	30.04(12)	18.77(16)
386	44.90(5)	26.00(5)	34.80(5)	123.60(5)	8.11(7)
387	3.88(4)	20.75(6)	2.57(3)	0.69(4)	22.63(4)
388	19.83(3)	25.50(2)	0.00(2)	14.00(2)	40.17(3)
389	194.25(4)	27.20(5)	60.63(4)	183.00(5)	21.00(4)
390	27.12(5)	15.03(9)	67.50(7)	97.21(7)	4.57(11
391	141.00(2)	9.50(2)	18.00(2)	105.75(2)	7.10(3)
392	153.75(2)	13.75(2)	6.00(2)	6.75(2)	44.73(3)
729	13.00(2)	0.50(2)	0.00(2)	4.50(2)	35.50(2)
730	15.15(2)	0.25(2)	4.00(2)	0.00(2)	-
731	2.92(3)	326.00(2)	0.00(2)	1.00(2)	-
732	0.65(2)	0.30(2)	0.00(2)	0.00(2)	-
733	0.30(3)	21.37(3)	1.50(2)	0.67(3)	5.07(2)
734	1.27(2)	1.50(2)	0.00(2)	0.00(2)	3.00(2)
735	1.50(2)	57.00(2)	7.50(2)	0.20(2)	-
736	-	5.00(2)	0.00(2)	6.75(2)	-
Mean (# sets))	74.36(182)	60.25(221)	75.22(175)	75.74(231)	16.38(202)
Biomass	215.2	175.1	218.7	220.2	45.9

[a]Preliminary analysis.

Table 22. American plaice population numbers ($x10^{-3}$) from seasonal R.V. surveys in 1985-86 in Division 3L.

Age (years)	1985 (Winter)	1985 (Sring)	1985 (Summer)	1985 (Fall)	1986 (Winter)
1	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	31.2	148.7	54.3
3	133.8	433.5	506.0	257.0	154.7
4	808.0	1,405.7	3,573.5	1,672.1	450.8
5	5,470.7	8,570.0	14,768.6	14,268.3	2,680.7
6	16,637.5	28,497.3	62,699.4	69,233.4	9,679.0
7	68,038.1	84,508.3	159,409.8	170,545.4	25,564.7
8	99,895.8	102,402.7	147,995.8	134,131.3	36,438.1
9	97,996.9	71,465.8	87,625.5	93,886.1	21,140.2
10	100,671.0	45,078.4	33,890.6	37,312.8	14,479.9
11	40,345.2	24,369.1	13,758.4	16,226.3	6,139.8
12	17,711.3	12,066.6	10,344.3	11,257.8	2,112.1
13	10,008.7	6,716.9	5,654.5	5,931.1	1,632.1
14	2,785.0	3,250.2	1,955.2	1,889.6	377.1
15	1,549.2	1,632.7	925.0	1,180.6	278.5
16	741.5	1,040.0	446.5	537.1	178.1
17	292.1	213.4	269.8	104.5	56.5
18	73.1	15.4	39.6	37.6	26.5
19	16.8	15.4	-	-	-
Unknown	0.0	44.5	0.0	16.9	0.0
Total	463,174.7	391,725.9	543,893.7	558,636.6	121,443.1
2+	463,174.7	391,681.4	543,893.7	558,619.7	121,443.1
4+	463,040.9	391,247.9	543,356.5	558,214.0	121,234.1
6+	456,762.2	381,272.2	525,014.4	542,273.6	118,102.6
8+	372,086.6	268,266.6	302,905.2	302,494.8	82,858.9
12+	33,177.7	24,950.6	19,634.9	20,938.3	4,660.9

Table 23. Comparison of various partial recruitment vectors for Divisions 3LN American plaice.

Age	PR84	PR85	PR86	PR87
6	.014	.006	.025	.041
7	.068	.016	.100	.116
8	.130	.039	.220	.233
9	.240	.096	.300	.374
10	.391	.222	.470	.536
11	.625	.705	.580	.745
12	.897	.790	.730	1.000
13-19	1.000	1.000	1.000	1.000

PR84-87 - Partial recruitment vectors used in the 1984, 1985, 1986 and 1987 SPA runs respectively.

Table 24. Results of SPA calibration for A. plaice in Divisions 3LN.

Regression	Parameter	F_T .40	.50	.55	.60
Avg. exploitable biomass vs CPUE, 1965-86. (unweighted least squares linear regression)	r	.858	.873	.870	.865
	intercept	+8299	+3088	+1189	-392
	slope	185608	188183	189149	189963
	'86 residual	+42204	+18487	+9826	+2590
	'85 residual	+17985	-1324	-8371	-14252
	'86+'85 residual	+60189	+17163	+1455	-11662
	('86 res.)^2 + ('85 res.)^2 ($x10^{-6}$)	2105	344	167	210

Table 25. Results of SPA, F_T = 0.55, for A. plaice in Div. 3LN.

POPULATION NUMBERS

AGE	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6	183748	193151	171804	155248	122138	119214	113301	144275	180217	221203	215169	229132	219479	187907	186383	189874	206416	167454	119179	70544	26134	6262
7	148771	147689	153489	138645	125393	98117	95823	91347	116132	146792	176361	173501	164521	173780	150644	148678	152810	176151	136655	96728	54217	21167
8	119885	115498	113476	119137	110485	96624	78238	71646	72958	90639	113573	138351	135366	143775	135194	111972	113484	123266	137862	109633	78722	50995
9	105073	90043	86308	88298	90381	79578	70906	55592	52708	52351	66907	85507	98829	101031	109354	95388	81178	88995	97028	108824	88035	59862
10	86103	79883	66665	64935	64090	60055	54056	45504	36778	34019	36822	47719	56284	69466	72237	77550	65818	60008	65735	73379	84954	62784
11	54824	63904	60016	46317	44654	42673	39917	32793	27387	25063	20848	24315	29322	36759	45681	48892	51065	44150	38865	48029	51807	55937
12	36439	39890	47051	40897	32261	26794	25774	23784	17617	15418	13543	12975	13694	18620	22080	30054	30260	29854	22842	24801	28037	30119
13	29674	24787	28457	29745	23356	18441	15175	13796	11196	9186	9150	7577	6757	7819	9974	14996	17675	14259	12083	12246	12478	15145
14	18756	19750	16045	17577	17931	13713	10543	8220	6051	4542	4861	4677	4019	3710	3708	6662	9214	6732	4962	5886	5892	6815
15	9689	11579	12455	9176	9752	10612	7406	5621	3364	2333	2233	2012	2034	2104	1465	2498	4150	2543	2041	1910	2642	3163
16	7337	6329	6803	6927	5198	5311	5204	3422	2655	1342	1127	841	585	676	472	933	1485	771	526	612	626	1323
17	3763	4148	3710	3307	3793	2821	2379	2675	1167	526	561	384	283	199	293	416	543	222	157	112	151	269
18	2245	1932	2458	1849	1594	2155	1191	1135	1069	230	257	103	140	86	25	168	269	98	49	16	11	41
19	2109	1335	737	1008	957	754	1010	571	453	49	129	38	44	30	23	9	132	12	18	1	2	3
6+	808417	799917	769474	723065	651984	576862	520923	500379	529152	601689	661561	727135	751356	746161	739611	728169	736500	708545	638223	560723	443446	313995
7+	624668	606766	597670	567817	529846	457648	407622	356104	348934	380486	446391	498063	531876	558255	551306	538295	528083	541090	519044	482179	417312	337623
8+	475897	459078	444181	429171	404453	359531	311799	264757	232802	233693	270010	324502	347356	384475	400665	389618	375273	370939	382189	385451	353095	286456
9+	356012	343580	330705	310035	293968	262907	233561	193112	159844	143054	156437	186150	211990	240700	265511	277646	261789	247673	244307	275818	274364	236461

POPULATION BIOMASS

AGE	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6	47703	47799	44380	38582	31810	29451	26400	36055	39756	49883	48010	53772	51676	44845	53667	55980	71871	47463	43133	21982	9331	1543
7	47973	47908	51930	43163	36648	28975	27522	30433	38035	43891	54339	53008	58625	55778	48752	53419	56104	57544	62107	31909	24891	6549
8	51918	49997	47069	46844	38805	32992	26774	29860	23593	32520	41331	47346	50583	52073	51125	46248	45637	48673	72318	42920	32781	19823
9	57440	49772	45820	45480	41842	35374	28291	23999	22153	25067	32815	38294	51838	44003	50528	42794	33629	39311	58750	50427	41906	27261
10	52340	54748	44029	37752	35281	33526	26036	22444	13486	18667	21277	24857	30[illegible]	35068	35525	36131	26381	26770	49453	34578	46486	33389
11	38838	53727	42220	33075	27449	26645	24053	18109	16999	16399	15307	15558	20034	22261	25508	25359	21427	19692	21853	24694	33150	31912
12	26278	33447	38871	31030	24265	17188	17421	14485	13223	13310	11290	9807	10620	12853	16589	17316	14248	14783	12850	15661	23115	20702
13	22718	19778	24027	25092	19014	14733	11730	8786	9168	9242	6924	6464	6093	6607	9763	11741	8911	8764	8332	9855	13723	13276
14	18719	20365	16828	18556	19548	11937	8858	6386	5204	5096	4581	4212	4110	3355	5082	7187	5182	5106	3897	6005	8189	7954
15	10865	12689	15368	11178	11708	9950	6600	5457	3354	3186	2584	1913	2431	2218	2224	3388	2609	2053	1851	2358	4606	4658
16	9025	8120	9159	9788	7272	6108	6080	3467	2378	2137	1601	1095	784	1169	1131	1276	1170	792	581	866	1273	2513
17	5232	6207	5788	5157	6490	3504	3213	3246	1119	917	697	561	385	195	545	722	546	254	156	126	393	612
18	3402	2378	3749	3111	2635	3131	1785	1422	695	502	330	189	183	121	50	427	194	126	38	29	23	133
19	3120	2046	1314	1849	1856	1181	1663	771	480	101	213	68	80	54	58	21	149	20	26	2	6	10
6+	395572	408981	390554	350658	304624	254695	216427	204919	186642	220918	243679	257143	289272	280801	300548	302007	290057	271351	326344	241406	240162	169334
7+	347869	361181	346175	312076	272814	225245	190027	168864	146886	171036	195669	203372	237596	235956	246881	246027	218186	223867	263211	219423	230851	167790
8+	299895	313273	294244	268913	236166	196270	162504	138432	116851	127144	141330	150364	178971	180178	198129	192608	162083	166343	221104	187515	205940	161241
9+	247977	263276	247175	222069	197361	163278	135731	108572	93258	94624	99999	103018	128388	128105	147003	146360	116446	117670	148787	144595	173159	141418

Table 25 Cont'd.

FISHING MORTALITY

AGE	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6	0.018	0.030	0.014	0.014	0.019	0.018	0.015	0.017	0.005	0.026	0.015	0.017	0.033	0.021	0.036	0.017	0.003	0.002	0.009	0.001	0.011	0.023
7	0.053	0.064	0.053	0.027	0.061	0.026	0.091	0.025	0.048	0.057	0.043	0.048	0.050	0.051	0.097	0.070	0.015	0.010	0.022	0.006	0.031	0.064
8	0.086	0.091	0.051	0.076	0.128	0.109	0.142	0.107	0.132	0.104	0.084	0.136	0.093	0.074	0.148	0.122	0.043	0.039	0.037	0.019	0.074	0.128
9	0.074	0.101	0.085	0.120	0.209	0.187	0.244	0.213	0.238	0.152	0.138	0.218	0.153	0.135	0.144	0.171	0.102	0.103	0.079	0.047	0.138	0.206
10	0.098	0.086	0.164	0.174	0.207	0.208	0.300	0.308	0.267	0.290	0.215	0.287	0.226	0.219	0.190	0.218	0.199	0.234	0.114	0.148	0.218	0.295
11	0.118	0.106	0.184	0.162	0.311	0.304	0.318	0.456	0.375	0.332	0.274	0.374	0.254	0.310	0.217	0.280	0.336	0.459	0.249	0.339	0.342	0.410
12	0.185	0.138	0.259	0.360	0.359	0.369	0.425	0.553	0.416	0.322	0.381	0.452	0.360	0.424	0.187	0.332	0.552	0.706	0.423	0.487	0.415	0.550
13	0.207	0.235	0.282	0.306	0.332	0.359	0.413	0.624	0.702	0.436	0.471	0.434	0.400	0.546	0.201	0.287	0.765	0.856	0.519	0.584	0.405	0.550
14	0.282	0.261	0.359	0.389	0.325	0.416	0.429	0.693	0.753	0.510	0.682	0.633	0.447	0.729	0.195	0.276	1.087	0.994	0.755	0.601	0.370	0.550
15	0.226	0.332	0.387	0.368	0.408	0.513	0.572	0.550	0.719	0.528	0.777	1.039	0.642	0.941	0.251	0.320	1.483	1.373	1.004	0.916	0.491	0.550
16	0.370	0.334	0.521	0.402	0.411	0.603	0.466	0.875	1.430	0.673	0.876	0.889	0.877	0.895	0.279	0.341	1.702	1.392	1.353	1.199	0.645	0.550
17	0.467	0.323	0.497	0.530	0.366	0.662	0.540	0.717	1.424	0.507	1.490	0.810	0.990	1.869	0.242	0.335	1.511	1.302	1.962	2.127	1.096	0.550
18	0.320	0.763	0.691	0.458	0.548	0.558	0.536	0.719	2.886	0.375	1.706	0.655	1.326	1.139	0.850	0.159	2.951	1.499	3.305	1.943	1.239	0.550
19	0.388	0.386	0.544	0.444	0.414	0.609	0.495	0.789	1.612	0.593	1.108	0.845	0.961	1.026	0.279	0.289	1.737	1.607	1.515	1.305	0.722	0.550

SELECTIVITY COEFFICIENTS USED TO CALCULATE AVG. EXPLOITABLE BIOMASS

AGE	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6	0.079	0.131	0.045	0.038	0.053	0.044	0.034	0.028	0.008	0.065	0.030	0.032	0.080	0.040	0.185	0.055	0.004	0.002	0.017	0.003	0.026	0.041
7	0.226	0.279	0.167	0.075	0.170	0.063	0.203	0.040	0.074	0.139	0.084	0.092	0.118	0.098	0.493	0.225	0.020	0.013	0.042	0.011	0.073	0.116
8	0.367	0.401	0.159	0.212	0.359	0.260	0.317	0.174	0.203	0.255	0.165	0.261	0.221	0.140	0.753	0.391	0.058	0.049	0.071	0.035	0.178	0.233
9	0.316	0.441	0.265	0.335	0.585	0.443	0.545	0.346	0.367	0.374	0.272	0.417	0.365	0.257	0.733	0.550	0.137	0.127	0.153	0.086	0.332	0.374
10	0.418	0.377	0.514	0.486	0.580	0.495	0.671	0.500	0.411	0.714	0.423	0.548	0.540	0.416	0.972	0.700	0.266	0.289	0.219	0.269	0.525	0.538
11	0.503	0.466	0.575	0.450	0.871	0.723	0.711	0.741	0.578	0.819	0.540	0.715	0.608	0.588	1.000	0.899	0.449	0.566	0.480	0.614	0.824	0.745
12	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
13	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
14	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
15	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
16	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
17	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
18	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
19	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

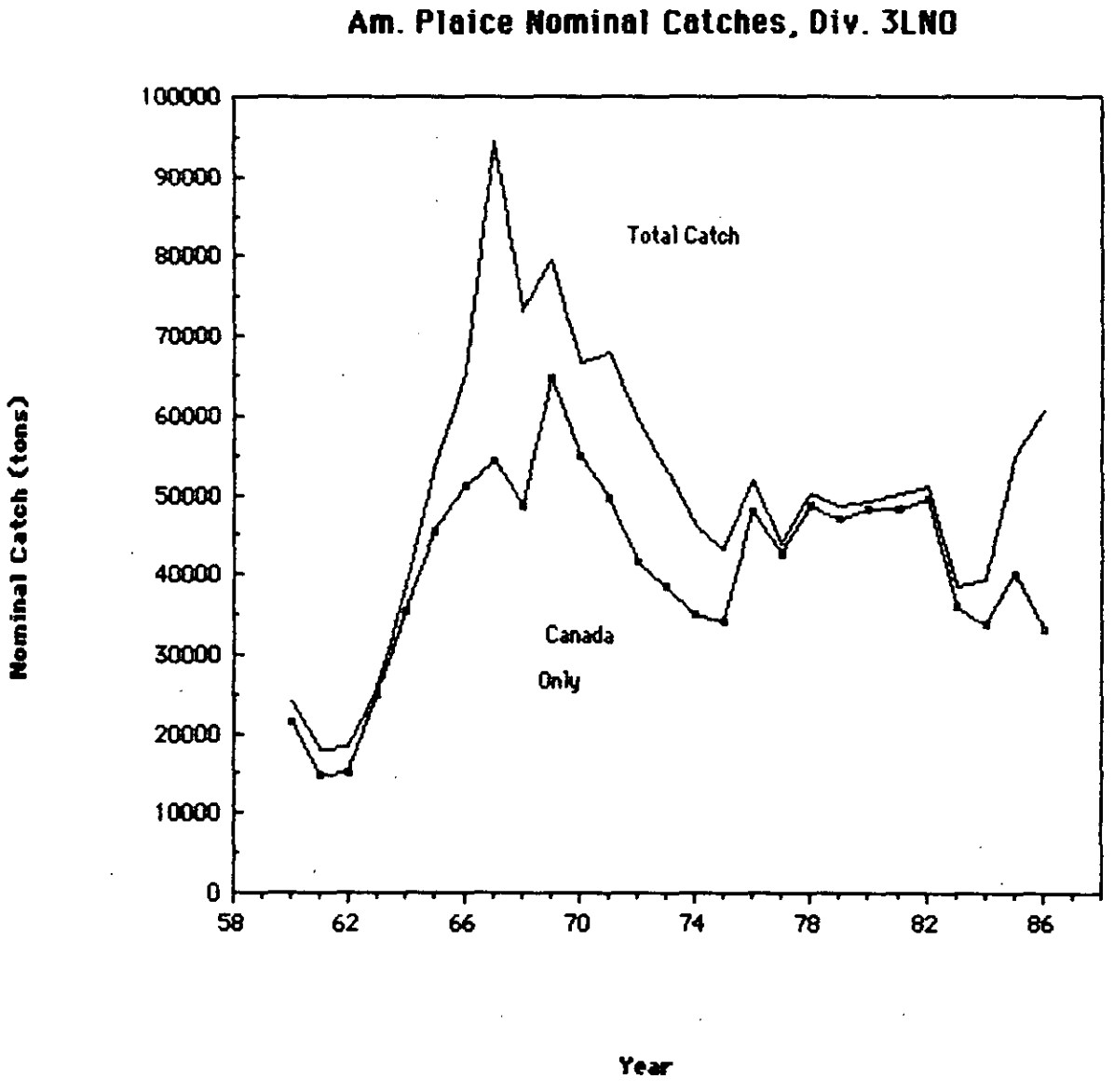

Fig.1. Nominal catches of A.plaice in NAFO Div. 3LNO from 1960-1986.

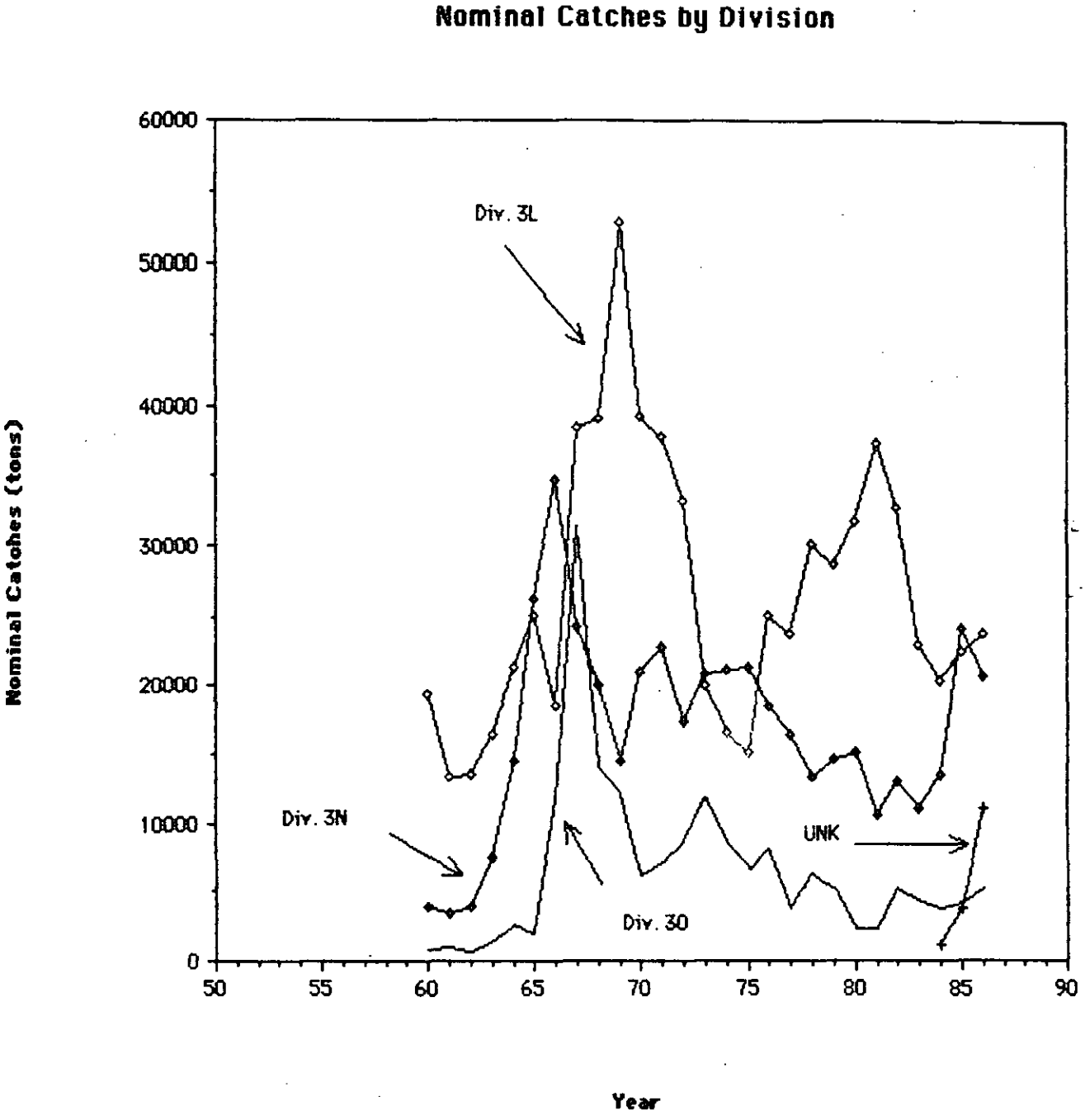

Fig.2. Nominal catches of A.plaice in NAFO Div. 3LNO by division during 1960-1986.

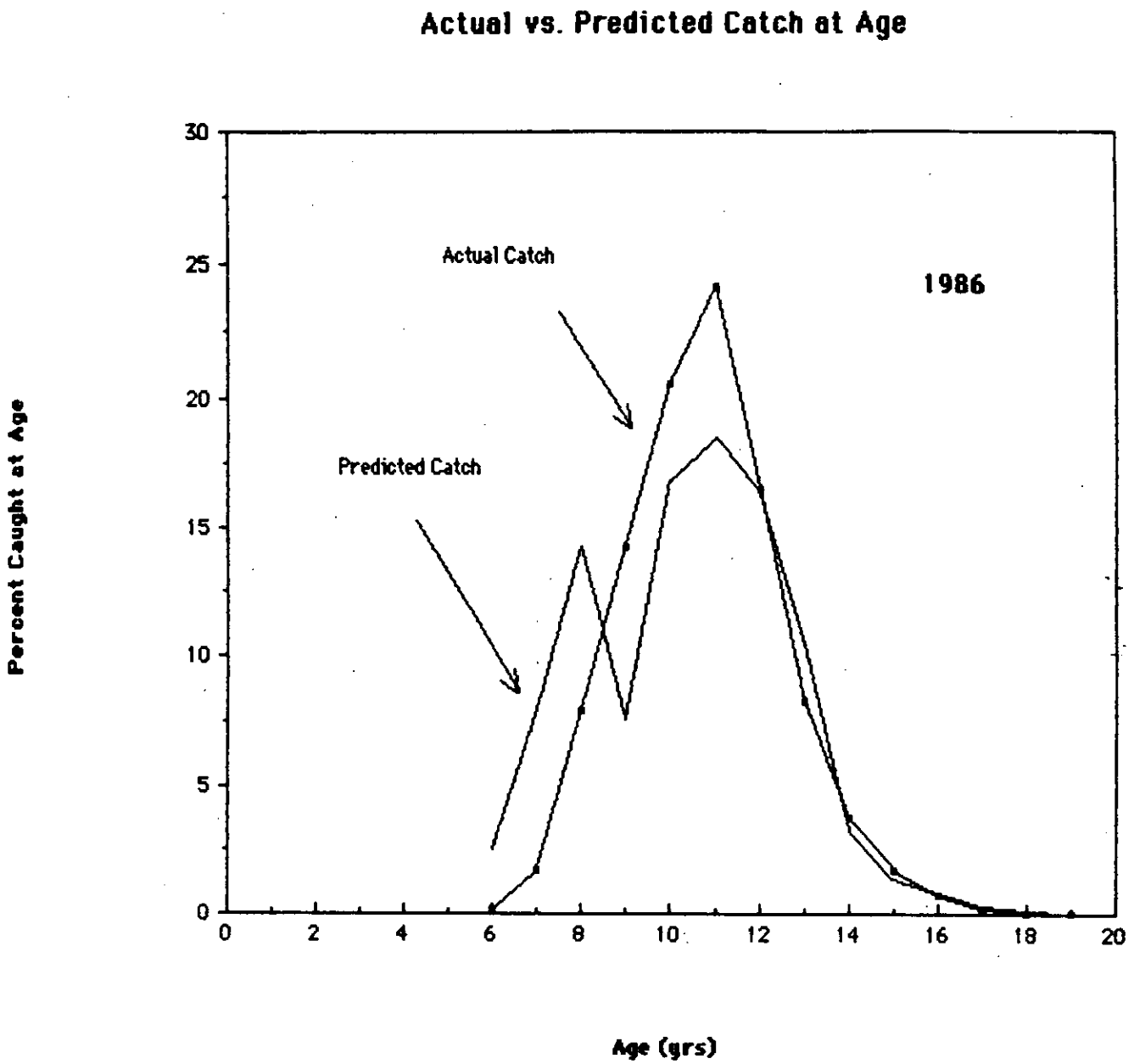

Fig.3. Actual numbers caught versus predicted numbers caught at age of A.plaice in NAFO Div. 3LN , 1986.

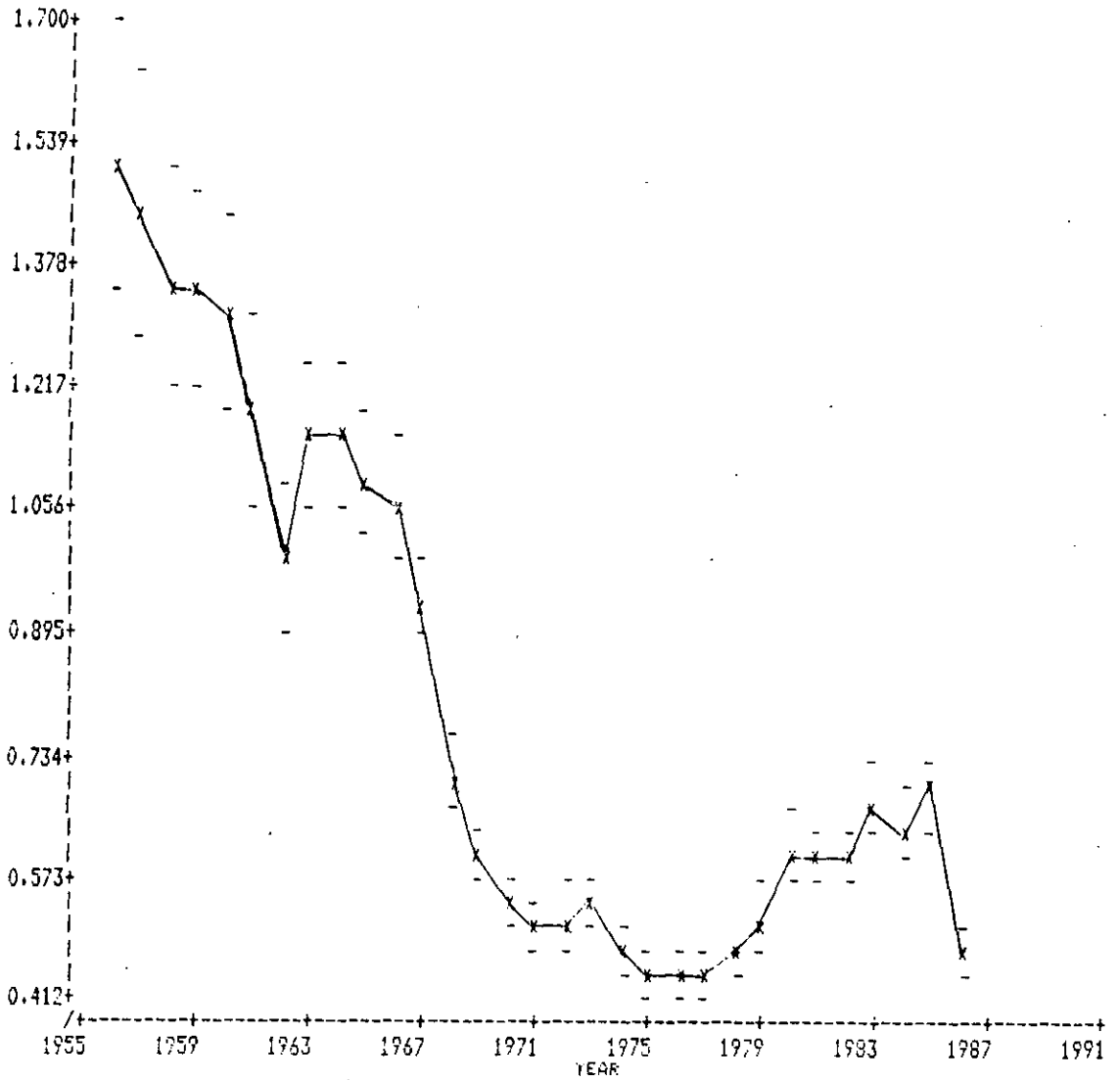

Fig. 4a. CPUE from multiplicative model, with error bars, for A. plaice in Div. 3LN.

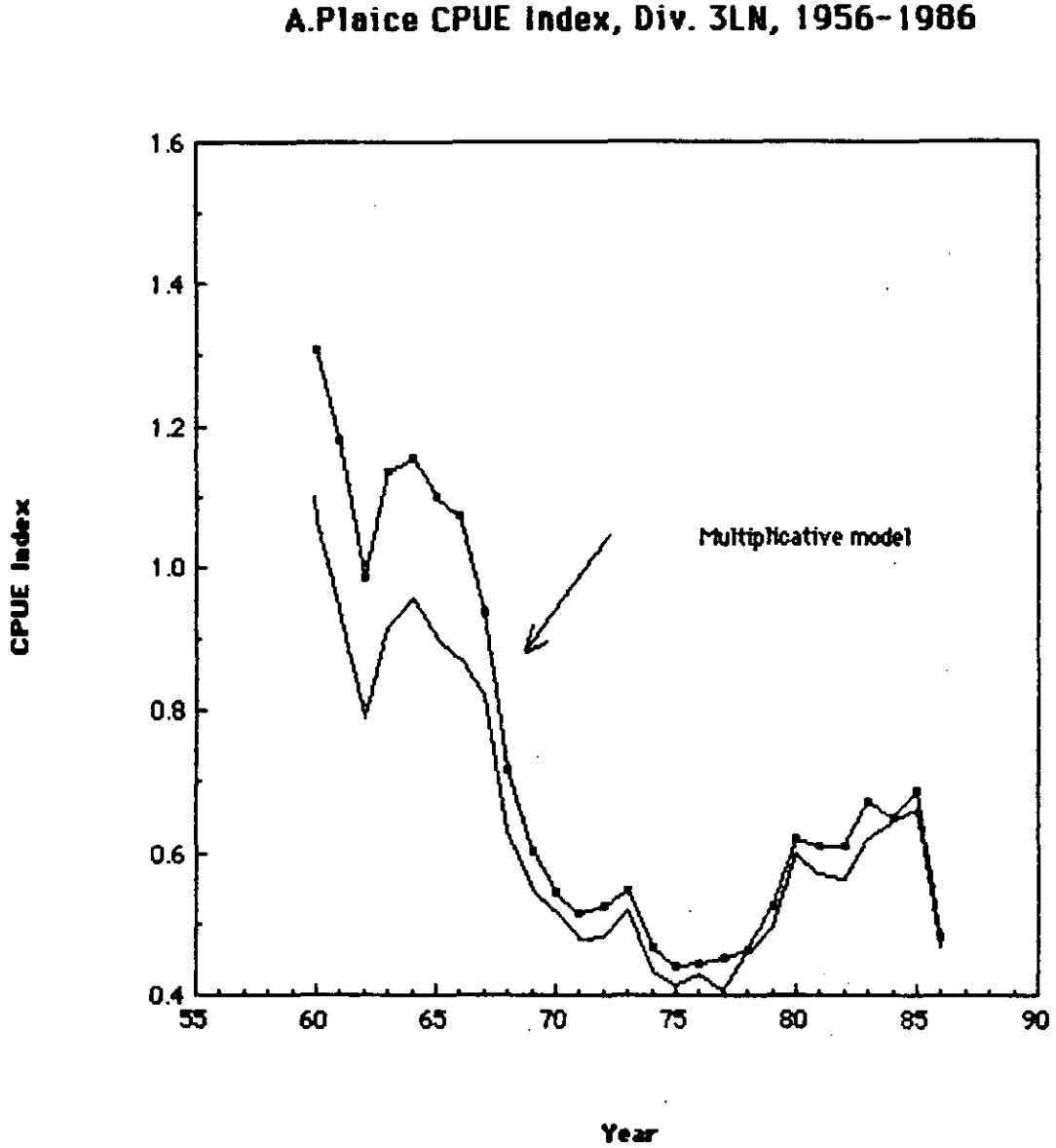

Fig.4b. Catch per unit effort for A.plaice in Div. 3LN using both the conventional and multiplicative models.

A.Plaice R.V. Survey Index, Div. 3L and 3N, 1971-1986

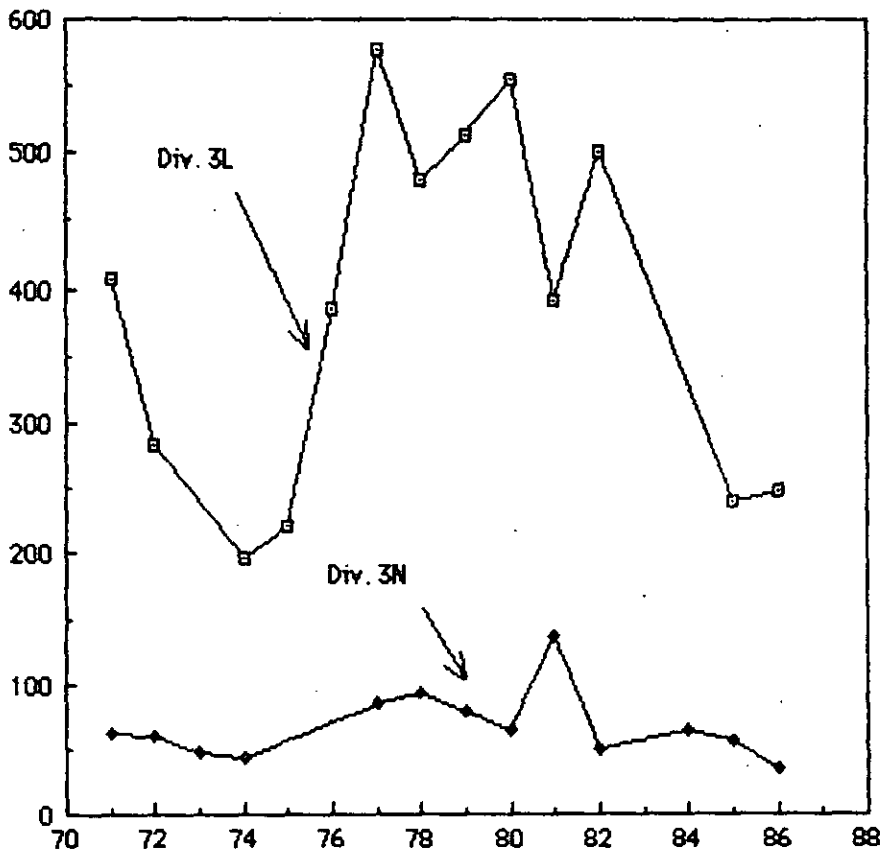

Fig.5. Research vessel survey abundance index for A.plaice in Div. 3L and 3N from 1971-1986(1973,1983 and 1984 missing for Div. 3L and 1975, 1976 and 1983 missing for Div. 3N).

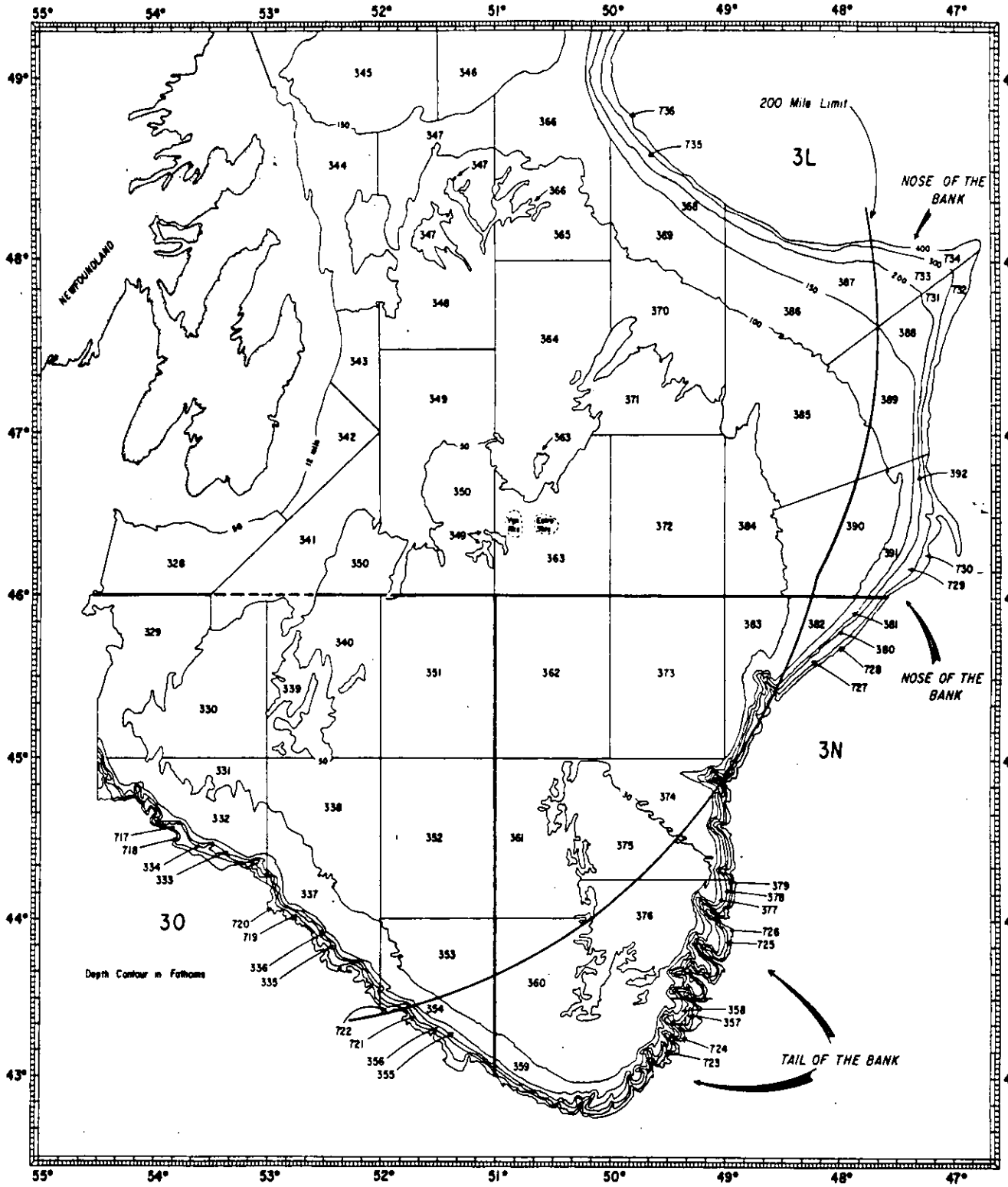

Fig. 6. NAFO Div. 3LNO, showing the Canadian 200 mile limit in relation to the Nose and Tail of the Bank, as well as the stratification scheme used in Canadian groundfish surveys.

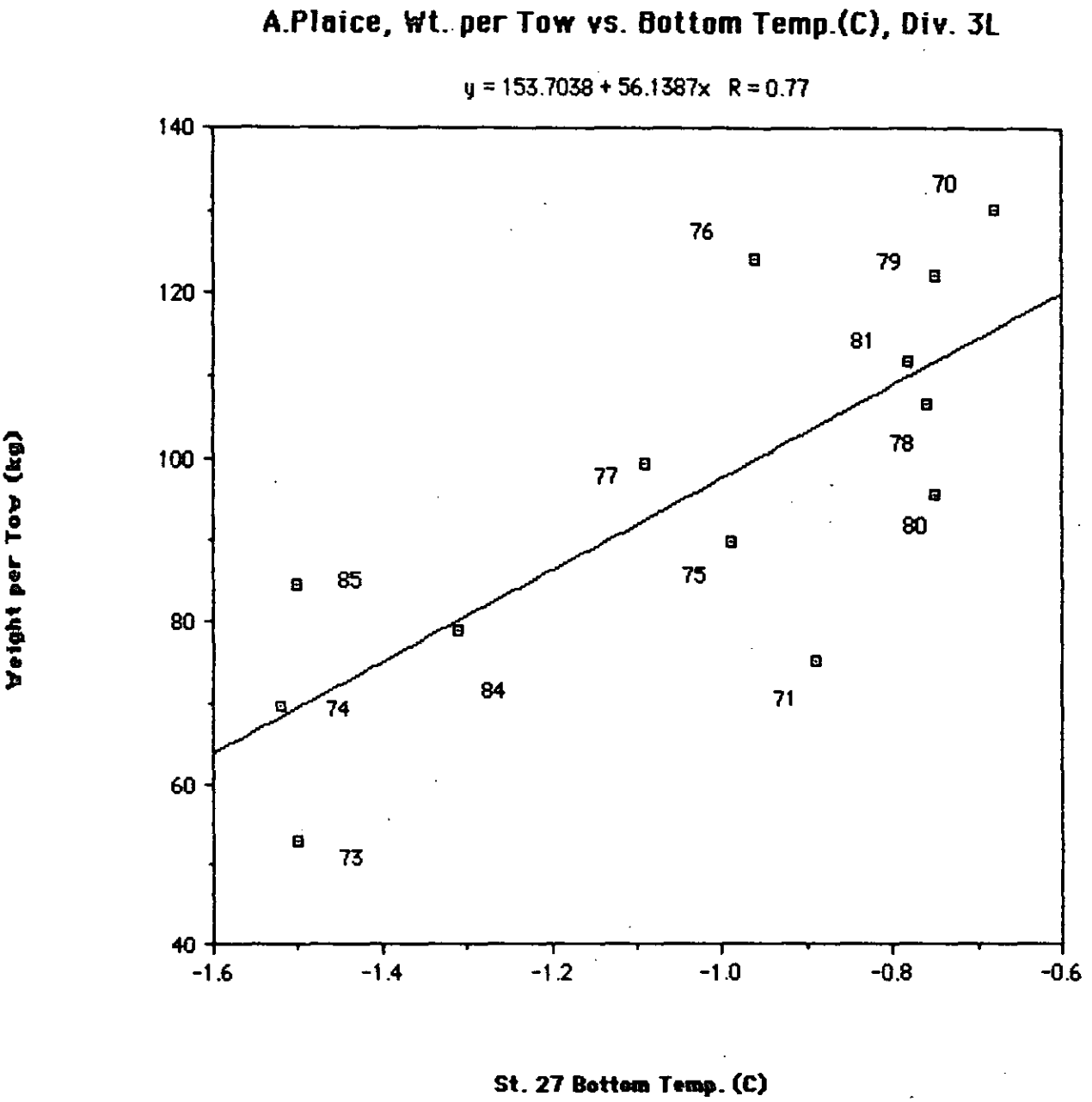

Fig.7. Regression of weight per tow in year i + 1 versus bottom temperature at St. 27 in year i for A.plaice in Div. 3LN (Labelled points refer to year i).

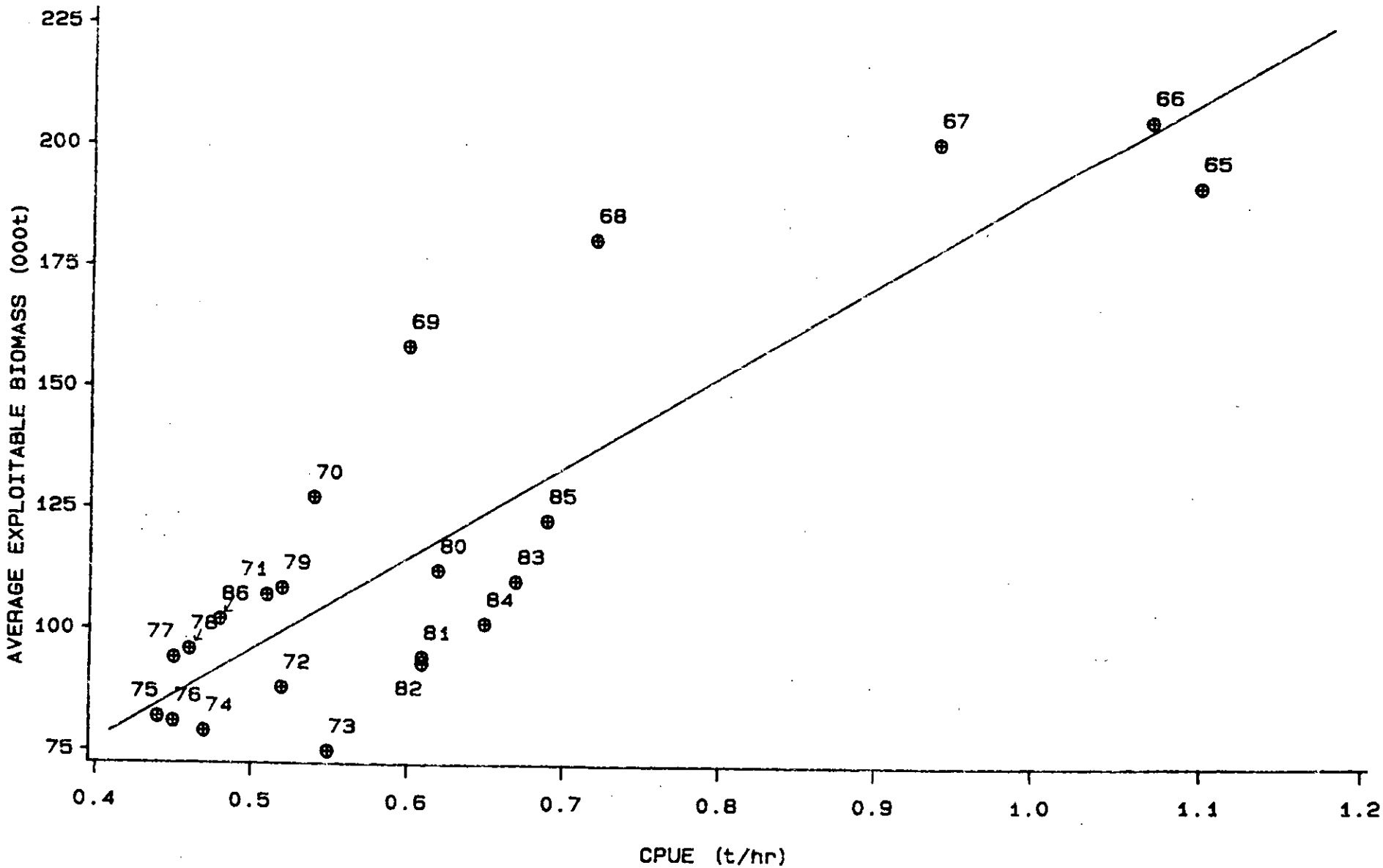

Fig. 8. Average exploitable biomass from SPA with F_T in 1986 of 0.55 vs CPUE, Div. 3LN A. plaice.

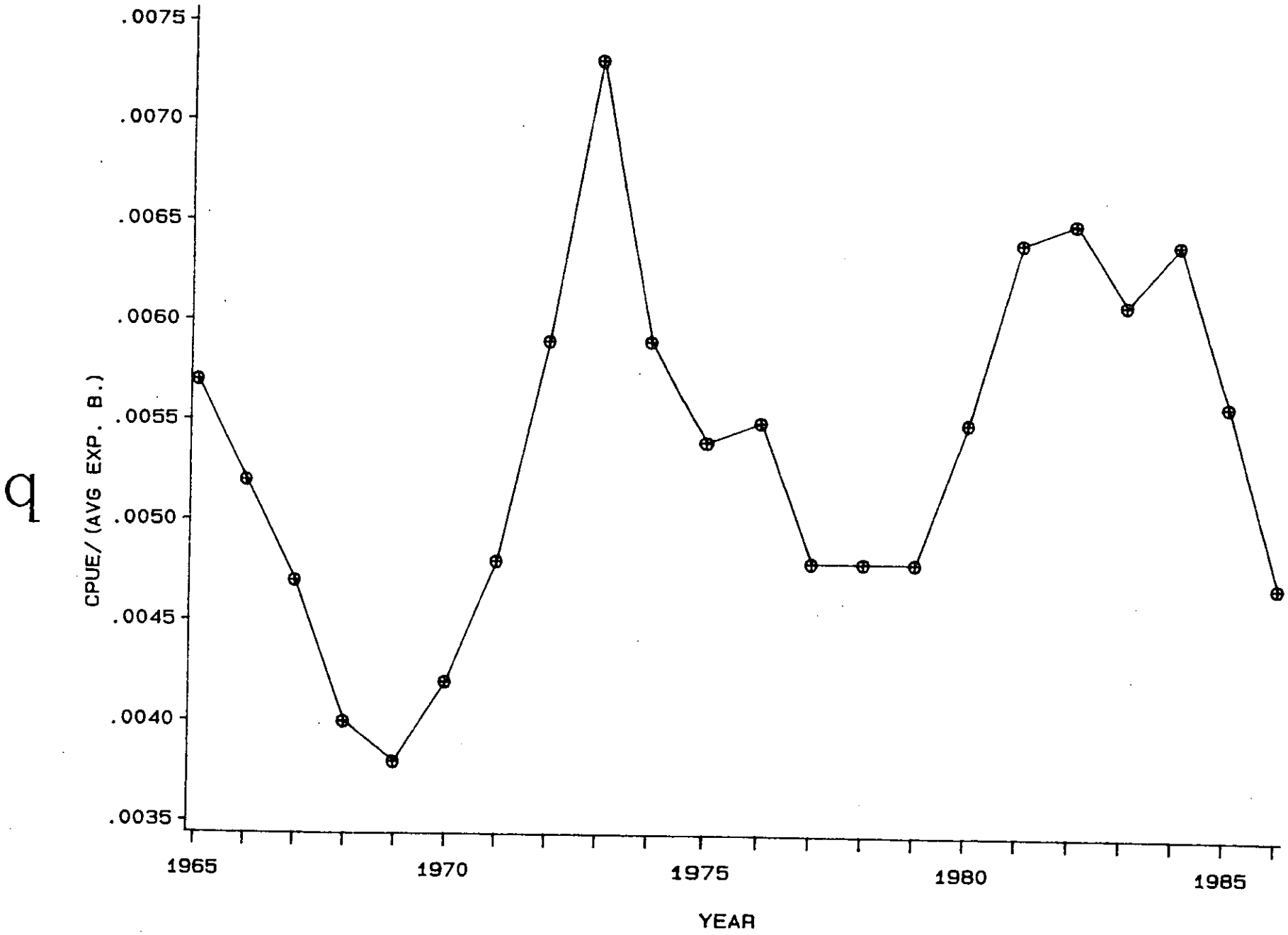

Fig. 9. Plot of catchability (q), defined as CPUE divided by average exploitable biomass from SPA, for the years 1965-86 for Div. 3LN A. plaice.

APPENDIX

The following analyses were conducted at the request of STACFIS in June 1987.

The catch and weights at age for 1986 were recalculated (Table 26), based on length frequencies from the Spanish fishery in Div. 3NO. Using these frequencies, a catch of 22,089 t, and an age-length key from the Canadian survey in Div. 3N in 1986, numbers at age were calculated and added to those from the Canadian fishery in Div. 3N in 1986 (8,065 t). Because 83% of the catch in Div. 3L in 1986 was taken by Canada, and the length frequency data from the Spanish catch in Div. 3L did not differ from the Canadian data by the same margin as the data from Div. 3N, no adjustment to the 1986 catch-at-age in Div. 3L was made using the Spanish data. Also, examination of the 1985 Spanish length frequency data from the catch in Div. 3NO (about 5,000 t) showed these data to be quite different from 1986, and similar to the Canadian length frequency data for 1985. Therefore, no recalculation of the 1985 catch-at-age w The revised partial recruitment vector (Table 26) was calculated by averaging fishing mortalities from 1973-77 in a cohort analysis. These years were chosen as a period in which the average catches in Divs. 3L and 3N were about equal and the proportions of catch-at-age were similar to those in the revised 1986 numbers-at-age.

Based on the calibrations of SPA shown in Table 27, the value of 0.55 was chosen for F_T in 1986. The results of this SPA are shown in Table 28. Using this SPA as the basis for catch projections as well as the parameters shown in Table 29, the $F_{0.1}$ catch for 1988 in Divs. 3LN is 28,000 tons (Table 30).

Table 26. Recalculated numbers and weights at age, as well as partial recruitment, for 3LN A. plaice, 1986.

Age	Numbers ('000)	Weights (kg)	Calculated catch weight(t)	% Nos. at age	Partial Recruitment
2	22	.017	-	0.02	-
3	143	.029	4	0.16	-
4	1256	.074	93	1.38	-
5	4199	.116	487	4.61	-
6	8690	.188	1634	9.54	.050
7	9726	.269	2615	10.67	.127
8	9149	.408	3733	10.04	.284
9	10683	.539	5756	11.72	.465
10	12676	.643	8153	13.91	.665
11	14231	.748	10648	15.62	.833
12	10401	.965	10036	11.41	1.000
13	5749	1.261	7250	6.31	1.000
14	2390	1.625	3884	2.62	1.000
15	1227	2.025	2484	1.35	1.000
16	446	2.501	1115	0.49	1.000
17	116	2.954	343	0.13	1.000
18	12	4.170	50	0.01	1.000
19	1	5.236	5	0.001	1.000
2+	91,117		58,290		
6+	85,497		57,706		

Table 27. Results of SPA calibration for A. plaice in Div. 3LN.

Regression	Parameter	F_T .45	.50	.55	.60
Avg. exploitable biomass vs. CPUE, 1965-86	r	.877	.873	.866	.858
	intercept	7969	5430	3355	1627
	slope	206,867	207,898	208,743	209,449
	'86 residual	+20,553	+9,772	+948	-6,407
	'86 residual	-987	-9,950	-17,270	-23,360
	'86 + 85 residual	19,566	-178	-16,322	-29,767
	('86 res)^2 + ('85 res)^2 (x10^{-6})	423	194	299	587
9+ population nos. from SPA vs. 9+ population nos. from r.v. surveys 1971-86, excluding 1973, 75, 76, 83, 84	r	.436	.543	.618	.670
	intercept	185,216	170,375	158,258	148,184
	slope	207	252	289	319
	'86 residual	+17,714	+7,952	-20	-6,649
	'85 residual	+49,370	+41,623	+35,304	+30,056
	'86 + 85 residual	67,084	49,575	35,284	23,407
	('86 res)^2 + ('85 res)^2 (x10^{-6})	2,751	1,741	1,246	947

Table 28. A. plaice, Div. 3LN, SPA at F_T = 0.55.

POPULATION NUMBERS

AGE	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
6	183748	193151	171804	155248	122138	119214	113300	144276	180217	221089	215449	227871
7	148771	147689	153489	138645	125393	98117	95824	91346	116133	146792	176288	173730
8	119885	115498	113476	119137	110485	96624	78238	71646	72958	90640	113573	138276
9	105073	90043	86308	88298	90381	79578	70906	55592	52708	52351	66908	85507
10	86103	79883	66665	64935	64090	60055	54056	45504	36778	34019	36822	47720
11	54824	63904	60016	46317	44654	42673	39917	32793	27387	23063	20848	24315
12	36439	39890	47051	40897	32261	26794	25774	23784	17017	15418	13543	12975
13	29674	24787	28457	29745	23356	18441	15175	13796	11196	9186	9150	7577
14	18756	19750	16045	17577	17931	13713	10543	8220	6051	4542	4861	4677
15	9689	11579	12455	9176	9752	10612	7406	5621	3364	2333	2233	2012
16	7337	6329	6803	6927	5198	5311	5204	3422	2655	1342	1127	841
17	3763	4148	3710	3307	3793	2821	2379	2675	1167	520	561	384
18	2245	1932	2458	1849	1594	2155	1191	1135	1069	230	257	103
19	2108	1335	737	1008	957	754	1010	571	453	49	129	38
6+	808416	799917	769474	723065	651984	576862	520922	500379	529152	601576	661747	726027
7+	624668	606766	597670	567817	529846	457648	407622	356104	348935	380486	446298	498156
8+	475896	459077	444181	429171	404453	359531	311799	264757	232802	233694	270011	324426
9+	356011	343580	330705	310035	293968	262907	233561	193112	159844	143054	156437	186150
10+	250938	253537	244397	221737	203587	183329	162655	137520	107136	90703	89529	100643

AGE	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6	219526	184745	187139	179122	171611	128753	104856	106429	194596	353232
7	183489	173818	148055	147725	144007	140017	105169	85001	87047	159092
8	135553	142930	135185	109852	112704	116059	113210	83691	69130	69687
9	98767	101185	108663	95414	79442	88356	91128	88624	66795	52002
10	56284	69415	72362	76984	65839	58587	65212	68548	68456	45394
11	29323	36759	45639	48994	50601	44167	37702	47601	47851	42396
12	13694	18620	22080	30060	30345	29505	22856	23849	27676	26881
13	6757	7819	9974	14996	17647	14328	11772	12257	11699	14858
14	4019	3710	3708	6682	9214	6709	5019	5631	5602	6177
15	2034	2104	1465	2498	4150	2543	2022	1956	2433	3171
16	583	876	672	933	1485	771	528	597	663	1153
17	283	199	293	416	543	222	157	112	138	300
18	140	86	25	188	269	98	49	18	11	31
19	44	30	23	9	132	12	18	1	2	3
6+	750496	742296	735283	713874	687990	630127	559697	524316	582101	774376
7+	530970	557551	548144	534752	516379	501373	454841	417887	387505	421144
8+	347481	383733	400089	387026	372372	361357	349672	332886	300458	262052
9+	211928	240803	264903	277174	259668	245298	236462	249195	231327	192365
10+	113161	139618	156241	181760	180225	156941	145334	160571	164532	140363

TABLE 4B CONT'D,

POPULATION BIOMASS (AVG,)

AGE	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
6	47703	47799	44380	38582	31810	29451	26400	36055	39756	49857	48073	53474
7	47973	47908	51930	43163	36648	28975	27523	30433	30035	43891	54310	53079
8	51918	49997	47069	46844	38805	32992	26774	29860	23592	32521	41331	47319
9	57440	49772	45820	45480	41842	35374	28291	23999	22153	25067	32816	38294
10	52340	54748	44029	37752	35281	33526	26036	22444	18486	18667	21277	24858
11	38838	53727	42220	33075	27449	26645	24053	18109	16999	16399	15307	15558
12	26278	33447	38871	31030	24265	17188	17421	14485	13223	13310	11290	9807
13	22718	19778	24027	25092	19014	14733	11730	8786	9168	9242	8924	6464
14	18719	20365	16828	18556	19548	11937	8858	6386	5204	5096	4961	4212
15	10865	12689	15368	11178	11708	9950	6600	5457	3354	3186	2584	1913
16	9025	8120	9159	9788	7272	6108	6080	3467	2378	2137	1601	1095
17	5232	6207	5788	5157	6490	3504	3213	3246	1119	917	697	561
18	3402	2377	3749	3111	2635	3131	1785	1422	695	502	330	189
19	3120	2046	1314	1849	1856	1181	1663	771	480	101	213	68
6+	395571	408981	390554	350658	304624	254695	216426	204920	186642	220892	243713	256889
7+	347868	361181	346175	312076	272814	225245	190027	168864	146886	171036	195640	203416
8+	299895	313273	294244	268913	236166	196270	162504	138432	116850	127144	141330	150336
9+	247977	263276	247175	222069	197361	163278	135731	108572	93258	94624	99999	103018
10+	190537	213504	201355	176589	155519	127904	107440	84573	71105	69557	67184	64723

AGE	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6	51687	44082	53330	52784	59161	36485	37927	29792	69794	59395
7	58289	55791	47874	53065	52849	47302	47575	28029	33872	37510
8	50657	51756	51138	45319	45317	45773	59145	32668	28636	23921
9	51852	44275	50186	42806	32873	39014	55036	40850	31084	22510
10	30981	35040	35593	35837	28391	26059	40113	32130	36387	22293
11	20834	22261	25482	25420	21197	19701	21113	24434	30146	23234
12	10620	12853	16589	17292	14301	14513	12860	14892	22956	18249
13	6093	6606	9764	11741	8890	8830	8053	9868	12856	13181
14	4110	3355	5082	7187	5182	5076	3963	5652	8206	7061
15	2431	2218	2224	3388	2610	2053	1822	2441	4139	4518
16	784	1169	1131	1276	1170	792	581	825	1380	2028
17	385	195	545	722	546	253	156	126	257	623
18	183	121	50	427	194	126	38	29	23	91
19	80	54	58	21	149	20	26	2	6	10
6+	288985	279777	299044	297285	272828	245997	288408	221738	279742	234624
7+	237298	235694	245714	244501	213667	209513	250481	191946	209948	175229
8+	179009	179904	197841	191436	160818	162211	202906	163917	176076	137719
9+	128352	128148	146703	146117	115502	116438	143761	131250	147440	113798
10+	76500	83873	96517	103311	82628	77424	88724	90400	116356	91287

FISHING MORTALITY

AGE	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
6	0.018	0.030	0.014	0.014	0.019	0.018	0.015	0.017	0.005	0.026	0.015	0.017	0.033	0.021	0.036
7	0.053	0.064	0.053	0.027	0.061	0.026	0.091	0.025	0.048	0.057	0.043	0.048	0.050	0.051	0.098
8	0.086	0.091	0.051	0.076	0.128	0.109	0.142	0.107	0.132	0.104	0.084	0.136	0.092	0.074	0.148
9	0.074	0.101	0.085	0.120	0.209	0.187	0.244	0.213	0.238	0.152	0.138	0.218	0.153	0.135	0.145
10	0.098	0.086	0.164	0.174	0.207	0.208	0.300	0.308	0.267	0.290	0.215	0.287	0.226	0.219	0.190
11	0.118	0.106	0.184	0.162	0.311	0.304	0.318	0.456	0.375	0.332	0.274	0.374	0.254	0.310	0.218
12	0.185	0.138	0.259	0.360	0.359	0.369	0.425	0.553	0.416	0.322	0.381	0.452	0.360	0.424	0.187
13	0.207	0.235	0.282	0.306	0.332	0.359	0.413	0.624	0.702	0.436	0.471	0.434	0.400	0.546	0.201
14	0.282	0.261	0.359	0.389	0.325	0.416	0.429	0.693	0.753	0.510	0.682	0.633	0.447	0.729	0.195
15	0.226	0.332	0.387	0.368	0.408	0.513	0.572	0.550	0.719	0.528	0.777	1.039	0.642	0.941	0.251
16	0.370	0.334	0.521	0.402	0.411	0.603	0.466	0.875	1.430	0.673	0.876	0.889	0.877	0.895	0.279
17	0.467	0.323	0.497	0.530	0.366	0.662	0.540	0.717	1.424	0.507	1.490	0.810	0.990	1.869	0.242
18	0.320	0.763	0.691	0.458	0.548	0.558	0.536	0.719	2.886	0.375	1.706	0.655	1.326	1.139	0.850
19	0.388	0.386	0.544	0.444	0.414	0.609	0.495	0.789	1.612	0.593	1.108	0.845	0.961	1.026	0.279

AGE	1980	1981	1982	1983	1984	1985	1986
6	0.018	0.003	0.002	0.010	0.001	0.001	0.028
7	0.071	0.016	0.013	0.028	0.007	0.022	0.070
8	0.124	0.043	0.042	0.045	0.026	0.085	0.156
9	0.171	0.105	0.104	0.085	0.058	0.186	0.256
10	0.220	0.199	0.241	0.115	0.159	0.279	0.366
11	0.279	0.339	0.459	0.258	0.342	0.377	0.458
12	0.333	0.550	0.719	0.423	0.512	0.422	0.550
13	0.287	0.767	0.849	0.537	0.583	0.439	0.550
14	0.276	1.087	0.999	0.742	0.639	0.369	0.550
15	0.320	1.483	1.373	1.020	0.881	0.547	0.550
16	0.341	1.703	1.391	1.353	1.261	0.594	0.550
17	0.235	1.511	1.303	1.958	2.127	1.296	0.550
18	0.159	2.951	1.499	3.326	1.915	1.239	0.550

Table 29. American plaice in Div. 3LN: parameters used for biomass and yield projections.

Age	Population in 1986 (000)	Catch in 1986 (000)	Mean wt. (kg)	PR
6	190,000[1]	8,690	0.298	0.050
7	159,092	9,726	0.356	0.127
8	69,687	9,149	0.440	0.284
9	52,002	10,683	0.541	0.465
10	45,394	12,676	0.623	0.665
11	42,396	14,231	0.747	0.833
12	26,881	10,401	0.984	1.000
13	14,858	5,749	1.303	1.000
14	6,177	2,390	1.676	1.000
15	3,171	1,227	2.161	1.000
16	1,153	446	2.715	1.000
17	300	116	3.146	1.000
18	31	12	4.009	1.000
19	3	1	4.094	1.000

[1]Geometric mean (1974-82).

Table 30. A. plaice, Div. 3LN, Catch Projections.

POPULATION NUMBERS

	1986	1987	1988
6	190000	190000	190000
7	159092	147716	152203
8	69687	121478	114432
9	52002	48811	87883
10	45394	32766	32627
11	42396	25784	20198
12	26861	21953	14680
13	14858	12698	11621
14	6177	7016	6721
15	3171	2918	3715
16	1153	1478	1544
17	300	544	793
18	31	142	286
19	3	15	75
6+	611144	613541	636781
7+	421144	423541	446781
8+	262052	275825	294578
9+	192365	154347	180146

POPULATION BIOMASS (AVERAGE)

	1986	1987	1988
6	49999.58	50723.40	50939.13
7	49640.85	46410.51	48335.38
8	25797.62	45661.30	44046.26
9	22593.96	21735.94	40670.14
10	21610.97	16245.76	16976.50
11	23213.32	14732.75	12345.09
12	18608.33	15983.08	11576.66
13	13619.90	12241.49	12137.21
14	7284.43	8704.97	9031.48
15	4820.25	4664.45	6434.34
16	2201.62	3009.05	3361.18
17	663.59	1267.52	1999.74
18	87.47	420.06	926.18
19	7.44	44.38	246.02
6+	240149.35	241844.65	259027.30
7+	190149.76	191121.25	208088.16
8+	140508.91	144710.74	159752.79
9+	114711.29	99049.44	115706.53

CATCH BIOMASS

	1986	1987	1988
6	2587	1106	662
7	3462	2567	1594
8	4026	5650	3249
9	5780	4409	4918
10	7901	4710	2934
11	10635	5352	2674
12	10235	6970	3010
13	7491	5339	3156
14	4006	3796	2348
15	2651	2034	1673
16	1211	1312	874
17	365	553	520
18	48	183	241
19	4	19	64
6+	60402	44000	27917
7+	57815	42894	27255
8+	54353	40327	25661
9+	50327	34677	22412

FISHING MORTALITY

	1986	1987	1988
6	0.052	0.022	0.013
7	0.070	0.055	0.033
8	0.156	0.124	0.074
9	0.256	0.203	0.121
10	0.366	0.290	0.173
11	0.458	0.363	0.217
12	0.550	0.436	0.260
13	0.550	0.436	0.260
14	0.550	0.436	0.260
15	0.550	0.436	0.260
16	0.550	0.436	0.260
17	0.550	0.436	0.260
18	0.550	0.436	0.260
19	0.550	0.436	0.260
6+	0.180	0.125	0.074