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An Assessment Update of the American Plaice Stock in NAFO Divisions 3LNØ

by

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The following Tables 20, 21, 22 and 23 were not included with the manuscript which was reproduced for presentation at the June 1985 Meeting of the Scientific Council as SCR Doc. 85/51. The Secretariat was informed of this omission by the authors in March 1986.

Table 20. American plaice population numbers ($\times 10^{-5}$) estimated from research vessel surveys (fall) in NAFO Division 3L. Estimates in each year are for the same strata.^a Biomass ($t \times 10^{-3}$) estimates and their 95% confidence intervals are included at the bottom of the table.

Age	Survey-Year			
	ATC 323,324,325 Sep.-Nov. 1981	ATC 333,334 Oct.-Dec. 1982	WT 7,8,9 Oct.-Nov. 1983	WT 16,17,18 Jul.-Sep. 1984
1	16.6	2.6	0.0	0.0
2	22.1	33.6	2.0	0.0
3	160.0	106.3	22.8	2.4
4	239.8	374.3	89.2	27.7
5	428.4	686.2	474.7	175.7
6	598.8	1235.2	1024.5	617.6
7	1621.7	1550.2	1732.6	1683.8
8	1400.5	1526.3	1535.7	1943.7
9	1176.0	829.3	784.2	1155.5
10	1059.9	452.6	436.2	772.3
11	429.1	228.6	187.2	306.6
12	311.2	100.5	140.2	178.0
13	119.4	36.3	83.2	84.6
14	32.9	13.4	12.8	40.4
15	9.2	14.7	14.9	26.4
16	2.2	5.8	6.9	10.6
17		2.4	2.0	2.9
18		0.3		
Totals:				
2+	7611.1	7196.1	6549.1	7028.2
4+	7429.0	7056.2	6524.3	7025.8
6+	6760.8	5995.7	5960.4	6822.4
8+	4540.3	3210.3	3203.3	4521.0
12+	474.8	173.5	260.0	342.9
Upper Biomass	377.7	246.9	311.8	333.1
Lower	271.3	204.0	248.4	294.5
No. sets	95	107	116	170

^a3 out of 23 strata not surveyed in 1983.

Table 21. Mean numbers and weights (kg) caught per tow (with upper and lower 95% confidence limits) from research vessel surveys (fall) in NAFO Division 3L. Estimates in each year are for the same strata.^a

Year	Numbers			Weights		
	Upper	Mean	Lower	Upper	Mean	Lower
1981	(395.5)	306.2	(216.9)	(151.9)	109.1	(66.3)
1982	(355.7)	289.2	(222.6)	(99.3)	82.0	(64.8)
1983	(349.6)	280.4	(211.2)	(133.6)	106.4	(79.2)
1984	(321.8)	282.5	(243.2)	(134.0)	118.4	(102.9)

^a3 out of 23 strata not surveyed in 1983.

Table 22. American plaice population numbers ($\times 10^{-5}$) estimated from research vessel surveys (fall) in NAFO Division 3L. Value 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.

Age	Survey-year			
	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
1	8.3	1.3	0.0	0.0
2	11.0	16.8	2.0	0.0
3	80.0	53.1	22.8	2.4
4	119.9	187.1	89.2	27.7
5	214.2	343.0	474.7	175.7
6	431.1	771.0	1,024.5	617.6
7	1,682.7	1,370.6	1,732.6	1,683.8
8	1,567.7	1,826.6	1,535.7	1,943.7
9	1,333.3	1,067.9	784.2	1,155.5
10	1,303.1	588.5	436.2	772.3
11	557.8	297.2	187.2	306.6
12	404.5	130.6	140.2	178.0
13	155.1	47.3	83.2	84.6
14	42.7	17.5	12.8	40.4
15	11.9	19.1	14.9	26.4
16	2.8	7.6	6.9	10.6
17		3.2	2.0	2.9
18		0.4		
Totals				
2+	7,917.8	6,747.5	6,549.1	7,028.2
4+	7,826.8	6,677.6	6,524.3	7,025.8
6+	7,492.7	6,147.5	5,960.4	6,822.4
8+	5,378.9	4,005.9	3,203.3	4,521.0
12+	617.0	225.7	260.0	342.9

Table 23. Results of cohort analysis calibration for Divisions 3LN American plaice.

Regression	Parameter	.20	.225	.25	.275	F_T	.30	.325	.35	.40
Avg. midyear exploitable biomass vs CPUE, 1965-84	r					0.894	0.900	0.899	0.893	0.875
	int.					-23.8	-23.8	-23.8	-23.8	-23.7
	slope					239.6	236.9	234.5	232.6	229.3
	84 resid.					+19.9	+9.9	+4.8	-1.2	-19.2
	83 resid.					+20.3	+11.8	+1.0	-6.7	-11.1
Actual midyear exploitable biomass vs CPUE, 1965-84	r	0.630	0.623	0.613	0.603	0.593				
	int.	-6.3	-5.5	-4.8	-4.3	-3.8				
	slope	221.4	216.8	213.1	210.2	207.7				
	84 resid.	+30.2	+13.7	+0.6	-10.2	-19.2				
	83 resid.	-19.3	-27.0	-33.2	-38.2	-42.4				

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INTRODUCTION

Tac regulation

The first TAC for this stock was imposed in 1973, at a level of 60,000 t (Table 1). Since then, the TAC has been set at levels between 47,000 and 60,000 t, with the 1985 TAC equal to 49,000 t (Fig. 1).

Catch trends

This stock has been exploited since the late 1940's-early 1950's. The nominal catch reached a high of 94,000 t in 1967, 35,000 t of which were taken by U.S.S.R. vessels (Table 1). Since 1976, the fishery has been conducted almost exclusively by Canadian vessels, and catches have averaged over 45,000 t during this period. The lower catches taken in 1983 and 1984 are attributable to a reduction in fishing effort, caused by financial and labor problems in the industry.

The fishery is conducted mainly by stern otter trawlers, mostly TC5. Inshore catches in Div. 3L in recent years have been between 2,500 and 4,500 t. The fishery is carried out mainly in Div. 3L, with Div. 30 being of minor importance in recent years (Table 2). The fishery is usually conducted on a 12-month basis, with peak catches often occurring in the May-July period (Table 3).

Catch/Effort

Catch rates from Can(N) TC4 and 5 otter trawlers declined steadily from about 0.9 t/hr in the early-mid 1960's to about 0.4 t/hr in the mid 1970's (Table 4 Fig. 2). Catch rates have increased since then and have been between 0.56 and 0.65 t/hr since 1980. The total directed catch, defined as the sum of trawl catches in which plaice is the predominant species, ranged from 31,000 to 36,000 t in the period 1976-82, but declined to less than 18,500 t in both 1983 and 1984. The decline in the total calculated effort for this stock in 1983 and 1984 can be seen in Table 4.

STOCK ASSESSMENT

As has been the case in recent years, only the portion of the stock in Div. 3LN was assessed. Because of lower commercial sampling levels in Div. 30 in earlier years, a comparable assessment of this portion of the stock is not possible. Past practice has been to add an amount for Div. 30, usually equal to recent average catches, to the projected catch estimate for Div. 3LN to produce a TAC for the total stock area.

Sampling

The length frequency and otolith samples used to calculate numbers and weights at age from the commercial fishery in 1984 are presented in Table 5.

Numbers caught at age

These were determined in the usual manner by applying quarterly age-length keys (sexes separate) to monthly length frequencies for each NAFO Division. Total catch at age was then obtained by combining male and female numbers at age for Div. 3LN. Table 6 contains the catch at age and associated statistics for 1984. Table 7 contains the catch at age for the period 1960-84 and Table 8 gives the corresponding proportions at age. The 1960-64 data were not used in the cohort analysis calibration because the sampling level during this period was considerably lower than that of subsequent years (Pitt and Brodie 1981).

It can be seen from Table 7 that the catch at ages 6-8 has declined noticeably from 1979 to 1984. In fact, the proportions at these ages in 1984 are historic lows (Table 8). Although there are no discarding estimates available by age for 1983 or 1984, Stevenson (1980, 1981, 1982, 1983) noted a significant increase in the discard rate of plaice age 6-10 from 1980 to 1982. It is suspected that these high discarding levels may have continued into 1984. Because estimates of discarding are available only for a relatively short time period, the catch at age in Table 7 does not include discards, and, as such, represents only the numbers landed, rather than the numbers actually caught.

Weights at age

These were determined for the 1984 catch in the usual manner by applying a length-weight equation ($\log \text{weight} = 3.3247 \log \text{length} - 5.553$) to monthly average lengths data age. The average weights, presented in Table 6, were obtained by taking the mean of the monthly average weights at age, weighted by the numbers caught at age each month. The weights at ages 6-11 are lower in 1984 than 1983, although they are close to the weights at these ages observed in the 1979-82 period (Table 9). The weights at ages 12-18 are higher than those observed in recent years. Table 10 contains the calculated catch biomass (numbers x weights at age) and these values compare favorably in most years with the nominal catch in Div. 3LN (Table 2).

Natural Mortality

The value of 0.2, used in recent assessments, was retained.

Research vessel survey data

There are essentially two series of research vessel data pertaining to this stock:
a) stratified random surveys conducted from 1971 to 1984, in the spring, in Div. 3LN \emptyset , and
b) stratified random surveys conducted from 1981 to 1984, in the fall, in Div. 3L.

Results from the spring series, in the form of average weight per 30 minute tow per stratum, are shown in Tables 12, 13, and 14, for Div. 3L, 3N, and 3 \emptyset respectively. The following points are important when considering these data:

A. For Div. 3LN \emptyset combined:

- 1) The 1971-82 surveys were conducted by the research vessel A.T. Cameron.
- 2) There was no survey in any of the 3 NAFO Divisions in the spring of 1983.
- 3) The 1984 survey was conducted by the R. V. Alfred Needler.

B. For Div. 3L:

- 1) Survey coverage was extremely poor in 1973 and 1984.

C. For Div. 3N:

- 1) Survey coverage was extremely poor in 1976.
- 2) In 1975 and 1981, at least one stratum with a normally high abundance of plaice was not surveyed.

D. For Div. 3 \emptyset :

- 1) There were no surveys in 1971, 1972, and 1974.
- 2) Survey coverage was extremely poor in 1981.
- 3) There are few strata which were covered in each of the surveys.

In attempting to derive a series which would be comparable across most years, the results from strata indicated by an asterisk in Tables 12 and 13 and Fig. 3 were analysed. These strata are ones which historically had high plaice abundance and were common to almost all surveys. For Div. 3L, these strata consistently contain about 65% of the total estimated plaice biomass in the Division while those in Div. 3N usually contain between 65 and 80% of the estimated biomass.

Tables 15 and 16 contain the estimated population numbers at age from the selected strata in Div. 3L and 3N respectively. The estimates for Div. 3L declined slightly between 1977 and 1982, but there are no data for 1983 and 1984 to show if this trend continued. The estimates for Div. 3N selected strata tend to fluctuate more between years, with the 1984 value being above the historic average. However, because the survey coverage was incomplete for the stock

area in 1984, no effort was made to convert the earlier survey data from the A.T. Cameron to make it comparable with the 1984 data from the Alfred Needler. Tables 17 and 18 show the mean numbers and weights per tow respectively, along with the 95% confidence intervals, for plaice in the selected strata in Div. 3L and 3N.

Results from the fall series, in the form of average weight per 30 minute tow per stratum, are shown in Table 19. The following points should be noted when considering these data:

- 1) The first 2 surveys were conducted by the A.T. Cameron and the last 2 by the Wilfred Templeman.
- 2) The first 3 surveys were primarily in October-November and the last one was primarily in August.
- 3) Survey coverage was reasonably good. However one stratum of some importance was omitted in 1983.

To derive a series in which yearly estimates were comparable, the following steps were taken:

- 1) Strata common to most of the surveys were selected. These are indicated in Table 19. Data from these selected strata can be seen in Table 20 as population at age and biomass estimates and in Table 21 as mean numbers and weights per tow. It can be seen by comparing the biomass estimates in Table 19 with those in Table 20 that the selected strata encompass virtually all of the estimated plaice biomass in Div. 3L.
- 2) Length frequencies of plaice caught in the A.T. Cameron surveys were adjusted to make them comparable with those from the Wilfred Templeman. Gavaris and Brodie (1984) indicated that the number of plaice < 28 cm in length caught by the A.T. Cameron should be multiplied by 0.5 to make the numbers comparable to catches by the Wilfred Templeman. Similarly, the number of plaice > 28 cm in length caught by the A.T. Cameron should be multiplied by 1.3. The results of these conversions can be seen by comparing Tables 20 and 22.

The resulting series (Table 22) shows little fluctuation between 1981 and 1984. The decline in numbers from 1981 to 1983 was followed by an increase in 1984. It should be noted that these estimates are for Div. 3L only and are not directly comparable with those from the spring surveys because different combinations of strata are examined.

Partial recruitment (PR)

The significant reduction in the catch at ages 6-9 in 1984 (Tables 7 and 8) suggested a change in the partial recruitment pattern. This was substantiated by examining the 1984 research vessel survey catch at age for Div. 3L (Table 22), which showed these year-classes to be well represented in the population. The change in the PR pattern at these ages could be attributed either to avoidance or, most likely, discarding.

Because no estimates of discarding exist for the 1984 catch at age, it was felt that the research vessel surveys could be used to indicate the proportions of numbers at age in the population in 1984. Therefore, the 1984 surveys in the summer in Div. 3L and in the spring in Div. 3N were combined in an attempt to derive the PR pattern. PR vectors for Div. 3L and Div. 3N were calculated by dividing the percent at age in the commercial catch from each division by the percent at age in the research catch from each division and normalizing at age 12 for Div. 3N and age 13 for Div. 3L. The average of these two vectors, weighted by the numbers caught at age in each division, was calculated as the PR for Div. 3LN (Table 11).

Previous attempts to calculate PR in this manner have not been successful for this stock. However, with the suspected increase in discarding, it was felt that methods used to calculate PR in the past, which involved averaging fishing mortalities over recent years, would not be as reliable. Even so, a comparison of various PR vectors (Table 11) reveals that PRIT, which was calculated by the same method as the PR used in the 1984 assessment (Brodie and Pitt 1984), gives results at ages 6-10 similar to the PR calculated for this assessment (PR85). However, it was felt that the values at ages 11 and 12 in PRIT (particularly 11), were unrealistically low, given the catch at age in 1984. It should also be noted from Table 11 that the PR used for projections in the last two assessments (PRPROJ) has significantly higher values at ages 6-10 than the PR vectors calculated in 1984 and 1985.

Terminal fishing mortality (F_T) in 1984

Several methods were used in attempting to calibrate the cohort analysis for this stock. Of the two relationships employed in the 1984 assessment (average midyear exploitable biomass vs CPUE, and midyear 8+ population numbers vs abundance from spring research vessel surveys), only the former was used in 1985, as the survey series is not complete for 1983 and 1984. Additionally, true midyear exploitable biomass vs CPUE was used in this assessment for calibration. A summary of the calibration results with these two relationships, over a range of terminal F values, is given in Table 23. A description of the methods follows:

- 1) Average midyear exploitable biomass vs CPUE, 1965-84. These biomass values were calculated by applying average (1960-84) selectivity coefficients at age to midyear population biomass estimates from cohort analysis. The CPUE values are those shown in Table 4. The correlation coefficient (r) reaches a maximum of 0.9 at $F_T = 0.3$, and the sum of the 1983 and 1984 residuals is minimized at a value of F_T between 0.325 and 0.350. The plot of this relationship at $F_T = 0.325$ is shown, for illustrative purposes, in Fig. 4.
- 2) True midyear exploitable biomass vs CPUE, 1965-84. These biomass values were calculated from individual yearly selectivity coefficients at age. The CPUE values are the same as those used in the previous relationship. Although these regressions were significant at $\alpha = 0.05$, r ranged from only 0.593 at $F_T = 0.3$ to 0.630, at $F_T = 0.2$. The 1983 point was below the regression line over this range of F_T values, but the 1984 residual was minimized at $F_T = 0.25$. The plot of the relationship at this level of F_T is shown in Fig. 5.

As was the case in the 1984 assessment, the relationships of population biomass from cohort vs CPUE and weighted fishing mortality vs fishing effort were examined but were considered inappropriate for calibration of the cohort analysis. Given the fit of average exploitable biomass vs CPUE compared to true exploitable biomass vs CPUE, it was decided to put more faith in the former relationship. With the former series indicating F_T in the range 0.30 to 0.35 and the latter series pointing to F_T of 0.25 or less, it was decided to select 0.30 as the appropriate level of terminal fishing mortality in 1984. Results of cohort analysis at this level of F_T are shown in Table 24.

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Table 1. Nominal catches (t) of American plaice for NAFO Divisions 3LNØ,
1960-84 and TAC's from 1973 to 1985.

Year	Canada	France	Poland	USSR	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	517	50,337	55,000
1983 ^a	35,907	41	-	170	1,561	37,679	55,000
1984 ^a	33,727	170	-	52	39	33,988	55,000
1985							49,000

^aProvisional

Table 2. Breakdown of plaice nominal catches (t) in Divisions 3LNØ by Division, for the years 1960-84.

Year	Division 3L	Division 3N	Division 3Ø	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	32,761	12,457	5,119	50,337
1983 ^a	22,964	10,342	4,373	37,679
1984 ^a	19,554	11,056	3,378	33,988

^aProvisional

Table 3. Breakdown of plaice nominal catches (t) by Division and month, for the years 1977-84.

	1977	1978	1979	^{3L} 1980	1981	1982	1983 ^a	1984 ^a
Jan.	34	247	2,003	2	135	23	529	1,332
Feb.	1,140	143	543	658	50	317	166	363
Mar.	175	123	1,475	1,056	2,414	578	151	2,702
Apr.	279	389	1,576	565	5,590	1,627	1,540	2,133
May	2,986	3,309	4,110	7,391	8,986	5,228	4,535	2,904
June	3,899	5,974	4,359	8,632	6,887	5,296	4,207	3,646
July	3,418	5,775	5,321	2,934	3,104	6,106	2,895	3,930
Aug.	3,314	4,990	4,080	1,784	2,759	3,142	1,843	1,671
Sept.	2,465	3,269	2,289	679	2,373	2,948	2,270	397
Oct.	2,128	2,149	1,146	3,094	1,872	2,765	2,087	128
Nov.	2,317	1,212	1,117	1,540	2,251	2,877	1,447	193
Dec.	1,608	2,565	689	3,382	848	1,854	1,294	155
Unk.								
Total	23,763	30,145	28,708	31,717	37,269	32,761	22,964	19,554
				^{3N}				
Jan.	4	798	510	28	482	16	314	498
Feb.	798	268	350	376	105	6	259	146
Mar.	338	469	135	519	154	42	248	293
Apr.	200	525	668	15	406	77	418	1,141
May	1,246	502	773	526	880	398	800	1,299
June	2,416	1,593	1,363	1,836	1,227	641	749	2,182
July	2,431	1,432	1,947	1,574	2,563	2,681	1,445	2,665
Aug.	2,418	1,931	2,055	1,641	1,759	2,685	1,202	775
Sept.	1,659	1,196	1,809	1,349	1,219	1,796	495	196
Oct.	1,668	2,013	1,259	3,386	1,055	3,132	1,545	380
Nov.	1,849	1,601	2,516	2,495	679	748	1,039	1,327
Dec.	1,516	1,115	1,327	1,374	99	235	1,828	154
Unk.								
Total	16,543	13,443	14,712	15,119	10,628	12,457	10,342	11,056
				^{3P}				
Jan.	1	274	274	4	188	-	767	98
Feb.	359	434	93	17	72	107	147	1,091
Mar.	120	216	189	477	214	548	397	527
Apr.	118	452	260	23	98	49	452	97
May	341	1,223	221	91	64	2,071	687	268
June	516	450	339	288	200	1,317	597	195
July	494	288	341	95	352	63	263	394
Aug.	546	303	270	29	82	123	124	19
Sept.	372	322	340	66	204	158	296	293
Oct.	331	879	437	335	281	219	234	269
Nov.	378	955	1,564	283	354	258	338	108
Dec.	99	644	821	542	152	206	71	19
Unk.								
Total	3,675	6,440	5,149	2,250	2,261	5,119	4,373	3,378

^aProvisional

Table 4. Catch and effort data for American plaice for NAFO Divisions 3L and 3N. Directed catch (Column 2) refers to catch directed for plaice by Canada (N) otter trawls tonnage class 4 and 5.

Year	Directed catch (tons)	CPUE (tons/hr)	Total catch (tons)	Total effort (hours calculated)
1960	12,502	1.067	23,309	21,849
1961	9,301	0.942	16,896	17,928
1962	11,777	0.789	17,507	22,187
1963	17,503	0.914	23,977	26,232
1964	19,359	0.954	35,978	37,729
1965	18,082	0.905	51,304	56,690
1966	29,536	0.876	53,270	60,811
1967	34,416	0.818	62,879	76,869
1968	31,344	0.629	59,164	94,060
1969	39,251	0.548	67,322	122,850
1970	24,020	0.516	60,379	117,014
1971	24,439	0.479	60,724	126,772
1972	23,137	0.481	50,717	105,441
1973	20,027	0.517	40,986	79,277
1974	20,957	0.434	37,736	86,949
1975	27,111	0.416	36,479	87,690
1976	35,710	0.430	43,745	101,733
1977	32,117	0.406	40,306	99,276
1978	33,290	0.460	43,588	94,757
1979	30,763	0.495	43,420	87,717
1980	34,982	0.597	46,836	78,452
1981	34,199	0.570	47,897	84,030
1982	33,052	0.562	45,218	80,459
1983 ^a	18,215	0.622	33,306	53,547
1984 ^a	16,608	0.647	30,610	47,311

^aprovisional

Table 5. List of commercial sampling, by quarter and Division, available for 1984, for American plaice in Divisions 3LN0, provided by the St. John's Commercial Sampling Section.

Division		Quarter				Total
		1	2	3	4	
3L (offshore)	Can(N) catch (t)	4,333	7,421	4,005	273	16,032
	Samples	37	29	11	6	83
	Measured	13,030	11,038	3,958	1,766	29,792
	Otoliths	798	842	645	509	2,794
3L (inshore)	Can(N) catch (t)	0	250	2,078	326	2,654
	Samples	-	11	20	3	34
	Measured	-	4,345	6,611	816	11,772
	Otoliths	-	569	906	206	1,681
3N	Can(N) catch (t)	927	4,537	2,882	492	8,828
	Samples	10	8	3	6	27
	Measured	3,307	2,807	895	2,201	9,210
	Otoliths	784	637	315	601	2,337
3G	Can(N) catch (t)	1,711	536	294	113	2,654
	Samples	13	1	-	-	14
	Measured	4,777	669	-	-	5,102
	Otoliths	844	117	-	-	939

Table 6. Average weights and lengths, and catch at age with associated statistics for American plaice in Divisions 3LN in 1984.

AGE	AVERAGE		CATCH		
	WEIGHT	LENGTH	N, MEAN	STD, ERR,	C, V,
4	0.050	19.000	1	0.01	-
5	0.214	28.353	8	3.17	0.42
6	0.309	32.747	89	17.10	0.19
7	0.365	34.445	460	51.31	0.11
8	0.436	36.237	1718	105.75	0.06
9	0.523	38.112	4095	192.34	0.05
10	0.558	38.834	8235	280.80	0.03
11	0.665	41.034	11247	317.79	0.03
12	0.873	44.627	7793	264.44	0.03
13	1.161	48.685	4414	183.91	0.04
14	1.483	52.415	2168	114.69	0.05
15	2.042	57.707	934	58.48	0.06
16	2.629	62.298	349	33.57	0.10
17	2.912	64.364	80	16.42	0.20
18	3.839	70.040	13	3.71	0.28
19	3.029	65.083	1	1.11	0.81

TABLE 7
AMERICAN PLAICE, DIV. I, N., CATCH MATRIX (WEIGHTS 1103)

		1954																	
		1955																	
		1956																	
		1957																	
1960		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
1960		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
309	189	428	960	1788	3041	5139	2228	1874	2079	1948	1545	2199	837	5222	295	3400	6337	3538	538
816	501	632	1740	3025	8964	8224	7216	3147	6624	2314	7524	2023	4966	7295	8065	7874	12560	1576	4650
1324	1161	1054	1337	3015	8972	5073	7913	3113	12623	9066	3534	6576	8670	8264	15963	10827	9238	11601	1718
1285	2254	1159	1442	5760	6789	7798	6330	9065	10830	10225	12624	18388	9656	10767	13186	11253	11593	11242	4492
2210	2994	1605	2275	8180	6493	7285	5754	9133	9045	10830	10225	12624	10907	7789	7741	6445	10772	11329	4085
2462	2337	2894	3521	5892	4644	5038	5521	9166	6255	10793	10128	9833	10864	7741	5901	4524	6867	8857	10796
3367	2143	3243	4892	5892	5758	5032	4966	9700	11193	8811	8074	9147	5245	5839	4773	3750	5825	3406	8235
2648	3673	2317	3673	3023	4624	5378	5034	4647	5796	5111	2940	2415	2014	2977	1640	3385	8553	7936	4414
2488	2433	3151	3591	2830	4174	4377	5126	4496	4223	3328	3720	2896	1251	1738	594	5527	3936	2179	4428
1387	1408	1370	1408	1296	2054	1626	2501	2755	3556	3851	1753	1806	1828	595	1099	469	1099	148	349
931	581	942	623	607	1270	1037	1314	1230	1051	1236	898	1239	802	187	373	193	57	383	146
236	303	771	620	563	556	973	1110	616	834	447	527	913	65	170	93	53	25	231	43
236	303	480	395	536	618	283	310	296	315	360	286	337	20	80	25	18	5	101	13

AND SOONER OR LATER, SIGHTS AT AGE 45 PROBABLY ONE TOTAL

AMERICAN PLACE OF BIRTH, GIVING AT AGE AS PROPORTION OF TOTAL																			
		TABLE 8.																	
1930		1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
6	0.0142	0.0204	0.0358	0.0385	0.0510	0.0831	0.0326	0.0278	0.0249	0.0277	0.0203	0.0329	0.0144	0.0103	0.0485	0.1040	0.0337	0.0187	0.0040
7	0.0175	0.0222	0.0301	0.0447	0.0598	0.1169	0.1317	0.1056	0.0491	0.0758	0.0325	0.0974	0.0302	0.0843	0.1430	0.1387	0.1054	0.1283	0.1116
8	0.0168	0.0248	0.0342	0.0499	0.0659	0.1254	0.1446	0.1142	0.0485	0.0745	0.0325	0.0974	0.0302	0.0843	0.1430	0.1387	0.1054	0.1283	0.1116
9	0.0155	0.0235	0.0332	0.0492	0.0644	0.1231	0.1433	0.1125	0.0475	0.0733	0.0317	0.0963	0.0301	0.0835	0.1420	0.1375	0.1043	0.1271	0.1107
0.0105	0.0132	0.0207	0.0304	0.0453	0.0608	0.1139	0.1324	0.1024	0.0464	0.0724	0.0312	0.0953	0.0301	0.0835	0.1417	0.1372	0.1042	0.1267	0.1097
1	0.0131	0.0152	0.0222	0.0321	0.0470	0.0924	0.1131	0.0924	0.0491	0.0758	0.0325	0.0974	0.0302	0.0843	0.1430	0.1387	0.1054	0.1283	0.1116
2	0.0154	0.0250	0.0356	0.0500	0.0750	0.1333	0.1533	0.1233	0.0700	0.1092	0.0500	0.1333	0.0500	0.1092	0.1644	0.1533	0.1233	0.1533	0.1233
3	0.0122	0.0168	0.0236	0.0366	0.0516	0.1051	0.1256	0.0951	0.0500	0.0850	0.0500	0.1051	0.0500	0.0850	0.1644	0.1533	0.1233	0.1533	0.1233
4	0.0142	0.0176	0.0242	0.0376	0.0526	0.1022	0.1227	0.0922	0.0500	0.0866	0.0500	0.1022	0.0500	0.0866	0.1644	0.1533	0.1233	0.1533	0.1233
5	0.0175	0.0214	0.0281	0.0411	0.0561	0.1056	0.1261	0.0956	0.0500	0.0866	0.0500	0.1056	0.0500	0.0866	0.1644	0.1533	0.1233	0.1533	0.1233
6	0.0142	0.0174	0.0240	0.0366	0.0516	0.1016	0.1221	0.0916	0.0500	0.0866	0.0500	0.1016	0.0500	0.0866	0.1644	0.1533	0.1233	0.1533	0.1233
7	0.0175	0.0212	0.0279	0.0408	0.0558	0.1048	0.1253	0.0948	0.0500	0.0866	0.0500	0.1048	0.0500	0.0866	0.1644	0.1533	0.1233	0.1533	0.1233
8	0.0168	0.0210	0.0277	0.0405	0.0555	0.1036	0.1241	0.0936	0.0500	0.0866	0.0500	0.1036	0.0500	0.0866	0.1644	0.1533	0.1233	0.1533	0.1233
9	0.0168	0.0214	0.0282	0.0412	0.0562	0.1044	0.1247	0.0942	0.0500	0.0866	0.0500	0.1044	0.0500	0.0866	0.1644	0.1533	0.1233	0.1533	0.1233

TABLE 9.
AMERICAN PLAICE, DIV 3H, WEIGHTS AT AGE (KG)

AGE	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
6	0.193	0.189	0.177	0.227	0.285	0.277	0.287	0.290	0.276	0.259	0.278	0.244	0.257	0.248	0.264	0.250	0.246	0.238	0.238	0.238	0.213	0.401	0.307	0.307	
7	0.243	0.279	0.276	0.257	0.378	0.365	0.358	0.348	0.351	0.372	0.329	0.339	0.347	0.345	0.359	0.353	0.374	0.374	0.374	0.374	0.375	0.306	0.365	0.365	
8	0.313	0.373	0.380	0.354	0.497	0.498	0.499	0.469	0.462	0.412	0.397	0.404	0.484	0.380	0.416	0.418	0.403	0.414	0.414	0.414	0.444	0.453	0.453	0.436	
9	0.487	0.493	0.322	0.525	0.547	0.525	0.610	0.610	0.602	0.564	0.536	0.494	0.527	0.519	0.629	0.612	0.623	0.515	0.546	0.537	0.480	0.483	0.512	0.694	0.523
10	0.594	0.593	0.411	0.621	0.639	0.603	0.738	0.788	0.697	0.670	0.680	0.612	0.679	0.629	0.694	0.706	0.658	0.676	0.618	0.594	0.570	0.523	0.655	0.558	
11	0.675	0.741	0.338	0.738	0.721	0.760	0.927	0.916	0.847	0.851	0.785	0.795	0.772	0.763	0.816	0.912	0.941	0.884	0.773	0.683	0.653	0.542	0.609	0.599	
12	0.957	0.895	0.885	0.885	0.885	0.885	0.852	0.852	0.984	0.984	0.984	0.982	0.982	0.867	0.909	0.904	1.041	1.039	1.039	1.039	0.979	0.979	0.979	0.973	
13	1.093	0.888	0.905	0.887	0.875	0.875	0.920	0.920	0.932	0.932	0.932	1.064	1.050	1.043	1.034	0.935	1.243	1.159	1.159	1.159	1.159	0.949	0.949	0.949	1.164
14	1.193	1.198	1.206	1.196	1.206	1.206	1.209	1.209	1.209	1.209	1.209	1.369	1.369	1.369	1.369	1.369	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372
15	1.282	1.264	1.272	1.272	1.272	1.272	1.289	1.289	1.289	1.289	1.289	1.453	1.453	1.453	1.453	1.453	1.453	1.453	1.453	1.453	1.453	1.453	1.453	1.453	1.453
16	1.308	1.324	1.330	1.324	1.324	1.324	1.511	1.511	1.596	1.596	1.596	1.490	1.490	1.490	1.490	1.490	1.490	1.490	1.490	1.490	1.490	1.490	1.490	1.490	1.490
17	1.411	1.423	1.423	1.423	1.423	1.423	1.872	1.872	1.921	1.921	1.921	1.905	1.905	1.905	1.905	1.905	1.905	1.905	1.905	1.905	1.905	1.905	1.905	1.905	1.905
18	1.526	1.526	1.525	1.525	1.525	1.525	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931
19	1.582	1.558	1.558	1.558	1.558	1.558	1.957	1.957	1.957	1.957	1.957	2.025	2.025	2.025	2.025	2.025	2.025	2.025	2.025	2.025	2.025	2.025	2.025	2.025	2.025

TABLE 10.
AMERICAN PLAICE, DIV 3H, CALCULATED CATCH BIOMASS (T)

AGE	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	
6	60	36	76	218	510	879	1424	619	523	603	541	405	611	204	1316	730	887	1726	941	1942	959	205	85	376	29	
7	224	140	174	317	1762	2544	2764	1165	2216	764	2490	753	1433	2416	2322	2349	2895	2858	4697	3735	837	591	1550	165	165	
8	481	413	513	1490	4552	4953	3561	3561	3561	3561	3561	3561	3561	3561	3561	3561	3561	6433	6466	7537	5603	1911	2166	2166	2166	
9	821	116	595	757	3151	4243	4991	5457	8491	6851	6851	6851	6851	6851	6851	6851	6851	8311	7833	5965	5965	7230	7288	2136	2136	
10	1313	174	981	1295	5227	5121	4992	7556	6953	7554	7554	8052	7591	5312	4550	4550	6899	6955	7645	7645	7645	7645	6240	4595	4595	4595
11	1711	1724	1726	2116	5083	7713	5323	7713	8991	11092	8552	8295	7339	7910	5410	4264	4264	5775	5775	7142	8555	5414	7479	7479	7479	
12	2886	1854	2296	3296	4882	4847	4847	4847	4847	4847	4805	5220	6277	5760	5419	4282	4282	3998	3998	3998	3998	3998	3998	3998	3998	
13	3469	3232	3697	3559	2786	4421	6779	6779	5251	5251	5251	5251	5251	5251	5251	5251	3943	3943	3943	3943	3943	3943	3943	3943		
14	2936	2917	3800	3419	3419	4181	5895	4085	4734	5019	3735	2377	1844	1978	1978	1978	1978	1978	1978	1978	1978	1978	1978	1978	1978	
15	2020	2207	2820	2697	2738	2441	2693	4727	3963	2966	3640	2805	2805	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320
16	1814	1844	1756	1997	3315	2155	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	676	676	676	676	676	676	676	676	
17	1314	1314	1349	1166	1166	1166	1166	1166	1166	1166	1166	1166	1166	1166	1166	1166	1166	1013	1013	1013	1013	1013	1013	1013	1013	
18	1444	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
19	369	472	755	1070	1209	775	775	775	775	775	775	775	775	775	775	775	775	821	821	821	821	821	821	821	821	

6+ 1 18830 19840 19991 23799 36379 47062 50313 64017 61392 65672 56370 54807 52269 48816 36340 34662 43389 40339 43097 40750 45247 46559 48834 34448 33409

Table 11. Comparison of various partial recruitment vectors for
Divisions 3LN American plaice.

Age	PR84	PR85	PRPROJ	PRIT
6	.014	.010	.067	.006
7	.068	.013	.194	.016
8	.130	.033	.305	.039
9	.240	.100	.369	.096
10	.391	.246	.502	.222
11	.625	.776	.668	.474 ^a
12	.897	.910	.872	.790
13+	1.000	1.000	1.000	1.000

PR84 - used in cohort analysis in 1984 assessment.

PR85 - used in cohort analysis in Table 24.

PRPROJ - used for catch projections in the 1983 and 1984 assessments.

PRIT - calculated by iterating average 1981-84 F's in a preliminary cohort analysis. Presented here for comparison with PR84, which was calculated by the same method in 1984.

^aAdjusted subsequently to 0.705. See Appendix.

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 successive 30 minute tows in each stratum. The stratified mean weight per tow (kg/30 min.) and the biomass estimates ($t \times 10^{-3}$) along with their approximate 95% confidence limits are given at the bottom of the table. Strata marked with an asterisk were used in the calculations of abundance and biomass in Tables 15-18.

Depth (fm)	Stratum	ATC 187	ATC 199	Year - Trip																		
				1971	1972	1973	1974	207	ATC 208	ATC 209	ATC 222	ATC 233	ATC 246	ATC 262	ATC 276	ATC 290	ATC 304	ATC 305	ATC 317	ATC 318	ATC 328	ATC 329
51-100	328	-	-	-	-	-	-	-	-	-	-	-	-	26.9(3)	-	27.3(5)	-	52.5(2)	72.8(3)	12.5(2)		
51-100	341	-	-	-	-	-	-	-	-	-	-	-	-	94.2(4)	43.8(4)	88.8(6)	47.0(6)	136.5(2)	146.6(5)	69.6(4)		
51-100	342	-	-	-	-	-	-	-	-	-	-	-	-	75.4(2)	72.6(2)	59.5(4)	77.0(4)	-	43.3(3)	60.1(4)		
51-100	343	-	-	-	-	-	-	-	-	-	-	-	-	103.1(2)	112.6(3)	90.2(4)	107.1(4)	177.5(2)	115.8(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)	-	
151-200	345	-	-	-	-	-	-	-	-	-	-	-	-	22.8(4)	27.1(4)	56.3(2)	8.4(4)	10.1(5)	32.5(4)	7.6(4)	-	
151-200	346	-	-	-	-	-	-	-	-	-	-	-	-	45.8(2)	22.3(2)	8.4(3)	2.8(3)	29.8(3)	5.3(3)	-		
101-150	347	28.8(2)	-	92.3(3)	-	-	-	-	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)	-			
51-100	348*	21.4(3)	-	17.0(4)	46.8(4)	73.6(6)	47.5(4)	83.7(6)	21.6(6)	232.8(6)	150.2(6)	124.3(6)	66.6(3)	65.1(6)	105.7(7)	110.8(9)	118.3(4)	-				
51-100	349*	28.1(2)	-	56.5(2)	33.5(4)	82.3(3)	78.1(3)	99.0(4)	40.5(4)	44.3(6)	45.5(6)	44.5(6)	40.5(4)	45.5(6)	96.8(10)	72.8(4)	125.6(6)	89.5(6)	-			
51-100	350*	77.9(3)	56.3(3)	111.7(3)	50.1(4)	69.8(4)	21.5(3)	90.4(4)	103.1(4)	96.8(5)	88.0(8)	77.2(5)	62.3(3)	68.0(8)	114.5(10)	76.6(7)	108.2(6)					
51-100	353*	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)	161.5(2)	195.5(6)	144.4(5)	-	-	-	92.2(5)	168.0(5)	144.4(5)		
51-100	364*	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)	-	88.7(3)	-	-	-	-	-	-	-		
101-150	365	34.4(3)	-	-	63.0(3)	37.6(4)	40.8(4)	76.7(4)	-	-	-	7.2(4)	70.5(4)	20.2(3)	-	-	-	-	-	-	-	
151-200	366	0.0(2)	-	-	4.8(2)	1.1(2)	29.0(3)	0.0(3)	-	-	-	0.7(4)	0.8(2)	8.3(5)	-	-	-	-	-	-	-	
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)	-	-	-	-	-	
51-100	370*	46.0(2)	82.5(3)	-	90.5(3)	43.5(3)	93.1(3)	162.1(3)	70.7(3)	211.7(4)	172.2(3)	154.0(2)	-	-	152.0(2)	102.9(4)	-	-	-	-	-	
51-100	371	95.8(3)	91.9(2)	-	63.0(3)	-	-	93.4(3)	114.1(3)	175.8(3)	147.0(3)	177.0(2)	-	-	102.9(4)	95.4(4)	50.8(6)	63.7(5)	-	-	-	
51-100	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)	-	-	-	60.5(2)	32.3(2)	-	-	-	-	-	
51-100	384	87.9(3)	69.5(2)	124.4(3)	26.6(3)	-	-	54.0(2)	54.5(3)	79.0(4)	48.8(2)	-	-	-	60.5(2)	32.3(2)	-	-	-	-	-	
51-100	385*	139.5(4)	84.2(4)	34.5(3)	17.3(2)	72.1(4)	79.5(2)	168.0(5)	135.4(6)	102.2(7)	224.4(4)	-	-	-	70.8(3)	70.8(3)	-	-	-	-	-	
101-150	386	20.9(2)	-	24.1(3)	22.6(3)	51.0(2)	4.8(3)	19.5(3)	11.5(4)	7.2(3)	20.8(2)	-	-	-	9.2(3)	-	-	-	-	-	-	
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)	-	-	-	-	-	-	
151-200	388	1.4(2)	-	12.2(2)	6.6(3)	0.2(2)	13.0(2)	0.7(2)	0.5(3)	0.1(2)	0.1(2)	-	-	-	0.4(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)	-	-	-	-	-	
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(5)	-	-	-	18.5(2)	35.8(4)	-	-	-	-	-	
101-150	391	-	24.1(2)	12.2(2)	43.3(3)	16.8(2)	2.4(2)	45.4(2)	15.4(2)	17.2(4)	11.0(2)	-	-	-	4.3(2)	10.3(2)	-	-	-	-	-	
151-200	392	-	-	291.9(3)	1.8(4)	-	-	-	3.1(2)	1.9(3)	3.3(3)	-	-	-	-	2.8(2)	-	-	-	-	-	
201-300	729	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
301-400	730	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
201-300	731	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
301-400	732	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
201-300	733	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
301-400	734	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
201-300	735	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
301-400	736	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Upper	154.2	112.8	64.4	60.5	91.3	87.9	111.3	101.6	95.1	125.1	-	-	-	97.5	108.0							
Mean (#sets)	109.4(58)	79.0(38)	49.2(32)	47.1(70)	60.7(55)	76.8(64)	98.3(02)	87.1(94)	95.3(115)	78.1(77)	-	-	-	80.4(103)	87.4(37)							
Lower	64.5	45.2	33.9	33.7	30.0	65.8	85.3	72.7	66.8	65.4	41.6	-	-	63.4	66.9							
Upper	328.2	193.9	69.9	130.6	187.9	187.6	307.1	249.1	262.5	331.1	-	-	-	304.6	269.0							
Biomass	232.8	135.8	53.3	101.7	124.8	163.9	271.3	213.7	223.4	252.1	-	-	-	207.7	222.0							
Lower	137.4	77.7	36.8	72.8	61.7	140.3	235.4	178.2	184.3	170.2	110.7	-	-	110.7	175.0							

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/50 mln.) and the biomass estimates ($\times 10^{-3}$) along with their approximate 95% confidence limits are given at the bottom of the table. Strata marked with an asterisk were used in the calculations of abundance and biomass in Tables 15-18.

Depth (fm)	Stratum	Year - Trip										AN 27		
		1971	1972	1973	1974	1975	1976	1977	1978	1979	1980			
151-200	357	-	-	0.0(2)	-	-	5.5(2)	-	2.4(3)	0.5(3)	0.0(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)		
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)		
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)		
31-50*	361*	17.3(2)	49.2(3)	25.2(4)	37.2(4)	46.3(4)	21.1(5)	22.0(3)	17.5(4)	20.3(8)	33.7(7)	-		
31-50	362*	89.0(2)	110.4(4)	58.0(5)	40.8(4)	18.6(3)	38.7(5)	27.4(5)	18.6(3)	37.3(12)	46.5(11)	45.5(6)	39.0(5)	
31-50	373*	93.1(4)	55.6(4)	27.6(4)	12.1(4)	-	75.5(5)	70.5(4)	85.8(4)	35.2(11)	33.6(8)	75.8(5)	46.8(8)	
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)	83.4(5)	31.8(5)	66.1(7)	
< 50	375*	17.3(5)	41.5(3)	35.6(5)	14.6(3)	-	61.3(4)	39.1(5)	17.7(5)	54.7(3)	170.0(3)	12.4(4)	112.1(5)	
< 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)	10.6(4)	
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)
101-150	378*	23.2(2)	22.3(2)	42.7(2)	21.0(5)	-	-	7.8(2)	10.0(2)	6.9(3)	10.0(2)	3.8(2)	6.5(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)	
201-300	380	-	15.7(3)	3.9(2)	3.4(2)	-	2.3(2)	-	1.5(2)	2.7(3)	0.3(3)	-	-	
101-150	381*	25.6(3)	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)
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(5)	25.5(4)	103.5(2)	56.8(2)	38.5(2)
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)
201-300	723	-	-	-	-	-	-	-	-	-	-	-	-	
301-400	724	-	-	-	-	-	-	-	-	-	-	-	-	
201-300	725	-	-	-	-	-	-	-	-	-	-	-	-	
301-400	726	-	-	-	-	-	-	-	-	-	-	-	-	
201-300	727	-	-	-	-	-	-	-	-	-	-	-	-	
301-400	728	-	-	-	-	-	-	-	-	-	-	-	-	
Upper Mean (#sets)	101.4	60.4	48.3	58.6	50.3	53.2	65.9	310.5	57.7	44.9	92.4	39.7	66.2	
Lower	58.6(23)	48.3(45)	34.2(48)	29.5(37)	25.8(22)	43.9(30)	51.7(48)	76.6(39)	40.4(82)	37.8(81)	67.6(54)	32.7(60)	54.7(60)	
Upper Biomass	84.2	74.4	49.6	32.9	26.5	52.2	82.1	367.3	72.2	56.2	102.8	49.4	82.9	
Lower	48.6	59.5	35.1	25.2	22.6	43.1	64.5	90.6	50.6	47.4	75.3	40.7	68.4	
	13.1	44.6	20.6	17.5	18.7	34.0	46.8	-186.1	28.9	38.5	47.7	31.9	54.0	

Table 14. Mean weight (kg) of American plaice per tow, by stratum, from R. V. surveys in Division 30. 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 ($\times 10^3$), along with their approximate 95% confidence limits are given at the bottom of the table.

Depth (fm)	Stratum	Year = Trip									
		1973 207	1975 ATC 208	1976 ATC 209	1977 ATC 233	1978 ATC 245	1979 ATC 263	1980 ATC 277	1981 ATC 291	1982 ATC 303	1984 ATC 327
											AN 27
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)
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)
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)
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)
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)
151-200	334	-	-	0.0(2)	0.0(2)	0.0(3)	0.6(3)	0.0(2)	-	0.1(4)	0.0(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)
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)
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)
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)
51-100	339	152.4(2)	47.2(2)	-	-	65.5(2)	262.4(3)	-	96.5(2)	27.0(4)	160.0(2)
31-50	340	-	20.0(3)	81.2(6)	52.1(3)	9.8(2)	59.2(7)	85.8(2)	97.3(3)	35.3(6)	49.5(4)
31-50	351	65.7(5)	73.5(4)	56.3(4)	62.7(5)	16.5(5)	46.8(11)	76.3(10)	180.0(4)	46.3(9)	92.9(6)
31-50	352	25.8(5)	77.9(4)	61.1(4)	17.1(5)	8.4(4)	17.9(6)	38.0(11)	-	36.6(7)	27.0(7)
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)
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)
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)
151-200	356	0.9(2)	-	-	-	-	11.6(2)	4.8(2)	30.5(2)	-	4.3(2)
201-300	717	-	-	-	-	-	-	-	-	-	-
301-400	718	-	-	-	-	-	-	-	-	-	-
201-300	719	-	-	-	-	-	-	-	-	-	-
301-400	720	-	-	-	-	-	-	-	-	-	-
201-300	721	-	-	-	-	-	-	-	-	-	-
301-400	722	-	-	-	-	-	-	-	-	-	-
Upper Mean (#sets)	54.0	54.7	88.9	57.8	25.4	56.3	58.8	182.0	38.9	58.3	
Lower	41.2(45)	42.9(34)	52.2(45)	47.4(39)	20.1(49)	45.4(84)	46.5(59)	115.1(21)	31.8(74)	48.0(56)	
Upper Biomass	60.3	63.6	115.2	72.2	33.0	75.7	76.0	125.3	51.7	78.4	
Lower	46.1	49.1	67.6	59.2	26.1	61.1	60.1	79.2	42.4	64.5	
	31.9	36.2	20.0	46.1	19.2	46.4	44.2	33.2	33.0	50.6	

Table 15. American plaice population numbers ($\times 10^{-3}$) estimated from research vessel surveys in NAFO Division 3L (selected strata).

Age (years)	Year - Trip										
	1971	1972	1974	1975	1976	1977	1978	1979	1980	1981	1982
	ATC 187	ATC 199	ATC 222	ATC 233	ATC 246	ATC 262	ATC 276	ATC 290	304	317	ATC 328
1	0.0	57.8	0.0	0.0	0.0	0.0	240.3	0.0	239.6	0.0	
2	0.0	72.3	0.0	546.8	486.0	355.1	574.3	531.0	786.0	458.9	134.0
3	1,957.9	351.1	197.3	2,151.0	8,245.1	3,042.8	13,375.9	1,247.6	5,014.4	4,224.5	3,570.1
4	12,128.6	13,168.8	4,375.9	3,376.6	15,644.5	13,392.9	19,820.8	17,009.6	9,654.2	4,572.1	12,946.5
5	49,026.1	27,599.0	6,777.0	8,997.8	16,611.4	43,428.3	75,997.6	55,552.4	53,302.7	15,667.9	13,206.7
6	65,897.8	51,732.1	23,736.9	24,837.0	18,176.5	85,776.6	80,647.6	87,857.4	92,503.1	43,223.2	36,035.6
7	84,752.0	54,566.8	30,945.7	39,750.3	54,403.9	143,571.4	103,411.2	89,021.1	95,642.5	52,925.5	58,229.7
8	34,224.0	41,036.3	32,361.9	51,781.1	99,786.9	137,116.0	101,981.5	104,585.9	118,323.1	89,074.0	89,308.9
9	59,060.1	23,830.3	28,902.3	39,241.6	76,831.2	83,797.7	69,455.3	75,187.1	91,247.8	72,775.0	108,946.1
10	26,039.5	25,690.5	28,951.7	32,455.5	64,863.3	78,632.1	50,693.8	63,745.4	58,130.0	46,470.4	80,780.0
11	23,624.6	15,466.2	15,205.8	16,076.2	39,214.0	32,917.7	17,449.8	32,670.3	25,811.8	25,591.1	47,137.3
12	22,088.2	16,332.2	13,421.7	11,556.3	23,009.0	22,177.5	12,127.5	13,675.7	16,490.8	10,228.5	20,727.2
13	16,605.4	7,643.9	7,944.9	5,580.2	10,934.7	9,176.3	5,387.2	5,015.1	8,534.2	4,582.8	11,194.1
14	11,554.3	6,127.8	4,285.0	3,153.8	3,119.4	3,474.2	3,464.9	2,674.6	5,228.5	1,655.1	5,388.8
15	5,776.0	5,045.9	2,521.6	1,412.1	2,399.7	2,593.3	1,436.2	1,682.8	1,881.1	1,287.2	1,710.8
16	4,002.2	3,454.5	895.9	1,180.8	1,117.2	1,476.0	728.2	792.5	1,484.6	856.1	1,295.2
17	2,260.8	1,153.6	142.7	316.3	817.3	690.7	393.4	338.0	423.6	472.3	655.3
18	1,291.1	318.7	0.0	104.4	258.3	440.1	85.2	90.3	220.8	67.6	95.5
19	223.6	119.0	38.9	-	92.4	74.8	-	17.3	48.1	25.3	-
20	177.3	100.4	-	-	-	-	-	-	-	-	-
21	111.8	-	-	-	-	-	-	-	-	-	-
22	88.6	-	-	-	-	-	-	-	-	-	-
Unknown	366.8	-	-	720.2	-	-	70.5	59.2	1,820.2	142.5	101.8
Total	421,256.7	293,867.2	200,705.2	243,218.0	436,010.8	662,133.5	557,100.9	551,993.6	584,547.5	374,539.6	491,423.6
2+	420,889.9	293,809.4	200,705.2	242,497.8	436,010.8	662,133.5	557,030.4	551,694.1	582,727.3	374,157.5	491,321.8
4+	418,932.0	293,386.0	200,507.9	239,800.0	427,279.7	658,735.6	543,080.2	549,915.5	576,926.9	369,474.1	487,617.7
6+	357,777.3	252,618.2	189,355.0	227,425.6	395,023.8	601,914.4	447,261.8	477,353.5	513,970.0	349,234.1	461,464.5
8+	207,127.5	146,319.3	134,672.4	162,838.3	322,443.4	372,566.4	263,203.0	300,475.0	325,824.4	253,085.4	367,199.2
12+	64,179.3	40,296.0	29,250.7	23,283.9	41,748.0	40,102.9	23,622.6	24,286.3	32,311.7	19,174.9	41,026.9

Table 16. American plaice population numbers ($\times 10^{-3}$) estimated from research vessel surveys in NAFO Division 3N (selected strata).

Age (years)	Year - Trip										
	1971	1972	1973	1974	1975	1977	1978	1979	1980	1981	1982
	208	ATC 187	ATC 199	ATC 209	ATC 222	ATC 233	ATC 263	ATC 277	ATC 289	304	318
1	0.0	50.6	0.0	0.0	0.0	21.2	51.2	0.0	232.9	35.3	0.0
2	0.0	327.7	12.1	0.0	661.7	50.2	175.1	120.0	62.5	531.0	403.6
3	3,542.4	542.9	202.1	1,033.3	2,762.6	811.9	6,096.4	579.2	509.1	3,610.2	1,062.2
4	3,726.2	2,731.7	976.4	3,157.9	5,003.3	7,137.5	11,967.2	2,647.7	1,931.5	6,106.9	3,613.0
5	3,706.9	3,696.8	4,730.9	4,683.5	2,954.0	11,644.7	20,754.2	9,621.7	4,780.2	3,084.7	1,593.2
6	2,073.8	5,053.4	5,394.1	7,419.1	1,998.1	15,312.3	15,671.3	13,417.2	8,473.7	11,509.8	2,746.9
7	5,798.1	2,517.4	5,320.6	5,910.5	2,953.5	11,773.4	15,558.2	14,400.5	11,370.4	29,428.5	2,954.6
8	3,931.6	4,561.2	3,960.8	5,241.5	2,206.7	10,207.5	9,452.4	14,255.2	9,180.3	24,581.4	6,060.4
9	6,755.1	6,255.4	2,692.4	3,302.1	1,413.6	8,947.8	5,988.4	6,627.1	7,744.9	17,807.8	6,882.1
10	6,749.5	8,703.7	4,076.0	3,426.6	922.8	5,787.6	6,386.1	7,321.2	4,764.2	12,241.9	5,267.5
11	6,146.4	5,801.8	4,893.9	2,409.6	832.4	4,513.2	3,987.6	3,263.4	2,620.3	5,624.9	3,405.5
12	4,583.7	4,334.6	3,385.1	1,536.7	470.3	2,811.0	2,737.4	1,731.9	1,969.9	3,438.9	2,163.1
13	2,186.0	2,788.8	2,421.7	1,517.8	501.5	1,640.2	1,606.9	681.8	910.9	1,907.3	611.1
14	1,472.5	2,212.5	720.4	577.8	295.5	1,126.0	989.5	586.0	663.7	598.4	851.7
15	975.5	767.4	601.2	604.6	270.9	565.6	858.3	558.1	443.7	1,224.3	491.5
16	984.8	566.7	445.3	206.5	143.1	364.5	208.5	275.6	389.5	599.5	523.7
17	381.9	122.2	518.1	88.1	35.8	112.2	197.8	61.5	452.6	309.3	484.1
18	787.6	131.1	138.0	43.2	23.9	-	35.6	-	93.6	249.6	317.2
19	338.4	122.2	117.4	36.3	63.0	-	0.0	-	31.7	-	23.7
20	141.9	173.8	82.4	-	-	-	46.5	-	15.8	-	23.9
21	0.0	-	-	-	-	-	-	-	-	-	-
22	72.6	-	-	-	-	-	-	-	-	-	-
Unknown	1,028.0	46.4	-	47.3	-	-	47.3	-	40.9	84.4	-
Total	55,382.9	51,508.3	40,688.9	41,242.4	23,510.7	82,805.6	102,785.9	78,199.2	56,449.4	124,433.1	40,981.9
2+	54,354.9	51,411.3	40,688.9	41,195.1	23,510.7	82,805.6	102,717.4	78,148.0	56,408.5	124,115.8	40,946.6
4+	50,812.5	50,540.7	40,474.7	40,161.8	20,086.4	81,943.5	96,445.9	77,448.8	55,836.9	119,974.6	39,480.8
6+	43,379.4	44,112.2	34,767.4	32,320.4	12,129.1	63,161.3	63,724.5	65,179.4	49,125.2	109,521.6	32,783.1
8+	35,507.5	36,541.4	24,052.7	18,990.8	7,177.5	36,075.6	32,495.0	37,361.7	29,281.1	68,583.3	27,081.6
12+	11,924.9	11,219.3	8,429.6	4,611.0	1,802.0	6,619.5	6,680.5	3,894.9	4,971.4	8,327.3	5,466.1

Table 17. Mean numbers per tow (with upper and lower 95% confidence limits) from research vessel surveys (spring) in NAFO Divisions 3L and 3N. Estimates are for the same strata each year.

Year		3L Upper	Mean	Lower		3N Upper	Mean	Lower
1971		(441.8)	297.6	(153.4)		(112.7)	67.8	(22.9)
1972		(418.1)	213.8	(9.6)		(72.4)	62.3	(52.2)
1973 ^a						(68.4)	49.0	(29.7)
1974		(177.0)	136.3	(95.6)		(69.9)	49.5	(29.0)
1975 ^b		(387.1)	228.1	(69.0)		(123.1)	64.3	(5.4)
1976 ^c		(477.1)	325.3	(173.6)				
1977		(609.2)	495.2	(381.1)		(176.1)	99.8	(23.5)
1978		(515.3)	397.2	(279.1)		(186.1)	123.8	(61.5)
1979		(494.4)	393.8	(293.1)		(164.2)	94.0	(23.7)
1980		(582.9)	411.4	(239.8)		(88.6)	68.0	(47.4)
1981 ^d		(384.2)	291.7	(199.2)		(257.5)	180.1	(102.8)
1982		(529.1)	365.7	(202.4)		(68.8)	52.3	(35.8)
1984 ^{a,e}						(98.7)	77.2	(55.7)

^aCoverage for 3L very poor.

^bStrata 373, 378, 382, 383 (Div. 3N) omitted.

^cCoverage for 3N very poor.

^dStratum 361 (Div. 3N) omitted.

^eNo 1983 survey. 1984 survey by different vessel.

Table 18. Mean weight caught (kg) per tow (with upper and lower 95% confidence limits) for research vessel surveys (spring) in NAFO Divisions 3L and 3N. Estimates are for the same strata each year.

Year		3L Upper	Mean	Lower		3N Upper	Mean	Lower
1971		(196.0)	130.2	(64.4)		(104.2)	58.5	(12.9)
1972		(127.9)	75.3	(22.6)		(76.1)	58.2	(40.2)
1973 ^a						(54.9)	37.3	(19.6)
1974		(73.9)	53.1	(32.2)		(39.7)	30.0	(20.4)
1975 ^b		(117.1)	69.8	(22.6)		(31.6)	25.2	(18.9)
1976 ^c		(105.6)	89.9	(74.2)				
1977		(145.8)	124.1	(102.3)		(64.3)	47.0	(29.7)
1978		(120.1)	99.5	(78.9)		(63.4)	47.4	(31.4)
1979		(130.7)	106.5	(82.4)		(73.3)	38.6	(3.9)
1980		(173.8)	122.0	(70.3)		(44.7)	34.7	(24.8)
1981 ^d		(123.1)	95.7	(68.3)		(127.3)	87.7	(48.2)
1982		(145.9)	111.7	(77.6)		(43.2)	33.9	(24.7)
1984 ^{a,e}						(80.0)	63.2	(46.4)

^aCoverage for 3L very poor.

^bStrata 373, 378, 382, 383 (Div. 3N) omitted.

^cCoverage for 3N very poor.

^dStratum 361 (Div. 3N) omitted.

^eNo 1983 survey. 1984 survey by different vessel.

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.), the biomass estimates ($\text{tx}10^{-3}$), along with their approximate 95% confidence limits, are given at the bottom of the table. Strata marked with a plus sign were omitted from the calculations in Tables 20-22.

Stratum	1981	1982	1983	1984
	ATC 323	ATC 324	WT 7	WT 16
	325	333	WT 8	WT 17
328+	-	-	-	50.1(4)
341	8.2(3)	18.2(4)	121.3(4)	110.8(5)
342	109.7(3)	44.8(3)	19.5(4)	162.5(2)
343+	50.9(4)	-	483.2(3)	53.3(4)
344	227.3(4)	106.2(3)	70.7(6)	193.0(6)
345	10.5(4)	17.4(6)	13.6(8)	48.4(7)
346	13.0(3)	4.3(4)	10.8(5)	11.5(6)
347	324.3(3)	235.9(4)	134.7(6)	216.5(6)
348	114.1(6)	126.8(5)	112.3(11)	201.4(11)
349	20.1(7)	27.5(5)	113.1(9)	81.7(14)
350	8.3(6)	4.3(2)	72.1(8)	128.9(12)
363	65.5(4)	34.3(3)	253.7(3)	54.9(8)
364	254.2(9)	114.7(11)	95.2(11)	254.6(10)
365	242.8(4)	284.0(4)	198.7(5)	67.9(4)
366	318.3(3)	19.3(6)	50.8(4)	39.7(11)
368	0.0(2)	1.5(2)	-	0.0(2)
369	218.5(2)	27.9(4)	129.4(6)	76.4(7)
370	121.0(4)	88.2(6)	121.0(6)	145.8(7)
371	149.9(4)	97.3(5)	180.4(5)	110.7(7)
372	20.3(5)	79.9(7)	102.5(4)	74.0(13)
384	63.2(3)	176.9(4)	105.0(3)	210.8(6)
385	78.5(8)	128.4(8)	107.1(5)	96.5(12)
386	121.8(3)	123.0(4)	-	99.0(8)
387	2.3(2)	0.3(3)	-	0.7(3)
388+	-	0.0(3)	-	0.0(2)
389+	-	25.1(4)	-	103.1(6)
390	38.5(3)	87.8(4)	72.7(3)	89.5(3)
391+	-	37.0(2)	25.0(2)	233.8(2)
392+	-	5.1(2)	4.7(2)	10.5(2)
729+	-	-	-	3.3(2)
730+	-	-	-	0.0(2)
731+	-	-	-	0.0(2)
732+	-	-	-	0.0(2)
733+	-	-	-	0.0(4)
734+	-	-	-	0.0(3)
735+	-	2.3(2)	-	0.0(3)
736+	-	-	0.0(2)	-
Upper Mean (#sets)	150.3	94.9	140.4	122.2
Lower	108.2(99)	78.6(120)	110.8(125)	108.4(208)
Upper Biomass	379.7	249.4	339.6	353.6
Lower	273.3	206.4	268.0	313.8
	166.9	163.4	196.4	273.9

Table 24. Results of cohort analysis for Divisions 3LN plaice at $F_t = 0.30$.

Table 24. Cont..

		Ave. Exploitable Biomass (Tons)																								
Age	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	
6	1152	1324	1197	1431	1769	1737	1790	1662	1446	1192	1105	987	1354	1902	2159	2170	2610	2349	3435	3719	3089	2175	342	446		
7	3885	3756	4165	4514	5285	459	4959	4959	5176	5055	5796	5000	4468	3796	3054	2634	2151	5815	6513	6099	6563	8045	11227	14068		
8	6334	6313	7472	8866	10773	12853	14192	14951	15223	1659	13069	12764	11927	10682	8017	6139	4979	5562	4388	6056	10609	10446	10684	10598	10598	
9	9505	10899	10734	12883	15628	17556	18570	1872	1804	15526	14526	12668	10972	10682	8017	6841	5527	7117	6786	11074	13503	15667	14193	13773		
10	11002	1423	14385	1723	1790	18553	19113	19195	19113	1972	18021	17320	16772	15325	14888	13441	10116	9513	7742	8853	8677	11706	12734	15067	15681	13635
11	12739	17324	16903	16903	1790	1987	1987	1987	1987	1987	1987	1987	1987	1987	1987	1987	1987	1987	1987	1987	1987	1987	1987	1987	1987	
12	15534	15536	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636	15636		
13	1657	1463	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	1532	
14	15722	1232	7797	9973	8666	7078	7984	7330	5625	5738	5652	6407	5738	3686	3253	1568	977	7334	1555	391	193	570	216	274	166	166
15	1779	5670	6669	7288	8188	8178	8178	8178	8178	8178	8178	8178	8178	8178	8178	8178	8178	8178	8178	8178	8178	8178	8178	8178	8178	
16	1779	7797	9973	8666	7078	7984	7330	5625	5738	5652	6407	5738	3686	3253	1568	977	7334	1555	391	193	570	216	274	166	166	166
17	1779	7797	9973	8666	7078	7984	7330	5625	5738	5652	6407	5738	3686	3253	1568	977	7334	1555	391	193	570	216	274	166	166	166
18	1779	7797	9973	8666	7078	7984	7330	5625	5738	5652	6407	5738	3686	3253	1568	977	7334	1555	391	193	570	216	274	166	166	166
19	2980	2527	3112	3131	4671	3114	1553	2023	1967	1305	1583	912	678	109	258	50	105	58	44	20	171	25	57	10	10	10
6+	129259	134288	140914	149339	152982	170447	180173	176478	160013	141015	112740	94173	78869	64872	67689	69950	68950	80775	83682	97531	103977	95804	104105	135276	137285	

		True Exploitable Biomass (Tons)																							
Age	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
6	350	196	393	964	2663	3402	5055	1786	1472	1713	1216	885	934	214	2736	1195	1522	1633	1412	940	3438	235	117	211	92
7	1312	739	905	2285	2271	2289	9263	7724	1077	1716	5469	1150	1717	5152	427	697	573	573	421	1246	956	817	1272	560	287
8	2921	2291	2291	7799	17101	16193	6676	1077	1716	5469	1150	1717	5152	427	697	573	573	421	1246	956	817	1272	560	287	
9	4818	5084	5084	1478	1444	1444	10034	14105	14105	14105	14105	14105	14105	14105	14105	14105	14105	14105	14105	14105	14105	14105	14105	14105	
10	7710	7313	7313	17365	17705	17705	16852	16852	16852	16852	16852	16852	16852	16852	16852	16852	16852	16852	16852	16852	16852	16852	16852	16852	
11	10052	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028	9028
12	16948	11924	15572	18817	18817	18817	18817	18817	18817	18817	18817	18817	18817	18817	18817	18817	18817	18817	18817	18817	18817	18817	18817	18817	
13	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	15534	
14	16747	14103	15526	17273	18962	18962	17066	17066	17066	17066	17066	17066	17066	17066	17066	17066	17066	17066	17066	17066	17066	17066	17066	17066	
15	13722	12132	9547	16147	10234	10234	10234	12546	12546	12546	12546	12546	12546	12546	12546	12546	12546	12546	12546	12546	12546	12546	12546	12546	
16	17797	9978	9616	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146
17	5669	5730	6288	8338	4674	4674	4674	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852
18	3508	4063	2527	3112	3281	4671	3114	2247	1553	1907	1305	1586	912	678	109	258	60	105	58	64	20	171	25	57	10
19	110689	103632	976668	103676	186664	178088	175569	174072	170342	165192	12941	12941	12941	12941	12941	12941	12941	12941	12941	12941	12941	12941	12941	12941	

		Fishing Mortality																							
Age	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
6	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	
7	0.007	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	
8	0.014	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	
9	0.025	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	
10	0.049	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	
11	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	
12	0.092	0.076	0.076	0.076</																					

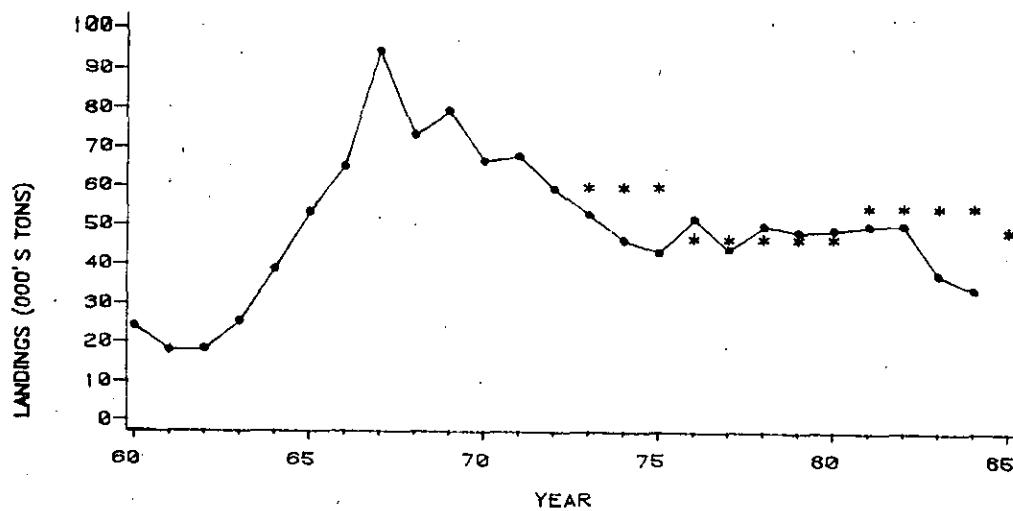


FIG. 1. LANDINGS OF PLAICE IN NAFO DIVISIONS 3LNO FOR THE YEARS 1960-84 AND TACS FOR 1973-85
(TACS DENOTED BY ASTERISKS).

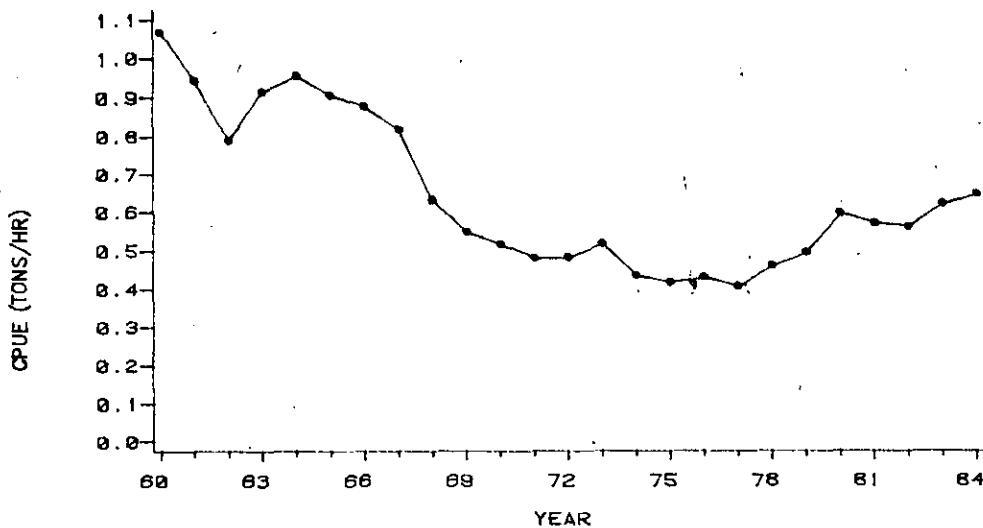


FIG. 2. CATCH RATES OF A PLAICE BY CANADIAN TRAWLERS (TC4&5) IN NAFO DIVISIONS 3LN FOR THE YEARS 1968-84.

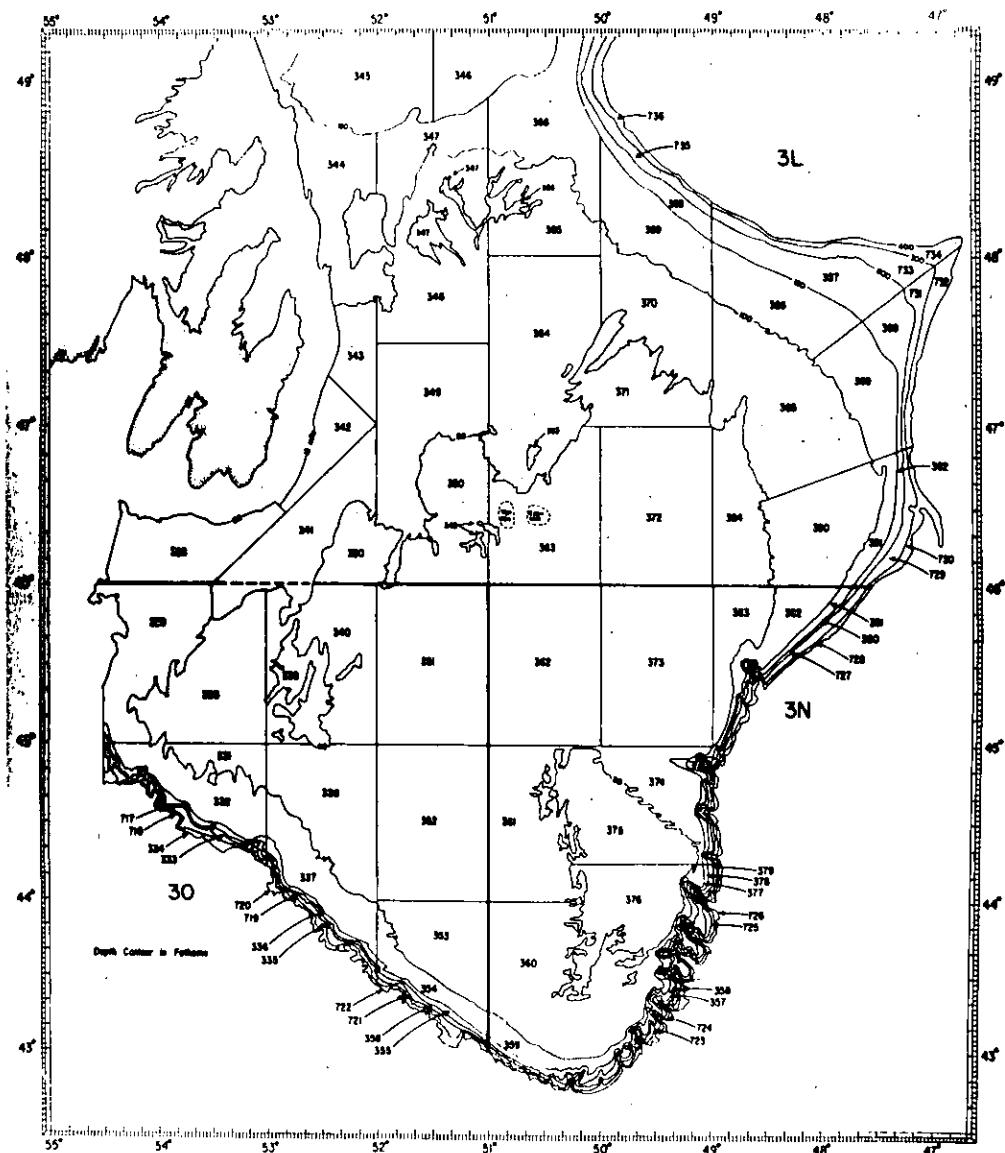


Fig. 3. Strata used in Canadian research vessel surveys in NAFO Divisions 3LNØ.

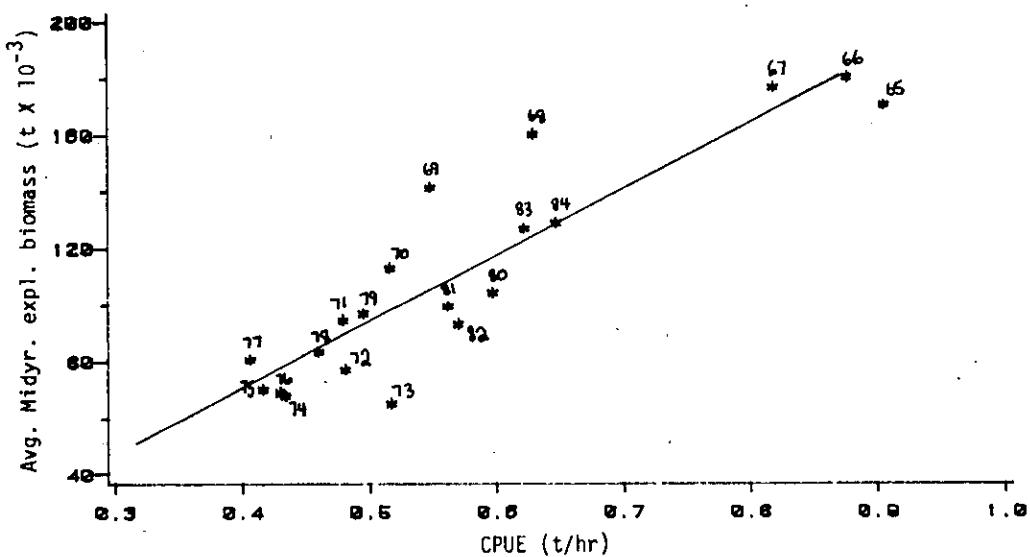


FIG. 4. AVERAGE MIDYEAR EXPLOITABLE BIOMASS FROM COHORT CFT .925 VS CPUE FOR PLAICE, DIV. 3LN, FOR THE YEARS 1965-84.

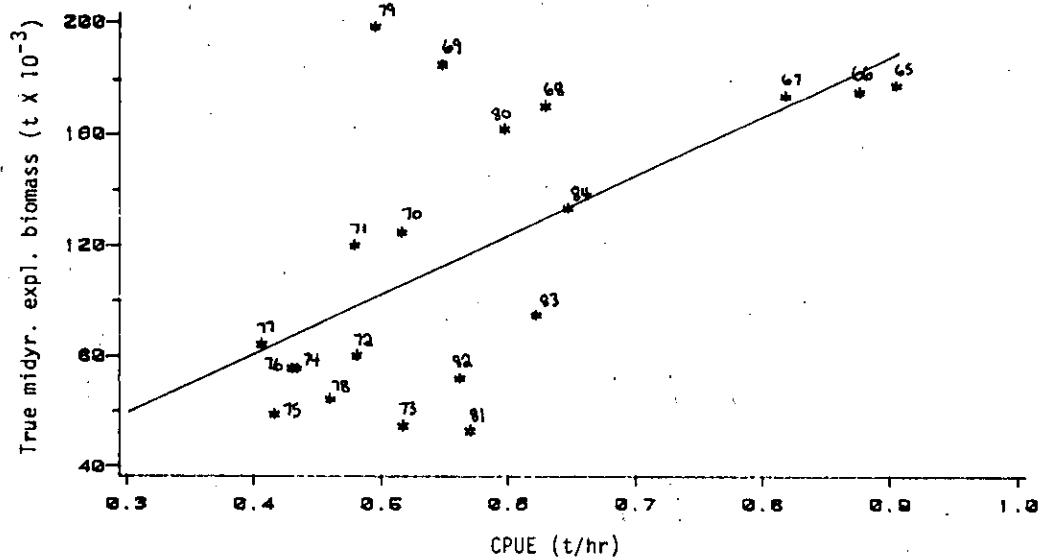


FIG. 5. TRUE MIDYEAR EXPLOITABLE BIOMASS FROM COHORT CFT .250 VS CPUE FOR PLAICE, DIV. 3LN, FOR THE YEARS 1965-84.

Appendix

After further analysis, it was decided to use PRIT (Table 11), with a modification at age 11, as the partial recruitment vector for the 1984 fishery. The value at age 11 was adjusted to 0.705, this being the value which produced a year-class at age 6 in 1979 which was approximately equal to the geometric mean of the 1974-78 age 6 population numbers from cohort analysis.

The revised PR vector was then used in cohort analysis. The analysis was calibrated using the methods discussed previously, with the exception that the 1983 and 1984 points were not used in calculating the regression lines (Table 1A). The best estimate of terminal F in 1984 was considered to be 0.30 and the cohort analysis at this level of F_T is shown in Table 2A.

The parameters used for catch projections are shown in Table 3A and the projections appear in Table 4A. The TAC recommended for the stock in 1986 is 55,000 t, 51,000 t from the projection for Div. 3LN plus 4,000 t (average catch level) for Div. 30.

Table 1A. Results of cohort analysis calibration for Division 3LN American plaice. Cohorts were run using revised PR vector.

Regression	Parameter	F_T				
		.250	.275	.300	.325	.350
Avg. midyr. exploitable biomass vs CPUE, 1965-82	r	.902	.901	.898	.896	
	intercept	-21.6	-22.5	-23.2	-23.9	
	slope	231.7	232.4	232.9	233.4	
	84 res.	+28.2	+16.1	+5.7	-3.2	
	83 res.	+27.5	+17.8	+9.4	+2.2	
True midyr. exploitable biomass vs CPUE, 1965-82	r	.624	.623	.621		
	intercept	-5.7	-5.9	-5.2		
	slope	217.9	217.9	217.9		
	84 res.	-1.7	-13.6	-23.5		
	83 res.	-35.3	-41.4	-46.5		

Table 2A. Results of cohort analysis for Div. 3LN plaice using revised PR and $F_T=0.30$.
POPULATION NUMBERS

AGE	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
6	175940	206528	199496	186165	183803	183765	193177	171799	155355	122157	119399	113338	144683	182268
7	124342	143768	168920	162946	151551	148867	147703	153510	138641	125480	98133	95975	91377	116466
8	107516	101064	117254	137728	131835	119861	115576	113487	119154	110481	96695	79576	71769	72983
9	76461	86829	81694	95046	111552	105191	90023	86372	88307	90395	79576	70964	55602	52810
10	50605	61076	68986	65855	76512	86120	79980	66648	64988	64098	60066	54054	45552	36786
11	42209	39432	47296	55029	52030	55241	63917	60095	46303	44698	42679	39926	32791	27426
12	32486	32330	30178	36606	42435	36723	40232	47062	40962	32250	26829	25779	23792	17015
13	20444	23551	24531	22361	26449	29552	25019	28737	29754	23409	18432	15204	13800	11202
14	16857	14324	15958	17987	15020	18915	19650	16235	17806	17938	13757	10536	8243	6054
15	12874	11552	9526	10215	11478	9737	11709	12374	9332	9940	10618	7442	5615	3383
16	7348	9092	7878	5793	6275	7475	6368	6909	6860	5325	5464	5209	3451	2650
17	5729	4761	6170	5255	3570	3916	4262	3742	3394	3739	2925	2505	2679	1191
18	2713	3849	3372	4199	3739	2374	2057	2551	1875	1666	2110	1276	1238	1072
19	1599	1956	2450	2063	2877	2552	1441	840	1084	978	813	973	641	537
6+	677123	740112	783709	807249	819126	810289	801113	770361	723814	652554	577496	521431	501233	531844
7+	501183	533584	584213	621084	635323	626524	607937	598562	568460	530397	458098	408093	356550	349576
8+	376841	389815	415294	458138	483779	477656	460234	445053	429881	404917	359965	312119	265173	233110
9+	269325	288751	298040	320410	351938	357796	344657	331565	310665	294436	263269	233968	193404	160127
10+	192864	201922	216346	225364	240385	252605	254635	245193	222357	204041	183694	162904	137802	107318
11+	142259	140846	147359	159509	163873	166485	174655	178545	157369	139943	123627	108850	92249	70532
12+	100050	101414	100063	104480	111843	111244	110738	118450	111066	95246	80948	68924	59458	43105
13+	67564	69084	69885	67874	69408	74521	70505	71388	70104	62996	54119	43145	35666	26090
AGE	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984			
6	227603	227548	245464	245640	240309	234073	339598	298240	247999	129030	53688			
7	148471	181620	183635	197893	195198	193547	186151	275394	243691	202799	104793			
8	90913	114948	142642	143663	154723	152690	147098	144165	1223629	198092	163624			
9	52372	67131	86632	102342	107825	118318	109746	10937	114114	179199	158119			
10	34102	36838	47903	57206	723513	480335	53445	57073	77573	83600	140655			
11	23070	20916	24329	29472	37513	32697	32021	33989	34803	30722	40584			
12	15450	13549	13031	13705	18743	10074	15501	19253	17312	16110	18697			
13	9185	9176	7582	6802	7828	3747	3715	6764	9628	8024	7461	9183		
14	4547	4860	4699	4022	2052	2107	1495	2504	4217	2882	30956			
15	2336	2237	2011	582	891	675	958	1490	826	805	1478			
16	1358	1129	844	286	198	305	418	564	226	202	339			
17	516	574	386	114	142	88	25	198	271	115	53	55		
18	249	253	35	53	32	24	8	140	13	32	4			
19	52	145	35	32	24	8	140	13	32	4				
6+	610224	680924	759308	803860	841544	863473	979302	1031933	1030962	912046	760043			
7+	382621	453377	513844	558220	601235	629400	639703	733693	782963	783016	706355			
8+	234150	271756	330208	360327	406036	435853	453552	458299	539272	580217	601562			
9+	143237	156808	187566	216664	251313	283163	306454	314134	315643	382125	437938			
10+	90866	89677	100934	114322	143488	164845	196708	204198	201528	202927	279819			
11+	56764	52839	53031	57117	71147	87046	111819	126625	117975	116626	139164			
12+	33694	31923	28702	27644	33634	39011	58374	69552	64201	58484	74297			
13+	18375	15672	13939	14891	16313	26353	35563	29397	27662	33713				

Table 2A. (continued)

POPULATION BIOMASS (MID-YEAR)

AGE	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
6	30747	35361	31967	38196	47231	47708	47806	44378	38609	31815	29497	26409	36158	40209
7	30771	36287	42171	43612	51063	48005	47913	51938	43162	36674	28980	27568	30443	30123
8	35140	33956	40189	47685	57944	51907	50033	47074	46851	38804	33018	26778	29914	23601
9	33350	38240	38162	44858	53764	57507	49761	45856	45485	41849	35373	28317	24004	22201
10	26603	32120	37726	36435	41727	52351	54817	44017	37785	35285	33533	26035	22472	18491
11	25750	25638	30792	35424	33389	39151	53739	42281	33065	27480	26650	24660	18107	17029
12	23807	24437	23076	26409	30301	26503	33753	38881	31089	24255	17215	17425	14491	13221
13	15534	17324	19087	15994	20674	22615	19987	24299	25101	19045	14725	11757	8790	9175
14	16747	14103	15526	16692	14723	18902	20248	17066	18850	19558	11984	8851	6412	5209
15	13722	12132	9547	10147	12031	10924	12857	15246	11406	11984	9957	6642	5449	3381
16	7797	9978	8616	7077	7984	9230	8179	9346	9673	7491	6348	6087	3513	2369
17	6669	5730	7288	8338	5632	5500	6407	5852	5335	6378	3686	3436	3253	1168
18	3508	4694	4063	6611	6010	3631	2604	3951	3166	2791	3045	1953	1607	707
19	2080	2527	3112	3281	4671	3914	2241	1553	2023	1907	1305	1586	912	679
6+	272226	292529	311522	340761	387144	397846	410344	391739	351600	305337	255314	216904	205526	187563
7+	241479	257168	279555	302565	339914	350139	362538	347361	312991	273522	225817	190495	169368	147354
8+	210708	220881	237384	258953	288851	302134	314625	295423	269829	236848	196837	162927	138925	117230
9+	175569	186925	197194	211267	230907	250227	264592	248349	222978	198044	163820	136149	109011	93629
10+	142218	148685	158832	166409	177143	192720	214832	202493	177493	156195	128447	107832	85007	71429
11+	115615	116564	121106	129974	135417	140369	160015	158476	139708	120909	94914	81797	62535	52938
12+	89865	90926	90314	94550	102027	101218	106277	116195	106643	93429	68264	57737	44428	35909
13+	66058	66489	67238	68141	71727	74716	72523	77313	75554	69174	51050	40311	29937	22688
AGE	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984			
6	51344	50792	57635	57936	57479	66943	100491	102888	70313	46713	15023			
7	44407	55988	56177	62977	62826	63304	67349	101435	82539	92351	34586			
8	32623	41852	48916	53827	56183	58257	61639	58235	89064	104462	64296			
9	25077	32933	38855	53874	47378	54971	49796	46148	50975	110450	73914			
10	18720	21288	24967	31548	36685	38528	39936	33968	38545	53828	68891			
11	16404	15364	15569	20954	22794	26971	28070	24403	25078	34089	35363			
12	13342	11296	9859	10630	12958	17097	18623	16562	18250	18306	28703			
13	9241	8957	6469	6143	6617	9872	12197	10084	11645	11917	17082			
14	5103	4959	4239	4115	3404	5093	7288	5593	6724	6735	10717			
15	3191	2592	1911	2460	2224	2276	3397	2704	2609	3416	6357			
16	2173	1606	1102	783	1200	1136	1316	1181	910	1169	3058			
17	907	734	565	391	193	570	726	592	263	274	777			
18	553	319	216	187	127	48	451	201	173	54	166			
19	109	258	60	105	58	64	20	171	25	67	10			

Table 2A. (continued)

FISHING MORTALITY

AGE	1	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
6	1	0.002	0.001	0.002	0.006	0.011	0.018	0.030	0.014	0.014	0.019	0.018	0.015	0.017	0.005	0.026	0.014	0.015	0.030
7	1	0.007	0.004	0.004	0.012	0.035	0.053	0.064	0.053	0.027	0.061	0.026	0.091	0.025	0.048	0.056	0.042	0.045	0.046
8	1	0.014	0.013	0.010	0.011	0.026	0.086	0.091	0.051	0.076	0.128	0.109	0.142	0.107	0.132	0.103	0.083	0.132	0.087
9	1	0.025	0.030	0.016	0.017	0.059	0.074	0.101	0.084	0.120	0.209	0.187	0.243	0.213	0.237	0.152	0.137	0.215	0.147
10	1	0.049	0.056	0.024	0.036	0.126	0.098	0.086	0.164	0.174	0.207	0.208	0.300	0.307	0.267	0.289	0.215	0.286	0.222
11	1	0.067	0.067	0.056	0.060	0.148	0.117	0.106	0.183	0.162	0.310	0.304	0.318	0.456	0.374	0.332	0.273	0.374	0.253
12	1	0.122	0.076	0.100	0.125	0.162	0.184	0.136	0.258	0.360	0.359	0.368	0.425	0.553	0.417	0.321	0.381	0.450	0.360
13	1	0.156	0.189	0.110	0.198	0.135	0.208	0.232	0.279	0.306	0.332	0.359	0.412	0.624	0.702	0.437	0.469	0.434	0.396
14	1	0.178	0.208	0.246	0.249	0.233	0.280	0.263	0.354	0.383	0.324	0.414	0.429	0.691	0.752	0.509	0.682	0.629	0.447
15	1	0.148	0.183	0.297	0.287	0.229	0.225	0.328	0.390	0.361	0.398	0.512	0.569	0.551	0.713	0.527	0.774	1.039	0.634
16	1	0.234	0.188	0.205	0.284	0.272	0.362	0.332	0.511	0.407	0.399	0.580	0.465	0.864	1.436	0.662	0.873	0.883	0.878
17	1	0.198	0.145	0.185	0.140	0.208	0.444	0.313	0.491	0.512	0.372	0.629	0.505	0.716	1.363	0.512	1.415	0.804	0.773
18	1	0.127	0.252	0.291	0.178	0.182	0.300	0.696	0.656	0.450	0.518	0.574	0.489	0.635	2.835	0.340	1.767	0.572	1.296
19	1	0.177	0.187	0.242	0.236	0.229	0.309	0.352	0.460	0.406	0.403	0.551	0.519	0.668	1.139	0.552	0.911	0.950	0.728

AGE 1 1978 1979 1980 1981 1982 1983 1984

6	1	0.016	0.029	0.010	0.002	0.001	0.008	0.002	0.001	0.008	0.005	0.015	0.015	0.005	0.025	0.012	0.042	0.046	
7	1	0.046	0.074	0.056	0.008	0.007	0.015	0.015	0.007	0.015	0.021	0.025	0.012	0.042	0.029	0.042	0.047	0.047	
8	1	0.068	0.130	0.091	0.034	0.021	0.021	0.021	0.021	0.021	0.160	0.211	0.237	0.237	0.297	0.237	0.297	0.237	0.297
9	1	0.126	0.132	0.147	0.074	0.074	0.079	0.079	0.079	0.079	0.163	0.085	0.067	0.067	0.360	0.160	0.211	0.211	0.211
10	1	0.209	0.175	0.197	0.166	0.166	0.166	0.166	0.166	0.166	0.163	0.085	0.067	0.067	0.360	0.160	0.211	0.211	0.211
11	1	0.302	0.206	0.253	0.295	0.295	0.295	0.295	0.295	0.295	0.570	0.297	0.237	0.237	0.362	0.362	0.362	0.362	0.362
12	1	0.421	0.181	0.309	0.475	0.475	0.475	0.475	0.475	0.475	0.642	0.434	0.300	0.300	0.362	0.362	0.362	0.362	0.362
13	1	0.545	0.198	0.276	0.675	0.675	0.675	0.675	0.675	0.675	0.642	0.434	0.300	0.300	0.362	0.362	0.362	0.362	0.362
14	1	0.719	0.194	0.273	1.006	1.006	1.006	1.006	1.006	1.006	0.751	0.434	0.300	0.300	0.362	0.362	0.362	0.362	0.362
15	1	0.939	0.245	0.319	1.430	1.075	0.540	0.300	0.540	0.540	0.278	0.665	0.300	0.300	0.362	0.362	0.362	0.362	0.362
16	1	0.872	0.278	0.331	1.687	1.208	1.208	1.208	1.208	1.208	0.665	0.665	0.300	0.300	0.362	0.362	0.362	0.362	0.362
17	1	1.884	0.231	0.234	1.390	1.255	1.255	1.255	1.255	1.255	1.100	0.300	0.300	0.300	0.362	0.362	0.362	0.362	0.362
18	1	1.085	0.874	0.150	2.843	1.089	2.321	0.300	2.321	2.321	0.300	0.300	0.300	0.300	0.362	0.362	0.362	0.362	0.362
19	1	0.959	0.254	0.302	1.512	1.110	0.596	0.300	0.596	0.596	0.300	0.300	0.300	0.300	0.362	0.362	0.362	0.362	0.362

Table 3A. Parameters used for catch projections to 1986, Division 3LN plaice.

Age	Population in 84 (000's)	Catch in 84 (000's)	Mean wt(kg) (82-84 avg.)	Partial Recruitment (1960-78 Avg.)
6	237,158 ^a	89	0.341	0.025
7	180,438 ^a	460	0.415	0.100
8	163,624	1,718	0.490	0.220
9	158,119	4,085	0.576	0.300
10	140,655	8,235	0.608	0.470
11	64,867	11,247	0.657	0.580
12	40,584	7,793	0.794	0.730
13	18,697	4,414	1.041	(13+)1.000
14	9,183	2,168	1.334	
15	3,956	934	1.735	
16	1,478	349	2.284	
17	339	80	2.515	
18	55	13	3.107	
19	4	1	3.184	

^aGeometric mean, 1974-78 from cohort at $F_t = 0.3$.

Table 4A. Results of catch projections for Div. 3LN plaice.

POPULATION NUMBERS				CATCH NUMBERS			
AGE	1984	1985	1986	AGE	1984	1985	1986
6	237158	237000	237000	6	89	1322	1403
7	180438	194088	192845	7	460	4291	4522
8	163624	147315	155031	8	1718	7045	7878
9	158119	132412	114235	9	4085	8578	7837
10	140655	125769	100671	10	8235	12512	10593
11	64867	107728	91690	11	11247	13057	11745
12	40584	42985	76434	12	7793	6444	12098
13	19497	26215	29389	13	4414	5219	6166
14	9183	11340	16768	14	2168	2258	3518
15	3958	5570	7254	15	934	1109	1522
16	1478	2399	3563	16	349	478	747
17	339	896	1535	17	80	178	322
18	55	206	373	18	13	41	120
19	4	33	132	19	1	7	28
6+	1019157	1033956	1027120	6+	41586	62557	68499
7+	781999	796956	790120	7+	41497	61235	67096
8+	601561	602868	597274	8+	41037	56944	62574
9+	437937	455554	442243	9+	39319	49879	54697
POPULATION BIOMASS (AVERAGE)				CATCH BIOMASS			
AGE	1984	1985	1986	AGE	1984	1985	1986
6	73282.35	73030.12	73016.78	6	30	451	478
7	67830.94	72196.95	71682.42	7	191	1782	1878
8	72210.22	63693.21	66922.78	8	841	3459	3857
9	81451.59	66749.66	57461.91	9	2354	4944	4517
10	75105.14	65598.62	52331.84	10	5010	7611	6444
11	34955.33	59940.65	50806.63	11	7393	8583	7721
12	26094.22	28379.21	50202.91	12	6185	5114	9602
13	15316.65	22007.88	24500.28	13	4595	5433	6419
14	9637.64	12196.74	17908.71	14	2891	3011	4692
15	5400.19	7791.48	10076.32	15	1620	1923	2640
16	2656.81	4420.08	6517.08	16	797	1091	1707
17	671.06	1818.29	3091.40	17	201	449	810
18	134.45	515.26	1424.59	18	40	127	374
19	9.93	85.61	335.35	19	3	21	88
6+	464756.51	478423.76	486281.02	6+	32153	44000	51227
7+	391474.17	405393.64	413264.23	7+	32123	43549	50749
8+	323843.23	333194.70	341581.81	8+	31932	41767	48871
9+	251433.01	269503.49	274659.03	9+	31091	38308	45013
FISHING MORTALITY							
AGE	1984	1985	1986	6+	0.049	0.071	0.079
6	0.000	0.006	0.007	6	0.003	0.025	0.026
7	0.003	0.025	0.026	7	0.012	0.054	0.058
8	0.012	0.054	0.058	8	0.029	0.074	0.079
9	0.029	0.074	0.079	9	0.067	0.116	0.123
10	0.067	0.116	0.123	10	0.211	0.143	0.152
11	0.211	0.143	0.152	11	0.237	0.180	0.191
12	0.237	0.180	0.191	12	0.300	0.247	0.262
13	0.300	0.247	0.262	13	0.300	0.247	0.262
14	0.300	0.247	0.262	14	0.300	0.247	0.262
15	0.300	0.247	0.262	15	0.300	0.247	0.262
16	0.300	0.247	0.262	16	0.300	0.247	0.262
17	0.300	0.247	0.262	17	0.300	0.247	0.262
18	0.300	0.247	0.262	18	0.300	0.247	0.262
19	0.321	0.247	0.262	19	0.321	0.247	0.262