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Status of the American Plaice Stock in NAFO Subarea 3Ps

by

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ABSTRACT

Catches from this stock have been between 1,700 and 4,000t annually since 1978 and are taken almost exclusively by Canadian vessels. At present, the database for this stock is not considered sufficient to permit an analytical assessment. The catch rates in the offshore trawler fishery have increased markedly from 1983 to 1985, with virtually all the catch in this fishery in the last 2 years being taken in February, 1984 and March, 1985. Estimates of abundance and biomass from research vessel surveys in Subdivision 3Ps continue to be highly variable, particularly from 1984-85 and 1985-86. With the commercial and research vessel abundance indices showing the stock to be in good condition, continuation of the 5,000 t TAC is recommended for 1987.

RESUME

Depuis 1978, les prises de ce stock se situent entre 1 700 et 4 000 t et elles sont effectuées presque exclusivement par des bateaux canadiens. La base de données actuelle sur ce stock n'est pas jugée suffisante pour permettre l'évaluation quantitive détaillée. Les taux de prise par les chalutiers hauturiers ont augmenté sensiblement de 1983 à 1985 et pratiquement toutes les prises au cours des deux dernières années ont été faites au cours des mois de février 1984 et de mars 1985. Les estimations de l'abondance et de la biomasse d'après les recensements effectués par les navires de recherche dans la sous-division 3Ps varient considérablement, particulièrement par rapport à 1984-85 et 1985-86. Etant donné que les indices d'abondance enregistrés par les navires de recherche et les bateaux de pêche commerciale montrent que le stock est en bon état, on recommande à nouveau un TPA de 5 000 t pour 1987.

INTRODUCTION/RESULTS

TAC - CATCH HISTORY

TAC regulation for this stock was introduced in 1974 at a level of 11,000 t. Since then, the TAC has ranged from 4,000 to 11,000 t, remaining at 5,000 t from 1980 to 1986 (Table 1). The fishery has been carried out mainly by Canadian vessels, with the foreign fleet taking significant catches from 1966 to 1973. The highest catch on record occurred in 1973, at 14,769 t, but has been between 1700 and 4000 t in each year from 1978 to 1985 (Table 1, Fig. 1). The fishery is conducted mostly by otter trawlers, with a small inshore fishery occurring, mainly in the summer months (Table 2).

CATCH - EFFORT DATA

Catch rates from Can(N) offshore otter trawlers, from main species plaice data, are shown in Table 3 and Fig. 2. After showing a slight increase from 1980 to 1983, the catch rate doubled in 1984 and then rose by a further 30% in 1985. The figures observed in the last 2 years are the highest in the series. Also, the directed (main species plaice) catch of 2821 t in 1985 was the highest since 1977. Table 2 shows that virtually all of the offshore fishery in the last 2 years was carried out over a short time period, February in 1984 and March in 1985. It should be noted that this represents a significant change from the pattern observed from 1980 to 1983. It should also be noted that similar seasonal catch rates have been observed in recent years in the adjacent Grand Bank American plaice stock, i.e. CPUE of 1 t/hr or greater in February-March with annual average catch rates between 0.5 and 0.6 t/hr. Unfortunately, there is very little data for Subdivision 3Ps plaice to test for seasonal differences in catch rates; total directed catches in 1980 to 1983 did not exceed 1300 t per year and the 1984 and 1985 directed catches were taken almost exclusively during one month.

SAMPLING DATA/COMMERCIAL CATCH AT AGE

Table 4 lists the sampling data from the Canadian commercial fishery in 1985 which was used to calculate mean lengths and weights at age as well as the catch at age in Table 5. The catch-at-age matrix for the years 1973-85 is shown in Table 6. It should be noted that the values for certain years are based on sampling which was not as intense as that carried out in 1985. Unfortunately, accurate weights at age are not available for all years (Brodie, 1985). For these reasons, SPA was not attempted for this stock.

RESEARCH VESSEL SURVEY DATA

Stratified random surveys have been conducted in Subdivision 3Ps in each year of the period 1972-86, using the stratification system shown in Fig. 4. Table 7 gives the mean weight per tow, by stratum, as well as the total mean weight per tow and biomass. It can be seen readily that the biomass estimates show large fluctuations and that survey coverage is incomplete in some years.

Although there are several strata common to most surveys, these strata, indicated in Table 7, usually contain less than 35% of the estimated stock biomass. Therefore the estimates from these selected strata may not accurately reflect changes in stock abundance.

In addition to the matter of inconsistent survey coverage, there is the fact that different vessel gear combinations have been used in the surveys. This was documented in some detail in Brodie, 1985. The conversion factors used to make the A.T. Cameron series comparable with the W. Templeman - A. Needler series are described in Gavaris and Brodie, 1984. Table 8 contains the original data, by age, from the selected strata and Table 9 contains the converted data. Fig. 3 shows the total no./tow from Table 9. Because the conversions involve changes to the length frequency data, the estimates of mean number and weight per tow (Table 10) and total abundance and biomass (Table 11) for the selected strata, which are calculated without the length frequency data, cannot be made comparable over the whole series by using these conversion factors.

Of particular interest in the survey data are the results from the 1984-86 surveys. The 1984 survey produced a low value for biomass, the 1985 survey produced the highest on record by far, and the 1986 survey gave a value slightly higher than the 1984 estimate (Tables 7, 11). Table 10 shows that the mean weight of a fish caught in the selected strata in 1985 was close to 2.0 kg, which contrasts with 0.7 kg in 1984 and 1986. In fact, this large discrepancy and its subsequent effect on the 1985 biomass estimate can be explained by the catch of over 2600 kg of very large American plaice in 2 sets in stratum 317 (Table 7, Fig. 4) in the 1985 survey. The effects of these catches on the abundance estimates can also be seen in Table 8, where the 13+ ages constitute an extremely high percentage of the total number per tow in the 1985 survey. This was not the case in the commercial fishery, where the age compositions in 1984 and 1985 were not drastically different (Table 6). The difference in the mean weight of plaice caught in the 1986 survey and an examination of the length frequency data from this survey suggest a return to a more usual distribution of catch-at-age.

DISCUSSION/CONCLUSIONS

With the increase in commercial catch rates in recent years, and considering the results of the 1985 and 1986 research vessel surveys, it would appear that the stock is in good condition. However, the evidence available is not sufficient to suggest an increase in the TAC from its present level of 5,000 t. First, the sudden increases in CPUE may be due to seasonal variability, rather than reflecting an increase in stock size. Second, the high biomass from the 1985 survey can be attributed to 2 catches of unusually large plaice, consisting of many fish of year-classes not found to any extent in the 1984 or 1986 surveys. Given these considerations, it is recommended that the current TAC be maintained for 1987.

REFERENCES

Brodie, W.B. 1985. An assessment of American plaice in NAFO Subdivision 3Ps. CAFSAC Res. Doc. 85/54, 13 p.

Gavaris, S., and W.B. Brodie. 1984. Results of comparative fishing between the A.T. Cameron and the W. Templeman during July-August, 1983. CAFSAC Res. Doc. 84/41, 16 p.

Table 1. Catches and TAC's (tons) of American plaice in NAFO Subdivision 3Ps, 1960-85.

Year	Canada [Nfld.	Canada M&Q	Canada Total]	France(SP)	USSR	Other	Total	TAC
1960	422	405	827	60	-	-	887	-
1961	764	660	1424	31	-	-	1455	-
1962	659	363	1022	2	-	-	1024	-
1963	504	25	529	208	1	16	754	-
1964	1132	230	1362	152	-	28	1542	-
1965	574	1275	1849	162	-	11	2022	-
1966	1162	1332	2494	667	218	27	3406	-
1967	2201	1074	3275	533	678	8	4494	-
1968	4007	1516	5523	524	8233	-	14280	-
1969	2888	1178	4066	245	2180	-	6491	-
1970	7368	4227	11595	397	336	-	12328	-
1971	4667	1286	5953	820	409	-	7182	-
1972	4301	1621	5922	383	220	13	6538	-
1973	10972	1840	12812	547	1368	42	14769	-
1974	5887	443	6330	268	-	-	6598	11,000
1975	2517	1301	3818	65	128	200	4211	11,000
1976	5302	128	5430	5	9	14	5458	8,000
1977	4235	307	4542	63	-	-	4605	6,000
1978	3419	192	3611	47	-	-	3658	4,000
1979	3405	187	3592	74	-	-	3666	4,000
1980	2516	213	2729	206	-	-	2935	5,000
1981	2703	57	2760	457	-	-	3217	5,000
1982	1823	46	1869	317	-	-	2186	5,000
1983	1421	83	1504	222	-	-	1726	5,000
1984[a]	2494	138	2632	338	-	-	2970	5,000
1985[a]	3585	277	3862	-	-	128	3990	5,000
1986								5,000

[a]provisional.

Table 2. Nominal catch by month, American plaice in Subdivision 3Ps, 1972-85.

Year	Jan.	Feb	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	UNK	Total
1972	1118	105	311	161	110	109	391	520	604	880	1044	1185	-	6538
1973	1681	500	2599	1527	96	350	969	2607	931	504	2237	768	-	14769
1974	162	133	1576	2575	123	137	165	399	567	128	364	269	-	6598
1975	6	6	1495	616	332	280	186	115	120	82	441	532	-	4211
1976	98	254	461	191	91	284	439	512	353	433	984	1358	-	5458
1977	28	547	663	339	309	287	414	204	105	261	712	736	-	4605
1978	250	141	185	1066	853	121	433	427	40	41	55	46	-	3658
1979	467	376	1086	212	189	262	225	265	124	161	246	53	-	3666
1980	14	464	180	63	216	359	166	170	170	191	256	686	-	2935
1981	423	57	236	371	363	331	302	156	214	263	273	228	-	3217
1982	53	4	285	315	181	156	133	195	125	95	463	181	-	2186
1983	98	47	161	71	61	155	169	91	327	372	149	25	-	1726
1984[a]	130	1923	101	19	117	123	152	60	31	183	55	76	-	2970
1985[a]	3	61	2837	230	10	59	35	81	166	99	324	20	65	3990

[a]Provisional.

Table 3. Catch and effort for American plaice in Subdivision 3Ps. Catch rates calculated from Canada (N) OT catch and effort data.

Year	Total catch (tons)	CPUE (t/hr)	Calculated effort (hr)	Directed catch (tons)
1967	4,494	0.740	6,073	1,342
1968	14,280	0.677	21,093	2,735
1969	6,491	0.553	11,738	1,754
1970	12,328	0.679	18,156	5,539
1971	7,182	0.530	13,551	2,778
1972	6,538	0.494	13,235	3,212
1973	14,769	0.506	29,188	9,542
1974	6,598	0.331	19,934	4,218
1975	4,211	0.307	13,717	1,797
1976	5,458	0.311	17,550	4,340
1977	4,605	0.326	14,126	3,045
1978	3,658	0.302	12,113	2,361
1979	3,666	0.407	9,007	2,276
1980	2,935	0.317	9,259	1,175
1981	3,217	0.396	8,124	1,303
1982	2,186	0.452	4,836	1,148
1983	1,726	0.460	3,752	866
1984[a]	2,970	0.931	3,190	2,192
1985[a]	3,990	1.212	3,291	2,821

[a]Provisional.

Table 4. List of commercial sampling by quarter and division available for 1985, for American plaice in Subdivision 3Ps as collected by the St. John's Commercial Sampling Section.

	Quarter				Total
	1	2	3	4	
Can(N) Catch (t)	2584	298	276	427	3585
Samples	10	-	-	1	11
Measured	3589	-	-	337	3926
Otoliths	733	-	-	97	830

Table 5. Average weights (kg) and lengths (cm) at age, and catch numbers ($x10^{-3}$) at age for American plaice in the commercial fishery in Subdivision 3Ps in 1984.

	AVERAGE		CATCH		
AGE	WEIGHT	LENGTH	MEAN	STD. ERR.	C. V.
6	0.204	29.000	3	0.03	0.01
7	0.273	31.592	27	7.22	0.27
8	0.358	34.295	359	29.69	0.08
9	0.484	37.556	945	57.69	0.06
10	0.647	40.959	1153	71.16	0.06
11	0.884	44.994	957	60.76	0.06
12	1.214	49.505	550	40.04	0.07
13	1.524	52.985	275	27.53	0.10
14	1.907	56.728	183	18.79	0.10
15	2.356	60.487	123	15.26	0.12
16	2.739	63.272	65	11.41	0.18
17	3.222	66.416	43	8.54	0.20
18	3.454	67.825	16	5.35	0.34
19	3.636	69.000	4	2.74	0.71
20	4.385	73.000	3	0.03	0.01

TABLE 6. CATCH NUMBERS($x10^{-3}$) AT AGE FOR AMERICAN PLAICE IN SUBDIV. 3PS, 1973-85.

AGE	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
6	46	312	264	121	24	53	97	2	9	2	5	4	3
7	568	783	619	442	150	206	182	148	115	29	77	14	27
8	823	857	613	1110	370	498	545	609	510	193	371	109	359
9	1170	1165	570	1499	896	994	900	925	929	390	440	613	945
10	941	1221	422	1249	917	1033	845	897	539	801	620	1170	1153
11	2003	777	403	963	1055	769	654	720	429	1142	463	1223	957
12	1344	880	480	705	384	729	382	633	214	463	303	667	550
13	1272	844	401	454	280	329	241	401	114	198	237	357	275
14	1140	490	239	219	249	228	162	73	90	125	82	234	183
15	974	220	77	161	191	120	133	87	70	44	14	112	123
16	827	173	100	127	209	76	48	50	34	22	11	43	65
17	426	96	95	99	138	21	25	21	18	12	3	12	43
18	377	145	64	42	91	11	3	12	7	5	1	6	16
19	239	61	60	3	31	5	1	1	3	1	1	1	4

Table 7. Mean weight (kg) of American plaice per tow, by stratum, from R. V. surveys in Subdivision 3Ps. Numbers in parentheses are the number of successful 30 minute tows in each stratum. The stratified mean weight per tow and the biomass estimates, along with their approximate 95% confidence limits are given at the bottom of the table. Strata marked with an asterisk were used in the calculation of abundance and biomass in Tables 8 and 9.

Depth (fm)	Stratum	Year - Survey 1972 ATC 197	1973 ATC 207	1974 ATC 221	1975 ATC 234	1976 ATC 247	1977 ATC 261	1978 ATC 275	1979 ATC 287	1980 ATC 302	1981 ATC 316	1982 ATC 330	1983 AN 9	1984 AN 26	1985 WT 26	1986 WT 45
101-150	306	-	-	0.3(6)	0.4(4)	0.6(2)	0.5(6)	1.0(6)	1.4(5)	1.1(2)	0.6(3)	0.5(3)	0.2(4)	0.1(2)	2.7(2)	0.6(3)
51-100	307*	0.0(3)	0.0(5)	1.9(7)	0.4(4)	1.4(4)	1.1(4)	0.1(4)	0.1(4)	1.6(2)	0.9(3)	2.5(4)	1.3(4)	0.0(2)	0.1(3)	1.0(3)
31-50	308*	-	0.7(2)	28.1(2)	17.3(4)	16.3(2)	18.8(4)	-	0.7(4)	4.0(2)	306.5(2)	49.3(2)	101.2(3)	1.5(2)	3.7(2)	0.0(2)
101-150	309*	0.0(2)	1.2(3)	0.1(4)	2.6(6)	0.5(3)	1.1(6)	1.3(6)	3.9(6)	0.7(2)	1.5(2)	0.4(2)	0.3(3)	7.3(2)	1.6(3)	0.2(2)
101-150	310*	-	-	0.2(3)	1.5(6)	-	0.3(6)	0.5(6)	1.7(6)	3.0(2)	3.0(2)	1.0(3)	0.2(3)	0.5(2)	4.2(3)	2.0(2)
51-100	311*	8.1(4)	109.1(9)	13.4(8)	8.8(4)	12.6(6)	3.9(4)	5.9(4)	40.4(4)	108.5(2)	10.0(2)	2.7(3)	2.0(3)	2.6(2)	16.2(4)	77.0(3)
31-50	312	249.5(2)	-	43.3(2)	18.4(3)	20.6(5)	12.5(4)	-	0.1(3)	-	1.2(2)	5.3(2)	12.2(3)	0.6(2)	1.5(2)	4.0(2)
101-150	313*	0.5(2)	168.3(2)	0.7(5)	0.4(3)	1.2(3)	0.5(10)	4.1(2)	4.0(5)	2.6(2)	21.5(2)	1.2(2)	2.9(3)	0.7(2)	0.9(2)	9.7(2)
0-30	314	28.6(2)	-	0.2(2)	-	1.1(2)	16.3(4)	-	-	0.5(2)	0.3(5)	23.3(5)	11.9(7)	5.3(4)	0.5(7)	2.0(8)
31-50	315	71.7(2)	48.3(2)	103.0(2)	-	32.7(2)	27.2(4)	-	5.3(3)	48.1(4)	33.0(2)	53.5(3)	61.4(8)	35.3(5)	40.9(7)	62.5(6)
101-150	316*	3.2(2)	23.0(3)	0.4(6)	-	0.8(4)	3.7(6)	4.0(6)	12.0(3)	7.5(2)	18.9(2)	-	5.3(4)	1.7(2)	3.8(3)	7.0(2)
51-100	317*	64.9(4)	161.7(7)	30.2(8)	9.9(4)	5.1(4)	1.4(4)	51.3(4)	249.6(3)	318.4(2)	56.0(2)	34.2(3)	52.0(3)	6.0(2)	1312.8(2)	29.3(2)
101-150	318*	-	134.3(2)	1.8(2)	0.0(4)	1.9(2)	0.7(6)	10.9(2)	3.9(2)	8.9(2)	-	0.3(2)	3.6(3)	7.3(2)	-	7.0(2)
51-100	319*	14.0(4)	15.6(5)	61.2(2)	11.8(4)	63.0(4)	48.6(6)	34.2(4)	8.1(2)	39.3(4)	79.5(2)	33.0(7)	112.1(7)	43.3(6)	26.5(2)	27.1(8)
0-30	320	-	2.7(2)	-	-	11.2(3)	-	-	-	12.3(6)	7.0(2)	18.8(4)	34.0(14)	9.4(8)	38.3(5)	17.0(9)
31-50	321	90.5(2)	3.4(2)	-	-	88.5(2)	-	-	-	30.5(5)	45.5(2)	27.3(4)	47.2(10)	28.0(6)	23.1(7)	26.9(10)
51-100	322	-	-	-	-	75.1(4)	-	-	2.8(2)	67.1(8)	21.5(2)	58.0(8)	71.2(11)	64.3(8)	179.2(13)	55.5(12)
51-100	323	222.6(3)	-	-	-	111.0(4)	34.5(2)	-	-	162.5(3)	108.5(2)	256.5(2)	125.7(6)	44.4(4)	68.0(3)	170.5(5)
51-100	324	-	-	-	-	53.6(2)	-	-	4.0(2)	26.8(2)	-	71.3(2)	91.5(4)	15.5(3)	202.3(2)	7.5(5)
31-50	325	-	-	-	-	60.4(2)	-	-	2.7(2)	7.7(4)	4.6(2)	41.4(5)	53.4(8)	27.0(5)	25.7(3)	6.5(8)
31-50	326	-	-	-	-	-	-	-	15.7(2)	13.9(2)	1.9(2)	44.3(2)	40.8(3)	29.8(2)	-	8.0(2)
151-200	705	0.9(2)	1.4(2)	0.8(4)	0.3(2)	2.2(2)	1.1(4)	0.2(3)	2.8(4)	0.5(2)	0.9(2)	0.6(2)	0.5(3)	0.4(2)	3.5(2)	2.2(2)
151-200	706	4.4(2)	8.2(2)	2.2(7)	-	-	3.1(4)	1.6(2)	5.6(3)	1.4(2)	6.8(2)	0.6(4)	1.9(5)	0.3(2)	1.8(4)	7.3(4)
151-200	707	14.9(2)	-	0.0(2)	0.4(4)	0.1(2)	0.0(4)	3.6(2)	2.1(2)	4.5(2)	-	-	0.0(3)	8.1(2)	-	4.0(2)
201-300	708	-	-	-	0.0(3)	-	0.2(4)	-	0.5(2)	0.6(2)	-	-	0.2(2)	1.4(2)	-	3.6(2)
301-400	709	-	-	-	-	-	-	-	-	-	-	-	0.2(2)	0.0(2)	-	-
301-400	710	-	-	-	-	-	-	-	-	-	-	-	0.0(3)	2.5(2)	1.3(2)	0.7(2)
201-300	711	-	-	-	-	-	-	-	-	0.2(2)	0.7(2)	0.0(2)	0.8(8)	0.9(5)	1.0(8)	1.4(9)
201-300	712	-	-	-	-	-	-	-	1.4(2)	0.0(2)	0.2(2)	0.0(3)	0.9(7)	-	1.0(6)	0.4(9)
201-300	713	-	-	-	0.6(3)	-	-	-	-	0.2(2)	0.9(6)	0.3(2)	0.4(7)	-	0.4(8)	0.1(5)
201-300	714	-	-	-	-	-	-	0.0(2)	-	1.0(2)	0.1(8)	0.0(6)	0.3(10)	-	-	8.8(5)
151-200	715	0.0(2)	-	0.0(4)	0.0(2)	0.2(2)	0.2(4)	0.3(4)	0.4(3)	0.5(2)	0.3(2)	0.2(2)	0.8(3)	0.0(2)	-	1.8(2)
151-200	716	0.0(2)	-	0.1(3)	-	-	0.9(6)	0.4(4)	2.1(4)	0.5(2)	1.8(4)	0.4(2)	1.5(4)	0.2(3)	4.2(5)	1.8(4)
Upper		96.2	50.7	177.7	7.8	68.2	25.2	23.2	17.8	43.6	44.3	50.8	41.8	31.1	90.8	23.2
Mean (No. sets)		56.8(42)	26.8(48)	25.2(79)	5.1(60)	42.3(66)	15.8(102)	8.6(61)	9.5(78)	27.8(80)	21.0(71)	30.7(91)	34.5(171)	20.8(95)	54.9(110)	30.4(144)
Lower		17.4	2.9	-127.3	2.4	16.3	6.4	-6.1	1.2	11.9	-2.4	10.7	27.1	10.5	19.0	16.0
Upper		57,275	25,815	91,649	2,899	60,921	14,526	10,251	13,533	56,174	54,888	64,601	54,823	33,730	106,650	39,904
Biomass (t)		33,826	13,654	12,999	1,901	37,757	9,109	3,785	7,236	35,776	25,974	39,076	45,200	22,549	64,494	30,450
Lower		10,378	1,494	-65,651	902	14,593	3,692	-2,681	938	15,378	-2,940	13,551	35,577	11,368	22,337	20,995

Table 8. Mean number of American plaice per tow from R.V. surveys in NAFO Subdivision 3Ps (with approximate 95% confidence intervals). The same strata were used in the calculations for each year. (ATC, AN, WT refers to the research vessels, A.T. CAMERON, A. NEEDLER and W. TEMPLEMAN respectively.)

Age	ATC207 1973	ATC221 1974	ATC234 1975	ATC247 1976	ATC261 1977	ATC275 1978	ATC287 1979	ATC302 1980	ATC316 1981	ATC330 1982	AN9 1983	AN9 1984	WT26 1985
1	-	-	-	-	-	-	-	-	-	-	-	-	-
2	0.03	0.66	0.02		0.03	-	0.16	0.90	0.18	0.09	0.01	-	-
3	3.74	4.47	1.04	0.55	0.18	1.33	0.56	4.24	1.97	1.29	0.22	-	-
4	7.62	8.89	2.70	7.23	0.74	1.46	2.98	5.56	8.76	3.65	0.96	0.11	0.12
5	15.57	11.97	4.89	10.96	5.86	6.78	7.79	16.71	10.88	4.26	4.40	0.23	0.47
6	25.58	7.52	4.52	18.10	5.27	10.05	12.43	27.99	17.43	4.80	12.25	1.38	1.09
7	23.41	7.17	3.08	9.58	7.99	9.03	24.41	61.61	29.84	6.51	17.81	3.31	1.48
8	14.29	5.42	2.25	8.80	6.16	8.03	14.60	43.02	33.89	7.34	20.05	4.99	1.40
9	12.62	6.76	0.75	6.81	4.15	8.23	6.88	23.65	19.01	8.64	19.45	5.05	2.17
10	10.27	4.90	0.78	7.21	2.68	3.69	2.38	13.98	6.45	4.62	9.85	4.61	3.63
11	6.37	4.28	0.71	4.70	1.74	3.94	2.20	5.09	1.48	1.83	5.84	2.70	5.05
12	3.08	4.49	0.74	1.91	0.64	2.81	2.09	2.94	1.27	1.53	2.05	1.32	5.16
13	3.96	3.45	0.37	0.91	0.10	1.32	1.21	1.35	1.46	0.77	1.24	0.53	5.82
14	2.50	0.65	0.16	0.33	0.24	0.46	0.84	0.51	1.77	0.60	0.68	0.39	5.12
15	2.16	1.42	0.13	0.29	0.10	0.16	0.66	0.02	0.45	0.23	0.51	0.19	6.38
16	1.14	0.25	0.17	0.35	0.06	0.44	0.42	0.23	0.70	0.12	0.59	0.05	5.76
17	0.75	0.43	0.04	0.05	0.02	0.10	0.07	0.01	0.23	0.06	0.14	0.02	3.66
18	0.61	0.11	0.05	0.09	0.01	-	-	0.03	0.47	0.11	0.09	0.02	4.19
19	0.25	0.14	0.02	0.01	0.01	-	-	-	0.49	0.02	0.06	-	0.26
20	0.08	0.03	-	0.03	-	-	-	-	-	0.02	-	-	0.13
21	0.18	-	-	-	-	-	-	-	-	-	-	-	-
22	0.14	0.02	-	-	-	-	-	-	-	-	-	-	-
23	0.05	-	-	-	-	-	-	-	-	-	-	-	-
Unknown	-	-	0.02	-	0.03	0.53	-	0.02	-	-	-	-	-
Upper	271.97	489.35	39.55	160.14	66.87	154.48	176.42	1171.29	1334.89	77.25	168.23	46.69	184.35
Mean	134.40	73.03	22.44	77.91	36.01	58.36	79.68	207.86	136.73	46.49	96.20	24.90	51.89
Lower	-3.11	-343.32	5.34	-4.33	5.11	-37.72	-17.03	-755.59	-1061.39	15.74	24.15	3.12	-80.57
No. Sets	39	47	40	33	56	38	39	22	19	29	36	24	24

Table 9. Mean number per tow from R.V. surveys in Subdivision 3Ps (with approximate 95% confidence intervals). The same strata were used in the calculations for each year. Values for the trips by the A. T. Cameron, 1973-82 were adjusted by the appropriate conversion factors so that these trips would be comparable to those of the A. Needler, 1983-84, and the W. Templeman, 1985.

	YEAR-SURVEY												
Age	ATC207 1973	ATC221 1974	ATC234 1975	ATC247 1976	ATC261 1977	ATC275 1978	ATC287 1979	ATC302 1980	ATC316 1981	ATC330 1982	AN9 1983	AN26 1984	WT26 1985
1	-	-	-	-	-	-	-	-	-	-	-	-	-
2	0.02	0.33	0.01	-	0.01	-	0.08	0.45	0.09	0.05	0.01	-	-
3	1.88	2.24	0.52	0.28	0.09	0.67	0.28	2.12	0.99	0.64	0.22	-	-
4	3.80	4.44	1.35	3.60	0.38	0.73	1.49	2.78	4.38	1.83	0.96	0.11	0.12
5	8.71	6.06	2.63	5.54	3.28	3.39	3.90	8.35	5.57	2.40	4.40	0.23	0.47
6	16.46	4.72	3.70	13.11	3.55	5.27	7.40	17.32	11.50	3.19	12.25	1.38	1.09
7	22.12	6.90	3.70	10.51	7.59	7.67	20.37	52.05	31.42	5.11	17.81	3.31	1.48
8	17.03	6.71	2.92	11.15	7.63	9.85	17.37	47.85	42.71	8.35	20.05	4.99	1.40
9	15.80	8.79	0.98	8.70	5.39	10.70	8.73	30.14	24.72	11.07	19.45	5.05	2.17
10	12.52	6.38	1.01	9.38	3.48	4.81	3.09	17.58	8.39	6.00	9.85	4.61	3.63
11	8.28	5.57	0.92	6.11	2.25	5.12	2.85	6.61	1.92	2.39	5.84	2.70	5.05
12	4.00	5.83	0.96	2.48	0.83	3.66	2.71	3.82	1.65	1.99	2.05	1.32	5.16
13	5.14	4.48	0.48	1.18	0.14	1.72	1.57	1.76	1.90	1.00	1.24	0.53	5.82
14	3.26	0.84	0.20	0.42	0.31	0.60	1.09	0.66	2.30	0.77	0.68	0.39	5.12
15	2.81	1.85	0.17	0.38	0.13	0.20	0.85	0.02	0.59	0.29	0.51	0.19	6.38
16	1.49	0.32	0.22	0.46	0.07	0.57	0.54	0.29	0.91	0.15	0.59	0.05	5.76
17	0.98	0.55	0.06	0.08	0.02	0.14	0.09	0.02	0.30	0.08	0.14	0.02	3.66
18	0.79	0.14	0.07	0.12	0.02	-	-	0.03	0.61	0.15	0.09	0.02	4.19
19	0.32	0.18	0.03	0.03	0.01	-	-	-	0.64	0.03	0.06	-	0.26
20	0.10	0.04	-	0.04	-	-	-	-	-	0.02	-	-	0.13
21	0.24	-	-	-	-	-	-	-	-	-	-	-	-
22	0.18	0.03	-	-	-	-	-	-	-	-	-	-	-
23	0.06	-	-	-	-	-	-	-	-	-	-	-	-
Unknown	-	-	0.02	-	0.01	0.58	-	0.02	-	-	-	-	-
Upper	246.75	531.64	36.01	169.15	64.15	157.99	188.33	1596.35	1394.71	73.99	168.23	46.69	184.35
Mean	125.99(39)	66.40(47)	19.95(40)	73.57(33)	35.19(56)	55.68(38)	72.41(39)	191.87(22)	140.59(19)	45.51(29)	96.20(36)	24.90(24)	51.98
Lower	5.25	-398.82	3.89	-22.01	6.23	-46.66	-43.42	-1212.60	-1113.55	17.06	24.15	3.12	-80.57

Table 10. Mean number and weight per 30 minute tow, with 95% confidence intervals, of American plaice from research vessel survey data from selected strata in Subdivision 3Ps.

Year	Number/tow			No. sets	Missing strata	Weight (kg)/tow		
	Upper	Mean	Lower			Upper	Mean	Lower
1972	64.1	26.9	-10.4	23	308,310,318	25.9	11.6	-2.7
1973	267.2	137.4	7.7	39	310	90.0	46.9	3.8
1974	502.1	77.3	-347.5	47		236.3	25.4	-185.6
1975	39.5	22.7	5.9	40	316	11.9	7.1	2.3
1976	160.1	77.9	-4.3	33	310	60.2	25.2	-9.8
1977	66.4	36.0	5.6	56		42.5	18.0	-6.5
1978	159.2	58.2	-42.8	38	308	49.2	17.2	-14.9
1979	177.1	79.9	-17.3	39		61.6	25.1	-11.4
1980	1682.6	206.9	-1268.8	22		365.5	47.3	-271.0
1981	1333.7	136.8	-1060.2	19	318	410.9	47.8	-315.2
1982	76.9	46.5	16.1	29	316	28.2	17.0	5.9
1983	167.9	96.2	24.5	36		78.0	45.8	13.7
1984	46.5	24.9	3.3	24		30.9	16.4	1.9
1985	183.1	51.9	-79.3	24	318	421.4	101.8	-217.8
1986	60.7	31.4	2.0	28		41.3	20.8	0.3

Table 11. Abundance and biomass estimates, with 95% confidence intervals, for American plaice from research vessel survey data from selected strata in Subdivision 3Ps.

Year	Number ($x10^{-6}$)			No. sets	Missing Strata	Biomass (kg x 10^{-6})		
	Upper	Mean	Lower			Upper	Mean	Lower
1972	12.2	5.1	-2.0	23	308,310,318	4.9	2.2	-0.5
1973	55.6	28.6	1.6	39	310	18.8	9.8	0.8
1974	111.0	17.1	-76.8	47		52.2	5.6	-41.0
1975	8.2	4.7	1.2	40	316	2.5	1.5	0.5
1976	33.4	16.2	-0.9	33	310	12.6	5.3	-2.0
1977	14.7	8.0	1.2	56		9.4	4.0	-1.4
1978	33.8	12.4	-9.1	38	308	10.5	3.7	-3.2
1979	39.2	17.7	-3.8	39		13.6	5.6	-2.5
1980	371.8	45.7	-280.4	22		80.8	10.5	-59.9
1981	282.4	29.0	-224.5	19	318	87.0	10.1	-66.7
1982	15.9	9.6	3.3	29	316	5.8	3.5	1.2
1983	37.1	21.3	5.4	36		17.2	10.1	3.0
1984	10.3	5.5	0.7	24		6.8	3.6	0.4
1985	38.8	11.0	-16.8	24	318	89.2	21.6	-46.1
1986	13.4	6.9	0.4	28		9.1	4.6	0.1

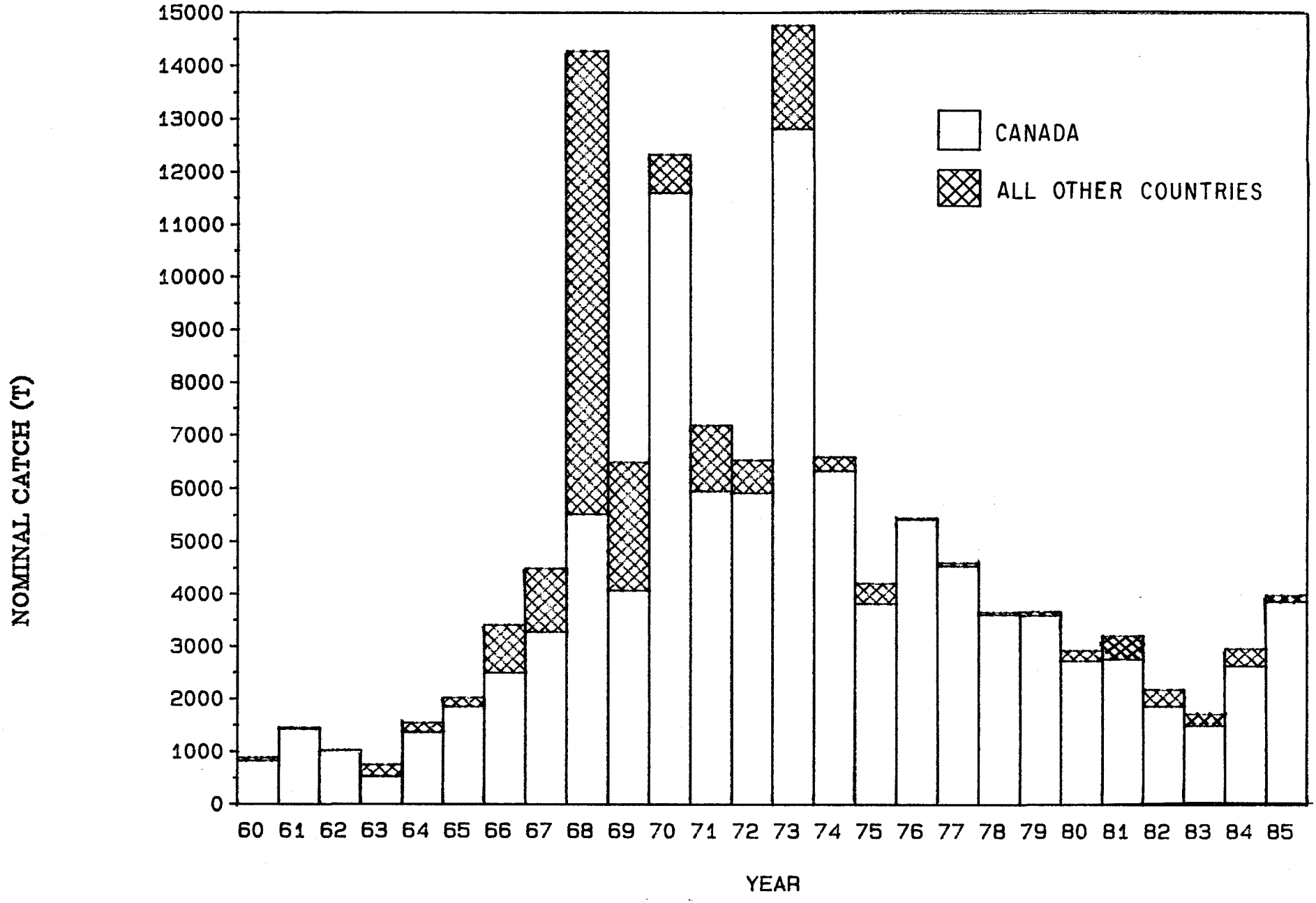

FIG.1 NOMINAL CATCHES OF AMERCIAN PLAICE , NAFO SUBDIVISION 3PS, 1960-85.

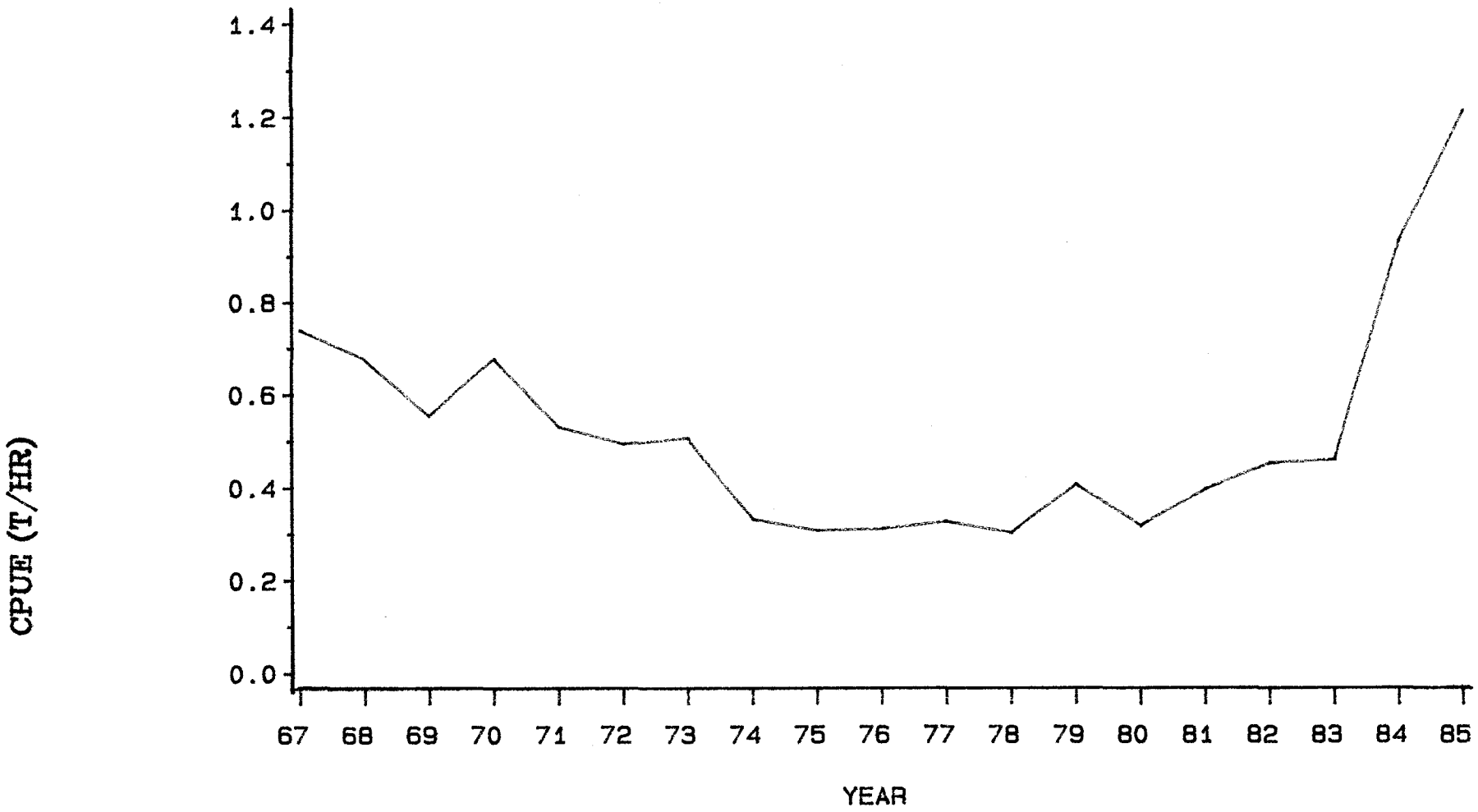

FIG.2 CPUE FOR AMERICAN PLAICE IN SUBDIVISION 3PS . CATCH RATES CALCULATED FROM CANADA (N) OT CATCH AND EFFORT.

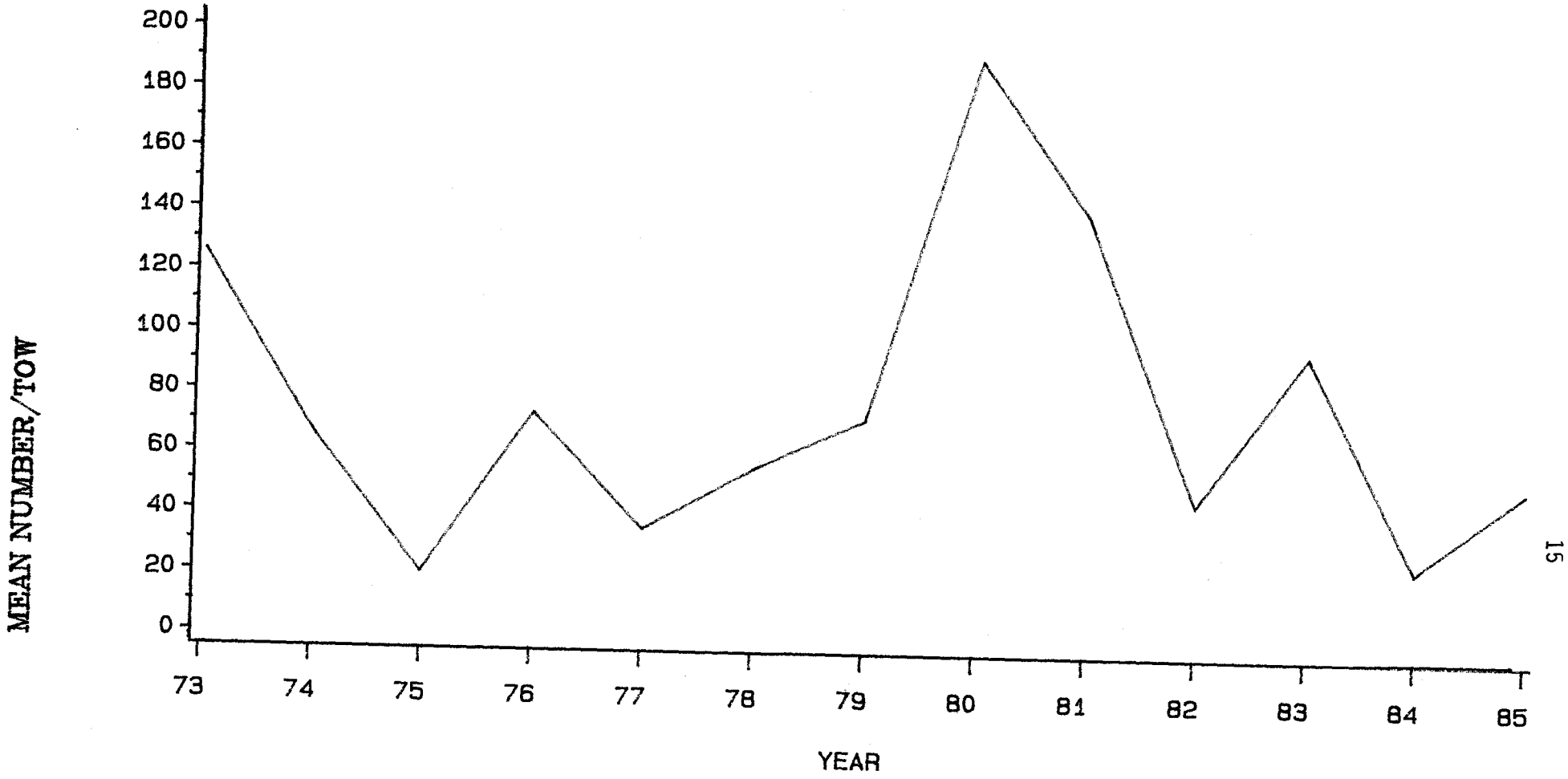

FIG.3 MEAN NUMBER PER TOW FROM R.V. SURVEYS IN SUBDIVISION 3PS.

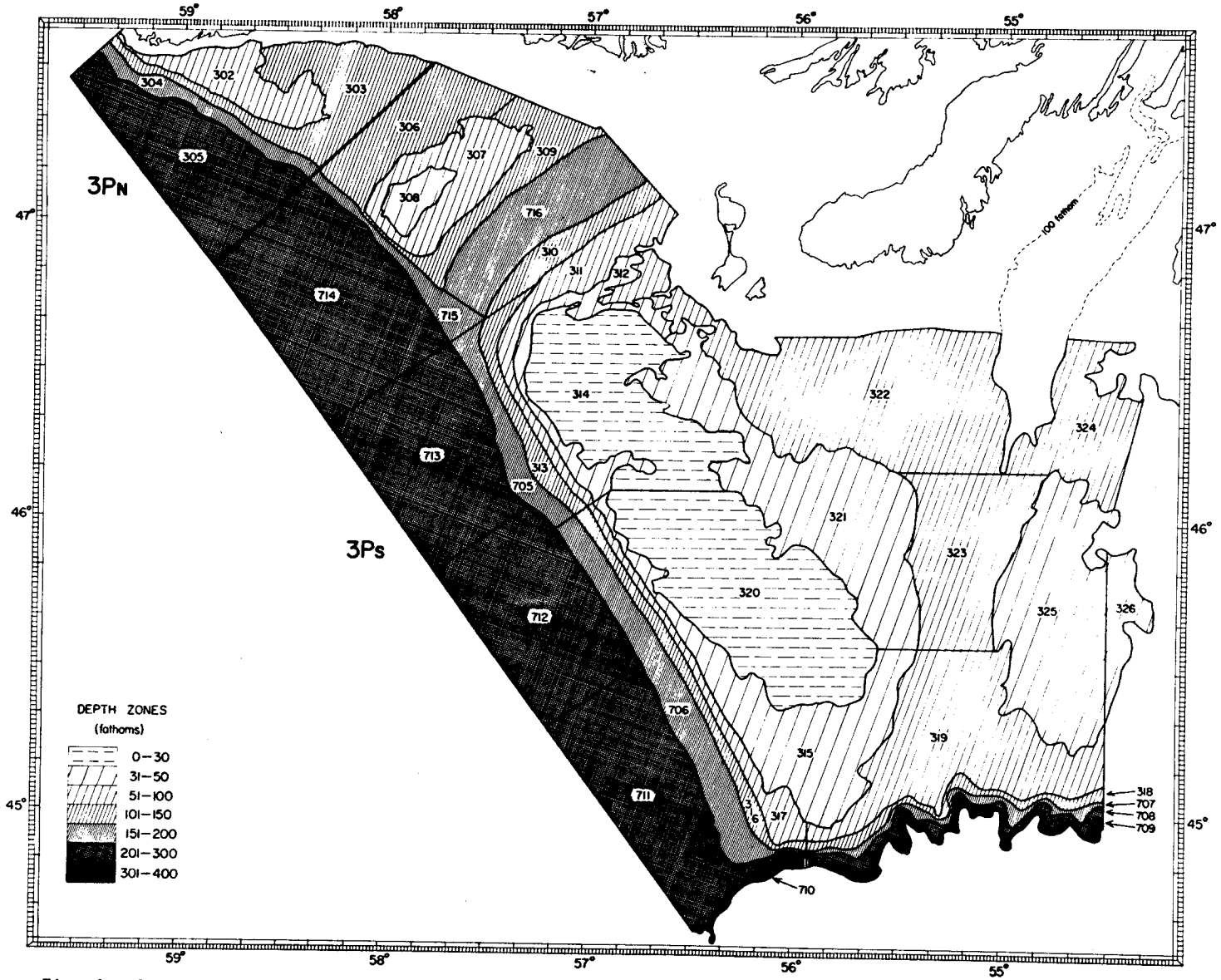

Fig. 4. Strata map of St. Pierre Bank (NAFO Subdivision 3Ps)