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Flatfish Stock Trends of the Scotian Shelf

by

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Abstract

Despite declines in catch rates of plaice, witch and yellowtail flounder in the early 1970's, there are indications in 1980 that the stocks on the Scotian Shelf are rebuilding.

Commercial catch per unit of effort of stern otter trawlers (tonnage class 4) is presented for 1972-1980 using a median smoother technique.

Data from research vessel surveys show a small increase in abundance of plaice since 1978. A gradual stabilization in mean numbers per tow is evident in yellowtail flounder since 1977. Numbers per tow for witch flounder show an increase from 1970 until 1973-74. Since that time a decline is observed, but numbers have stabilized for the past few years.

The major flatfish stocks can probably continue to support the present level of fishing.

Résumé

En dépit des diminutions des taux de capture de plie canadienne, de plie grise et de limande à queue jaune du début des années 1970, on a des indications en 1980 que les stocks du plateau néo-écossais sont en voie de rétablissement.

Les prises commerciales par unité d'effort des chalutiers de pêche arrière (classe de tonnage 4), lissées par la méthode des médianes, sont présentées pour les années 1972-1980.

Les relevés par navire de recherche indiquent une légère augmentation d'abondance de plie canadienne depuis 1978. Il y a depuis 1977 stabilisation graduelle du nombre moyen de limandes à queue jaune par trait de chalut. Pour la plie grise, le nombre par trait a augmenté de 1970 à 1973-74. On a ensuite observé un déclin, mais le nombre s'est stabilisé ces quelques dernières années.

Les principaux stocks de poissons plats peuvent probablement continuer à alimenter la pêche aux niveaux actuels.

Introduction

There are six species of flatfish currently being exploited on the Scotian Shelf, or NAFO Div. 4VWX. They are American plaice, witch flounder, yellowtail flounder, Greenland and Atlantic halibut and winter flounder.

This assessment document updates the status of the flatfish stock for 1980. It reviews the recent results of the groundfish research vessel surveys and the results of the commercial catch rates.

Background information on the fishery are reviewed in earlier documents, Halliday (1973), Cleary (1979), and Metzals (1980).

The organization of the paper will be as follows; discussion on the three species of major importance will be presented first and then a brief summary of the lesser (economically) important species.

American plaice 4V

The plaice, (Hippoglossoides platessoides) is among the most widely distributed of the groundfish (Scott 1976). The distribution, obtained by research vessel surveys shows no strong relationship with depth or temperature but the main concentrations are located on Banquereau Bank or 4V. Plaice prefer the cooler temperatures of depths of 50-100 fathoms rather than the shallower water on the banks. They also prefer the deep water on the slope of the continental shelf (Scott 1976). The summer research catch distribution gives no evidence of separate stocks in the areas.

Commercial Catch Rates

The fishery is a directed fishery in the summer but a by-catch fishery in the winter (W. Smith pers. comm.). Landings of plaice have

fluctuated around 6,500 t since 1975 (Table 1). The catch for 1980 is 6,259 t (provisional).

Foreign exploitation of this resource has been minimal since 1977. The USSR caught 5,000 t in 1974 but their involvement has declined substantially since then (Table 2).

A breakdown of landings by gear is available since 1972 and is given in Table 3. The bulk of the plaice catch¹ in 4V (84%) is taken by large otter trawlers, stern trawlers taking on average 53% and side trawlers taking 31% of the total catch.

Age Composition

Extensive coverage of the sampling (back to 1948) for this stock was provided by Cleary (1979). The sampling for 1980 consisted of 24 samples, mostly taken from otter trawlers. Eleven samples were taken in the period from January to March and seven were taken in April and May, with the rest (6) taken during June to November.

Age length keys by sex were derived from these samples from otter trawler samples and numbers-at-age generated (Table 4).

Commercial mean weights-at-age were also calculated. These weights were weighted by otter trawl catches (Table 5). The values do not indicate any dramatic change in the fishery.

The age composition (in percentage by number) of males in the commercial landings varied from a high of 64% in 1970 to a low of 33% in 1978. The percentage of males was lowest in 1977 and 1979.

These percentages are generated from samples of landings, and since there is a substantial amount of discarding (of young plaice) this is an incomplete picture of the actual catch.

In the research vessel surveys though, there is a more uniform trend of approximately an even number of males to females (Table 6). The average for 1970-1980 was 54% male and 46% female.

Total mortality values (Z) were generated from the research surveys' number per tow estimates (Table 7). Estimates were made for males and females separately, in order to try and observe a trend. Ages used in generating (Z) were ages 7-11 in year t versus ages 8-12 in year t+1. High values indicating a high fishing mortality are observed in 1976-1977 and 1977-1978.

¹ The commercial "catch" referred to throughout this paper is actually the commercial landed catch or landings.

Commercial CPUE

The commercial CPUE index was obtained by calculating the catch in tons per hour by stern trawlers tonnage class 4, 150-500 GRT. The months of March to May were chosen since these are the months of high catch rates. The data are presented in Table 8.

Effort statistics are available from NAFO (ICNAF) Statistical Bulletins, but are only available for flatfish by species since 1972.

The actual effort in this fishery is difficult to define since it is not a directed fishery. Fishermen, although preferring to go for cod (or any high-priced species) will "scrape up a trip" (W. Smith pers. comm.) for plaice.

The overall trend since 1972 shows an increase in abundance up to 1975 and then a decline until 1977, with a gradual levelling off for 1980.

In order to analyze the data further, a median smoother technique, MED3R (S. Smith pers. comm.) was applied. This program smoothes the data by choosing the median.

The same trend is still evident when the smoothed values of commercial CPUE were plotted with the research CPUE (stratified mean numbers per tow) in Figure 1.

Research CPUE

Random stratified surveys have been conducted on the Scotian Shelf by the A.T. Cameron during the summer months for 1970-1980. The stratified mean numbers per tow were used from these surveys as an index of abundance (Table 7). The total numbers per tow for plaice in NAFO Div. 4V for 1980 show a small increase in abundance since 1978.

The total number of males per tow in 1980 has increased since 1978. This total is the same as 1974. The females (number per tow) on the other hand, have been declining since 1976 but show a small increase in 1980. Figure 2a and 2b show 6 and 7 year old plaice data, raw and median smoothed. The overall trend is the same.

The evidence for stock rebuilding and stabilization is present for 1980 and this fishery will probably continue to be able to support the present level of fishing.

Yellowtail Flounder Fishery 4VWX

The yellowtail fishery is also largely a by-catch fishery. Total catches averaged 1785 t from 1970-1980. Catches from 1963-1969 averaged 6068 t. The catch in 1980 was 2498 t (Table 9).

Most catches are taken from NAFO Div. 4V during the summer months, especially in July (Table 10 and 11). Minimal catches are obtained in NAFO Div. 4W and 4X.

Otter trawlers of tonnage class 4 are the main gear taking yellowtail, and Danish seiners and longliners are next in importance (Table 12). Side otter trawlers average about 53% of the total yellowtail flounder catch by Canada.

The commercial catch per unit of effort is derived from landings by stern otter trawlers, tonnage class 4. The months of March to May were chosen (Table 13). The values were smoothed and plotted (Figure 3). An increase in abundance can be detected from 1977 onwards.

Stratified mean catch per tow at age from research surveys for yellowtail shows a gradual stabilization in numbers per tow for both male and female (Table 14).

Stratified mean catch per tow at age 6 and age 7 were plotted (Figure 4) using both raw and median smoothed data. It is evident that a stabilization in total abundance occurred with a slight decrease in the number of 6 year old males since 1976.

Witch Fishery 4VW

Witch flounder landings from 4VW reached a high of 22,000 t in 1968 and peaked again at 17,000 t in 1971 and have gradually declined since that time. Since 1975 the average landings have been around 3,000 t (Table 15). Catch by gear is given in Table 16. Witch flounder is taken mainly (63%) by otter trawlers, predominantly stern trawlers. Catch by month given in Table 17 shows that catches are taken mostly during March to June.

Sampling for this stock is detailed in Cleary (1979). Twelve samples in 1980 were combined to generate two age-length keys, one for side otter trawlers and the other for stern otter trawlers. The numbers of males to females (in percentage) in side trawler landings was 43% males to 57% females. The percentage (in numbers) of stern trawler landings was 48% male and 52% female. The difference is almost negligible. These percentages were then used to estimate the total number of males and females in the landings at age (Table 18a and 18b).

Commercial catch per unit of effort was obtained from stern otter trawler landings, tonnage class 4 (Table 19) for March until May. Although the CPUE fluctuates it reaches a peak in 1974 and 1977, and there is an upward trend in abundance, (Figure 5) suggested by the smoothed data.

From research surveys, catch in numbers per tow for both sexes combined show an increase from 1970 until 1973-1974. Since that time, a marked decline is observed, but the numbers have stabilized for the past few years. The same trend is observed in males and females separately (Table 20) and in Figure 6 where age 7 males show constancy for 1973-1980 and age 7 females are increasing in number since 1976.

Total mortality (Z) was calculated for males and females in Table 20. Ages used in generating (Z) were ages 7-11 for year t and ages 8-12 for year t+1. The values fluctuated greatly for any two years. The total mortality (Z) for 1979-1980 for both male and female witch was lower than 1978-1979.

Greenland Halibut 4VWX

Landings since 1977 averaged approximately 460 t (Table 21).

Landings by month are given in Table 22. Relatively high landings are recorded in February and March. Greenland halibut is caught mainly (98%) by otter trawlers (Table 23).

Winter Flounder 4VWX

Catches have been almost the same every year, fluctuating at around 1,000 - 1,200 t (Table 24). It is mainly an inshore directed fishery, composed of small draggers (<40') (W. Smith pers. comm.).

Research survey estimates of total population (in numbers $\times 10^{-6}$) and biomass (t $\times 10^{-3}$) show a decline in the population since 1972. (Figure 7)

Atlantic Halibut 4VWX

Table 25 shows the total Atlantic halibut landings for 1963-1980. Since 1978 the average catch has been around 1,000 t.

Table 26 and 27 have a breakdown of halibut catches by month and by NAFO Divisions, 4V, 4W, and 4X. Most catches are in 4X with a peak in June; year-round catches are reported. Halibut is mostly (73%) taken by longliners (Table 28).

Conclusion

Total landings of the major flatfish species (American plaice, yellowtail and witch flounder) are given in Table 29 and Figure 8. Since 1977 an average of 11,000 t was caught. In 1980 the total is 12,211 t.

References

- Cleary, L. 1979. Flatfish of the Scotian Shelf. CAFSAC Res. Doc. 79/27.
- Halliday, R.G. 1973. The Flatfish fisheries of the Scotian Shelf. ICNAF Res. Doc. 73/102.
- Metuzals, K. 1980. Update on the status of A. plaice, yellowtail and witch flounder, Atlantic halibut and Greenland halibut. CAFSAC Res. Doc. 80/41.
- Scott, J.S. 1976. Summer distribution of groundfish on the Scotian Shelf 1970-1974. Tech. Report 635 J.F. Res. Bd. Canada.

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Table 1. Total¹ American plaice catch (t) for NAFO Div. 4VWX (1963-1980)²

YEAR	4V	4W	4X	TOTAL
1963	1376	683	250	2309
64	1967	603	512	3082
1965	4707	2797	694	8198
66	8167	5313	726	14206
67	8884	780	1106	10770
68	10489	7830	946	19265
69	8076	4789	870	13735
1970	5242	2481	635	8358
71	7765	5991	545	14301
72	6912	3175	566	10653
73	8686	3407	339	12432
74	11363	4951	458	16772
1975	7336	4115	296	11747
76	8488	2350	309	11147
77	6716	592	449	7757
78	5501	743	512	6756
79	5029	478	811	6318
1980 ³	6259	552	640	7451

¹ Includes foreign catch.

² All data for 1963-1971 from revised nominal catches Statistical Bulletin 1973.

³ Provisional

Table 2. American plaice landings (t) by month and country for NAFO Division 4V.

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL ¹
<u>Canada</u>													
1970	1062	845	967	185	312	271	162	47	200	161	244	573	5029
71	985	950	887	1001	620	207	224	141	250	96	252	714	6327
72	712	776	1161	1007	810	215	206	123	111	68	166	268	5623
73	919	620	226	619	388	169	303	120	56	43	93	677	4233
74	523	914	1760	775	794	423	274	107	71	55	115	401	6212
1975	621	599	1544	545	844	296	333	275	188	135	118	255	5753
76	423	481	1137	968	459	382	626	350	319	304	377	343	6169
77	446	529	432	592	1120	829	1045	724	173	172	503	136	6701
78	39	427	364	838	1126	691	893	317	172	265	220	122	5474
79	165	248	566	573	570	430	605	324	194	304	383	662	5024
1980 ²	143	392	665	510	993	875	821	509	231	490	338	292	6259
<u>USSR</u>													
1970	-	-	-	-	-	-	-	-	79	-	113	-	192
71	-	14	6	9	389	47	498	169	194	81	13	-	1420
72	-	-	120	-	6	56	83	280	464	145	-	-	1154
73	-	-	-	-	531	96	77	2644	1013	14	-	-	4375
74	597	-	-	-	-	812	722	1254	920	780	-	-	5085
1975	14	25	38	125	114	132	199	201	213	201	126	134	1522
76	35	65	74	62	109	72	142	57	304	494	316	402	2132
77	-	-	-	-	-	-	-	-	-	-	-	-	-
78	-	-	-	-	-	3	5	-	-	-	-	-	8
79	-	-	-	2	-	-	-	-	-	-	-	-	2
1980 ²	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>Total³</u>													
1970	1062	845	968	187	312	271	166	47	286	161	364	573	5242
71	988	966	906	1010	1009	254	722	310	444	177	265	714	7765
72	718	782	1379	1010	827	271	289	403	575	220	166	272	6912
73	932	628	283	619	919	265	380	2764	1069	57	93	677	8686
74	1124	974	1760	775	794	1235	996	1363	991	835	115	401	11363
1975	646	643	1596	670	958	438	532	476	401	336	251	389	7336
76	459	546	1279	1030	568	454	768	407	623	898	693	763	8488
77	446	532	432	592	1120	829	1045	724	173	172	503	148	6716
78	39	427	366	838	1126	694	898	317	172	279	221	124	5501
79	165	248	567	575	571	430	605	324	194	304	383	662	5028
1980	143	392	665	510	993	875	821	509	231	490	338	292	6259

¹ Includes NK (not known) months of the year

² Provisionsal

³ Includes France, Japan and Poland

Table 3. Nominal catch in tons for American plaice by gear in Div. 4V for all countries, 1972-1980
 (% of total landings for that gear in parenthesis)

YEAR	SIDE OTTER TRAWLERS	STERN OTTER TRAWLERS ¹	DANISH SEINE	LONGLINE	OTHERS	TOTAL
1972	3012 (44)	3267 (47)	364 (5)	189 (3)	80 (1)	6912
1973	1971 (23)	5909 (68)	482 (6)	152 (2)	94 (1)	8608
1974	2193 (19)	8318 (73)	510 (5)	125 (1)	217 (2)	11363
1975	2779 (38)	3455 (47)	657 (9)	171 (2)	274 (4)	7336
1976	2438 (29)	4678 (55)	1178 (14)	87 (1)	107 (1)	8488
1977	2661 (40)	2285 (34)	1443 (21)	218 (3)	104 (2)	6711
1978	1766 (32)	2150 (39)	1222 (21)	164 (3)	199 (5)	5501
1979	1731 (34)	2189 (44)	806 (16)	193 (4)	110 (2)	5029
1980 ²	1878 (30)	2603 (42)	1500 (24)	209 (3)	69 (1)	6259
Total	20,429 (31)	34,854 (53)	8162 (12)	1508 (2)	1254 (2)	66207

¹Includes other trawlers' landings

²Provisional

Table 4. Catch at age ($\times 10^{-3}$) of male and female American plaice in 4V 1976-1980.

AGE	MALES					FEMALES				
	1976	1977	1978	1979	1980	1976	1977	1978	1979	1980
3	-	-	-	-	-	-	2	-	-	-
4	-	-	-	-	-	-	-	-	-	-
5	6	36	1	59	19	-	12	3	16	20
6	25	66	71	128	157	23	114	67	87	28
7	131	232	95	363	368	30	359	149	431	239
8	240	363	143	567	1004	107	671	260	231	760
9	581	714	362	521	620	427	592	412	269	319
10	758	447	401	543	305	534	1212	400	214	529
11	1762	945	494	385	333	1243	1147	636	291	279
12	1130	505	245	246	466	750	924	897	627	327
13	714	265	260	220	460	820	803	817	560	631
14	405	78	128	63	239	607	535	373	370	675
15	113	15	107	23	159	228	379	312	249	501
16	45	1	70	6	56	266	87	271	105	363
17	14	-	24	3	29	183	50	200	53	152
18	35	-	12	-	18	246	50	94	23	153
19	31	-	-	-	5	141	25	65	13	20
20	3	-	12	-	4	120	19	43	17	31
21	2	-	-	-	-	77	23	17	-	71
22	-	-	-	-	-	57	17	18	4	74
23	-	-	-	-	-	26	1	12	2	13
24	-	-	-	-	-	26	2	8	-	4
25	-	-	-	-	-	-	-	6	-	-
26	-	-	-	-	-	-	-	14	5	34

Table 5. Commercial weight (kg) at age of American plaice caught by otter trawler in NAFO division 4V (1970-1980).¹

AGE	1976	1977	1978	1979	1980
MALE					
4	-	-	-	-	-
5	-	0.15	0.17	0.17	0.25
6	0.38	0.25	0.22	0.22	0.26
7	0.34	0.34	0.27	0.24	0.32
8	0.36	0.41	0.38	0.29	0.33
9	0.38	0.43	0.41	0.38	0.47
10	0.43	0.48	0.45	0.45	0.51
11	0.44	0.46	0.49	0.58	0.53
12	0.52	0.55	0.58	0.58	0.51
13	0.56	0.60	0.56	1.69	0.54
14	0.72	0.71	0.72	1.02	0.55
15	0.98	0.55	0.92	1.33	0.70
16	2.44	1.24	1.10	1.22	0.68
17	1.43	1.14	1.12	1.48	1.00
18	0.57	-	1.28	-	0.95
19	0.53	-	-	-	0.76
20	-	-	-	-	0.95
FEMALE					
5	-	0.19	-	0.16	0.27
6	0.38	0.40	0.27	0.35	0.29
7	-	0.63	0.41	0.33	0.39
8	0.45	0.56	0.40	0.50	0.40
9	0.53	0.56	0.52	0.54	0.55
10	0.64	0.65	0.59	0.68	0.64
11	0.64	0.74	0.64	0.80	0.73
12	0.71	0.82	0.79	0.87	0.86
13	0.88	0.97	0.82	1.02	0.90
14	0.94	0.96	1.05	1.10	1.03
15	1.52	1.07	1.05	1.49	1.07
16	1.01	1.45	1.29	1.69	1.33
17	1.89	1.41	1.20	2.01	1.53
18	1.43	1.77	1.66	2.63	1.71
19	1.75	1.52	1.68	1.73	1.85
20	1.67	1.74	1.54	1.99	1.83
21	1.95	1.72	1.73	-	1.68
22	2.00	1.95	2.53	3.21	2.07
23	2.14	-	1.70	3.10	2.08
24	2.10	2.71	2.15	-	2.23
25	-	-	2.77	-	-
26	3.32	-	3.25	2.52	2.36

Table 6. Age composition (percentage in numbers) American plaice 4V from research vessel surveys 1970-1980.

AGE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<u>MALE</u>											
1	0.001	0.001	0.002	0.003	0.001	0.002	0.001	0.083	0.004	0.191	0.031
2	0.089	0.644	1.288	0.222	2.518	1.590	0.208	0.149	0.624	1.084	0.376
3	3.179	0.738	3.177	2.648	4.468	10.531	3.096	1.543	0.404	1.934	4.999
4	5.444	10.029	1.499	3.186	4.617	4.937	14.661	4.693	3.673	3.124	1.896
5	14.966	10.156	4.201	3.117	7.091	4.568	4.942	10.087	5.414	10.582	3.463
6	11.154	17.115	6.438	8.176	1.820	3.244	5.330	4.110	11.831	8.733	7.726
7	9.117	9.343	18.736	10.355	7.884	2.907	3.373	5.501	7.363	4.569	9.732
8	6.498	6.395	4.465	14.661	8.686	7.252	3.951	5.390	6.417	6.800	12.349
9	3.197	4.490	4.359	5.411	7.105	4.886	6.419	6.884	5.581	6.141	6.707
10	0.939	2.265	4.968	2.471	3.121	6.311	4.781	4.066	5.903	5.142	5.219
11	0.809	1.267	1.055	1.846	1.595	4.265	1.975	1.117	3.498	3.251	3.213
12	0.525	0.772	1.565	1.104	1.683	1.137	1.083	0.803	3.914	2.592	3.103
TOTAL	55.91	63.22	51.75	53.20	50.59	51.63	49.82	44.43	54.63	54.14	58.8
<u>FEMALE</u>											
1	0.001	0.001	0.002	0.003	0.001	0.002	0.001	0.002	0.004	0.002	0.002
2	0.001	0.374	0.354	0.363	1.979	0.594	0.911	0.026	0.216	0.850	0.705
3	1.812	0.343	1.609	2.587	4.262	9.841	2.778	0.351	0.404	0.659	4.999
4	5.849	2.805	3.604	3.814	4.734	4.495	13.069	3.495	3.143	1.126	2.727
5	9.865	4.071	6.147	1.618	5.333	4.901	5.339	14.961	4.546	5.716	2.805
6	8.373	9.509	6.366	8.117	3.574	2.873	6.047	4.110	12.039	6.566	4.184
7	7.773	3.711	11.250	8.427	4.611	1.861	4.093	9.115	4.436	12.877	4.357
8	4.527	4.994	7.626	11.989	7.782	4.564	2.611	7.908	4.705	4.144	6.974
9	2.949	4.171	2.782	4.444	9.065	4.883	5.826	3.616	3.820	4.802	4.811
10	1.367	2.889	5.709	3.133	3.627	7.587	3.445	4.711	3.771	3.442	4.404
11	0.841	1.207	1.788	0.969	3.066	3.355	3.778	4.458	4.664	2.741	3.244
12	0.722	2.708	1.011	1.335	1.375	3.414	2.282	2.822	3.624	2.932	1.975
Total	44.08	36.79	48.25	46.80	49.41	48.37	50.12	55.58	45.37	45.86	41.19

Table 7. Stratified mean catch per tow at age (number) calculated for American plaice from Canadian summer bottom trawl survey in NAFO Div. 4V, 1970-1980

AGE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<i>MALE</i>											
1	-	-	-	-	-	-	-	0.047	-	0.090	0.020
2	0.069	0.473	0.841	0.084	1.993	0.878	0.260	0.085	0.153	0.510	0.240
3	2.453	0.542	2.075	1.000	3.359	5.317	3.263	0.878	0.099	0.910	3.190
4	4.201	7.369	0.979	1.203	3.471	2.727	18.292	2.671	0.901	1.470	1.210
5	1.650	7.462	2.744	1.177	5.331	2.523	6.166	5.741	1.328	4.990	2.210
6	2.508	12.575	4.205	3.087	1.368	1.792	6.650	2.339	2.902	4.710	4.920
7	7.036	5.365	12.237	3.910	5.927	1.606	4.208	3.131	1.806	2.150	6.210
8	5.015	4.669	2.916	5.536	6.530	4.006	4.929	3.068	1.574	3.200	7.380
9	2.467	3.299	2.347	2.043	5.341	2.699	8.009	3.913	1.369	2.390	4.290
10	0.725	1.664	3.245	0.933	2.346	3.486	5.965	2.314	1.448	2.420	3.330
11	0.524	0.931	0.689	0.597	1.199	2.356	2.464	0.636	0.858	1.530	2.050
12	0.405	0.567	1.022	0.417	1.265	0.628	1.351	0.457	0.960	1.220	1.980
13+	0.246	1.525	0.976	0.163	0.377	1.456	0.626	0.488	0.122	0.520	0.740
NK	0.616	0.237	-	1.121	0.495	0.956	0.023	0.076	-	-	-
TOTAL	44.014	48.164	34.768	21.362	38.240	30.930	62.792	25.841	13.528	31.100	38.270
	.355	.486	.324	-.241	.482	-.475	.901	.744	-.468	-.472	
Z (7-11)/(8-12)											
<i>FEMALE</i>											
1	-	-	-	-	-	-	-	-	-	-	-
2	-	0.275	0.231	0.137	1.488	0.328	1.137	0.015	0.053	0.400	0.450
3	1.398	0.252	1.051	0.977	3.204	5.436	3.466	0.200	0.099	0.310	3.190
4	3.514	2.061	2.354	1.440	3.559	2.483	16.305	1.989	0.771	0.530	1.740
5	7.513	2.991	4.015	0.611	4.009	2.707	6.661	8.515	1.115	2.690	1.790
6	5.462	6.987	4.168	3.065	2.687	1.587	7.544	2.339	2.953	3.090	2.670
7	5.999	2.727	7.348	3.182	3.466	1.023	5.106	5.188	1.088	6.060	2.780
8	3.494	3.669	4.981	4.527	5.950	2.521	3.258	4.501	1.154	1.950	4.490
9	2.276	3.065	1.817	1.678	6.815	2.697	7.259	2.058	0.937	2.250	3.070
10	1.055	2.123	3.729	1.183	2.727	4.191	4.298	2.681	0.925	1.520	2.810
11	0.649	0.387	1.168	0.366	2.305	1.853	4.714	2.537	1.144	1.290	2.070
12	0.557	1.990	0.660	0.504	1.034	1.886	2.847	1.506	0.989	1.380	1.250
13+	1.636	3.760	3.370	0.412	2.557	2.467	3.701	1.127	2.077	4.160	7.140
NK	0.615	0.157	-	1.177	-	0.401	0.092	-	0.031	-	-
TOTAL	36.257	30.942	34.868	19.262	39.613	29.574	66.994	32.745	13.240	25.740	33.420
	.138	.009	.336	-.538	.476	-.600	.511	1.212	-.483	-.036	
Z (7-11)/(8-12)											

Table 8. American plaice research and commercial catch-per-unit of effort in NAFO Div. 4V,
1970-1980

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Canadian Stern Trawler TC4 (t/hr)	-	-	.082	.091	.153	.187	.111	.092	.127	.154	.121
Median Smoothed			.082	.091	.153	.153	.111	.111	.127	.127	.121
Research number/tow	80.27	79.11	69.64	40.62	95.17	60.50	127.79	58.59	26.77	56.84	71.69
Median Smoothed	80.27	79.11	69.64	69.64	60.50	60.50	60.50	58.59	56.84	56.84	71.69

Table 9. Total¹ yellowtail flounder catch (t) for NAFO Div. 4VWX (1963-1980)

YEAR	4V	4W	4X	TOTAL
1963	1740	2148	84	3972
64	4084	1165	150	5399
1965	4330	1550	224	6104
66	3521	1164	166	4851
67	3808	1163	225	5196
68	6953	5970	205	13128
69	2491	1134	201	3826
1970	670	2686	326	3682
71	889	668	218	1775
72	697	624	164	1485
73	980	394	139	1513
74	573	130	236	939
1975	1101	254	213	1568
76	473	201	230	904
77	1101	40	302	1443
78	1085	156	387	1628
79	1657	142	400	2199
1980 ²	2180	70	248	2498

¹ Includes foreign catch.

² Provisional

Table 10. Yellowtail flounder catch in 4V, 4X and 4W

4V Yellowtail flounder Nominal catch (tons round) by month for Canada

YEAR	MONTH												TOTAL
	J	F	M	A	M	J	J	A	S	O	N	D	
1972	3	2	19	142	187	43	38	25	3	-	2	5	475
1973	1	1	1	63	129	4	9	2	-	-	-	-	210
1974	5	14	4	21	221	61	23	6	-	-	2	-	357
1975	-	-	1	115	456	118	95	91	8	7	-	1	892
1976	-	-	5	8	24	14	116	37	35	102	20	15	376
1977	5	2	4	105	222	176	354	101	23	8	72	23	1095
1978	-	2	2	156	242	158	125	160	24	35	97	71	1072
1979	-	-	-	181	246	115	485	169	42	209	176	34	1657
1980	-	-	-	217	470	397	396	249	42	328	61	20	2180

4W Yellowtail flounder nominal catch (tons round) by month for Canada

YEAR	MONTH												TOTAL
	J	F	M	A	M	J	J	A	S	O	N	D	
1972	8	1	287	15	1	1	11	6	6	2	7	23	368
1973	3	1	48	3	9	-	3	3	2	7	1	2	82
1974	3	-	-	-	1	3	8	-	1	-	5	-	21
1975	-	-	-	6	2	7	-	1	-	-	-	-	16
1976	-	-	-	-	1	1	6	-	2	4	-	2	16
1977	1	1	6	2	14	2	-	2	1	1	4	6	40
1978	-	1	8	22	6	5	5	20	9	10	47	22	155
1979	-	-	2	2	65	22	9	16	2	22	1	1	142
1980	-	-	1	1	9	16	28	6	1	1	5	2	70

4X Yellowtail flounder nominal catch (tons round) by month for Canada

YEAR	MONTH												TOTAL
	J	F	M	A	M	J	J	A	S	O	N	D	
1972	2	1	9	23	14	21	33	21	17	8	4	1	154
1973	2	13	15	10	5	14	14	20	19	6	2	1	121
1974	1	-	11	8	18	32	31	24	52	33	1	4	215
1975	3	2	9	7	16	18	31	29	33	26	-	-	174
1976	1	7	7	16	30	30	47	28	32	15	4	1	218
1977	3	9	20	27	25	62	57	28	26	14	9	4	289
1978	2	10	23	21	47	109	53	60	21	9	7	27	389
1979	-	2	20	23	145	61	37	36	34	33	4	5	400
1980	5	11	20	43	27	42	35	18	22	22	-	2	248

Table 11. 4VWX yellowtail flounder nominal catch (tons round) by month for Canada

YEAR	MONTH												TOTAL
	J	F	M	A	M	J	J	A	S	O	N	D	
1972	18	4	315	180	202	65	82	52	26	10	13	30	997
1973	6	15	64	76	143	18	26	25	21	13	3	3	413
1974	9	14	15	29	240	96	62	30	53	33	8	4	593
1975	3	2	10	128	474	143	126	121	41	33	-	1	1082
1976	1	7	12	24	55	45	169	65	69	121	24	18	610
1977	14	12	30	134	261	240	411	131	50	23	85	33	1424
1978	2	13	33	199	295	272	183	240	54	54	151	120	1616
1979	-	2	22	206	456	198	531	221	78	264	181	40	2199
1980 ¹	6	11	21	261	506	455	459	273	65	351	66	24	2498

¹Provisional

Table 12. 4VWX yellowtail flounder nominal catch by Canada by gear, 1972-1980
 (% of total landings for that gear in parenthesis)

YEAR	SIDE OTTER TRAWL	STERN OTTER TRAWL	DANISH SEINES	LONGLINERS	MISC. ¹	TOTAL
1972	760 (76)	171 (17)	52 (5)	11 (1)	2 (<1)	996
1973	269 (65)	52 (12)	71 (17)	20 (5)	1 (<1)	413
1974	208 (35)	294 (50)	56 (9)	32 (5)	3 (<1)	593
1975	565 (52)	428 (39)	40 (4)	49 (5)	-	1,082
1976	165 (27)	360 (59)	61 (10)	24 (4)	-	610
1977	760 (53)	434 (31)	141 (10)	14 (1)	75 (5)	1,424
1978	687 (42)	713 (44)	92 (6)	18 (1)	106 (7)	1,616
1979	1355 (62)	650 (30)	148 (7)	40 (1)	6 (<1)	2,199
1980 ²	1336 (53)	798 (32)	320 (13)	12 (<1)	32 (1)	2,498
TOTAL	6,105 (53)	3,900 (34)	981 (9)	220 (2)	225 (2)	11,431

¹Miscellaneous includes gillnet and pair seines

²Provisional

Table 13. Yellowtail flounder research and commercial catch per unit of effort in NAFO Div. 4VWX, 1970-1980

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Canadian Stern Trawler TC4 t/hour	-	-	.024	.110	.024	.117	.019	.019	.024	.050	.095
Median Smoothed			.024	.024	.024	.019	.019	.019	.024	.050	.095
Research number/tow	20.00	17.17	18.43	19.01	25.56	30.71	19.18	49.95	12.64	26.96	17.09
Median Smoothed	20.00	18.43	18.43	19.01	25.56	25.56	25.56	25.56	19.18	17.09	17.09

Table 14. Stratified mean catch per tow at age (number) calculated for yellowtail, from Canadian summer bottom trawl surveys in NAFO Div. 4VWX, 1970-1980

AGE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 ¹	1980
<i>MALE</i>											
1	-	-	-	-	-	0.003	-	-	-	.042	-
2	0.453	0.145	-	0.214	1.099	0.145	0.687	0.208	0.089	.192	-
3	1.423	0.704	0.165	1.080	1.733	2.895	1.671	1.965	0.454	1.043	.220
4	1.812	1.357	0.451	1.674	1.824	2.226	1.994	10.342	1.219	2.809	.760
5	3.176	1.986	1.011	2.168	2.312	3.218	1.159	6.522	1.899	3.903	2.090
6	2.469	2.252	1.279	2.162	2.142	2.667	1.586	3.205	1.654	3.549	1.970
7	1.216	1.409	3.437	1.663	2.149	2.451	1.553	4.256	1.015	1.843	1.230
8	0.266	0.664	1.888	0.683	0.981	1.585	0.599	2.889	0.239	0.295	0.400
9	0.032	0.043	0.898	0.036	0.192	0.085	0.110	0.353	0.043	0.022	0.280
10	0.015	-	0.192	0.045	-	0.069	-	-	-	-	0.040
11	-	-	0.033	-	0.003	-	-	-	-	-	0.070
12	-	-	0.007	-	-	-	-	-	-	-	-
13+	-	-	0.008	-	-	-	-	-	-	-	-
NK	0.043	0.115	0.018	0.081	-	0.769	0.011	-	0.028	-	-
Total	10.908	8.679	9.383	9.804	12.435	16.118	9.369	29.739	6.635	13.7	7.060
Z $\frac{7+}{8+}$.772	-.355	2.133	.725	.648	1.777	-.340	3.281	1.409	1.006	-
<i>FEMALE</i>											
1	-	-	-	-	0.035	0.035	-	-	-	.020	-
2	0.326	0.151	0.007	0.197	0.860	0.542	0.095	0.086	0.031	.054	.100
3	0.921	0.932	0.167	0.427	1.250	2.205	1.051	1.808	0.263	.725	.810
4	1.646	0.974	0.460	1.189	1.362	2.789	1.659	6.349	1.114	1.445	.900
5	3.267	1.853	0.963	1.801	2.030	1.838	1.595	4.762	1.449	3.025	2.010
6	1.624	2.452	1.264	1.968	3.018	1.794	1.572	2.294	1.477	3.979	2.190
7	0.710	1.390	2.277	1.682	2.538	2.067	1.796	2.065	1.118	2.454	1.880
8	0.383	0.263	2.250	1.311	1.513	1.271	1.316	2.086	0.444	1.075	1.230
9	0.135	0.106	1.141	0.437	0.459	0.657	0.462	0.617	0.095	0.524	0.510
10	0.048	0.059	0.361	0.095	0.039	0.100	0.231	0.095	0.014	0.048	0.260
11	-	0.023	0.107	0.037	0.022	0.007	0.002	0.031	-	0.015	0.100
12	0.007	-	0.026	0.017	-	0.007	0.013	-	-	-	0.020
13+	-	0.004	0.015	-	-	-	-	0.009	-	-	0.020
NK	0.020	0.284	-	0.051	-	1.274	0.007	0.011	-	-	-
TOTAL	9.087	8.490	9.044	9.209	13.128	14.587	9.806	20.210	5.999	13.26	10.030
Z $\frac{7+}{8+}$	1.047	-.747	1.174	.561	.811	.707	.297	2.288	.005	.664	-

¹Numbers not combined for 4VWX but run separately for 4V, 4W and 4X.

Table 15. Total¹ witch flounder catch (t) for NAFO Div. 4VWX, 1963-1980

YEAR	4V	4W	4X	TOTAL
1963	4971	2440	75	7486
64	5808	2564	257	8629
1965	5068	7454	421	12943
66	5241	9047	224	14512
67	5740	1693	383	7816
68	7598	13349	735	21682
69	4338	8963	792	14093
1970	3282	1959	807	6048
71	5640	11083	1141	17864
72	4894	5759	698	11351
73	6572	6862	535	13969
74	4913	2004	498	7415
1975	3284	5307	331	8922
76	2718	2683	341	5742
77	1555	455	421	2431
78	1540	563	188	2291
79 ²	1572	209	290	2071
1980 ²	1785	175	302	2262

¹ Includes foreign catch

² Provisional

Table 16. Nominal Catch (in tons) of witch flounder in Division 4VW
for all countries by gear
(% of total landings for that gear in parenthesis)

YEAR	SIDE OTTER TRAWL	STERN OTTER TRAWL	DANISH & SCOTTISH SEINE	OTHER	TOTAL
1972	2459 (23)	6925 (65)	1257 (12)	12 (0)	10,653
1973	2194 (16)	9700 (72)	1464 (11)	76 (1)	13,434
1974	1968 (28)	3675 (53)	1221 (18)	53 (1)	6,917
1975	1121 (13)	6360 (74)	995 (12)	115 (1)	8,591
1976	751 (14)	3709 (69)	869 (16)	72 (1)	5,401
1977	272 (13)	785 (39)	838 (42)	115 (6)	2,010
1978	406 (19)	715 (34)	930 (45)	52 (2)	2,103
1979*	412 (24)	503 (29)	769 (44)	60 (3)	1,744
1980*	293 (15)	769 (39)	839 (43)	59 (3)	1,960
TOTAL	9876 (19)	33,141 (63)	9182 (17)	614 (1)	52,813

* Canadian landings only

Table 17. Witch flounder landings (t) by month and country for NAFO Div. 4VW

YEAR	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL ¹
<u>CANADA</u>													
1970	465	243	844	255	485	428	213	207	137	254	280	349	4160
71	360	688	1300	848	762	470	304	172	237	146	322	432	6041
72	330	871	1540	873	277	327	206	188	152	144	152	286	5346
73	646	738	908	1187	559	253	124	207	125	151	217	356	5471
74	205	1012	1884	676	306	323	206	110	225	174	187	149	5457
1975	165	265	734	693	324	278	100	103	142	131	88	102	3125
76	81	159	573	360	253	158	125	87	105	109	103	68	2181
77	89	204	473	106	208	276	100	155	89	69	103	33	1905
78	29	265	384	209	240	299	153	106	108	90	65	19	1967
79	24	114	507	109	234	192	118	114	96	139	77	57	1781
1980 ²	29	98	534	255	201	272	115	124	96	125	61	50	1960
<u>USSR</u>													
1970	-	-	77	-	98	88	142	238	203	47	83	83	1059
71	-	48	773	1159	1556	2449	2601	1340	487	80	119	49	10661
72	-	2	430	47	790	852	1035	900	702	287	67	-	5112
73	-	-	46	22	777	1360	770	3602	1249	32	3	39	7900
74	25	-	5	188	313	170	252	197	22	30	20	122	1344
1975	53	85	134	446	405	472	713	719	764	722	453	453	5419
76	4	8	164	143	304	413	183	124	431	629	-	807	3210
77	-	-	6	4	4	3	81	-	-	-	-	-	98
78	-	-	-	-	-	-	116	18	-	-	-	-	134
79	-	-	-	-	3	-	-	-	-	-	-	-	3
1980 ²	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>TOTAL³</u>													
1970	472	248	931	255	583	516	355	445	340	301	363	432	5241
71	364	739	2087	2007	2318	2919	2905	1512	724	226	441	481	16723
72	330	932	2096	929	1067	1179	1241	1088	854	432	219	286	10653
73	668	754	978	1209	1336	1613	894	3809	1374	183	220	396	13434
74	234	1107	1889	875	619	494	463	307	247	204	207	271	6917
1975	228	369	879	1139	730	750	813	823	906	855	541	558	8591
76	85	167	745	503	557	572	308	211	536	738	103	875	5400
77	93	205	479	111	212	279	181	155	89	69	104	33	2010
78	29	265	384	209	241	300	269	124	108	90	65	19	2103
79	24	114	507	109	241	192	118	114	96	139	77	57	1788
1980 ²	29	98	534	255	201	272	115	124	96	125	61	50	1960

¹ Includes catches of not known months of the year

² Provisional

³ Includes other Foreign Catches

Table 18a. 4VW witch, male removals at age ($\times 10^{-3}$)

AGE	1976	1977	1978	1979	1980
4	-	-	-	-	-
5	-	3	-	107	20
6	95	15	20	296	87
7	151	46	67	164	175
8	351	27	73	105	392
9	809	42	113	67	316
10	607	117	75	164	122
11	1507	101	108	783	191
12	1535	196	138	88	181
13	987	284	147	185	248
14	742	203	110	218	128
15	620	97	66	62	94
16	399	59	71	26	47
17	122	33	49	7	58
18	85	55	26	-	7
19	20	11	19	-	27
20	35	6	10	-	11
21	33	1	15	-	-
22	-	3	3	-	-
23	74	-	-	-	-
24	-	-	-	-	-
25	-	-	-	-	-
26+	-	-	7	-	-

Table 18b. 4VW witch, female removals at age ($\times 10^{-3}$)

AGE	1976	1977	1978	1979	1980
5	-	1	8	1	21
6	20	3	24	26	15
7	18	12	80	100	90
8	69	10	98	48	259
9	-	14	120	150	165
10	181	117	43	120	114
11	142	66	317	67	107
12	433	252	263	212	90
13	311	298	295	151	329
14	304	261	387	314	278
15	391	195	340	445	137
16	402	165	159	123	253
17	316	303	200	54	130
18	352	83	157	176	44
19	158	108	27	71	46
20	149	70	11	4	34
21	68	22	1	-	13
22	41	43	13	17	16
23	1	12	5	-	25
24	6	17	2	8	-
25	37	9	-	26	10
26+	62	22	20	17	12

Table 19. Witch flounder research and commercial catch per unit of effort in
NAFO Div. 4VW, 1970-1980

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Canadian Stern Trawler TC4 t/hour	-	-	.062	.096	.150	.047	.047	.148	.086	.406	.133
Median Smoothed	-	-	.062	.096	.096	.047	.047	.086	.133	.133	.133
Research number/tow	5.13	5.92	4.23	9.13	18.39	5.55	3.08	3.52	3.12	2.41	3.24
Median Smoothed	5.13	5.13	5.92	9.13	9.13	5.55	3.52	3.12	3.12	3.12	3.24

Table 20. Stratified mean catch per tow at age (number) calculated for Witch Flounder from Canadian summer bottom trawl surveys in NAFO Div. 4VW, 1970-1980

AGE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<i>MALE</i>											
2	-	-	-	-	.016	.038	-	-	-	.011	-
3	.021	-	.007	-	.118	.103	-	.125	.022	.021	.070
4	-	-	-	.091	.249	.086	.107	.039	.082	-	.070
5	.238	.029	.114	.047	.080	.051	.134	.219	.166	.032	.120
6	.211	.029	.137	.021	.047	.141	.091	.195	.198	.074	.160
7	.325	.098	.244	.090	.278	.100	.127	.126	.150	.106	.210
8	.402	.165	.429	.174	.359	.267	.045	.039	.078	.127	.210
9	.228	.197	.284	.361	1.112	.325	.233	.069	.102	.159	.110
10	.110	.079	.185	.345	1.262	.224	.167	.230	.192	.042	.030
11	.021	.137	.061	.136	1.149	.207	.299	.166	.122	.064	.150
12	.096	.086	.100	.192	.810	.081	.128	.142	.087	.032	.040
13+	.021	-	.047	.183	1.076	.041	.182	.472	.368	.095	.070
NK	.604	.609	.047	.371	.062	.300	.173	.023	.034	-	-
TOTAL	2.268	1.437	1.650	2.047	6.618	1.964	1.675	1.841	1.602	0.762	1.240
Z (7-11)/(8-12)	.492	-.449	-.004	-1.444	1.327	.253	.299	.106	.418	.081	
<i>FEMALE</i>											
2	-	-	.056	-	-	.038	-	-	.007	.021	.010
3	.010	.007	.003	.054	.083	.093	.017	.007	.044	.900	.030
4	-	-	-	.495	.131	.188	.103	.041	.022	.053	.030
5	.183	.096	.100	.244	.064	.055	.065	.114	.023	.042	.110
6	.145	.063	.069	.102	.083	.071	.041	.176	.151	.074	.260
7	.217	.121	.197	.636	.318	.144	.021	.034	.172	.095	.180
8	.371	.572	.569	.823	.966	.406	.031	.027	.095	.042	.320
9	.223	.669	.313	.637	1.121	.425	.072	.023	.261	.064	.150
10	.113	.510	.260	.732	1.311	.484	.081	.175	.133	.032	.130
11	.110	.419	.275	.457	2.214	.240	.159	.147	.081	.085	.090
12	.301	.274	.263	.676	1.697	.399	.163	.176	.094	.032	.050
13+	.306	.325	.348	1.198	3.374	.701	.579	.693	.421	.211	.640
NK	.882	1.432	.123	1.014	.409	.353	.057	.049	.018	-	-
TOTAL	2.863	4.486	2.581	7.078	11.776	3.587	1.405	1.674	1.521	1.652	2.000
Z (7-11)/(8-12)	.201	.310	.019	-.624	1.110	1.211	-.410	-.414	1.068	-.844	

Table 21. Total¹ Greenland halibut catch (t) for NAFO Div. 4VWX, 1963-1980

YEAR	4V	4W	4X	TOTAL
1963	-	-	-	-
64	1	-	1	2
1965	-	-	-	-
66	1	-	-	1
67	2	-	-	2
68	10	-	-	10
69	36	-	3	39
1970	14	3	3	20
71	19	2	3	24
72	11	-	7	18
73	10	1	1	12
74	35	-	-	35
1975	27	2	-	29
76	57	6	6	69
77	197	9	9	215
78	495	6	15	516
79	864	11	3	878
1980 ²	182	51	-	233

¹ Includes foreign catch

² Provisional

Table 22. Greenland halibut nominal catches, (tons) round by month,
1972-1980 for NAFO Division 4VWX for Canada

YEAR	MONTH												TOTAL
	J	F	M	A	M	J	J	A	S	O	N	D	
1972	-	-	-	3	1	1	7	2	3	-	-	1	18
1973	1	-	-	-	3	1	1	-	-	-	5	1	12
1974	-	1	2	5	3	4	5	2	1	5	3	-	31
1975	-	-	-	2	1	-	3	5	10	3	3	1	28
1976	3	9	20	8	3	3	4	5	6	2	-	-	63
1977	3	13	122	10	2	6	10	16	21	4	3	5	215
1978	3	262	176	6	5	29	6	5	8	6	6	4	516
1979	2	493	245	18	6	4	13	8	13	3	70	3	878
1980	1	75	58	3	2	3	3	11	55	1	10	11	233
TOTAL	13	853	623	55	26	51	52	54	117	24	100	26	1994

Table 23. Greenland halibut nominal catches in tons round by gear,
1972-1980 for NAFO Div. 4VWX 1972-1980.

YEAR	OTTER TRAWLERS	LONGLINES	MISC ¹ (and Others)	TOTAL
1972	9 (50)	8 (44)	1 (6)	18
1973	11 (92)	1 (8)	-	12
1974	23 (74)	5 (16)	3 (10)	31
1975	28 (100)	-	-	28
1976	57 (90)	5 (8)	1 (2)	63
1977	207 (96)	4 (2)	4 (2)	215
1978	510 (99)	-	6 (1)	516
1979	878 (100)	-	-	878
1980 ²	223 (96)	-	10 (4)	233
Total	1946 (98)	23 (1)	25 (1)	1994

¹ Miscellaneous gear

² Provisional

Table 24. Total¹ winter flounder catch (t) for NAFO Div. 4VWX, 1963-1980

YEAR	4V	4W	4X	TOTAL
1963	17	65	614	696
64	12	19	1280	1311
1965	32	179	1128	1339
66	55	34	1257	1346
67	37	5	902	944
68	10	28	1143	1181
69	4	12	1400	1416
1970	8	44	1478	1530
71	237	1364	1483	3084
72	78	551	825	1454
73	480	655	774	1909
74	777	1005	974	2756
1975	179	525	670	1374
76	235	345	717	1297
77	226	9	1024	1259
78	186	137	884	1207
79	226	12	825	1063
1980 ²	28	10	1116	1154

¹ Includes foreign catch

² Provisional

Table 25. Total¹ Atlantic halibut catches (t) for NAFO Div. 4VWX (1963-1980)

YEAR	4V	4W	4X	TOTAL
1963	214	479	840	1533
1964	332	358	861	1551
1965	486	458	665	1609
1966	532	313	331	1176
1967	380	322	546	1248
1968	250	363	604	1217
1969	192	431	441	1064
1970	115	349	366	830
1971	231	360	414	1005
1972	178	216	456	850
1973	147	226	401	774
1974	124	127	404	655
1975	114	159	376	649
1976	144	148	422	714
1977	51	177	448	676
1978	244	283	565	1092
1979	223	346	566	1135
1980 ²	287	353	690	1330

¹ Total includes foreign catches from USA, UK, Italy.

² Provisional

Table 26. Atlantic Halibut nominal catches (t) for NAFO Div. 4VWX by month for Canada¹

YEAR	MONTH												TOTAL
	J	F	M	A	M	J	J	A	S	O	N	D	
1972	27	40	49	50	86	108	152	118	111	60	14	5	820
1973	36	42	80	100	72	81	86	89	99	58	17	5	765
1974	15	30	26	45	46	79	78	109	104	75	24	10	641
1975	26	28	37	58	70	81	71	103	84	53	18	9	638
1976	20	38	35	66	78	100	107	65	99	63	29	8	708
1977	26	31	44	68	84	107	108	81	55	54	33	14	705
1978	22	50	41	114	149	169	159	111	108	54	34	70	1081
1979	9	21	79	127	208	240	141	101	82	45	45	37	1135
1980	14	78	81	158	234	237	168	107	67	95	49	42	1330

¹ Nominal catches include those catches from Maritimes, Quebec and Newfoundland.

Table 27. Atlantic halibut nominal catch (t) for NAFO Div. 4V by month for Canada

YEAR	MONTH												Total
	J	F	M	A	M	J	J	A	S	O	N	D	
1972	18	22	12	8	15	9	41	24	18	6	-	-	173
1973	16	12	25	13	3	7	15	24	18	3	6	1	143
1974	4	22	17	14	1	12	13	21	6	5	3	-	118
1975	15	19	11	10	5	4	8	18	13	3	2	-	108
1976	13	21	16	12	17	16	15	10	19	1	1	1	142
1977	2	7	12	5	8	2	17	5	11	8	5	2	84
1978	6	14	15	35	34	18	23	18	14	6	4	56	243
1979	-	17	28	23	29	35	33	26	5	6	14	7	223
1980	1	39	34	46	35	39	32	18	15	18	8	2	287

Atlantic halibut nominal catch (t) for NAFO Div 4W by month for Canada

YEAR	MONTH												TOTAL
	J	F	M	A	M	J	J	A	S	O	N	D	
1972	3	3	20	18	29	30	24	26	28	2	6	4	193
1973	10	7	39	38	40	24	19	21	17	6	2	2	225
1974	3	1	3	13	10	24	28	28	11	2	4	-	127
1975	1	6	16	25	25	16	25	24	8	7	3	1	157
1976	1	1	6	36	26	26	23	15	9	1	3	-	147
1977	-	2	9	17	28	33	24	24	16	11	6	6	176
1978	3	10	11	42	53	44	40	39	20	7	6	1	276
1979	1	-	14	62	109	78	41	21	12	2	4	2	346
1980	1	8	17	43	101	67	45	31	12	7	10	11	353

Atlantic halibut nominal catch (t) for NAFO Div. 4X by month for Canada

YEAR	MONTH												TOTAL
	J	F	M	A	M	J	J	A	S	O	N	D	
1972	6	15	17	24	42	69	87	68	65	52	8	1	454
1973	10	23	16	49	29	50	52	44	64	49	9	2	397
1974	8	7	6	18	35	43	37	60	87	68	17	10	396
1975	10	3	10	23	40	61	38	61	63	43	13	8	373
1976	6	16	13	18	35	58	69	40	71	61	25	7	419
1977	24	22	23	46	48	72	67	52	28	35	22	6	445
1978	13	25	15	37	62	107	96	54	74	41	24	13	562
1979	8	4	37	42	70	127	67	54	65	37	27	28	566
1980	12	31	30	69	98	131	91	58	40	70	31	29	690

Table 28. Atlantic halibut nominal catch (t) by gear in NAFO Div. 4VWX for Canada
(% of total landings for that gear in parenthesis)

YEAR	SIDE OTTER TRAWL	STERN OTTER TRAWL	LONGLINES	DANISH SEINES	OTHER ¹	TOTAL
1972	55 (7)	69 (8)	629 (77)	1 (0)	66 (8)	820
1973	43 (6)	56 (7)	643 (84)	3 (1)	20 (2)	765
1974	11 (2)	45 (7)	536 (84)	1 (0)	48 (7)	641
1975	42 (7)	77 (12)	501 (78)	3 (1)	15 (2)	638
1976	68 (10)	81 (11)	530 (75)	1 (0)	28 (4)	708
1977	39 (5)	124 (18)	477 (68)	1 (0)	64 (9)	705
1978	57 (5)	195 (18)	662 (61)	5 (1)	162 (15)	1081
1979 ²	52 (5)	180 (16)	808 (71)	4 (0)	91 (8)	1135
1980 ²	38 (3)	273 (20)	937 (71)	2 (0)	80 (6)	1330
TOTAL	405 (5)	1100 (14)	5723 (73)	21 (1)	574 (7)	7823

¹ Includes NK and MISC gears.

² Provisional

Table 29. Nominal catch of A. plaice, witch and yellowtail flounder in NAFO Division 4VWX¹

YEAR	NAFO DIVISION					COUNTRY												
	4Vn	4Vs	4W	4X	Total	Canada	FR	JAP	POL	ROM	USSR	UK	USA	GDR	POR	BUL	SPA	CUBA
1960	4088	782	3965	1095	9930	9694	8	-	-	-	-	-	228	-	-	-	-	-
61	1913	1916	5709	288	9826	9592	-	-	-	-	26	-	208	-	-	-	-	-
62	2798	1918	6752	359	11827	10893	-	-	-	-	624	-	310	-	-	-	-	-
63	5895	2192	5232	461	13780	12919	-	-	-	-	544	-	317	-	-	-	-	-
64	5099	6952	4328	913	17292	16531	230	-	-	-	103	9	419	-	-	-	-	-
1965	4885	9310	11343	1284	26822	18630	182	-	1	-	7714	1	294	-	-	-	-	-
66	5951	11008	14638	1350	32947	19928	39	-	-	-	12825	11	144	-	-	-	-	-
67	4522	13955	3568	1759	23804	23217	-	-	1	-	301	2	283	-	-	-	-	-
68	4255	20787	25558	1896	52496	23978	177	-	-	-	28222	-	119	-	-	-	-	-
69	4499	10446	14056	1867	30868	18534	140	-	25	-	12071	-	98	-	-	-	-	-
1970	4371	4830	7128	1770	18099	12171	39	8	3	84	5663	-	131	-	-	-	-	-
71	4820	9474	17742	1904	33940	15362	26	-	-	-	18406	-	146	-	-	-	-	-
72	3712	8791	9558	1428	23489	13771	253	15	3	-	9262	3	180	2	-	-	-	-
73	3579	12659	10663	1013	27914	11424	136	9	-	-	16250	-	54	-	41	-	-	-
74	4517	12332	7085	1192	25126	13390	147	206	-	-	11305	7	71	-	-	-	-	-
1975	3358	8363	9676	840	22237	11129	58	-	-	-	10862	-	137	-	18	4	29	-
76	4127	7552	5234	880	17793	10008	96	-	-	-	7620	-	69	-	-	-	-	-
77	3161	6211	1087	1172	11631	11390	28	-	-	-	152	-	61	-	-	-	-	-
78	2394	5732	1462	1087	10675	10428	32	9	-	-	166	-	39	-	-	-	-	1
79	2408	5847	851	1409	10515	10474	6	-	-	-	16	-	19	-	-	-	-	-
1980 ²	2414	7765	831	2471	13481	13481	-	-	-	-	-	-	-	-	-	-	-	-

¹ Data for 1960-1971 from Halliday 1973.

² Foreign catch not available at this time.

4V American Plaice C,PUE. (median smoothed)

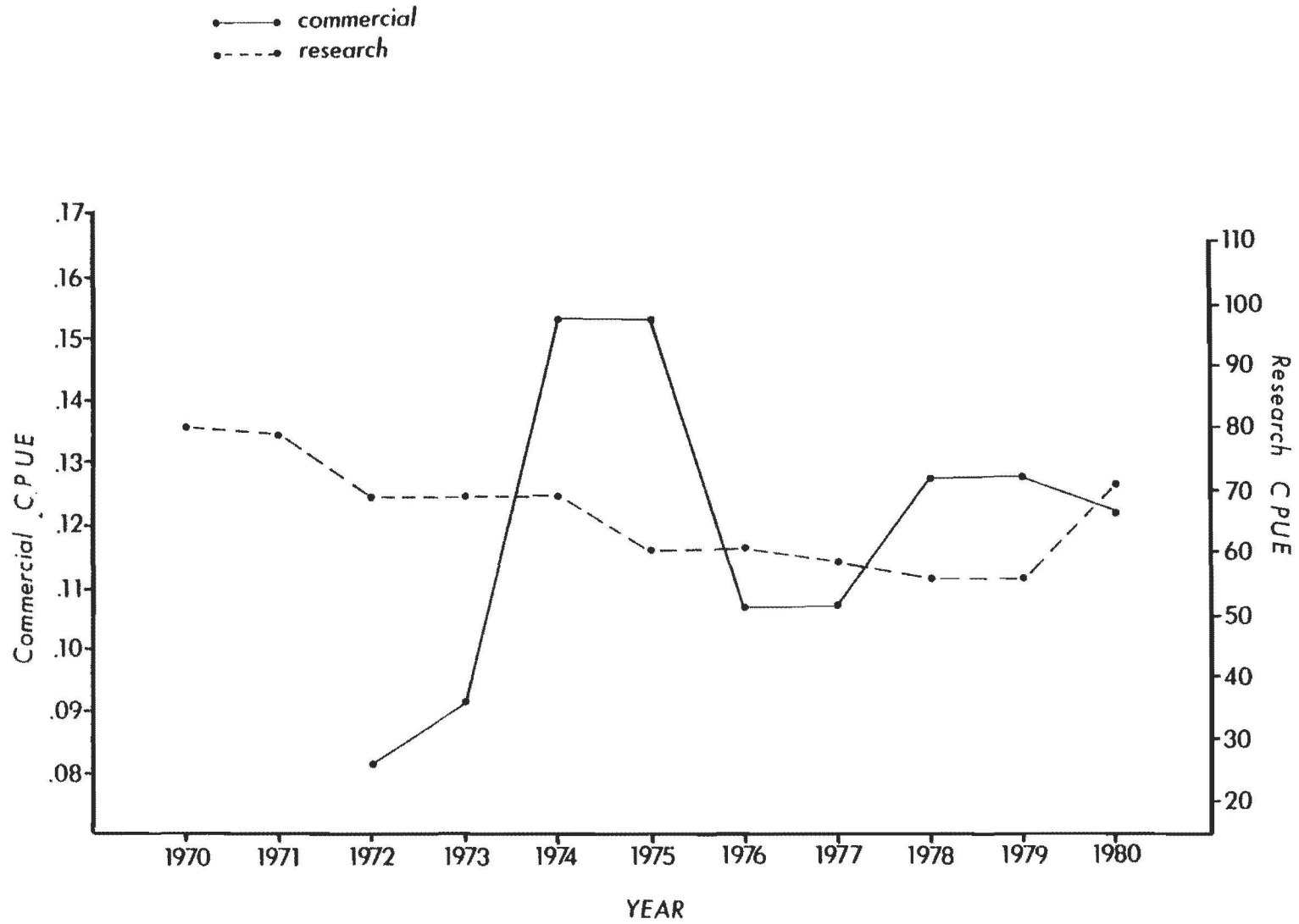
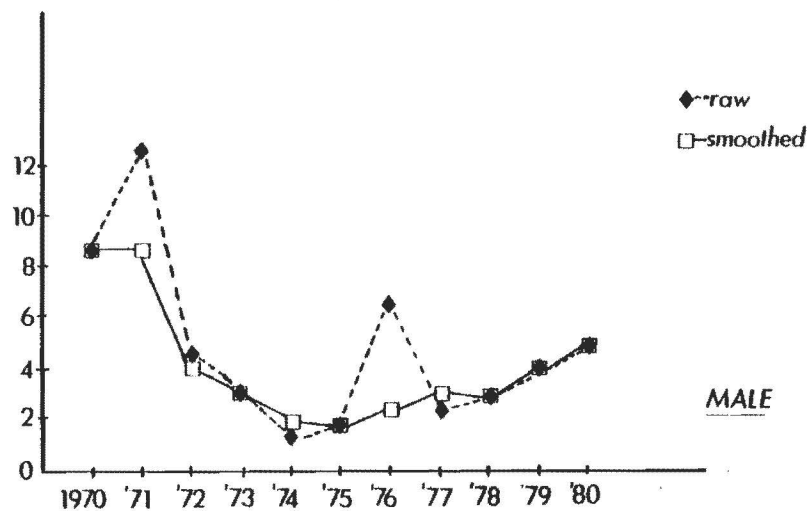
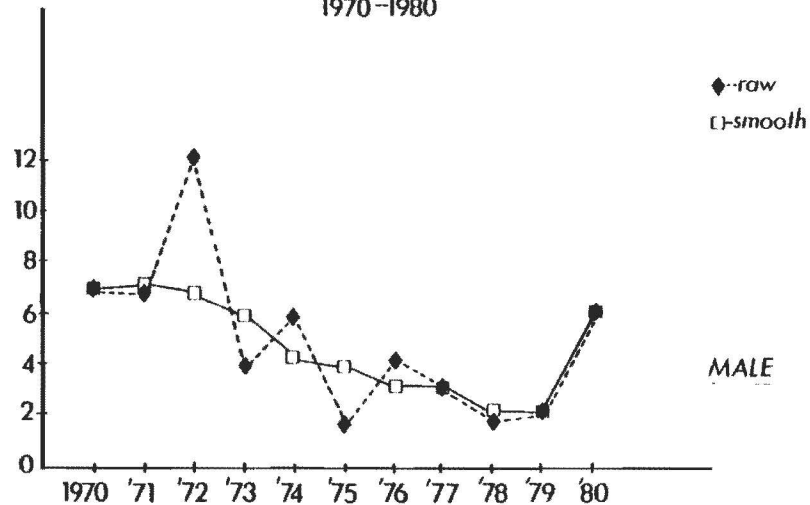


Figure 1. 4V American plaice commercial CPUE (t/hr) and research CPUE (numbers/tow) median smoothed for 1970-1980.

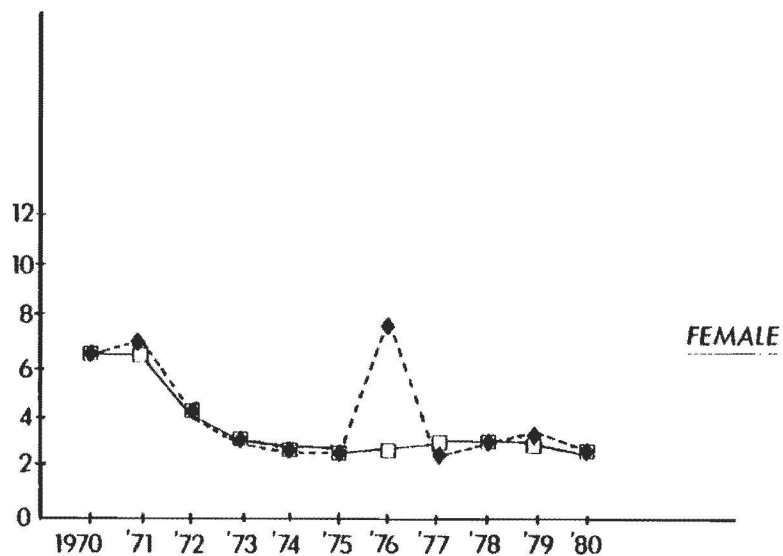
A. Stratified mean catch per tow of age 6 4V Plaice.
1970-1980



B. Stratified mean catch per tow of age 7 4V Plaice.
1970-1980



CATCH/TOW



CATCH/TOW

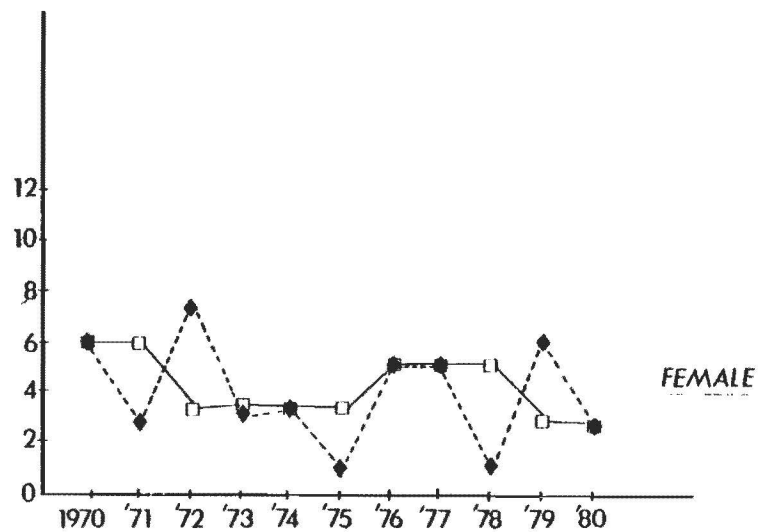


Figure 2. Stratified mean catch per tons (numbers of age) of age 6 plaice (A) and age 7 plaice (B) in NAFO area 4V from research survey 1970-1980.

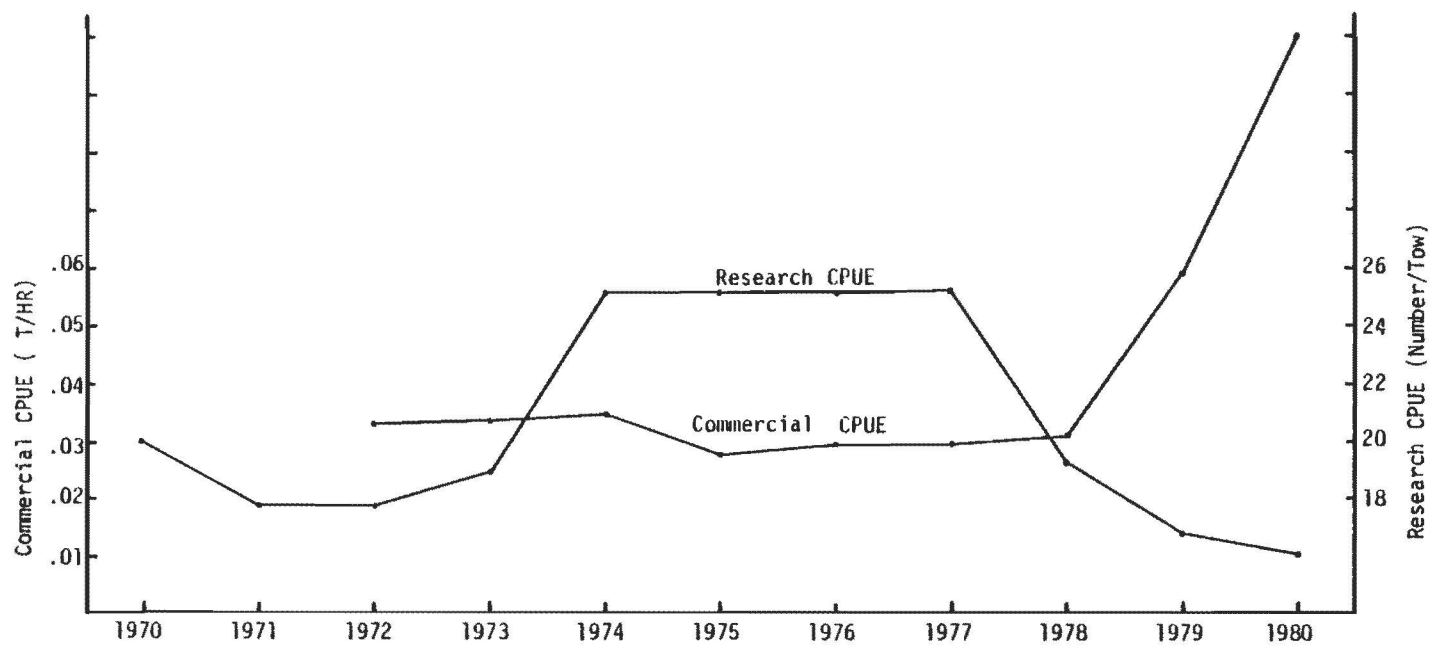
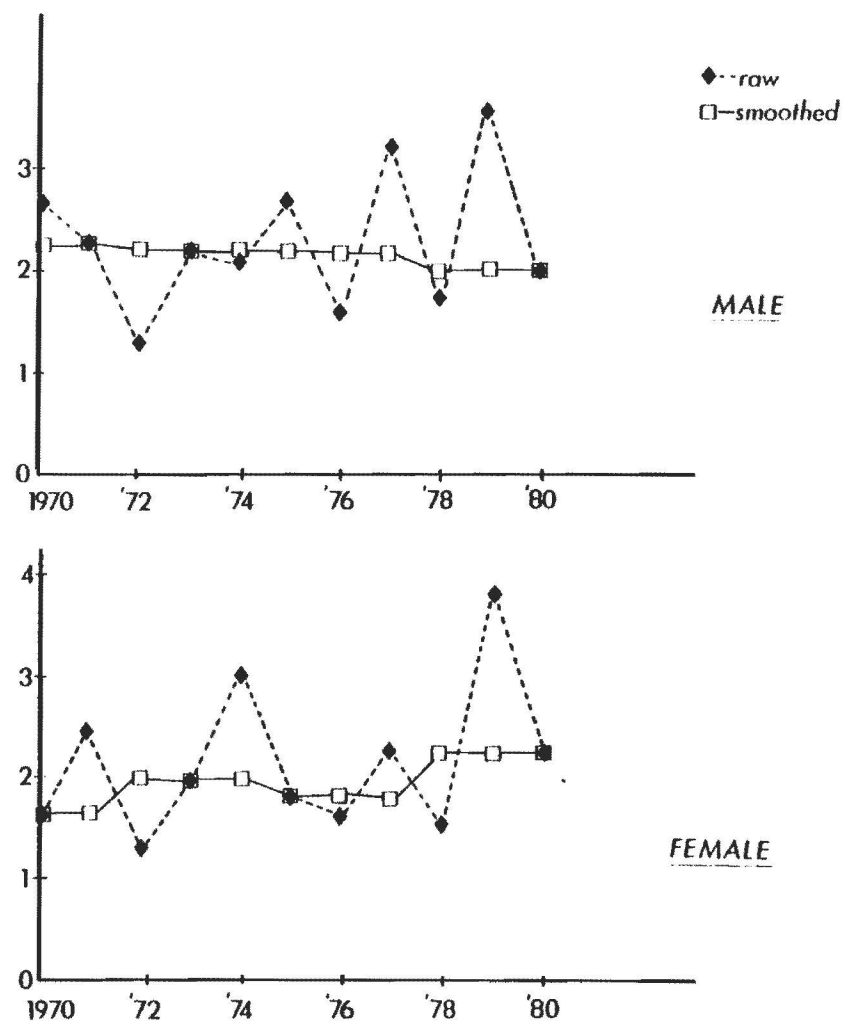


Figure 3. 4VWX yellowtail commercial CPUE (t/hr) and research CPUE (numbers/tow) median smoothed for 1970-1980.

A. Stratified mean catch per tow of age 6 Yellowtail.
4VWX



B. STRATIFIED MEAN CATCH PER TOW OF AGE 7 YELLOWTAIL.
4VWX

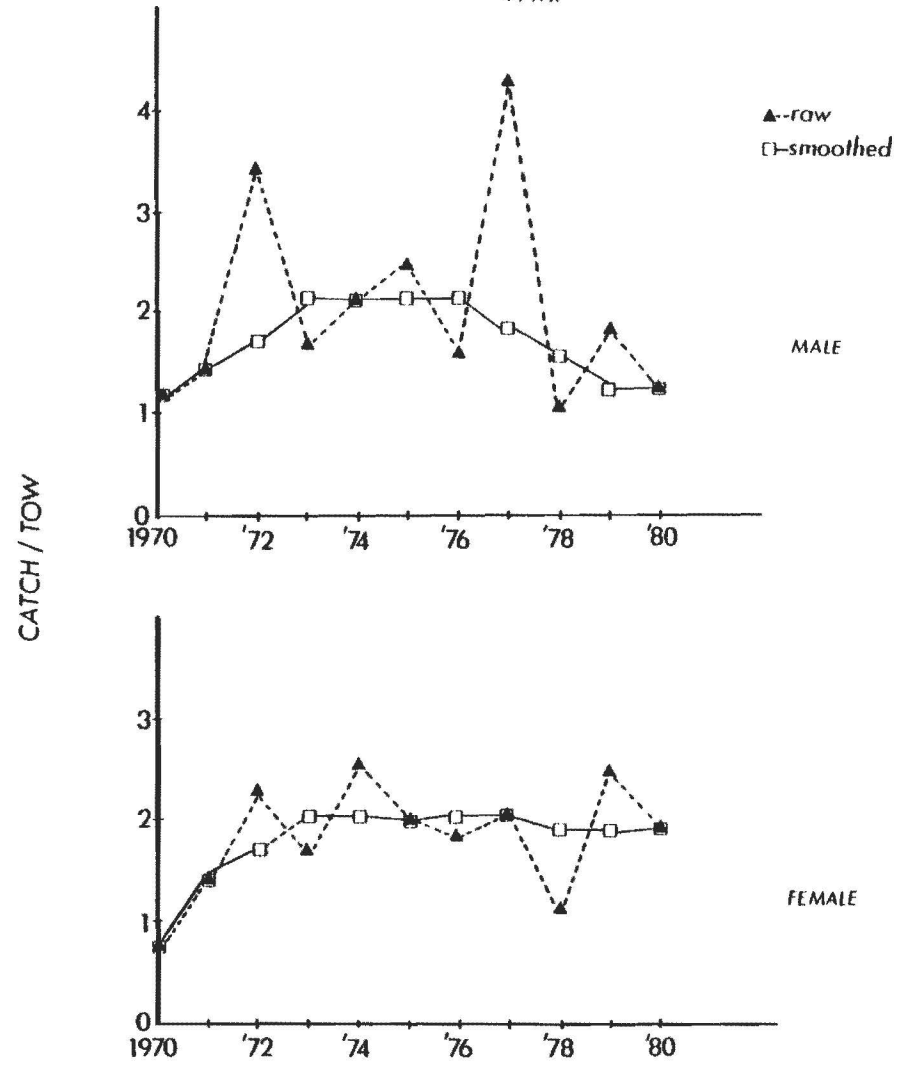


Figure 4. Stratified mean catch per tow (in numbers) of age 6 (A) and age 7 (B) Yellowtail in NAFO Div. 4VWX from research surveys 1970-1980.

4VW Witch Flounder C PUE (median smoothed)

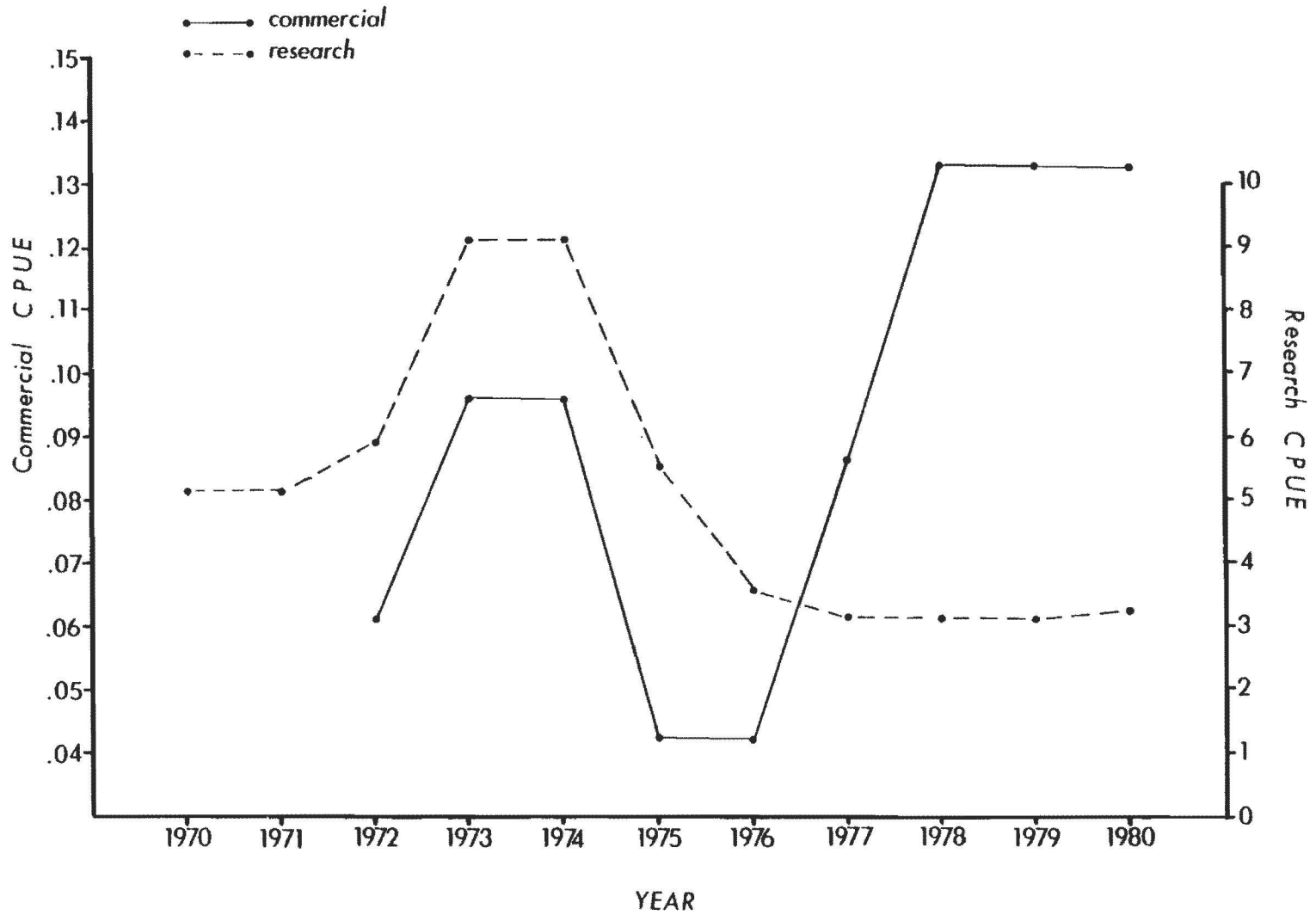


Figure 5. 4VW witch commercial CPUE (t/hr) and research CPUE (numbers/tow) median smoothed for 1970-1980.

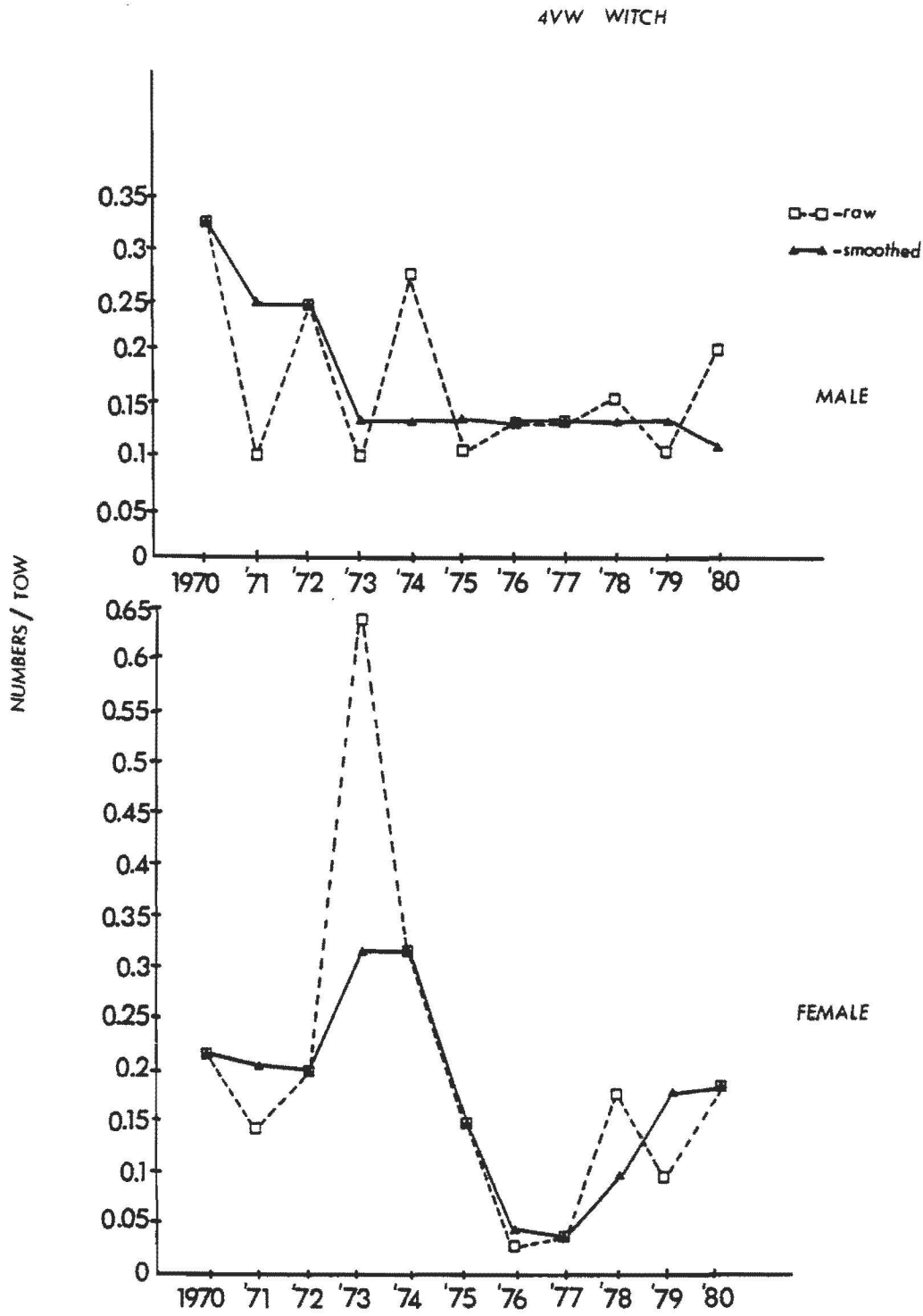


Figure 6. Stratified mean catch per tow at age 7.

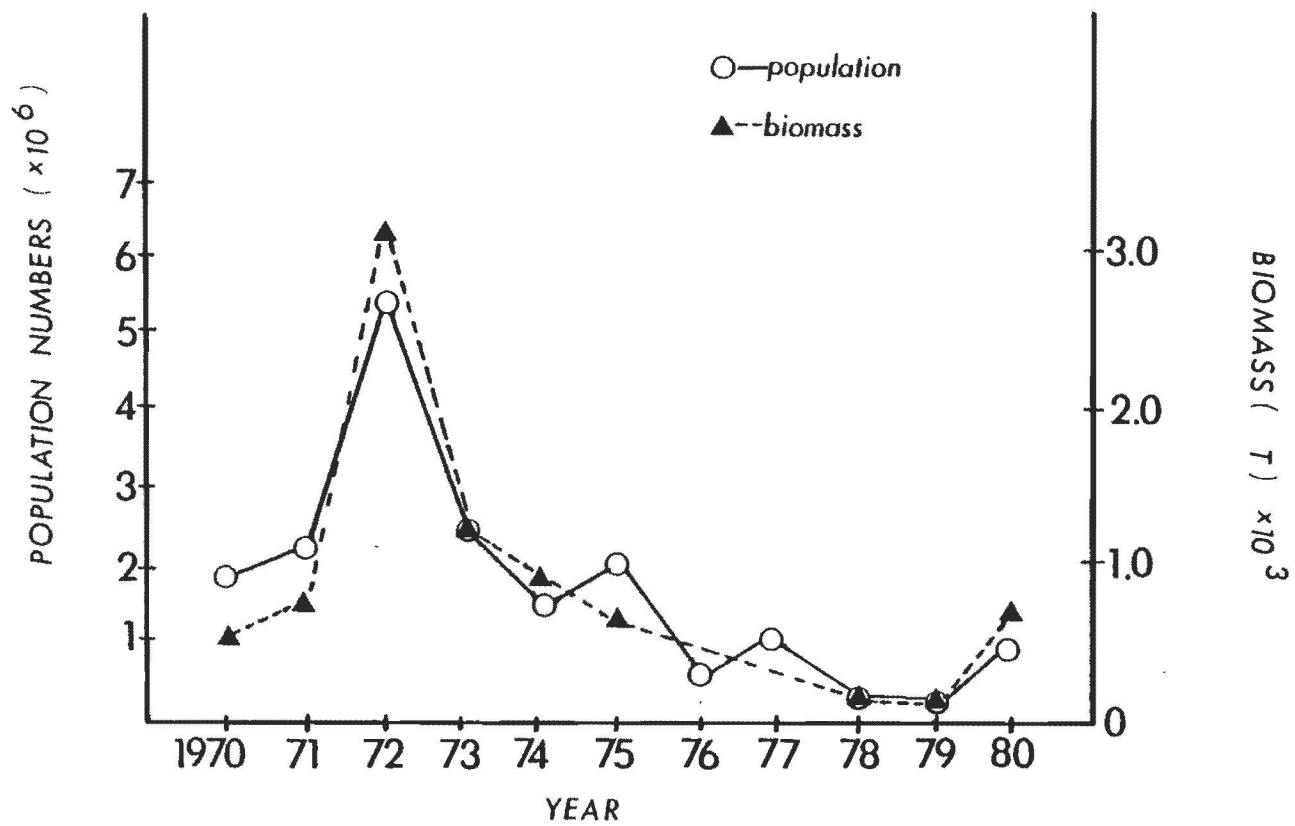


Figure 7. Estimated population and biomass of 4VWX winter flounder

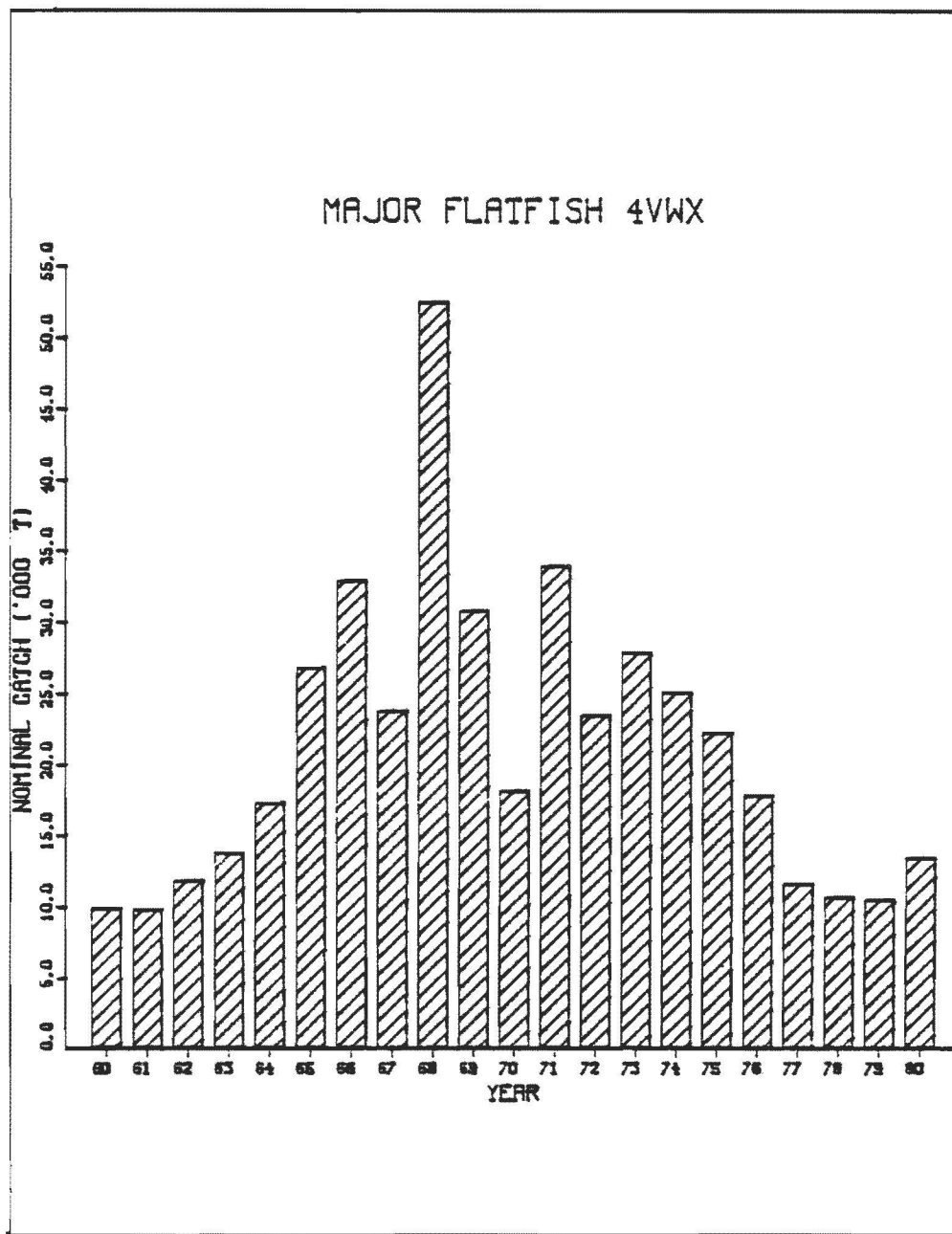


Figure 8. Nominal catch of American plaice, Witch and Yellowtail Flounder combined in Div. 4VWX, 1960-1980.