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Updated estimates of total allowable catches of several flatfish stocks for Subareas 2 and 3.

by

T. K. Pitt
Department of Environment
Fisheries and Marine Service
Biological Station
St. John's, Newfoundland

Introduction

This document presents updated assessments for American plaice stock for Divisions 3LNO, 3M and 3Ps, yellowtail from Division 3LNO, witch from Division 3NO and 3Ps, and Greenland halibut from Subarea 2-3K-L. A new assessment for 2J-3K-L witch is presented in another document (Res. Doc. 74/48); also a new assessment for American plaice in Subarea 2-Division 3K (Res. Doc. 74/69).

Except for plaice and yellowtail for Division 3LNO, the updating consists of recording nominal catches since, at present, no proper biological assessments are available for the remaining flatfish stocks.

American plaice (Division 3LNO) (Table 1)

The catch per hour for Grand Bank plaice has stabilized since 1970 after declining from relatively high levels in the mid 1960's (Table 2). The total amount landed in 1973 (from preliminary data) was lower than in 1972 with a corresponding lower total effort. The TAC for 1973 was 60,000 tons (52,000 for 3LN plus 8000 for 30).

The 1974 TAC of 60,000 tons was based on an assessment using catch data up to 1971. With the addition of the 1972 and 1973 data, it appears that the projected estimates of stock size, especially in the pre-recruited age-groups, were overestimated. However, the fact that the 1973 TAC was not taken has apparently, to a certain extent at least, compensated for these overestimations. It should be pointed out that the data presented in Table 1 is for Division 3L-N with an additional allowance added for Division 30.

A terminal F for 1973 was calculated from the mean survival rate for the fully recruited age-groups 1972-73. Recruitment estimates for 1974 and 1975 were average values for 1971-73. Using partial recruitment values of fishing mortality (F) for the pre-1971 data, yield per recruit curves indicated $F_{0.1}$ levels at 0.55 for males and 0.48 for females. The updated assessment with the addition of 1972 and 1973 data produced new partial recruitment values giving estimates of $F_{0.1}$ at approximately 0.50 and 0.45 for males and females respectively. These values all occurred at 90-95% of the yield calculated to very high levels of F.

Using the latter fishing mortality values for fully recruited fish in 1975 (0.50 males and 0.45 females) (Table 1) gave a projected 1975 TAC of approximately 47,000 tons for 3L and 3N, assuming most of the 1974 TAC is removed. Previous allowances for Division 3O were 8000 tons in 1973 and 1974; however, preliminary reports of nominal catches in 1973 indicate that more than 10,000 tons were caught in this Division. Additionally, Canada (N) 1973 data indicate an increase in the catch per hour in this Division over the previous two years; hence 9000-12,000 tons from this Division would seem appropriate for 1974 and 1975, giving a total Grand Bank TAC at between 56,000-60,000 tons for 1975.

American plaice (Division 3M) (Flemish Cap)

This is a relatively small population and a TAC of 2000 tons was established at the January, 1974, Mid-Year Meeting. Table 3 updates the table in Res. Doc. 74/3 from new information received by the Secretariat from Canadian, Polish and USSR scientists (Summ. Doc. 74/75). It is suggested that the TAC remain at 2000 tons.

American plaice (Division 3Ps) (St. Pierre Bank)

A TAC of 10,000 was recommended by STACRES and established at 11,000 tons by the Commission for 1974. It is suggested that 10,000 tons should be recommended again for 1975 pending a proper assessment. As with Division 3M plaice, the table of landings (Table 4) is updated in accordance with Summ. Doc. 74/75.

Yellowtail (Divisions 3LNO) (Grand Bank)

The yellowtail fishery on the Grand Bank increased rapidly from practically nil in 1964 to about 39,000 tons in 1972. A TAC of 50,000 tons was established for 1973 without a proper assessment but based on the assumption that this stock was expanding. The assessment at the 1973 Annual Meeting indicated a TAC of 40,000 tons for 1974.

The updated assessment presented here uses 1969-73 catch data and includes recent adjustments in the nominal catches for 1969 (Summ. Doc. 74/25) which increased the USSR catch from around 1800 to about 5000 tons with a corresponding increase in the total catch from 12,000 to 16,000 tons. The 1973 assessment was for 3LN only with the total TAC arrived at by adding an amount for 3O. The calculations presented here include 3LNO data combined (Table 5). Terminal F was calculated from estimates of year-class abundances from research vessel surveys, 1972 and '73.

Of the 1973 catch of about 32,000 tons (provisional data), Canada caught about 90%. The breakdown by numbers at age (Table 5) indicates a substantial increase in the landings of 5 and 6-year-old fish. It is not clear if more small fish were actually caught than previously, but at least more small fish were landed (Fig. 1) and constituted a significant part of the total landings. An estimated 64.7 million fish were caught in 1972 to produce about 39,300 tons whereas in 1973, a total of about 72.2 million fish were required to give 32,800 tons.

For the first time 3-year-old yellowtail appeared in the commercial landings although they accounted for less than 0.5% of the total estimated number caught; however, 4-year-old fish accounted for about 5% of the numbers in 1973 as compared to about 2.7% in 1972. At the same time 5-year-olds increased from 19% in 1972 to 35% in 1973.

Because of increased numbers of 5- and 6-year-olds, higher values of F were estimated for these age-groups. The possibility that the 1967 and 1968 year-classes were especially abundant should be considered. This is not, however, indicated from research vessel survey data (Table 6) where 4- to 6-year-old yellowtail were in fact found to be much less abundant in 1973 than in 1972. While these estimates do have very large variances it seems reasonable to assume that abundant year-classes would show up in these surveys. Chekhova (Res. Doc. 74/54) also indicated lower abundance of yellowtail on the Grand Bank than in 1971 and 1972.

In light of these observations using a recruitment figure for 5-year-olds at the 1971-72 level in 1973 is probably optimistic so that projected removals for 1974 and 1975 are optimal. If the TAC of 40,000 tons is not removed in 1974 but the catch remain at the 1973 level, a TAC of not more than 35,000 tons could be available in 1975 with fishing at $F_{0.1}$ (0.60); however, if about 40,000 tons is taken, a TAC of not more than 32,000 tons could be recommended at $F_{0.1}$. These projected amounts of course assume recruitment at the 1972 level.

Partial recruitment rates used for 1974 and 1975 estimates are from the updated calculations using 1973 data. These rates were used to calculate yield per recruit curves and gave $F_{0.1}$ at 0.60 on a flat-topped curve (F_{max} = 1.8) as compared to $F_{0.1}$ at 0.70 using pre-1972 data (F_{max} = 2.0), both values 90-95% of the maximum yield.

An MSY of 35,000 tons was calculated using 1973 partial recruitment rates. The fact that catch per hour has remained fairly constant (Table 7) is an optimistic indicator; however, with a small number of year-classes involved consecutive year-class failures could obviously have a drastic effect on this stock.

The expansion of the stock could in part at least have been the result of favourable environmental conditions in the mid to late 1960's and more recent downward temperatures could have an opposite effect. The removal of the projected TAC's for 1974 and 1975 can probably only be achieved by continuing removing large numbers of small fish as in 1973. Male yellowtail are 50% mature at age 5 at an average size of 31.3 cm and females at approximately 6 years at 37.4 cm (Pitt, 1970); hence a considerable proportion of the catch is composed of immature fish.

Witch (Division 3NO) (Southern half of Grand Bank)

A proper assessment is still not available for this stock so that any recommendation for a TAC will have to be based on recent catch levels (Table 8). A TAC of 10,000 tons was recommended for 1974 and an amount similar to this or perhaps slightly higher at 12,000 tons could be considered for 1975 since up to 14,000 tons have been removed from this stock in a single year.

With increased sampling activity by the St. John's Station in 1974 an assessment probably will be available to recommend a TAC for 1976.

Witch (Subdivision 3Ps) (St. Pierre Bank)

As for 3NO no assessment is available. A TAC of 3000 tons was agreed to by the Commission for 1974 at the 1973 Meeting. A revision of the landings from this Subdivision (Summ. Doc. 74/25) and included in Table 9 suggests a potential removal level of up to 4000 tons.

Greenland halibut (Subarea 2 and Division 3K-3C)

A revision of the listing of nominal catches (Summ. Doc. 74/25) (Table 10) resulted in minor changes only in the list given in Res. Doc. 74/2 on which STACRES recommended a TAC of 30,000 tons for 1974. A TAC of 35,000 tons was agreed to by the Commission. The recommendation is that the TAC should remain at the level in 1975.

References

Pitt, T. K. 1970. Distribution, abundance and spawning of yellowtail flounder, Limanda ferruginea, in the Newfoundland area of the Northwest Atlantic. J. Fish. Res. Bd. 27 (12): 2261-2271.

Tables 1. Stock table (a) male and (b) female American plaice for Divisions 3LN (1971-75). Stock size and F's for 1971 calculated from modified virtual population model using 1968-73 catch data (all stocks and catches X 10^{-3}) M = 0.25 for males and 0.20 females.

		1971			1972			1973			1974			1975			$\bar{W}$
	Age	Stock	Catch	F	Stock	Catch	F	Stock	Catch	F	Stock	Catch	F	Stock	Catch	F	kg
a)	7	74341	3836	0.06	59380	3064	0.06	56783	2930	0.06	(64000)	2765	0.05	(64000)	2765	0.05	0.315
	8	49456	5732	0.14	54492	5336	0.12	43525	3196	0.09	41621	4503	0.13	(47424)	5132	0.13	0.350
	9	35207	7890	0.29	33482	6955	0.27	37763	2753	0.25	31120	6971	0.29	28469	5799	0.26	0.455
	10	21469	6312	0.40	20525	6987	0.48	19955	3879	0.25	27000	7277	0.36	18143	4736	0.33	0.609
	11	14814	3422	0.30	11207	5230	0.73	9893	3894	0.58	12153	4601	0.55	14661	5158	0.50	0.724
	12	3135	1251	0.59	8547	2813	0.46	4202	1655	0.58	4313	1530	0.55	5456	1919	0.50	0.800
	13	2100	750	0.51	1354	649	0.75	4205	1656	0.58	1832	703	0.55	1936	666	0.50	0.906
	14	755	184	0.32	983	472	0.76	503	198	0.58	1833	692	0.55	822	289	0.50	0.998
	15	538			427	129	0.37	354	137	0.58	219	83	0.55	823	289	0.50	1.133
	16					42											
	Total Caught (tons)		16000			17700			11700			16000			14700		
b)	8	125783	3371	0.03	79850	2140	0.3	110522	2962	0.03	(105000)	2814	0.03	(105000)	2814	0.03	0.351
	9	88488	5371	0.07	99998	3700	0.04	63481	3342	0.05	87864	3883	0.05	(83475)	3690	0.05	0.471
	10	58155	6903	0.14	67604	3920	0.07	78498	3910	0.06	49325	3443	0.08	(68446)	4777	0.08	0.615
	11	45172	6053	0.16	41406	4636	0.13	51853	4848	0.11	60678	5997	0.12	37290	3528	0.11	0.745
	12	44660	5654	0.15	31575	4435	0.17	29771	2590	0.10	38112	5868	0.18	42295	6010	0.17	0.878
	13	16633	3814	0.29	31485	4678	0.18	21850	3655	0.20	22060	3800	0.21	25954	4377	0.20	1.114
	14	14897	3337	0.28	10196	3248	0.43	21567	3710	0.21	14595	2827	0.24	14648	2630	0.22	1.199
	15	9695	3127	0.44	9206	1821	0.24	5434	1600	0.30	14320	3489	0.31	9414	2158	0.29	1.357
	16	5390	2059	0.54	5109	1746	0.47	5901	1953	0.45	3010	1049	0.48	5600	2846	0.45	1.499
	17	3192	878	0.36	2571	1529	0.65	2615	516	0.45	3080	1077	0.48	1526	505	0.45	1.799
	18	1567	685	0.65	1823	527	0.38	1097	363	0.45	815	383	0.48	1561	516	0.45	1.990
	19	659	360	0.90	669	256	0.54	1020	337	0.45	575	199	0.48	413	136	0.45	2.030
	20	287	120	0.61	219	128	0.50	319	105	0.45	532	185	0.48	290	96	0.45	2.130
	21		36	0.61	127	42	0.50	354	119	0.45							
	Total Caught (tons)		38200			32300			27100			32000			32700		

Table 2. Total catch, effort and catch per unit effort for plaice Divisions 3LNO. Catch/effort calculated from Canada (N) data.

Year	Totals		
	Catch	Effort ('000 hours)	C/Effort (Kg)
1964	38567	53.5	720
1965	53002	64.9	817
1966	64828	61.3	1056
1967	93891	128.4	731
1968	73056	130.5	560
1969	79437	156.7	507
1970	66645	155.3	429
1971	67888	175.9	386
1972	59361	157.5	377
1973*	47297	139.6	388.

*Preliminary figures.

Table 3. Plaice - Division 3M (Flemish Cap) - Nominal Catch

Year	Canada	Fra	Ice	Pol	Rom	Spa	USSR	UK	Total Stock
1963	14			108			51	20	179
1964				8			1831	37	1876
1965	19		2	216			4964	3	5204
1966				17			4003		4020
1967	57			63				2	121
1968	100						121		221
1969	12						113		125
1970							62		62
1971							1079		1079
1972				8	106	17	665	65	861
1973*	14	3		39			149		205

*Preliminary data.

Table 4. American plaice 3Ps - St. Pierre Bank and South Coast Nfld. - Nominal catch

	Canada							
Year	Inshore	Total	Fra	Pol	Rom	USSR	UK	Total Stock
1963		529	208				16	754
1964		1362	152				28	1542
1965		1849	162					2011
1966		2494	667			218		3379
1967		3273	533			678		4484
1968		5523	524			8233		14280
1969		4406	245			2180		6491
1970		11595	397			336		12328
1971		5953	820			409		7182
1972		5922	383		13	220		6538
1973*		9757	664	1		1424	35	11881

*Preliminary data.

Table 5. Stock table of yellowtail for Division 3LNO 1972-75 with calculated TAC, M = 0.30 (all stock and catches X 10^{-3})

	1972			1973			1974[a]			1975[a]			1974[b]		1975[b]			$\bar{W}$
Age	Stock	Catch	F	Stock	Catch	F	Stock	Catch	F	Stock	Catch	F	Catch	F	Stock	Catch	F	kg
5	132867	5604	0.05	(133000)	20970	0.20	(133000)	20881	0.20	(133000)	20881	0.20	22876	0.22	(133000)	20410	0.20	0.305
6	70078	12307	0.22	93667	23000	0.32	(80834)	19213	0.32	(80731)	19294	0.32	24654	0.43	(79135)	18834	0.32	0.452
7	48520	29031	1.11	41660	16100	0.58	47489	18805	0.60	(43962)	17199	0.60	23032	0.80	(38961)	15389	0.60	0.610
8	14046	12100	0.73	11450	4522	0.60	16955	6714	0.60	19328	7112	0.60	8223	0.80	15813	6246	0.60	0.725
9	3745	2650	1.36	3848	809	0.60	4660	1840	0.60	6900	2732	0.60	2260	0.80	5662	2236	0.60	0.842
10	2937	855	0.42	711	324	0.60	833	329	0.60	1896	751	0.60	404	0.80	1551	610	0.60	1.030
11	818	429	0.90	871	344	0.60	289	114	0.60	339	134	0.60	126	0.80	277	109	0.60	1.103
Total caught (tons)		39291	0.91		32849	0.60		33300	0.60		34536	0.60	40469	0.80		31956	0.61	

[a]Assuming TAC of 40,000 tons not taken in 1974

[b]Assuming TAC of 40,000 tons taken in 1974

Table 6. Estimation of population number of yellowtail from stratified random surveys of the Grand Bank Division 3L and 3N by the A. T. Cameron, (millions of fish)

Age	1971	1972	1973
3	1.63	4.18	0.35
4	20.03	32.61	4.32
5	46.66	64.13	28.98
6	88.53	71.45	38.52
7	88.44	36.46	40.59
8	12.81	13.99	15.59
9	4.09	1.46	6.15
10	0.62	0.73	0.47
Total	262.81	225.0	135.07

Table 7. Catch and effort data for yellowtail Divisions 3LNO. Catch/hour calculated from Canada (N) data.

Year	Catch (tons)	Effort (thousands of hours)	Total Catch/Hour (kg)	Main Species Catch/Hour (kg)
1969	15708	51.3	306	621
1970	26426	59.1	447	592
1971	37342	91.3	409	593
1972	39259	103.0	381	594
1973*	31611	73.5	430	635

*Preliminary figures.

Table 8. Nominal catches of witch Division 3NO 1963-72

Year	Canada	Fra	GDR	Pol	USSR	UK	Total Stock
1963	895	795			485	8	2183
1964	1055					11	1066
1965	1324				849	4	2177
1966	3644		4	16	3828	30	7522
1967	2863		20	29	8565	26	11503
1968	1503	18			9078		10599
1969	479	6	8		4215		4700
1970	723	1			6039		6763
1971	178	10		3	14774		14965
1972	3419	17			5738	3	9177
1973*	4653	39		9	1765	4	6470

*Preliminary figures.

Table 9. Nominal catches of witch, Subdivision 3Ps, 1963-72.

Year	Canada	Fra	USSR	UK	Total Stock
1963	771	131		22	924
1964	963			48	1011
1965	555			15	570
1966	1344		79	21	1444
1967	3790		982	33	4805
1968	2561	106	1464		4131
1969	2309	95	1691	1	4096
1970	2591	111			2702
1971	2193	57			2202
1972	1517	69			2250
1973 *	2623	139	372		3135

*Preliminary figures.

Table 10. Nominal catches of Greenland halibut Subarea 2 and Division 3KL, 1963-73.

Year	Canada	Den	FRG	GDR	Ice	Nor	Pol	Rom	Spa	USSR	Uk	Total
1963	776		10				691			125		1602
1964	1757		35	2396			1834			302		6324
1965	8082			1249			939			479		10749
1966	16209		355	1324			1114			242		19244
1967	16604		42	1415			3296			4287		25644
1968	13322		4	4122			5806			8732		31986
1969	11553		202	10014	1	38	5406			9268		36482
1970	10706		13	9158		660	8266	225		7384		36412
1971	9408			647	2		5234	7		9094		24392
1972	8952	970	86	402		1389	6986	120	3	10183	731	29822
1973*	6304	786	642	319		783	9060			7606	58	25558

*Preliminary figures.

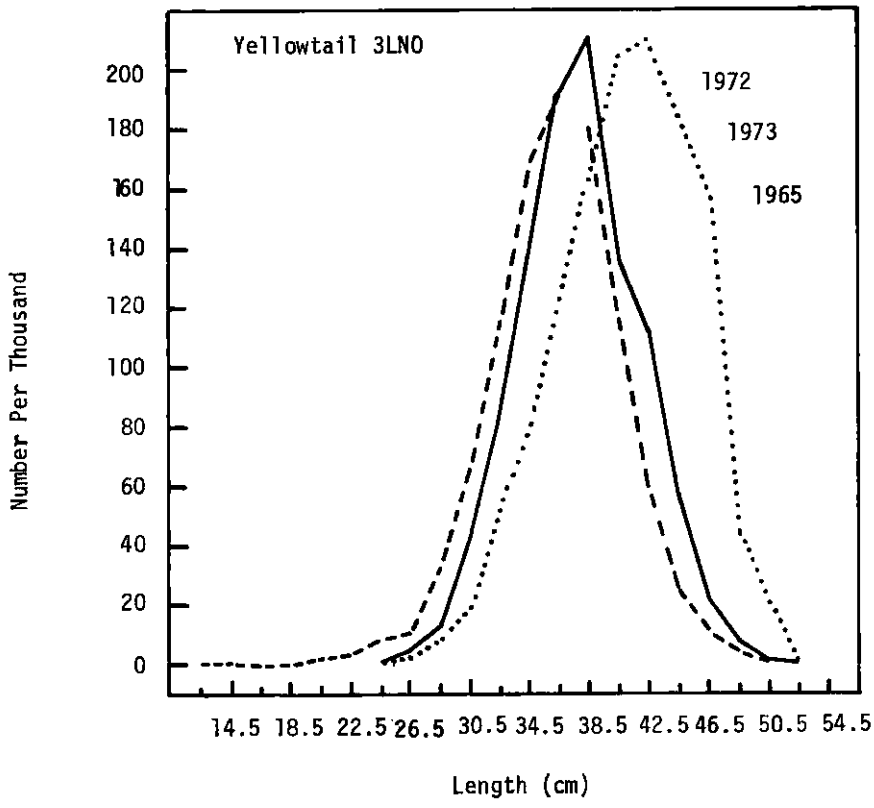

Fig. 1. Length frequencies of commercial yellowtail for Division 3LNO for 1965, 1973 and 1974.