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1981 Analyses of Offshore Cod Stock in Division 4X

by

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Abstract

Reported cod landings in Div. 4X were 31,000 metric tons in 1980 which is twice the catch for 1976. Due to misreporting of catch location, especially by the inshore fleet, catch separation between the two cod stocks in Div. 4X is difficult. Catch per unit of effort by Canadian fleet for offshore 4X cod was compared to abundance indices from Canadian research vessel survey. Results suggest that stock abundance of offshore cod is relatively stable and that fishing mortality remains high and almost twice the F_{max} of 0.35. It is suggested that catch should stay at a minimum level in 1982.

Résumé

Les captures de morue dans la Div. 4X ont presque doublé depuis les cinq dernières années, atteignant 31,000 tonnes métriques en 1980. La localisation des captures, spécialement celles effectuées par la flotte côtière, n'étant pas rapportée fidèlement, il est difficile de partager les prises entre les deux stocks de morue à l'intérieur de la Div. 4X. Les captures par unité d'effort de la flotte canadienne pour la morue du large furent comparées à l'indice d'abondance calculé à partir des données des campagnes d'échantillonnage scientifique. Ces résultats suggèrent que la population de morues du large est relativement stable alors que la mortalité par la pêche demeure cependant très élevée, soit presque le double du F_{max} de 0.35. Il est suggéré que la prise devrait demeurer minimale en 1982.

Introduction

Cod in Div. 4X may be assigned to different stocks. Tagging information has shown that cod on the offshore banks (Browns - LaHave) mix little with the inshore component (southwest Nova Scotia - Bay of Fundy) but may interchange with those on George's Bank (Halliday, 1973). Traditionally, the Div. 4X cod fishing has been an inshore fishery, but the introduction of large trawlers during the 1960's increased the offshore cod landings to an estimated 18,000 metric tons in 1969. Serious over-exploitation of this stock has been previously indicated (Halliday, 1974; Sinclair, 1980). Quota restrictions were imposed on "offshore" cod for 1975 at a TAC level of 5,000 mt and since 1976, the TAC level was kept as low as possible (0-4,000 mt).

Nominal Catch

Reported cod landings in Div. 4X increased from 12,000 mt in 1958 to 35,500 mt in 1968, then stabilized around 22,000 mt during the 1970's (Table 1). In 1979 total landings increased again and reached 31,000 mt in 1980. Since 1976, over 95% of the total catch has been landed by the Canadian fishery. Estimating landings for the offshore stock is very difficult. Offshore catches were obtained by assigning all foreign landings from 4X and all Canadian landings from subdivisions 4X-N and 4X-P (Figure 4). Catches taken from 4X-0 by vessels over 25 gross tons were also assigned to the offshore component (Table 2). It is also well known from MFD port technicians that vessels under 25 gross tons are fishing offshore in Div. 4X and even in Div. 5Z during the summer months (May to October). As these vessels are not required to maintain fishing log records, it is almost impossible to assign what portion of their landings are coming from offshore banks. So, the estimated offshore catches (Table 2) are probably under-estimated while total 4X landings are probably over-estimated. However, assuming that these estimates are indicative of landing trends from the offshore stock, it appears that landings declined from 18,000 mt in 1969 to 3,900 mt in 1976 and then increased again to about 8,000 mt from 1978 (Table 2, Figure 1). During the same period of time, the proportion of catch taken by otter-trawls decreased from 90% in 1968 to 28% in 1974 and increased to 58% by 1980 (Table 3). The longlines took the rest of the catch. The reduction in the catch and the associated change in the fishing gear were both the result of quota restrictions imposed on haddock fishing in Div. 4X.

Canadian Research Survey

The area of distribution of the offshore cod stock is approximated by Strata 70-85 inclusive from summer Canadian research surveys. Estimates of numbers at age (Table 4, Figure 2) indicate a decline of the stock from 1974 to 1978. In 1979 and 1980, population estimates are higher than in 1978, but are still low. Biomass estimates were also higher during the last 2 years due to the higher proportion of older fish in the catch.

The total mortality has decreased substantially during the last two years, but the average value during the last five years is well over the F_{\max} of 0.35 (Halliday, 1974).

Catch Per Unit Effort

As most of the catch was taken by otter-trawls of tonnage class 4 and by longlines of tonnage class 3, the average monthly catch per unit effort where cod represented more than 50% of the total reported catch was calculated for these two gears and compared with the catch rate of the research survey cruises (Table 5, Figure 3). Although, some discrepancies between these estimates are evident, they indicate a relatively stable situation.

References

- Halliday, R.G. 1973. Notes on the status of cod and haddock stocks of the Scotian Shelf. ICNAF Res. Doc. 73/7, 18 p.
- Halliday, R.G. 1974. A virtual population assessment of the Div. 4X offshore cod stock. ICNAF Res. Doc. 74/25, 9 p.
- Sinclair, A. 1980. Research survey population estimates for 4X offshore cod. CAFSAC Res. Doc. 80/46, 2 p.

Table 1. 4X cod nominal catches (mt) by country, 1958-79.

Year	Canada	Spain	USSR	USA	FRG	France	Japan	UK	Others	Total	% Canada (M&Q)
1958	11074			1147						12221	90.6
1959	12866			862						13728	93.7
1960	12123			1605						13728	88.3
1961	12423	2	9	1261						13965	90.7
1962	14549	3	80	1197						15829	91.9
1963	15790	1	684	1301	9					17785	88.8
1964	21067		2922	1413	338			7	8	25755	81.8
1965	24221	144	1553	871	125					26914	90.0
1966	24164	803	4961	966					5	30899	78.2
1967	27814	2536	667	1445						32462	85.7
1968	30770	2829	1061	859		24				35543	86.6
1969	24056	8217	1	448		3			1	32726	73.5
1970	17994	3647	10	499			152			22302	80.7
1971	20181	2615	337	239			6			23378	86.3
1972	20479	1547	30	323	2					22381	91.5
1973	20002	1519	562	136			5			22224	90.0
1974	19005	1640	119	385	15	5		2		21171	89.8
1975	19493	900	207	483	3				5	21091	92.4
1976	16138	175		341					3	16657	96.9
1977	21884		4	760		185				22833	95.8
1978	23348		6	279	2		3		1	23639	98.8
1979	28337			48			1			28386	99.8
1980	30995										

Table 2. Nominal catch (mt) of "offshore" cod in Div. 4X, 1968-1980

Year	Canada (M & Q)			Canada Nfld.	Foreign	USA	Total Offshore
	4XP	4XN	4XO				
1968	9335	2061	916		3914	859	17085
1969	5520	2923	924		8222	448	18037
1970	2305	1301	1251		3809	499	9165
1971	2157	1725	1156		2958	239	8235
1972	1418	1581	1710		1579	323	6611
1973	1173	1473	1451		2086	136	6319
1974	943	1127	1057		1781	385	5293
1975	1033	1379	962		1115	483	4972
1976	737	1403	1237		178	341	3896
1977	1488	1701	1224		189	760	5362
1978	3593	2802	1384	10	12	279	8080
1979	1746	2693	1535	28	1	48	6051
1980	1565	3509	1918	420	N.A.	N.A.	7412

Table 3. Nominal catch (mt) of "offshore" cod in Div. 4X (NOP) by gear type for Canadian (M&Q) fishery, 1968-80.

Year	Otter trawls %	Longlines %	Others %	Total
1968	11095 (90)	1181 (9)	36 (1)	12312
1969	8265 (88)	1092 (12)	10	9367
1970	3339 (69)	1153 (24)	365 (7)	4857
1971	2953 (59)	1994 (39)	91 (2)	5038
1972	3167 (67)	1467 (31)	75 (2)	4709
1973	1662 (41)	2435 (59)		4097
1974	867 (28)	2260 (72)		3127
1975	1298 (38)	2054 (61)	22 (1)	3374
1976	1708 (51)	1504 (44)	165 (5)	3377
1977	2034 (46)	2289 (52)	90 (2)	4413
1978	3880 (54)	3056 (42)	267 (4)	7203
1979	3410 (57)	2444 (41)	120 (2)	5974
1980	4080 (58)	2851 (41)	61 (1)	6992

Table 4. Div. 4X offshore cod: Research survey estimates of population numbers at age ($\times 10^{-3}$) and estimated mortality (Strata 70-85 inclusive).

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
0	-	-	-	-	190	-	-	-	27	-	-
1	891	286	19	74	115	225	143	87	164	176	-
2	1588	7604	1320	2040	593	705	628	1620	438	1148	365
3	2660	4265	2871	1188	4186	999	1998	2887	1504	472	2295
4	4375	574	1988	1972	664	2264	1968	1432	1449	1502	968
5	1935	1465	413	696	1820	1780	1485	611	864	1116	1055
6	2610	638	414	218	927	908	456	753	190	561	1456
7	1148	855	95	101	167	628	189	199	234	438	377
8	578	28	385	59	-	150	99	248	31	293	182
9	202	-	214	116	-	144	-	53	-	30	74
10	110	-	99	40	-	32	42	-	-	72	-
11	16	-	3	34	8	194	15	-	-	66	59
12	-	-	3	7	-	140	-	14	-	-	-
13+	-	-	161	24	151	9	7	40	-	60	-
Total	16112	15715	7985	6567	8820	8177	7032	7943	4900	5934	6831
Biomass (t)	43890	19090	21010	15190	22630	22560	19268	18899	11624	21587	20744
\bar{Z} 4+/5+	1.30	.69	1.07	.06	-0.06	1.00	.80	.93	.05	.26	
\bar{Z} 5+/6+	1.47	.78	1.09	.03	.33	1.60	.56	1.44	-.14	.20	
\bar{Z} 6+/7+	1.66	1.58	1.28	.61	-.04	1.83	.38	1.60	-.75	-.15	
							\bar{Z} 4+/5+	\bar{Z} 5+/6+	\bar{Z} 6+/7+		
				1970-80:			.61	.74	.80		
				1975-80:			.61	.73	.58		

Table 5. Div. 4X cod: catch rates for Canadian (M&Q) otter trawls (mt/hr) and longlines (mt/line) and for Canadian Research Survey (kg/tow).

Year	Otter Trawls - TC-4 (June-August)	Longlines TC-3 (Sept-Dec)	Research Survey July
1970	.254	.297	30.18
1971	.116	.219	13.12
1972	.259	.190	13.46
1973	.206	.170	10.45
1974	-	.123	15.55
1975	.200	.183	15.52
1976	.137	.173	11.35
1977	.452	.316	13.00
1978	.287	.255	7.99
1979	.194	.166	13.88
1980	.206	.229	14.26

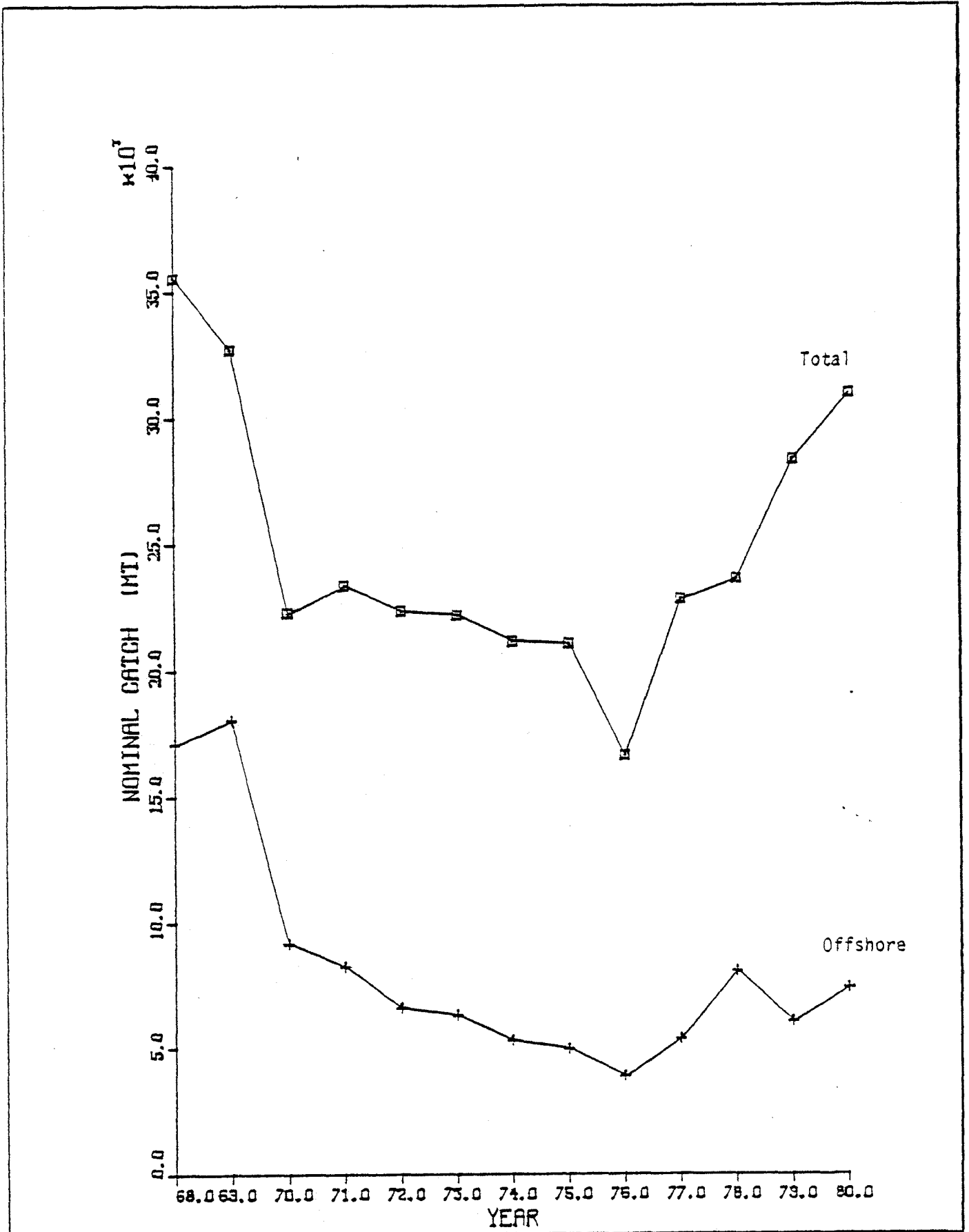


Figure 1. Division 4X cod: Nominal catch (mt), 1968-80.

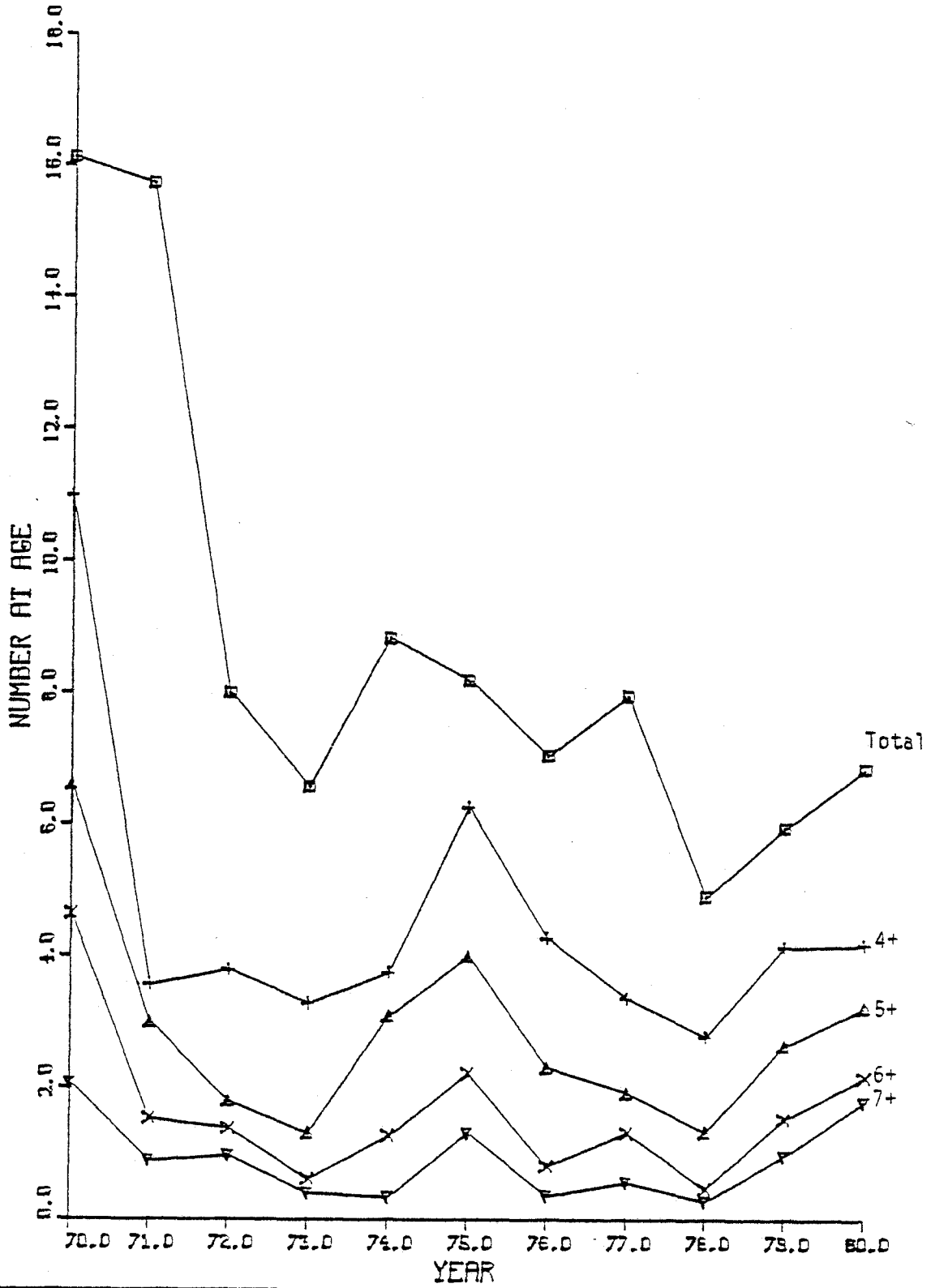


Figure 2. Division 4X cod: Research survey population estimates (Strata 70-85), 1970-80.

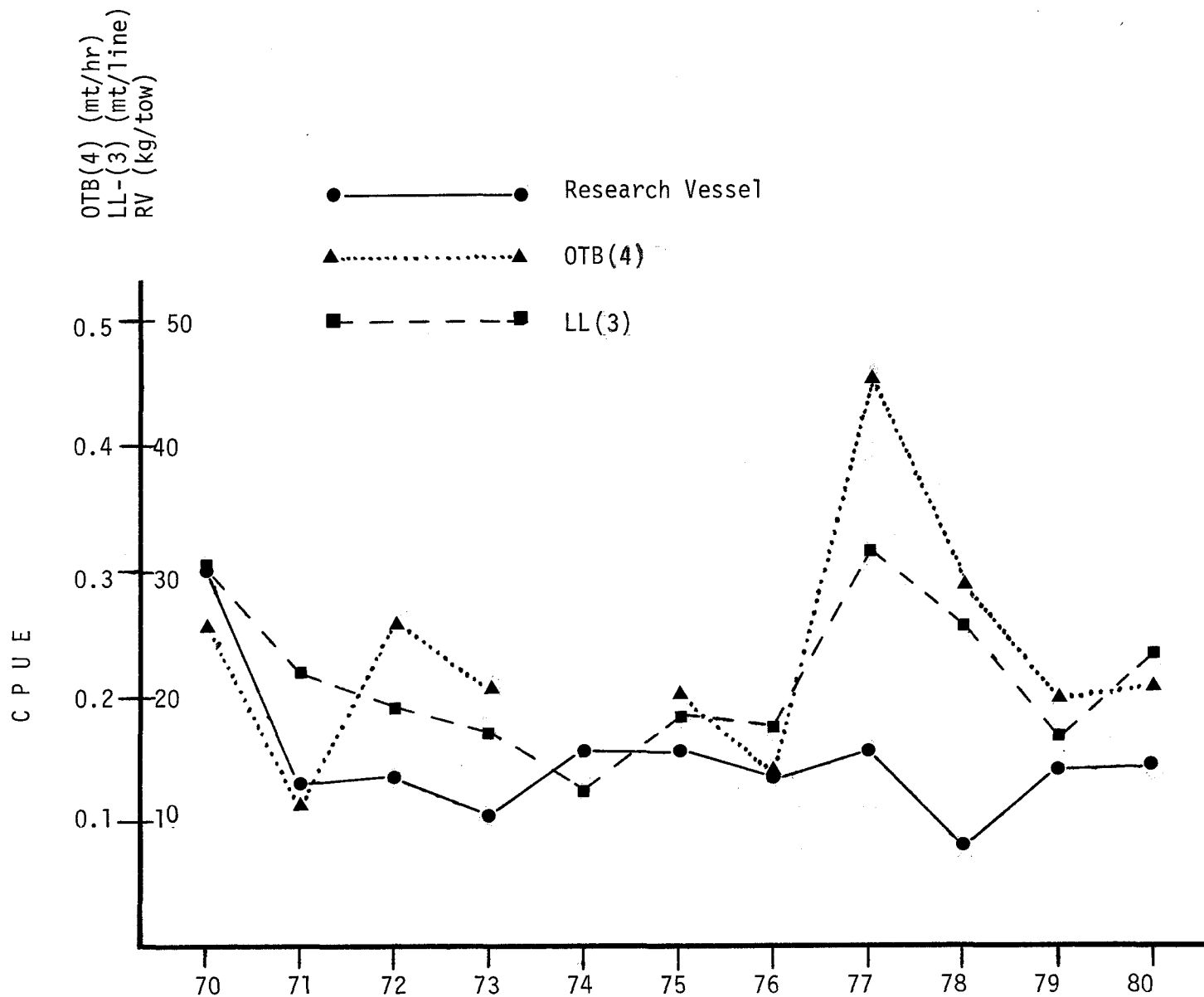


Figure 3. Offshore 4X cod: CPUE to otter trawls of tonnage class 4 (mt/hr) and to longlines of tonnage class 3 (mt/line) and to research survey (kg/tow), 1970-80.

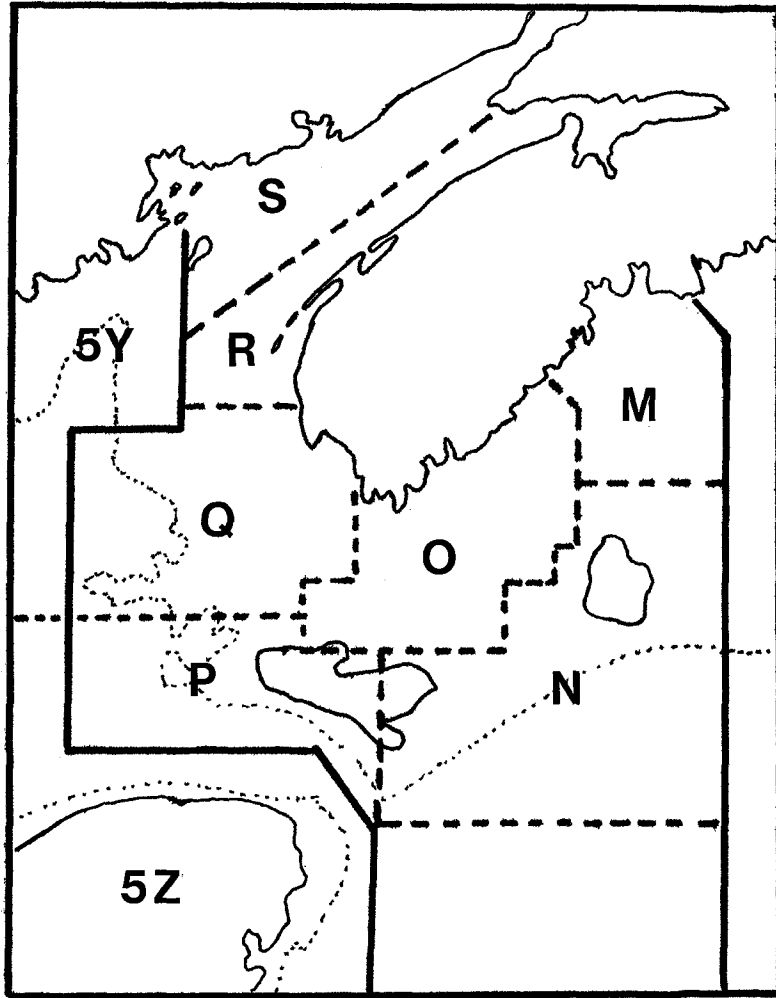


Figure 4. Map showing the seven subdivisions (M to S) within Division 4X.