

Northwest Atlantic



Fisheries Organization

Serial No. N816

NAFO SCR Doc. 84/VI/31

SCIENTIFIC COUNCIL MEETING - JUNE 1984

Redfish in NAFO Divisions 3LN

by

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INTRODUCTION

The data available for this stock are very limited. The present TAC is 25,000 t and the long-term average catch is about 22,000 t. In recent years, the general production model has not been used since regressions of CPUE on effort are not significant without the anomalous 1968 and 1974 points. Catch curves based on a Canadian research survey to the area in 1979 suggested fishing at an F of about 0.12.

METHODS AND RESULTS

From the mid-1970's on, Canada has taken the majority of the landings in Div. 3L (Table 1a) while the USSR has predominated in the fishery in Div. 3N (Table 1b). The fishery is prosecuted throughout the year (Tables 2a, 2b) in both Divisions. A summary of historical catches (Table 3) indicates that in most years the greatest proportion of redfish is taken in Div. 3N. The catches for the stock area are summarized in Fig. 1.

The multiplicative model (Gavaris 1980) was used to standardize the catch rate series to 1959. Categories of vessel class-country-gear, month, and Divisions were used in an unweighted regression. The results (Table 4) indicate significance and the resultant standardized CPUE and effort are shown in Table 5 and Fig. 2 and 3. Effort has remained fairly constant since the mid-1970's but the catch rate approximately doubled between 1979 and 1980 but has remained reasonably stable since. Except for this increase between 1979 and 1980, and the anomalously low 1968 and 1974 points, the catch rates have remained quite stable throughout the history of this fishery. Regressions of CPUE on effort with and without the 1968 and 1974 points (Tables 6a and b) indicate that the past problems with correlation still exist and the general production model is still not feasible.

The commercial frequencies available from the 1983 fishery (Fig. 4-8) are reflective of the fact that the majority of the Canadian fishery is conducted in 3L. These all indicate fish of 25-35 cm predominating in the catches from Div. 3L. The smaller fish recorded by the USSR (Fig. 7) were also present in their Div. 3N sample suggesting that fishing was taking place in the vicinity of the 3L-3N boundary.

There are no new research data available for this stock.

DISCUSSION

The overall lack of data precludes any indepth analysis of this stock. Except for the sudden jump in catch rates between 1979 and 1980, the catch rates have shown remarkable stability over the history of this fishery. Whether the sudden increase in 1980 to a higher, possibly stable level is due to an increase in stock biomass or some other reason is unknown at present but sudden increases of this magnitude in redfish biomass are not to be expected. There is nothing in the limited data to suggest pessimism concerning this stock. The data do not suggest a change in the 1985 TAC from the present level of 25,000 t.

REFERENCES

Gavaris, S. 1980. Use of a multiplicative model to estimate catch rate and effort from commercial data. *Can. J. Fish. Aquat. Sci.* 37: 2272-2275.

Table 1a. Division 3L redfish catches by country and year.

Country	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Canada (MQ)	31	7	1	-	1,671	1,671	18	934	554	1,696	1,003
Canada (N)	158	286	165	1,827	4,195	7,686	3,143	4,086	2,412	5,925	5,910
France (M)	-	-	2	6	13	6	45	4	3	-	-
France (SP)	-	-	3	-	4	-	8	-	11	-	-
FRG	17	366	50	-	29	-	-	7	-	-	-
GDR	343	261	-	-	744	144	918	168	375	509	12
Japan	29	-	-	-	-	87	522	-	26	128	181
Poland	94	183	397	-	81	-	-	4	2	-	-
Portugal	1,112	2,662	590	1,245	1,534	299	261	265	639	275	125
Romania	8	5	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	141	8	-	-	137	25
UK	102	93	171	120	9	4	-	2	-	-	-
USSR	1,201	845	10,040	640	7,691	3,231	1,395	114	345	737	607
Ireland	-	-	-	-	-	160	-	-	-	-	-
Den-G-F	-	1	-	-	-	-	-	-	-	-	-
Cuba	-	-	-	-	-	23	-	-	-	-	-
Kor-S	-	-	-	-	-	-	-	-	-	-	29
Total	3,095	4,709	11,419	3,838	15,971	13,452	6,318	5,584	4,367	9,407	7,892

Table 1b. Division 3N redfish catches by country and year.

Country	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Bulgaria	116	-	-	-	-	-	-	-	-	-	-
Canada (M)	6	-	-	5	307	43	1	198	683	442	-
Canada (N)	249	71	34	48	320	137	18	1,285	367	63	337
France (M)	-	-	-	-	-	-	-	25	-	-	-
France (SP)	2	-	-	-	-	-	-	-	-	-	-
FRG	-	-	-	-	-	-	12	-	-	-	-
GDR	3	-	-	-	-	-	11	-	-	58	-
Poland	-	23	-	19	-	-	-	-	-	-	-
Portugal	-	115	20	104	-	-	-	-	-	-	1
Japan	31	1,984	24	-	-	-	-	-	-	-	-
Romania	2	-	-	-	-	-	-	9	-	-	-
Spain	-	-	-	-	-	59	1	-	14	239	278
UK	-	3	454	-	-	-	-	-	-	-	-
USSR	25,429	26,392	10,335	13,857	3,914	2,645	4,532	5,904	8,944	12,762	1,044
Cuba	-	-	-	-	-	180	1,150	1,062	1,644	1,309	2,621
USA	-	-	-	-	-	-	-	-	11	-	-
Kor-S	-	-	-	-	-	-	-	-	-	-	26
Total	25,838	28,588	10,867	14,033	4,541	3,064	5,725	8,483	11,663	14,873	13,677

Table 2a. Division 3L redfish catches by month and year.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Unknown	Total
1972	52	184	996	160	12	96	231	57	47	51	93	4	1,112	3,095
1973	17	834	423	225	277	521	428	739	632	303	293	16	1	4,709
1974	251	846	557	1,094	2,040	2,528	1,458	343	443	472	675	712	-	11,419
1975	112	87	226	169	126	358	309	160	353	1,095	738	105	-	3,838
1976	33	833	3,916	2,324	578	1,290	2,205	537	815	2,122	954	364	-	15,971
1977	170	275	1,764	1,034	498	920	2,016	1,339	820	2,069	1,406	981	160	13,452
1978	41	535	301	356	466	669	272	48	19	224	933	2,454	-	6,318
1979	76	1	1,084	1,391	116	132	492	466	5	22	1,290	509	-	5,584
1980	271	112	396	119	373	261	80	10	718	311	22	1,694	-	4,367
1981	280	61	137	1,120	2,286	532	73	90	404	161	1,980	2,283	-	9,407
1982	1,130	671	1,251	1,225	289	281	459	37	639	1,299	138	348	125	7,892

Table 2b. Division 3N redfish catches by month and year.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Unknown	Total
1972	6	5	844	-	1,215	2,189	2,724	3,407	6,769	6,455	1,538	686	-	25,838
1973	2	38	208	1	24	501	7,789	11,536	6,419	1,732	246	43	-	28,588
1974	167	471	512	982	1,947	2,417	1,481	321	615	646	629	679	-	10,867
1975	-	700	3,002	640	970	1,023	1,284	947	3,716	1,453	136	162	-	14,033
1976	645	721	475	828	755	301	298	27	146	284	61	-	-	4,541
1977	454	91	1,383	305	47	135	390	217	22	1	19	-	-	3,064
1978	1	1,230	1,806	875	390	794	32	343	-	12	23	219	-	5,725
1979	3,693	1,177	562	1	1,091	21	563	804	248	98	155	70	-	8,483
1980	3,561	2,798	2,269	121	368	833	81	422	1,085	122	2	1	-	11,663
1981	6,293	3,657	877	78	77	145	1,035	1,577	413	273	208	240	-	14,873
1982	3,042	1,970	2,919	1,141	243	100	580	3,156	485	21	12	7	1	13,677

Table 3. Summary of redfish catches in Divisions 3LN.

Year ^a	3L	3N	Total	TAC
1959	34,107	10,478	44,585	
1960	11,463	16,547	28,010	
1961	8,349	14,826	23,175	
1962	3,425	18,009	21,434	
1963	8,191	12,906	21,097	
1964	3,898	4,206	8,104	
1965	9,451	4,042	13,493	
1966	6,927	10,047	16,974	
1967	7,684	19,504	27,188	
1968	2,348	15,265	17,613	
1969	927	22,142	23,069	
1970	1,029	13,359	14,388	
1971	10,043	24,310	34,353	
1972	3,095	25,838	28,933	
1973	4,709	28,588	33,297	
1974	11,419	10,867	22,286	28,000
1975	3,838	14,033	17,871	20,000
1976	15,971	4,541	20,512	20,000
1977	13,452	3,064	16,516	16,000
1978	6,318	5,725	12,043	16,000
1979	5,584	8,483	14,067	18,000
1980	4,367	11,663	16,030	25,000
1981	9,407	14,803	24,280	25,000
1982 ^a	7,892	13,677	21,569	25,000
1983 ^a			22,221	25,000

^aProvisional

Table 4. Regression of multiplicative model for Div. 3LN redfish.

MULTIPLE R.....0.849
 MULTIPLE R SQUARED.....0.721

ANALYSIS OF VARIANCE				
SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	8.088E0	8.088E0	
REGRESSION	35	8.726E1	2.493E0	32.634
TYPE 1	6	2.073E1	3.454E0	45.216
TYPE 2	4	9.006E0	2.252E0	29.472
TYPE 3	1	3.111E0	3.111E0	40.721
TYPE 4	24	1.432E1	5.968E-1	7.812
RESIDUALS	441	3.369E1	7.640E-2	
TOTAL	477	1.290E2		

Table 5. Predicted relative power of CPUE and effort for Div. 3LN redfish.

YEAR	TOTAL CATCH	PROP.	RELATIVE POWER		EFFORT
			MEAN	S.E.	
1959	44585	0.502	1.000	0.000	44585
1960	28010	0.131	0.814	0.083	34408
1961	23175	0.226	0.919	0.096	25228
1962	21434	0.404	0.944	0.091	22710
1963	21097	0.511	0.870	0.084	24261
1964	8104	0.397	0.833	0.090	9731
1965	13493	0.210	0.800	0.099	16868
1966	16974	0.214	0.989	0.122	17166
1967	27188	0.086	0.992	0.144	27412
1968	17613	0.022	0.346	0.066	50892
1969	23069	0.824	0.903	0.065	25556
1970	14388	0.339	0.826	0.084	17415
1971	34353	0.350	0.716	0.057	47997
1972	28933	0.791	0.977	0.071	29623
1973	33297	0.080	0.929	0.184	35853
1974	22286	0.003	0.244	0.092	91497
1975	17871	0.550	0.977	0.073	20385
1976	20512	0.454	0.726	0.060	28263
1977	16516	0.549	0.853	0.074	19354
1978	12043	0.642	0.617	0.052	19504
1979	14067	0.647	0.682	0.060	20619
1980	16030	0.588	1.169	0.112	13718
1981	24280	0.425	1.305	0.125	18610
1982	21569	0.585	1.105	0.099	19528
1983	22221	0.145	1.256	0.184	17690

AVERAGE C.V. FOR THE MEAN:0.114

Table 6a. Regression of CPUE on effort, including 1968 and 1974, for 3LN redfish.

CORRELATION MATRIX (WITH T-VALUES)

1.00000	-0.65301
-4.13516	1.00000

MEAN OF DEPENDENT VARIABLE 0.86768

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		1.12705	0.07284	15.47367
1	27.95492	-0.00928	0.00224	-4.13516

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1	18.82171		
REGRESSOR;X 1	1	0.58612	0.58612	17.09951
RESIDUAL	23	0.78837	0.03428	
TOTAL	25	20.19620		

COEFFICIENT OF DETERMINATION (R*2).....	0.4264269497
CORRECTED R*2 (R*2).....	0.4014889910
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(1, 23)	17.0995130237
STANDARD ERROR OF THE ESTIMATE.....	0.1851403816
DURBIN-WATSON STATISTIC.....	1.1069077581
COEFFICIENT OF VARIATION (AT THE MEAN OF Y),.(%/o)	21.3374033747

Table 6b. Regression of CPUE on effort, excluding 1968 and 1974, for 3LN redfish.

CORRELATION MATRIX (WITH T-VALUES)

1.00000	-0.20482
-0.95892	1.00000

MEAN OF DEPENDENT VARIABLE 0.91748

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		1.00910	0.10213	9.88039
1	24.19496	-0.00379	0.00395	-0.95892

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1	19.36063		
REGRESSOR;X 1	1	0.02753	0.02753	0.91954
RESIDUAL	21	0.62879	0.02994	
TOTAL	23	20.01695		

COEFFICIENT OF DETERMINATION (R*2).....	0.0419504933
CORRECTED R*2 (R*2).....	-0.0036709118
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(1, 21)	0.9195353189
STANDARD ERROR OF THE ESTIMATE.....	0.1730390199
DURBIN-WATSON STATISTIC.....	0.8845888959
COEFFICIENT OF VARIATION (AT THE MEAN OF Y),.(%/o)	18.8602855554

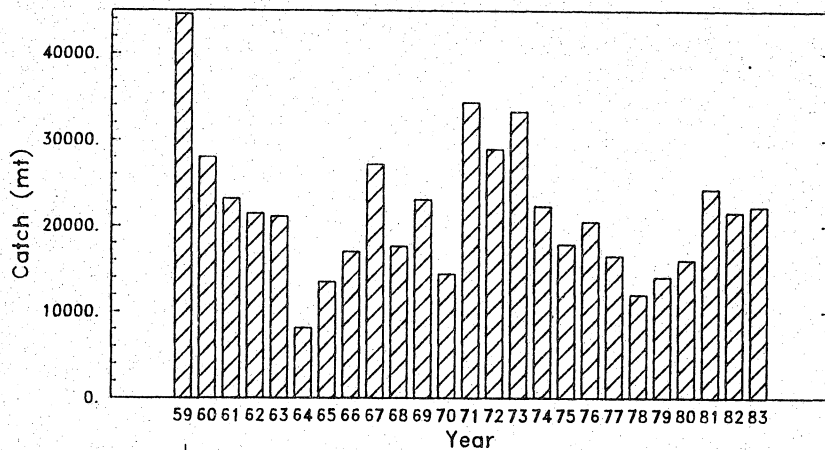


Fig.1: Nominal catches of redfish from Div. 3LN, 1959-1983. (1983 Provisional)

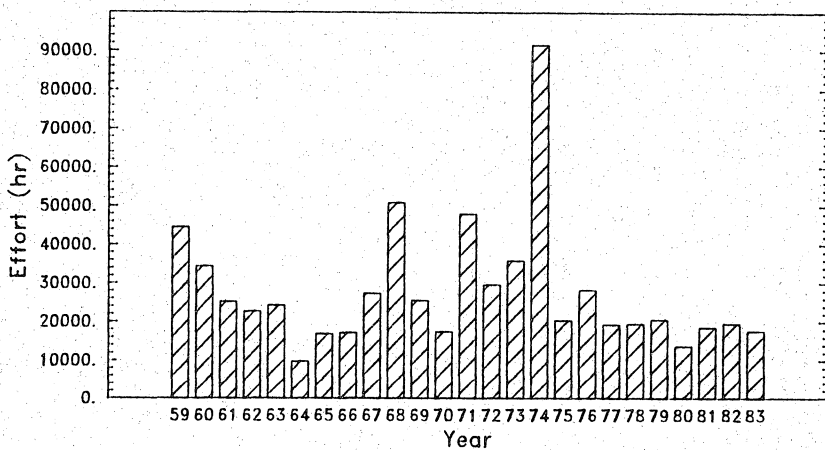


Fig.2: Standardized directed effort for redfish, Div. 3LN, 1959-1983. (1983 Provisional)

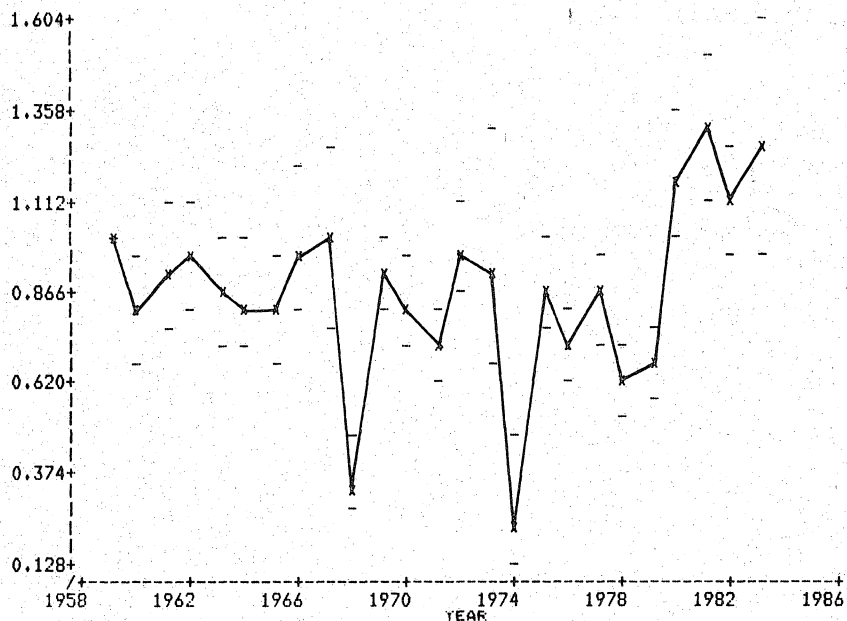


Fig. 3: Standardized catch rates for Div. 3LN redfish.

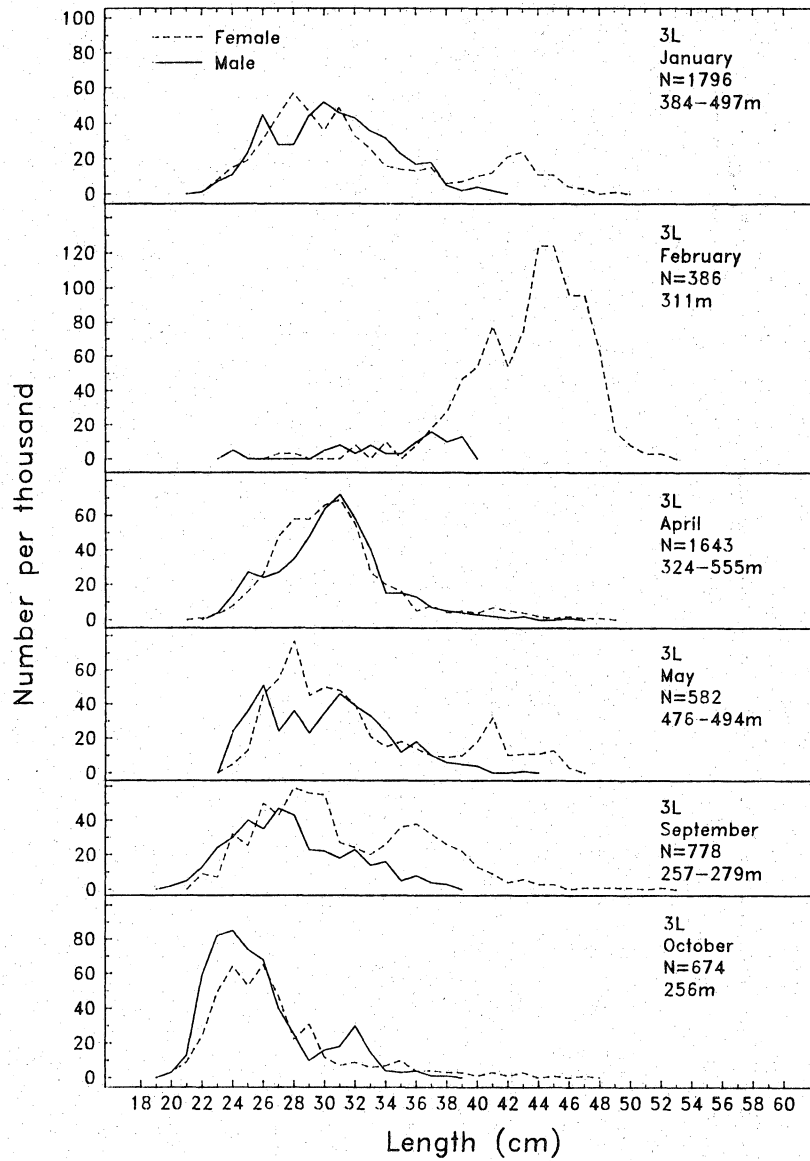


Fig.4: Commercial frequencies from Canadian (Nfld.) otter trawl redfish fishery in Div. 3L in 1983 (port sampling).

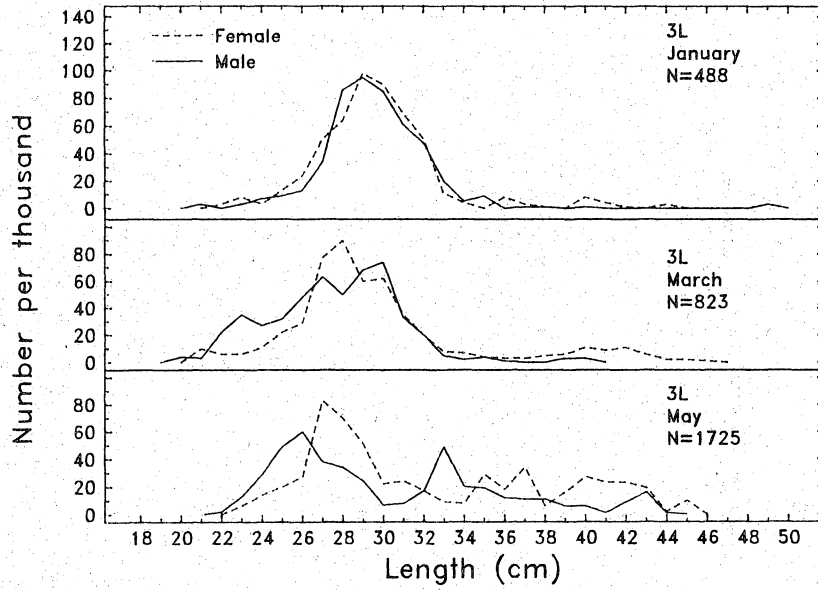


Fig.5: Commercial frequencies from Canadian (Nfld.) otter trawl redfish fishery in Div. 3L in 1983 (FCR sampling).

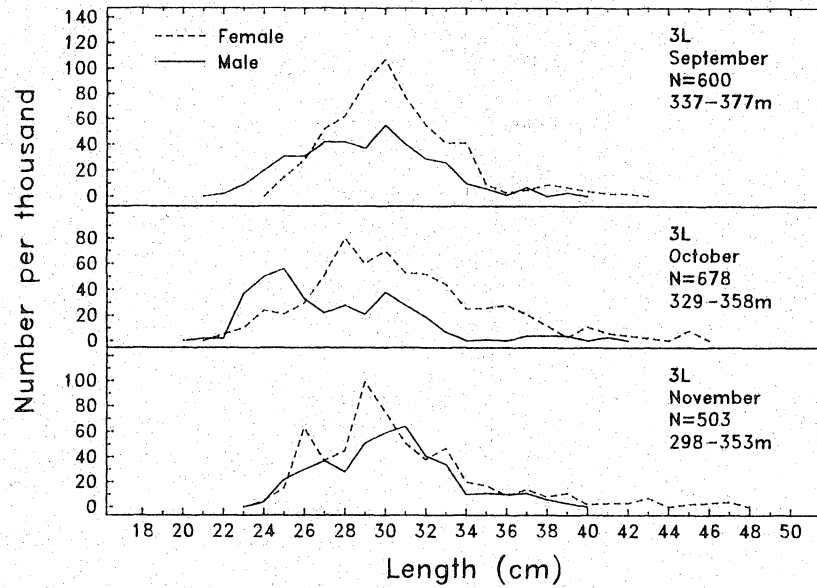


Fig.6: Commercial frequencies from Canadian (Maritimes) otter trawl redfish fishery in Div. 3L in 1983 (port sampling).

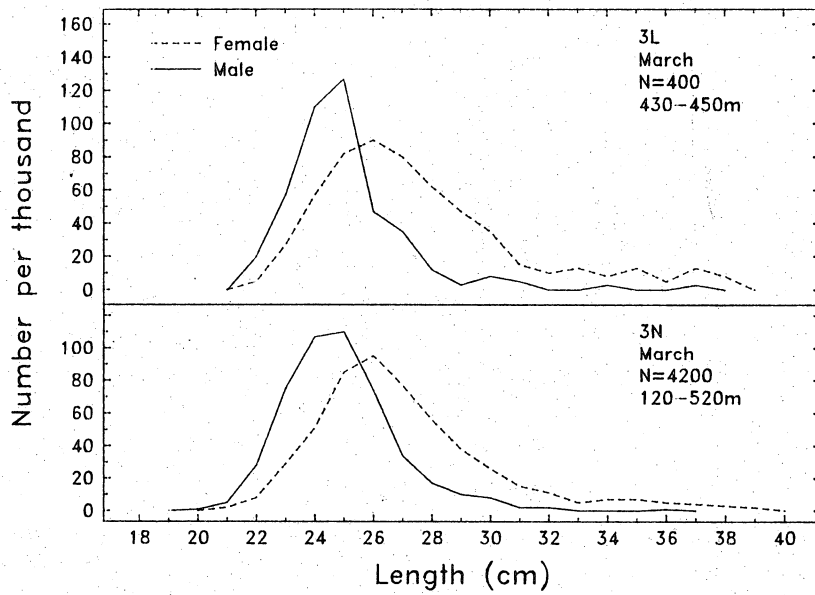


Fig.7: 1983 USSR commercial frequencies (total length) of redfish from Div. 3LN (otter trawl).

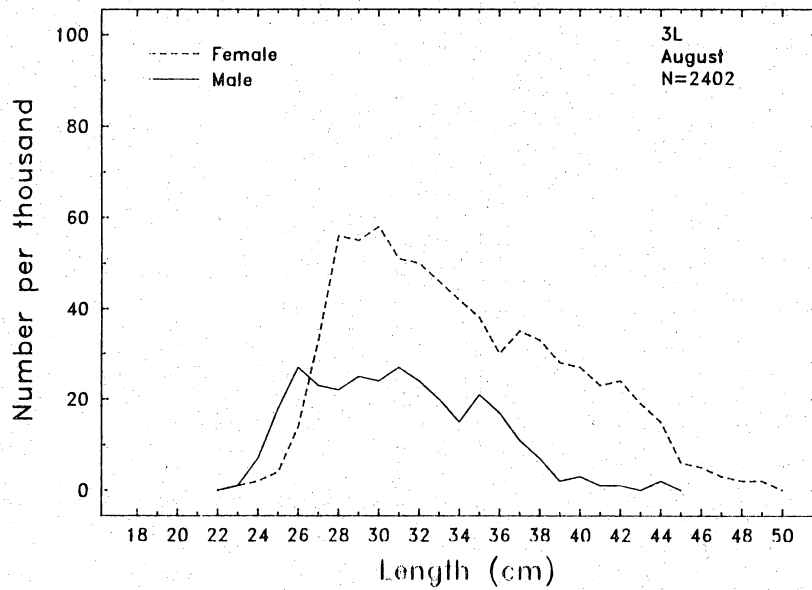


Fig.8: Commercial frequencies from G.D.R. otter trawl redfish fishery in Div. 3L in 1983 (FCR sampling).

