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### **The Redfish of NAFO Division 3Ø**

by

D.B. Atkinson  
Fisheries Research Branch  
Department of Fisheries and Oceans  
P.O. Box 5667  
St. John's, Newfoundland A1C 5X1

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### Abstract

Canadian landings from this stock have decreased from the mid 1970's. The catch rates, while showing considerable year to year fluctuation, have gradually increased since the early 1970's. The few commercial frequencies available indicate that the fishery is still concentrated on smaller fish than those taken from other stocks. It is assumed that a reserve of larger fish exists in deeper water.

### Résumé

Les débarquements canadiens de ce stock ont diminué depuis le milieu des années 70. Les quantités des prises, bien que présentant de considérables fluctuations d'année en année, ont augmenté graduellement depuis le début des années 70. Les quelques fréquences commerciales disponibles indiquent que la pêche est encore plus concentrée sur les petits poissons que sur d'autres stocks. On suppose qu'il y a une réserve de gros poissons dans les eaux profondes.

### Introduction

Since 1973, nominal catches have ranged between about 7,000 and 18,000 t. The TAC's have not been achieved since 1978. In 1983, only 36% of the quota was taken while in 1984, provisional statistics indicate that about 45% was taken. There remains a lack of sufficient data to carry out any analytical assessment for this stock.

### Methods and Results

Again in 1984, the USSR dominated this fishery (Table 1). Canadian landings were up only during the period 1976-1981, a time roughly corresponding to one of low cod abundance and reasonably good redfish markets. The catches have fluctuated considerably over the past 26 years (Fig. 1). Fishing was conducted throughout the year (Table 2) but tended to be greater in the first three quarters. This trend does not differ from the historic pattern.

In preparing this update, the historic catch/effort database was totally re-examined. First, the participating country-gear-TC's were re-evaluated and modifications to the inclusion list made. Second, the corrected Maritimes data have been included and last, although residual plots did not reveal any systematic biases with catches or effort less than 10, these were deleted as the regression results were much improved without them. It is thought that the considerable variability of these low values caused a lowering of the F values and correlation coefficient. Only catches comprising >50 % redfish were used and the data were weighted step-wise by effort.

The corrected version of the multiplicative model (corrected F's) (Gavaris MS 1980) was run and instead of determining relative catch rates, the actual values were determined. The results (Table 3) indicate significance. Type 1 is country-gear-TC and type 2 is year. The catch rates (Table 4, Fig. 3) indicate a gradual increase since about the mid-1970's. There has been a decrease in effort in recent years (Table 4, Fig. 2).

A general production model run a number of years ago (Gavaris MS 1981) indicated an MSY of 19,000 t and a yield at 2/3 effort MSY of 17,000 t. Because 4 years have past since this previous analysis, a general production model was run this year. The analysis was done using unlagged effort data and with the effort data lagged 6, 8 and 10 years (Gulland 1961). All regressions were significant and the results are:

LAG	MSY	EFFORT <sub>msy</sub>	2/3 EFFORT <sub>msy</sub>	YIELD 2/3 EFFORT <sub>msy</sub>
nil	18,988	34,914	23,276	16,878
6	16,452	24,477	16,318	14,624
8	16,462	21,694	14,463	14,633
10	16,474	19,668	13,112	14,644

The results of the analysis using a lag of 8 years are shown in Fig. 4 and 5.

The few commercial frequencies available from the 1984 fishery (Fig. 6,7 and 8) indicate fish 20-30 cm predominating. This is in keeping with historic trends which show smaller fish taken from this stock than from neighbouring areas. This trend results from the fact that, due to bad bottom, the larger fish, which are found in

deeper water, are not caught.

There are no research data available for this stock.

#### Conclusions

The increase in the catch rates in recent years would indicate that this stock is healthy. Although the general production model results indicate a yield at  $2/3$  effort MSY below the present TAC, the fishery is conducted on smaller fish and there is, no doubt, a reserve of larger fish in the deeper water. It would seem most appropriate for the TAC for 1986 to remain at the present level of 20,000 t.

#### References

- Gavaris, C.A. MS 1981. An assessment of Redfish in Division 30. CAFSAC Res. Doc. 81/38.
- 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.
- Gulland, J.A. 1961. Fishing and stocks of fish at Iceland. U.K. Min. Agric. Fish. Food, Fish. Invest. (Ser. 2) 23(4): 52 p.

Table 1. Division 30 redfish catches by country and year.

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983 <sup>a</sup>	1984 <sup>a</sup>
Canada (MQ) (M) <sup>b</sup>	42	34		610	655	381	1,557	565	417	47	4	27
Canada (N)	91	57	103	3,054	2,317	1,460	4,847	976	2,160	444	3	137
Fr. (M)	-	-	-	1	-	-	-	-	-	-	-	-
Fr. (Sp.)	-	31		15	2	-	-	-	-	-	-	-
GDR	472	-	-	-	-	-	-	-	-	-	-	-
Japan	-	44	7	4	-	3	2	-	-	496	2	1,259
Poland	36	-	-	-	-	-	-	-	-	-	-	-
Portugal	-	-	-	1	-	-	134	59	-	5	-	-
Romania	-	-	-	-	-	-	664	-	-	-	-	-
Spain	-	-	-	-	-	1	8	-	-	-	-	-
UK	-	13		-	-	-	-	-	-	-	-	-
USSR	8,156	12,747	15,000	11,663	7,376	4,647	8,008	14,219	8,659	8,717	5,670	6,039
Cuba	-	-	-	-	500	368	2,517	1,487	1,368	1,651	1,460	1,316
U.S.A.	-	198	-	-	-	-	-	-	-	-	-	-
Total	8,797	13,124	15,110	15,348	10,850	6,860	17,737	17,306	12,604	11,360	7,139	8,778

<sup>a</sup>Provisional.<sup>b</sup>Maritimes and Quebec were combined prior to 1979.

Table 2. Division 30 redfish catches by month and year.

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1973	-	-	84	10	292	2,006	3,468	2,384	529	19	4	1	8,797
1974	1	12	585	1,523	3,380	1,678	1,298	218	26	-	1	4,402	13,124
1975	-	2	1,926	1,313	2,186	3,680	723	897	3,123	1,159	-	101	15,110
1976	352	452	399	857	1,477	1,497	3,119	1,440	2,221	2,540	40	954	15,348
1977	553	36	1,047	1,736	987	1,865	1,580	1,113	1,032	828	63	10	10,850
1978	48	102	1,478	1,326	1,216	930	656	353	433	155	158	5	6,860
1979	35	844	2,464	2,072	87	1,997	739	692	1,235	1,320	3,594	2,658	17,737
1980	612	1,250	856	3,698	1,145	858	143	2,395	1,860	149	986	3,354	17,306
1981	991	3,735	1,444	1,601	621	1,467	773	584	510	873	5	-	12,604
1982	-	1	1,121	1,258	545	652	4,555	2,245	661	233	89	-	11,360
1983 <sup>a</sup>	254	355	2,904	1,227	71	156	576	939	319	-	73	265	7,139

<sup>a</sup>Provisional.

Table 3: Regression of multiplicative model for redfish in Div.30.

multiple r.....0.732  
multiple r squared.....0.535

analysis of variance				
source of variation	df	sums of squares	mean squares	f_value
intercept	1	5.500e0	5.500e0	
regression	25	3.686e1	1.474e0	11.470
type 1	1	1.994e1	1.994e1	155.141
type 2	24	1.698e1	7.074e-1	5.504
residuals	249	3.201e1	1.285e-1	
total	275	7.436e1		

Table 4: The predicted catch rate for redfish in Div.30.

year	total catch	catch rate		effort
		mean	s.e.	
1959	9268	0.806	0.107	11496
1960	5030	0.852	0.229	5902
1961	11394	0.961	0.171	11859
1962	7557	0.841	0.132	8989
1963	9194	0.645	0.101	14246
1964	20232	0.615	0.129	32881
1965	22438	0.709	0.231	31634
1966	15305	0.562	0.252	27211
1967	19037	1.129	0.200	16859
1969	15878	0.595	0.093	26671
1970	13192	0.537	0.045	24578
1971	19792	0.772	0.139	25632
1972	16117	0.608	0.076	26517
1973	8797	0.811	0.136	10846
1974	13124	0.616	0.052	21305
1975	15110	0.649	0.054	23292
1976	15348	0.906	0.082	16944
1977	10850	0.773	0.071	14044
1978	6860	0.703	0.067	9760
1979	17737	1.174	0.100	15114
1980	17306	0.876	0.080	19756
1981	12604	1.118	0.104	11275
1982	11360	1.260	0.146	9019
1983	7139	0.905	0.117	7887
1984	8778	1.038	0.278	8459

average c.v. for the mean=0.160

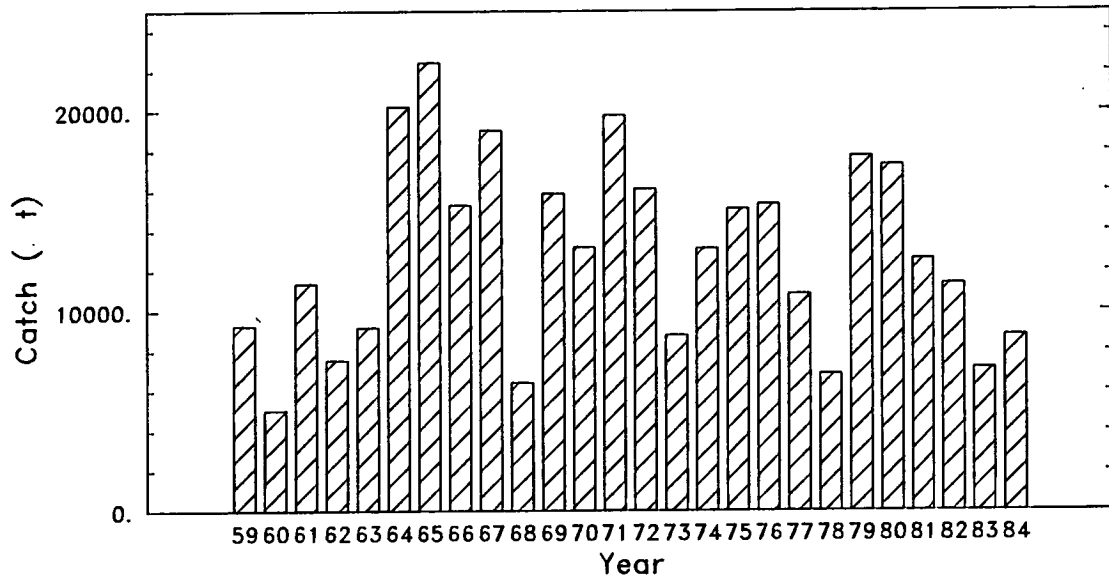


Fig.1: Nominal catches of redfish in Div.30, 1959–1984.  
(1983 and 1984 Provisional)

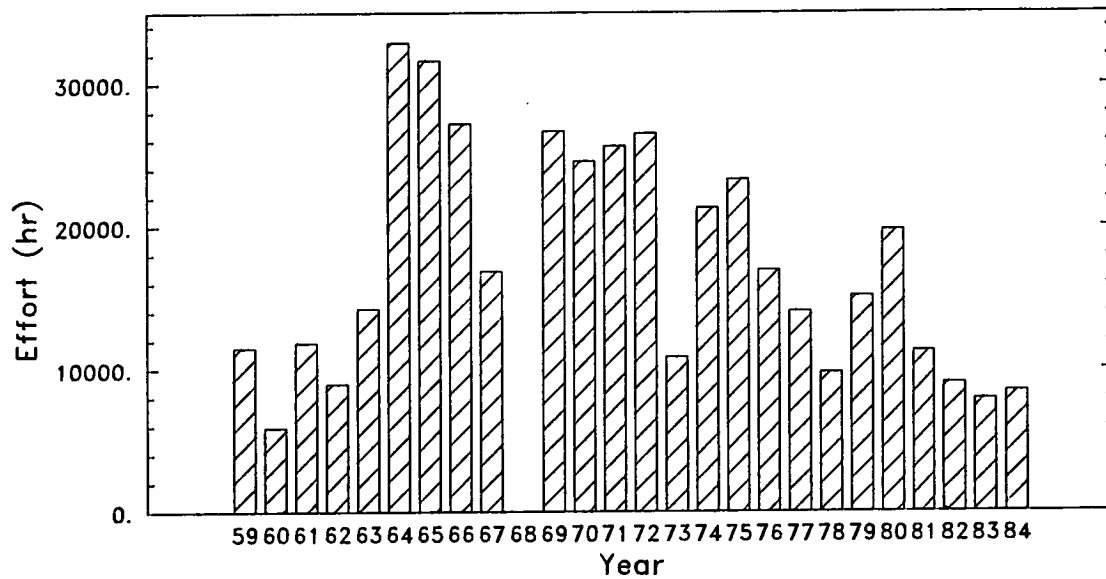


Fig.2: Standardized directed effort for redfish in Div.30, 1959–1984.  
(1983 and 1984 Provisional)

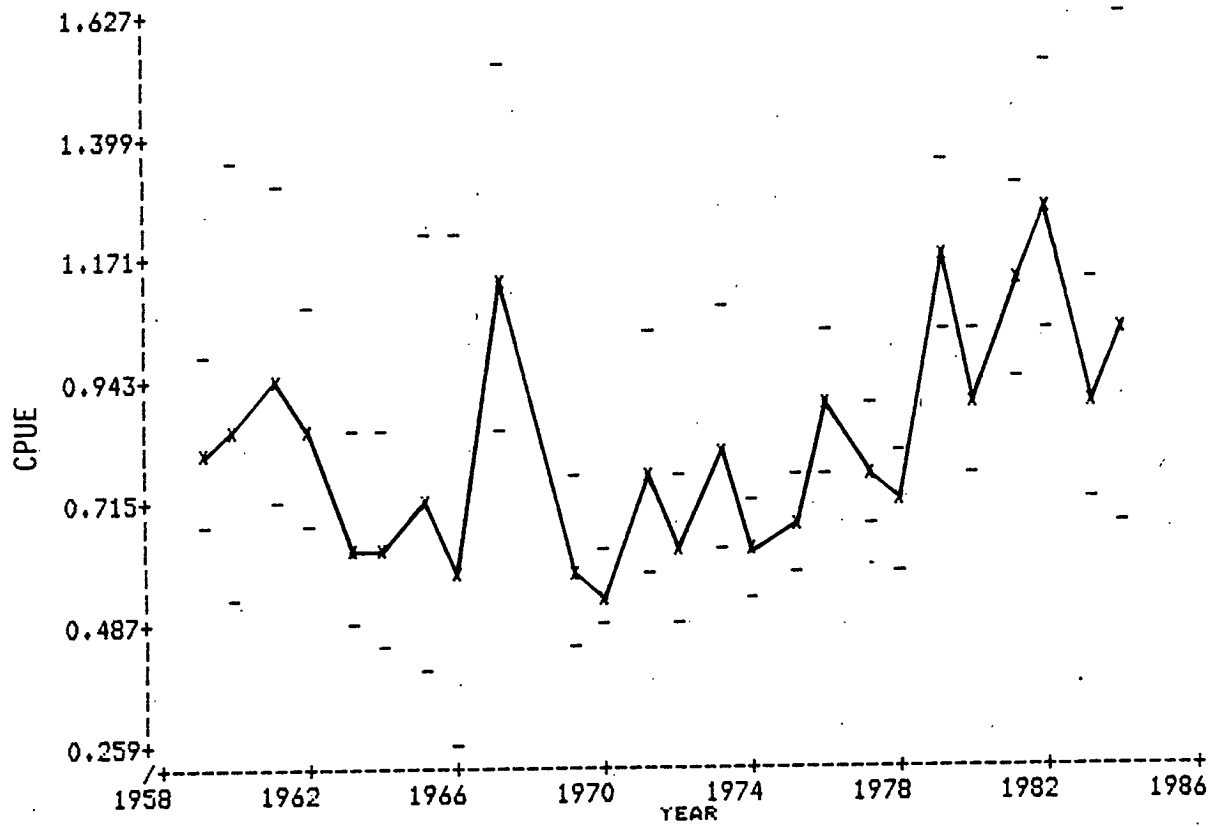


Fig. 3: Standardized CPUE (t/hr) for redfish in Div.30, 1959-1984.  
(1983 and 1984 Provisional)



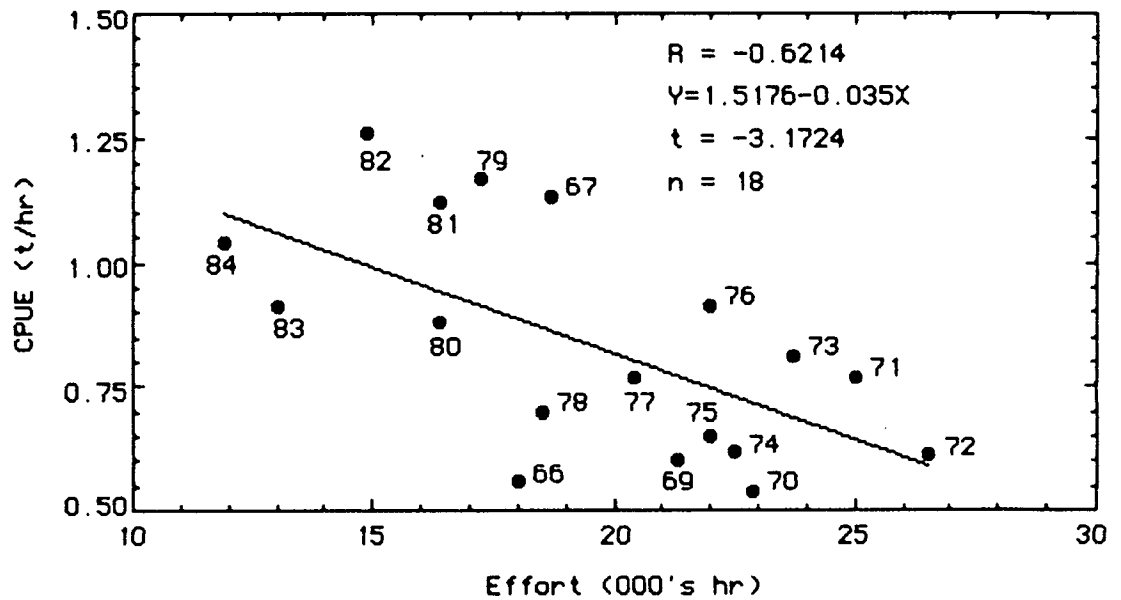


Fig.4: Regression of standardized CPUE on standardized effort for redfish in NAFO Div.30 using data lagged 8 years.

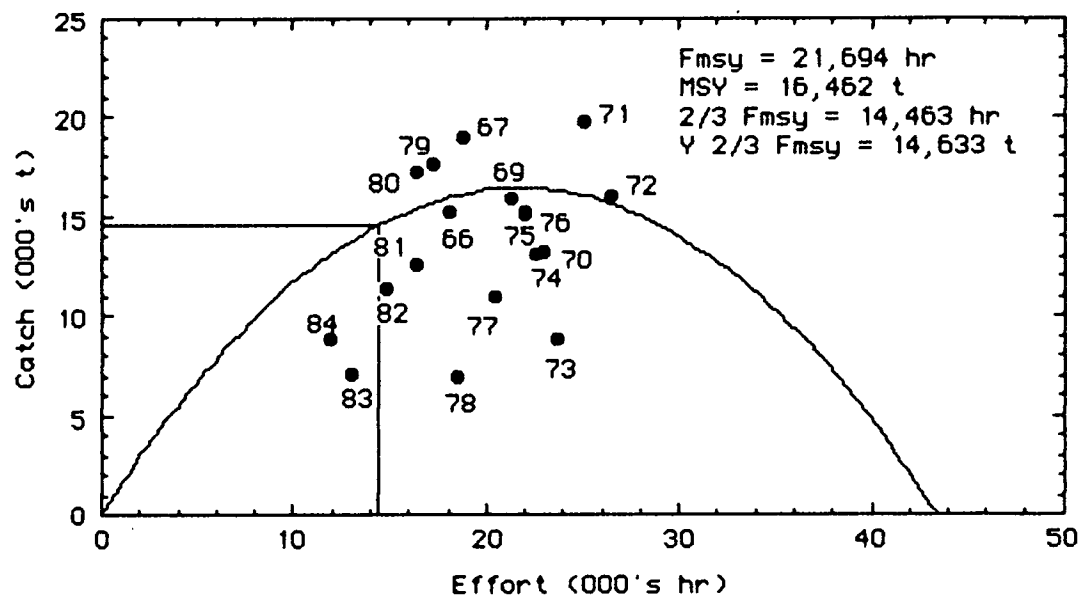


Fig.5: General production curve derived from regression of Fig.4.

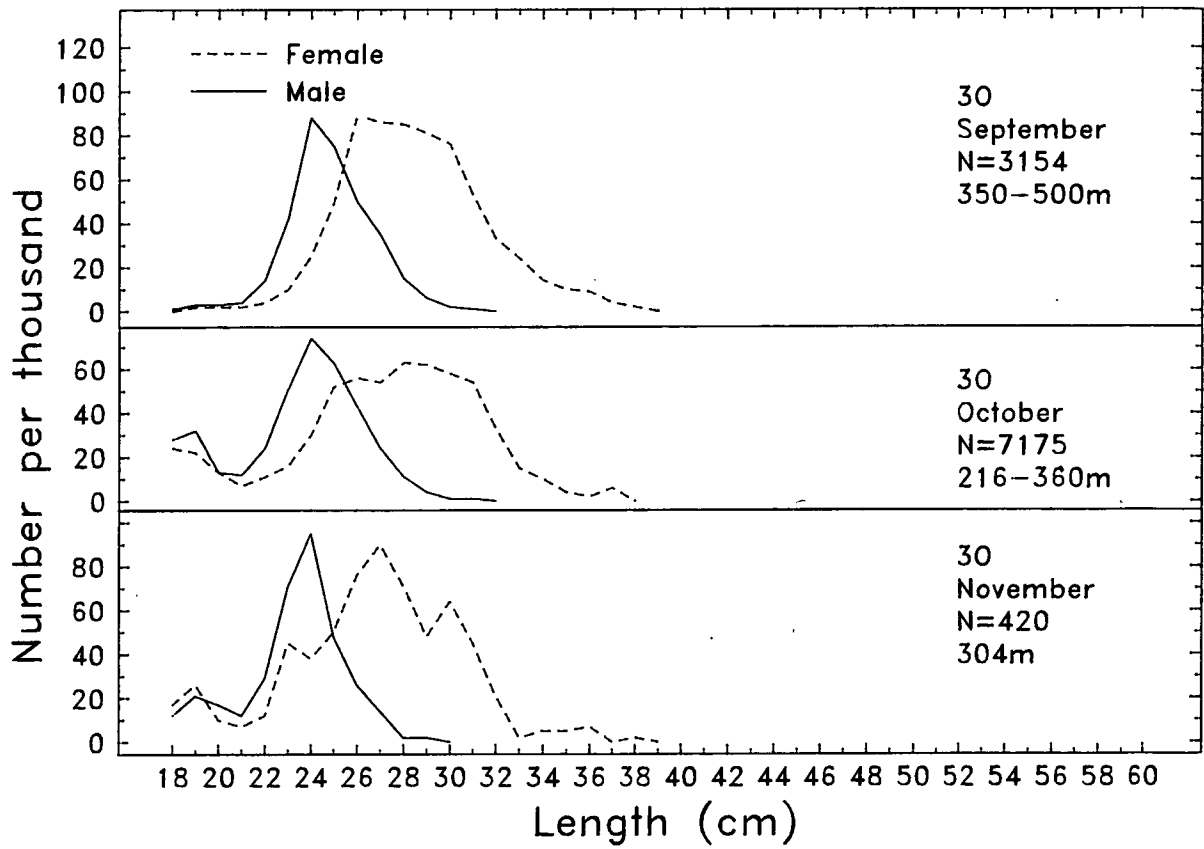


Fig.6: Commercial frequencies from Japanese otter trawl redfish fishery in Div.30 in 1984 (sea sampling).

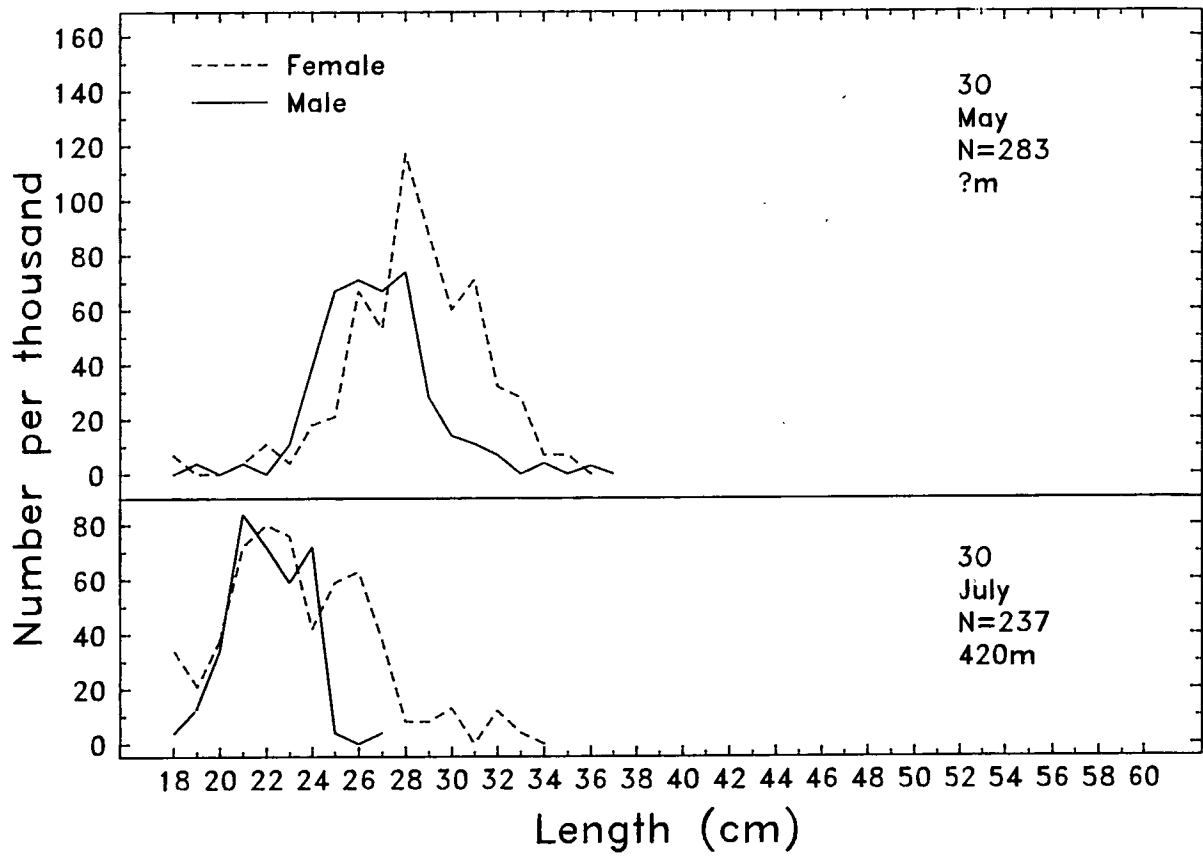


Fig.7: Commercial frequencies from Can (Nfld) otter trawl redfish fishery in Div.30 in 1984 (sea sampling).

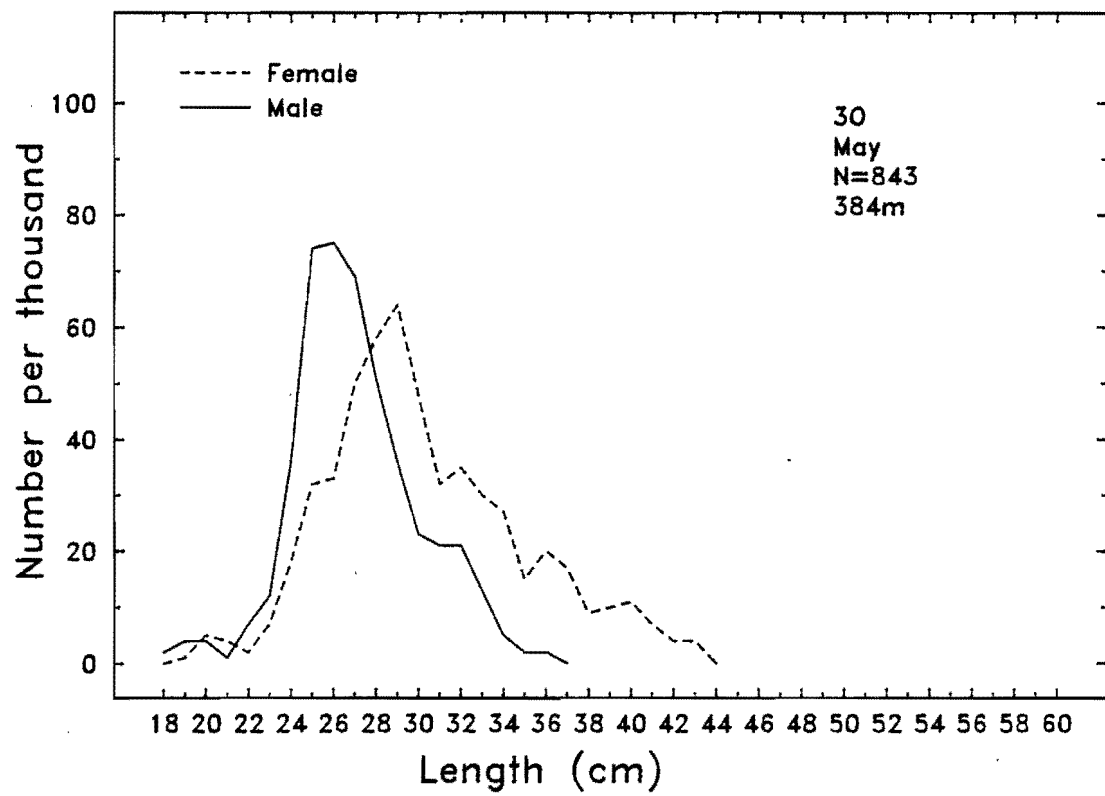


Fig.8: Commercial frequencies from Can. (Nfld) otter trawl redfish fishery in Div.30 in 1984 (port sampling).