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The Redfish of NAFO Div. 3LN

by

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Introduction

There are insufficient data available to carry out an analytical assessment of this stock. A catch curve derived from a Canadian survey to the area in 1979 indicated a fishing mortality of about 0.12. The long term average catch is about 22,000 t while the present TAC is 25,000 t.

Methods and Results

In recent years, the USSR has taken the majority of the total landings from Div. 3N, whereas the Canadian fleet has predominated in Div. 3L (Tables 1a, 1b). The fishery is prosecuted throughout the year in both Divisions (Tables 2a, 2b). Historically,larger landings have been recorded from 3N (Table 3). The trend in catches over time is illustrated in Fig. 1.

In preparing this update, the historic catch/effort database was totally re-examined before running the multiplicative model (Gavaris 1980). 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 finally, all catches and effort of less than 10 units were deleted from the analysis as it was thought that rounding of these small numbers may introduce a systematic bias to the data. Only catches comprising >50 % redfish were used. The data were weighted step-wise by effort since this weighting improved the regression without altering the overall trends in the data. There were no significant differences between months so these were combined. Similarly, no differences were noted between Div. 3L and Div. 3N so these were combined. The various combinations are summarized in Table 4.

The regression results (Table 5) indicate significance. The resultant effort and catch rate series are shown in Table 6 and Fig. 2 and 3. The revised catch rate series shows a great deal of fluctuation with time although overall the trend could be considered to be fairly stable. Rates have increased since 1978. The apparent drop in 1984 may be due to the fact that this point includes provisional Canadian data only.

Regressions of CPUE on effort for unlagged data and effort data lagged 6, 8 and 10 years (Gulland 1961) were run. None of these were significant (see eg. Fig. 4), so an equilibrium general production model could not be run.

The commercial frequencies available from the 1984 fishery (Fig. 5-8) are mainly from the Canadian fishery in 3L. These indicate a wide range of lengths being caught in 3L. The few foreign frequencies available suggest that smaller fish are being taken in 3N.

There are no recent Canadian research data available for this stock, although a series of surveys are presently being conducted in 3L and results will be available in the future.

Discussion

Assessment of this stock remains difficult because of the limited database. The revised catch rate series does not indicate the same degree of stability up to the mid 1970's as had been noted earlier (Atkinson MS 1984) but the increase in recent years is still observed. The apparent decrease in 1984 is probably due to the limited amount of data available at the present time. There is no evidence to suggest a change in the TAC for 1986 from the current level of 25,000 t.

References

Atkinson, D.B. MS 1984.Redfish in NAFO Divisions 3LN. NAFO SCR DOC. 84/VI/31.

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

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983[a]
Canada (MQ) (M)	7	1	-	1,671	1,671	18	934	554	1,696	1,003	2,663
Canada (N)	286	165	1,827	4,195	7,686	3,143	4,086	2,412	5,925	5,910	3,800
France (M)	-	2	6	13	6	45	4	3	-	-	-
France (SP)	-	3	-	4	-	8	-	11	-	-	-
FRG	366	50	-	29	-	-	7	-	-	-	-
GDR	261	-	-	744	144	918	168	375	509	12	586
Japan	-	-	-	-	87	522	-	26	128	159	-
Poland	183	397	-	81	-		4	2	-	-	2
Portugal	2,662	590	1,245	1,534	299	261	265	639	275	125	91
Romania	5	-	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	141	8	-	-	137	25	347
UK	93	171	120	9	4	-	2	-	-	-	-
USSR	845	10,040	640	7,691	3,231	1,395	114	345	737	607	1,168
Ireland	-	-	-	-	160	--	-	-	-	-	-
Den-G-F	1	-	-	-	-	-	-	-	-	-	-
Cuba	-	-	-	-	23	-	-	-	-	-	-
Kor-S	-	-	-	-	-	-	-	-	-	29	-
Total	4,709	11,419	3,838	15,971	13,452	6,318	5,584	4,367	9,407	7,870	8,657

[a]Provisional.

[b]Maritime and Quebec were combiend prior to 1979.

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

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Bulgaria	-	-	-	-	-	-	-	-	-	-	-
Canada (M)	-	-	5	307	43	1	198	683	442	-	-
Canada (N)	71	34	48	320	137	18	1,285	367	63	337	1
France (M)	-	-	-	-	-	-	25	-	-	-	-
France (SP)	-	-	-	-	-	-	-	-	-	-	-
FRG	-	-	-	-	-	12	-	-	-	-	-
GDR	-	-	-	-	-	11	-	-	58	-	-
Poland	23	-	19	-	-	-	-	-	-	-	-
Portugal	115	20	104	-	-	-	-	-	-	1	-
Japan	1,984	24	-	-	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	9	-	-	-	-
Spain	-	-	-	-	59	1	-	14	239	278	875
UK	3	454	-	-	-	-	-	-	-	-	-
USSR	26,392	10,335	13,857	3,914	2,645	4,532	5,904	8,944	12,762	10,414	7,844
Cuba	-	-	-	-	180	1,150	1,062	1,644	1,309	2,621	2,370
USA	-	-	-	-	-	-	-	11	-	-	-
Kor-S	-	-	-	-	-	-	-	-	-	26	-
Total	28,588	10,867	14,033	4,541	3,064	5,725	8,483	11,663	14,873	13,677	11,090

[a]Provisional.

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
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	1,126	672	1,232	1,225	295	289	459	37	643	1,367	173	352	-	7,870
1983[a]	1,304	496	672	1,080	934	708	274	642	562	1,070	799	116	-	8,657

[a]Provisional.

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	581	3,156	485	21	12	7	-	13,677
1983[a]	869	609	2,029	2,186	1,226	675	1,121	1,266	303	376	208	222	-	11,090

[a]Provisional.

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

Year	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	7,870	13,677	21,547	25,000
1983[a]	8,657	11,090	19,747	25,000
1984[a]			14,049	25,000

[a]Provisional.

Table 4: Parameter estimates from the analysis of catch rates for 3LN redfish using a multiplicative model.

country-gear-TC	estimate	month	estimate
CAN(MQ)-OTB4	-0.577	JAN	
POR-OTB6		FEB	
		MAR	
		APR	combined
CAN(N)-OTB4		MAY	since
CAN(M)-OTB4		JUN	differences
CAN(MQ)-OTB5		JUL	were
CAN(N)-OTB5	0.000	AUG	not
CAN(N)-OTM4		SEP	significant
CAN(N)-OTM5		OCT	
GDR-OTB6		NOV	
GDR-OTB7		DEC	
JAP-OTB7			
POR-OTB7			
USSR-OTB7		division	
		3L	combined
GDR-OTB5	0.554	3N	as above
USSR-OTM7			
USSR-OTB4	-0.998		

Table 5: Regression of multiplicative model for 3LN redfish.

multiple r.....0.650
multiple r squared.....0.422

analysis of variance

source of variation	df	sums of squares	mean squares	f_value
intercept	1	2.208e1	2.208e1	
regression	28	7.231e1	2.583e0	13.113
type 1	3	3.480e1	1.160e1	58.891
type 2	25	1.607e1	6.426e-1	3.263
residuals	502	9.887e1	1.969e-1	
total	531	1.933e2		

Table 6: Predicted catch rate for 3LN redfish

year	total catch	catch rate mean	s.e.	effort
1959	44585	1.604	0.125	27789
1960	28010	1.195	0.129	23443
1961	23175	1.255	0.151	18470
1962	21434	1.478	0.132	14501
1963	21097	1.153	0.123	18291
1964	8104	0.892	0.140	9085
1965	13493	1.032	0.154	13075
1966	16974	1.650	0.227	10290
1967	27188	1.431	0.148	18994
1968	17613	0.952	0.151	18496
1969	23069	1.203	0.116	19173
1970	14388	1.349	0.178	10662
1971	34353	1.361	0.163	25236
1972	28933	1.450	0.148	19955
1973	33297	1.471	0.293	22634
1974	22286	1.356	0.255	16434
1975	17871	1.395	0.156	12810
1976	20512	1.248	0.089	16430
1977	16516	1.238	0.094	13336
1978	12043	1.048	0.084	11494
1979	14067	1.288	0.096	10920
1980	16030	1.681	0.149	9535
1981	24280	1.689	0.129	14379
1982	21547	1.809	0.133	11909
1983	19747	1.801	0.153	10962
1984	14049	1.144	0.215	12283

average c.v. for the mean: 0.114

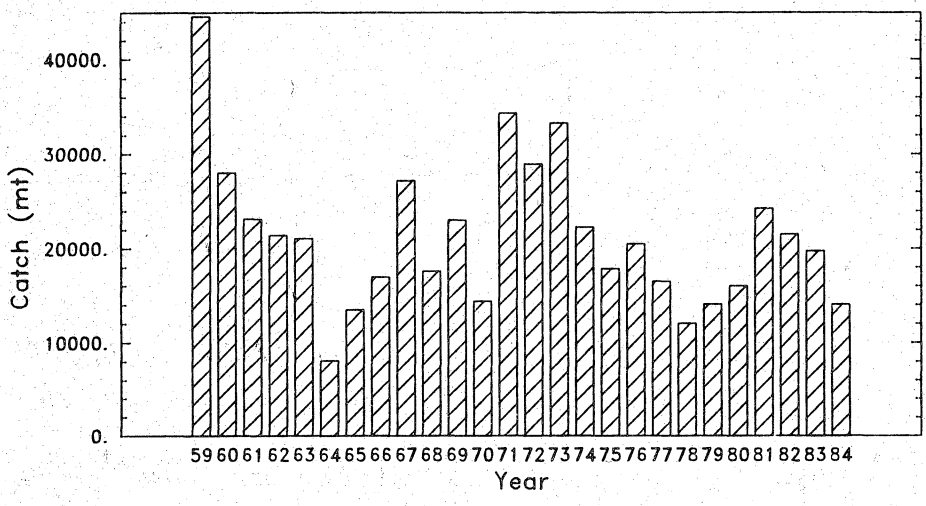

Fig.1: Nominal catches of redfish from Div. 3LN, 1959–1984. (1983 and 1984 Provisional)

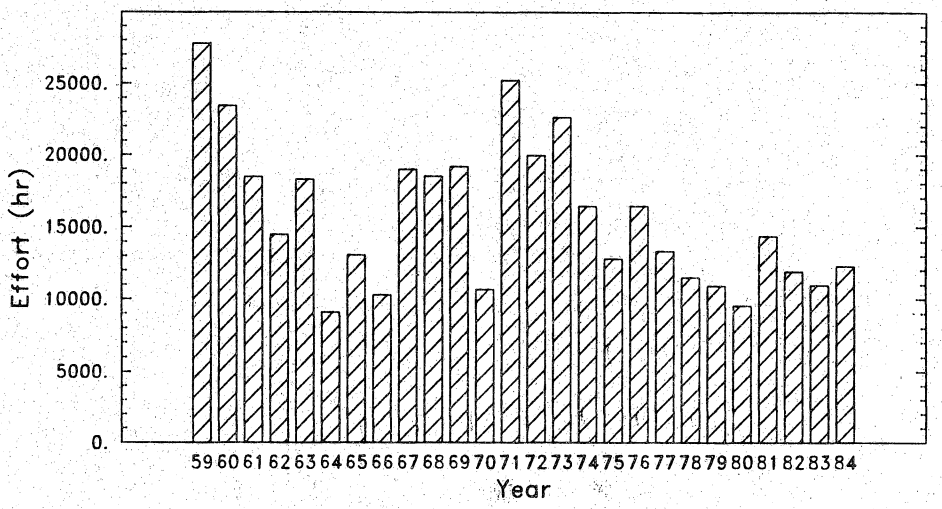

Fig.2: Standardized directed effort for redfish, Div. 3LN, 1959–1984. (1983 and 1984 Provisional)

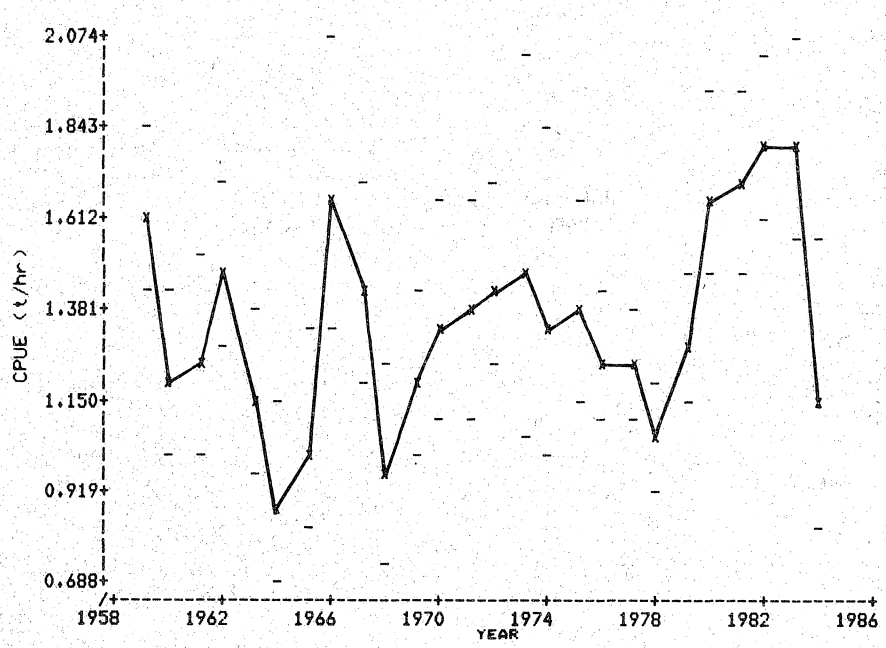

Fig.3: Standardized CPUE for 3LN redfish (1959-1984).

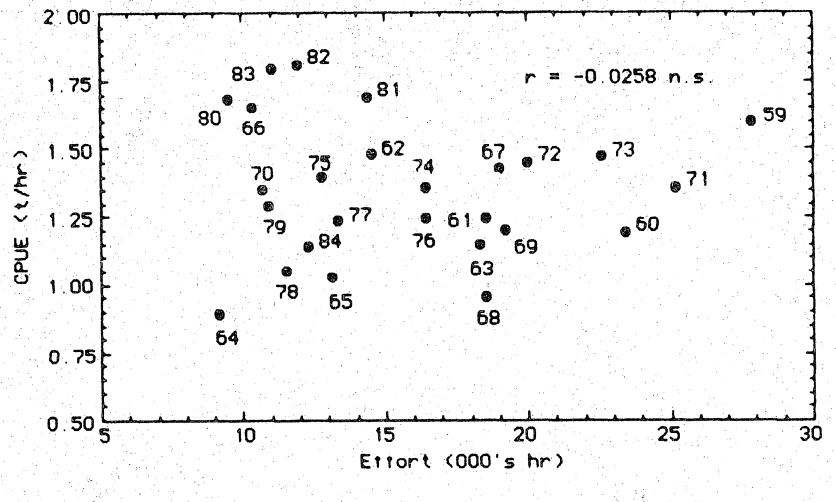

Fig.4: Regression of CPUE on effort for 3LN redfish (1959-1984).

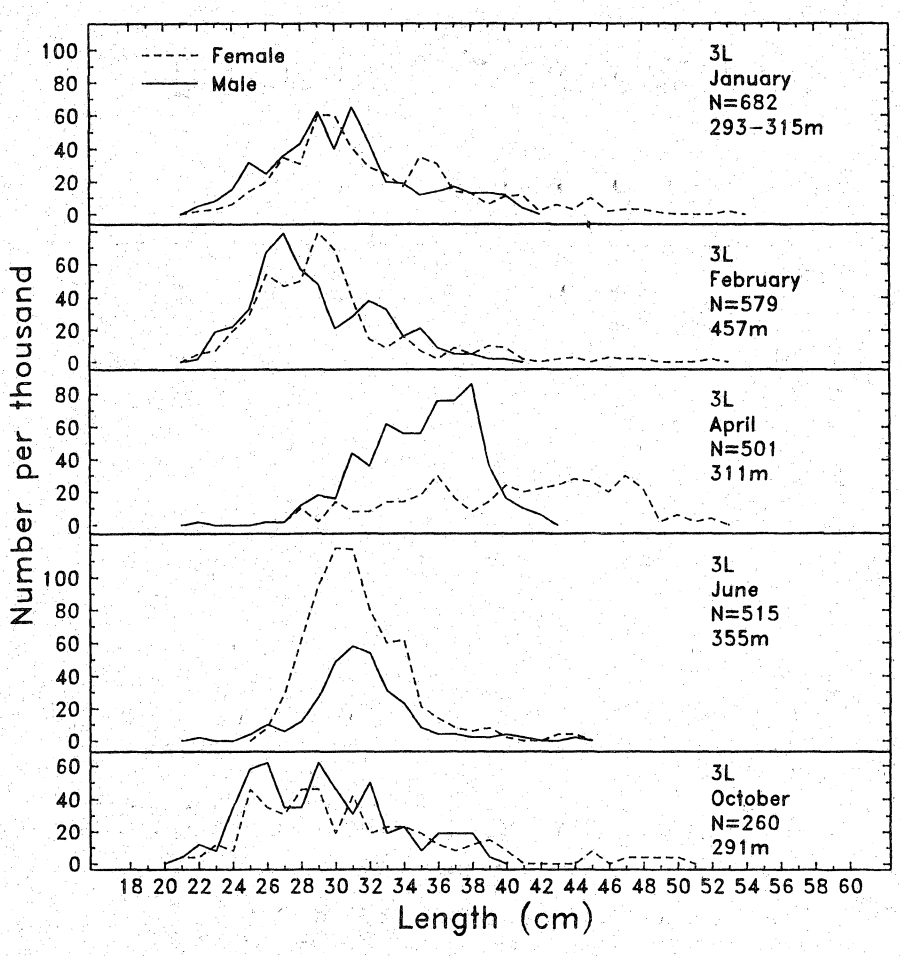

Fig.5: Commercial frequencies from Can (Nfld) otter trawl redfish fishery in Div. 3L in 1984 (port sampling).

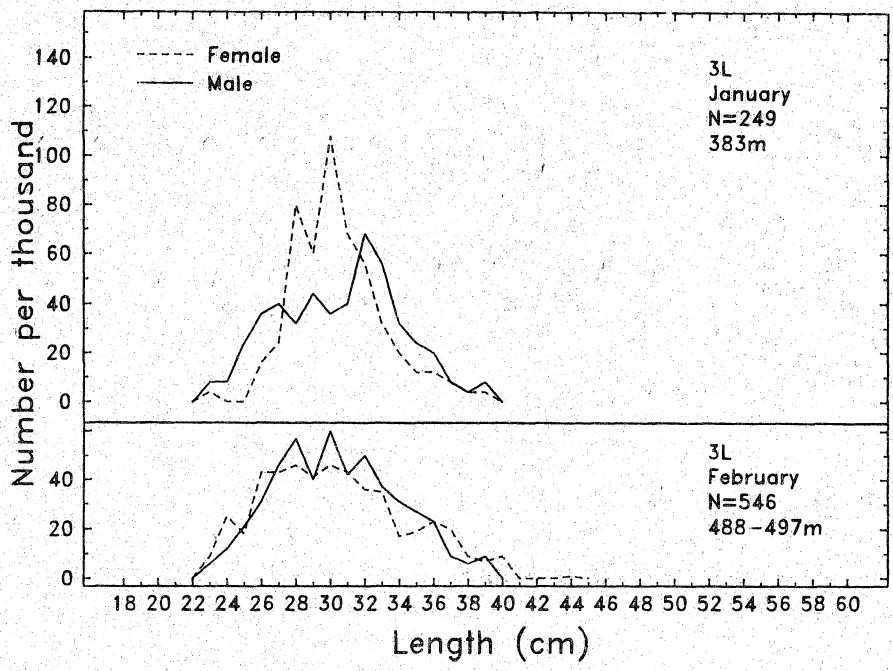

Fig.6: Commercial frequencies from Can (Nfld) otter trawl redfish fishery in Div. 3L in 1984 (sea sampling).

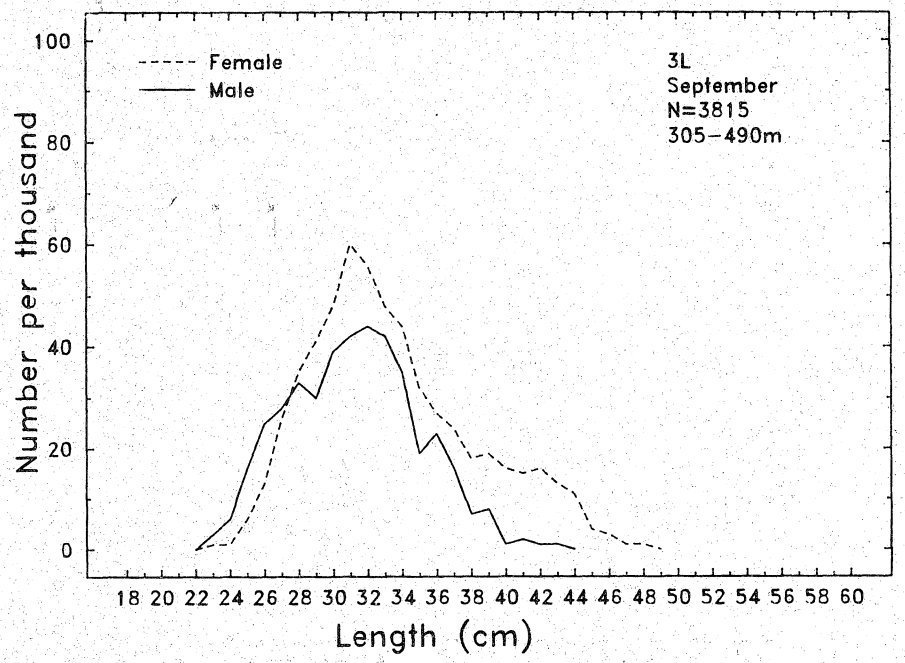

Fig.7: Commercial frequency from G.D.R otter trawl redfish fishery in Div. 3L in 1984 (sea sampling).

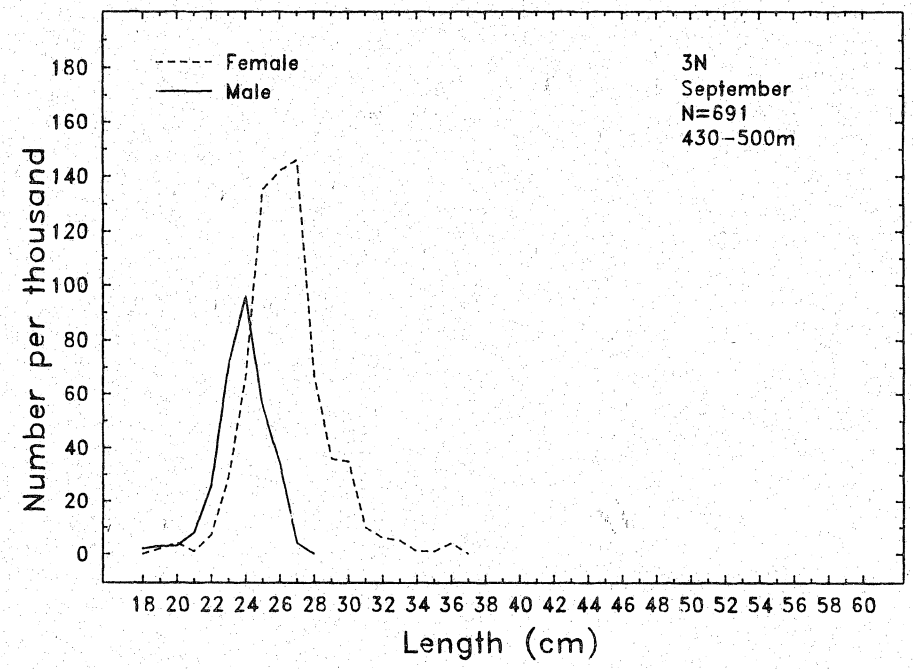

Fig.8: Commercial frequency from Japan otter trawl redfish fishery in Div. 3N in 1984 (sea sampling).