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2+3K Redfish

by

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

Abstract

The standardized catch rate series has shown a gradual increase from 1976-1982 although the confidence interval is quite large. Results of research cruises suggest that the stock is stable and contains relatively numerous fish 20-40 cm. Since 1979 only about 50% of the TAC's have been taken due to a reduction of effort in the area. Although the data base for this stock is expanding, the time series is still of insufficient length to carry out an analytical assessment.

Résumé

La série des taux de capture standardisés indique une augmentation graduelle entre 1976 et 1982, bien que l'intervalle de confiance soit plutôt grand. D'après les résultats des croisières par navires de recherche, le stock serait stable et contiendrait un nombre relativement important de poissons de 20-40 cm de long. Depuis 1979, par suite d'une diminution de l'effort de pêche dans cette région, seulement environ 50 % du TPA a été capturé. Bien que la base de données sur ce stock prenne sans cesse de l'importance, la série est encore trop courte pour qu'il soit possible de faire une évaluation analytique.

Introduction

Catches of redfish in NAFO Subarea 2 and Div. 3K have averaged about 24,000 t since 1970 with a high of 39,000 t in 1973 and lows of 15,000 t in 1980 and 1982. Prior to 1976 the catches were primarily by the USSR but since then there has been an increase in the Canadian catches.

Methods and Results

Catch and effort:

ICNAF/NAFO data (catches comprising ≥50% redfish) were used for the period 1959-81 while preliminary Newfoundland 1982 data were obtained from Economics Branch, Newfoundland Region. Because of the apparent problems with the Maritimes catch/effort data, these were eliminated from the analyses.

The multiplicative model (Gavaris 1980) was used to standardize the catch/effort data. As in last year's assessment (Gavaris and Atkinson MS 1981), the analysis was done in two parts, due to a shift in fleet composition around 1976 (Table 1). The results of the regressions of ln (catch rate), weighted in a step-wise fashion (Gavaris pers. comm.) by effort against the categories of vessel type, month, area, and year are shown in Tables 2a and 3a respectively, while the relative (to 1976 as the standard) catch rates are shown in Tables 2b and 3b. The combined series of catches, standardized effort, and standardized CPUE are illustrated in Fig. 1-3. It can be seen that after bottoming out in the late 1960's to the mid-1970's, the catch rates have shown an increasing trend since 1976 and in 1982 achieved a level comparable to the highest on record (1962-64). It must be remembered, however, that the Maritimes data are not included and their influence on this trend is unknown at present.

Catch and weight at age:

Age length keys for males and females were constructed from otolith collections from the 1982 Canadian commercial fishery and these were combined with the collected Canadian commercial frequencies using the procedure of Gavaris and Gavaris as presented to the DFO seminar on "Sampling of commercial marine fish and invertebrate catches" held in Ottawa, February 1982 to arrive at the numbers caught at age and weight at age shown in Table 4. The majority of the fish caught were aged 10-19. The commercial frequencies (Fig. 4-8) reflect this with fish 25-35 cm predominating in the catches except for in 2H, February-March in 2J and 3K, and August in 3K when larger or a wide range of sizes were caught. The time series of catch at age and weight at age are shown in Tables 5 and 6, respectively. Although this data base is expanding, there are still insufficient data to carry out an analytical assessment.

Research survey indices:

The GADUS ATLANTICA has conducted research surveys in 2J and 3K in the fall of 1978-82 inclusive. The numbers and weights caught per standard tow, as

well as the total estimated biomass, is shown in Table 7 while the length frequency distribution from the 1982 survey is shown in Fig. 9. Results from USSR research in the same area in 1982 are shown in Fig. 10. The results from the two 1982 surveys are very similar. The numbers and weights caught per standard tow are similar in 1979, 1980, and 1982. The higher figures for 1981 can be attributed to two abnormally large catches, one in 2J and the other in 3K. With these eliminated, the new values for numbers and weight per tow and biomass are 136.31 (C.V. = .20), 65.35 (C.V. = .22), and 199,394 (C.V. = .22) respectively bringing the values more in line with the 3 years noted above. The 1978 estimates cannot be attributed to one or a few large catches as large numbers were caught in a great number of sets. The 1979-82 data suggest a fairly constant stock biomass over the period but because of the high coefficients of variation, the biomass values must be viewed with caution.

References

Gavaris, C. A., and D. B. Atkinson. MS 1981. An assessment of redfish in Subarea 2 + Division 3K. CAFSAC Res. Doc. 82/31.

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.

Table 1. Nominal catches of Subarea 2 + Division 3K redfish, 1970-82.

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Bulgaria	0	0	0	20	0	0	0	0	0	0	0	0	0
Canada	63	153	49	374	153	445	3,894	3,498	22,052	26,587	7,785	13,416	11,232
Cuba	0	0	0	0	0	0	0	0	0	43	0	0	0
Faroes	0	0	0	9	0	0	0	0	0	0	0	0	0
GDR	4,827	2,662	2,400	2,484	2,465	2,447	1,729	1,305	2,909	543	1,102	720	425
Iceland	0	209	296	0	0	0	2	0	0	0	0	0	0
Japan	10	48	0	0	0	0	0	4	255	0	0	4	0
Norway	173	53	4	30	13	0	9	0	0	0	0	0	0
Poland	5,223	6,184	2,136	4,489	3,646	4,219	3,950	2,269	625	302	870	635	21
Portugal	0	0	620	2,784	4,820	2,971	823	845	378	544	266	393	82
Romania	845	168	329	305	0	0	0	312	0	0	0	0	0
Spain	0	0	3	0	0	26	0	134	37	0	44	0	0
USSR	10,379	9,785	13,481	24,230	11,898	13,575	14,881	8,014	2,685	2,578	4,208	2,474	3,057
Denmark	0	0	0	51	9	0	0	0	0	0	0	0	0
France	0	0	19	4	48	4	11	110	22	3	7	0	0
FRG	439	94	470	3,349	6,593	1,837	647	803	157	68	148	0	89
UK	11	0	226	836	500	35	19	245	26	62	79	0	0
Others	0	0	0	0	0	0	0	0	0	0	10	0	0
Total	21,970	19,356	20,033	38,966	30,145	25,559	25,965	17,539	29,146	30,730	14,519	17,642	14,906

Table 2a.

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R.....0.786
MULTIPLE R SQUARED.....0.619

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	7.317E-1	7.317E-1	
REGRESSION	23	4.869E1	2.117E0	7.120
TYPE 1	3	1.563E1	5.210E0	17.523
TYPE 2	8	1.668E1	2.085E0	7.013
TYPE 3	12	1.063E1	8.857E-1	2.979
RESIDUALS	101	3.003E1	2.973E-1	
TOTAL	125	7.945E1		

Table 2b.

PREDICTED RELATIVE POWER

YEAR	TOTAL CATCH	PROP.	RELATIVE POWER MEAN	RELATIVE POWER S.E.	EFFORT
1959	186837	0.358	0.800	0.191	233560
1960	129773	0.223	0.535	0.150	242696
1962	19657	0.048	2.122	0.880	9265
1963	23671	0.437	2.101	0.715	11266
1964	56178	0.312	2.012	0.687	27922
1965	42653	0.452	1.786	0.608	23884
1966	32730	0.288	1.455	0.542	22496
1967	26162	0.079	1.057	0.372	24749
1970	21970	0.012	1.014	0.395	21657
1971	19356	0.145	0.787	0.266	24590
1973	38965	0.151	0.644	0.143	60530
1975	25559	0.013	1.101	0.386	23208
1976	25965	0.325	1.000	0.000	25965

AVERAGE C.V. FOR THE MEAN:0.306

Table 3a.

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R.....0.560
MULTIPLE R SQUARED.....0.313

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	1.537^{E-1}	1.537^{E-1}	
REGRESSION	21	2.738^{E1}	1.304^{E0}	3.392
TYPE 1	4	5.221^{E0}	1.305^{E0}	3.395
TYPE 2	10	9.656^{E0}	9.656^{E-1}	2.512
TYPE 3	1	1.163^{E0}	1.163^{E0}	3.026
TYPE 4	6	4.115^{E0}	6.858^{E-1}	1.784
RESIDUALS	156	5.997^{E1}	3.844^{E-1}	
TOTAL	178	8.751^{E1}		

Table 3b.

PREDICTED RELATIVE POWER

YEAR	TOTAL CATCH	PROP.	RELATIVE POWER MEAN	RELATIVE POWER S.E.	EFFORT
1976	25965	0.326	1.000	0.000	25965
1977	17539	0.392	1.361	0.286	12884
1978	28896	0.335	1.498	0.270	19285
1979	30730	0.300	1.431	0.267	21475
1980	14519	0.385	1.629	0.329	8912
1981	17642	0.612	1.549	0.302	11388
1982	14906	0.366	2.075	0.407	7183

AVERAGE C.V. FOR THE MEAN:0.167

Table 4. Estimated catch at age and weight at age of redfish from Division 2+3K, 1982.

AGE	WEIGHT	CATCH	VAR(CATCH)	STD.ERROR	COEF.VAR
7	0.141	186	1495.317	38.67	0.21
8	0.173	828	9495.263	97.44	0.12
9	0.209	1866	36307.096	190.54	0.10
10	0.253	3049	88527.293	297.54	0.10
11	0.269	3249	104463.737	323.21	0.10
12	0.297	3288	113508.358	336.91	0.10
13	0.327	3416	117545.564	342.85	0.10
14	0.356	2884	100234.782	316.60	0.11
15	0.406	3121	92454.698	304.06	0.10
16	0.450	2599	71480.443	267.36	0.10
17	0.489	2530	61652.440	248.30	0.10
18	0.564	1698	33605.024	183.32	0.11
19	0.598	1274	25100.551	158.43	0.12
20	0.646	866	15015.949	122.54	0.14
21	0.695	879	13256.204	115.14	0.13
22	0.707	520	8277.006	90.98	0.18
23	0.795	413	4689.528	68.48	0.17
24	0.790	428	4846.326	69.62	0.16
25	0.851	268	2619.286	51.18	0.19
26	0.860	306	3029.051	55.04	0.18
27	0.873	283	2777.968	52.71	0.19
28	0.880	212	2025.566	45.01	0.21
29	0.904	188	1622.579	40.28	0.21
30	1.227	912	6581.845	81.13	0.09

Table 5. 2+3K REDFISH CATCH AT AGE, 1976-1982

AGE	1976	1977	1978	1979	1980	1981	1982
6	7	22	4	240	28	44	0
7	30	102	400	2159	301	199	186
8	136	219	1241	5678	1669	607	828
9	1265	612	3297	8798	996	1398	1866
10	2067	843	4071	9251	869	1819	3049
11	3866	1569	4495	6700	839	1536	3249
12	5580	1930	5806	4011	1031	1047	3288
13	7818	2241	6207	7374	1549	1348	3416
14	8652	3315	6267	6646	1889	1409	2884
15	8615	3162	5265	6571	2050	2138	3121
16	2700	2776	5331	6075	1727	1887	2599
17	1826	2504	3969	5544	1753	2302	2530
18	946	1812	2250	1796	1032	1920	1698
19	757	1778	1488	1241	793	1470	1274
20	1128	1638	1495	1391	10058	1308	866
21	968	895	1084	1412	669	1019	879
22	885	940	950	789	532	1001	520
23	1100	555	591	573	503	1093	413
24	1005	618	883	599	748	1004	428
25	684	598	828	930	521	828	268
26	678	514	746	569	524	903	306
27	512	435	509	590	505	540	283
28	632	418	535	589	389	749	212
29	284	200	139	283	415	580	188

Table 6. 2+3K REDFISH WEIGHT AT AGE, 1976-1982.

AGE	1976	1977	1978	1979	1980	1981	1982
6	0.103	0.103	0.103	0.103	0.110	0.088	0.103
7	0.135	0.135	0.135	0.135	0.170	0.115	0.141
8	0.169	0.169	0.169	0.169	0.184	0.158	0.173
9	0.205	0.205	0.205	0.205	0.217	0.198	0.209
10	0.243	0.243	0.243	0.243	0.240	0.220	0.253
11	0.282	0.282	0.282	0.282	0.279	0.241	0.269
12	0.322	0.322	0.322	0.322	0.287	0.277	0.297
13	0.362	0.362	0.362	0.362	0.314	0.317	0.327
14	0.403	0.403	0.403	0.403	0.361	0.352	0.356
15	0.443	0.443	0.443	0.443	0.418	0.397	0.406
16	0.482	0.482	0.482	0.482	0.463	0.445	0.450
17	0.521	0.521	0.521	0.521	0.534	0.493	0.489
18	0.559	0.559	0.559	0.559	0.566	0.544	0.564
19	0.596	0.596	0.596	0.596	0.596	0.593	0.598
20	0.631	0.631	0.631	0.631	0.674	0.629	0.646
21	0.665	0.665	0.665	0.665	0.651	0.703	0.695
22	0.698	0.698	0.698	0.698	0.747	0.733	0.707
23	0.730	0.730	0.730	0.730	0.788	0.757	0.795
24	0.759	0.759	0.759	0.759	0.754	0.808	0.790
25	0.788	0.788	0.788	0.788	0.769	0.822	0.851
26	0.815	0.815	0.815	0.815	0.946	0.843	0.860
27	0.841	0.841	0.841	0.841	0.931	0.933	0.873
28	0.866	0.866	0.866	0.866	0.922	0.918	0.880
29	0.889	0.889	0.889	0.889	0.999	0.891	0.904

Table 7. Numbers and weights of redfish caught, per standard tow and total estimated biomass, from Canadian research cruises in 2J and 3K.[a]

Year	No. sets	No. per tow	Weight per tow (kg)	Total biomass (t)
1978	118	707.5 (.39)	215.4 (.26)	657,320 (.26)
1979	197	163.5 (.24)	69.0 (.26)	210,513 (.26)
1980	203	163.4 (.24)	77.2 (.33)	235,532 (.33)
1981	171	388.7 (.48)	156.9 (.42)	478,660 (.42)
1982	230	182.8 (.33)	68.6 (.33)	209,166 (.33)

[a]Coefficient of variation shown in brackets.

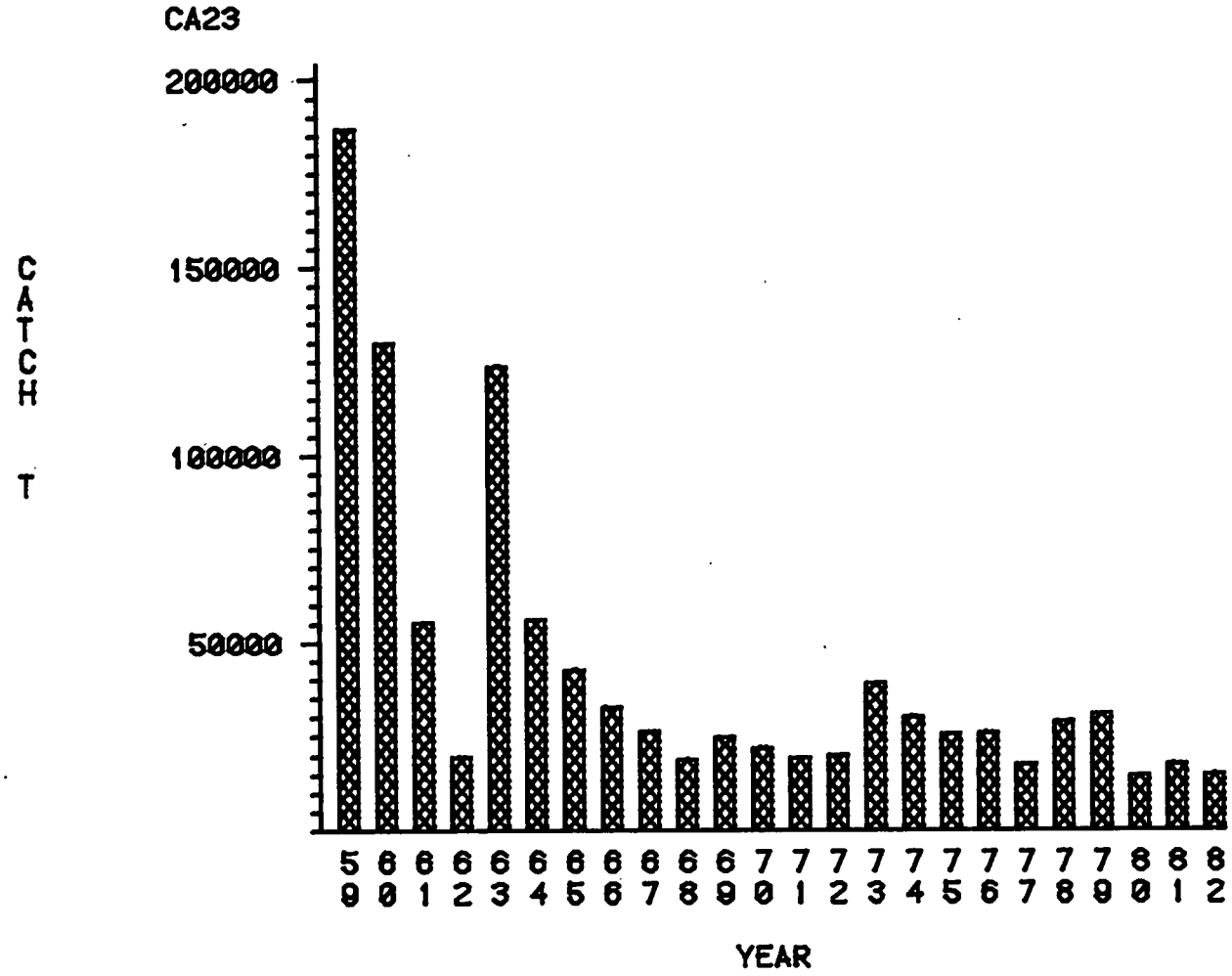


FIG.1: NOMINAL CATCHES OF REDFISH IN NAFO DIV.2+3K
(1982 IS PROVISIONAL)

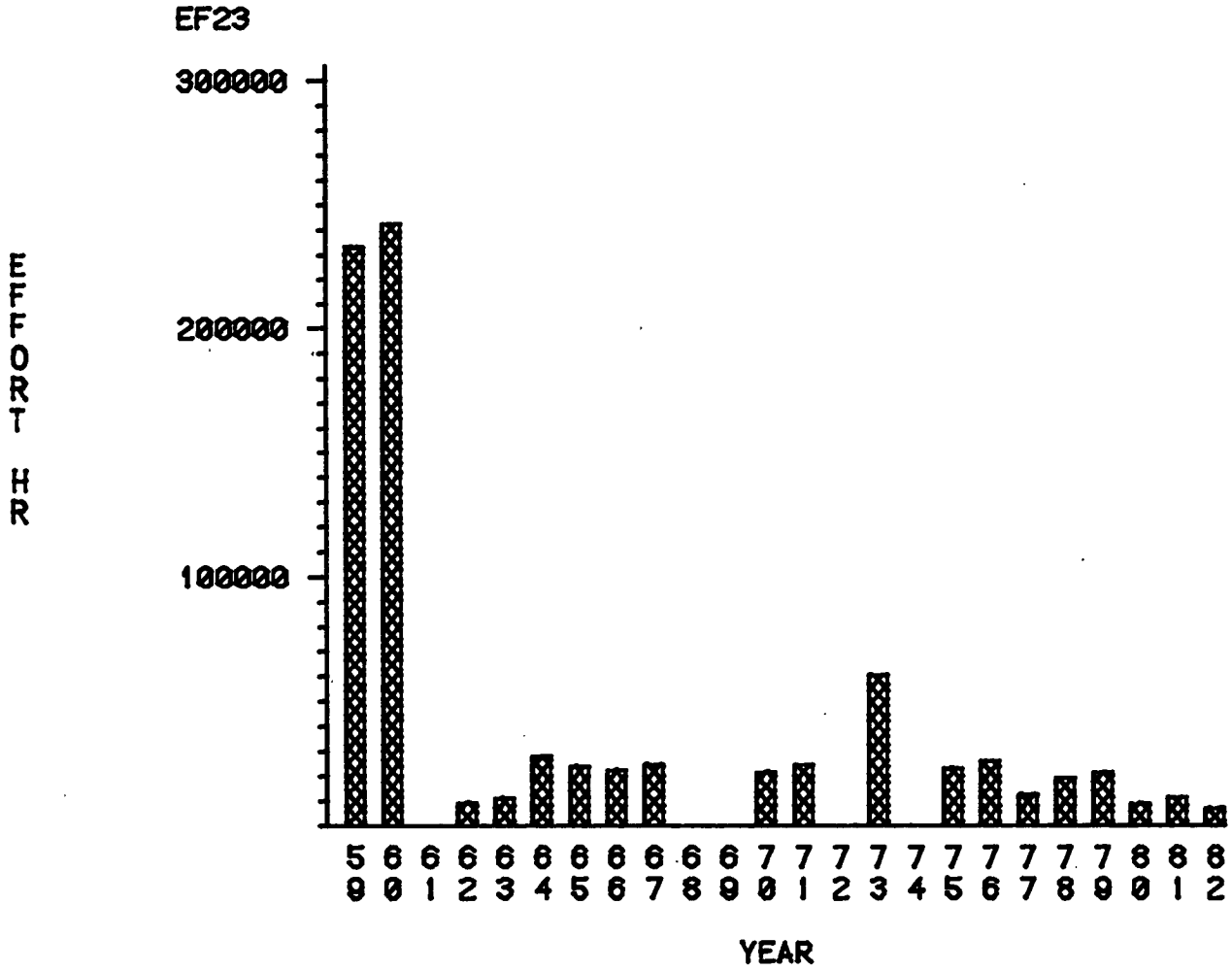
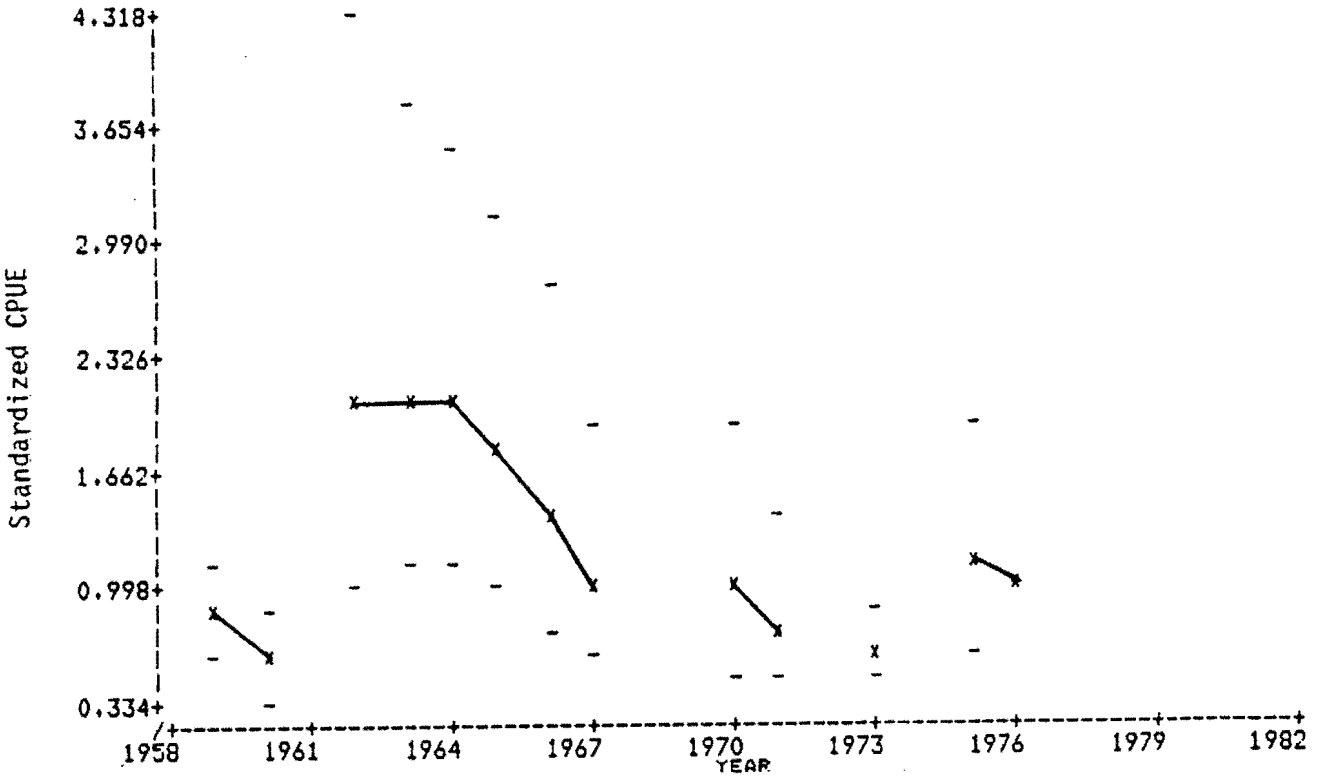


FIG.2: STANDARDIZED EFFORT FOR REDFISH IN DIV. 2+3K
(MARITIMES AND QUEBEC DELETED)



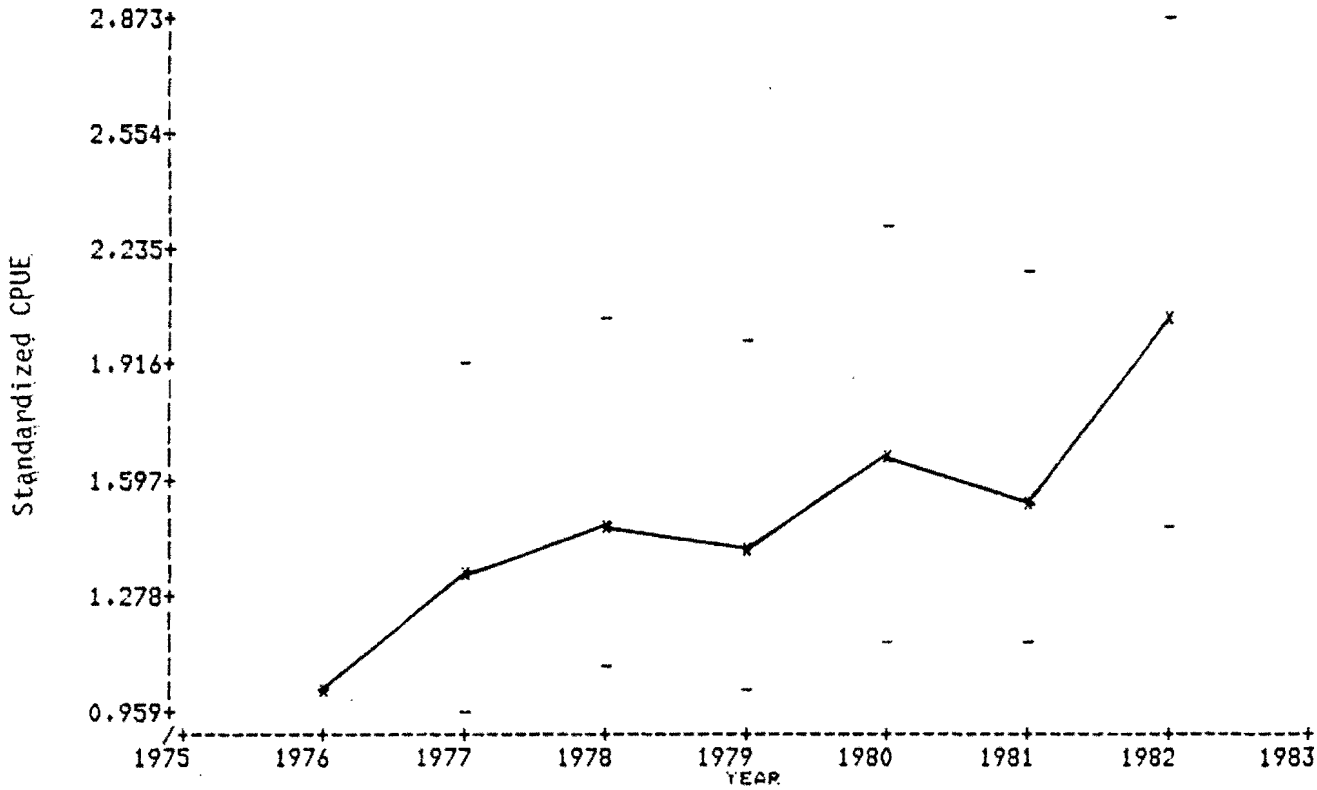


Fig. 3. Standardized (to 1976) CPUE for Division 2+3K redfish for the periods 1959-76 and 1976-82.

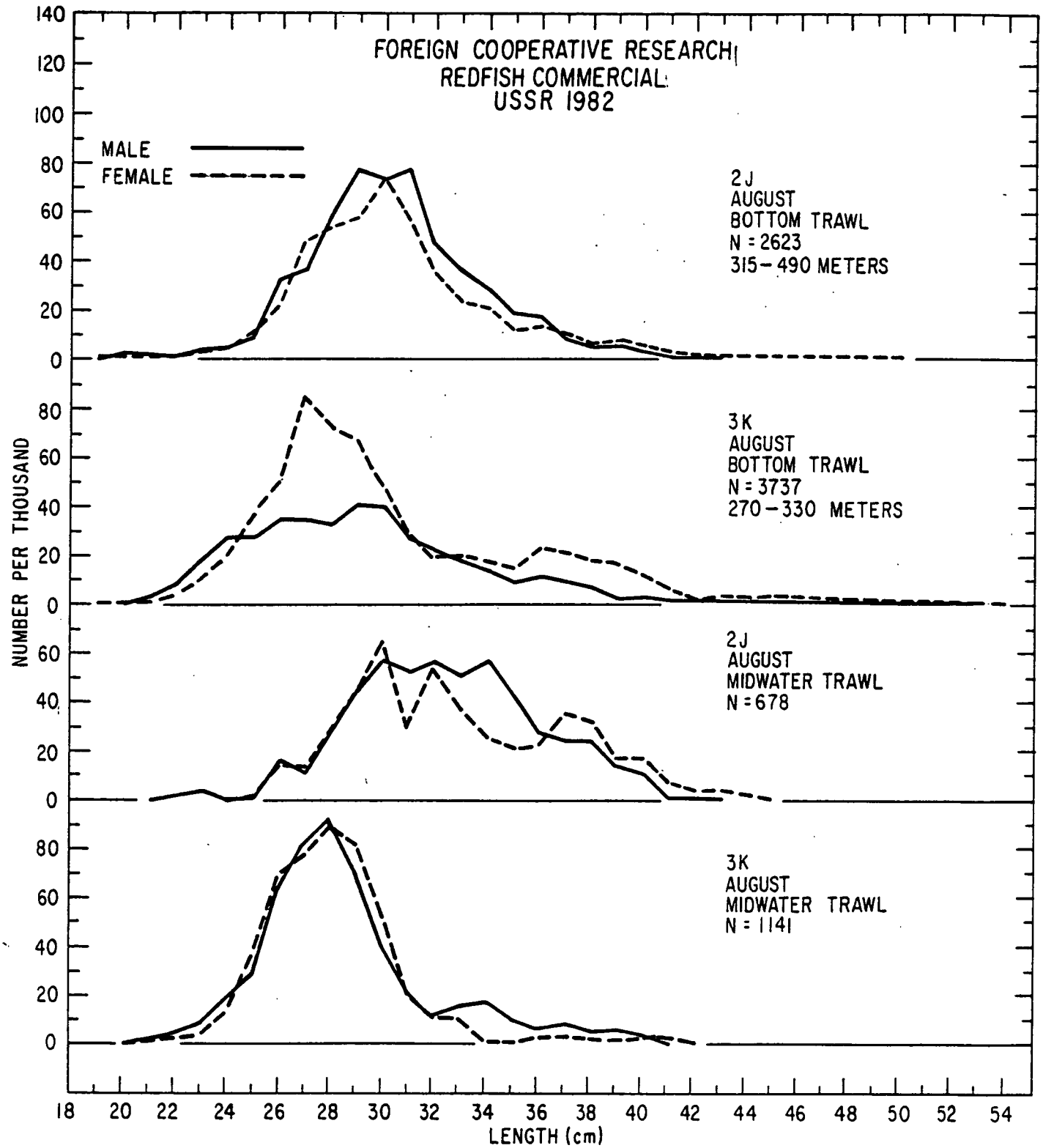


Fig. 4. 1982 USSR commercial length frequencies as collected by the Foreign Observer Program for redfish in Div. 2J, 3K.

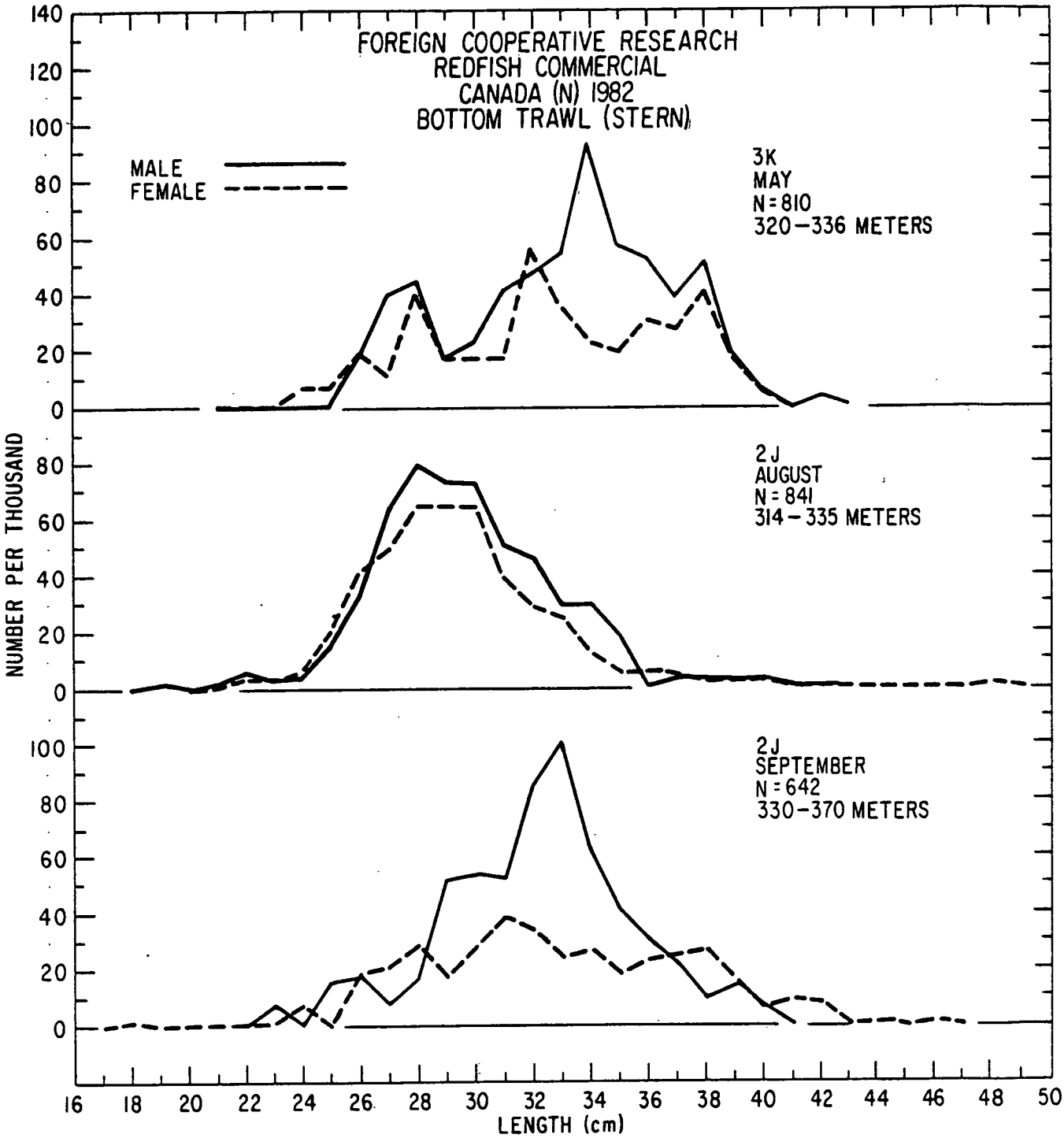


Fig. 5. 1982 Canada (Newfoundland) commercial length frequencies as collected by the Foreign Observer Program for redfish in Div. 2J,3K.

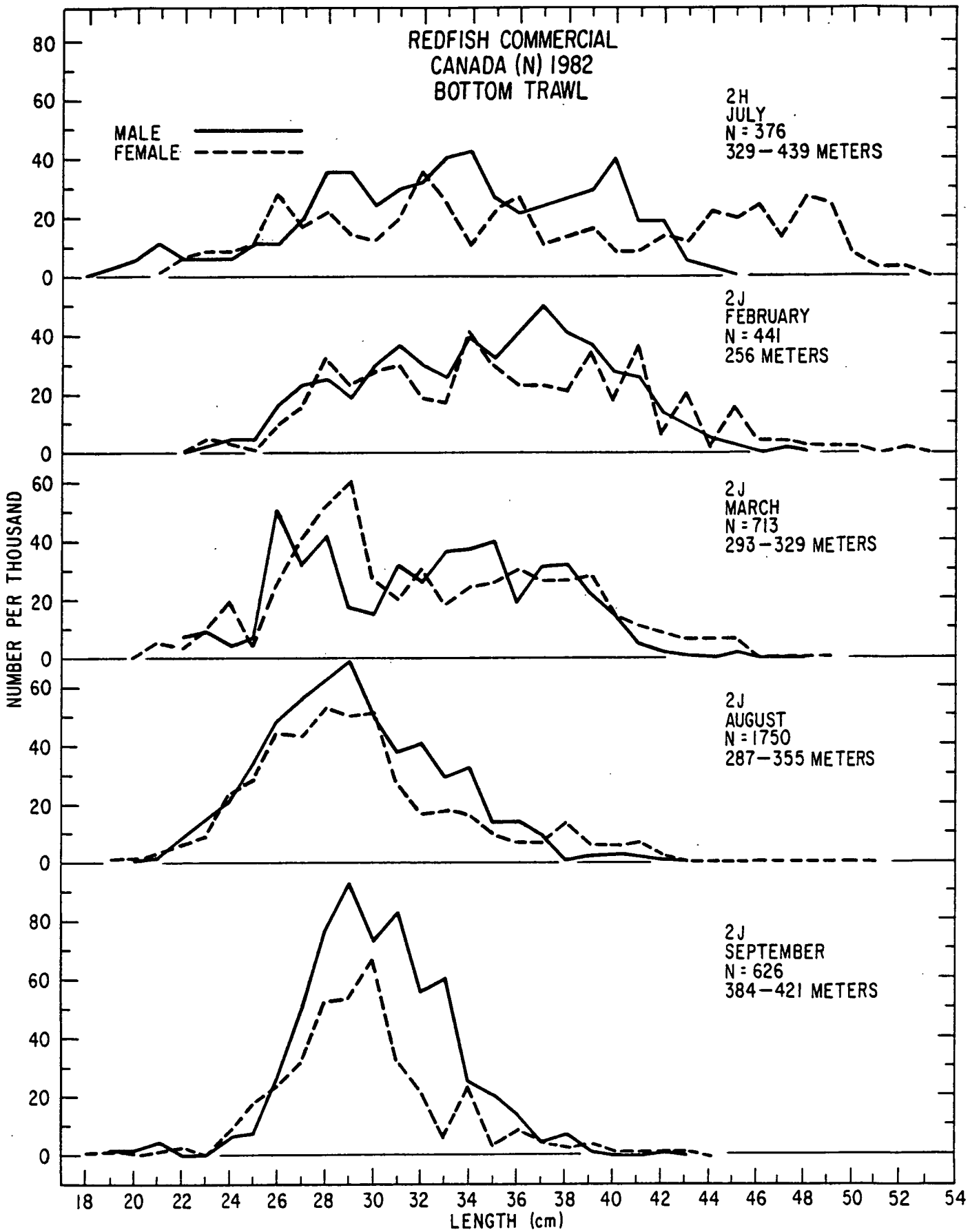


Fig. 6. 1982 Canada (Newfoundland) commercial length frequencies as collected by port sampling for redfish in Div. 2H,2J.

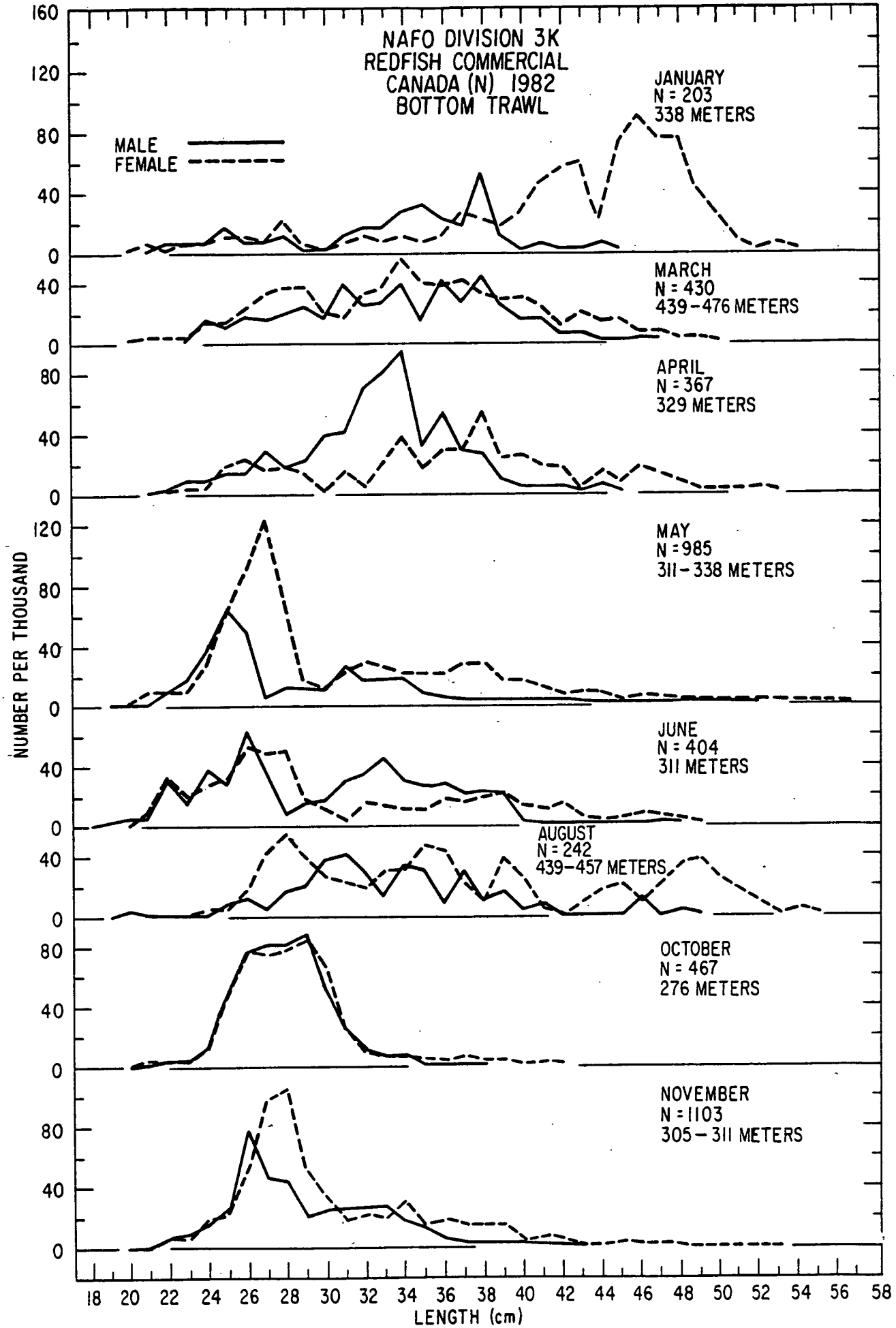


Fig. 7. 1982 Canada (Newfoundland) commercial length frequencies as collected by port sampling for redfish in Div. 3K.

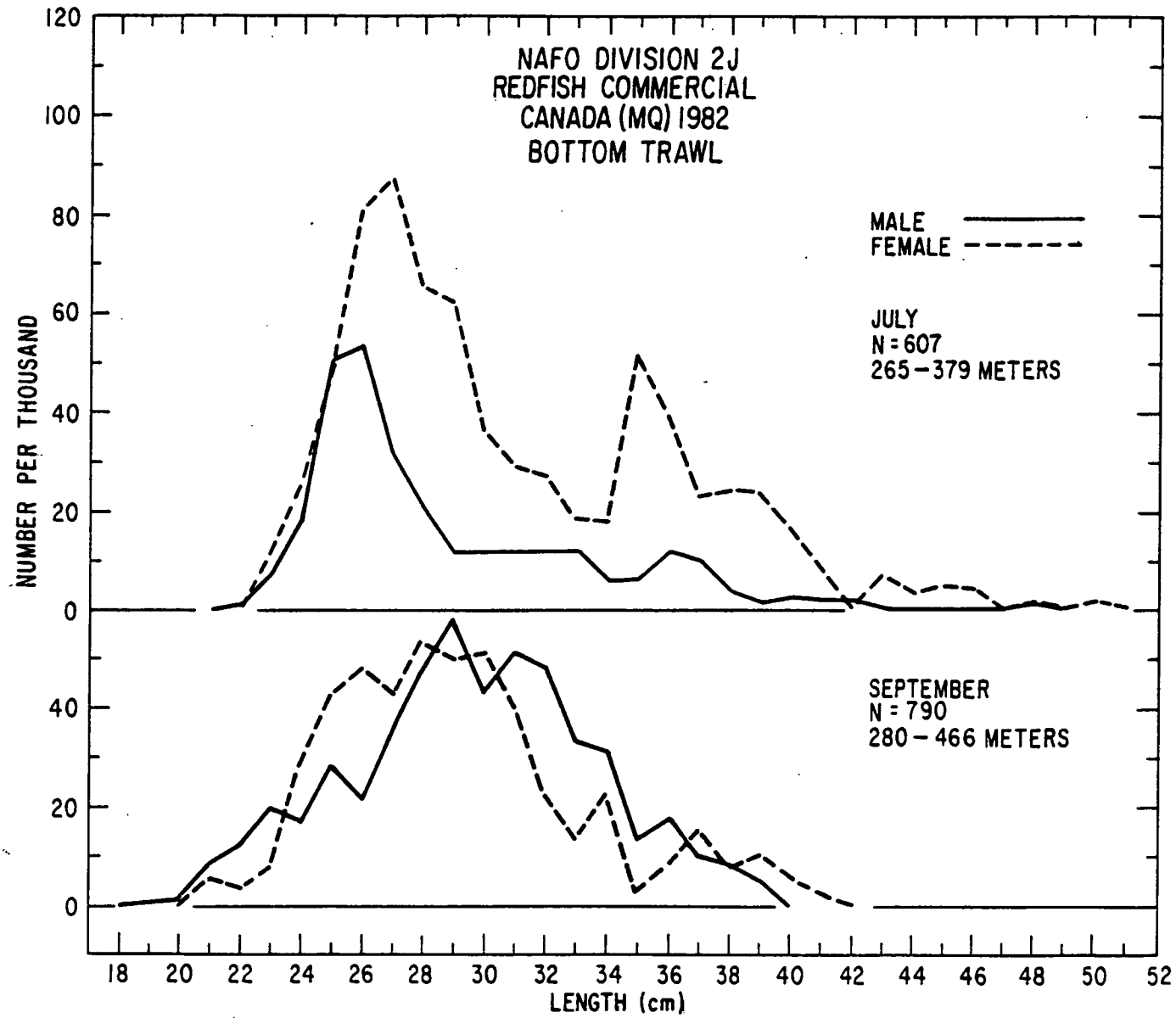


Fig. 8. 1982 Canada (MQ) commercial length frequencies as collected by port sampling for redfish in Div. 2J.

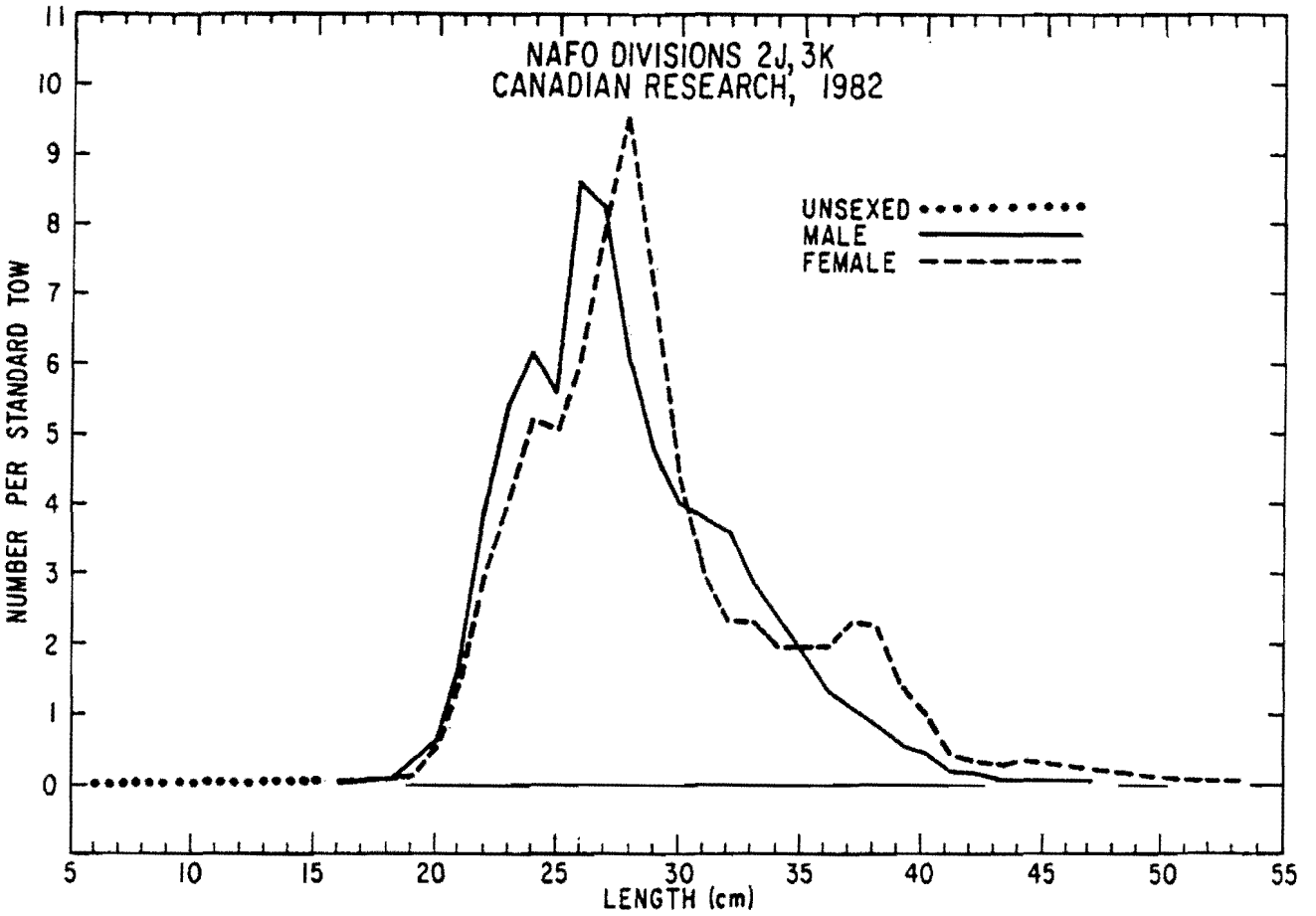


Fig. 9. Number redfish caught at length per standard tow in Div. 2J and 3K during 1982 Canadian research cruise.

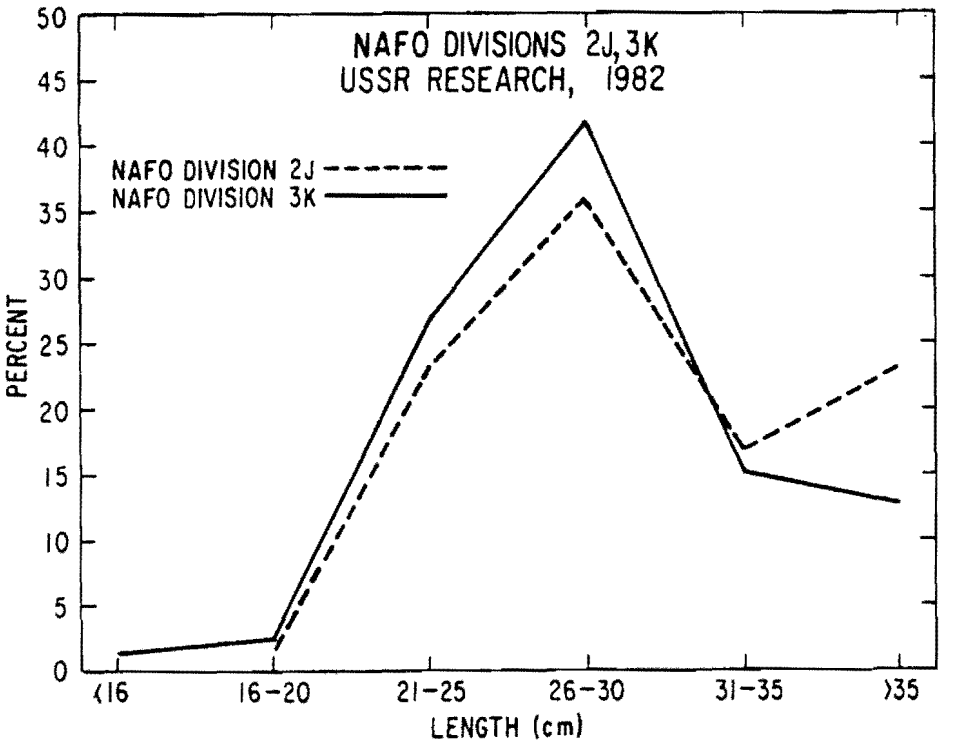


Fig. 10. Percent redfish caught at length in Div. 2J and 3K during 1982 USSR research cruise.