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Canadian Atlantic Fisheries  
Scientific Advisory Committee

CAFSAC Research Document 83/26

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Comité scientifique consultatif des  
pêches canadiennes dans l'Atlantique

CSCPCA Document de recherche 83/26

An Assessment of the 3P Redfish Stock

by

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### Abstract

In recent years catches have been well below the TAC's due to a lack of effort. Catch rates are well below those of the mid-1960's but there are indications of an increase since 1977. The high historic catch rates may have been related to strong year-classes of the late 1950's entering the fishery and therefore may not reflect the long term stock size. Research data indicate relatively high numbers of fish aged 2-4 and 6-10 present in the population. Although sufficient data are available for an analytical assessment, the low effort and consequent low fishing mortalities in recent years preclude the estimate of fishing mortality and stock abundance.

### Résumé

Les prises de ces dernières années ont été de beaucoup inférieures aux TPA, par suite d'un effort de pêche diminué. Les taux de capture sont bien au-dessous de ceux du milieu des années 1960. Cependant, depuis 1977, on observe des signes d'augmentation. Il se peut que les taux de capture historiques élevés aient été reliés aux abondantes classes d'âge de la fin des années 1950 qui ont rallié le stock exploitable et, par conséquent, ne reflètent pas l'effectif du stock à long terme. Les résultats des croisières de recherche indiquent la présence de nombres relativement élevés de poissons âgés de 2-4 et 6-10 ans dans la population. Bien que nous possédions suffisamment de données pour une évaluation analytique, le peu d'effort de pêche et les faibles mortalités qui en ont résulté ces dernières années ne permettent pas d'estimer la mortalité par pêche et l'abondance du stock.

## Introduction

In 1959 the catch was 3,900t then increased to 37,000t in 1970 but since then there has been a gradual decline to about 6,000t in 1982. The TAC's were not caught in the period 1979-1982. During this period 60%, 42%, 50% and 33% of the respective TAC's were caught. These low catches are primarily due to decreased effort, particularly in 1982 with the closure of some fish plants on the south coast of Newfoundland.

## Methods and Results

### Catch and effort

Catches comprised of  $\geq 50\%$  redfish and their corresponding effort were obtained from ICNAF/NAFO Statistical Bulletins for the period 1959-1981. Newfoundland data for 1982 were obtained from Economics Branch, Newfoundland Region. Because of problems with the Maritimes data they were not used in the analysis. Catch rates were standardized using the multiplicative model (Gavaris 1980) using the categories of vessel type, gear and year and weighted step-wise by effort. The regression results were highly significant (Table 1) and the nominal catches, standardized effort and standardized CPUE are shown in Table 2 and Fig. 1-3. The catch rates in recent years (1974-1982) are fairly stable but lower than rates from the mid 1960's to early 1970's. The higher catch rates of the mid 1960's probably resulted from the recruitment of strong year-classes of the late 1950's into the fishery and do not represent average historic stock levels.

### Numbers at Age:

Commercial length frequencies (Fig. 4-7) were applied to the total reported catch then converted to numbers at age by the method of Gavaris and Gavaris as presented to the DFO seminar on "Sampling of commercial marine fish and invertebrate catches" held in Ottawa, February 1982 using age-length data also collected in 1982. The frequencies show many different lengths being caught at various times but generally fish below about 25 cm were not common. This is reflected in Table 3 which shows the estimated numbers and weight at age. Tables 4 and 5 show the catch and weight-at-age respectively for the period 1973-1982 inclusive.

### Research cruise data:

Because of the great fluctuations in estimated total biomass and numbers and weight per tow from one year to the next, the time series is considered an unreliable index of abundance and has not been included. The numbers caught per tow at age during the 1982 research cruise by the A.T. Cameron (Fig. 8) show relatively large numbers of fish aged 2-4 present suggesting good future recruitment to the fishery. The mode at age 9 corresponds to the mode at age 8 noted from the 1981 survey (Atkinson and Gavaris MS 1982). As was noted in 1982, fish aged 7-10 have been relatively abundant in research catches for a number of years.

### Discussion

From 1980 on there has been increasing difficulty in assessing this stock because of low fishing effort and the resulting low fishing mortalities. This problem culminated in last year's assessment (Atkinson and Gavaris MS 1982) when it was concluded that terminal F could not be determined with any accuracy and therefore an analytical assesment was not possible. In 1981, 50% of the TAC was caught and in 1982 it dropped to 33%. This further decrease has, no doubt, an associated decrease in fishing mortality and it is therefore felt that again this year, the results of an analytical assessment would be inconclusive. As a result, no analytical assessment has been carried out at this time.

### 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.
- Atkinson, D.B. and C.A. Gavaris. MS 1982. 3P Redfish. CAFSAC Res. Doc. 82/35.

TABLE 1. REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R,.....0.647  
 MULTIPLE R SQUARED,.....0.419

ANALYSIS OF VARIANCE				
SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	3.968E2	3.968E2	
REGRESSION	32	1.004E2	3.138E0	20.057
TYPE 1	3	2.056E1	6.852E0	43.792
TYPE 2	6	9.787E0	1.631E0	10.425
TYPE 3	23	7.770E1	3.378E0	21.591
RESIDUALS	890	1.393E2	1.565E-1	
TOTAL	923	6.365E2		

Table 2. Catch, standardized effort, and standardized CPUE for 3P redfish.

## PREDICTED RELATIVE POWER

YEAR	TOTAL CATCH	PROP.	RELATIVE POWER		EFFORT
			MEAN	S.E.	
1959	3866	0.356	1.000	0.000	3866
1960	9225	0.348	0.845	0.173	10923
1961	9776	0.672	0.819	0.145	11933
1962	13439	0.570	0.721	0.124	18652
1963	13747	0.776	1.020	0.179	13473
1964	13807	0.803	1.050	0.190	13150
1965	18733	0.761	1.404	0.255	13339
1966	20868	0.618	1.470	0.268	14196
1967	32991	0.333	1.343	0.242	24563
1968	13884	0.391	1.116	0.205	12437
1969	32784	0.214	1.262	0.229	25977
1970	37270	0.252	1.121	0.200	33246
1971	27500	0.143	0.934	0.173	29431
1972	26037	0.150	0.884	0.162	29451
1973	18368	0.634	0.916	0.158	20043
1974	22158	0.270	0.740	0.130	29959
1975	28445	0.373	0.689	0.120	41275
1976	19167	0.504	0.466	0.117	28773
1977	17163	0.567	0.529	0.091	32437
1978	15245	0.692	0.595	0.101	25633
1979	9619	0.701	0.592	0.103	16248
1980	7564	0.758	0.679	0.119	11142
1981	8941	0.613	0.580	0.103	15417
1982	5964	0.622	0.769	0.143	7752

AVERAGE C.V. FOR THE MEAN:0.172

Table 3. Estimated numbers of redfish caught at age in the commercial fishery in 3P in 1982 and the estimated fish weight at age.

AGE	WEIGHT	CATCH	VAR(CATCH)	STD. ERROR	COEF. VAR
6	0.060	3		0.01	0.01
7	0.098	11	23.600	4.86	0.46
8	0.184	77	269.596	16.42	0.21
9	0.220	236	823.733	28.70	0.12
10	0.266	252	1701.761	41.25	0.16
11	0.326	612	7202.816	84.87	0.14
12	0.361	864	10397.328	101.97	0.12
13	0.373	952	11748.039	108.39	0.11
14	0.396	1327	16207.426	127.31	0.10
15	0.416	1052	13285.617	115.26	0.11
16	0.441	949	11936.668	109.26	0.12
17	0.514	462	4563.353	67.55	0.15
18	0.518	325	3257.258	57.07	0.18
19	0.573	235	1797.287	42.39	0.18
20	0.599	152	1489.853	38.60	0.25
21	0.655	190	1483.269	38.51	0.20
22	0.665	209	1571.486	39.64	0.19
23	0.699	196	1742.193	41.74	0.21
24	0.678	305	2260.911	47.55	0.16
25	0.707	397	3643.984	60.37	0.15
26	0.745	580	5447.806	73.81	0.13
27	0.850	390	3833.968	61.92	0.16
28	0.820	415	4492.615	67.03	0.16
29	0.932	345	3777.409	61.46	0.18
30	0.986	878	7096.485	84.24	0.10

TABLE 4 3P REDFISH CATCH AT AGE, 1973-1982.

AGE	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
6	13	105	401	41	257	1339	440	191	8	3
7	11	895	694	56	491	4146	1510	976	204	11
8	16	1876	1868	263	499	7359	2703	1776	1550	77
9	8	1647	883	581	790	7382	2859	2377	1923	236
10	20	1528	486	386	835	5203	1606	1929	1686	252
11	536	1830	1112	434	777	2358	896	1532	1344	612
12	1004	1399	623	506	971	2049	1020	1219	1236	864
13	3076	3602	1016	990	849	857	714	629	1327	952
14	6099	3058	1123	1119	1022	1085	710	802	635	1327
15	9314	3173	2206	1072	1438	1162	496	579	518	1052
16	5866	7661	3613	1796	793	927	449	313	384	949
17	7300	2597	8428	1124	1298	791	603	366	348	462
18	1842	3930	6040	4154	1005	1067	548	308	304	325
19	878	1063	12060	1897	2659	852	531	315	399	235
20	1149	1326	3015	6345	1490	1883	655	319	374	152
21	589	701	2323	1463	4659	520	1021	428	286	190
22	385	1555	2080	2387	2281	1534	676	809	510	209
23	404	2821	1758	1957	2398	1040	1263	484	876	196
24	484	1410	790	1310	2031	1080	731	796	521	305
25	168	2147	1205	2269	1083	1053	1053	482	1021	397
26	2	1887	995	1613	619	674	691	490	688	580
27	2	2	687	868	396	532	454	239	649	390
28	2	2	2	575	307	339	345	287	450	415
29	2	2	2	2	289	187	207	171	371	345

TABLE 5 3P REDFISH WEIGHT AT AGE, 1973-1982.

AGE	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
6	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.113	0.060
7	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.137	0.098
8	0.177	0.177	0.177	0.177	0.177	0.177	0.177	0.177	0.177	0.184
9	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.220	0.220
10	0.247	0.247	0.247	0.247	0.247	0.247	0.247	0.247	0.266	0.266
11	0.286	0.286	0.286	0.286	0.286	0.286	0.286	0.286	0.290	0.326
12	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.340	0.361
13	0.369	0.369	0.369	0.369	0.369	0.369	0.369	0.369	0.355	0.373
14	0.406	0.406	0.406	0.406	0.406	0.406	0.406	0.406	0.417	0.396
15	0.445	0.445	0.445	0.445	0.445	0.445	0.445	0.445	0.426	0.416
16	0.481	0.481	0.481	0.481	0.481	0.481	0.481	0.481	0.465	0.441
17	0.516	0.516	0.516	0.516	0.516	0.516	0.516	0.516	0.515	0.514
18	0.553	0.553	0.553	0.553	0.553	0.553	0.553	0.553	0.541	0.518
19	0.587	0.587	0.587	0.587	0.587	0.587	0.587	0.587	0.621	0.573
20	0.621	0.621	0.621	0.621	0.621	0.621	0.621	0.621	0.625	0.599
21	0.657	0.657	0.657	0.657	0.657	0.657	0.657	0.657	0.601	0.655
22	0.688	0.688	0.688	0.688	0.688	0.688	0.688	0.688	0.650	0.665
23	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.652	0.699
24	0.770	0.770	0.770	0.770	0.770	0.770	0.770	0.770	0.707	0.678
25	0.816	0.816	0.816	0.816	0.816	0.816	0.816	0.816	0.726	0.707
26	0.865	0.865	0.865	0.865	0.865	0.865	0.865	0.865	0.784	0.745
27	0.913	0.913	0.913	0.913	0.913	0.913	0.913	0.913	0.811	0.850
28	0.948	0.948	0.948	0.948	0.948	0.948	0.948	0.948	0.872	0.820
29	0.985	0.985	0.985	0.985	0.985	0.985	0.985	0.985	0.883	0.932

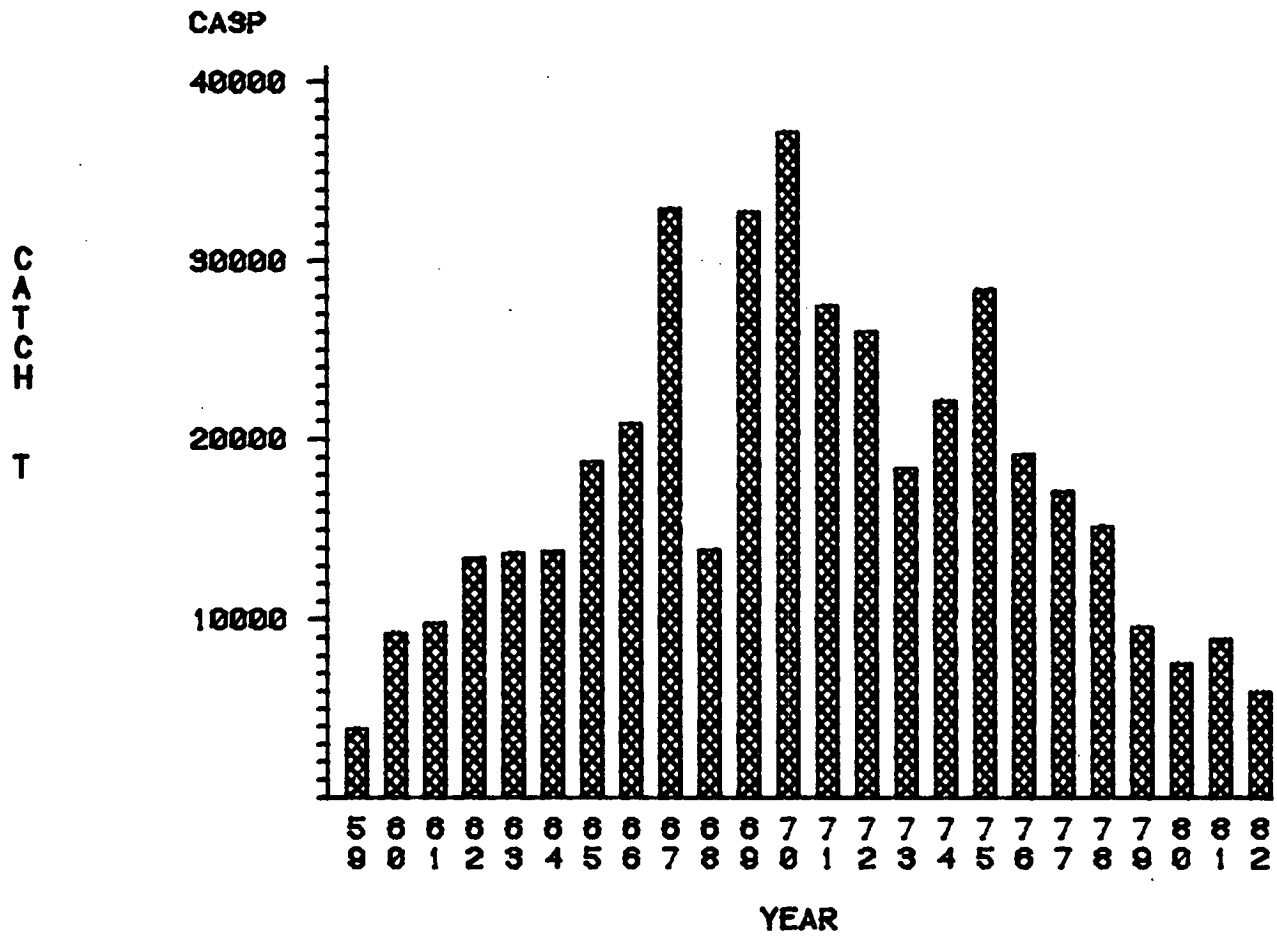


FIG.1: NOMINAL CATCHES OF REDFISH IN NAFO DIV. 3P  
(1982 IS PROVISIONAL)



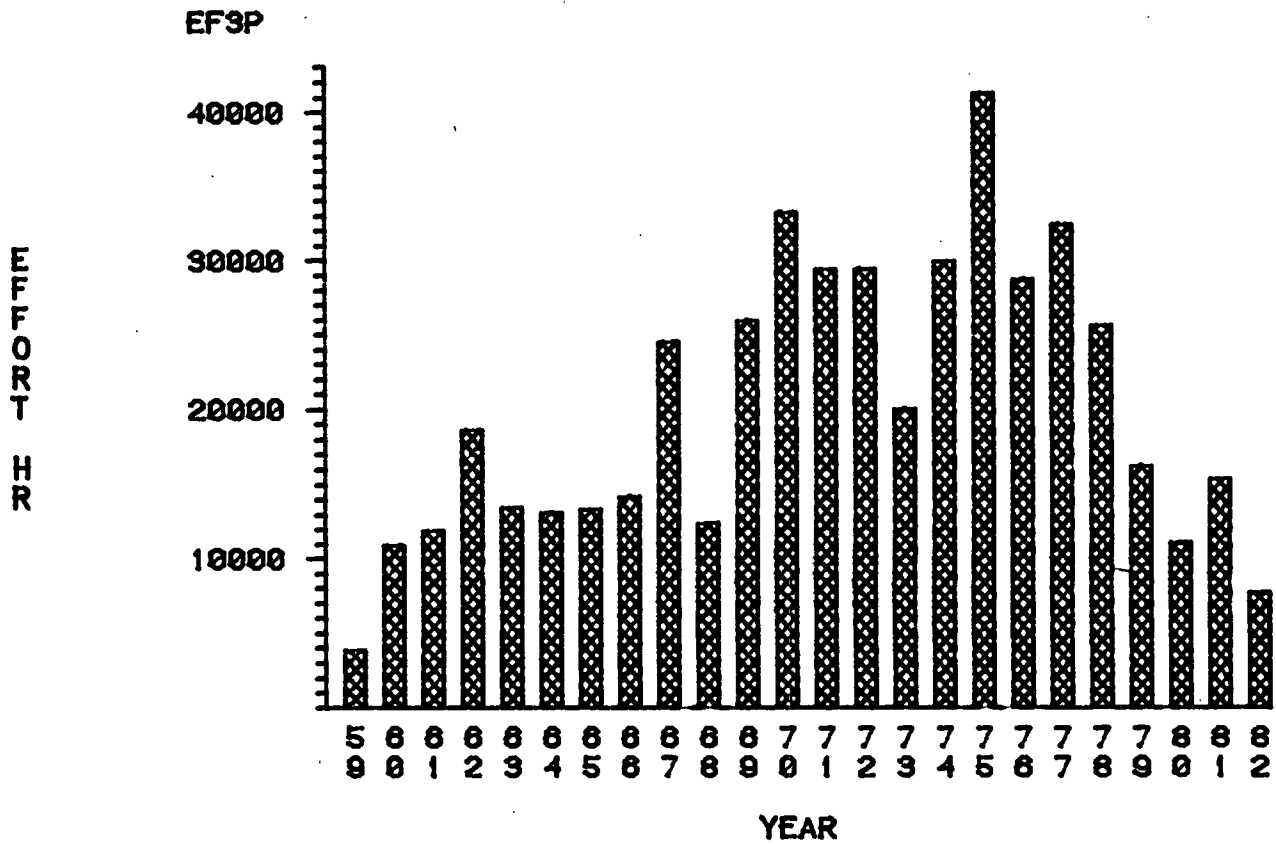


FIG.2: STANDARDIZED EFFORT FOR REDFISH IN DIV. 3P  
(MARITIMES AND QUEBEC DELETED)

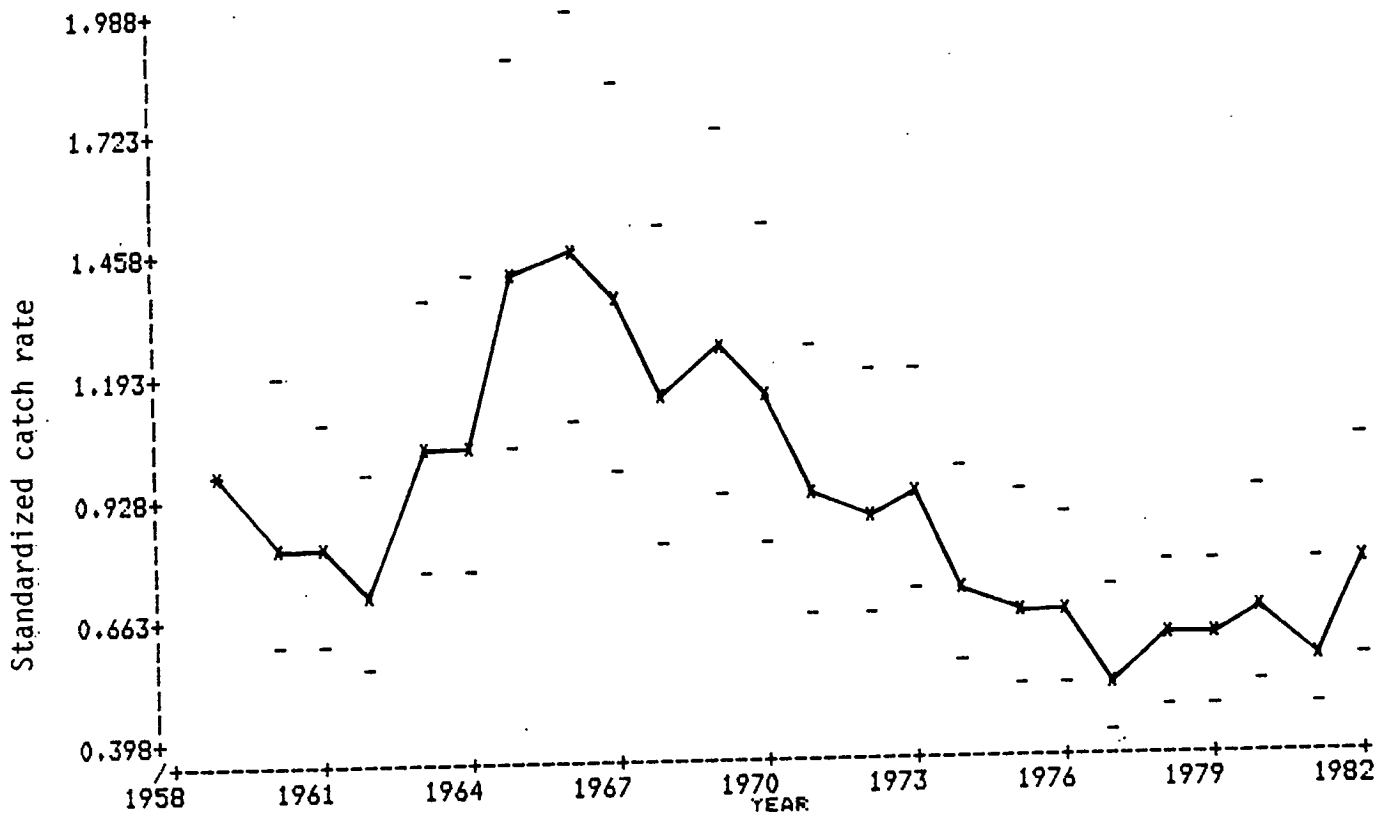


Fig. 3. Standardized catch rates for redfish in NAFO Div. 3P

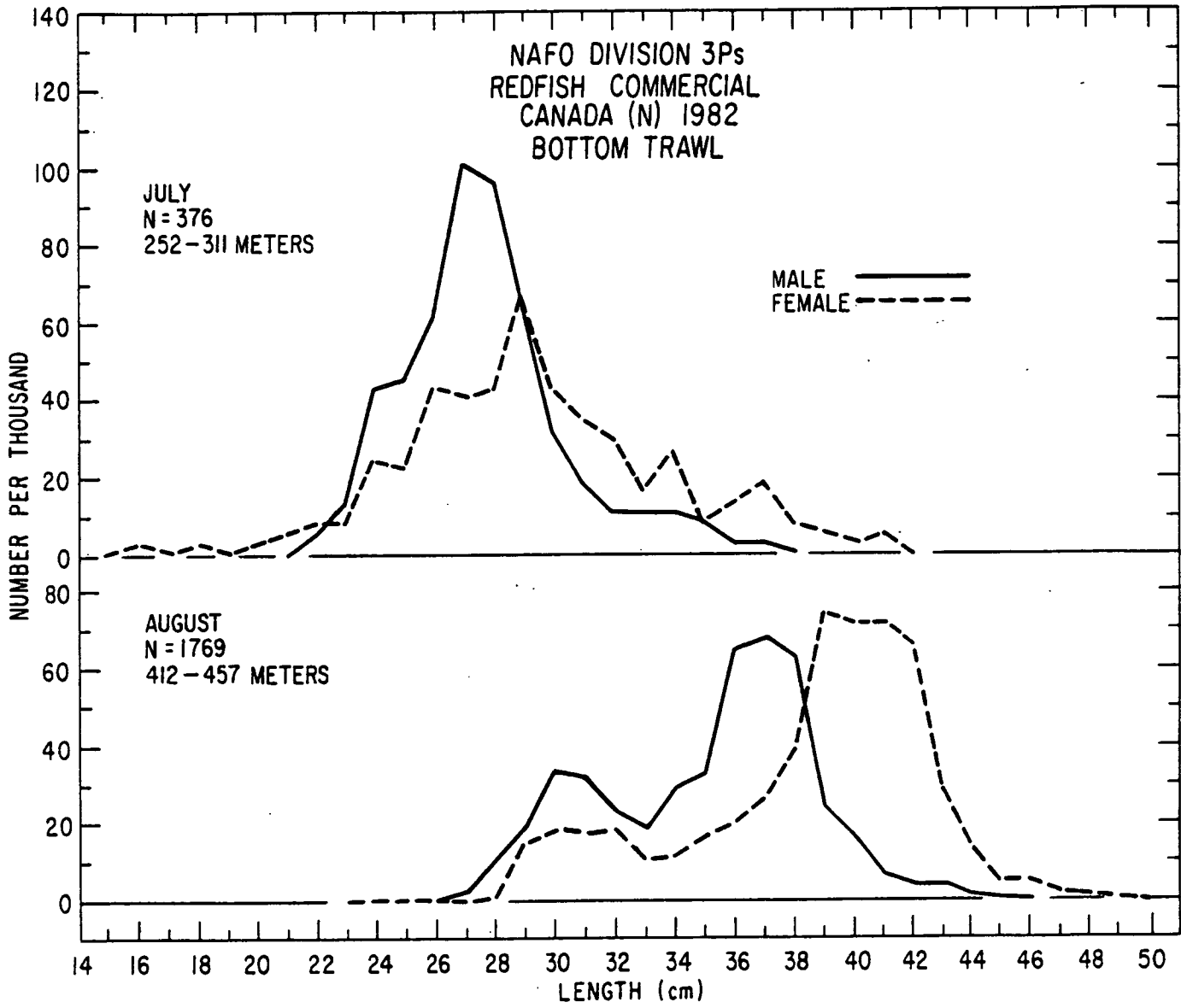


Fig. 4. Canada (Nfld.) commercial redfish frequencies from 3Ps in 1982 from port sampling.

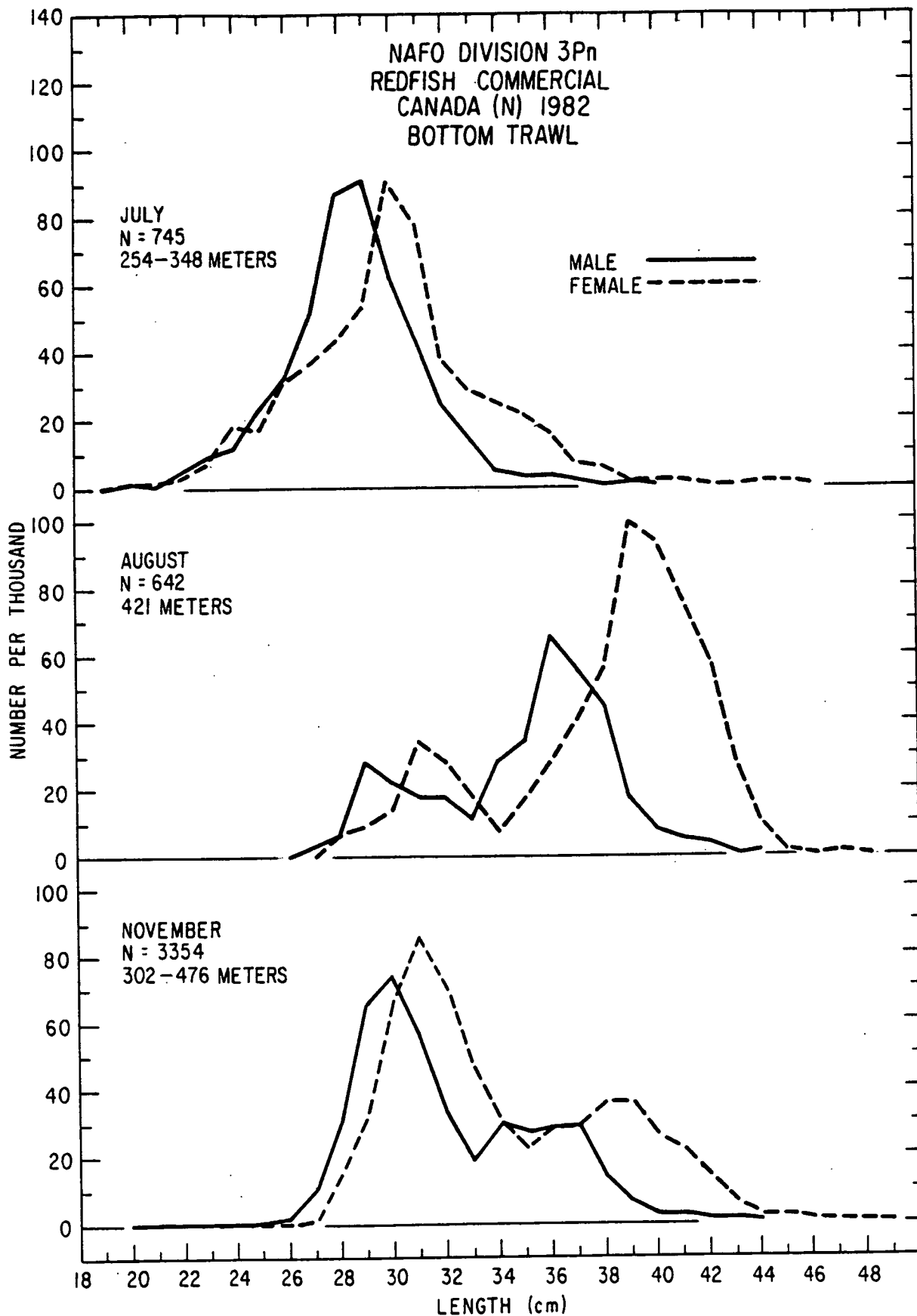


Fig. 5. Canada (Nfld.) commercial frequencies from 3Pn in 1982 from port sampling.

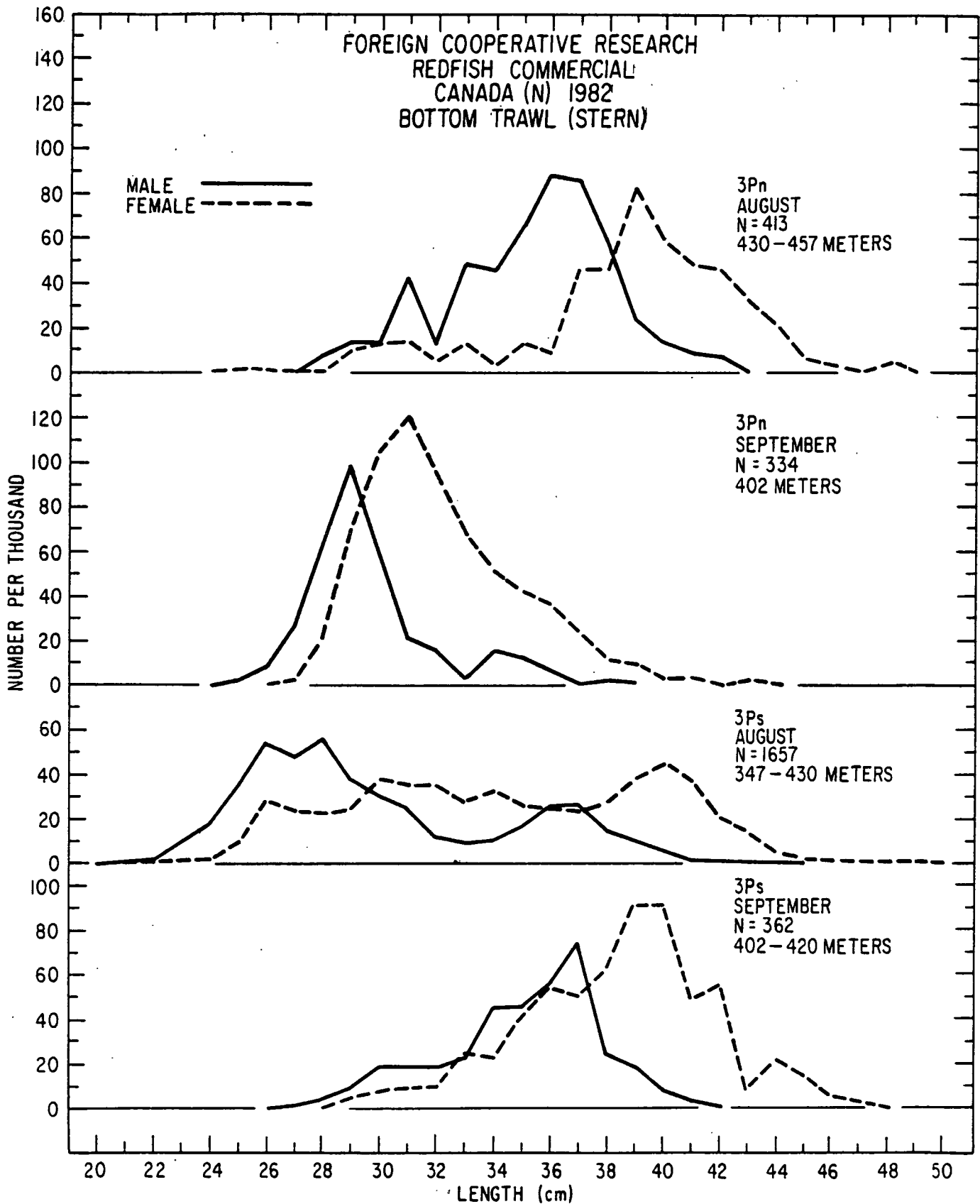


Fig. 6. Canada (Nfld.) commercial redfish frequencies from 3P in 1982 from the Foreign Observer Program (stern trawlers).

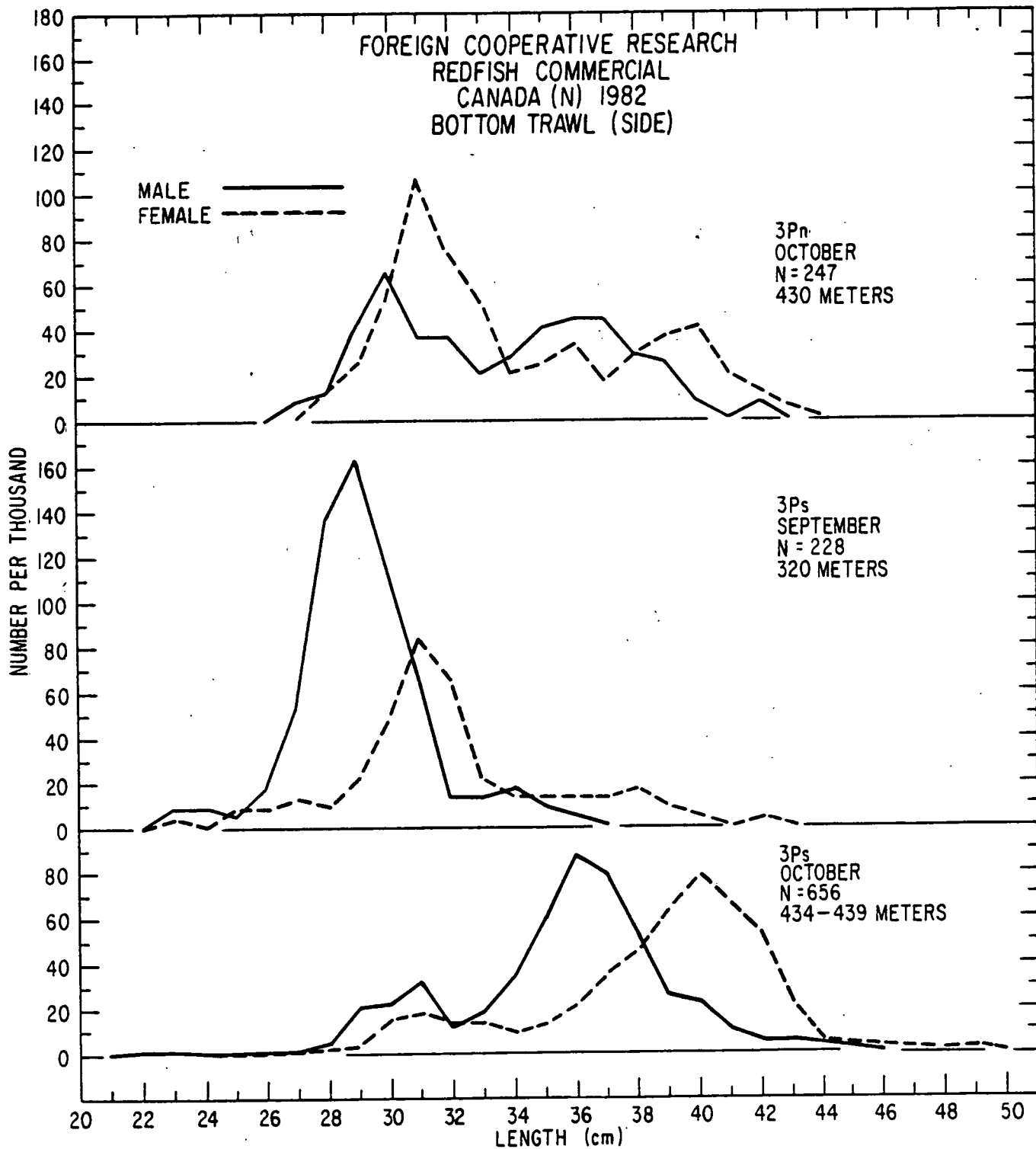


Fig. 7. Canada (Nfld.) commercial redfish frequencies from 3P in 1982 from the Foreign Observer Program (side trawlers).

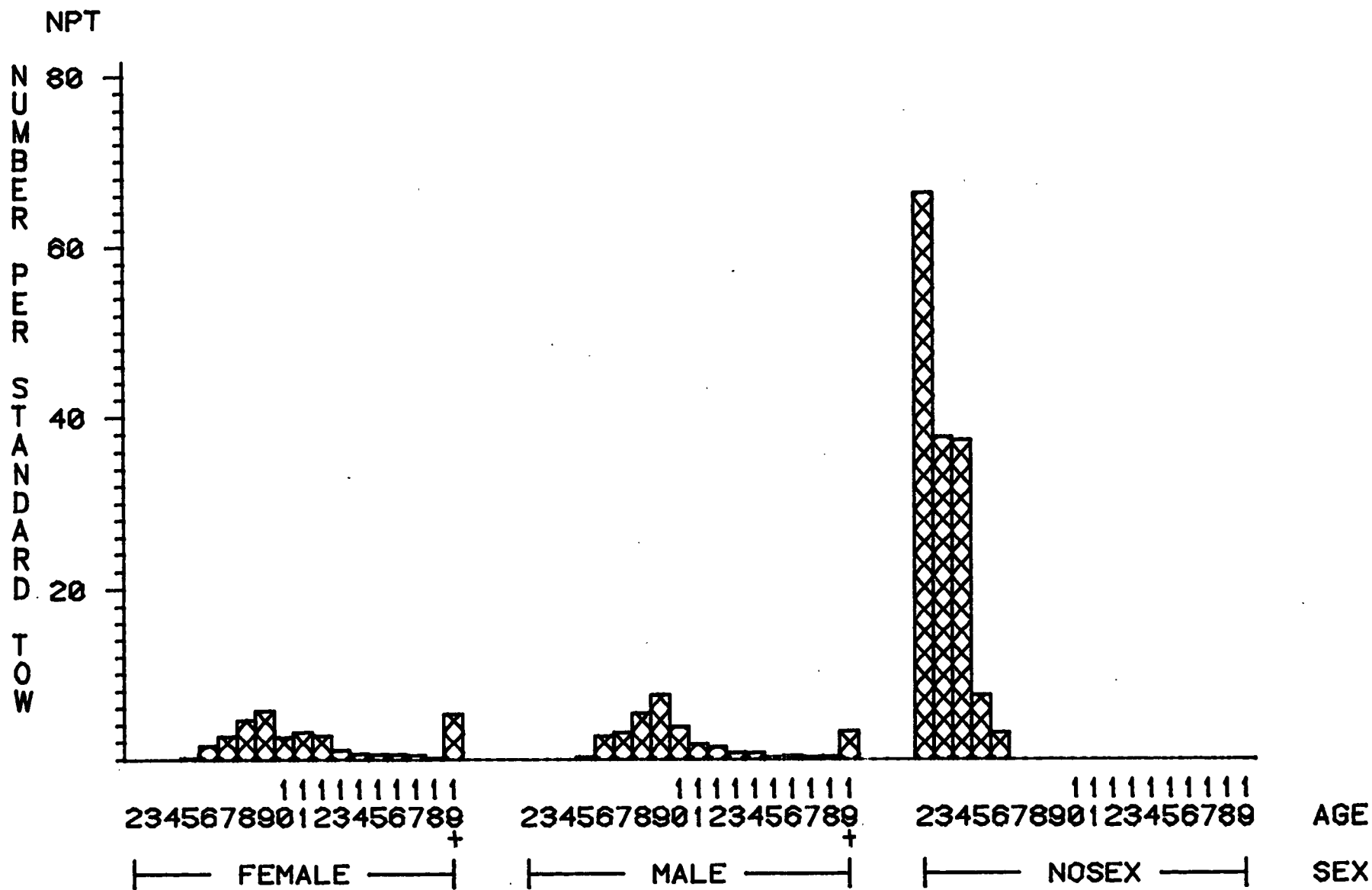


FIG.8: NUMBERS CAUGHT AT AGE PER STANDARD TOW IN 3P DURING 1982 CANADIAN RESEARCH CRUISE