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Recent Changes in Haddock Abundance on the Grand Bank and St. Pierre Bank

by

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Abstract

Haddock stocks on the Grand Banks and St. Pierre Bank have been at a very low level since the 1960's but are presently showing signs of improvement. Data from research vessel surveys and the commercial fishery have indicated an increased abundance of small fish which have been estimated as belonging to the 1980 and 81 year-classes. Survey results suggests that these year-classes are approximately one tenth the size of those which were most successful in the past.

Résumé

Les stocks d'aiglefin des Grands bancs et du banc St-Pierre sont à un très bas niveau depuis 1960, mais ils semblent actuellement augmenter. Les données tirées des relevés faites par les navires de recherche et celles provenant de la pêche commerciale révèlent la présence d'un nombre accru de petits poissons qui semblent appartenir aux classes d'âge de 1980 et 1981. Les résultats des relevés permettent de croire que le nombre de poissons de ces classes d'âge représentent environ dix pourcent de celui des meilleures classes anêtrieures.

Haddock stocks on the Grand Bank and St. Pierre Bank have been at a very low level since the early 1960's. Strong year classes in the late 1940's and 50's supported a fishery which caught as much as 75000 tons on the Grand Bank (3NO) in 1961 (Fig. 1) and 58000 tons on St. Pierre Bank (3Ps) in 1955 (Fig. 2). Year class success has been poor since the 1950's in 3NO and the last moderately successful year class in 3Ps was that in 1966.

Data available from research vessel surveys and the commercial fishery in recent years have indicated that the haddock stocks on the Grand Bank and St. Pierre Bank are showing some signs of improvement. One report from the Observer Program in August of 1983 indicated that there was considerable discarding of small haddock (34.5 tons in 3 days) by some Can(N) vessels while fishing in the Southeast Shoal area. While there were considerable numbers caught, the problem appeared to be restricted to a specific area. No length frequencies were obtained and as such the actual year classes caught could not be determined.

Haddock length frequencies obtained from research vessel surveys over the period 1980-83 (Fig. 3 and 4) have indicated modal peaks which have been estimated as corresponding to year classes. Otoliths collected on the surveys have not been aged and the ages of the incoming year classes have been estimated from the frequencies along with age data available from the past. It would appear that the current successful year classes in 3NO are those of 1980 and 1981 while the 1981 year class appears to be the only significant one in 3Ps. Reports of Soviet research surveys in 3NO (NAFO SCS Doc. 83/VI/16) have indicated the same trend in year class abundance.

Biomass and abundance estimates from stratified random research cruises since 1972 have shown (Tables 1-6) an increase in recent years although there is considerable variation about the mean estimates.

Relative strengths of current year classes

Some of the dominant year classes in the recent history of the haddock stocks have been the 1949, 1952 and 1955 year classes in 3NO and the 1949 and 1957 in 3Ps. A comparison of numbers at age caught per 30 min. tow from research surveys in earlier years with surveys in current years indicated (Table 7) that the 1980 and 81 year classes were smaller than those successful in the past. In Div. 3NO the current year classes were smaller than the earlier year classes by a factor of approximately ten.

Soviet data as provided in NAFO SCS Doc. 83/VI/16 are shown below for comparison. Values are similar to those obtained from comparable Canadian surveys other than the large values obtained for the two year classes in the 1982 Soviet survey. A more detailed look at the Soviet research data would be necessary to determine if variation between sets was significant or if a particular set was influential.

Survey year	# Per ½ hr tow	80 Year Class %	80 Year Class # per tow	81 Year Class %	81 Year Class # per tow
		3Ø			
81	26	77	20		
82	376	45	169	51	190
		3N			
81	3.5	77	3		
82	35	2	1	96	34

Future prospects

It is obvious that the extent to which these year classes could be effective in permitting a directed haddock fishery is dependent on their size. The data available would indicate that even though the year classes are relatively strong, they appear to be considerably below the strength of those which previously provided a substantial haddock fishery. Surveys conducted prior to 1981 were line surveys as opposed to the stratified random surveys since that time. An unadjusted comparison of mean numbers per tow as presented here might not provide an accurate comparison.

It is not feasible to predict if a future directed fishery would be possible or its extent, unless we have a more accurate estimate of the year class sizes. The only research information available for Div.'s 3NO during 1983 was that from a juvenile flatfish survey (Fig. 3) which did not have extensive courage over the Grand Bank. Largest catches were restricted to the central part of the Bank at the border of 3N and 3Ø in the area of the 45°N Lat. line. A survey in 1984 will provide a further estimate of year class abundance once the data have been fully analyzed particularly since the 1980 year class will be 4 years old and more fully recruited to fishing gears.

Table 1. Haddock biomass and abundance estimates from stratified random research vessel surveys in Subdivision 3Ps.

Year	Biomass (tons)			Numbers (000's)			Mean No. per tow	Mean wt. (kg) per tow
	Mean	Upper	Lower	Mean	Upper	Lower		
1972	2886	5315	457	2442	4144	740	3.97	4.70
1973	683	1037	328	1759	3789	-271	3.05	1.18
1974	866	1224	509	659	950	367	1.42	1.86
1975	666	1023	308	478	826	129	1.24	1.73
1976	937	1625	250	691	1164	219	0.77	1.05
1977	1996	4723	-731	1551	3255	-152	2.69	3.46
1978	118	217	18	214	537	-109	.33	0.18
1979	770	3935	-2395	554	2052	-945	.73	1.01
1980	829	1488	169	359	613	105	.28	0.64
1981	472	997	-53	342	741	-56	.28	0.38
1982	1570	2445	694	14602	28150	1053	11.48	1.23
1983	2345	5275	-584	6684	13661	-293	5.10	1.79

Table 2. Haddock biomass and abundance estimates from stratified random research vessel surveys in Division 3N.

Year	Biomass (tons)			Numbers (000's)			Mean No. per tow	Mean wt. (kg) per tow
	Mean	Upper	Lower	Mean	Upper	Lower		
1972	119	312	-74	302	1329	-726	0.25	0.10
1973	38	203	-126	22	119	-74	0.02	0.04
1974	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0
1976	7	25	-11	126	486	-233	0.13	0.01
1977	30	200	-140	78	527	-371	0.06	0.02
1978	0	0	0	0	0	0	0	0
1979	6	105	-90	8	116	-99	0.01	0.01
1980	89	308	-129	20	68	-29	0.02	0.07
1981	29	125	-68	217	1004	-571	0.19	0.03
1982	84	708	-540	1349	12077	-9378	1.09	0.07

Table 3. Haddock biomass and abundance estimates from stratified random research vessel surveys in Division 3Ø. (Survey not conducted in 1974.)

Year	Biomass (tons)			Numbers (000's)			Mean No. per tow	Mean wt. (kg) per tow
	Mean	Upper	Lower	Mean	Upper	Lower		
1973	421	933	-91	284	762	-194	0.26	0.38
1975	631	5853	-4590	379	1406	-649	0.33	0.54
1976	413	4306	-3481	1257	2421	93	0.98	0.32
1977	185	534	-164	248	468	28	0.20	0.15
1978	3911	11621	-3798	4431	11563	-2701	3.44	3.04
1979	906	1511	300	1524	3858	-811	1.14	.68
1980	1311	2015	607	725	1085	365	0.56	1.01
1981	36	488	-417	213	2926	-2499	0.31	0.05
1982	11798	34728	-11132	78539	255381	-98303	58.98	8.86

Table 4. Haddock biomass estimates (wt.'s in tons) by stratum from stratified random research vessel surveys in NAFO Subdivision 3Ps.

Depth Range (fm)	Strata	Area (sq mi)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
	314	974	0	-	0	-	7	0	0	-	0	0	7	63
0-30	320	1320	-	0	-	-	0	-	-	-	0	0	105	94
	308	112	-	0	0	0	0	0	0	0	0	19	0	0
	312	272	72	-	0	0	0	0	0	0	-	0	0	5
	315	827	0	0	0	-	0	0	-	0	0	0	0	31
31-50	321	1189	0	0	-	-	0	-	0	-	8	0	0	0
	325	944	-	-	-	-	0	-	0	0	0	0	0	0
	326	166	-	-	-	-	-	-	0	0	0	0	0	0
	307	395	323	0	152	111	0	30	0	19	74	0	342	22
	311	317	117	0	85	22	393	221	0	1	0	1	0	20
	317	193	155	3	89	13	92	204	-	20	0	87	333	192
51-100	319	984	17	12	34	141	84	1358	-	0	0	0	293	633
	322	1567	-	-	-	-	3	-	0	0	0	0	0	0
	323	696	5	-	-	-	0	0	0	-	0	0	0	0
	324	494	-	-	-	-	0	-	-	0	0	-	0	0
	306	419	-	-	21	0	86	0	0	136	0	142	28	67
	309	296	292	195	16	10	0	0	54	10	0	7	0	15
101-150	310	170	804	79	195	215	-	2	42	14	0	0	213	7
	313	165	742	64	160	79	202	103	22	40	133	149	152	929
	316	189	140	340	169	45	35	74	-	80	106	31	-	156
	318	123	371	10	0	9	0	3	-	14	105	-	69	51

Table 4 (Cont'd.)

Depth Range (fm)	Strata	Area (sq mi)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
	705	195	-	-	15	0	37	0	0	6	0	0	0	0
	706	476	-	-	36	-	-	0	-	87	373	0	0	0
151-200	707	93	-	-	7	0	0	0	-	307	0	-	-	0
	715	132	-	-	-	20	0	0	0	37	29	12	26	60
	716	539	-	-	-	-	-	0	0	0	0	25	0	0
	708	117	-	-	-	0	-	0	-	0	0	-	-	0
	711	961	-	-	-	-	-	-	-	-	0	0	0	0
201-300	712	973	-	-	-	-	-	-	-	0	0	0	0	0
	713	950	-	-	-	0	-	-	-	-	0	0	0	0
	714	1195	-	-	-	-	-	-	-		0	0	0	0

Table 5. Haddock biomass estimates (wt.'s in tons) by stratum from stratified random research vessel surveys in NAFO Division 3Ø.

Depth Range (fm)	Strata	Area (sq mi)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
	330	2089		0		0	0	0	0	325	0	0	0
	331	456		0		0	0	-	0	18	0	-	0
31-50	338	1898		0		323	0	64	0	42	85	-	74
	340	1716		-		0	0	0	0	0	0	0	13
	351	2520		0		0	0	0	0	51	0	0	99
	352	2580		0		0	0	17	0	0	0	-	14
	353	1282		266		0	0	0	0	18	0	-	1219
	329	1721		0		-	304	0	2710	1	0	0	0
	332	1047		0		250	36	0	619	53	153	-	99
51-100	337	948		22		43	16	0	582	359	119	-	9678
	339	585		0		0	-	-	0	0	-	0	23
	354	474		67		-	51	0	0	8	0	36	0
	333	151		-		8	0	63	0	12	326	-	237
101-150	336	121		44		0	6	40	0	19	288	-	204
	355	103		0		8	0	-	-	0	123	0	112
	334	92		-		-	0	0	0	0	190	-	26
151-200	335	58		16		-	0	-	0	0	7	-	0
	356	61		0		-	-	-	-	0	21	0	-

Table 6. Haddock biomass estimates (wt.'s in tons) by stratum from stratified random research vessel surveys in NAFO Division 3N.

Depth Range (fm)	Strata	Area (sq mi)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
	375	1593	0	0	0	0	-	0	0	0	0	0	0
<30	376	1499	0	0	-	0	0	0	0	0	0	0	0
	360	2992	25	-	-	0	0	0	0	0	0	0	0
	361	1853	52	0	0	0	0	0	0	0	89	-	7
31-50	362	2520	0	0	0	0	0	0	0	0	0	8	5
	373	2520	0	0	0	-	0	0	0	0	0	0	0
	374	931	0	0	0	0	-	0	0	0	0	0	0
	383	674	0	0	0	-	0	0	0	0	0	0	0
	359	421	38	0	-	-	7	0	-	0	0	21	48
51-100	377	100	0	0	0	0	-	0	0	0	0	0	0
	382	647	0	0	0	-	0	0	0	0	0	0	0
	358	225	0	38	-	-	-	29	-	8	0	0	20
101-150	378	139	0	0	0	-	-	1	0	0	0	0	0
	381	182	3	0	0	0	-	0	0	0	0	0	0
	357	164	-	0	-	-	-	0	-	0	0	0	3
151-200	379	106	-	0	0	-	-	0	0	0	0	0	0
	380	116	0	0	0	-	-	0	-	0	0	0	-

Table 7. Estimates of relative abundance (mean no. per tow) of haddock year classes from a comparison of length frequencies.

Div.	Year Class	No. per 30 min tow Age 1	No. per 30 min tow Age 2	Depth range (F&M)	No. tows	Dates	Trip No.
3NO	49		212	41-78	29	Mar. 1951	INV. 2
	52		283	23-146	47	May-June 1954	INV. 2+3
	55		300	26-81	34	May-June 1957	INV. 2+3
	80		17	23-197	138	March-April 1982	ATC 327-328
	80		18	≤100	110		
	81	13		23-197	138	March-April 1982	ATC 327-328
	81	11		≤100	110		
3Ps	49		753	24-235	42	May-June 1951	INV. 5+6
	56	54			30	June 1957	INV. 4
	57		60		30	June 1959	INV. 2
	81	27		24-250	83	May-June 1982	ATC 330
	81		6	20-250	173	April-May 1983	A. Needler 9

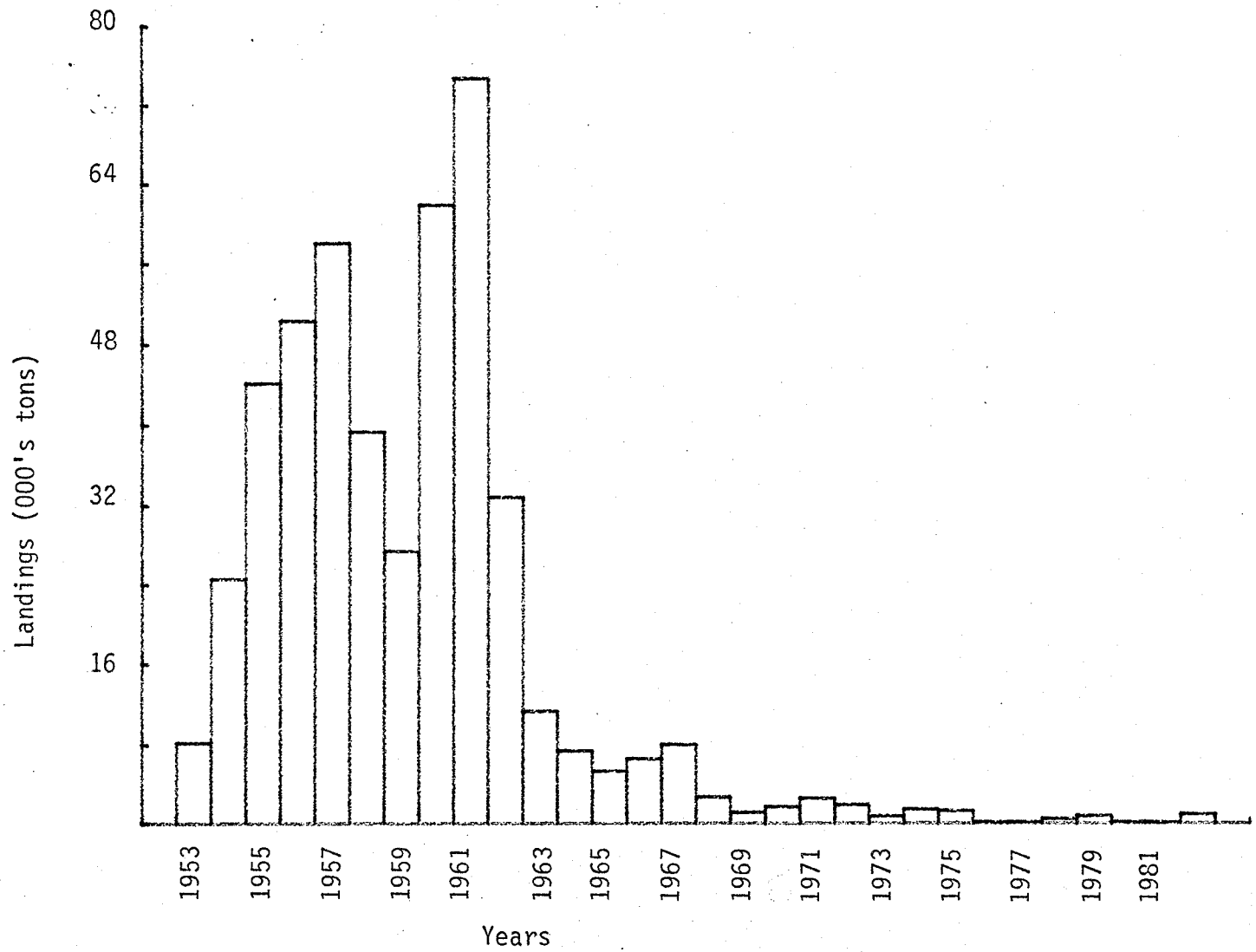

Fig. 1. Total haddock landings from NAFO Divisions 3NO for the period 1953-82.

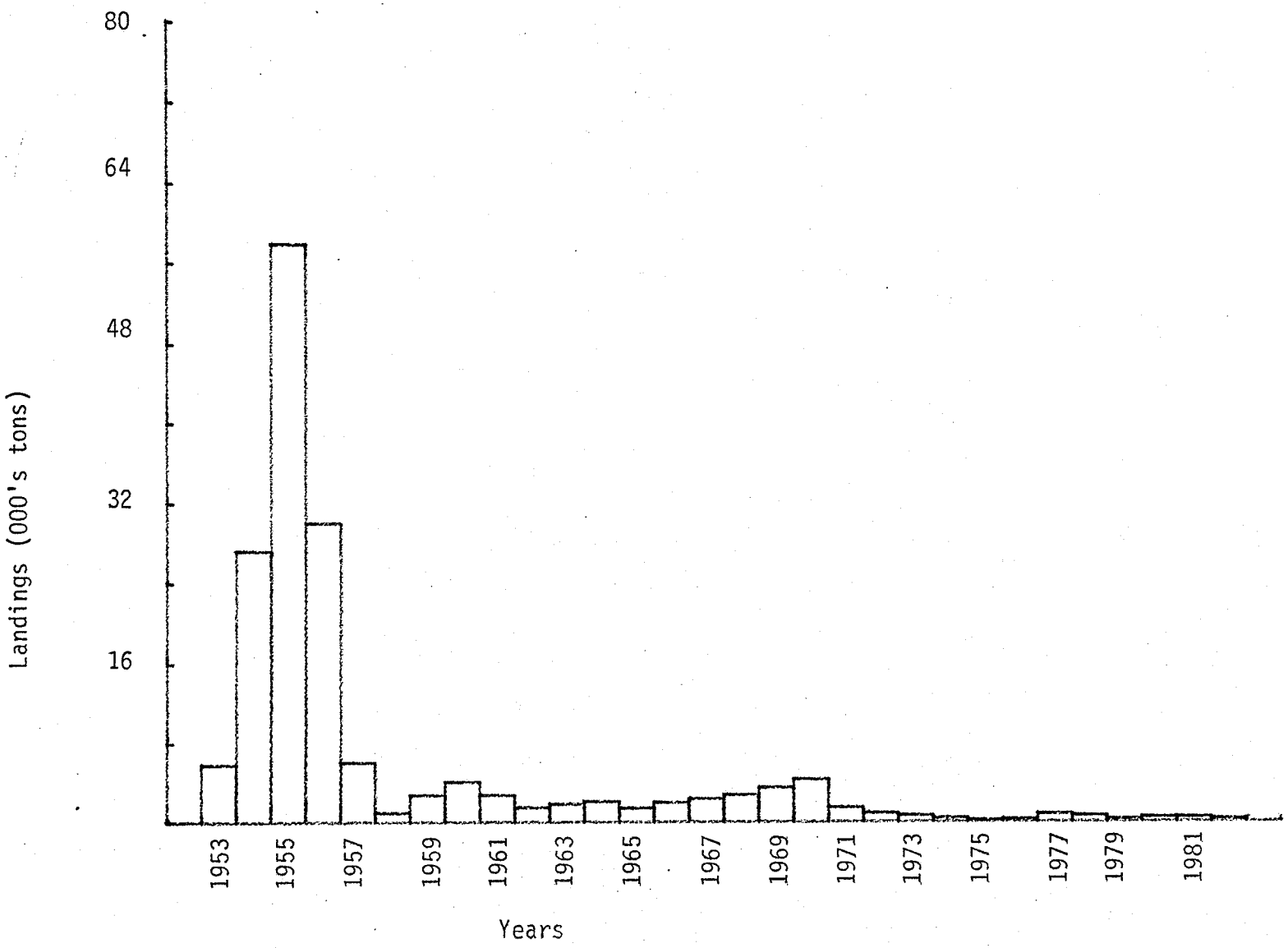

Figure 2. Total haddock landings from NAFO Subdivision 3Ps for the period 1953-1982.

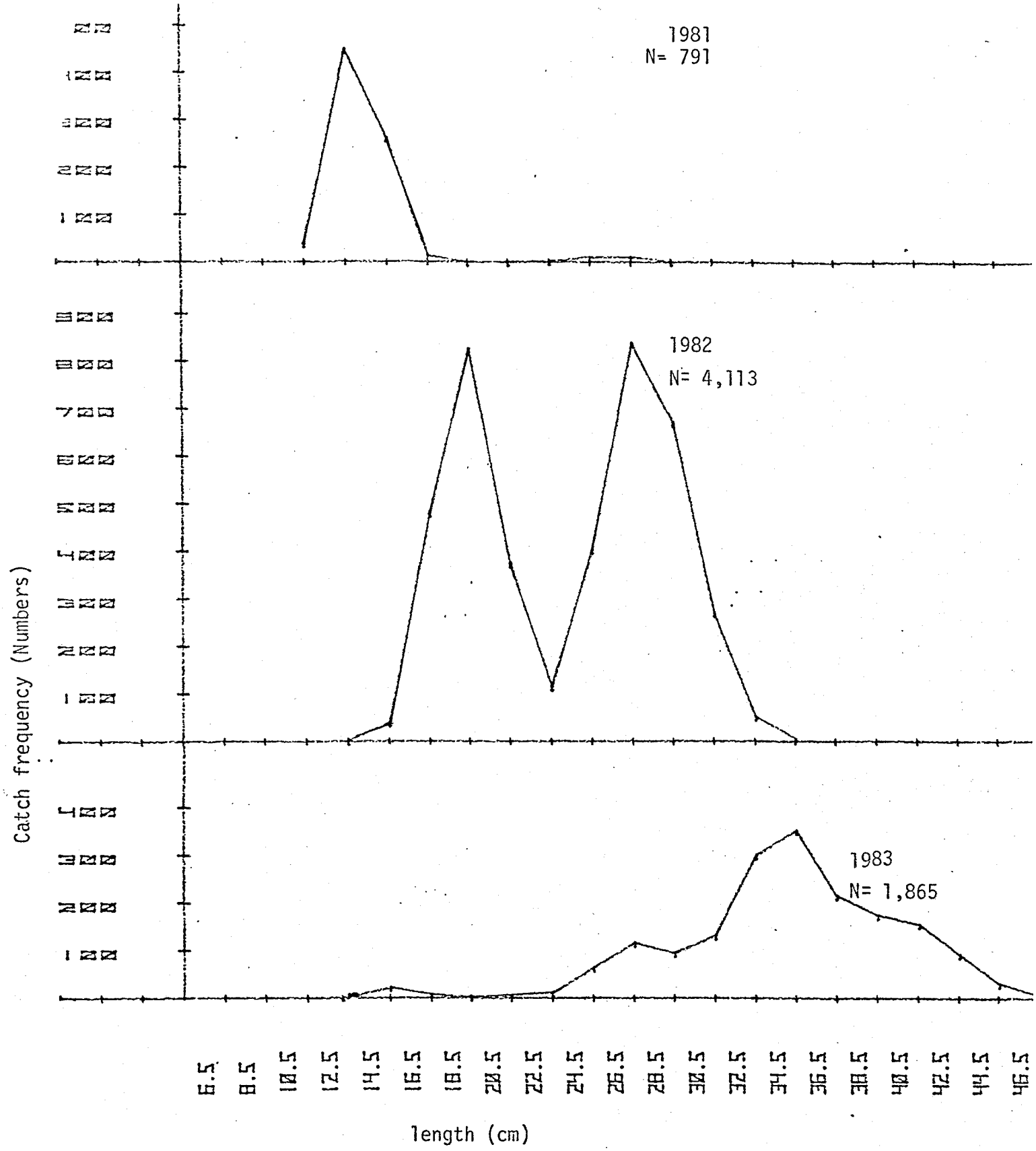

Fig. 3. Haddock catch frequencies from research surveys in NAFO Divisions 3NO.

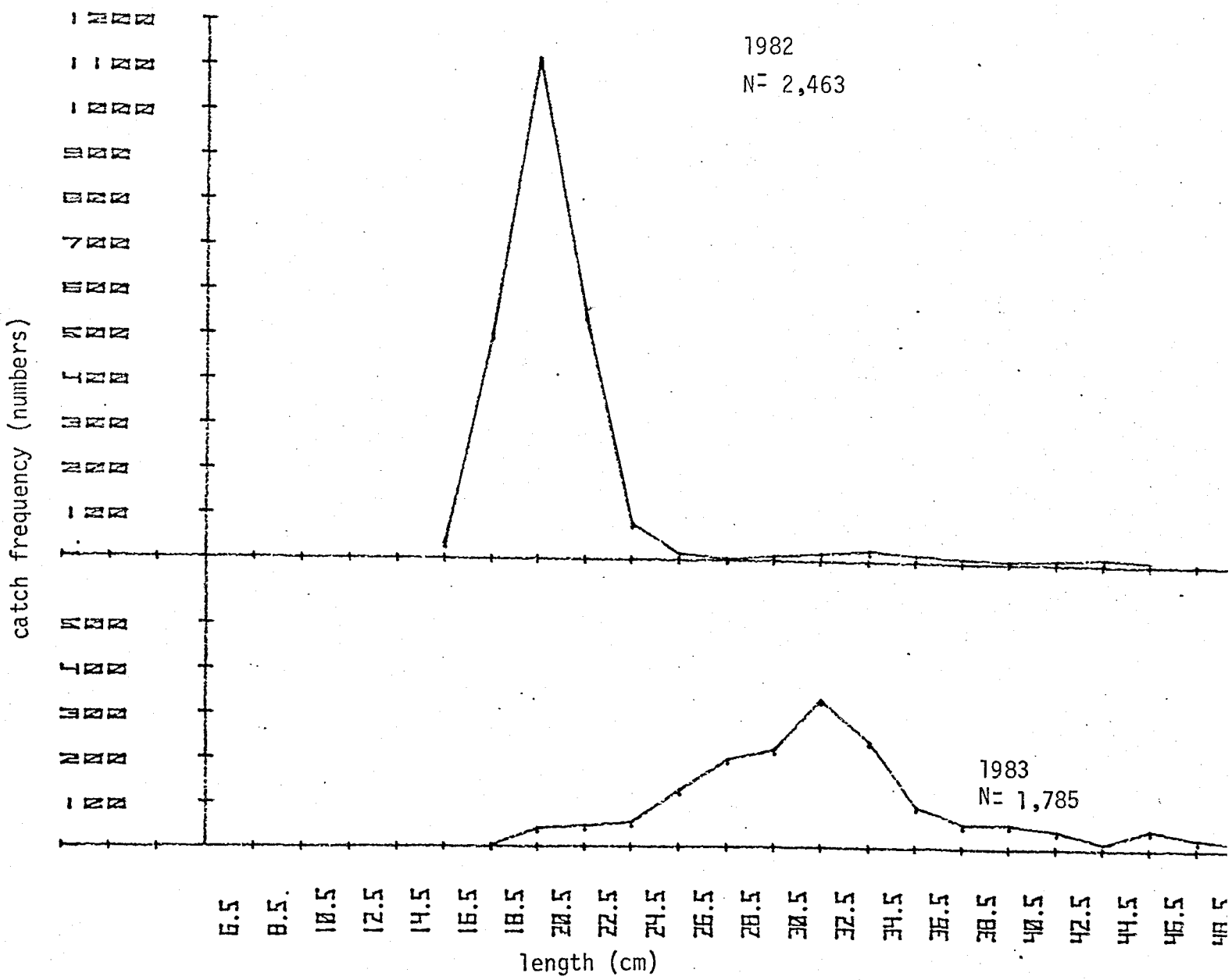

Fig. 4. Haddock catch frequencies from research surveys in NAFO Subdivision 3Ps