A REVIEW OF STOCK STATUS - 3NO & 3Ps HADDOCK

by

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Abstract

Haddock occurring in Newfoundland waters belong to two major populations; those from the Grand Bank (NAFO Div. 3L, 3N, and 3O) and from St. Pierre Bank (NAFO Subdiv. 3Ps). Total landings from these populations have been substantial in the past with the highest catch occurring in 1955 (104,000t). Large catches were also taken in 1949 (79,000 t) and 1961 (80,000t). After 1961, catches declined rapidly to 14,000t in 1963 and gradually to 1500t in 1975. Catches remained at this low level until the mid 1980's when there was an increase to about 12,000t by 1986. Catches remained at about 9000t until 1989 but have since declined substantially to about 1600t in 1991. The increased catches in the mid 80's were possible because of a pulse of good recruitment and increased fishing effort. Research vessel surveys indicate that yearclasses since the early 1980's are weak and consequently catches will remain low.

Résumé

L'aiglefin présent dans les eaux de Terre-Neuve provient de deux grandes populations, celle des Grands Bancs de Terre-Neuve (divisions 3L, 3N et 3O de l'OPANO) et celle du banc de St. Pierre (sous-division 3Ps de l'OPANO). Les débarquements totaux en provenance de ces deux populations ont été assez élevés par le passé, atteignant un sommet de 104 000 t en 1955. Ils ont également été abondants en 1949 (79 000 t) et en 1961 (80 000 t). Après 1961, toutefois, les prises sont descendues rapidement, pour se situer à 14 000 t en 1963; elles ont ensuite diminué graduellement jusqu'à 1 500 t (1975). Elles sont restées à ce niveau jusqu'au milieu des années 80, puis ont augmenté à nouveau. En 1986, elles étaient remontées à environ 12 000 t. Les prises sont demeurées aux alentours de 9 000 t jusqu'en 1989 pour se remettre à diminuer considérablement par la suite. En 1991, elles étaient d'environ 1 600 t. L'augmentation enregistrée au milieu des années 80 s'explique par un bon recrutement et par un effort de pêche accru. D'après les campagnes d'évaluation des navires scientifiques, les classes d'âge sont faibles depuis le début des années 80 et par conséquent les prises resteront basses.

INTRODUCTION

The history of the haddock fishery in NAFO Subarea 3 is a relatively short one. Prior to 1945 catches were low on the Grand Bank (3NO) but increased rapidly in the late 1940's and remained high until the early 1960's. The average annual nominal catch from 1948 to 1962 from Subarea 3 was 61,000 t. There is evidence to suggest that haddock were abundant earlier but that they were not a desired species in a salt fish operation and were not kept or not recorded separately. This is also supported by the reported presence of large numbers of haddock in inshore waters at intervals since the 1920's.

Also characteristic of the fishery during the periods of highest reported catches were very high discard rates. The use of 70 mm. mesh size in codends through the 1950's and up to 100 mm. by 1960 along with a plant requirement of 45 cm. fish produced high discard rates in the order of 30-45 % by weight and 50-70 % by number.

As the large yearclasses passed through the fishery and were followed by a long series of poor yearclasses, catches remained low for about 15 years. The appearance of relatively good yearclasses in the early 1980's saw catches increase in the late 1980's. Catches have subsequently declined with the return of a series of weak yearclasses.

DIVISION 3LNO

A. The Commercial Fishery

1. Landings and catch rates

Landings by division and country since 1953 are shown in Tables 1 to 3. Historically, landings have been highest in Division 3O and for the Canadian fleet normally from the period January to May. Landings for the period since 1975 (Fig.1) show an increasing trend from 1984 to 1988 followed by a substantial decline in recent years.

The fishery in the 1950's was conducted mainly by Nfld. T.C. 4 otter trawlers and catches were taken mainly during the winter-spring period as haddock concentrated in the warmer waters along the southwest slope of the Grand Bank (Div. 3O). The recent relatively good catches were obtained in a similar location and time by Canadian T.C. 5 vessels.

B. Research surveys

Research Surveys have been conducted by Canada in Divisions 3NO since 1972 using the stratified-random survey design (Fig.3). Biomass and abundance estimates from these surveys were very low until 1982 when there was a substantial increase. The mean number and weight per tow were highest in 1984, declined sharply in 1985, and showed a moderate increase again in 1988 (Table 4; Fig. 3). Both indices have remained very low since that time. Confidence limits about the

estimates were generally large as the result of highly variable catches generally from a small number of strata (Tables 5-6).

Stratified-random surveys conducted by the USSR from 1984-1990 showed a somewhat similar pattern of biomass and abundance trends (Tables 5,7,8) although indices are generally higher. The largest values in both the Canadian and USSR surveys occurred in 1984 and 1988 and both have shown low biomass and abundance in recent years.

Mean number per tow at age from Canadian surveys (Table 9) shows that the sharp increase in abundance in 1982 resulted from the appearance of the relatively strong 1980 and 1981 yearclasses. Other yearclasses also appear to have been moderately successful (1982 and 1983) and were responsible for sustaining a higher than normal abundance and biomass until 1988. Since 1983, no strong yearclasses have been observed.

SUBDIVISION 3Ps

A. The Commercial Fishery

Haddock were not known to exist in abundance on St.Pierre Bank prior to 1950 (Hodder,1966). The appearance of the very abundant 1949 yearclass led to an increase in catches which peaked at 58,000 t in 1955 (Table 10). There was no significant yearclass survival after 1949 and the fishery declined and remained low, especially in the 1970's. Catches showed a significant increase beginning in 1984 (Fig. 4) and peaked at 7500 t in 1985 mainly as a result of increased French catches . Catches have since declined and were approximately 500 t in 1991.

B. Research Surveys

Research vessel surveys have been conducted by Canada in Subdivision 3Ps since 1972 using the stratified-random design (Fig. 5). Biomass and abundance estimates from surveys were highest in 1985 but have since generally declined (Table 11, Fig. 6). Although the timing of surveys has varied, biomass in recent years has been found mainly in strata within depths ranging from 100-200 fathoms (Table 12). Mean number per tow at age estimates (Table 13) indicate that biomass and abundance increases in the mid-1980's were due to the presence of the moderately successful 1981 yearclass. Yearclass abundance has been low since that time.

Summary

The most recent CAFSAC reviews of these stocks (1987 and 1990) both recommended that there be no directed fishing for haddock. It was recognized that the increased catches in the mid to late 1980's were possible because of a pulse of relatively

good recruitment and increased fishing effort. It was predicted that the apparent high fishing mortality on these yearclasses and the absence of significant recruitment would lead to reduced catch levels.

In spite of this the management plans for these stocks have in recent years included precautionary TAC's varying from 4100 to 10,000 t in Div. 3LNO (4100 t in 1991 and 92) and 150 to 3200 t in 3Ps (3200 t in 1991 and 92). The most recent survey data indicates that the stocks have declined and that the abundance of the early 1980's year classes declined substantially at ages greater than 5 or 6. The most recent CAFSAC advice (January 1990) also suggested that catches be reduced so that haddock could reach spawning age (A50 for females approximately 5.0 years in both stocks). It would appear that the spawning potential was only partially realized. Commercial catches have also declined as had been predicted. The limited information available for the 3NO Canadian fishery in 1991 indicated that ages 5 to 7 predominated.

The data available for both stocks indicate that both have declined and that biomass levels may be similar to the low values observed in the 1970's. Research survey data suggest that year classes since those of the early 1980's are weak. It is recommended, once again, that there be no directed fishery for these stocks and that measures should be considered to protect any future pulses of recruitment in an effort to provide for a more sustainable haddock fishery.

References

Hodder, V.M. 1966. Trends in the haddock fishery of ICNAF Subarea 3. ICNAF Res. Bull. No. 3: 55-63.

Templeman, W., V.M. Hodder and R. Wells. 1978. Age, growth, year class strength, and mortality of the haddock, Melanogrammus aeglefinus, on the southern Grand Bank and their relation to the haddock fishery in this area. ICNAF Res. Bull., No. 13:31-52.

Table 1. Historical catches of haddock (t) from NAFO Div. 3L for the years 1953-91.

Year	Can(M)	Can(N)	France (M)	France (SP)	Spain	Port.	UK	USSR	Pol.	Other	Total
1953	42	101				221					364
1954	(292)				76	13	757				1138
1955	43	83			113	3					242
1956	33	60			63	16					172
1957	65				174	4	147				390
1958	150	35			506	1					692
1959	65	650			210		26				951
1960	33	20		120	157		3			9	342
1961	31	5	1	109	264		1	1409			1820
1962	7	14	11	53	489						574
1963	5			26	749		10	148		25	963
1964	100	1			482		26	690			1299
1965	7	2	5		948		14	88			1064
1966	17	4		83	511		87	56			758
1967	3	8		20	830		4			3	868
1968	33	41			995		14	2			1085
1969	38	31			515		15				599
1970	38	70			867						975
1971	24	201			662		2				889
1972	7	67			475		15				564
1973		50			334				25	6	415
1974		17			18						35
1975		5									5
1976		5									5
1977	1	1									2
1978	7	6									13
1979	12	8			90						110
1980	20	2	2								24
1981	18	10									28
1982	11	16		4							31
1983	27	12									39
1984	121	37									158
1985	95	75									170
1986	357	126			23					3	509
1987	382	88				22					492
1988	85	47									132
1989[a]	19	47			54						120
1990[a]	11	15			2						28
1991[a]		22									22

[a]Provisional.

Table 2. Historical catches of haddock (t) from NAFO Division 3N for the years 1953-91.

Year	Can(M)	Can(N)	France (M)	France (SP)	Spain	Port.	UK	USSR	USA	Pol.	Other	Total
1953	58	42										100
1954	(695)				11614	203						12512
1955	50	270			25797	630						26753
1956	179	1484			23858		368		3			25892
1957	286	1435			24447							26168
1958	1765	4752			15129				2			21648
1959	311	2383			5043				1			7738
1960	285	961		204	3514		20	35959				40943
1961	152	651		135	1826			19610				22374
1962	149	776		18	569			1				1513
1963	19	270		16	554							859
1964	215	500	2	119	422		9	25	1			1293
1965	23	489	3	30	759		7					1311
1966	67	493		58	675			33				1326
1967	16	44			1341			75				1476
1968		19			382			377				778
1969		37			390							427
1970	15	22			434			19			4	494
1971	2	3			814			157				976
1972	25	3			535		1	269				833
1973					336			49		3		388
1974		1			47		30	883				961
1975		1						944				945
1976		2			1			48				51
1977		2			1			22				25
1978		9						41			50	100
1979	1	5		1	181			15				203
1980		44		2							1	47
1981	3	9		3								15
1982		9			74	1						84
1983	1	5		3	266			24			1	300
1984	1	25			1105			21			7	1159
1985	4	76			693			2			5	780
1986	64	162		9	41				4			280
1987	198	522	5	1	860	119			1			1706
1988	60	432			474							966
1989[a]	81	154		2	322							559
1990[a]	83	12			98	9						202
1991[a]	9	3										12

[a]Provisional

Table 3. Historical catches of haddock (t) from NAFO Division 3Ø for the years 1953-91.

Year	Can(M)	Can(N)	France (M)	France (SP)	Spain	Port.	UK	USSR	USA	Other	Total	Total 3LNO
1953	2920	5058				83					8061	8525
1954		4773			6932	312					12017	25667
1955	943	1816			14233	28	291		8		17319	44314
1956	5866	15597			2818				73		24354	50418
1957	6706	21840			3028		236		10		31820	58378
1958	4386	11949			1151				4	140	17630	39970
1959	5265	11930			2313		62		20		19590	28279
1960	3246	12438		2449	2074		302	347	1		20857	62142
1961	7518	21009		4177	707			18703	1	114	52229	76423
1962	6648	20059		2325	522		79	1613			31246	33333
1963	2037	6232		937	904		138	140	1	28	10417	12239
1964	1369	3594		637	326		14	115			6055	8647
1965		1723		302	893		229	784		41	3972	6347
1966	140	349		49	418		104	4134			5194	7278
1967	40	330		48	832		42	5210		12	6514	8858
1968	1	187		12	1217			451			1868	3731
1969	119	287		27	268						701	1727
1970	191	18		1	864			90			1164	2633
1971	11	15			1196			320			1542	3407
1972	48	19			891		6	73			1037	2434
1973	8	11		16	277			39			340	1143
1974	2	7			6		116	317			448	1444
1975	5	4						339			348	1298
1976	3	42			3			34			82	138
1977	55	14			7			25		9	110	137
1978	89	267		14						1	371	484
1979	166	362		1				12		1	542	855
1980	54	53									107	178
1981	13	62		6							81	124
1982	138	701		4		8		3			854	969
1983	20	150		19				20		4	213	552
1984	858	427		193				27		29	1534	2851
1985	1813	1231								19	3063	4013
1986	3846	2188							1	515	6550	7339
1987	1444	1754			214			6		44	3462	5660
1988	3310	3812			2			18		7	7149	8247
1989[a]	3288	2701						2	28		6019	6698
1990[a]	1535	1396				8				1	2940	3170
1991[a]	394	684									1078	1112

[a]Provisional.

Table 4. Haddock biomass and abundance estimates from stratified random research vessel surveys. (Divisions 3N and 3Ø combined.)

Year	Biomass (tons) Mean	Upper	Lower	Numbers (000's) Mean	Upper	Lower	Mean # per tow	Mean wt. per tow (kg)
				Canadian Surveys				
1973	459	985	-67	306	794	-182	0.14	0.21
1975	631	5853	-4590	379	1406	-649	0.19	0.31
1976	438	4568	-3691	1387	2583	191	0.61	0.19
1977	215	569	-139	325	545	107	0.13	0.09
1978	4079	12242	-4085	4587	12087	-2913	1.85	1.65
1979	913	1519	308	1533	3867	-801	0.59	0.35
1980	1401	2117	684	745	1108	382	0.29	0.55
1981	64	598	-470	430	1640	-780	0.24	0.04
1982	11882	34813	-11049	79888	256767	-96991	30.93	4.60
1984	54873	80465	29281	104284	158194	50376	40.17	21.14
1985	12244	66382	-41893	18512	100594	-63570	7.13	4.72
1986	15901	118786	-86984	24017	190593	-142558	9.25	6.13
1987	21240	54939	-12458	21123	48542	-6297	8.18	8.22
1988	41692	103349	-19965	33407	82922	-16108	12.87	16.06
1989	2859	5513	204	1871	2946	798	0.72	1.10
1990	11603	38609	-15403	7190	23722	-9342	2.95	4.75
1991	2836	17299	-11627	4830	11386	-1726	1.79	1.05
				USSR Surveys				
1984	222973	399185	46762	426566	771778	81354	165.28	86.40
1985	80726	123219	38232	143502	233875	53129	55.60	31.28
1986	36084	132659	-60490	47841	190539	-94857	18.54	13.98
1987	26311	68810	-16189	38533	119528	-42462	14.93	10.19
1988	206229	498060	-85601	191862	453394	-69671	74.34	79.91
1989	8382	17049	-285	6471	12147	795	2.51	3.25
1990	708	1137	279	1310	2329	290	0.51	0.27

Table 5. Haddock biomass estimates (t) by stratum from Canadian stratified random research vessel surveys in NAFO Division 3M.

Depth Range (fm)	Strata	Area (sq mi)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1984	1985	1986	1987	1988	1989	1990	1991
	375	1593	0	0	0	0	–	0	0	0	0	0	0	2679	22	0	6	0	0	0	0
≤ 30	376	1499	0	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	360	2992	25	–	–	0	0	0	0	0	0	0	0	160	0	112	12	0	0	0	0
	361	1853	52	0	0	0	0	0	0	0	89	–	7	7514	755	14	0	0	0	0	0
31–50	362	2520	0	0	0	0	0	0	0	0	0	8	5	7783	0	0	0	0	0	0	0
	373	2520	0	0	0	–	0	0	0	0	0	0	0	2337	0	0	0	0	0	0	0
	374	931	0	0	0	0	–	0	0	0	0	0	0	3294	0	0	0	0	0	0	0
	383	674	0	0	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	359	421	38	0	–	–	7	0	–	0	0	21	48	8	0	3	0	0	41	0	0
51–100	377	100	0	0	0	0	–	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	382	647	0	0	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	358	225	0	38	–	–	–	29	–	8	0	0	20	182	25	0	7	2	0	0	0
101–150	378	139	0	0	0	–	–	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	381	182	3	0	0	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	357	164	–	0	–	–	–	0	–	0	0	0	3	0	0	0	–	0	0	0	0
151–200	379	106	–	0	0	–	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	380	116	0	0	0	–	–	0	–	0	0	0	–	0	0	0	0	0	0	0	0

Table 6. Haddock biomass estimates (t) by stratum from Canadian 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	1984	1985	1986	1987	1988	1989	1990	1991
	330	2089		0		0	0	0	0	325	0	0	0	0	0	0	0	0	0	0	0
	331	456		0		0	0	-	0	18	0	-	0	0	0	0	0	0	0	-	0
31-50	338	1898		0		323	0	64	0	42	85	-	74	8491	1053	326	206	499	142	53	0
	340	1716		-		0	0	0	0	0	0	0	13	10	7	0	1	0	0	0	0
	351	2520		0		0	0	0	0	51	0	0	99	161	0	604	0	0	0	0	0
	352	2580		0		0	0	17	0	0	0	-	14	11371	713	25	66	523	119	0	0
	353	1282		266		0	0	0	0	18	0	-	1219	698	72	0	13	167	41	32	0
	329	1721		0		-	304	0	2710	1	0	0	0	0	0	2	0	120	43	0	0
	332	1047		0		250	36	0	619	53	153	-	99	9647	165	447	1401	4401	44	5957	57
51-100	337	948		22		43	16	0	582	359	119	-	9678	498	1480	256	16023	35548	1662	0	433
	339	585		0		0	-	-	0	0	-	0	23	0	0	0	0	0	0	0	0
	354	474		67		-	51	0	0	8	0	36	0	36	0	59	3215	302	18	0	0
	333	151		-		8	0	63	0	12	326	-	237	0	2358	1065	68	9	213	317	1362
101-150	336	121		44		0	6	40	0	19	288	-	204	0	4823	1010	9	64	136	659	423
	355	103		0		8	0	-	-	0	123	0	112	6	479	380	166	56	164	66	0
	334	92		-		-	0	0	0	0	190	-	26	0	283	11277	0	0	26	33	179
151-200	335	58		16		-	0	-	0	0	7	-	0	0	2	295	35	0	180	57	19
	356	61		0		-	-	-	-	0	21	0	-	0	6	25	14	0	29	16	104
	717																				220
201-300	719																				38
	721																				0
	718																				0
301-400	720																				0
	722																				0

Table 7. Haddock abundance and biomass (t) by stratum from USSR research vessel surveys in NAFO Division 3N.

Depth range (fm)	Strata	Area (sq. mi.)	Abundance							Biomass						
			1984	1985	1986	1987	1988	1989	1990	1984	1985	1986	1987	1988	1989	1990
≤ 30	375	1593	6869	10113	0	0	0	0	0	3332	5900	0	0	0	0	0
	376	1499	0	5629	0	0	0	0	0	0	3165	0	0	0	0	0
31–50	360	2992	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	361	1853	64423	36712	0	0	0	0	0	28446	16323	0	0	0	0	0
	362	2520	111384	6746	0	36	0	0	0	60510	3803	0	4	0	0	0
	373	2520	0	1449	0	0	0	0	0	0	924	0	0	0	0	0
	374	931	0	89	0	0	0	0	0	0	38	0	0	0	0	0
	383	674	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51–100	359	421	484	0	15	15	15	0	0	203	0	84	4	2	0	0
	377	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	382	647	0	0	0	0	0	0	0	0	0	0	0	0	0	0
101–150	358	225	97	8	0	1539	16	0	0	92	3	0	65	16	0	0
	378	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	381	182	0	0	0	0	0	0	0	0	0	0	0	0	0	0
151–200	357	164	0	0	0	0	0	171	0	0	0	0	0	0	203	0
	379	106	0	0	3	0	0	2	0	0	0	3	0	0	2	0
	380	116	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8. Haddock abundance and biomass (t) by stratum from USSR research vessel surveys in NAFO Division 3M.

Depth range (fm)	Strata	Area (sq. mi.)	Abundance							Biomass						
			1984	1985	1986	1987	1988	1989	1990	1984	1985	1986	1987	1988	1989	1990
31-50	330	2089	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	331	456	2316	0	0	0	0	0	0	1573	0	0	0	0	0	0
	338	1898	55621	4911	546	682	0	27	0	30143	3251	409	364	0	74	0
	340	1716	18458	0	0	0	0	0	0	10245	0	0	0	0	0	0
	351	2520	6158	290	0	0	0	0	0	3792	159	0	0	0	0	0
	352	2580	129500	2781	324	93	0	0	0	63586	1493	176	46	0	0	0
	353	1282	18	0	2088	0	129324	46	0	59	0	1284	0	142127	295	0
51-100	329	1721	17522	7256	0	804	31	93	0	12616	4313	0	680	34	90	0
	332	1047	10365	43915	3330	7054	2182	263	0	6236	28519	3098	5662	1228	139	0
	337	948	426	8925	39199	4928	12928	3764	307	593	3859	28784	2689	12832	4953	65
	339	585	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	354	474	954	13865	670	45	42322	0	0	509	8344	823	2	45346	0	0
101-150	333	151	195	297	912	268	83	104	7	156	238	753	268	52	100	9
	336	121	154	101	357	17990	4146	526	119	133	91	331	12514	3748	717	66
	355	103	1596	67	12	1574	139	823	161	735	50	41	1029	58	898	29
151-200	334	92	0	347	86	152	139	8	79	0	254	64	145	129	11	80
	335	58	2	0	278	3149	68	368	210	2	0	199	2553	68	504	243
	356	61	20	0	6	14	327	153	326	13	0	7	26	458	216	71

Table 9 . Mean numbers of haddock per tow at age from Canadian research vessel surveys in NAFO Subdivision 3NO.

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
0	0.01	0.00	0.00			0.02			0.00	0.01	0.00		
1	0.41	0.00	0.34	12.21		0.12	0.06	0.04	0.77	0.01	0.00	0.69	0.11
2	0.03	0.00		18.16		6.35	0.08	0.00	0.04	0.45	0.08	0.11	1.11
3	0.01	0.00		0.00		18.40	1.36	0.16	0.57	0.22	0.18	0.32	0.08
4	0.06	0.03		0.00		14.97	3.63	4.31	2.56	0.31	0.03	0.40	0.10
5	0.12	0.18		0.01		0.16	1.77	4.61	3.27	4.92	0.10	0.19	0.19
6	0.04	0.03		0.02		0.00	0.20	0.10	0.84	5.55	0.17	0.47	0.09
7		0.01		0.04		0.01	0.01	0.01	0.11	1.20	0.11	0.54	0.09
8		0.01		0.02		0.02	0.02	0.00	0.00	0.17	0.04	0.19	0.02
9				0.06		0.05	0.02	0.00	0.00	0.01	0.01	0.04	
10						0.02	0.00	0.00	0.00	0.01			
11						0.00	0.00	0.00	0.00				
12						0.02	0.01	0.00					
13						0.01							
14						0.00							
15						0.01							
TOTAL	0.68	0.26	0.34	30.57		40.17	7.16	9.25	8.18	12.87	0.72	2.95	1.79
Upper Limit	1.55	0.40	1.28	97.72		60.94	39.05	73.42	18.79	31.94	1.13	9.72	4.22
Lower Limit	-0.20	0.12	-0.61	-36.58		19.41	-24.74	-54.91	-2.44	-6.21	0.31	-3.83	-0.64
No. Sets	172	140	60	136		117	178	203	191	161	195	171	209
Trip #	ATC289, 291	ATC303, 304	ATC319	ATC327, 328		AN27	WT29, AN43	WT47	WT58, 59	WT70	WT82	WT94, 95	WT105, 106
# Aged	87	125	31	292		313	236	199	397	280	223	256	168
DATES	Apr-Jun	Apr-May	May	Mar-Apr		Apr-May	Apr	Apr-May	Apr-May	Apr-May	Apr-May	Apr-May	Apr-May

Table 10. Historical catches of haddock (t) from NAFO Subdivision 3Ps for the years 1953-91.

Year	Can(M)	Can(N)	France (M)	France (SP)	Spain	Port.	UK	USSR	USA	Jap.	Other	Total
1953		5849										5849
1954		26490			685	4						27179
1955		39948			15637	117	2095					57797
1956		25177			3531	291	827		114			29940
1957		4271			1474	36	239				59	6079
1958		368			496	9	67				19	956
1959	925	774		28	956		62		5			2750
1960	1154	794		144	1908		84					4084
1961	373	658	8	230	1446		42					2757
1962	291	411	2	33	605		137		2			1481
1963	141	437		158	978		127				15	1856
1964	69	835		221	646		325					2096
1965	75	295	12	178	619		259					1428
1966	54	493	2	449	548		241	212				1999
1967	174	1083		373	560		172					2362
1968	222	844		159	1198			343				2766
1969	146	1840		939	571		2					3498
1970	491	1684		1158	946			48		6		4333
1971	21	901	13	45	497							1477
1972	49	379		52	421							901
1973	14	352		16	234		6	26		2		650
1974	37	166	28		157							388
1975	18	128		1								147
1976	118	101	26									245
1977	252	516	16	9								793
1978	305	295		3								603
1979	98	176	8	19								251
1980	69	176	168	34								447
1981	12	223	135	75								445
1982	36	164	36	73								309
1983	58	88	10	318								474
1984	685	221		1839								2745
1985	1798	428		5272								7498
1986	732	868	1808	1974							31	5413
1987	115	558	873	1141								2687
1988	1081	680	158	468								2387
1989[a]	2083	424		413								2920
1990[a]	1251	257		70								1578
1991[a]	189	265		60								514

[a]Provisional

Table 11. Haddock biomass and abundance estimates from stratified-random research vessel surveys in Subdivision 3Ps.

Year	Biomass (tons)			Numbers (000's)			Mean # per tow	Mean wt. per tow (kg)
	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
1984	6442	12490	-607	7659	16626	-131	7.06	5.94
1985	32349	59214	5484	30328	55299	5356	25.81	27.53
1986	18309	105498	-68879	18471	142618	-105675	14.08	13.95
1987	10092	23021	-2836	5724	12263	-816	4.37	7.71
1988	5241	6963	3520	3634	6442	826	2.77	3.99
1989	5752	14500	-2995	7269	20702	-6165	5.52	4.37
1990	3157	6347	-33	1181	2011	352	0.98	2.61
1991	588	3823	-2647	1419	5605	-2767	1.08	0.45
1992	1045	7219	-5129	744	2211	-722	0.57	0.80

Table 12 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	1984	1985	1986	1987	1988	1989	1990	1991	1992
	314	974	0	-	0	-	7	0	0	-	0	0	7	63	0	0	0	0	0	0	0	0	0
0-30	320	1320	-	0	-	-	0	-	-	-	0	0	105	94	111	0	0	0	0	0	0	0	0
	308	112	-	0	0	0	0	0	0	0	0	19	0	0	32	0	0	0	0	0	0	0	0
	312	272	72	-	0	0	0	0	0	0	-	0	0	5	1327	0	0	0	0	0	0	0	0
	315	827	0	0	0	-	0	0	-	0	0	0	0	31	1	0	0	0	1	0	0	0	0
31-50	321	1189	0	0	-	-	0	-	0	-	8	0	0	0	0	0	0	0	0	0	0	8	0
	325	944	-	-	-	-	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	326	166	-	-	-	-	-	-	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0
	307	395	323	0	152	111	0	30	0	19	74	0	342	22	185	12	390	1408	331	30	0	2	0
	311	317	117	0	85	22	393	221	0	1	0	1	0	20	1178	9	4	0	90	0	8	0	0
	317	193	155	3	89	13	92	204	-	20	0	87	333	192	56	0	0	0	1	0	0	0	0
51-100	319	984	17	12	34	141	84	1358	-	0	0	0	293	633	3509	1108	129	164	332	74	-	0	0
	322	1567	-	-	-	-	3	-	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
	323	696	5	-	-	-	0	0	0	-	0	0	0	0	0	3	0	1	0	0	0	0	0
	324	494	-	-	-	-	0	-	-	0	0	-	0	0	0	0	0	0	1	0	0	0	0
	306	419	-	-	21	0	86	0	0	136	0	142	28	67	0	1195	105	841	307	15	102	0	0
	309	296	292	195	16	10	0	0	54	10	0	7	0	15	0	354	239	286	527	217	34	24	0
101-150	310	170	804	79	195	215	-	2	42	14	0	0	213	7	0	4105	762	1180	116	43	0	0	0
	313	165	742	64	160	79	202	103	22	40	133	149	152	929	0	917	511	2598	19	508	7	26	5
	316	189	140	340	169	45	35	74	-	80	106	31	-	156	28	493	401	362	38	158	36	8	55
	318	123	371	10	0	9	0	3	-	14	105	-	69	51	9	-	7878	307	42	194	-	129	23
	705	195	-	-	15	0	37	0	0	6	0	0	0	0	0	3026	2357	139	176	0	193	3	0
	706	476	-	-	36	-	-	0	-	87	373	0	0	0	0	670	1237	907	652	665	603	102	409
151-200	707	93	-	-	7	0	0	0	-	307	0	-	-	0	0	-	1817	234	960	576	-	240	502
	715	132	-	-	-	20	0	0	0	37	29	12	26	60	5	-	37	25	67	69	60	3	42
	716	539	-	-	-	-	-	0	0	0	0	25	0	0	0	20392	1912	1243	1380	3070	2089	4	0
	708	117	-	-	-	0	-	0	-	0	0	-	-	0	0	-	37	211	176	83	-	0	0
	711	961	-	-	-	-	-	-	-	-	0	0	0	0	0	0	393	113	0	0	0	24	0
201-300	712	973	-	-	-	-	-	-	-	0	0	0	0	0	-	61	32	37	0	0	26	0	0
	713	950	-	-	-	0	-	-	-	-	0	0	0	0	-	0	14	36	0	0	0	15	0
	714	1195	-	-	-	-	-	-	-		0	0	0	0	-	-	54	0	27	49	0	0	9

Table 13. Mean numbers of haddock per tow at age from Canadian research vessel surveys in NAFO Subdivision 3Ps.

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
0	0.00	0.01	0.00							0.00	0.00		
1	0.10	0.00	0.04	10.38	0.51	0.17	0.01	0.06	0.13	0.61	2.47	0.09	0.03
2	0.03	0.00	0.04	0.45	3.86	0.25	0.16	0.01	0.06	0.18	1.64	0.07	0.72
3	0.08	0.00	0.02	0.29	0.37	4.78	0.61	3.77	0.05	0.04	0.21	0.10	0.16
4	0.25	0.04	0.06	0.07	0.11	1.41	21.56	5.32	0.18	0.07	0.04	0.02	0.06
5	0.19	0.13	0.07	0.16	0.11	0.34	2.94	4.09	0.99	0.44	0.04	0.05	0.04
6	0.04	0.02	0.02	0.05	0.08	0.08	0.38	0.69	2.71	0.94	0.19	0.08	0.03
7	0.02	0.04	0.00	0.01	0.01	0.03	0.06	0.04	0.17	0.47	0.45	0.31	0.03
8	0.01	0.00	0.00		0.01		0.03	0.01	0.04	0.01	0.51	0.23	0.01
9	0.01	0.01	0.00				0.04	0.05	0.01	0.00	0.01	0.04	
10		0.00	0.00				0.00	0.01	0.02	0.00			
11		0.00	0.02				0.00	0.01	0.00	0.00			
12		0.01					0.00	0.01	0.00	0.01			
13							0.00	0.01	0.00				
14							0.00						
15													
TOTAL	0.73	0.28	0.27	11.41	5.07	7.06	25.81	14.08	4.37	2.77	5.56	0.98	1.08
Upper Limit	3.98	0.48	0.59	22.00	10.36	15.32	47.06	108.71	9.37	4.91	15.71	1.66	4.25
Lower Limit	-2.53	0.07	-0.05	0.82	-0.22	-1.21	4.55	-80.55	-0.62	0.63	-4.59	0.29	-2.10
No. Sets	81	81	71	92	171	95	112	145	135	152	157	109	164
Trip #	ATC287	ATC302	ATC316	ATC330	AN9	AN26	WT26	WT45	WT55, 56	WT68	WT81	WT91	WT103
# Aged	131	36	40	233	322	184	291	312	299	396	263	151	108
DATES	Feb-Mar	Mar-Apr	Mar	May-Jun	Apr-May	Apr	Mar	Mar	Feb-Mar	Jan-Feb	Feb	Feb	Feb

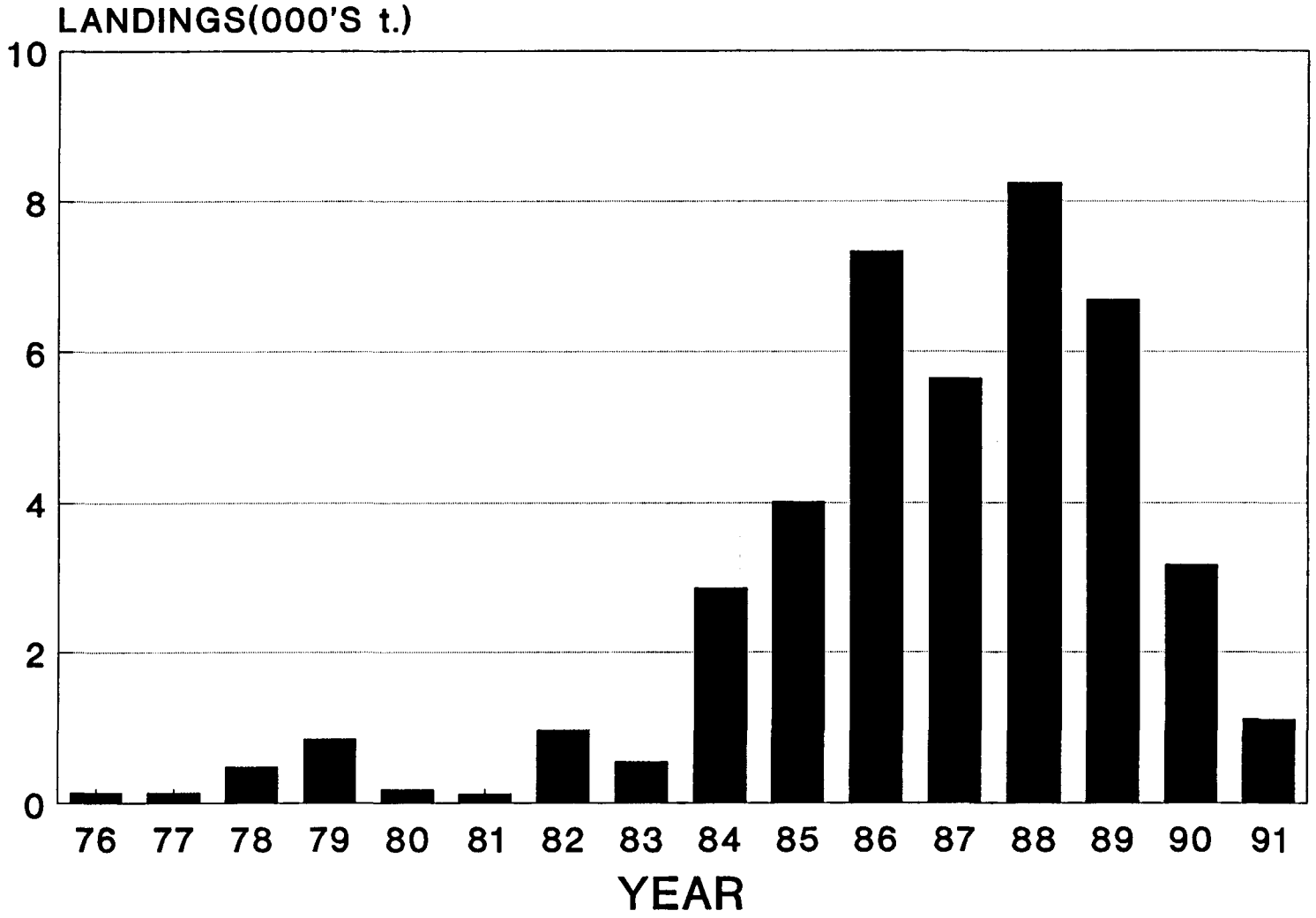

Figure 1. Haddock landings from Divs.3LNO.

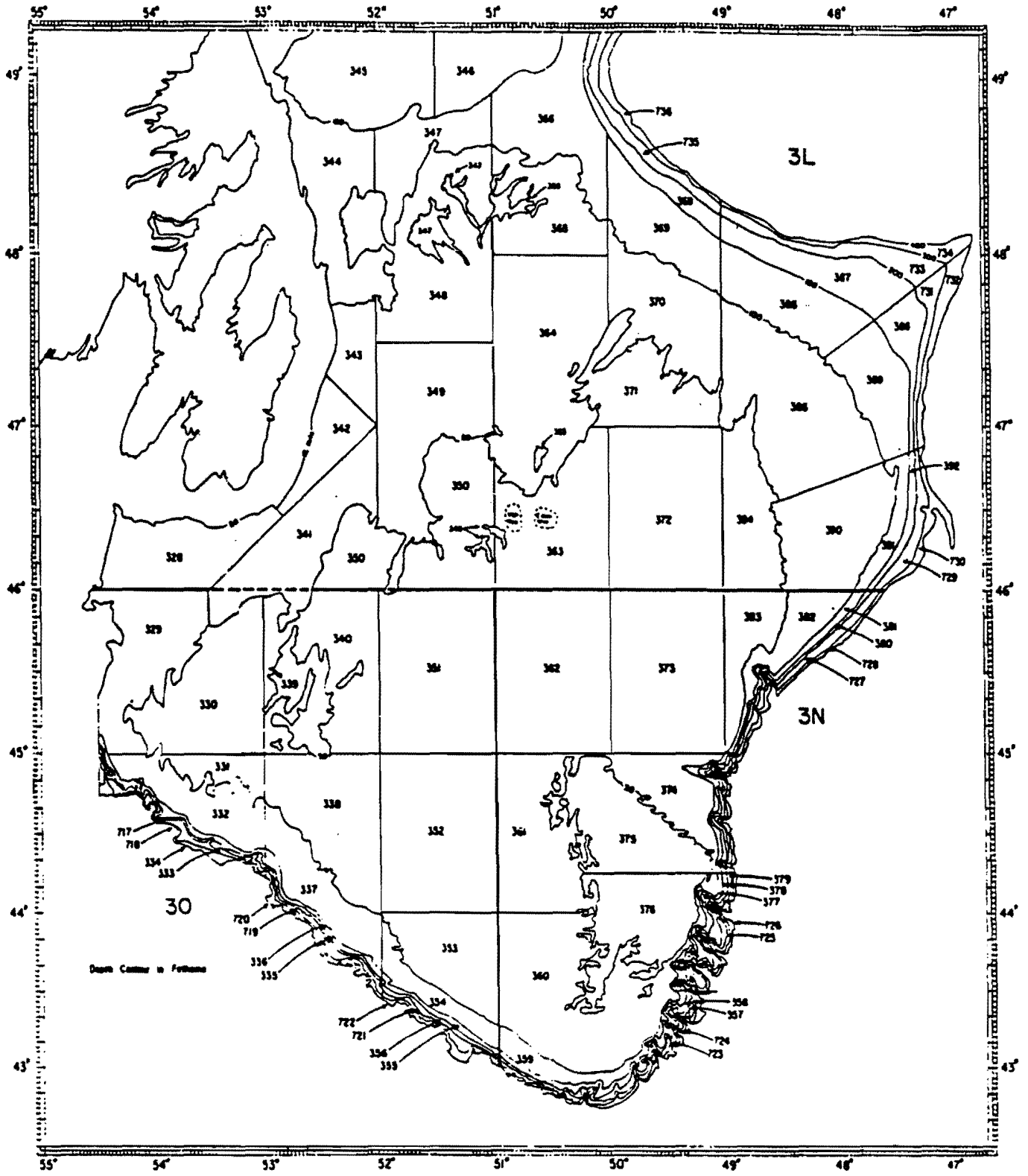

Fig. 2. Stratification scheme used for stratified-random research vessel groundfish surveys in NAFO Div. 3LNO

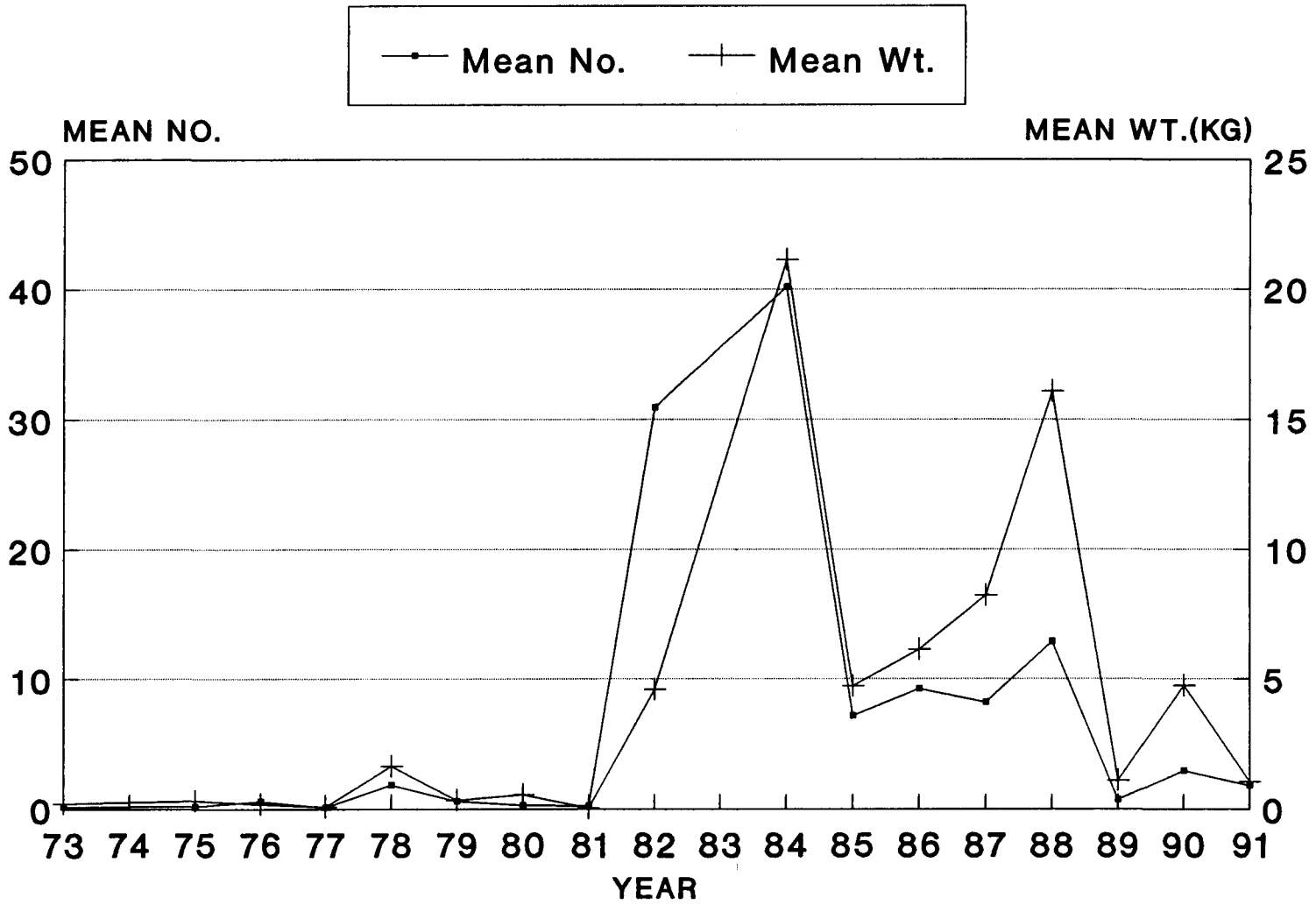

Fig.3 HADDOCK MEAN WT. AND NO. PER TOW
(3NO-CANADIAN SURVEYS)

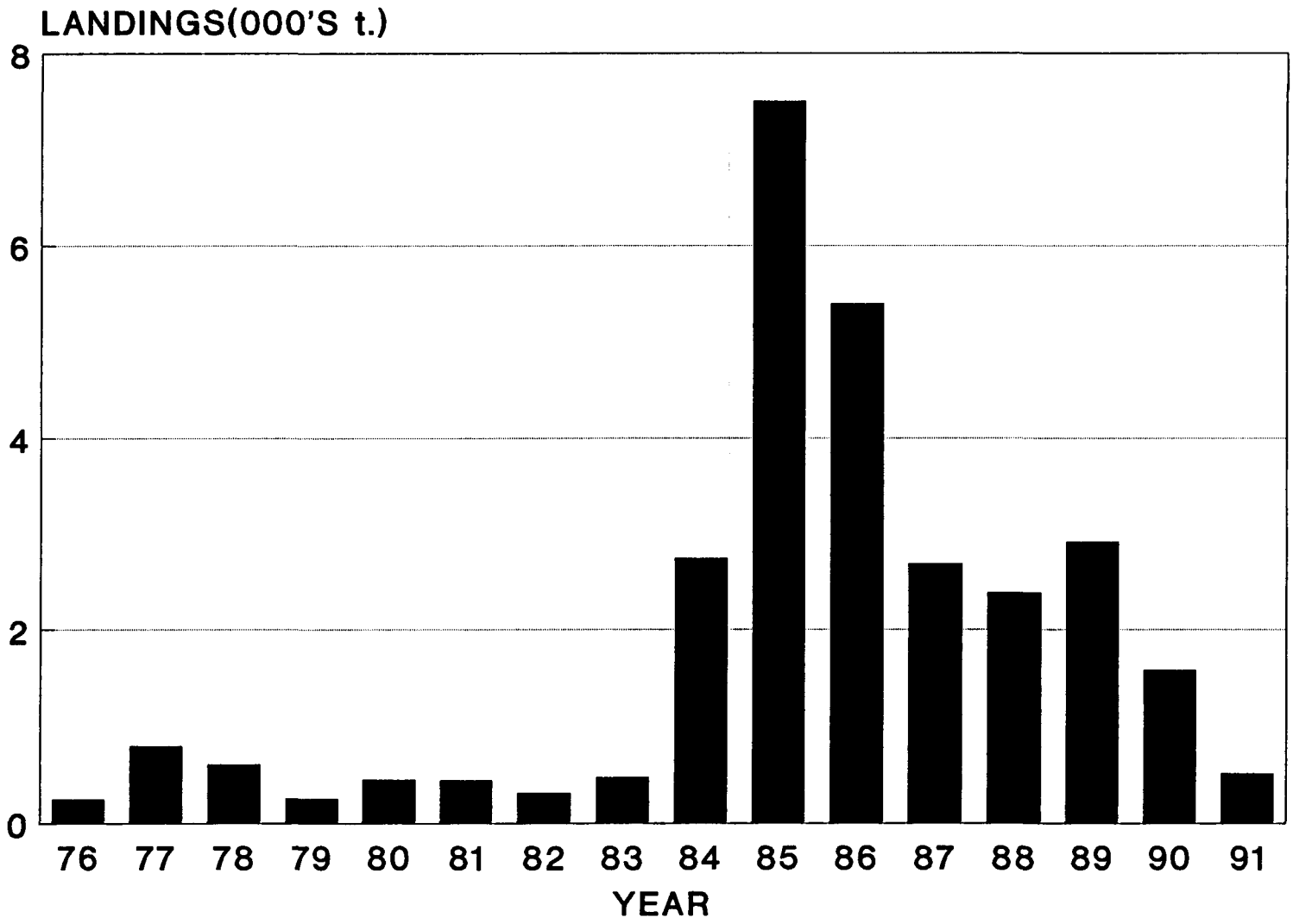

Figure 4. Haddock landings from Subdiv. 3Ps.

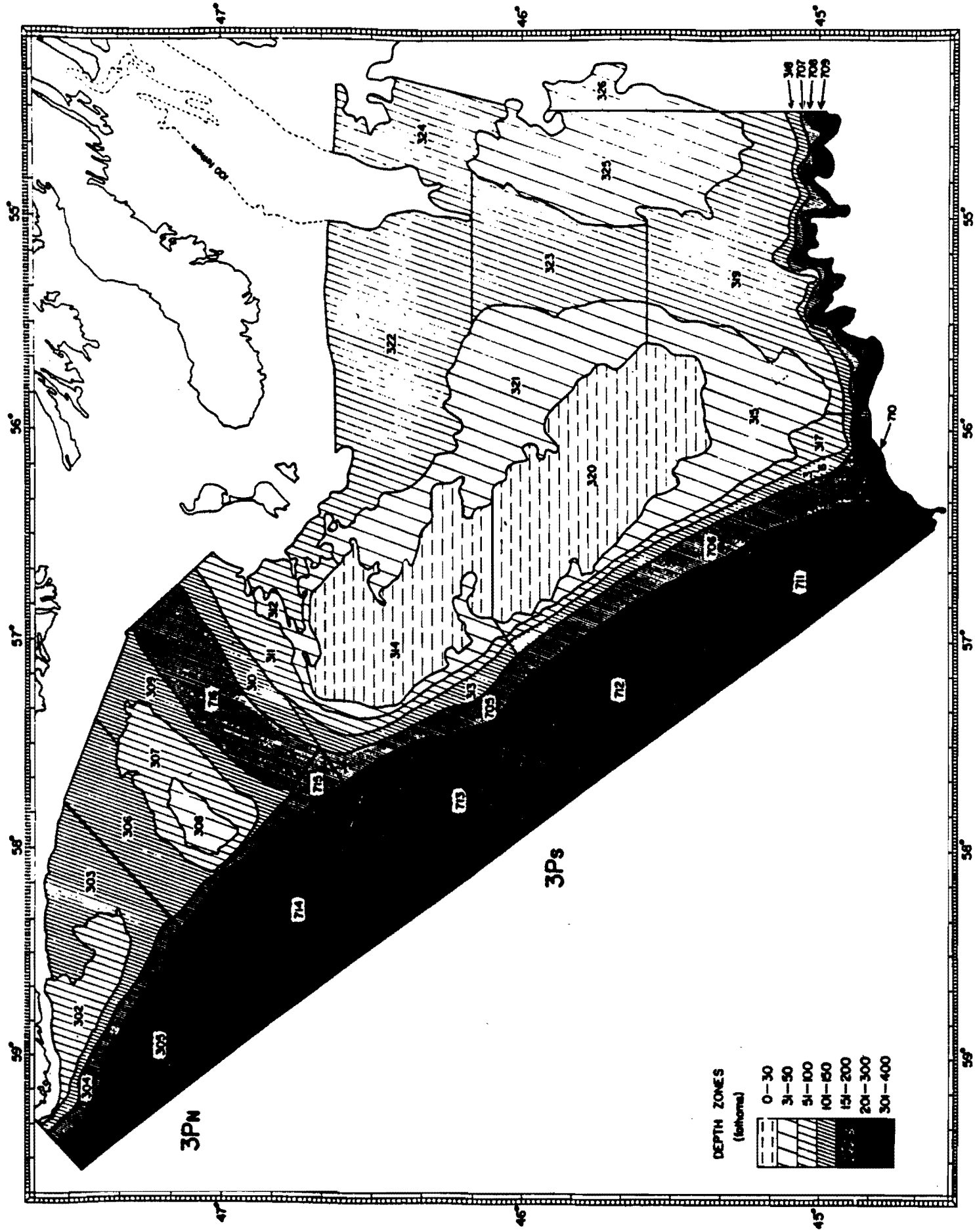

Figure 5. Stratification scheme used for random-stratified groundfish surveys in Subdiv. 3Ps.

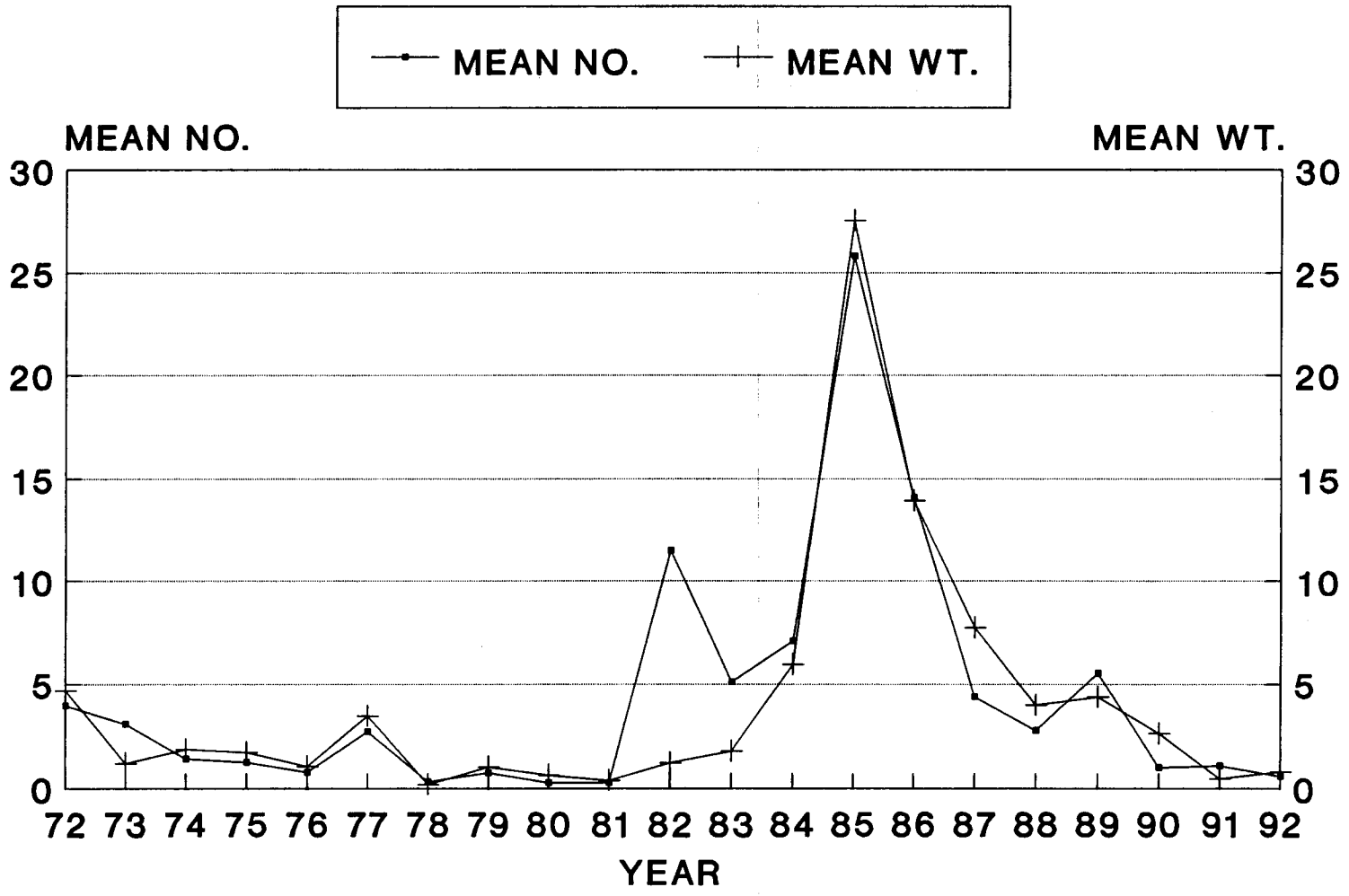

Fig.6. Haddock mean Nos. and Wts. per tow -3Ps.
(Canadian Surveys)