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An assessment in 1993 of the cod stock in NAFO Subdivision 3Ps

by

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ABSTRACT

Catches of cod from NAFO Subdivision 3Ps have ranged from a high of 84,000t in 1961 to a low of 27,000t in 1978. Since 1976, only Canada and France have participated in the fishery. Catches were relatively stable at about 42,000t from 1988 to 1991 but declined to 32,000t in 1992.

Research vessel indices of abundance from Canadian and French surveys were used in single formulation of the ADAPT calibration analysis to estimate fishing mortality and population numbers for 1992.

The analysis indicated strong year effects and suggested a poor fit in all cases. It was concluded that calibrations were not possible but that fishing mortality was probably within the range of 0.50 to 0.90. An illustrative analysis at $F=0.70$ suggested that the age 3+ population biomass had declined in recent years and may be at the lowest observed in the time series.

RÉSUMÉ

Les prises de morue dans la subdivision 3Ps de l'OPANO se sont échelonnées entre un maximum de 84 000 t en 1961 et un minimum de 27 000 t en 1978. Depuis 1976, ces prises proviennent exclusivement de navires canadiens et français. Elles ont été relativement stables, se situant autour des 42 000 t, de 1988 à 1991, mais sont tombées à 32 000 t en 1992.

On a utilisé les indices d'abondance obtenus lors des levés de recherche effectués par les navires scientifiques canadiens et français dans une seule formulation de l'analyse d'étalonnage ADAPT afin d'estimer la mortalité par pêche et la grosseur du stock pour 1992.

L'analyse a révélé des effets marqués selon l'année et s'est avérée inadéquate dans tous les cas. On en a conclu que l'étalonnage n'était pas possible, mais que la mortalité par pêche était probablement de l'ordre de 0,50 à 0,90. Il ressort d'une analyse à $F = 0,70$, réalisée à titre indicatif, que la biomasse d'âge 3+ a diminué ces dernières années et pourrait se trouver à son plus bas niveau de la série chronologique.

INTRODUCTION

Nominal catches were highest from 1959 to 1974 (average of 62,000t) peaking at 84,000t in 1961 (Table 1; Figure 1). They then gradually declined to a low of 27,000t in 1978. From 1985 to 1987, catches averaged 50,000t, mainly due to the increased catches by France, but were relatively stable at about 42,000t from 1988 to 1991. The 1992 catch was only about 32,000t, reflecting a decline in French offshore and Canadian inshore catches by about 8,500t and 3,300t respectively.

Since 1976 only Canada and France have participated in the fishery. Catches by inshore gear (trap, gillnet, longline and handline) have traditionally accounted for the largest portion of the total Canadian catches and these ranged between 20,000t and 29,000t since 1976 with a decline to 18,000t in 1992 (Figure 1). The longline fishery takes the largest portion of the total inshore catch followed by gillnet, trap and handline (Figure 2).

French catches since 1959 have been taken by a metropolitan France freezer fleet (METRO) and by inshore and offshore fleets based in St. Pierre and Miquelon (SPM). From 1959 to 1977, most of the SPM catch was caught by the inshore fleet, with the largest catch (3,800t) occurring in 1961. Catches by this fleet have declined to less than 500t in recent years. Offshore catches by SPM trawlers increased from about 200t in 1975-76 to between 10,000t and 16,000t since 1985, but declined to about 8,000t in 1992. METRO catch was highest in 1986 at about 12,000t because of the diversion of fishing effort from the Gulf of Lawrence. Catches declined rapidly thereafter, and the fleet has not fished in Subdiv. 3Ps since 1989. There were no catches by the French otter trawl fleet for the first quarter of 1993 because of a dispute with Canada concerning allocations in the Canadian zone.

Nominal catches reported for 1992 (Table 2) were obtained from the Department of Fisheries and Oceans (Canada) and from French scientists at the IFREMER laboratory at St. Pierre (France).

In recent years an increasing portion of the winter otter trawl catch has been taken in deeper waters. This effort was not as pronounced in the 1993 winter fishery although there were catches at depths greater than those covered in the surveys.

Catch and average weight-at-age

A summary of the sampling used to derive the Canadian catch-at-age in 1992 is given in Table 3. The following relationship was applied in deriving the average weights-at-age; $\log \text{weight} = 3.0879 \log \text{length} - 5.2106$. The discrepancy between reported and calculated catch from these average weights in 1992 was approximately 3%. Catch numbers and average weights at age are shown in Tables 4 and 5 and Figure 3. The 1986 and 1987 year classes were most abundant in the total catch. Similar data for the French catch were provided by the St. Pierre laboratory and indicated a predominance of the same year classes. (Table 6; Figure 3). Average weights at age from the French catches were somewhat higher at the earlier ages (2-5) and generally

lower at ages 6 and older.

Tables 7 - 9 show catch (numbers and biomass) and average weights-at-age for the 1959-92 period.

Research vessel surveys

Stratified-random surveys have been conducted in Subdivision 3Ps during winter-spring by Canada since 1972 and France for the 1978-1992 period. The two survey series are similar with regard to the stratification scheme used (Figure 4), method of sampling, and analysis of results but differ in the type of fishing gear used and the daily timing of the survey (daylight hr only for French survey). Canadian surveys were conducted by the research vessels A. T. Cameron (1972-82), the A. Needler (1983-84) and the W. Templeman (1985-93). From the limited amount of comparable fishing data available it has been concluded that the three had similar fishing power and that no adjustments were necessary. The French survey has been conducted by the research vessels Cryos (1978-91) and Thalassa (1992). Comparable fishing data between these two vessels is not available. Although the same fishing gear and survey design were used, it was the opinion of French scientists that the results from the two vessels might not be comparable. The French discontinued their surveys after 1992.

Canadian surveys have covered strata in depth ranges to 300 fathoms since 1980 while similar coverage by French surveys occurred only in 1981, 1983, and 1990-92. To account for incomplete coverage of strata in certain years for both surveys, estimates of biomass and abundance for non sampled strata were obtained using a multiplicative model. Results from both survey series are highly variable.

Biomass estimates from Canadian surveys (Table 11; Figure 5) showed an increasing trend in the mid 1980's peaking at 85,000t in 1988. This was followed by a decline in 1989, increases in both 1990 and 91, and a substantial decline to about 10,000t in 1993, the lowest level observed in the 1978-93 time series. Abundance estimates (Table 10) showed a similar pattern.

French surveys (Tables 14, 15; Figure 5) showed an increasing trend from 1978 to 1986 followed by declines to the late 1980's. Increases in both 1990 and 91 were followed by a substantial decline in 1992 to the lowest values observed in the time series.

Mean number-per-tow estimates from the Canadian surveys (Table 12) indicated that in 1993 the 1987 and 89 year-classes were most abundant. Results from the French surveys (Tables 16 and 17) indicated that the 1989 and 1990 year-classes were most abundant in 1992.

French surveys have only covered depths from 200 fath. to 300 fath. in 5 of the 15 surveys. The surveys in 1990 and 1991 indicated that a considerable portion of the total biomass occurred in the deeper waters, particularly in strata bordering the Laurentian Channel (711-714). This pattern was similar to that observed in the Canadian surveys. Mean number-per-tow estimates previously provided by French scientists have not included data from the deeper waters (with

the exception of stratum 708). Age compositions for the deeper strata were estimated for surveys since 1990 and are included in Tables 16 and 17. Because information was not available for previous years, it was assumed that either (1) there was no catch in the deeper water strata in the earlier years (Table 16) or (2) that the proportion of numbers in the unsurveyed area was the same as that observed in the Canadian surveys when there had been coverage (Table 17). The latter was considered the more reasonable assumption.

Results from research surveys to 1992 indicated that cod were being found in proportionally higher numbers in deeper water in the most recent years (Figures 6-7). The commercial fishery was also catching cod in deeper water than normally found and to some extent at depths greater than those covered during the survey. In some years the survey has included coverage of the 300-400 ftm depth range. Only in 1993 was a significant portion (20%) of the total survey biomass found in this area. There was concern that the low estimates observed during the 1992 survey may have in part resulted from their apparent distribution change. In order to address this, two surveys were conducted in 1993, one in February and another in April. The later survey was conducted as recommended by CAFSAC because it was expected that at that time fewer cod would be outside the surveyable area. A further decline in the biomass index was observed in the April survey and the 1992-1993 results were among the lowest observed in the time series.

Bottom temperatures from Canadian Surveys in 1993 have indicated the persistence of temperatures < 0.0 C. at depths of 100 fathoms and less in recent years while those at depths > 100 fathoms have been substantially higher (Table 13). Values from strata including the slope of the bank have been quite variable. Bottom temperatures, particularly at shallower depths, were higher when surveys were conducted later in the spring.

Data from the commercial fishery as well as research vessel surveys suggest that changes in the stock distribution have occurred in recent years. There has been a tendency for survey catches to be larger in deeper waters; i.e. the Laurentian Channel and Southern Halibut Channel. Catches in depths < 100 ftm have been very low since 1990. Some commercial catches in 1992 have been reported from greater depths than those included in the survey. This is generally an area that is difficult to survey because of rough bottom conditions.

Commercial catch and effort data

During previous assessments, various problems were noted with the catch rate data. Rates from the French fleet were difficult to interpret because of possible learning over time, the considerable fluctuations in catch, and the possible influences of fishing area restrictions. Catch-rate-at-age data from the Canadian fisheries indicated that there were substantial fluctuations in the age structure of the catch. These problems have not been resolved and consequently the results from the respective catch rate analyses were not used in calibrations.

Estimation of stock parameters

A number of formulations of ADAPT were tried incorporating the research vessel indices. These included using both Canadian (1978-1993) and French (1978-1991) indices, and the Canadian index alone. The assumptions of both flat topped and dome shaped partial recruitments were examined. The Laurec-Shepherd method was also carried out using the Canadian index only. Residual patterns indicated strong year effects and suggested a poor fit in all cases. In addition, the resulting age 4+ population estimate did not track the age 4+ survey estimate. Although the Canadian survey indicated a substantial decline in 1992 and 1993, the population estimates did not. It was concluded that calibrations of Sequential Population Analysis (SPA) were not possible with these indices.

Based on the above results and on a multiplicative analyses of catch-at-age from research surveys and the commercial fishery it was concluded that fishing mortality in recent years has probably been in the range of 0.5 to 0.9. An illustrative SPA using $F=0.70$ was conducted to demonstrate stock size trends. Partial recruitment was assumed to be flat topped and equal to the average of the last 3 years (1989-1991). With a reduction in the French fishery in 1992, some decrease in effort would be expected. Anecdotal information suggests that there was some increase in the inshore effort in recent years but the magnitude cannot be determined.

Assessment Results

The results of the illustrative SPA suggest that the age 3+ population biomass peaked around 1984-1985 but decreased in recent years, and may now be at or near the lowest observed during the time series (Figure 8). The 6+ biomass also decreased during this period.

Fishing mortalities on fully recruited ages (6+) peaked in 1974, just before the extension of jurisdiction, and in 1976 were at the lowest observed. Since then there has been a gradual increasing trend in F_s . During the late 1980s they were well in excess of twice $F_{0.1}$.

Prognosis

During the 1992 assessment of this stock, concerns were expressed about the reliability of the survey estimates of stock size because of questions about the distribution of the fish relative to the survey coverage. Results from both surveys in 1993 support the decline observed in 1992. Possible movements of fish between 3Ps and other regions outside the stock or survey area may also confound this issue.

Results from the illustrative SPA indicate that fully recruited fishing mortalities have been greater than twice $F_{0.1}$ since the extension of jurisdiction, and have been gradually increasing since that time. There has been a gradual decline in stock size through the second half of the 1980s. Some decrease in the rate of decline can be expected because of recruitment of the relatively strong 1987 and 1989 year-classes. It is expected that the 1993 TAC of 20,000t will generate fishing mortalities greater than $F_{0.1}$.

Table 1. Cod catches (MT) from Subdivision 3Ps, 1959-92.

Year	Can (N)		Can(M)	France			Spain	Portugal	Other	Total
	Offshore (Mobile)	Inshore (fixed gear)		STPM M						
				Inshore	Offshore	Metro				
1959	2,726	32,718	4,784	3,078	-	4,952	7,794	3,647	471	60,170
1960	1,780	40,059	5,095	3,424	210	2,460	17,223	262	2,123	72,636
1961	2,167	32,506	3,883	3,793	347	11,490	21,015	4,985	3,434	83,620
1962	1,176	29,888	1,474	2,171	70	4,138	10,289	1,873	1,560	52,639
1963	1,099	30,447	331	1,112	645	324	10,826	209	6,828	51,821
1964	2,161	23,897	370	1,002	1,095	2,777	15,216	169	9,880	56,567
1965	2,459	25,902	1,203	1,863	707	1,781	13,404	-	4,535	51,854
1966	5,473	23,785	583	1,157	2,050	4,607	23,678	519	4,355	66,207
1967	3,861	26,331	1,259		2,244	3,204	20,851	980	4,044	62,774
1968	6,538	22,938	585	-	880	1,126	26,868	8	18,611	77,556
1969	4,269	20,009	849	1,415	1,062	15	28,141	57	7,982	63,799
1970	4,650	23,410	2,166	1,307	663	35	35,750	143	8,734	76,858
1971	8,657	26,651	731	1,196	455	2,730	19,169	81	2,778	62,448
1972	3,323	19,276	252	990	446	-	18,550	109	1,267	44,213
1973	3,107	21,349	181	976	189	-	19,952	1,180	5,707	52,641
1974	3,770	15,999	657	600	348	5,366	14,937	1,246	3,789	46,712
1975	741	14,332	122	586	189	3,549	12,234	1,350	2,270	35,373
1976	2,013	20,978	317	722	182	1,501	9,236	177	2,007	37,133
1977	3,333	23,755	2,171	845	407	1,734	-	-	-	32,245
1978	2,082	19,560	700	360	1,614	2,860	-	-	45	27,221
1979	2,381	23,413	863	495	3,794	2,060	-	-	-	33,006
1980	2,809	29,427	715	214	1,722	2,681	-	-	-	37,568
1981	2,696	26,068	2,321	333	3,768	3,706	-	-	-	38,892
1982	2,639	21,351	2,948	1,009	3,771	2,184	-	-	-	33,902
1983	2,100	23,915	2,580	843	4,775	4,238	-	-	-	38,451
1984	895	22,865	1,969	777	6,773	3,671	-	-	-	36,950
1985	4,529	24,854	3,476	642	9,422	8,444	-	-	-	51,367
1986	4,981	24,208	2,120	389	13,653	11,939	-	-	-	57,290
1987	3,693	26,589	2,517	551	15,214	8,737	-	-	-	57,301
1988	3,662	19,742	2,303	282	10,011	7,373	-	-	4	43,377
1989	3,098	23,208	2,361	335	9,646	892	-	-	-	39,540
1990*	2,990	20,047	3,289	158	14,769	-	-	-	-	41,253
1991*	3,395	21,297	2,596	204	15,583	-	-	-	-	43,075
1992*	3,905	17,940	2,628	2	7050	-	-	-	-	31,525

*Provisional.

Table 2. Cod landings (t) by Canada 1992 from NAFO Subdivision 3Ps by Month and Gear.

Month	Can (N)							Can (SF)					Can (G)				Total
	OT	MWT	ST	GN	LL	HL	Trap	OT	MWT	SSC	GN	LL	OT	DS	GN	LL	
Jan	470			102	747	14		88	12			13			1		1447
Feb	1164	3		87	359	18		260				109	64	3			2067
Mar	1912	81		183	183	30		128				145	264	1			2927
Apr	53	11		694	247	43		136				147	4	1			1336
May	24			946	532	133	267	55		1	25	154	2	4	7		2150
Jun	22		1	816	540	241	1303	99		16	21	108	8	3	5	5	3188
Jul	4		3	1005	754	341	1705	7			22	79		4		2	3926
Aug	1		1	241	811	160	17	3		28	48	177		1	12	1	1501
Sep	3		1	86	1415	144	3	2		8	22	141			6	9	1840
Oct	14		1	70	1026	106	3	13				24			6	17	1280
Nov	62			291	981	85		10				27				11	1467
Dec	67			313	912	13		46				68	36				1455
Total	3796	95	7	4834	8507	1328	3298	847	12	53	138	1192	378	18	36	45	24584

French Landings Quarter 1 5550
 Quarter 2 1500
 Quarter 3 2

Total Canadian and French Landings 31636

Table 3. Commercial cod sampling by Canada in NAFO Subdivision 3Ps in 1992.

Qtr.	Gear	No. aged	Month	No. meas.	Month	Total	
1	OT	1071	Jan	1045	512	3302	
			Feb	2845	1320		
			Mar	612	1403		
	OT (< 65')			Jan	304	47	1053
				Mar	283	902	
	MWT LL (Off.)			Mar	105	81	107
				Mar	<u>199</u>	145	<u>267</u>
				<u>5393</u>		<u>4729</u>	
2	OT	155	Apr	463	189	428	
			May	851	84		
	LL (Off.)		May	<u>139</u>	154	<u>409</u>	
				<u>1453</u>		<u>837</u>	
1-4	Offshore					6443	
1	LL	292	Jan	2978	747	1106	
2	LL	766	Apr	2825	247	962	
			May	3620	532		
	Trap		May	<u>2920</u>	267	<u>267</u>	
				<u>9365</u>		<u>1229</u>	
3	LL Trap	647	Aug	2577	811	2105	
			Jun	5523	1303	3031	
			Jul	3893	1705		
	GN			Jun	464	816	5008
				Jul	1215	1005	
	HL		Jul	200	341	980	
		Aug	<u>151</u>	160			
				<u>14023</u>		<u>11124</u>	
4	LL	789	Sep	6167	1415	4334	
			Oct	4432	1026		
			Nov	1519	981		
	HL			Sep	142	144	348
				Oct	<u>168</u>	106	
				<u>12368</u>		<u>4682</u>	
1-4	All	3720		45580		24584	

Table 4. Cod catch and average weight at age by gear from the Canadian fishery in NAFO Subdivision 3Ps during 1992.

Age	<u>Mobile gear</u>		Codtrap	Gillnet	Handline	<u>Longline</u>	
	< 65'	> 65'				Inshore	Offshore
	<u>Numbers (x 10⁻³)</u>						
2						3	
3	2	35	532	2	92	472	
4	105	110	1211	23	260	896	4
5	224	244	1762	376	544	2625	38
6	339	441	502	898	240	1683	119
7	86	208	43	437	39	472	99
8	22	73	7	183	12	117	57
9	9	42	2	71	3	31	31
10	8	63		21	1	11	26
11	3	41		29	3	12	17
12		24		11	2	5	11
13	1	18		13	2	2	4
14		17		12	1	3	1
15		7		12	2	1	
16		14		1			1
17		5		3			
18		5		1			
19		3					1
20		1					
Wt.	1053	4046	3298	5008	1328	8507	1237
	<u>Ave. wt.-kg.</u>						
2						0.31	
3	0.54	0.51	0.40	0.43	0.51	0.49	
4	0.78	0.70	0.58	0.82	0.68	0.73	0.87
5	0.99	1.07	0.86	1.46	0.99	1.10	1.52
6	1.31	1.56	1.25	1.96	1.42	1.57	2.07
7	1.90	2.06	1.85	2.61	2.15	2.20	2.80
8	2.17	2.81	2.36	3.22	2.63	2.72	3.27
9	2.96	4.65	2.65	4.00	3.99	3.67	4.07
10	3.08	6.33		6.61	6.28	4.50	5.51
11	3.95	7.36		7.31	8.54	5.30	5.92
12		9.56		8.60	9.11	5.81	6.73
13	3.16	10.32		8.88	9.41	8.03	5.71
14		13.45		9.60	9.52	8.48	7.98
15		14.74		10.34	9.36	10.84	
16		15.54		20.75			11.80
17		15.50		10.54			
18		15.05		20.75			
19		17.70					5.00
20		12.77					

Table 5. Catch, Average Weight and Average Length at Age from the Canadian Commercial Fishery for Cod in NAFO Subdivision 3Ps during 1992.

Age	Average		Catch		
	Weight	Length	Mean	Std. Err.	C.V.
2	0.312	33.352	4	1.91	0.54
3	0.450	37.303	1137	71.68	0.06
4	0.660	42.167	2619	125.68	0.05
5	1.039	48.728	5829	152.44	0.03
6	1.595	55.979	4242	120.85	0.03
7	2.319	63.130	1388	66.78	0.05
8	2.959	67.990	473	40.19	0.09
9	4.037	75.011	189	20.60	0.11
10	5.833	84.301	133	9.96	0.08
11	6.806	89.022	105	9.17	0.09
12	8.387	95.736	54	6.17	0.11
13	9.047	96.954	40	6.10	0.15
14	11.411	105.767	33	4.99	0.15
15	11.720	107.092	22	4.69	0.21
16	15.613	117.848	16	2.79	0.18
17	13.425	111.413	8	2.17	0.26
18	15.357	116.473	6	1.89	0.30
19	15.785	116.662	4	1.41	0.35
20	12.762	110.942	1	0.63	0.61
21	14.211	115.000		0.44	1.01

Table 6. Catch ('000) and Average Weight at age for cod from St. Pierre otter trawl fishery in NAFO Subdivision 3Ps during 1992.

Age	Qtr. 1	Mean Wt. (Kg)	Qtr. 2	Mean Wt. (Kg)	Subtotal	Weighted Mean Wt. (Kg)	Total
2							
3	60	0.55	36	0.53	96	0.54	96
4	488	0.79	286	0.71	774	0.76	774
5	772	1.12	359	0.96	1131	1.07	1131
6	994	1.62	354	1.38	1348	1.56	1349
7	457	2.17	144	1.84	601	2.09	601
8	124	2.85	38	2.35	162	2.73	162
9	69	4.21	12	3.31	81	4.08	81
10	53	5.08	7	3.67	60	4.92	60
11	64	6.63	4	4.7	68	6.52	68
12	26	7.32	1	5.91	27	7.27	27
13	3	12.6	0		3	12.60	3
14	9	12.29	0		9	12.29	9
15	2	14	0		2	14.00	2
16							
17							
Total #	3121		1241		4362	1.63	
Ave. Wt	1.79		1.21				7052
Catch (t)	5550		1500		7050		

Catch ('000) and average weight at age of cod in NAFO Subdivision 3Ps from the fisheries by Canada and France in 1992.

Age	Canada		France		Total	
	(N)	Ave. Wt.	(N)	Ave. Wt.	(N)	Ave Wt.
2	4	0.31	0	0	4	0.31
3	1137	0.45	96	0.54	1233	0.46
4	2619	0.66	774	0.76	3393	0.68
5	5829	1.04	1131	1.07	6960	1.04
6	4242	1.60	1348	1.56	5590	1.59
7	1388	2.32	601	2.09	1989	2.25
8	473	2.96	162	2.73	635	2.90
9	189	4.04	81	4.08	270	4.05
10	133	5.83	60	4.92	193	5.55
11	105	6.81	68	6.52	173	6.69
12	54	8.39	27	7.27	81	8.02
13	40	9.05	3	12.60	43	9.30
14	33	11.41	9	12.29	42	11.60
15	22	11.72	2	14.00	24	11.91
16	16	15.61	0		16	15.61
17	8	13.43	0		8	13.43
18	6	15.36	0		6	15.36
19	4	15.79	0		4	15.79
20	1	12.76	0		1	12.76
Total #	16303		4362		20665	
Catch	24584		7052			
Ave. Wt.		1.47		1.63		1.50

TABLE 7. CATCH NUMBERS AT AGE (THOUSANDS) FROM THE COMMERCIAL COD FISHERY IN NAFO SUBDIVISION 3PS FOR THE YEARS 1959-92.

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
3	1001	567	450	1245	961	1906	2314	949	2871	1143	774	756	2884	731	945	1887	1840	4110	935
4	13940	5496	5586	6749	4499	5785	9636	13662	10913	12602	7098	8114	6444	4944	4707	6042	7329	12139	9156
5	7525	23704	10357	9003	7091	5635	5799	13065	12900	13135	11585	12916	8574	4591	11386	9987	5397	7923	8326
6	7265	6714	15960	4533	5275	5179	3609	4621	6392	5853	7178	9763	7266	3552	4010	6365	4541	2875	3209
7	4875	3476	3616	5715	2527	2945	3254	5119	2349	3572	4554	6374	8218	4603	4022	2540	5867	1305	920
8	942	3484	4680	1367	3030	1881	2055	1586	1364	1308	1757	2456	3131	2636	2201	1857	723	495	395
9	1252	1020	1849	791	898	1891	1218	1833	604	549	792	730	1275	833	2019	1149	1196	140	265
10	1260	827	1376	571	292	652	1033	1039	316	425	717	214	541	463	515	538	105	53	117
11	631	406	446	187	143	339	327	517	380	222	61	178	85	205	172	249	174	17	57
12	545	407	265	140	99	329	68	389	95	111	120	77	125	117	110	80	52	21	43
13	44	283	560	135	107	54	122	32	149	5	67	121	62	48	14	32	6	4	31
14	0	27	58	241	92	27	36	22	3	107	110	14	57	45	29	17	2	3	11
3+	39280	46411	45203	30677	25014	26623	29471	42834	38336	39032	34813	41713	38662	22768	30130	30743	27232	29085	23465
4+	38279	45844	44753	29432	24053	24717	27157	41885	35465	37889	34039	40957	35778	22037	29185	28856	25392	24975	22530
5+	24339	40348	39167	22683	19554	18932	17521	28223	24552	25287	26941	32843	29334	17093	24478	22814	18063	12836	13374
6+	16814	16644	28810	13680	12463	13297	11722	15158	11652	12152	15356	19927	20760	12502	13092	12827	12666	4913	5048
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992				
3	502	135	368	1022	130	760	203	206	306	585	935	1071	2006	812	1233				
4	5146	3072	1625	2888	5092	2682	4521	4718	5103	2956	4951	8995	8622	7981	3393				
5	6096	10321	5054	3136	4430	9174	4538	11473	10253	11023	4971	7842	8195	10028	6960				
6	4006	5066	8156	4652	2348	4080	7018	6118	11228	9763	6471	2863	3329	5907	5590				
7	1753	2353	3379	5855	2861	1752	2221	5072	4283	5453	5046	2549	1483	2164	1989				
8	653	721	1254	1622	2939	1150	584	1496	2167	1416	1793	1112	1237	907	635				
9	235	233	327	539	640	1041	542	417	650	1107	630	600	692	620	270				
10	178	84	114	175	243	244	338	377	224	341	284	223	350	428	193				
11	72	53	56	67	83	91	134	333	171	149	123	141	142	108	173				
12	27	24	45	35	30	37	35	131	143	78	75	57	104	76	81				
13	17	13	21	18	11	18	8	24	79	135	53	29	47	50	43				
14	10	10	25	2	7	8	8	12	23	50	31	26	22	22	42				
3+	18695	22085	20424	20011	18814	21037	20150	30377	34630	33056	25363	25508	26229	29003	20602				
4+	18193	21950	20056	18989	18684	20277	19947	30171	34324	32471	24428	24437	24223	28191	19369				
5+	13047	18878	18431	16101	13592	17595	15426	25453	29221	29515	19477	15442	15601	20210	15976				
6+	6951	8557	13377	12965	9162	8421	10888	13980	18968	18492	14506	7600	7406	10182	9016				

TABLE 8. AVERAGE WEIGHTS AT AGE (KG.) FROM THE COMMERCIAL COD FISHERY IN NAFO SUBDIVISION 3PS FOR THE YEARS 1959-92.

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
3	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.55	0.45	0.41	0.52
4	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.68	0.70	0.65	0.72
5	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.30	1.08	1.01	1.13
6	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.96	1.75	1.65	1.66
7	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.67	2.45	2.55	2.48
8	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.42	2.99	3.68	3.60
9	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.19	4.10	4.30	5.40
10	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	4.94	5.16	6.49	6.95
11	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	5.92	5.17	7.00	7.29
12	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.76	7.20	8.20	8.64
13	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.78	7.75	9.53	9.33
14	9.16	9.16	9.16	9.16	9.16	9.16	9.16	9.16	9.16	9.16	9.16	9.16	9.16	9.16	9.16	9.16	9.16	9.16	10.90	8.72	10.84	9.58
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992										
3	0.48	0.45	0.58	0.66	0.64	0.54	0.56	0.63	0.63	0.58	0.60	0.46										
4	0.79	0.77	0.84	1.04	0.98	0.75	0.77	0.82	0.81	0.86	0.75	0.68										
5	1.32	1.17	1.33	1.40	1.36	1.18	1.21	1.09	1.16	1.27	1.17	1.04										
6	1.80	1.78	1.99	1.97	1.93	1.84	1.63	1.67	1.63	1.85	1.74	1.59										
7	2.30	2.36	2.58	2.64	2.51	2.43	2.31	2.17	2.25	2.45	2.37	2.25										
8	3.27	2.88	3.26	3.77	3.43	3.15	3.02	2.92	3.37	3.00	2.91	2.90										
9	4.36	3.91	3.77	4.75	4.35	4.30	4.33	3.58	4.11	4.22	3.69	4.05										
10	5.68	5.28	5.04	5.56	5.06	5.50	5.11	4.98	5.18	5.09	4.23	5.55										
11	7.41	6.18	6.56	6.01	5.42	6.19	6.20	5.61	6.29	6.35	6.34	6.69										
12	9.04	8.62	8.45	9.04	9.37	8.72	6.98	6.60	7.30	7.60	7.68	8.02										
13	8.39	8.64	10.06	11.20	11.95	8.05	7.08	7.46	7.75	8.31	8.64	9.30										
14	9.56	11.41	11.82	10.40	10.85	11.91	8.34	8.92	8.73	10.37	9.72	11.60										

TABLE 9. CATCH BIONASS AT AGE (t) FROM THE COMMERCIAL COD FISHERY IN NAFO SUBDIVISION 3PS FOR THE YEARS 1959-92.

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
3	280	159	126	349	269	534	648	266	804	320	217	212	808	205	265	528	515	1151	514
4	9619	3792	3854	4657	3104	3992	6649	9427	7530	8695	4898	5599	4446	3411	3248	4169	5057	8376	6226
5	8127	25600	11186	9723	7658	6086	6263	14110	13932	14186	12512	13949	9260	4958	12297	10786	5829	8557	10824
6	12205	11280	26813	7615	8862	8701	6063	7763	10739	9833	12059	16402	12207	5967	6737	10693	7629	4830	5969
7	11700	8342	8678	13716	6065	7068	7810	12286	5638	8573	10930	15298	19723	11047	9653	6096	14081	3132	2456
8	3024	11184	15023	4388	9726	6038	6597	5091	4378	4199	5640	7884	10051	8462	7065	5961	2321	1589	1351
9	5133	4182	7581	3243	3682	7753	4994	7515	2476	2251	3247	2993	5228	3415	8278	4711	4904	574	1110
10	6401	4201	6990	2901	1483	3312	5248	5278	1605	2159	3642	1087	2748	2352	2616	2733	533	269	578
11	3805	2448	2689	1128	862	2044	1972	3118	2291	1339	368	1073	513	1236	1037	1501	1049	103	337
12	3815	2849	1855	980	693	2303	476	2723	665	777	840	539	875	819	770	560	364	147	291
13	354	2278	4508	1087	861	435	982	258	1199	40	539	974	499	386	113	258	48	32	272
14	0	247	531	2208	843	247	330	202	27	980	1008	128	522	412	266	156	18	27	120
3+	64463	76563	89835	51994	44109	48512	48030	68036	51285	53352	55899	66138	66879	42672	52344	48152	42348	28787	30049
4+	64183	76404	89709	51645	43840	47979	47382	67770	50482	53032	55682	65926	66071	42467	52079	47624	41833	27636	29534
5+	54564	72612	85854	46988	40736	43987	40733	58343	42952	44336	50785	60327	61625	39055	48831	43455	36776	19260	23308
6+	46437	47011	74669	37265	33078	37901	34470	44233	29020	30150	38273	46378	52365	34097	36534	32669	30947	10703	12485
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992				
3	226	55	191	491	58	441	134	132	165	328	589	675	1163	487	567				
4	3602	1997	1170	2282	3921	2253	4702	4624	3827	2276	4060	7286	7415	5986	2307				
5	6584	10424	5711	4140	5183	12201	6353	15603	12099	13338	5418	9097	10408	11733	7238				
6	7010	8359	13539	8374	4179	8119	13825	11808	20660	15914	10807	4667	6159	10278	8888				
7	4295	6000	8380	13466	6752	4520	5863	12731	10408	12596	10950	5735	3633	5129	4475				
8	1952	2653	4514	5304	8464	3749	2202	5131	6826	4276	5236	3747	3711	2348	1841				
9	963	1002	1766	2350	2502	3925	2575	1814	2795	4793	2255	2466	2920	2288	1093				
10	918	545	792	994	1283	1230	1879	1908	1232	1743	1414	1155	1782	1810	1071				
11	372	371	408	496	513	597	805	1805	1058	924	690	887	902	685	1157				
12	194	197	389	316	259	313	316	1227	1247	544	495	416	790	584	650				
13	132	124	196	151	95	181	90	287	636	956	395	225	391	432	400				
14	87	108	239	19	80	95	83	130	274	417	277	227	228	214	487				
3+	26337	31836	37296	38383	33290	37623	38828	57199	61227	58105	42586	36583	39502	41973	30176				
4+	26111	31780	37105	37892	33232	37182	38694	57068	61061	57777	41997	35908	38338	41486	29609				
5+	22509	29784	35935	35611	29311	34929	33992	52444	57234	55501	37937	28622	30923	35500	27302				
6+	15925	19359	30224	31471	24128	22728	27639	36841	45136	42163	32519	19525	20516	23768	20064				

Table 11. Cod biomass estimates (t) from research vessel surveys in NAFO Division 3P.

DEPTH (fath)	Stratum number	Stratum Area sq. mi.	Date																																					
			Mar 20-30	Mar 16-23	Apr 19-30	Jun 2-13	Apr 14-26	Feb 21-28	16-Feb	19-Mar	Mar 7-26	28-Mar	13-Feb	27-Jan	Feb 1-16	31-Jan	Feb 2-20	Feb 5-25	Apr 1-21																					
0-30	314	974	(9)	(7)	(17)	2355	249	(640)	(1036)	0	(241)	432	369	2028	13103	567	25	0	24	8	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
31-50	308	112	175	278	205	193	311	38	125	240	305	490	766	681	1024	0	3	4	2	2	2	1	6	1	22	0	0	0	0	0	0	0	0	0	0	0	0			
51-100	307	395	5955	3916	883	1126	2095	3219	4105	1763	13723	3028	892	771	5189	12339	2688	13936	3138	340	20	9	9	608	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
101-150	306	419	(113)	433	1077	214	161	416	710	457	2652	1211	1250	236	590	755	1032	3589	267	779	24	16	25	849	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
151-200	705	195	0	66	0	0	60	1	91	674	1310	22	27	0	542	611	121	501	18	123	1	17	21	553	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
201-300	708	117	(28)	(100)	0	(183)	11	(125)	177	4633	(164)	(147)	0	0	(166)	327	8816	27852	57	(74)	555	1264	412	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
301-400	706	476	0	23	(39)	(250)	76	(171)	356	827	304	30	32	0	2068	447	8319	1134	370	69	100	10	17	21	553	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total **	10075	14703	7918	23189	11967	16489	39036	27754	48924	28638	46931	24709	54920	57029	75452	84949	42642	48948	54983	16014	10063	7742	5.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Mean wt/row	7.7	11.23	6.05	17.71	9.14	12.59	29.81	21.2	52.64	21.87	35.84	18.87	41.94	43.56	57.63	64.88	32.57	37.38	41.99	12.23	7.77	5.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Unadjusted total	9242	11175	6643	19394	9619	13562	33402	27647	46507	28317	46929	22574	53184	57028	75451	84967	42642	47308	54997	16015	11859	7808	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Upper limit	17506	14468	9171	29677	12282	18582	187818	52461	182556	35969	75189	30739	109270	85725	122747	447584	67528	90622	107637	23812	19164	10528	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lower limit	978	7883	4116	9112	6957	3660	-121014	2832	-48561	20666	18670	14408	-2903	28332	28156	-277649	17797	3993	2357	8217	4554	5088	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: numbers in brackets are estimates for non-sampled strata and only 0-300 fathom strata are used in deriving these estimates.
 * estimated using one tow
 ** total and mean wgt. per tow include sampled and estimated values for depths to 300 fathom. Estimates were derived from a multiplicative model using survey data to 1992.

TABLE 12. MEAN NUMBERS PER TOW AT AGE ADJUSTED FOR MISSING STRATA
FOR COD IN SUBDIVISION 3PS FOR THE YEARS 1972-93.

I	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
1 I	0.02	0.01	0.52	0.17	0.17	0.01	0.00	0.85	0.16	0.03	0.51
2 I	0.62	0.64	1.58	0.34	2.44	0.15	0.48	0.35	4.52	0.53	1.95
3 I	1.09	0.75	1.56	0.97	1.59	1.95	0.74	0.52	1.38	3.02	0.99
4 I	2.24	1.15	1.12	0.88	2.93	1.70	2.70	5.42	0.97	4.97	4.91
5 I	1.50	1.28	1.51	0.54	1.83	1.31	1.16	16.00	3.29	5.46	2.25
6 I	1.00	0.36	1.40	0.50	0.83	0.67	0.83	3.36	2.91	7.04	1.05
7 I	1.33	0.72	0.39	0.45	0.51	0.21	0.60	0.75	0.53	6.62	1.42
8 I	0.78	0.28	0.31	0.17	0.47	0.10	0.42	0.36	0.49	1.33	1.47
9 I	0.33	0.38	0.25	0.11	0.11	0.16	0.24	0.13	0.14	1.31	0.40
10 I	0.20	0.09	0.12	0.07	0.09	0.06	0.23	0.10	0.13	0.31	0.11
11 I	0.08	0.02	0.04	0.02	0.06	0.01	0.08	0.03	0.10	0.06	0.08
12 I	0.05	0.02	0.03	0.01	0.06	0.03	0.03	0.01	0.11	0.08	0.03
13 I	0.03	0.00	0.02	0.01	0.00	0.03	0.03	0.01	0.04	0.08	0.02
14 I	0.05	0.01	0.02	0.00	0.00	0.01	0.00	0.01	0.00	0.05	0.02
15 I	0.03	0.00	0.00	0.01	0.02	0.01	0.03	0.00	0.02	0.01	0.03
16 I	0.09	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.02
1+I	9.45	5.72	8.88	4.24	11.11	6.39	7.57	27.92	14.82	30.89	15.26
2+I	9.42	5.71	8.36	4.07	10.94	6.39	7.57	27.07	14.66	30.86	14.75
3+I	8.80	5.07	6.78	3.73	8.50	6.24	7.09	26.72	10.14	30.34	12.80
4+I	7.72	4.32	5.22	2.76	6.90	4.29	6.35	26.20	8.77	27.32	11.81
I	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
1 I	0.25	0.01	0.01	0.01	0.04	0.02	0.02	0.00	0.05	0.00	0.00
2 I	0.47	0.20	0.27	0.26	0.37	0.42	0.28	0.06	1.18	0.11	0.00
3 I	1.02	0.32	1.69	0.54	0.83	0.78	0.68	1.32	0.73	1.13	0.41
4 I	0.55	0.57	4.34	2.54	2.01	1.18	1.33	5.01	3.87	0.89	2.79
5 I	3.05	0.43	5.62	5.40	10.26	1.79	0.97	6.25	7.33	2.74	0.69
6 I	1.56	1.84	2.59	5.83	8.01	5.90	1.01	4.18	5.26	1.82	2.65
7 I	0.54	0.74	2.42	2.28	3.82	6.14	2.29	3.14	2.88	1.05	0.72
8 I	1.06	0.38	0.76	1.71	1.60	4.13	1.42	2.91	1.78	0.55	0.36
9 I	1.99	0.47	0.45	0.99	0.97	1.85	0.82	1.25	1.53	0.29	0.15
10 I	0.92	0.74	0.43	0.34	0.39	1.04	0.46	0.67	1.06	0.26	0.10
11 I	0.45	0.18	0.44	0.28	0.31	0.90	0.51	0.36	0.78	0.08	0.12
12 I	0.17	0.13	0.49	0.32	0.24	0.44	0.15	0.16	0.30	0.05	0.03
13 I	0.07	0.05	0.20	0.18	0.24	0.18	0.13	0.12	0.15	0.01	0.04
14 I	0.06	0.03	0.11	0.11	0.24	0.18	0.06	0.08	0.10	0.01	0.01
15 I	0.05	0.00	0.03	0.07	0.09	0.11	0.11	0.01	0.05	0.03	0.01
16 I	0.04	0.04	0.04	0.03	0.06	0.11	0.06	0.04	0.04	0.00	0.00
1+I	12.26	6.11	19.88	20.90	29.48	25.18	10.30	25.55	27.09	9.02	8.08
2+I	12.01	6.11	19.87	20.89	29.44	25.16	10.28	25.55	27.04	9.02	8.08
3+I	11.54	5.90	19.60	20.63	29.07	24.74	10.00	25.49	25.86	8.91	8.08
4+I	10.52	5.59	17.91	20.09	28.24	23.96	9.31	24.17	25.14	7.78	7.67

Table 13. Mean bottom temperature (°C) by stratum from Canadian research vessel surveys in NAFO Subdivision 3Ps over the period 1978-92.

Depth range	Strata	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993 (Feb)
0-30	314	0.20		-0.20	1.52	1.64	1.96	1.40	-1.23	-0.79	-0.52	0.14	-0.74	-0.84	-0.16	-1.08	-0.72
	320		-0.70	-0.22	1.60	1.72	2.53	1.88	-1.09	-0.74	-1.12	0.20	-0.35	-0.88	-0.33	-0.73	-0.72
Average		0.20	-0.70	-0.21	1.55	1.68	2.34	1.72	-1.17	-0.76	-0.85	0.17	-0.52	-0.90	-0.24	-0.91	-0.72
31-50	308	1.75	1.65	0.00	1.00	0.40	0.73	2.40	-0.25	-0.50	0.85	1.45	0.35	-0.50	-0.07	0.45	-
	312	0.75	0.13	0.00	1.30	1.45	1.60	2.80	-0.85	-0.80	-0.45	1.23	-0.37	-0.97	-0.13	-0.50	-0.6
	315		-0.80	-0.60	1.90	-0.67	1.14	1.44	-1.37	-0.80	-1.07	0.43	0.01	-0.85	-0.53	-0.54	-0.72
	321	0.53		-0.42	1.50	0.35	0.83	0.52	-1.21	-0.82	-0.73	0.19	-0.63	-0.70	-0.39	-0.80	-0.62
	325	0.55	-0.85	-0.95	2.05	0.7	-0.12	0.14	-1.50	-1.18	-0.79	-0.08	-0.56	-1.37	-0.68	-0.88	-0.97
	326	-0.50	-0.85	-1.05	-0.20	-0.90	-0.97	-1.00	-1.45	-0.90	-0.90	-0.35	-0.70	-1.00	-0.93	-1.10	-1.10
Average		.61	0.08	-0.58	1.19	-0.06	0.59	0.88	-1.15	-0.93	-0.73	0.37	-0.37	-0.81	-0.46	-0.42	-0.80
51-100	307	1.20	3.92	3.30	2.73	2.05	2.15	4.70	2.33	2.23	3.83	2.47	2.13	1.87	1.20	1.35	2.53
	311	1.32	1.48	1.60	4.35	0.07	1.50	1.20	-0.35	1.50	1.47	1.16	.80	-0.56	0.53	0.85	1.20
	317		-0.43	-0.35	2.40	-0.30	1.97	5.80	-0.15	-0.55	-0.40	0.40	0.20	0.20	-0.40	2.05	-0.40
	319		5.20	0.45	2.70	0.74	0.60	3.27	2.90	2.40	0.17	1.59	0.88	0.88	0.31	0.75	-0.53
	322	0.60		-0.32	-0.05	-0.46	-0.22	0.04	-1.32	-0.42	-0.47	0.18	-0.49	-0.48	-0.42	-0.65	-0.48
	323	0.27		-0.67	0.00	-0.70	-0.40	0.20	1.97	0.54	-0.65	-0.26	-0.60	-0.64	-0.55	-0.83	-0.44
	324		-0.50	-0.70		-0.95	-0.65	-1.03	-1.05	-1.40	-0.75	-0.05	-0.78	-0.70	-0.82	-0.92	-1.00
	Average		0.91	1.98	0.21	2.08	0.22	0.40	1.52	0.02	0.55	0.11	0.71	0.03	-0.25	-0.02	0.37
101-150	306	2.90	6.06	6.05	6.15	5.30	4.60	5.95	7.15	7.10	6.25	6.02	5.10	4.40	3.95	4.75	5.13
	309	2.07	5.67	5.75	4.70	4.05	5.00	5.80	5.53	6.45	5.65	5.37	4.15	3.65	4.10	3.90	4.70
	310	3.83	5.27	6.20	6.50	4.70	5.47	6.10	7.27	7.50	6.40	5.67	2.30	3.77	3.25	5.10	6.50
	313	2.60	5.22	5.30	7.25	3.00	5.00	6.90	6.05	8.10	7.00	6.60	5.10	2.95	3.65	5.50	6.60
	316		6.60	6.70	7.95	5.40	5.15	5.60	4.80	8.15	5.03	6.93	5.20	4.40	4.20	6.50	7.10
	318		-7.45	6.20		5.60	5.53	7.95		6.90	4.70	5.00	2.90		5.30	5.70	8.25
	Average		2.85	5.81	6.03	6.71	4.67	5.10	6.38	6.09	7.35	5.84	5.95	4.20	3.89	4.08	5.24
151-200	705	5.90	6.52	5.35	6.40	4.60	5.33	5.15	7.30	6.75	6.30	5.65	5.70	5.67	5.80	4.95	5.80
	706		6.10	5.50	6.30	4.72	5.28	6.60	7.40	7.10	4.96	5.90	5.38	6.03	5.80	5.32	6.20
	707		7.40	6.05			5.17	6.20		5.20	4.60	3.70	3.80		5.70	6.70	7.30
	715	5.30	6.00	5.80	6.30	4.45	5.03	6.25	6.30	7.00	6.25	5.60	5.75	5.55	2.85	5.05	5.55
	716	4.20	6.35	6.00	6.05	5.10	5.32	6.20	7.26	6.65	6.13	5.88	5.48	5.52	5.50	5.27	6.08
Average		5.13	6.41	5.74	6.21	4.72	5.24	6.08	7.23	6.64	5.54	5.66	5.28	5.68	5.13	5.46	6.19
201-300	708		5.60	4.95			4.95	5.95		4.75	4.20	3.85	4.60		5.0	5.55	5.25
	711			4.95	5.40	4.70	4.81	5.12	6.12	5.77	4.99	4.53	5.16	5.20	5.31	4.93	5.72
	712		5.40	4.85	5.50	4.20	4.99	5.65	5.62	4.90	4.76	5.15	4.88	4.88	4.83	4.62	5.27
	713			5.00	5.80	4.30	4.76	5.38	5.66	5.12	4.82	5.15	4.66	4.79	4.63	4.63	5.06
	714		5.20	4.95	5.15	4.50	4.71	6.30	5.62	5.28	4.84	5.12	4.69	4.72	4.68	4.68	5.01
Average			5.44	4.94	5.44	4.43	4.82	5.36	5.75	5.61	4.98	4.70	5.11	4.78	4.93	4.88	5.26
0-30		0.20	-0.70	-0.21	1.55	1.68	2.34	1.72	-1.17	-0.76	-0.85	0.17	-0.52	-0.90	-0.24	-0.91	-0.72
31-50		0.61	0.08	-0.58	1.19	-0.06	0.59	0.88	-1.15	-0.93	-0.73	0.37	-0.37	-0.81	-0.46	-0.42	-0.80
51-100		0.91	1.98	0.21	2.08	0.22	0.40	1.52	0.02	0.55	0.11	0.71	0.03	-0.25	-0.02	0.37	0.13
101-150		2.85	5.81	6.03	6.71	4.67	5.10	6.38	6.09	7.35	5.84	5.95	4.20	3.89	4.08	5.25	6.38
151-200		5.13	6.41	5.74	6.21	4.72	5.24	6.08	7.23	6.64	5.54	5.66	5.28	5.68	5.13	5.46	6.19
201-300			5.44	4.94	5.44	4.43	4.82	5.36	5.75	5.61	4.98	4.70	5.11	4.78	4.93	4.88	5.26

Table 14. Cod abundance (000's) from stratified-random cruises conducted by France in Subdivision 3Ps. Numbers in brackets are estimates for non-sampled strata.

Depth (m)	Strata	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
< 55	314	33	0	(73)	267	22	133	0	33	33	67	(354)	33	0	0	0
	320	36	241	(256)	784	90	572	663	136	45	(785)	0	90	181	0	45
	TOTAL	69	241	329	1051	112	705	663	169	78	352	354	123	181	0	45
56-90	308	189	12	35	35	161	46	157	50	134	31	38	65	0	12	23
	312	605	99	28	677	456	99	6837	155	298	0	75	56	5	360	0
	315	368	57	0	269	113	85	3597	28	321	868	265	28	28	0	28
	321	20	896	326	502	387	221	147	16	55	(628)	1222	0	0	0	0
	325	(108)	(152)	(138)	129	(567)	275	647	65	226	0	485	0	0	0	0
TOTAL	1290	1216	527	1612	1684	726	11385	314	1034	1527	2085	149	33	372	116	
91-180	307	1948	1154	3084	640	4662	2958	2624	785	21238	4694	1136	8852	1144	419	189
	311	402	1628	1158	4357	3995	4147	15162	1954	18038	9503	16231	5973	1040	265	275
	317	0	119	(697)	724	4940	1696	16436	989	1182	8457	5410	7993	859	2260	2344
	319	1051	4583	1146	3262	3516	7666	5473	3909	2887	5695	3639	9413	13319	2186	1427
	322	939	617	5742	1149	4916	5720	2603	4239	4883	11270	4776	6735	912	134	54
	323	349	226	318	1156	572	3671	3683	2670	4576	1907	1668	1621	95	24	72
	324	(479)	(611)	(570)	0	(1845)	2605	3147	1607	727	237	3164	1878	85	34	118
TOTAL	5168	8938	12715	11288	24446	28463	49128	16153	53531	41763	36024	42465	17454	5322	4479	
181-270	306	765	870	698	9691	2841	6333	947	278	14560	2956	2589	3935	2759	535	273
	309	355	1642	264	1453	595	1500	1588	872	4906	831	2859	5852	13611	476	811
	310	396	186	15	489	1095	935	105	9513	175	382	2276	146	553	279	303
	313	130	328	11	859	814	678	83	2359	138	1432	23	1639	995	305	28
	316	65	95	39	165	423	30	173	4088	826	215	667	4871	6236	1458	2637
	318	21	8	(191)	247	34	1182	604	576	5810	101	2786	1097	1936	1692	166
TOTAL	1732	3129	1218	12904	5802	10658	3500	17686	26415	5917	11200	17540	26090	4745	4218	
271-365	705	254	982	27	423	3286	672	908	69	224	220	274	267	87	73	0
	706	22	0	98	672	3054	179	532	163	1981	8977	791	157	717	378	98
	707	(140)	586	(166)	13	2603	183	19	827	1172	81	80	51	73	105	1940
	715	922	597	895	628	2473	588	1636	917	1132	961	882	276	2048	1311	45
	716	123	357	923	455	1772	1196	1058	25	2258	5353	4836	406	1707	1329	222
TOTAL	1461	2522	2109	2191	13188	2818	4153	2001	6767	15592	6863	1157	4632	3196	2305	
366-545	708	(52)	(68)	(63)	45	353	8	4	315	381	1543	88	172	297	2472	357
	711				0		33						0	823	702	22
	712				0		133						0	2466	2666	34
	713				21								0	1854	2017	22
	714				137		0						0	9877	47664	1054
TOTAL	52	68	63	203	353	174	4	315	381	1543	88	172	15317	55521	1489	
0-545	TOTAL	9775	16115	16960	29249	45585	43544	68833	36638	88206	67194	56614	61608	63707	69156	12652
Confidence Interval		12225	22211	19582	41387	59497	52592	113553	49004	136843	91756	77558	82570			
		7325	10019	14338	16795	31673	34164	24113	24272	39571	42632	35670	40648			

Table 15. Cod biomass (MT) from stratified-random cruises conducted by France in Subdivision 3Ps.

Depth (m)	Strata	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
< 55	314	17	0		1390	111	30	0	7	13	133		17	0	0	0
	320	108	814		3797	513	2803	3526	104	14	0	0	316	222	0	5
	TOTAL	125	814		5187	624	2833	3526	111	27	133	0	333	222	0	5
56-90	308	371	9	150	88	299	151	111	65	100	29	6	25	0	1	3
	312	820	270	112	2304	454	636	1403	145	343	0	28	55	2	11	0
	315	771	850	0	1076	821	326	16918	8	1813	2058	2134	198	41	0	510
	321	183	4785	3746	2199	3746	1362	1026	3	543	0	649	0	0	0	0
	325				2101		1332	1466	81	259	0	453	0	0	0	65
TOTAL	2145	5914	4008	7768	5320	3807	20924	302	3058	2087	3270	278	43	12	578	
91-180	307	3598	2714	4428	1876	9009	6269	5384	2976	23172	8089	565	6168	215	37	24
	311	87	3199	1136	5797	8202	3572	19599	1276	20627	1356	4815	675	267	8	13
	317	0	260		813	454	421	21353	1502	2562	1049	815	973	226	183	243
	319	997	5810	1303	4435	4078	11349	8101	2831	3179	5746	5434	5889	3067	1907	89
	322	605	1945	3381	1793	2404	967	1122	2388	5944	2734	215	864	172	11	5
	323	91	572	858	822	54	794	803	512	2399	953	311	60	10	19	14
	324				0		815	964	594	288	99	171	90	44	8	34
TOTAL	5378	14500	11106	15536	24201	24187	57326	12079	58171	20026	12326	14719	4001	2173	422	
181-270	306	3080	2660	2162	12197	3716	11967	2296	804	23131	8294	4041	4691	663	69	33
	309	167	2743	804	2176	1122	3318	3852	1581	7434	1901	4827	7947	6726	151	172
	310	411	190	19	481	1683	739	229	4675	169	503	739	164	93	33	32
	313	113	331	1	1099	1279	840	170	1753	142	562	26	373	240	18	5
	316	91	121	39	282	544	36	332	38395	695	334	320	2324	4464	481	1265
	318	42	25		593	34	5282	786	1828	28349	259	4558	941	2096	2109	304
TOTAL	3904	6070	3025	16828	8378	22182	7665	49036	59920	11853	14511	16440	14282	2861	1811	
271-365	705	321	1115	13	574	4550	984	1661	99	414	354	394	325	49	46	0
	706	11	0	293	952	4010	375	1141	333	3896	13845	1413	296	768	422	334
	707		1303		13	10980	652	49	2314	3338	134	102	118	193	125	1476
	715	836	832	1564	827	4159	1261	3806	2282	2613	1908	1772	542	1759	783	42
	716	178	455	1169	554	2104	1934	2326	86	2775	5685	6264	439	1096	842	89
TOTAL	1346	3705	3039	2920	25803	5206	8983	5114	13036	21926	9945	1720	3865	2218	1941	
365-545	708				85	373	44	8	593	849	6136	264	429	899	1771	286
	711				0		296						0	1058	954	64
	712				0		300						0	2926	3584	49
	713				108								0	2268	1789	7
	714				354		0						0	9607	58529	911
TOTAL				547	373	640	8	593	849	6136	264	429	16758	66627	1317	
0-545	TOTAL	12899	31002	21178	48787	64699	58856	98433	67235	135061	62164	40316	33918	39169	73891	6074

Table 16. MEAN NUMBERS PER TOW AT AGE FROM SURVEYS CONDUCTED BY FRANCE.
ZERO CATCHES ASSUMED FOR UNSURVEYED DEEP WATER STRATA.

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.00	0.05	0.00	0.05	0.79	3.56	0.02	0.10	0.08	2.52	4.02	1.43	0.29	0.81	0.08
2	0.57	0.33	5.25	0.14	9.16	8.31	8.87	4.25	5.55	15.80	11.34	18.89	2.39	12.14	3.35
3	1.22	0.30	1.22	3.78	1.50	4.16	5.85	11.21	3.23	8.82	11.36	12.25	18.26	7.08	4.20
4	2.39	1.61	0.36	3.81	6.35	2.29	11.54	5.78	11.64	2.17	7.03	6.27	20.11	12.96	1.40
5	1.59	5.85	1.90	3.96	6.08	5.55	6.89	3.04	20.28	6.36	2.76	4.44	7.66	12.68	0.84
6	0.93	2.53	3.21	5.74	4.63	4.70	14.53	0.82	16.59	9.57	4.98	2.66	2.46	7.56	0.51
7	0.69	1.41	1.18	4.35	3.47	3.50	4.28	1.51	6.99	6.38	3.58	3.39	0.73	2.42	0.19
8	0.40	0.74	0.48	1.23	4.05	2.13	1.63	0.88	5.34	2.26	1.22	1.55	1.00	1.07	0.05
9	0.23	0.29	0.21	0.92	1.21	1.60	2.37	0.60	2.95	1.49	0.60	0.77	0.44	0.91	0.02
10	0.17	0.17	0.16	0.36	0.66	0.58	1.69	0.67	0.61	0.73	0.27	0.21	0.26	0.62	0.01
11	0.02	0.22	0.13	0.12	0.32	0.19	0.47	0.84	0.45	0.15	0.27	0.10	0.11	0.06	0.01
12	0.03	0.07	0.08	0.11	0.11	0.15	0.12	1.02	0.55	0.28	0.12	0.05	0.09	0.15	0.01
13	0.01	0.08	0.06	0.05	0.16	0.06	0.10	0.09	0.17	0.11	0.11	0.05	0.03	0.03	0.03
14	0.02	0.17	0.13	0.10	0.08	0.05	0.09	0.18	0.25	0.22	0.25	0.06	0.06	0.03	0.03
1+	8.27	13.64	14.35	24.71	38.57	36.84	58.25	31.00	74.64	56.86	47.91	52.13	53.89	58.52	10.72
2+	8.27	13.59	14.35	24.66	37.78	33.28	58.23	30.90	74.58	54.34	43.89	50.70	53.60	57.71	10.64
3+	7.70	13.25	9.10	24.53	28.62	24.97	49.36	26.65	69.03	38.54	32.55	31.81	51.21	45.57	7.28
4+	6.49	12.95	7.88	20.74	27.13	20.81	43.51	15.44	65.81	29.72	21.19	19.56	32.95	38.49	3.09

Table 17. MEAN NUMBERS PER TOW AT AGE FROM SURVEYS CONDUCTED BY FRANCE. CATCHES FOR UNSURVEYED DEEP WATER STRATA ASSUMED SAME PROPORTION AS CANADIAN RV.

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.00	0.07	0.00	0.05	0.79	3.56	0.02	0.10	0.08	2.60	4.14	1.43	0.29	0.81	0.08
2	0.62	0.46	5.47	0.14	9.21	8.31	9.43	4.38	6.93	16.29	11.69	18.89	2.39	12.14	3.35
3	1.32	0.41	1.27	3.78	1.50	4.16	6.22	11.56	4.03	9.09	11.71	12.25	18.26	7.08	4.20
4	2.60	2.21	0.37	3.81	6.38	2.29	12.27	5.96	14.55	2.24	7.25	6.27	20.11	12.96	1.40
5	1.73	7.73	1.98	3.96	6.12	5.55	7.12	3.14	25.35	6.56	2.85	4.44	7.66	12.68	0.84
6	1.01	3.47	3.35	5.74	4.65	4.70	15.45	0.85	20.74	9.87	5.14	2.66	2.46	7.56	0.51
7	0.75	1.93	1.23	4.35	3.49	3.50	4.55	1.56	8.73	6.57	3.69	3.39	0.73	2.42	0.19
8	0.44	1.02	0.50	1.23	4.07	2.13	1.73	0.91	6.67	2.33	1.26	1.55	1.00	1.07	0.05
9	0.25	0.40	0.21	0.92	1.21	1.60	2.52	0.62	3.69	1.53	0.61	0.77	0.44	0.91	0.02
10	0.19	0.23	0.16	0.36	0.67	0.58	1.80	0.69	0.76	0.75	0.28	0.21	0.26	0.62	0.01
11	0.02	0.31	0.13	0.12	0.32	0.19	0.50	0.87	0.56	0.16	0.28	0.10	0.11	0.06	0.01
12	0.03	0.10	0.08	0.11	0.12	0.15	0.13	1.05	0.69	0.28	0.13	0.05	0.09	0.15	0.01
13	0.01	0.11	0.06	0.05	0.16	0.06	0.11	0.10	0.21	0.12	0.12	0.05	0.03	0.03	0.03
14	0.03	0.23	0.13	0.10	0.08	0.05	0.10	0.18	0.31	0.23	0.26	0.06	0.06	0.03	0.03
1+	8.99	18.68	14.95	24.71	38.77	36.84	61.96	31.96	93.30	58.62	49.39	52.13	53.89	58.52	10.72
2+	8.99	18.61	14.95	24.66	37.98	33.28	61.94	31.86	93.22	56.02	45.25	50.70	53.60	57.71	10.64
3+	8.37	18.15	9.48	24.53	28.77	24.97	52.50	27.48	86.29	39.73	33.56	31.81	51.21	45.57	7.28
4+	7.05	17.74	8.21	20.74	27.27	20.81	46.28	15.92	82.26	30.64	21.85	19.56	32.95	38.49	3.09

Table 18. Results from ADAPT using Canadian (1978-93) and French (1978-91) RV data with no dome.

SUBDIVISION 3PS COD

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POPULATION NUMBERS (000S)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	39101	22884	35528	64284	43555	72560	64542	53300	26667	36170	47988	59736	75412	26661	59255
4	60095	31559	18614	28755	51707	35542	58720	52659	43452	21556	29084	38444	47939	59927	21093
5	26858	44545	23059	13769	20929	37726	26673	43985	38844	30958	14974	19332	23336	31447	41842
6	12120	16474	27132	14306	8436	13127	22587	17731	25630	22526	15372	7762	8732	11691	16673
7	4266	6299	8904	14834	7503	4782	7056	12142	8982	10825	9608	6731	3764	4137	4227
8	1578	1907	3028	4232	6847	3554	2330	3767	5352	3478	3929	3301	3204	1740	1429
9	626	701	909	1344	1997	2947	1870	1379	1731	2421	1566	1594	1696	1504	694
10	418	300	363	448	613	1056	1471	1040	752	829	981	712	762	763	670
11	156	181	170	194	209	282	644	898	511	413	370	546	381	307	237
12	143	62	100	88	98	96	148	406	434	263	203	192	319	184	154
13	52	93	29	41	41	53	45	90	214	226	145	99	105	167	82
14	24	27	64	5	18	23	27	29	52	104	63	71	54	44	92
3+1	145437	125032	117899	142301	141952	171749	186111	187427	152620	129768	124284	138518	165706	138572	146449

SUBDIVISION 3PS COD

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FISHING MORTALITY

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	0.014	0.007	0.012	0.018	0.003	0.012	0.003	0.004	0.013	0.018	0.022	0.020	0.030	0.034	0.023
4	0.099	0.114	0.101	0.118	0.115	0.087	0.089	0.104	0.139	0.164	0.208	0.299	0.222	0.159	0.195
5	0.289	0.296	0.277	0.290	0.266	0.313	0.208	0.340	0.345	0.500	0.457	0.595	0.491	0.435	0.202
6	0.455	0.415	0.404	0.445	0.368	0.421	0.421	0.480	0.662	0.652	0.626	0.524	0.547	0.817	0.457
7	0.605	0.533	0.544	0.573	0.547	0.519	0.428	0.619	0.749	0.814	0.868	0.542	0.572	0.863	0.720
8	0.611	0.541	0.612	0.551	0.643	0.442	0.324	0.578	0.593	0.598	0.702	0.466	0.556	0.719	0.663
9	0.536	0.458	0.507	0.585	0.437	0.495	0.386	0.407	0.536	0.704	0.588	0.538	0.599	0.608	0.554
10	0.637	0.370	0.426	0.565	0.577	0.295	0.293	0.512	0.399	0.606	0.386	0.425	0.708	0.968	0.379
11	0.715	0.391	0.454	0.481	0.579	0.441	0.261	0.527	0.462	0.509	0.458	0.336	0.530	0.492	1.538
12	0.233	0.554	0.686	0.577	0.412	0.558	0.302	0.441	0.453	0.397	0.524	0.399	0.446	0.611	0.850
13	0.453	0.168	1.563	0.657	0.356	0.468	0.220	0.350	0.524	1.080	0.518	0.393	0.680	0.401	0.850
14	0.602	0.523	0.554	0.569	0.574	0.472	0.387	0.589	0.662	0.746	0.771	0.514	0.582	0.795	0.692

Table 18. (cont'd)

SUBDIVISION 3PS COD

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LOG RESIDUALS FOR CANADIAN RV INDEX

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
3	-0.05	0.13	0.66	0.86	0.14	-0.35	-1.40	0.47	0.02	0.14	-0.20	-0.55	-0.13	0.31	-0.04	-0.79
4	-0.23	1.11	-0.08	1.12	0.52	-1.29	-1.76	0.38	0.04	0.50	-0.33	-0.49	0.62	0.13	-0.29	0.04
5	-0.98	1.14	0.22	1.24	-0.06	-0.35	-1.96	0.11	0.19	1.06	0.05	-0.83	0.85	0.71	-0.56	-0.86
6	-0.96	0.13	-0.52	1.01	-0.36	-0.41	-0.79	-0.21	0.24	0.68	0.76	-0.33	0.98	0.92	-0.50	-0.64
7	-0.48	-0.64	-1.33	0.68	-0.18	-0.69	-0.77	-0.13	0.12	0.45	1.04	0.41	1.31	1.12	0.09	-1.00
8	-0.25	-0.57	-0.72	-0.07	-0.45	-0.12	-0.73	-0.51	-0.05	0.31	1.14	0.24	0.99	1.11	0.13	-0.46
9	-0.10	-0.84	-1.03	0.82	-0.75	0.46	-0.54	-0.27	0.29	-0.07	1.02	0.18	0.54	0.87	-0.03	-0.54
10	0.06	-0.41	-0.39	0.26	-1.09	0.51	-0.04	-0.23	-0.15	-0.11	0.71	0.22	0.52	0.97	-0.30	-0.54
11	-0.13	-1.42	-0.02	-0.70	-0.46	0.99	-0.78	-0.19	-0.08	0.23	1.41	0.46	0.45	1.44	-0.57	-0.62
12	-1.22	-1.24	0.41	0.18	-0.87	0.90	0.21	0.51	0.03	0.24	1.10	0.09	-0.37	0.83	-0.80	0.00

SUM OF CANADIAN RV RESIDUALS : -0.7911435740077142 MEAN RESIDUAL : -0.004975745748476185

LOG RESIDUALS FOR FRENCH RV INDEX

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
3	-1.08	-1.94	-0.98	-0.44	-0.98	-0.47	-0.01	0.83	0.28	0.98	0.95	0.81	0.97	1.07
4	-1.07	-0.82	-1.81	0.13	0.05	-0.59	0.52	-0.06	0.83	-0.15	0.73	0.34	1.28	0.62
5	-1.17	-0.40	-0.84	0.42	0.43	-0.26	0.28	-1.01	1.01	0.08	-0.03	0.19	0.55	0.75
6	-1.29	-0.60	-0.86	0.36	0.67	0.25	0.83	-1.80	0.34	0.42	0.15	0.20	0.01	0.84
7	-0.76	-0.44	-0.96	-0.17	0.29	0.75	0.56	-1.02	0.81	0.53	0.07	0.38	-0.58	0.53
8	-0.49	-0.07	-0.97	-0.36	0.35	0.36	0.52	-0.58	0.87	0.44	-0.29	0.12	-0.29	0.39
9	-0.35	-0.23	-0.85	0.26	0.13	0.03	0.87	-0.19	1.17	0.15	-0.33	-0.09	-0.71	0.14
10	-0.36	-0.03	-0.30	0.32	0.62	-0.07	0.68	0.09	0.32	0.41	-0.76	-0.70	-0.54	0.33
11	-1.65	0.88	0.38	0.14	1.09	0.28	0.34	0.60	0.54	-0.33	0.33	-1.04	-0.58	-0.97
12	-1.30	0.35	-0.01	0.44	0.39	0.66	0.04	1.16	0.47	0.28	-0.28	-1.20	-1.03	0.03

SUM OF RV 2 RESIDUALS : 0.000167066020171136 MEAN RESIDUAL : 0.000001193328715511435

Table 18. (cont'd) PARAMETER ESTIMATES FROM ADAPT USING CAN. AND FRA. RV(3-12)
IN A SINGLE ANALYSIS FOR COD IN SUBDIV 3Ps.

ESTIMATED PARAMETERS AND STANDARD ERRORS
APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.014402
MEAN SQUARE RESIDUALS 0.526198

AGE	PARAMETER	ESTIMATE	STD. ERR.	T-STATISTIC	C.V.
---	-----	-----	-----	-----	-----
3	ABUNDANCE	5.93770E4	3.11784E4	1.90443E0	0.53
4	ABUNDANCE	2.11970E4	7.63215E3	2.77732E0	0.36
5	ABUNDANCE	4.20532E4	1.36811E4	3.07381E0	0.33
6	ABUNDANCE	1.68280E4	5.40900E3	3.11111E0	0.32
7	ABUNDANCE	4.28416E3	1.28603E3	3.33132E0	0.30
8	ABUNDANCE	1.44714E3	4.65178E2	3.11093E0	0.32
9	ABUNDANCE	7.01876E2	2.40033E2	2.92408E0	0.34
10	ABUNDANCE	6.75753E2	2.52689E2	2.67425E0	0.37
11	ABUNDANCE	2.43492E2	3.76340E1	6.47001E0	0.15
12	ABUNDANCE	1.56356E2	6.98887E1	2.23722E0	0.45
3	RV1 SLOPE	1.99176E ⁻⁵	3.86157E ⁻⁶	5.15791E0	0.19
4	RV1 SLOPE	5.64113E ⁻⁵	1.05856E ⁻⁵	5.32904E0	0.19
5	RV1 SLOPE	1.14393E ⁻⁴	2.12233E ⁻⁵	5.38998E0	0.19
6	RV1 SLOPE	1.79567E ⁻⁴	3.31807E ⁻⁵	5.41178E0	0.18
7	RV1 SLOPE	2.26177E ⁻⁴	4.20306E ⁻⁵	5.38125E0	0.19
8	RV1 SLOPE	3.37089E ⁻⁴	6.32780E ⁻⁵	5.32711E0	0.19
9	RV1 SLOPE	4.28421E ⁻⁴	8.06915E ⁻⁵	5.30937E0	0.19
10	RV1 SLOPE	5.23898E ⁻⁴	9.87086E ⁻⁵	5.30753E0	0.19
11	RV1 SLOPE	5.95623E ⁻⁴	1.12044E ⁻⁴	5.31595E0	0.19
12	RV1 SLOPE	7.19959E ⁻⁴	1.39717E ⁻⁴	5.15298E0	0.19
3	RV2 SLOPE	9.14931E ⁻⁵	1.80402E ⁻⁵	5.07162E0	0.20
4	RV2 SLOPE	1.16487E ⁻⁴	2.27684E ⁻⁵	5.11617E0	0.20
5	RV2 SLOPE	1.89917E ⁻⁴	3.69662E ⁻⁵	5.13759E0	0.19
6	RV2 SLOPE	2.80087E ⁻⁴	5.44260E ⁻⁵	5.14620E0	0.19
7	RV2 SLOPE	3.45870E ⁻⁴	6.72372E ⁻⁵	5.14403E0	0.19
8	RV2 SLOPE	4.17160E ⁻⁴	8.11944E ⁻⁵	5.13780E0	0.19
9	RV2 SLOPE	5.28555E ⁻⁴	1.03003E ⁻⁴	5.13145E0	0.19
10	RV2 SLOPE	5.84691E ⁻⁴	1.13920E ⁻⁴	5.13246E0	0.19
11	RV2 SLOPE	5.16695E ⁻⁴	1.01609E ⁻⁴	5.08514E0	0.20
12	RV2 SLOPE	7.91219E ⁻⁴	1.54438E ⁻⁴	5.12322E0	0.20

Table 19. Results of Laurec-Shepherd calibration analysis for cod in Subdivision 3Ps.

VPA Version 3.0 (MSDOS)

At 9/05/1993 6:02

3Ps cod

CPUE data from file C3PSTUN.DAT

Disaggregated Qs

Log transformation

No trend in Q (mean used)

Terminal Fs estimated using Laurec-Shepherd

Tuning converged after 7 iterations

Total of the absolute F residuals for all ages in the last year, between iterations 6 and 7 = .000

Regression weights

1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1

Oldest age F = 1.000*average of 3 younger ages.

Fishing mortalities

Age, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992

3	.014	.007	.012	.018	.003	.012	.004	.004	.013	.018	.022	.025	.050	.046	.028
4	.099	.114	.102	.117	.116	.087	.090	.105	.142	.168	.208	.298	.280	.286	.278
5	.286	.292	.278	.290	.265	.318	.208	.343	.347	.511	.469	.581	.482	.609	.434
6	.453	.408	.395	.442	.366	.417	.425	.478	.668	.654	.648	.501	.526	.783	.841
7	.592	.528	.528	.551	.538	.514	.421	.627	.732	.825	.871	.578	.577	.792	.672
8	.577	.522	.602	.521	.598	.432	.321	.562	.608	.574	.725	.472	.622	.729	.570
9	.517	.417	.478	.569	.401	.439	.373	.400	.512	.735	.647	.573	.611	.748	.580
10	.608	.351	.371	.511	.548	.262	.248	.484	.390	.559	.418	.379	.797	1.000	.552
11	.705	.363	.419	.389	.488	.354	.224	.411	.423	.490	.402	.379	.443	.617	1.821
12	.282	.542	.565	.505	.301	.420	.254	.355	.601	.348	.492	.399	.634	.448	1.477
13	.360	.213	1.419	.492	.292	.298	.149	.277	.377	.815	.422	.358	.544	.535	.500
14	.449	.372	.801	.462	.360	.357	.209	.348	.487	.551	.439	.379	.507	.533	1.266

Log catchability residuals

Fleet : Canadian Rv numbers

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	-0.13	0.05	0.58	0.79	0.05	-0.42	-1.47	0.4	-0.04	0.06	-0.29	-0.43	0.31	0.55	0
4	-0.34	1.02	-0.18	1.03	0.44	-1.4	-1.85	0.29	-0.03	0.46	-0.39	-0.5	0.81	0.65	0
5	-1.15	0.97	0.05	1.08	-0.24	-0.49	-2.16	-0.02	0.07	1.02	-0.01	-0.87	0.77	0.96	0
6	-1.07	-0.01	-0.66	0.89	-0.51	-0.54	-0.9	-0.31	0.24	0.67	0.77	-0.37	0.88	0.93	0
7	-0.56	-0.75	-1.46	0.56	-0.28	-0.8	-0.93	-0.17	0.09	0.49	1.09	0.38	1.24	1.09	0
8	-0.28	-0.64	-0.74	-0.14	-0.5	-0.21	-0.86	-0.55	-0.03	0.27	1.22	0.2	1.09	1.18	0
9	-0.17	-0.98	-1.11	0.8	-0.91	0.3	-0.65	-0.37	0.23	0.03	0.95	0.23	0.57	1.09	0
10	0.05	-0.58	-0.56	0.2	-1.1	0.28	-0.32	-0.3	-0.23	-0.15	0.72	0.05	0.72	1.2	0
11	-0.07	-1.41	-0.12	-0.88	-0.58	0.85	-1.03	-0.44	-0.2	0.19	1.25	0.49	0.29	1.67	0
12	-1.07	-1.4	0.46	0.24	-1.11	0.75	0.03	0.38	-0.14	0.16	1.15	-0.02	-0.1	0.67	0

SUMMARY STATISTICS FOR AGE 3

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	F	F	Slope	Intrcpt				
1	-10.63	.562	.0000	.0263	-.327E-02	.338E-01	-10.634	.141
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
	.028	.662	0.000	.662	0.000			

SUMMARY STATISTICS FOR AGE 4

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	F	F	Slope	Intrcpt				
1	-9.53	.855	.0001	.2762	.722E-02	.513E-01	-9.532	.214
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
	.278	.855	0.000	.855	0.000			

SUMMARY STATISTICS FOR AGE 5

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	F	F	Slope	Intrcpt				
1	-8.67	.944	.0002	.4339	.344E-01	.559E-01	-8.675	.238
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
	.434	.944	0.000	.944	0.000			

SUMMARY STATISTICS FOR AGE 6

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	F	F	Slope	Intrcpt				
1	-8.20	.718	.0003	.8412	.831E-01	.363E-01	-8.203	.179
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
	.841	.718	0.000	.718	0.000			

SUMMARY STATISTICS FOR AGE 7

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	F	F	Slope	Intrcpt				
1	-7.94	.839	.0004	.6718	.126E+00	.381E-01	-7.944	.210
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
	.672	.839	0.000	.839	0.000			

SUMMARY STATISTICS FOR AGE 8

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	F	F	Slope	Intrcpt				
1	-7.81	.707	.0005	.5698	.109E+00	.300E-01	-7.814	.177
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
	.570	.707	0.000	.707	0.000			

SUMMARY STATISTICS FOR AGE 9

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	F	F	Slope	Intrcpt				
1	-7.38	.723	.0008	.5798	.916E-01	.352E-01	-7.382	.181
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
	.580	.723	0.000	.723	0.000			

SUMMARY STATISTICS FOR AGE 10

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	F	F	Slope	Intrcpt				
1	-7.20	.600	.0007	.5517	.744E-01	.296E-01	-7.204	.150
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
	.552	.600	0.000	.600	0.000			

SUMMARY STATISTICS FOR AGE 11

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	F	F	Slope	Intrcpt				
1	-7.08	.868	.0008	1.8210	.113E+00	.416E-01	-7.080	.216
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
	1.821	.868	0.000	.868	0.000			

SUMMARY STATISTICS FOR AGE 12

Fleet	Pred.	SE(q)	Partial	Raised	SLOPE	SE	INTRCPT	SE
q	F	F	Slope	Intrcpt				
1	-7.00	.737	.0009	1.4775	.767E-01	.388E-01	-7.000	.184
Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio				
	1.477	.737	0.000	.737	0.000			

Table 19. (cont'd)

Traditional type Terminal Fr. estimated using Linear-Stepford

Table 8: Filling mortality (F) at age. Columns: YEAR (1978-1991), AGE (1-14), and 1992 EBAB 90-92. Rows show mortality values for ages 1 through 14.

Run file: 3fr.cad

At 9/03/1991 6:04

Traditional type Terminal Fr. estimated using Linear-Stepford

Table 9: Relative F at age. Columns: YEAR (1978-1991), AGE (1-14), and 1992 MEAN 90-92. Rows show relative mortality values for ages 1 through 14.

Run file: 3fr.cad

At 9/03/1991 6:04

Traditional type Terminal Fr. estimated using Linear-Stepford

Table 10: Stock number at age (start of year). Columns: YEAR (1978-1991), AGE (1-14), and 1991 CAJST 76-80 ADJST 76-80. Rows show stock numbers for ages 1 through 14.

Table 20. Fishing mortality matrix for cod in Subdiv. 3Ps, 1959-1992.

AGE	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
3	0.019	0.011	0.010	0.029	0.025	0.030	0.032	0.013	0.033	0.015	0.016	0.024	0.055	0.021	0.035
4	0.155	0.136	0.135	0.199	0.137	0.206	0.210	0.265	0.195	0.197	0.150	0.229	0.290	0.125	0.151
5	0.263	0.430	0.409	0.343	0.332	0.255	0.329	0.489	0.435	0.379	0.250	0.445	0.403	0.346	0.465
6	0.403	0.395	0.553	0.314	0.346	0.433	0.255	0.477	0.472	0.363	0.365	0.404	0.456	0.259	0.552
7	0.402	0.343	0.357	0.425	0.290	0.332	0.537	0.715	0.475	0.531	0.537	0.659	0.716	0.661	0.623
8	0.196	0.565	1.114	0.246	0.419	0.365	0.405	0.550	0.415	0.539	0.547	0.633	0.520	0.525	0.792
9	0.421	0.335	0.679	0.549	0.254	0.506	0.425	0.797	0.417	0.292	0.750	0.461	0.520	0.533	1.051
10	0.521	0.545	1.089	0.457	0.400	0.296	0.579	0.513	0.297	0.559	0.776	0.460	0.755	0.529	0.759
11	0.213	0.314	0.655	0.397	0.195	1.195	0.237	0.652	0.522	0.352	0.151	0.440	0.333	0.735	0.551
12	0.731	0.207	0.345	0.435	0.375	0.927	0.536	0.493	0.231	0.607	0.326	0.290	0.642	1.095	1.257
13	0.392	1.150	0.490	0.299	0.721	0.365	1.177	1.392	0.354	0.017	0.957	0.644	0.403	0.549	0.343
14	0.390	0.440	0.760	0.400	0.340	0.390	0.440	0.670	0.420	0.460	0.600	0.520	0.720	0.570	0.760

AGE	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
3	0.052	0.035	0.053	0.014	0.014	0.007	0.012	0.015	0.003	0.012	0.003	0.004	0.013	0.015	0.022	0.023
4	0.325	0.293	0.376	0.265	0.099	0.114	0.102	0.115	0.115	0.057	0.089	0.103	0.142	0.167	0.209	0.295
5	0.719	0.543	0.597	0.483	0.288	0.295	0.277	0.290	0.267	0.313	0.208	0.339	0.340	0.515	0.467	0.599
6	0.524	0.579	0.633	0.515	0.454	0.414	0.403	0.445	0.365	0.421	0.421	0.479	0.659	0.637	0.659	0.542
7	0.943	1.496	0.652	0.423	0.603	0.530	0.541	0.571	0.547	0.520	0.425	0.619	0.744	0.807	0.527	0.596
8	0.670	0.755	0.441	0.449	0.610	0.537	0.605	0.546	0.639	0.442	0.325	0.578	0.594	0.591	0.690	0.425
9	1.471	1.356	0.333	0.450	0.530	0.456	0.501	0.575	0.431	0.489	0.385	0.405	0.537	0.705	0.575	0.521
10	0.929	0.469	0.177	0.515	0.629	0.364	0.423	0.554	0.564	0.259	0.258	0.509	0.401	0.605	0.357	0.410
11	1.110	0.930	0.126	0.294	0.713	0.383	0.443	0.475	0.560	0.426	0.255	0.514	0.459	0.512	0.460	0.337
12	1.627	0.731	0.256	0.535	0.220	0.550	0.663	0.554	0.404	0.526	0.287	0.425	0.435	0.392	0.530	0.401
13	2.244	0.469	0.107	0.749	0.417	0.156	1.532	0.615	0.334	0.454	0.202	0.326	0.495	0.955	0.509	0.401
14	0.910	1.000	0.450	0.470	0.570	0.460	0.500	0.540	0.510	0.430	0.370	0.520	0.590	0.670	0.630	0.500

AGE	1990	1991	1992
3	0.059	0.055	0.063
4	0.264	0.345	0.335
5	0.455	0.559	0.575
6	0.554	0.507	0.700
7	0.607	0.555	0.700
8	0.661	0.510	0.700
9	0.514	0.551	0.700
10	0.667	0.710	0.700
11	0.501	0.443	0.700
12	0.445	0.553	0.700
13	0.656	0.404	0.700
14	0.600	0.510	0.700

Table 21. Population numbers at the beginning of the year (000's) for cod in Subdiv. 3Ps, 1959-1992.

AGE	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
3	59431	59291	50994	48661	42951	70843	80994	84372	98469	70179	54421	35409	60050
4	106988	47753	48030	41343	38714	34296	56277	64218	68219	78022	56423	43855	28307
5	35943	74981	34124	34269	27742	27625	22844	37357	40216	45979	52476	39773	28564
6	24207	22618	39941	18567	19911	16297	17519	13456	18763	21253	25759	32481	20877
7	16276	13245	12443	18259	11099	11529	8657	11078	6836	9578	12105	14595	17760
8	5837	8915	7699	6916	9778	6801	6774	4143	4438	3471	4610	5790	6182
9	4030	3926	4146	2069	4425	5264	3866	3687	1957	2399	1658	2185	2518
10	3429	2166	2292	1722	978	2811	2599	2063	1360	1056	1468	641	1128
11	3630	1667	1025	631	893	537	1711	1193	749	827	480	553	331
12	1161	2401	998	436	348	602	133	1105	509	269	477	338	291
13	150	458	1598	577	230	195	195	47	553	331	120	282	207
14	0	83	119	801	350	92	111	49	10	318	266	38	121
3+	261081	237504	203407	174251	157420	176890	201680	222768	242078	233683	210263	175940	166335
4+	201650	178213	152414	125590	114469	106047	120886	138397	143609	163504	155843	140530	106285
5+	94662	130461	104384	84247	75755	71752	64409	74178	75390	85482	99419	96675	77979
6+	58720	55480	70260	49978	48013	44126	41564	36822	35174	39504	46943	56902	49415
AGE	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
3	39264	30449	41025	54272	57042	74520	39115	22874	35523	64277	43639	72691	65223
4	46555	31485	24074	31881	42769	42983	60166	31571	18605	28751	51701	35611	58826
5	17345	33642	21519	14243	19470	24033	26907	44603	23068	13762	20926	37722	26729
6	15628	10047	17242	8581	6778	8772	12143	16514	27179	14314	8430	13124	22583
7	10518	9581	4597	8357	2917	2948	4278	6317	8937	14873	7510	4777	7054
8	7104	4446	4205	1465	1533	1207	1581	1916	3043	4259	6879	3560	2326
9	2228	3431	1649	1763	546	808	631	704	917	1357	2019	2973	1874
10	908	1071	982	310	361	320	421	304	365	455	623	1074	1492
11	434	324	410	318	159	248	156	184	173	196	214	290	659
12	194	170	110	111	103	115	151	63	103	91	100	100	155
13	126	53	40	18	44	65	55	99	30	43	43	55	48
14	113	59	31	3	9	32	25	30	70	5	19	25	28
3+	140417	124759	115883	121322	131731	156050	145630	125178	118011	142382	142103	172002	186998
4+	101153	94310	74859	67050	74689	81530	106515	102304	82489	78105	98464	99311	121775
5+	54598	62825	50785	35169	31919	38547	46349	70734	63883	49354	46762	63700	62948
6+	37254	29183	29266	20926	12449	14514	19442	26131	40815	35592	25837	25978	36219
AGE	1985	1986	1987	1988	1989	1990	1991	1992					
3	52277	26304	36025	48172	51424	38839	16751	22258					
4	53217	42615	21259	28965	38594	41133	29984	12980					
5	44072	39301	30272	14730	19235	23459	25875	17327					
6	17778	25702	22900	14811	7562	8653	11792	12111					
7	12139	9020	10884	9915	6271	3601	4072	4309					
8	3765	5350	3509	3977	3552	2828	1606	1376					
9	1376	1729	2419	1592	1633	1902	1196	585					
10	1044	749	828	979	733	794	931	418					
11	916	513	411	369	544	399	334	375					
12	418	448	266	202	191	318	198	175					
13	95	224	238	147	97	105	166	93					
14	32	56	112	72	72	53	43	91					
3+	187130	152011	129121	123931	129909	122083	92948	72098					
4+	134852	125707	93096	75759	78486	83244	76197	49841					
5+	81636	83092	71837	46793	39891	42111	46213	36861					
6+	37564	43791	41565	32063	20656	18652	20338	19534					

Table 22. Beginning of year biomass (tonnes) for cod in Subdiv. 3Ps, 1959-1992.

AGE	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
3	10601	10575	9096	9680	7661	12636	14447	15049	17564	12518	9707	6316	10711	7003
4	59006	20989	21111	18172	17016	15074	24736	28227	29985	34294	24801	19276	12442	20463
5	31124	64727	29457	29553	23948	23848	19720	32248	34716	39691	45300	34334	24658	14973
6	34025	30467	53800	25009	26820	21952	23598	19125	25274	28625	34697	43752	28121	21051
7	33776	26597	24956	36665	22297	23149	17383	22244	13726	19233	24306	29306	35661	21119
8	16578	24744	21370	19196	27141	16877	18802	11500	12318	9635	12796	16071	17158	19719
9	14842	14244	15042	7506	16054	19095	14025	13375	7100	8704	6016	7925	9135	6053
10	15957	9886	10459	7857	4464	12827	11861	9416	6206	4818	6695	2926	5148	4144
11	20316	9227	5675	3493	4942	2970	9471	6604	4146	4580	2656	3059	1834	2402
12	7581	15599	6481	2832	2255	3909	862	7190	3307	1751	3096	2194	1894	1263
13	1133	3436	11992	4331	1728	1464	1463	353	4149	2483	902	2114	1552	942
14	0	713	1019	6880	3007	787	951	422	82	2729	2287	324	1040	972
3+	244968	231205	210487	170203	157327	156590	157319	164743	158574	169064	173262	167595	149354	122135
4+	234368	220629	201392	161523	149666	143954	142873	149694	141011	156546	163556	161293	138643	115132
5+	175362	199640	180280	143351	132650	128880	118136	121467	111025	122252	138755	142006	126201	94669
6+	144238	134913	150623	113768	108702	105032	98416	89219	76309	82561	93455	107672	101543	79696
AGE	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	5431	7317	9680	10249	36330	14646	7077	14987	24360	14373	31455	35327	30907	11895
4	13539	10582	14013	18799	18756	37332	17074	10109	18427	31432	21994	45688	42799	29524
5	29042	18576	12295	16808	22762	23059	37504	19770	13417	20115	38174	28986	52414	42263
6	13533	23224	11559	9130	12432	18315	22045	35193	20414	12922	20026	36555	29223	40658
7	19239	9231	16781	5857	6243	9132	13344	18077	29061	15475	10238	16167	26994	19533
8	12341	11672	4067	4256	3459	4467	5754	9219	12129	17704	9873	7255	11330	15042
9	12448	5981	6395	1979	2962	2363	2523	4086	5374	7221	9795	7374	5572	6641
10	4886	4484	1416	1647	1440	1959	1569	1997	2518	2989	4769	6830	5117	3665
11	1796	2272	1755	880	1355	789	1105	1190	1406	1267	1706	3626	5026	2873
12	1104	715	720	666	733	987	408	798	738	797	723	1195	3138	3052
13	400	297	133	328	509	399	822	259	369	378	508	471	992	1944
14	510	266	29	78	301	220	272	664	50	188	253	290	357	673
3+	114568	94617	78546	70677	107295	113668	109498	116349	128262	124867	149446	189763	213865	177792
4+	109137	87299	69166	60425	70955	99022	102421	101362	103902	110494	117961	154436	182962	165897
5+	95298	76718	55153	41629	52199	61691	85347	91253	85474	79062	96067	105748	140163	136373
6+	66256	58142	42857	24822	29437	38632	47843	71483	72058	58944	57893	79762	87749	94110
AGE	1987	1988	1989	1990	1991	1992								
3	16672	26765	27728	19810	9441	9617								
4	13708	19628	27570	30277	19776	8291								
5	28838	13495	18760	23794	25955	15303								
6	31759	21054	10080	12675	17529	16519								
7	22438	18647	12156	7196	9526	9527								
8	9506	10328	9605	7347	4289	3607								
9	5934	5234	5655	7171	3979	2008								
10	3879	4546	3157	3633	3933	1892								
11	2399	1976	3047	2286	1896	1994								
12	1746	1289	1221	2200	1381	1251								
13	1867	1060	695	915	1348	787								
14	916	576	554	478	355	911								
3+	142662	124596	120261	117681	98441	70707								
4+	125990	97531	92532	97572	59000	61090								
5+	112252	78203	64963	67595	69225	52799								
6+	53443	64708	46203	43501	43269	27496								

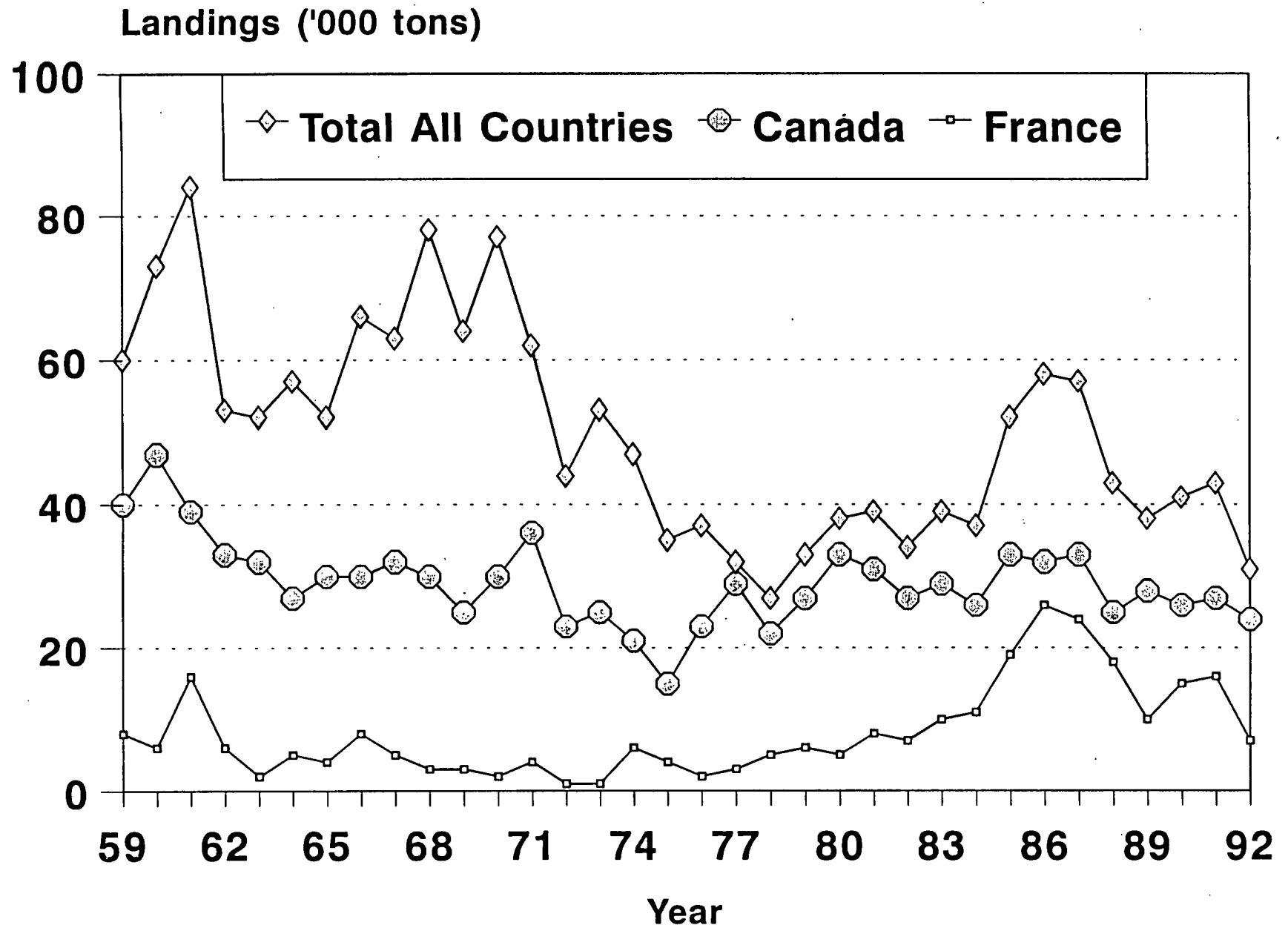


Figure 1. Cod landings from Subdivision 3Ps for the period 1959-92.

Landings ('000 tons)

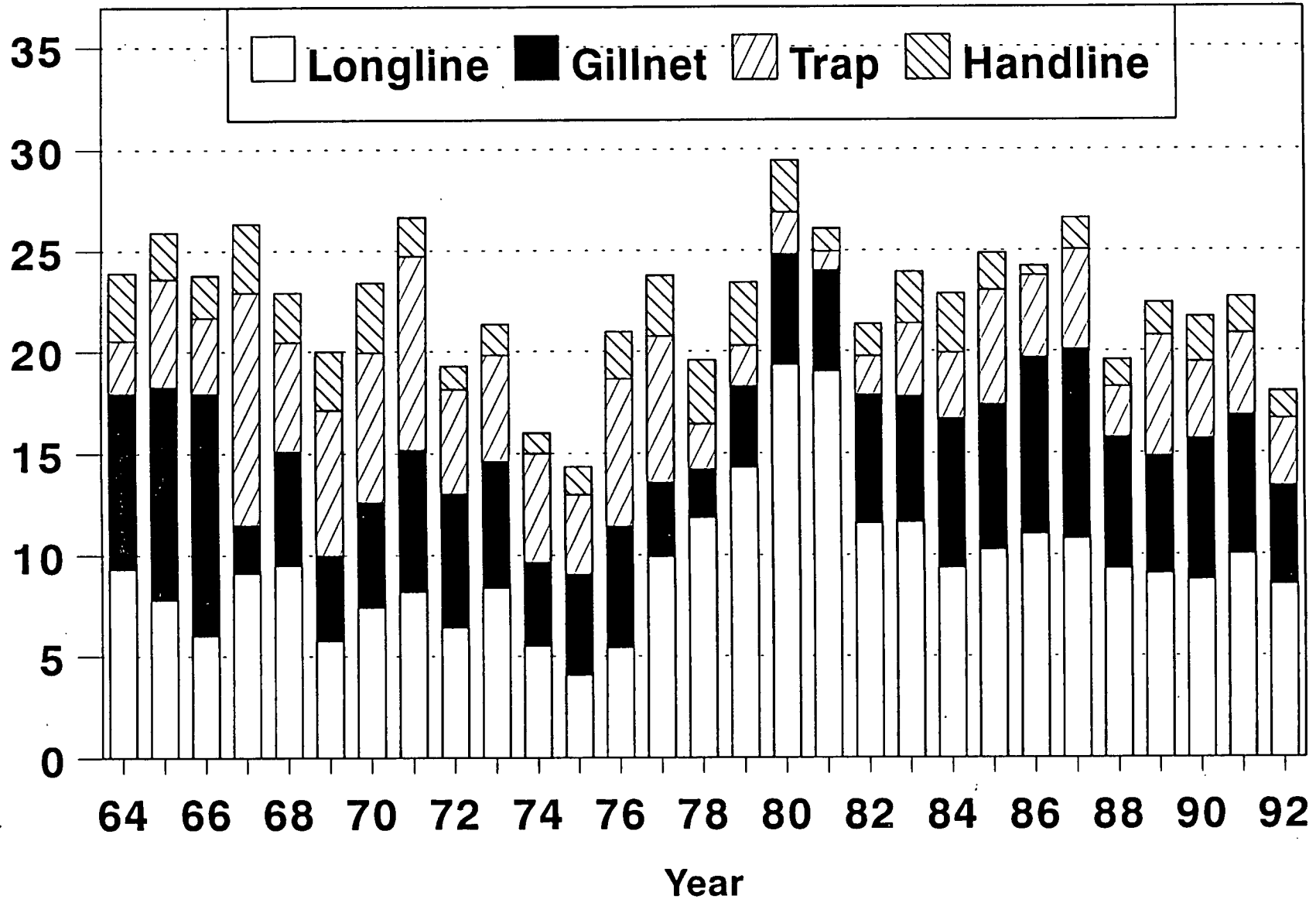


Figure 2. Fixed gear cod landings by Canada in Subdivision 3Ps.

Catch numbers (millions)

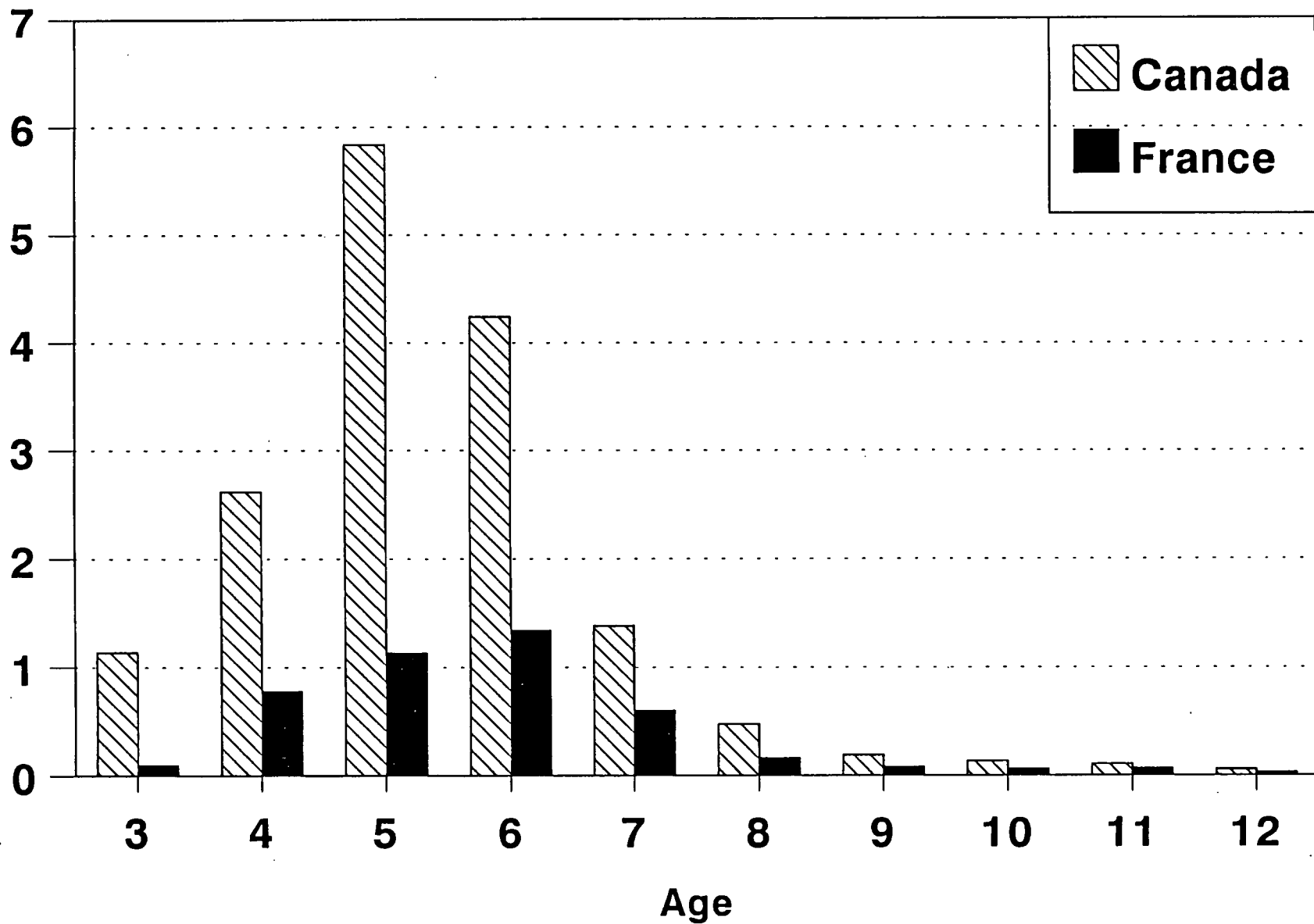


Fig 3. Canadian and French commercial age compositions for 1992.

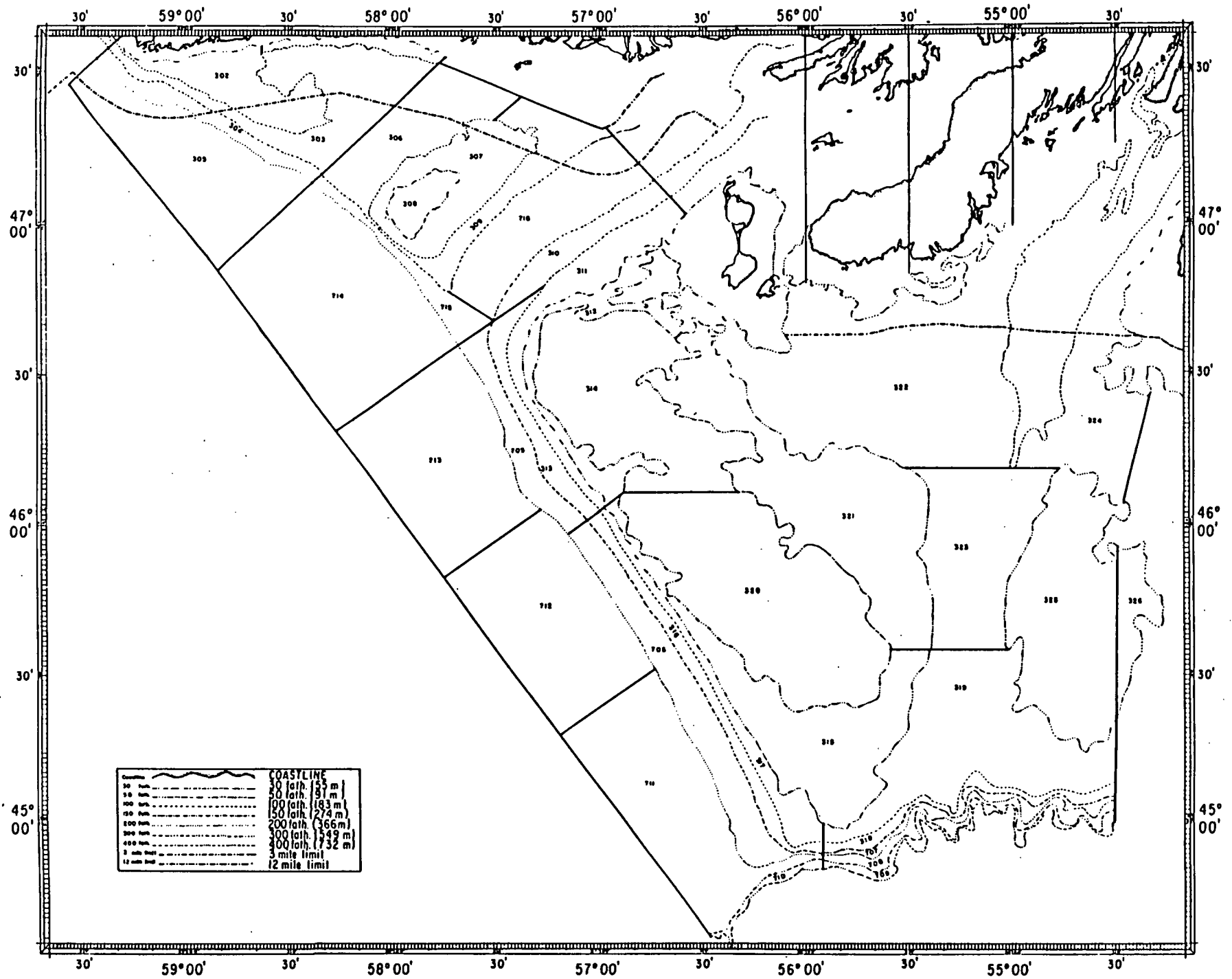


Figure 5. Stratification scheme used for random-stratified research vessel surveys in NAFO Subdivision 3Ps.

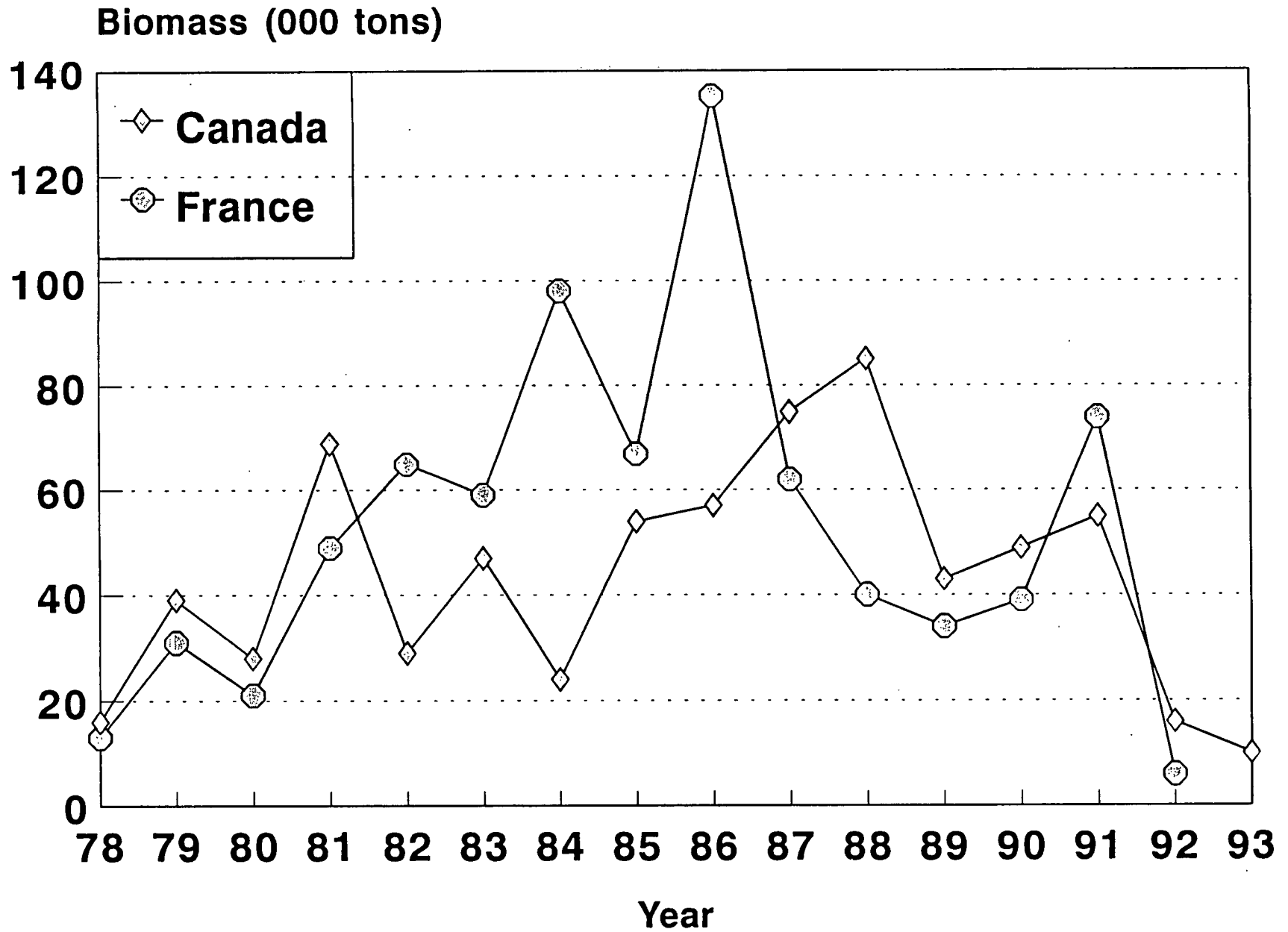


Figure 5. Biomass of cod in Subdiv. 3Ps estimated from Canadian and French RV.

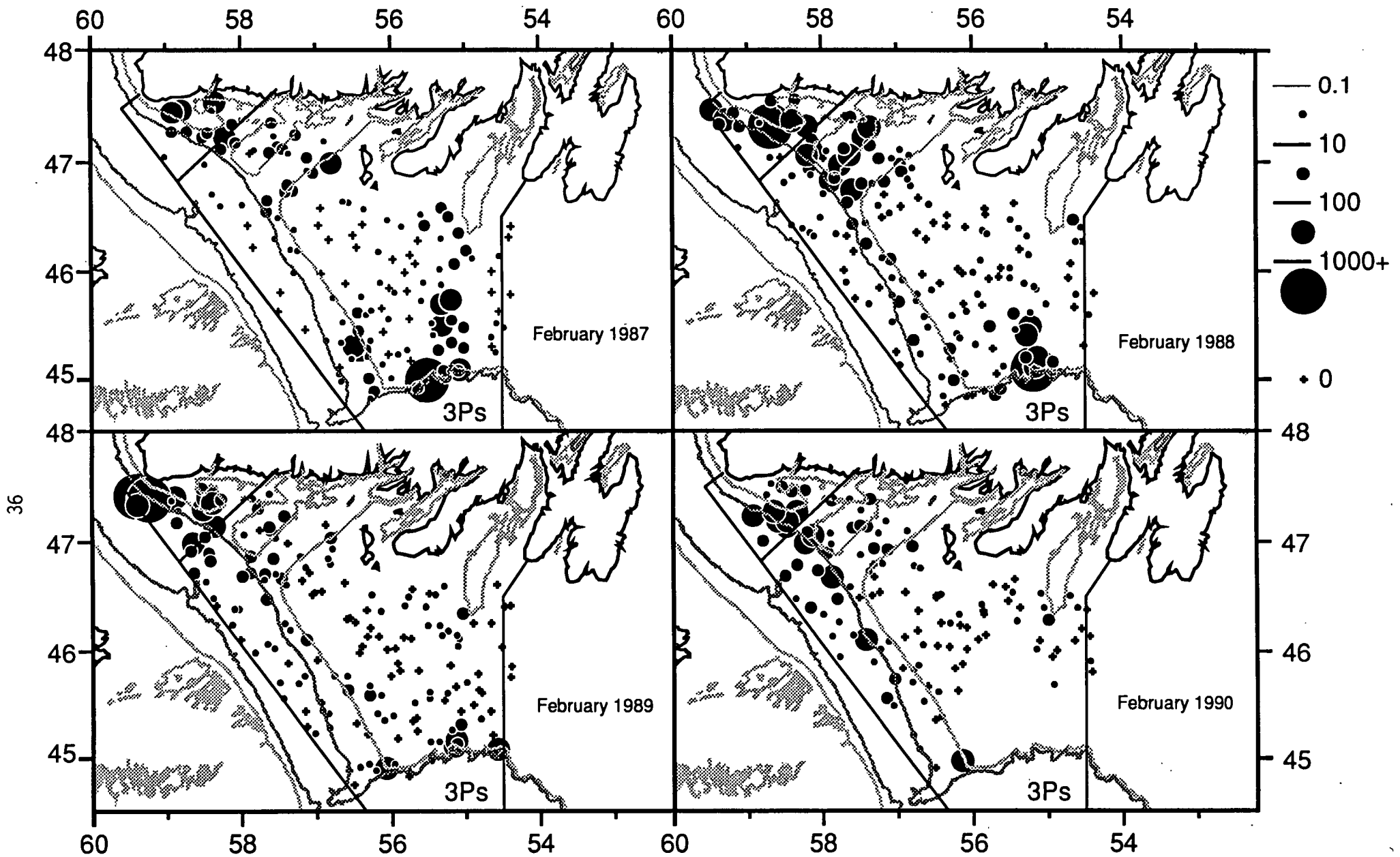


Figure 6. Cod distribution (numbers per tow) from the Canadian winter-spring surveys in Subdiv. 3Ps for the 1987-93 period.

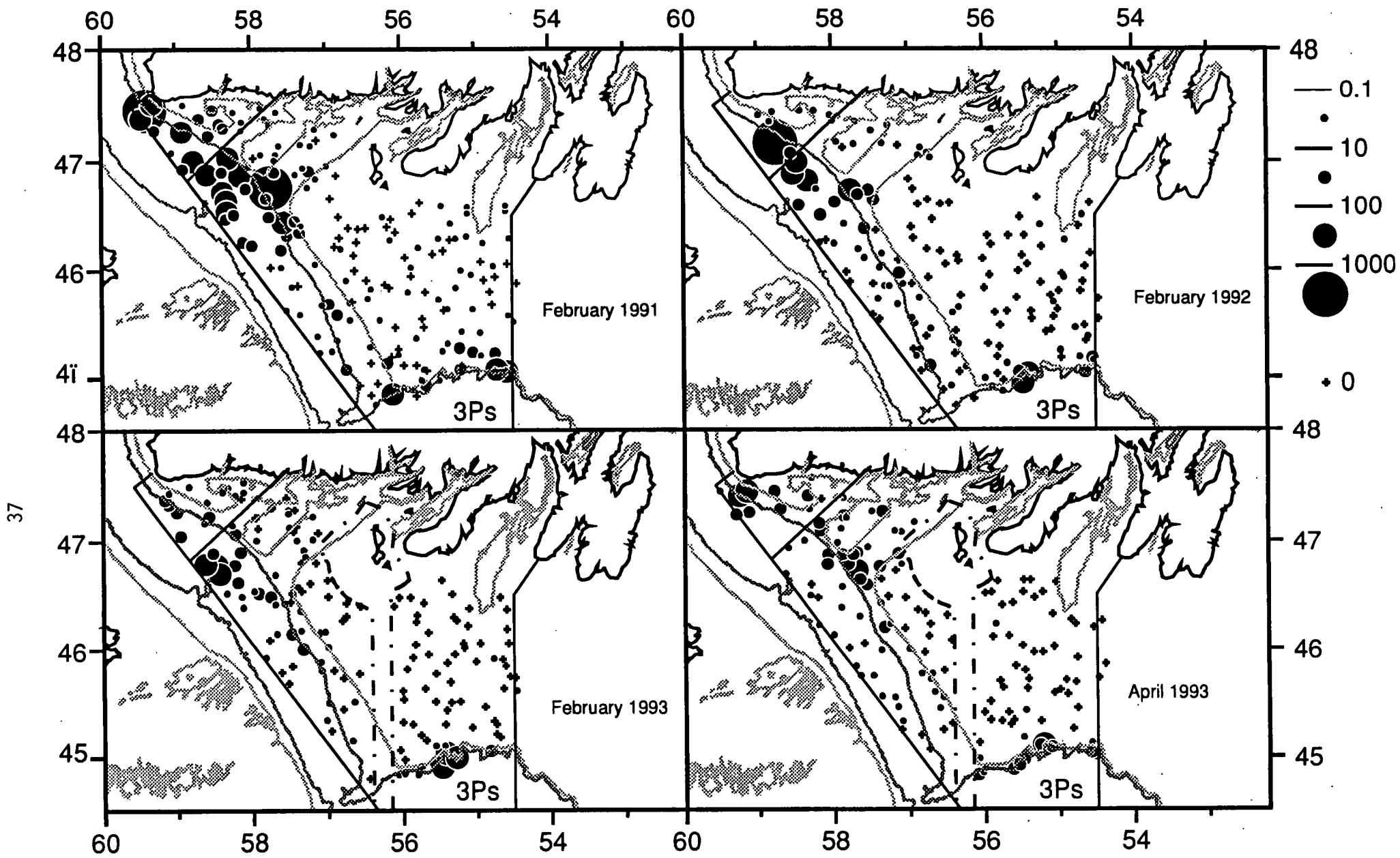


Figure 6. (cont'd)

Figure 7. Beginning of year biomass for ages 3+ and 6+ cod in Subdiv. 3Ps, 1959-1992.

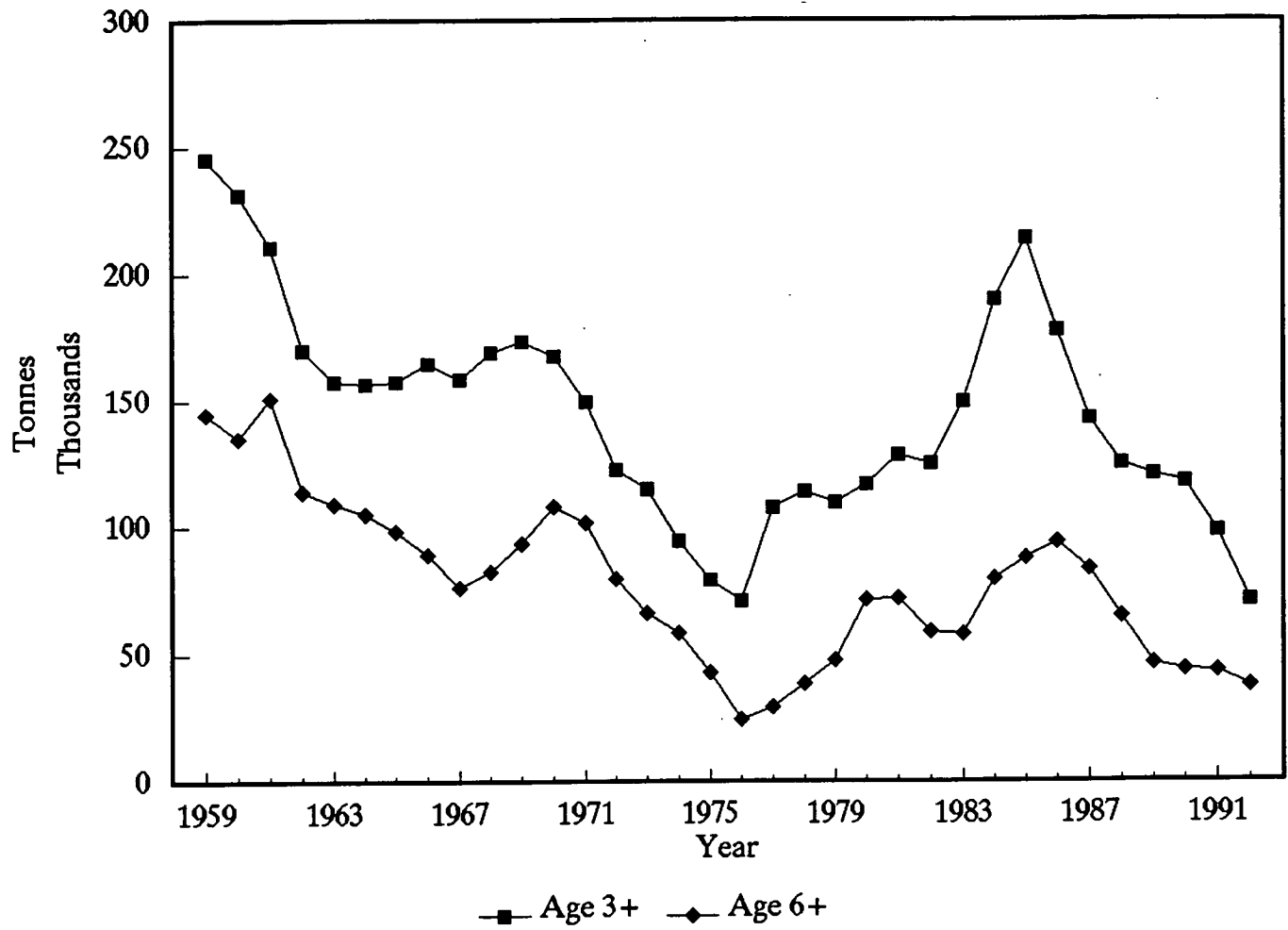


Figure 8. Average annual fishing mortality rates (ages 6+) for cod in Subdiv. 3Ps, 1959-92.

