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An Assessment of the Cod Stock in NAFO Div. 3NO

by

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Nominal catch and catch at age

Catches from this stock peaked at 227,000t in 1967 but declined steadily thereafter to a low of 15,000t in 1978. From 1979 to 1991 catches have ranged from 20,000 to 50,000 tons (Table 1, Figure 1). The continued reduction in recommended TAC's have contributed to reduced catches in recent years to a level of about 10,000 tons in 1993. Fisheries on this cod stock ceased about mid year in 1994 as the TAC had been reached. There is to be no directed cod fishery in 3NO during 1995, as recommended by the Scientific Council of NAFO (Scientific Council Rept.,1994). The stock was considered to be at a low level and rebuilding was necessary.

Landings during 1994 (Table 1) were mainly from the Regulatory Area by EU countries and non-contracting parties. The Canadian fishery (47 tons) was mainly by-catch in a longline fishery (Table 2).

Over the past several years, catches from the Regulatory Area have been those reported by contracting parties combined with estimates from Canadian surveillance authorities. Other catches (non-contracting parties) are those estimated by Canadian surveillance.

Sampling data for 1994 were available for the Portuguese fisheries (NAFO SCS Doc.95/13). An estimate of total removals at age for the total 1994 catch was obtained using this sampling data. Catch and average weight at age for the 1994 catch are presented in Table 3. The most abundant year-classes in the fishery during 1994 were the 1989 (age 5) and the 1990 (age 4). These year-classes were also dominant in the commercial catches in Div. 3NO in 1992 and 1993.

Catch-at-age, and mean weights-at-age 1959-94 period are presented in Tables 4-5. There would appear to be a decline in mean weights-at-age from 1993 to 1994 although this may have resulted from the area sampled (only from the Regulatory Area) and the time of year (1st half of year only).

Research vessel survey data

Stratified-random research vessel surveys have been conducted in the spring by Canada in Divisions 3N and 3O since 1971 and 1973 respectively with the exceptions of 1983 in Div. 3N and 1974 and 1983 in Div. 3O. Surveys from 1971 to 1982 were conducted by the research vessel **A.T. CAMERON** and those since 1984 have been conducted by the sister ships **ALFRED NEEDLER** and **WILFRED TEMPLEMAN**. The stratification scheme used for these surveys is based on depth and is presented in Figure 2.

Biomass and abundance estimates for these surveys are presented in Tables 6-9 and in Figure 3. Biomass for Divisions 3N and 3O combined increased gradually from the early 1970's to the early 1980's with a sharp increase between 1982 and 1984. Since 1984 biomass has been declining steadily, with the exception of what appears to be an anomalously high 1987 estimate. The increase in 1987 was caused by a large increase in Division 3O. Estimates of the Division 3NO total biomass in 1993 increased to about 75,000 tonnes, up from 46000 and 58000 in 1992 and 1991 respectively. The 1994 and 1995 3NO biomass estimates have declined further to 17000 and 9000 tons, the lowest in the time series.

Trends in Division 3NO cod abundance are similar to those observed for biomass with a large value occurring in 1987. While the abundances estimated for the 1988 to 1992 period are all among the lowest observed in the Canadian time series of RV abundance for this stock, the 1993 estimate was considerably higher. This resulted from increased estimates for the 1989 and 1990 year-classes. Abundance was much lower in 1994 and 1995 and was the lowest in the time series

Age composition data for Canadian spring surveys from 1971 to 1994 are presented in Table 10. The dominant year-classes in the 1992 to 1994 surveys have been those of 1989 and 1990. The year-classes from 1983 to 1988 were among the lowest observed in the time series.

Stratified random surveys have been conducted by Canada during autumn from 1990 to 1994. The results of these surveys are presented in Tables 11-13 and Figure 4. Biomass and abundance increased from 1990-91 but have since declined substantially. The 1989 year-class was abundant in the 1991 and 1992 surveys but declined drastically in 1993 and further in 1994 (Table 13).

Canada has also conducted stratified-random surveys during the August-September period in Div. 3NO since 1980 for the purpose of estimating abundance of juvenile as well as adult groundfish. This survey has been documented previously with respect to flatfish (Walsh, 1993). The surveys since 1988 have covered depths to 150 fathoms. The results in terms of biomass and abundance by division as well as mean numbers at age per tow are presented in Tables 14 to 16 and Figure 5. Biomass and abundance increased from 1989 to 1991 but have since generally decreased. The decline in abundance was most pronounced as the relatively strong 1989 and 1990 year-classes were severely reduced by 1994.

A summary of biomass and abundance for the three Canadian surveys is presented in Table 16.

Survey Distribution

Figure 7 shows the distribution of survey sets as well as the numbers caught per tow, for the Canadian spring and autumn surveys during 1994. Abundance was relatively low for all surveys. When found, cod were located mainly on the slope in the spring and more scattered on top of the shelf in the autumn.

Estimation of stock parameters

ADAPT Calibration

The adaptive framework (Gavaris 1988) used in this assessment included catch per tow data from both Canadian and Russian research vessel surveys, all disaggregated by age. The Russian data from 1977-92 was that presented in a document by Kuzmin (1992) while that for 1993 was provided by Russian scientists. In the analysis using ADAPT, input data was the same as that used previously with the addition of data from the 1994 surveys. The results of this analysis (Tables 17) were similar to that of the 1994 assessment (Davis et al,1994). Coefficients of Variation (CV's) were relatively high and year effects (both positive and negative) in the residual patterns suggested some uncertainty in the calibration analysis. Some of this uncertainty may have resulted from the inclusion of data from surveys (Canada and Russia - spring 1993) which have been considered as possible outliers in their respective time series (Sci. Coun. Rep., 1994,p 70). This possibility was also reinforced by the results from the two autumn 1994 and spring 1995 Canadian groundfish surveys. To determine the impact of the 1993 data, an analysis was conducted with data for the Canadian and Russian spring 1993 surveys omitted.

The formulation used with ADAPT (with 1993 data omitted) is described as follows:

Parameters estimated by ADAPT:

- Year-class estimates
  $N_{i,1994}$ i = 3 to 11

- Catchabilities for RV numbers at age
  $K(\text{Can Spring})_i$ i = 3 to 11
  $K(\text{Russia})_i$ i = 3 to 11
  $K(\text{Can Autumn})_i$ i = 3 to 11
  $K(\text{Can Juv})_i$ i = 3 to 11

Additional structure imposed

- Natural mortality was assumed to be 0.20.
- Error in the catch at age was assumed negligible.
- F on oldest age group (12) set at the mean weighted F for age group 7-10.
- Intercepts not fitted.

Input data

-	$C_{i,t}$	i = 3 to 12	t = 1977-94
-	$RV(\text{Can})_{i,t}$	i = 3 to 11	t = 1977-82, 1984-92,94
-	$RV(\text{Russia})_{i,t}$	i = 3 to 11	t = 1977-91, 1992
-	$RV(\text{Can-Autumn})_{i,t}$	i = 3 to 11	t = 1990-94
-	$RV(\text{Can-Juv.})_{i,t}$	i = 3 to 11	t = 1989-94

Objective function

- Minimize

$$\sum_{age}\sum_{year}\{obs(lnrv(Can\text{-}spring)_{i,t})\text{-}pred(lnrv(Can\text{-}spring)_{i,t})\}^2 +$$
$$\sum_{age}\sum_{year}\{obs(lnrv(Russia)_{i,t})\text{-}pred(lnrv(Russia)_{i,t})\}^2 +$$
$$\sum_{age}\sum_{year}\{obs(lnrv(Can\text{-}autumn)_{i,t})\text{-}pred(lnrv(Can\text{-}autumn)_{i,t})\}^2 +$$
$$\sum_{age}\sum_{year}\{obs(lnrv(Can\text{-}Juv.)_{i,t})\text{-}pred(lnrv(Can\text{-}Juv.)_{i,t})\}^2$$

Summary

- Number of observations = 387
- Number of parameters estimated = 45

The results from analyses with both options (with and without 1993 survey data) are presented in Tables 17 and 18. The statistics describing the parameter estimates suggested a better fit for all estimates when the 1993 data were omitted from the analysis. Estimated standard errors were highest with the Canadian autumn survey series and the T-statistic indicated that all ages were significant. Residuals indicate no obvious trends but all survey indices contain several year effects, both negative and positive. These effects were not as pronounced when the 1993 data were omitted. The high CV's on most abundance estimates and the patterns observed in the residuals suggest some uncertainty with the results of this analysis. This could be the result of highly variable survey indices as well as poorly estimated removals at age.

Assessment Results

Results from a cohort analysis based on F's obtained from ADAPT (with 1993 data omitted) are shown in Tables 19-21. The age 3+ population numbers have been declining for most years since 1985. The slight increase in the early 1990's resulted from the relatively strong 1989 and 1990 year-class. The present analysis indicates that the 1989 year-class at age 3 is much lower (17 million) than that estimated in 1994 (47 million) and 1993 (38 million) assessments. Although not as well estimated, the 1990 year-class appears to be much weaker.

The stock in 1994 is represented mainly by the 1989 and 1990 year-classes. (80% of the abundance and 60% of the biomass). These year-classes (1989 and 1990) have been in commercial catches since age 2 and have dominated the catch numbers at age from 1991 to 1994. These year-classes would not contribute significantly to the spawning stock until age 6 (50% mature between ages 5 and 6), i.e. 1995 for the 1989 year-class. The current analysis suggests that their contribution will be less than previously expected. Survey data indicate that year-classes since that of 1990 are not strong.

The spawning stock biomass (beginning of year biomass x maturity ogive) has declined substantially since the relatively high levels in the mid 1980's and is currently the lowest in the time series (Figure 8). Total biomass and abundance from the Canadian spring 1995 surveys declined further suggesting a lower spawning stock size.

References

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Table 1. Catch (t) of cod in NAFO Divisions 3NO.

Year	Canada	Spain	Portugal	Russia	Others	Total	TAC
1953	39884	12633	7919		5761	66197	
1954	17392	88674	24045		4650	134761	
1955	6053	64987	27711		15605	114356	
1956	5363	42624	15505		1390	64882	
1957	9641	51990	21740		6819	90190	
1958	4812	29436	11608		2195	48051	
1959	3687	39994	17730	48	2911	64370	
1960	3408	33972	14347	24204	3746	79677	
1961	5428	32284	9059	22854	3099	72724	
1962	3235	17413	3653	7971	2712	34984	
1963	5079	37632	10004	10184	6843	69742	
1964	2882	37185	8095	9510	6789	64461	
1965	4229	64652	1692	17166	11448	99187	
1966	6501	52533	5070	39023	5792	108919	
1967	3446	77948	9703	118845	16842	226784	
1968	3287	69752	6752	78820	6900	165511	
1969	3664	71160	4940	29173	8768	117705	
1970	4771	67034	3185	28338	8233	111561	
1971	2311	89915	6589	19307	8174	126296	
1972	1736	76324	11537	12198	1579	103374	
1973	1832	42403	7759	27849	586	80429	103000
1974	1360	38338	6602	26911	178	73389	101000
1975	1189	16616	5560	20785	24	44174	88000
1976	2065	9880	2620	8992	726	24283	43000
1977	2532	8827	1742	4041	462	17604	30000
1978	6246	5813	641	1819	199	14718	15000
1979	9938	13782	1140	2446	545	27851	25000
1980	5589	8999	1145	3261	997	19991	26000
1981	6096	13299	1091	3187	671	24344	26000
1982	10185	14361	2466	3985	608	31605	17000
1983	11374	12320	1109	3238	778	28819	17000
1984	8705	13590	1071	3306	431	27103	26000
1985	18179	13682	608	3968	462	36899	33000
1986	18035	23395	6890	1181	1144	50645	33000
1987	18652	15788	4108	764	2307	41619	33000
1988	19727	15889	3927	2973	634	43150	40000
1989	13433	17904	913	108	857	33215	25000
1990	10620	4678	2145	18	11385	28846	18600
1991[a]	12056	3976	1061	-	12296	29389	13600
1992[a]	7684	1927	448	51	2450	12561[b]	13600
1993[a]	5326	3031	521	150	700	9728[b]	10200
1994[a]	47	1783	49	0	823	2702	6000[c]

[a] Provisional

[b] Includes Canadian Surveillance Estimates and NAFO Scientific Council Estimates

[c] The fishery for cod was suspended in February 1994.

Table 2. Cod landings (t) by month from NAFO Divisions 3NO by Canada in 1994.

	3N	3O				
	Can/M	Can/N	Can/M			
	LL	GN	OT	MWT	LL	Totals
J						0
F					3	3
M		1			1	2
A	1	1	6		4	12
M	1		3	1	3	8
J					16	16
J						0
A					2	2
S					1	1
O					2	2
N					1	1
D						0
Total	2	2	9	1	33	47

Table 3. Catch numbers(000's) and average weight at age of cod from the fisheries in NAFO Divisions 3NO during 1994.

	3N		3O				3NO		3NO ALL COUNTRIES
			#		#		#		
AGE	OT	avg wgt	OT	avg wgt	Gillnet	avg wgt	UB TOTA	avg wgt	TOTAL
3	225,0	0,27	3,0	0,33	0,0	0,00	228,0	0,27	0,0
4	2240,6	0,46	50,0	0,59	0,0	0,00	2290,6	0,46	0,0
5	1006,2	0,87	88,0	1,31	6,0	2,15	1100,2	0,91	0,0
6	102,9	1,47	17,0	2,49	3,0	2,39	122,9	1,63	0,0
7	80,4	1,65	11,0	3,29	0,0	0,00	91,4	1,85	0,0
8	6,4	2,64	18,0	4,56	1,0	3,66	25,4	4,04	0,0
9	3,2	2,16	5,0	6,73	0,0	0,00	8,2	4,95	0,0
10	0,0	4,40	1,0	7,54	0,0	0,00	1,0	7,54	0,0
11	0,0	0,00	0,3	3,45	0,0	0,00	0,3	3,45	0,0
12	0,3	7,52	0,4	7,52	0,0	0,00	0,7	7,52	0,0
#	3665,0		193,7		10,0		3868,7		0,0
WGT.	2272,00		352,00		26,00		2650,00		

TABLE 4. CATCH AT AGE FOR DIV. 3NO COD ,1959 - 1994
AGE 13 IS A PLUS GROUP.

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
3	1711	1846	812	1026	313	6202	1013	753	20086	16359
4	13036	6503	4400	3882	5757	15555	7611	18413	62442	56775
5	5068	22050	11696	2206	11210	19496	7619	19681	50317	48608
6	6025	3095	15258	1581	4849	7919	13258	11795	18517	18485
7	3935	2377	2014	3594	1935	2273	9861	8486	4774	6337
8	1392	2504	1672	773	3840	1109	4827	4467	4651	1592
9	757	583	847	668	1165	788	1081	1829	236	505
10	926	387	196	433	608	328	1248	1694	180	178
11	1220	898	25	226	322	37	163	122	71	90
12	103	242	245	216	208	112	141	57	45	45
13	1128	1409	392	846	473	56	276	183	335	51
3+	35301	41894	37557	15451	30680	53875	47098	67480	161654	149025
4+	33590	40048	36745	14425	30367	47673	46085	66727	141568	132666
5+	20554	33545	32345	10543	24610	32118	38474	48314	79126	75891
6+	15486	11495	20649	8337	13400	12622	30855	28633	28809	27283

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
3	8154	2105	950	69	10058	6425	671	4054	607	920	72
4	12924	19703	26900	19797	27600	9501	8781	7534	2469	4337	3827
5	26949	10799	30300	12289	15098	10907	3528	5945	2531	2518	9208
6	11191	9481	11700	13432	5989	10872	2505	1084	1500	818	2784
7	2089	3646	3500	5883	1971	2247	3057	211	572	354	883
8	1393	1635	2500	1686	972	2147	1059	238	177	102	265
9	518	541	500	285	707	1015	921	44	209	58	58
10	292	149	200	216	243	676	461	37	65	51	17
11	134	227	100	78	137	428	252	13	41	8	12
12	202	90	50	74	116	257	152	9	25	5	7
13	574	1472	700	350	173	881	396	17	36	21	16
3+	64420	49848	77400	54159	63064	45356	21783	19186	8232	9192	17149
4+	56266	47743	76450	54090	53006	38931	21112	15132	7625	8272	17077
5+	43342	28040	49550	34293	25406	29430	12331	7598	5156	3935	13250
6+	16393	17241	19250	22004	10308	18523	8803	1653	2625	1417	4042

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	266	505	305	1179	58	57	153	516	277	1917	1064
4	1055	1091	1978	647	1000	2953	2865	422	318	2182	4505
5	3812	1262	1591	1893	1411	6203	6423	3491	1527	1502	4341
6	2275	2297	1012	1204	2324	3036	4370	3445	6347	1260	895
7	761	1902	1528	686	1220	2519	1512	1213	3955	1887	422
8	222	574	1492	1152	720	797	948	653	1009	1284	721
9	92	192	595	774	918	459	558	845	567	485	581
10	31	94	211	238	551	533	373	494	425	233	439
11	8	41	162	81	106	261	349	398	249	168	150
12	13	13	27	41	42	97	135	404	142	100	83
13	2	32	52	36	70	71	86	188	298	285	106
3+	8537	8003	8953	7931	8420	16986	17772	12069	15114	11303	13307
4+	8271	7498	8648	6752	8362	16929	17619	11553	14837	9386	12243
5+	7216	6407	6670	6105	7362	13976	14754	11131	14519	7204	7738
6+	3404	5145	5079	4212	5951	7773	8331	7640	12992	5702	3397

	1991	1992	1993	1994
3	1103	4508	1314	232
4	673	1769	3209	2326
5	995	837	637	1117
6	544	612	479	125
7	282	235	321	93
8	368	64	74	26
9	568	99	25	8
10	502	128	39	1
11	383	153	49	0
12	202	100	53	0
13	337	217	160	0
3+	5957	8722	6360	3928
4+	4854	4214	5046	3696
5+	4181	2445	1837	1370
6+	3186	1608	1200	253

TABLE 5. AVERAGE WEIGHT AT AGE FOR DIV. 3NO COD ,1959 - 1994
AGE 13 IS A PLUS GROUP.

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
3	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.48	0.48	0.48
4	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.90	0.90	0.90
5	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.35	1.35	1.35
6	1.95	1.95	1.95	1.95	1.95	1.95	1.95	2.14	2.14	2.14
7	2.82	2.82	2.82	2.82	2.82	2.82	2.82	3.16	3.16	3.16
8	3.39	3.39	3.39	3.39	3.39	3.39	3.39	4.21	4.21	4.21
9	3.98	3.98	3.98	3.98	3.98	3.98	3.98	6.34	6.34	6.34
10	4.68	4.68	4.68	4.68	4.68	4.68	4.68	7.69	7.69	7.69
11	5.25	5.25	5.25	5.25	5.25	5.25	5.25	8.46	8.46	8.46
12	6.17	6.17	6.17	6.17	6.17	6.17	6.17	10.24	10.24	10.24
13	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
3	0.48	0.48	0.48	0.54	0.57	0.42	0.38	0.50	0.57	0.72
4	0.90	0.90	0.90	0.97	1.00	0.73	0.89	0.91	1.00	1.05
5	1.35	1.35	1.35	1.44	1.43	1.20	1.28	1.41	1.48	1.55
6	2.14	2.14	2.14	2.08	2.19	1.96	2.13	2.33	2.48	2.25
7	3.16	3.16	3.16	2.89	3.63	2.86	3.14	3.25	3.51	3.74
8	4.21	4.21	4.21	3.56	4.63	4.67	4.16	4.03	4.74	4.61
9	6.34	6.34	6.34	5.95	6.25	7.32	5.53	6.67	7.17	6.19
10	7.69	7.69	7.69	7.95	9.56	5.46	6.74	8.74	8.81	7.23
11	8.46	8.46	8.46	8.32	11.17	8.40	5.27	9.14	11.70	9.48
12	10.24	10.24	10.24	10.14	13.99	7.51	7.09	12.49	11.47	12.87
13	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
3	0.65	0.71	0.90	0.94	0.85	0.79	0.48	0.39	0.49	0.74
4	0.98	1.04	1.27	1.17	1.17	1.15	0.86	1.01	0.82	1.00
5	1.39	1.69	1.84	1.50	1.87	1.51	1.37	1.52	1.30	1.38
6	2.09	2.50	2.69	2.20	2.63	2.28	2.05	2.16	1.83	1.79
7	2.87	3.69	3.55	3.83	3.80	3.04	3.25	3.49	2.89	2.23
8	3.70	5.49	5.33	5.26	5.20	4.05	4.65	5.41	4.76	3.77
9	4.75	7.98	7.13	7.49	6.27	5.76	6.62	7.95	7.26	5.12
10	7.15	9.22	9.10	8.80	8.08	7.22	8.32	9.82	8.95	6.88
11	7.98	10.60	9.01	9.82	8.99	8.92	9.15	9.94	9.85	9.37
12	10.11	12.61	10.15	12.28	11.01	12.61	11.13	9.88	12.59	11.07
13	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50

	1989	1990	1991	1992	1993	1994
3	0.51	0.55	0.55	0.33	0.36	0.27
4	0.97	1.01	0.85	0.65	0.78	0.46
5	1.60	1.46	1.59	1.06	1.35	0.91
6	2.24	2.51	2.30	1.80	1.84	1.63
7	3.27	2.73	3.83	2.82	2.82	1.84
8	4.61	4.14	5.56	4.85	4.11	4.04
9	7.08	5.02	7.53	5.56	5.87	4.94
10	8.31	8.37	9.04	7.43	7.76	7.54
11	9.47	9.29	11.98	8.64	8.79	3.44
12	12.25	11.25	13.98	10.65	8.67	7.52
13	13.50	11.91	13.60	14.11	12.74	10.00

Table 6. Cod abundance (1000's) from Canadian (Spring) RV Surveys in Division 3O. Numbers in brackets are estimates for non-sampled strata.

Depth range (fath)	Strata	Vessel Area Sq. mi	ATC 207-209 1973	ATC 233 1975	ATC 245 1976	ATC 263 1977	ATC 277 1978	ATC 289+291 1979	ATC 303 1980	ATC 318/319 1981	ATC 327/328 1982	AN 27 1984	AN 43 1985	WT 47 1986	WT 58 1987	WT 70 1988	WT 82 1989	WT 94/95 1990	WT 105/106 1991	WT 119/120 1992	WT 136/137 1993	WT 152/153 1994	WT 168/169 1995
31-50	330	2089	2143	418	680	889	1072	3674	1411	941	356	1921	1461	824	3763	993	342	949	86	16	45	0	0
	331	456	34	49	624	(185)	240	205	1284	(134)	377	993	548	214	650	240	137	186	34	17	0	0	0
	338	1898	2451	4987	3229	9047	1311	2666	1681	(1797)	4103	10116	2390	2976	5303	1781	3818	1371	1382	855	356	71	142
	340	1716	(979)	215	4165	258	708	1730	386	859	2340	2898	2734	2576	55431	1178	615	873	186	26	64	77	0
	351	2520	2837	936	615	4843	2535	39982	1513	3689	8701	18538	4413	32509	28753	2913	1470	2033	315	151	63	54	0
	352	2580	3409	1289	1791	5965	4648	2292	2113	(2264)	3486	11814	4859	2988	12097	8821	3769	4320	1439	775	443	121	174
	353	1282	225	706	48	321	1732	4388	48	(207)	257	0	674	165	1700	1674	385	529	69	192	144	0	38
51-100	329	1721	129	(380)	3682	172	1731	1012	65	129	754	775	501	501	42933	2233	388	1200	1608	48	108	3385	388
	332	1047	(1031)	1729	367	1729	7309	2613	118	(814)	5678	236	1839	458	2546	1297	393	1556	19059	1305	49906	0	255
	337	948	735	688	356	249	320	516	47	(234)	285	142	939	882	451	249	1281	285	939	1583	37573	47	125
	339	585	220	22	(109)	(129)	329	1361	(60)	198	2459	1054	88	29	278	102	15	132	44	44	22	0	0
	354	474	261	(105)	712	36	(230)	729	2076	107	107	142	261	178	1975	160	36	53	368	71	267	0	0
101-150	333	151	(19)	958	85	0	4	0	6	(14)	60	0	17	53	340	0	283	74	193	130	176	1050	6
	336	121	9	0	0	141	5	2	95	(4)	27	0	9	45	9	5	5	59	27	763	132	195	0
	355	103	19	0	4	(18)	(24)	19	128	19	151	0	398	12	54	12	178	50	97	27	66	12	4
151-200	334	92	(11)	(7)	7	0	2	0	21	(8)	3	0	152	856	14	70	52	235	483	173	414	202	86
	335	58	7	(0)	1	(0)	0	0	3	(0)	4	0	0	40	4	7	4	26	4	131	234	72	26
	356	61	2	(1)	(2)	(3)	(4)	5	18	2	48	0	0	9	2	30	37	40	44	135	130	124	7
31-50		12541	12078	8600	11152	21508	12246	54937	8436	9891	19622	46280	17079	42252	107697	17600	10536	10261	3511	2032	1115	323	354
51-100		4775	2376	2934	5226	2315	9919	6231	2366	1482	9283	2349	3628	2048	48183	4041	2113	3226	22018	3051	87876	3432	768
101-150		375	47	958	89	159	33	21	229	37	238	0	424	110	403	17	466	183	317	920	374	1257	10
151-200		211	20	8	10	3	6	5	42	10	55	0	152	905	20	107	93	301	531	439	778	398	119
201-300		245	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	2347	6369	752	539	205
301-400		309	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	4	102	46	270	48
Mean num/tow[a]			10.80	9.30	12.26	17.85	16.52	45.54	8.24	8.50	21.73	36.19	15.84	33.72	116.31	16.20	9.83	10.4	19.63	4.8	67.08	4.03	1.08
Adjusted total[a]			14518	12500	16476	23983	22204	61193	11073	11419	29199	48628	21283	45316	156302	21764	13208	13974	26377	6446	90143	5409	1505
Unadjusted total[b]			12481	11996	16365	23648	21946	61195	11013	5943	29198	48628	21282	45315	156304	21764	13208	13786	28727	12915	90953	6573	1251
1 STD DEV			2249	30391	10008	7626	16404	26941	3696	2900	8147	7299	3120	28003	40760	3478	3189	1692	23325	39878	279932	4104	587

[a] Adjusted totals are for strata to 200 fathoms, a multiplicative model using data to 1991 is used to estimate missing strata.

[b] Unadjusted total is for all strata fished.

nf strata not fished

Table 7. Cod biomass (t) from Canadian (Spring) RV Surveys in Division 3O. Numbers in brackets are estimates for non-sampled strata.

Depth range (fath)	Strata	Vessel Area Sq. mi	ATC 207-209 1973	ATC 233 1975	ATC 245 1976	ATC 263 1977	ATC 277 1978	ATC 289+291 1979	ATC 303 1980	ATC 318-319 1981	ATC 327-328 1982	AN 27 1984	AN 43 1985	WT 47 1986	WT 58 1987	WT 70 1988	WT 82 1989	WT 94/95 1990	WT 105/106 1991	WT 119/120 1992	WT 136/137 1993	WT 152/153 1994	WT 168/169 1995
31-50	330	2089	8986	474	287	592	2218	3753	470	3371	123	3626	4642	2136	5654	2767	1713	2262	90	2	11	0	0
	331	456	279	728	454	(183)	342	150	609	(410)	38	2630	3423	685	804	1224	183	(848)	98	97	0	0	0
	338	1898	4174	5558	1874	6947	1334	5729	1795	(5873)	5659	29905	7485	14405	9838	9124	14874	5475	6271	8466	2959	1006	1974
	340	1716	(2043)	2028	2688	298	966	3718	386	4294	2849	6827	5431	5796	77479	12421	2977	6338	70	4	979	49	0
	351	2520	3003	1561	2681	8134	4334	47954	5629	6621	4498	43255	23490	38217	66032	15852	11619	16567	3890	1128	696	30	0
	352	2580	2986	425	1428	6114	3961	6235	5625	(9618)	6236	34168	29692	15071	49765	57457	34373	28930	16762	9958	4879	944	2171
	353	1282	3172	77	2	262	84	1573	2	(541)	472	0	6083	951	9610	626	2371	3544	688	972	2222	0	377
51-100	329	1721	205	(221)	6417	180	2008	357	19	517	396	594	840	304	45335	9436	682	1611	1627	10	17	4456	1167
	332	1047	(1579)	829	351	939	4525	2266	9	(2068)	3474	2358	13471	2499	9808	8681	1369	8728	4097	960	30014	0	1140
	337	948	75	1904	32	629	614	23	133	(623)	610	434	1203	8497	2674	382	2787	1997	2373	17045	19121	370	831
	339	585	1086	40	(44)	(70)	249	1475	(31)	505	610	1087	359	29	354	233	146	103	3	7	3	0	0
	354	474	427	(35)	38	8	(83)	34	273	44	125	489	219	180	2179	530	25	317	2312	39	540	0	0
101-150	333	151	(36)	524	82	0	2	0	28	(49)	153	0	147	232	1057	0	1040	225	500	53	916	7131	12
	336	121	28	0	0	136	3	1	286	(15)	70	0	34	45	17	18	23	191	40	438	147	298	0
	355	103	74	0	4	(9)	(12)	24	367	32	135	0	135	12	114	19	195	96	86	3	58	11	19
151-200	334	92	(21)	(6)	6	0	6	0	43	(28)	8	0	570	3481	59	248	136	425	776	514	781	487	165
	335	58	22	(0)	3	(0)	0	0	10	(2)	11	0	0	126	18	39	7	63	2	44	2088	248	178
	356	61	10	(0)	(0)	(2)	(3)	12	49	9	166	0	0	32	7	102	74	142	11	45	154	79	16
31-50		12541	12541	24643	10851	9414	22530	13239	69112	14516	30728	19875	120411	80246	77261	219182	99471	63116	27869	20627	11746	2029	4522
51-100		4775	4775	3372	3029	6882	1826	7479	4155	481	3757	5215	4962	16092	11509	60350	19262	12756	10412	18061	49695	4826	3138
101-150		375	375	138	524	86	145	16	25	681	96	358	0	316	289	1188	37	512	626	494	1121	7440	31
151-200		211	211	53	6	9	2	9	12	102	31	185	0	570	3639	84	389	630	789	603	3023	814	359
201-300		245	245	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	1516	1212	896	733
301-400		309	309	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	41	78	499	57
Mean wt/tow[a]			20.99	10.72	12.20	18.23	15.44	54.55	11.73	25.76	19.08	93.30	72.35	68.98	208.97	88.67	55.51	57.94	29.54	29.61	48.81	11.24	6.34
Adjusted total[a]			28204	14411	16391	24502	20743	73302	15768	34619	25633	125375	97224	92698	280808	119156	74594	77014	39696	39786	65585	15104	8050
Unadjusted total			24527	14148	16346	24238	20647	73304	15735	15393	25632	125373	97223	92699	280807	119157	74595	77016	51566	41342	66875	16962	8840
1 Std Dev			5608	36602	36330	7066	7586	31154	4392	4906	4147	22302	14439	21700	50896	30074	29860	12064	17995	24899	143547	14840	2020

[a] Adjusted totals are for strata to 200 fathoms, a multiplicative model using data until 1991 is used in this model

nf strata not fished.

Table 8. Cod abundance from Canadian spring RV surveys in Division 3N. Numbers in brackets are estimates for non sampled strata.

Depth range			ATC	ATC	ATC	ATC	ATC	ATC	ATC	ATC	ATC	ATC	ATC	AN	WT 29	WT	WT	WT	WT	WT	WT	WT	WT	WT
			199	208-209	222	233	245	263	277	289+291	304	318-319	328	27	AN 43	47	58+59	70	82	95-96	105-106	119-120	136-137	152/153	168/169
(fath)	Strata	Area	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
0-30	375	1593	3826	399	1435	6617	(811)	7474	4329	263	508	10583	1578	1746	3184	912	2167	1116	1674	1226	60	80	40	0	0
	376	1499	788	38	(128)	1294	113	3601	225	225	113	225	32	7933	48	177	2813	375	113	177	48	0	0	0	19
31-50	360	2992	1516	(420)	(544)	2302	3425	4211	1011	1273	2695	524	2118	5679	3004	553	1198	1422	165	569	56	112	20	0	0
	361	1853	5796	835	904	3624	723	5610	4764	1165	1808	(3111)	4961	3283	10293	3310	10484	2841	1904	2380	817	35	226	28	20
	362	2520	11823	984	1466	431	1021	5830	7440	757	1204	3859	1608	18970	4385	2392	43871	1702	2605	3443	170	32	63	0	0
	373	2520	3831	142	426	(1137)	76	946	5959	327	331	1892	1589	8161	769	676	4307	1097	822	227	52	0	0	0	0
	374	931	175	175	0	140	(101)	1607	1817	297	0	163	1677	2893	175	47	266	363	28	210	14	14	0	0	0
	383	674	1644	51	25	(80)	17	320	1493	34	0	118	25	34	0	0	422	51	84	25	34	0	0	0	0
51-100	359	421	822	622	(152)	(367)	4709	1359	(745)	561	2133	611	126	95	0	1264	332	269	95	47	32	47	190	0	0
	377	100	1066	143	613	413	(46)	2800	105	73	490	1146	278	56	105	23	758	0	19	0	0	0	4	4	0
	382	647	4347	16	130	(150)	24	2639	1943	243	255	146	194	0	134	12	16	24	81	130	0	0	0	0	0
101-150	358	225	861	4189	(260)	(604)	(280)	262	(1209)	439	1993	135	1343	380	448	760	1478	549	709	456	59	1478	709	34	63
	378	139	3673	459	1683	(409)	(190)	657	120	403	1445	193	1236	318	2181	433	151	157	198	172	122	172	89	31	41
	381	182	779	861	79	156	(173)	3267	364	155	379	779	1851	200	2391	1312	68	191	102	273	55	7	0	7	20
151-200	357	164	(254)	1157	(43)	(105)	(46)	12	(216)	49	336	37	382	0	2831	137	(253)	6	18	123	148	302	12	105	12
	379	106	(295)	1802	785	(124)	(56)	24	0	671	408	40	322	175	525	801	4	8	44	139	406	1126	56	44	20
	380	116	118	641	70	(122)	(65)	22	(246)	96	26	15	(121)	83	788	136	313	226	118	270	300	57	4119	0	4
0-30		3092	4614	437	1563	7911	924	11075	4554	488	621	10808	1610	9679	3232	1089	4980	1491	1787	1403	108	80	34	0	19
31-50		11490	24785	2607	3365	7714	5361	18524	22484	3853	6038	9667	11978	39020	18626	6978	60548	7476	5608	6854	1143	193	304	28	20
51-100		1168	6235	781	895	930	4779	6798	2793	877	2878	1903	598	151	239	1299	1106	293	195	177	32	47	198	4	0
101-150		546	5313	5509	2022	1169	643	4186	1693	997	3818	1107	4430	898	5020	2505	1697	897	1009	901	236	1657	796	72	124
151-200		386	667	3600	858	351	157	48	462	816	770	92	825	258	4144	1074	570	240	180	532	854	1485	4161	149	36
201-300		420	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	539	1982	138	67	22
301-400		352	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	14	14	5	4	35
Mean #/tow*			33.23	10.33	6.98	14.43	9.48	32.45	25.54	5.60	11.28	18.82	15.53	40.02	24.97	10.34	55.02	8.30	7.01	7.88	1.90	3.94	4.33	0.20	0.20
Adjusted total*			41612	12930	8741	18073	11867	40640	31985	7008	14124	23574	19444	50107	31262	12943	68902	10397	8772	9866	2372	5132	5675	252	199
Unadjusted total			41062	12511	7615	14976	10108	40641	29569	7030	14125	20464	19321	50006	31260	12943	68649	10399	8778	9867	2372	5132	5675	331	257
1 std dev			9732	3455	1575	5078	7486	8735	4294	1241	2387	8782	2779	11314	4061	2758	12930	1186	1224	989	589	3369	25752	133	94

* Adjusted totals are for strata to 200 fathoms, a multiplicative model using data until 1991 is used in this model
nf strata not fished.

Table 9. Cod biomass (t) from Canadian (Spring) RV Surveys in Division 3N. numbers in brackets are estimates for non-sampled strata.

Depth range		Vessel	ATC	ATC	ATC	ATC	ATC	ATC	ATC	ATC	ATC	ATC	ATC	AN	WT 29	WT	WT	WT	WT	WT	WT	WT	WT	WT
			199	208-209	222	233	245	263	277	289+291	304	318-319	328	27	AN43	47	58+59	70	82	94/95	105/106	119/120	136/137	152/153	168/169
(fath)	Strata	Area Sq. mi.	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
0-30	375	1593	9691	1012	955	10591	(2148)	5424	3598	369	3229	29835	5943	2404	18475	14585	8034	16512	29104	10230	1141	1391	678	0	0
	376	1499	1837	783	(174)	383	77	9663	102	868	855	2208	2	1049	391	1883	2876	4454	745	2745	751	0	0	0	12
31-50	360	2992	1910	(919)	(382)	305	1948	4037	2182	1416	1738	3743	1238	7877	9161	1945	1282	494	1202	9486	581	842	1	0	0
	361	1853	4395	2453	350	3243	2616	5889	8203	2666	4173	(12196)	8125	12838	29220	50957	27584	15587	12722	20240	11883	278	2232	21	1
	362	2520	9416	4101	2231	306	1664	6830	6621	1632	5847	8701	3708	40764	16509	19686	69852	12714	16464	24747	2361	446	873	0	0
	373	2520	3325	1802	2359	(758)	1030	1749	4300	1838	857	4578	6647	17916	2446	2897	6788	5959	6090	3441	392	0	0	0	0
	374	931	681	266	0	135	(227)	1247	1324	479	0	146	2369	8335	877	769	1036	4032	489	3296	361	3	0	0	0
	383	674	1572	1	17	(14)	46	338	1564	146	0	430	5	295	0	0	818	71	335	326	113	0	0	0	0
51-100	359	421	303	251	(6)	(7)	659	147	(76)	190	478	208	13	71	0	134	43	44	21	6	15	3	51	0	0
	377	100	535	14	83	283	(14)	1379	130	22	287	428	22	29	13	54	328	0	9	0	0	0	1	1	0
	382	647	2032	7	59	(10)	44	991	2215	220	285	182	36	0	16	61	12	7	419	40	0	0	0	0	0
101-150	358	225	1030	1721	(64)	(69)	(111)	383	(300)	483	1034	229	236	182	122	547	1803	229	486	159	56	284	450	87	59
	378	139	4028	393	631	(49)	(78)	686	90	281	939	104	303	133	470	256	73	96	81	62	82	62	68	11	34
	381	182	883	1475	228	128	(146)	2797	393	196	427	533	2186	319	1544	747	82	270	39	212	232	1	0	37	9
151-200	357	164	(104)	1343	(13)	(14)	(25)	29	(74)	52	332	135	92	0	2102	259	(142)	18	22	62	59	158	17	68	15
	379	106	(107)	1776	515	(16)	(27)	50	0	601	178	53	179	129	324	365	4	15	22	61	204	633	60	42	13
	380	116	273	1116	180	(30)	(49)	55	(135)	232	57	25	(86)	224	847	135	454	181	176	180	110	56	3061	0	1
0-30		3092	11528	1795	1127	10974	2225	15087	3700	1237	4084	32043	5945	3453	18866	16468	10910	20966	20849	12975	1892	1391	678	0	12
31-50		11490	21299	9542	5339	4761	7531	20090	24194	8177	12615	29784	22092	88025	58213	76254	107382	39157	37302	61536	15691	1569	3106	21	1
51-100		1168	2870	272	148	300	717	2517	2421	432	1050	818	71	100	29	249	383	51	449	46	15	3	52	1	0
101-150		546	5941	3589	923	246	335	3866	783	960	2420	866	2725	634	2136	1550	1958	595	606	433	370	347	518	135	102
151-200		386	484	4235	708	60	101	134	209	885	567	213	357	353	3273	759	600	214	220	303	373	847	3138	110	29
201-300		420	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	351	802	58	34	7
301-400		196	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	nf	6	5	4	4	28
Mean wt./tow*			33.64	15.52	6.58	13.05	8.71	33.30	25.00	9.34	16.56	50.90	24.91	73.92	65.90	76.09	96.81	48.70	47.46	60.13	14.65	3.32	5.98	0.21	0.13
Adjusted total*			42123	19433	8245	16340	10911	41698	31307	11694	20737	63734	31196	92564	82515	95278	121233	60981	59426	75293	18342	4158	7492	268	144
Unadjusted total*			41912	18513	7607	15372	8084	41695	30722	11692	20736	51538	31104	92566	82515	95280	121091	60982	59426	75293	18699	4941	7554	310	180
1 std dev			7604	4550	2726	10797	2846	10170	3885	2401	3707	34566	7482	15557	12921	33617	19396	9751	11250	11482.5	7643	1410	20379	144	94

Table 10. Mean number per tow at age of cod from Spring RV surveys conducted by Canada in Divisions 3NO.

AGE	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1984	1985
1	0.00	0.01	0.06	0.04	0.41	0.55	0.01	0.56	3.00	0.01	0.33	1.40	0.01	0.01
2	2.57	1.15	2.35	1.13	2.84	3.67	2.30	0.72	0.90	5.32	0.35	8.40	3.29	0.41
3	25.88	8.84	2.39	4.05	4.22	2.73	9.50	7.18	2.27	1.36	5.02	1.06	6.21	4.50
4	3.56	18.94	1.67	0.73	2.37	1.73	6.16	8.29	8.99	0.66	1.47	3.17	9.92	6.09
5	2.72	1.69	2.21	0.36	0.53	1.57	4.53	2.52	7.62	1.06	1.71	0.54	5.30	2.43
6	0.65	0.70	0.44	0.31	0.28	0.25	1.51	0.97	1.71	0.43	2.16	0.42	5.61	0.89
7	0.66	0.57	0.25	0.11	0.54	0.07	0.48	0.62	0.51	0.21	1.05	0.70	1.87	0.98
8	0.29	0.40	0.18	0.03	0.22	0.12	0.22	0.04	0.25	0.18	0.47	0.52	1.00	0.74
9	0.15	0.29	0.20	0.01	0.22	0.06	0.10	0.01	0.10	0.18	0.49	0.23	1.81	0.89
10	0.02	0.17	0.12	0.06	0.07	0.07	0.10	0.03	0.02	0.09	0.22	0.14	1.57	1.35
11	0.05	0.08	0.05	0.02	0.01	0.02	0.01	0.04	0.06	0.05	0.04	0.06	0.86	0.99
12	0.09	0.05	0.08	0.00	0.02	0.00	0.04	0.00	0.00	0.07	0.13	0.04	0.32	0.49
13	0.00	0.00	0.12	0.00	0.01	0.00	0.09	0.04	0.04	0.03	0.06	0.01	0.11	0.24
14	0.29	0.35	0.44	0.12	0.13	0.05	0.12	0.01	0.10	0.12	0.16	0.13	0.22	0.39
1+	36.93	33.24	10.56	6.97	11.87	10.89	25.17	21.03	25.57	9.77	13.66	16.82	38.10	20.40
2+	36.93	33.23	10.50	6.93	11.46	10.34	25.16	20.47	22.57	9.76	13.33	15.42	38.09	20.39
3+	34.36	32.08	8.15	5.80	8.62	6.67	22.86	19.75	21.67	4.44	12.98	7.02	34.80	19.98
4+	8.48	23.24	5.76	1.75	4.40	3.94	13.36	12.57	19.40	3.08	7.96	5.96	28.59	15.48
5+	4.92	4.30	4.09	1.02	2.03	2.21	7.20	4.28	10.41	2.42	6.49	2.79	18.67	9.39
6+	2.20	2.61	1.88	0.66	1.50	0.64	2.67	1.76	2.79	1.36	4.78	2.25	13.37	6.96

	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.02	0.21	0.01	0.02	0.04	0.02	0.00	0.00	0.00
2	0.68	2.73	1.68	0.25	0.47	6.30	0.65	0.14	0.01
3	0.69	2.80	2.23	1.89	0.95	1.24	4.42	13.86	0.15
4	7.54	9.18	0.46	1.09	1.34	0.60	0.17	18.32	0.69
5	6.32	34.30	0.41	0.28	1.09	0.41	0.10	1.09	0.84
6	1.58	20.91	1.07	0.30	0.24	0.18	0.13	0.69	0.14
7	0.67	8.20	1.18	0.68	0.47	0.13	0.05	0.59	0.16
8	0.64	1.75	0.78	0.62	0.61	0.17	0.03	0.28	0.09
9	0.49	1.91	0.82	0.44	0.73	0.34	0.11	0.07	0.10
10	0.72	0.68	0.87	0.48	0.51	0.22	0.13	0.10	0.02
11	1.17	0.76	0.44	0.64	0.42	0.18	0.16	0.20	0.05
12	0.64	0.70	0.55	0.42	0.41	0.11	0.17	0.15	0.06
13	0.35	0.80	0.79	0.33	0.22	0.15	0.15	0.08	0.09
14	0.51	0.76	1.25	1.00	1.65	0.72	0.13	0.08	0.02
1+	22.02	85.69	12.54	8.44	9.15	10.77	6.40	35.65	2.42
2+	22.00	85.48	12.53	8.42	9.11	10.75	6.40	35.65	2.42
3+	21.32	82.75	10.85	8.17	8.64	4.45	5.75	35.51	2.41
4+	20.63	79.95	8.62	6.28	7.69	3.21	1.33	21.65	2.26
5+	13.09	70.77	8.16	5.19	6.35	2.61	1.16	3.33	1.57
6+	6.77	36.47	7.75	4.91	5.26	2.20	1.06	2.24	0.73

Table 11. Biomass (t) and Abundance (000's) of cod from autumn stratified random surveys in Division 3O.

Depth			Biomass					Abundance				
Range	Strata	Area	1990	1991	1992	1993	1994	1990	1991	1992	1993	1994
31-50	330	2089	2465	681	876	1668	787	1625	745	902	86	694
	331	456	1	232	83	127	82	11	377	68	826	51
	338	1898	6639	3771	1533	1710	9	3437	1311	249	464	37
	340	1716	1697	3520	2839	474	305	644	1520	2222	3297	258
	351	2520	7031	9922	1296	4276	296	4634	5334	662	968	210
	352	2580	11930	18064	1960	2338	2489	3060	4532	613	0	387
	353	1282	2666	7	0	0	0	674	24	0	1542	
51-100	329	1721	683	496	9	98	709	215	129	43	78	409
	332	1047	345	4	85	506	234	196	39	79	393	131
	337	948	1301	46	174	38	0	213	36	108	71	0
	339	585	618	0	40	162	26	73	0	22	176	22
	354	474	2	0	319	0	0	36	0	249	0	0
101-150	333	151	4	0	6	0	0	6	0	6	0	0
	336	121	16	0	0	48	0	3	0	0	27	0
	355	103	-	15	6	30	0	-	66	116	37	0
151-200	334	92	8	0	0	10	0	7	0	0	5	0
	335	58	5	4	0	0	0	4	2	0	0	0
	356	61	-	4	0	26	0	-	2	0	27	0
201-300	717	93	0	-	-	0	0	0	-	-	0	0
	719	76	0	0	-	0	8	0	0	-	0	3
	721	76	-	0	-	0	0	-	0	-	0	0
301-400	718	111	-	-	-	0	0	-	-	-	0	0
	720	105	-	-	-	0	0	-	-	-	0	0
	722	93	-	0	-	0	0	-	-	-	0	0
31-50		12541	32429	36197	8587	10593	3968	14085	13843	4716	5641	1637
51-100		4775	2949	546	627	804	969	733	204	501	718	562
101-150		375	20	15	12	78	0	9	66	122	64	0
151-200		211	13	8	0	36	0	11	4	0	32	0
Total			35411	36766	9226	11511	4937	14838	14117	5339	6455	2199
Upper			47985	51619	14078	20007	8358	21022	19938	8452	13057	3876
Lower			22833	21918	4376	3015	1517	8657	8295	2014	2939	521
std dev			6287	7426.5	2426	4248	1711	3092	2911	1557	3301	839

Table 12. Biomass (t) and Abundance ('000) of cod from autumn stratified random surveys in Division 3N

Depth			Biomass					Abundance				
Range	Strata	Area	1990	1991	1992	1993	1994	1990	1991	1992	1993	1994
0-30	375	1593	21899	38662	-	1499	5955	1814	11988	-	628	622
	376	1499	2089	14770	22566	66	900	1067	28265	47484	56	169
	360	2992	3727	1611								
31-50	361	1853	14530	8568	1817	4550	0	1492	842	861	898	0
	362	2520	4180	21096	4456	7393	6175	1913	2156	2956	1474	2967
	373	2520	4897	16186	6986	659	382	2218	7623	7756	405	105
	374	931	1129	3356	1660	40	0	447	3247	378	108	0
	383	674	40	34	-	418	1209	196	2097	-	163	314
					-	0	0	84	67	-	0	0
	359	421	1	0								
51-100	377	100	36	-	35	7	0	16	0	63	16	0
	382	647	47	10	74	0	8	49	-	101	0	4
					27	28	0	49	32	49	73	0
	358	225	130	95								
101-150	378	139	116	158	607	18	11	127	160	988	17	17
	381	182	-	0	103	1	5	110	261	151	5	5
					-	31	0	-	0	-	48	0
	357	164	128	64								
151-200	379	106	140	-	37	143	15	111	68	43	277	12
	380	116	-	13	93	58	43	156	-	119	95	28
					-	8	3	-	48	-	13	4
	723	155	-	-								
201-300	725	105	-	-	-	21	0	-	-	-	23	0
	727	160	-	-	-	35	0	-	-	-	28	0
					-	104	7	-	-	-	204	6
	724	124	-	-								
301-400	726	72	-	-	-	4	0	-	-	-	5	0
					-	0	0	-	-	-	0	0
0-30		3092	23988	53432	22566	1565	6855	2881	40253	47484	684	791
31-50		11490	28503	50851	14919	13060	7766	6350	16032	11951	3048	3386
51-100		1168	84	10	136	35	8	114	32	213	89	4
101-150		546	246	253	710	50	16	237	421	1139	70	22
151-200		386	268	77	130	209	61	267	116	162	385	44
201-300		420	-	-	-	160	7	-	-	-	255	6
301-400		196	-	-	-	4	0	-	-	-	5	0
Total			53089	104623	38461	15083	14713	9849	56854	60949	4536	4253
1 std dev			21661	29744	36002	5168	5752	1938	28556	82739	932	2121

Table 13. Mean No./Tow at age for Div. 3NO combined from Fall Research Vessel surveys

Age	1990	1991	1992	1993	1994
1	0.81	0.51	0.01	0.05	0.00
2	1.05	14.98	5.71	0.12	0.14
3	1.06	1.92	17.89	1.13	0.10
4	2.23	1.47	2.40	2.20	0.63
5	1.46	2.55	0.95	0.27	1.54
6	0.37	1.36	0.60	0.24	0.27
7	0.29	0.41	0.18	0.18	0.02
8	0.40	0.40	0.04	0.10	0.08
9	0.42	0.68	0.05	0.02	0.02
10	0.27	0.46	0.06	0.02	0.02
11	0.23	0.51	0.00	0.07	0.06
12	0.10	0.37	0.05	0.05	0.05
13	0.17	0.31	0.11	0.04	0.06
14+	0.69	1.07	0.20	0.18	0.12
Total	9.55	26.99	28.26	4.67	3.11
Upper	12.34	48.96	98.93	6.64	6.49
Lower	6.76	5.02	-42.42	2.7	0.01

Table 14 . Abundance (000's) and biomass (t) of cod from autumn juvenile RV Surveys

3N Depth Range	Abundance Strata	1989	1990	1991	1992	1993	1994	Biomass Strata	1989	1990	1991	1992	1993	1994
0-30	375	3238	14501	146399	27641	8574	7001	375	4250	6211	19242	7913	5984	1824
	376	3523	18802	56932	8405	9454	5497	376	823	1173	7337	3245	7340	990
31-50	360	1582	9163	54155	5526	572	416	360	320	1952	8749	1722	723	149
	361	32938	40768	66058	14576	9051	4855	361	5588	23257	27572	4661	6086	2839
	362	9643	19958	28717	11742	19822	7061	362	6419	14672	10539	7491	10569	7235
	373	23706	23245	1401	6536	-	508	373	18148	28119	1293	4631	-	377
	374	891	1806	6915	1946	1287	66	374	2688	3110	18313	2278	735	79
	383	2125	2460	227	179	-	0	383	2209	3487	100	81	-	0
51-100	359	201	53	34	15	0	750	359	13	86	29	16	0	752
	377	-	-	-	-	11	32	377	-	-	-	-	10	25
	382	516	183	83	275	-	0	382	224	68	27	174	-	0
101-150	358	-	-	-	3707	-	-	358	-	-	-	982	-	-
0-30		6761	33303	203331	36046	18028	12498		5073	7384	26579	11158	13324	2814
31-50		70885	97400	157473	40505	30732	12906		35372	74597	66566	20864	18113	10679
51-100		717	236	117	290	11	782		237	154	56	190	10	777
101-150		-	-	-	3707	-	-		-	-	-	982	-	-
Total		78363	130939	360921	80548	48772	26726		40682	82135	93201	33194	31447	14644
Upper		142761	167732	547326	108201	78517	40293		54446	112156	188123	41763	49429	26301
Lower		13967	94144	174516	52894	19024	13159		26921	52112	-1722	24624	13464	2987

3O	Abundance Strata	1989	1990	1991	1992	1993	1994	Biomass Strata	1989	1990	1991	1992	1993	1994
31-50	330	3937	11008	5551	2309	3286	9262	330	3079	3631	1623	1081	2591	8717
	331	654	582	355	315	1018	368	331	557	90	222	45	1295	374
	338	14123	75304	14661	1160	7263	1848	338	2503	5901	2211	709	12360	2522
	340	8664	16208	8135	2098	2250	3030	340	6095	8457	2898	836	1949	3544
	351	10413	11234	15857	10586	8605	7472	351	8773	10913	9837	9463	10231	8847
	352	10480	29118	18949	3333	5696	12356	352	26622	11662	19250	4063	6291	26508
	353	4860	1840	845	170	136	45	353	273	44	63	48	43	2
	354	831	1125	924	365	252	67	354	139	128	302	126	111	118
51-100	329	3251	-	1372	2479	1207	66	329	9943	-	575	1934	772	142
	332	2226	32164	12020	278	3255	1286	332	78	651	303	211	177	267
	337	3124	5408	504	176	1386	1915	337	40	171	58	45	320	535
	339	124	104	466	202	47	22	339	653	280	164	84	13	37
	333	-	-	-	-	0	-	333	-	-	-	-	0	-
	336	-	-	-	-	0	-	336	-	-	-	-	0	-
31-50		53962	146419	65277	20336	28506	34448		48041	40826	36406	16371	34871	50632
56-100		8725	37676	14362	3135	5895	3289		10714	1102	1100	2274	1282	981
Total		62687	184095	79639	23471	34401	37743	Total	58755	41928	37506	18645	36152	51623
Upper		93613	319061	115132	31178	46757	49926	Upper	87452	55455	54511	26134	59941	80988
Lower		31763	49126	44147	15766	22046	25560	Lower	30056	28401	20502	11158	12363	22257

Table15. Mean number per tow at age of cod from Juvenile Surveys conducted by Canada in Divisions 3NO during August and September

Age	1989	1990	1991	1992	1993	1994
1	1.40	60.88	36.33	0.84	1.98	2.75
2	14.16	11.62	74.04	12.28	3.70	4.03
3	12.58	6.53	8.54	12.89	8.85	1.25
4	5.82	8.99	2.45	1.42	7.91	4.07
5	1.21	3.62	1.96	0.69	0.80	4.79
6	0.72	0.67	0.72	0.52	0.30	0.41
7	1.22	0.50	0.19	0.22	0.28	0.08
8	0.79	0.63	0.17	0.05	0.10	0.13
9	0.25	0.53	0.24	0.03	0.02	0.05
10	0.17	0.28	0.19	0.03	0.04	0.01
11	0.2	0.21	0.23	0	0.10	0.05
12	0.11	0.04	0.18	0.02	0.08	0.06
13	0.09	0.08	0.17	0.10	0.06	0.08
14	0.16	0.27	0.48	0.13	0.09	0.09
1+	38.88	94.85	125.89	29.22	24.31	17.85
2+	37.48	33.97	89.56	28.38	22.33	15.1
3+	23.32	22.35	15.52	16.10	18.63	11.07
4+	10.74	15.82	6.98	3.21	9.78	9.82
5+	4.92	6.83	4.53	1.79	1.87	5.75
6+	3.71	3.21	2.57	1.10	1.07	0.96

Table 16. Comparison of Biomass and Abundance from Spring RV Surveys for 3NO Cod

	BIOMASS			ABUNDANCE		
			SPRING			
YEAR	3N	3O	3NO	3N	3O	3NO
1977	42	25	66	41	24	65
1978	31	21	52	32	22	54
1979	12	73	85	7	61	68
1980	21	16	37	14	11	25
1981	64	35	98	24	11	35
1982	31	26	57	19	29	49
1983	No Survey			No Survey		
1984	93	125	218	50	49	99
1985	83	97	180	31	22	53
1986	95	93	188	13	45	58
1987	121	281	402	69	156	225
1988	61	119	180	10	22	32
1989	59	75	134	9	13	22
1990	75	77	152	10	14	24
1991	19	52	71	3	26	29
1992	5	41	46	5	13	18
1993	8	67	75	6	91	97
1994	0.3	17	17	0.3	7	7
1995	0.2	9	9	0.3	2	2
			JUVENILE			
Year	3N	3O	3NO	3N	3O	3NO
1989	41	59	100	78	63	141
1990	82	42	124	131	184	315
1991	93	38	131	361	80	441
1992	33	19	52	81	23	104
1993	31	36	67	49	34	83
1994	15	52	67	27	38	65
			AUTUMN			
Year	3N	3O	3NO	3N	3O	3NO
1990	53	35	88	10	15	25
1991	105	37	142	57	14	71
1992	38	9	47	61	5	66
1993	15	12	27	5	6	11
1994	15	5	20	4	2	6

Table 17. Results from ADAPT using Canadian and Russian RV survey indices: parameters with associated CV's.

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.029292
MEAN SQUARE RESIDUALS 0.873587

PARAMETER	AGE	ESTIMATE	STD. ERR.	T-STAT	C.V.
NUMBERS					
	3	959	450	2.132	0.469
	4	8672	3006	2.885	0.347
	5	12429	4345	2.860	0.350
	6	1246	447	2.788	0.359
	7	800	265	3.013	0.332
	8	741	255	2.902	0.345
	9	344	115	3.004	0.333
	10	89	31	2.872	0.348
	11	105	38	2.740	0.365
INDEX 1: RV1					
	3	1.87E-4	4.33E-5	4.312	0.232
	4	2.16E-4	4.97E-5	4.342	0.230
	5	2.09E-4	4.80E-5	4.350	0.230
	6	2.06E-4	4.74E-5	4.346	0.230
	7	2.51E-4	5.77E-5	4.341	0.230
	8	2.59E-4	5.96E-5	4.339	0.230
	9	3.75E-4	8.64E-5	4.342	0.230
	10	5.18E-4	1.19E-4	4.344	0.230
	11	7.56E-4	1.74E-4	4.348	0.230
INDEX 2: RV2					
	3	4.65E-4	1.09E-4	4.253	0.235
	4	4.26E-4	1.00E-4	4.255	0.235
	5	4.11E-4	9.66E-5	4.256	0.235
	6	4.08E-4	9.58E-5	4.257	0.235
	7	4.03E-4	9.47E-5	4.254	0.235
	8	4.10E-4	9.63E-5	4.254	0.235
	9	5.56E-4	1.31E-4	4.256	0.235
	10	7.69E-4	1.81E-4	4.248	0.235
	11	1.13E-3	2.64E-4	4.269	0.234
INDEX 3: RV3					
	3	2.72E-4	1.23E-4	2.206	0.453
	4	3.43E-4	1.53E-4	2.251	0.444
	5	4.15E-4	1.83E-4	2.272	0.440
	6	4.96E-4	2.19E-4	2.267	0.441
	7	2.63E-4	1.16E-4	2.262	0.442
	8	3.12E-4	1.37E-4	2.273	0.440
	9	2.80E-4	1.23E-4	2.274	0.440
	10	3.92E-4	1.72E-4	2.278	0.439
	11	1.33E-3	5.86E-4	2.277	0.439
INDEX 4: RV4					
	3	1.22E-3	4.96E-4	2.450	0.408
	4	7.94E-4	3.18E-4	2.494	0.401
	5	6.46E-4	2.57E-4	2.512	0.398
	6	4.78E-4	1.91E-4	2.506	0.399
	7	3.78E-4	1.51E-4	2.504	0.399
	8	3.36E-4	1.34E-4	2.503	0.399
	9	2.50E-4	9.97E-5	2.509	0.399
	10	2.62E-4	1.05E-4	2.511	0.398
	11	1.10E-3	4.36E-4	2.513	0.398

Table 17. Cont'd. : Population numbers and fishing mortality.

POPULATION NUMBERS (000S)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	45381	40255	17435	19800	27560	21653	35166	41938	32290	8993
4	18844	36605	32126	14210	15970	22107	17452	27725	34284	26385
5	7946	13194	26046	22840	10679	12088	16310	13703	21794	25397
6	4161	4215	8524	12993	15250	7602	8457	11641	9942	12231
7	1293	2050	2711	4460	8579	10407	5308	5835	7428	5393
8	468	541	1358	1421	2963	5303	7138	3725	3673	3802
9	486	223	351	872	962	1907	2992	4802	2398	2286
10	133	209	130	235	631	614	1023	1749	3101	1548
11	73	50	125	91	164	431	312	622	933	2057
12	57	23	33	92	68	97	206	182	413	528
3+	78843	97367	88840	77012	82826	82209	94364	111922	116257	88620

	1987	1988	1989	1990	1991	1992	1993	1994
3	6618	13445	13872	6202	6920	27792	11965	953
4	7224	4951	10757	9623	4115	4667	18675	8607
5	19010	5533	3766	6833	3803	2760	2221	12386
6	14982	12405	3148	1724	1666	2213	1502	1242
7	6060	9149	4413	1437	602	872	1258	797
8	3047	3864	3912	1906	795	238	501	740
9	2255	1904	2250	2041	908	318	137	343
10	1367	1082	1046	1404	1145	230	171	89
11	930	672	501	645	752	483	72	105
12	1368	401	325	258	393	269	257	15
3+	62860	53406	43991	32074	21098	39842	36759	25276

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3NO CODS 6/14/95 01:34

FISHING MORTALITY 14/ 6/

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
3	0.015	0.026	0.005	0.015	0.020	0.016	0.038	0.002	0.002	0.019	0.090	0.023
4	0.156	0.140	0.141	0.086	0.079	0.104	0.042	0.041	0.100	0.128	0.067	0.074
5	0.434	0.237	0.495	0.204	0.140	0.157	0.137	0.121	0.378	0.328	0.227	0.364
6	0.508	0.241	0.448	0.215	0.182	0.159	0.171	0.249	0.412	0.502	0.293	0.833
7	0.671	0.212	0.446	0.209	0.281	0.177	0.154	0.263	0.470	0.371	0.250	0.650
8	0.541	0.233	0.243	0.190	0.241	0.372	0.196	0.240	0.274	0.322	0.270	0.341
9	0.644	0.338	0.202	0.124	0.249	0.423	0.337	0.237	0.238	0.314	0.535	0.399
10	0.781	0.314	0.156	0.158	0.180	0.478	0.297	0.428	0.211	0.310	0.510	0.569
11	0.960	0.196	0.112	0.102	0.323	0.536	0.338	0.209	0.370	0.208	0.640	0.527
12	0.654	0.273	0.261	0.170	0.238	0.362	0.246	0.292	0.298	0.329	0.391	0.490

	1989	1990	1991	1992	1993	1994
3	0.166	0.210	0.194	0.198	0.129	0.311
4	0.254	0.729	0.199	0.543	0.211	0.352
5	0.581	1.211	0.341	0.408	0.381	0.105
6	0.584	0.853	0.448	0.365	0.434	0.117
7	0.640	0.392	0.729	0.354	0.331	0.138
8	0.451	0.541	0.716	0.353	0.178	0.040
9	0.272	0.378	1.175	0.422	0.226	0.026
10	0.283	0.424	0.663	0.958	0.291	0.012
11	0.463	0.297	0.828	0.431	1.390	0.003
12	0.411	0.434	0.821	0.522	0.257	0.054

Table 17. Cont'd. : Residuals

MEAN SQUARE RESIDUALS : 0.8735869444
MEAN RESIDUAL : 0.000040481844
SUM OF ALL RESIDUALS : 0.01603081022

LOG RESIDUALS FROM RV1 14/ 6/95

	1977	1978	1979	1980	1981	1982	1984	1985	1986	1987
3	0.222	0.067	-0.260	-0.891	0.086	-1.233	-0.131	-0.191	-0.773	0.965
4	0.592	0.218	0.430	-1.392	-0.712	-0.256	0.625	-0.045	0.444	1.906
5	1.322	0.129	0.686	-1.305	-0.098	-1.367	0.777	-0.339	0.440	2.370
6	0.918	0.336	0.298	-1.611	-0.183	-1.133	1.074	-0.531	-0.112	2.160
7	0.827	0.392	0.027	-1.481	-0.474	-1.128	0.479	-0.310	-0.424	1.911
8	0.946	-1.021	-0.107	-0.532	-0.277	-0.683	0.259	-0.019	-0.175	1.034
9	-0.201	-1.842	-0.103	-0.449	0.538	-0.810	0.225	0.204	-0.305	1.181
10	0.845	-1.012	-1.067	-0.136	-0.189	-0.458	0.865	0.031	0.152	0.313
11	-1.156	0.275	-0.328	-0.185	-0.943	-1.280	0.809	0.620	-0.078	0.494

	1988	1989	1990	1991	1992	1993	1994
3	-0.006	-0.133	0.008	0.156	0.039	1.990	0.085
4	-0.701	-0.527	0.023	-0.199	-1.409	1.719	-0.715
5	-0.748	-0.647	0.436	-0.382	-1.447	1.146	-0.972
6	-0.358	-0.385	0.125	-0.302	-0.972	1.119	-0.444
7	-0.243	-0.073	0.552	0.304	-1.198	0.892	-0.053
8	0.028	-0.170	0.591	0.240	-0.440	0.959	-0.634
9	0.443	-0.422	0.245	0.684	0.230	0.524	-0.141
10	0.830	0.114	-0.033	-0.559	0.668	0.368	-0.732
11	0.224	0.849	0.088	-0.617	-0.511	2.094	-0.356

SUM OF RV RESIDUALS : 0.004248955865 MEAN RESIDUAL : 0.00002777095336

LOG RESIDUALS FROM RV2 14/ 6/95

	1977	1978	1979	1980	1981	1982	1983	1984	1985
3	0.193	0.095	-0.656	-0.832	-0.554	0.100	-0.159	0.638	1.555
4	0.668	0.244	-1.111	-0.783	-0.343	0.241	0.355	0.874	1.388
5	1.149	0.907	-0.799	-1.082	-0.667	0.898	0.307	0.958	1.793
6	1.133	1.065	-0.586	-0.672	-1.455	0.383	0.975	0.442	1.447
7	1.675	0.868	0.012	-0.199	-1.223	-0.328	0.611	0.630	1.141
8	1.798	1.212	-0.108	0.379	-0.890	-2.099	-0.182	0.385	0.858
9	0.525	0.745	0.225	-0.319	-0.760	0.435	0.401	-0.669	0.113
10	0.471	-0.218	0.869	0.280	-1.389	0.732	0.384	-0.206	-0.482
11	0.769	3.080	-0.188	0.122	-0.355	-0.114	0.398	-1.050	-0.277

	1986	1987	1988	1989	1990	1991	1993
3	1.196	-0.238	0.252	-1.151	-1.771	-0.385	1.717
4	1.475	-0.991	-1.303	-1.296	-1.458	0.514	1.526
5	1.063	-1.842	-2.149	-1.656	-1.243	0.818	1.545
6	1.066	-1.564	-1.798	-1.468	-0.731	0.487	1.277
7	1.036	-0.890	-1.796	-1.072	-1.460	0.272	0.722
8	1.253	-0.210	-1.105	-0.839	-1.684	0.664	0.568
9	0.933	-0.083	-0.451	-1.598	-2.141	1.466	1.180
10	0.343	-0.052	-0.125	-1.844	-1.374	0.558	2.052
11	-1.148	-0.320	-0.563	-1.400	-1.736	-0.014	2.794

SUM OF RV RESIDUALS : 0.002028247152 MEAN RESIDUAL : 0.00001408504966

LOG RESIDUALS FROM RV3 14/ 6/95

	1990	1991	1992	1993	1994
3	-0.232	0.348	1.193	-0.783	-0.526
4	0.420	0.372	1.023	-0.728	-1.086
5	0.448	0.930	0.319	-0.744	-0.952
6	0.258	1.038	-0.133	-0.604	-0.559
7	0.294	1.725	0.218	-0.167	-2.069
8	-0.099	1.243	-0.154	-0.131	-0.858
9	-0.388	2.128	-0.061	-0.295	-1.384
10	-0.120	0.743	0.559	-0.799	-0.382
11	-1.476	0.180	0.964	1.007	-0.674

SUM OF RV RESIDUALS : 0.004918672205 MEAN RESIDUAL : 0.0001093038268

LOG RESIDUALS FROM RV4 14/ 6/95

	1989	1990	1991	1992	1993	1994
3	-0.019	0.164	0.310	-0.665	-0.250	0.460
4	-0.043	0.859	0.012	-0.402	-0.320	-0.105
5	-0.113	0.860	0.180	-0.493	-0.148	-0.285
6	-0.150	0.582	0.384	-0.287	-0.397	-0.132
7	0.317	0.361	0.517	0.011	-0.132	-1.073
8	-0.020	0.541	0.236	-0.052	-0.237	-0.467
9	-0.458	0.470	1.086	-0.509	-0.217	-0.372
10	-0.117	0.194	0.189	0.171	0.255	-0.691
11	-0.513	-0.841	-0.505	1.109	1.428	-0.676

SUM OF RV RESIDUALS : 0.004834935002 MEAN RESIDUAL : 0.00008953583338

Table 18. Results from ADAPT using Canadian and Russian RV survey indices (1993 data omitted): parameters with associated CV's.

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.010385
MEAN SQUARE RESIDUALS 0.751855

PARAMETER	AGE	ESTIMATE	STD. ERR.	T-STAT	C.V.
NUMBERS					
	3	796	324	2.453	0.408
	4	4361	1106	3.942	0.254
	5	5430	1952	2.782	0.359
	6	593	219	2.703	0.370
	7	319	106	3.001	0.333
	8	362	141	2.575	0.388
	9	180	67	2.677	0.374
	10	48	19	2.563	0.390
	11	54	22	2.421	0.413
INDEX 1: RV1					
	3	1.80E-4	3.96E-5	4.548	0.220
	4	2.18E-4	4.77E-5	4.566	0.219
	5	2.18E-4	4.76E-5	4.570	0.219
	6	2.14E-4	4.68E-5	4.560	0.219
	7	2.67E-4	5.87E-5	4.555	0.220
	8	2.68E-4	5.87E-5	4.557	0.219
	9	3.94E-4	8.64E-5	4.564	0.219
	10	5.44E-4	1.19E-4	4.569	0.219
	11	7.24E-4	1.59E-4	4.548	0.220
INDEX 2: RV2					
	3	4.34E-4	9.71E-5	4.463	0.224
	4	4.00E-4	8.96E-5	4.464	0.224
	5	3.84E-4	8.60E-5	4.462	0.224
	6	3.88E-4	8.69E-5	4.461	0.224
	7	3.95E-4	8.86E-5	4.462	0.224
	8	4.05E-4	9.07E-5	4.463	0.224
	9	5.25E-4	1.17E-4	4.466	0.224
	10	6.90E-4	1.55E-4	4.464	0.224
	11	9.58E-4	2.15E-4	4.465	0.224
INDEX 3: RV3					
	3	4.04E-4	1.67E-4	2.415	0.414
	4	6.04E-4	2.51E-4	2.401	0.416
	5	6.94E-4	2.85E-4	2.437	0.410
	6	8.30E-4	3.42E-4	2.424	0.412
	7	4.50E-4	1.88E-4	2.393	0.418
	8	4.72E-4	1.96E-4	2.415	0.414
	9	4.07E-4	1.68E-4	2.423	0.413
	10	5.55E-4	2.29E-4	2.427	0.412
	11	2.05E-3	8.44E-4	2.427	0.412
INDEX 4: RV4					
	3	1.70E-3	6.36E-4	2.679	0.373
	4	1.26E-3	4.72E-4	2.673	0.374
	5	9.87E-4	3.66E-4	2.700	0.370
	6	7.34E-4	2.73E-4	2.688	0.372
	7	5.84E-4	2.19E-4	2.662	0.376
	8	4.78E-4	1.79E-4	2.671	0.374
	9	3.42E-4	1.28E-4	2.681	0.373
	10	3.52E-4	1.31E-4	2.683	0.373
	11	1.56E-3	5.79E-4	2.687	0.372

Table 18. Cont'd. : Population numbers and fishing mortality.

POPULATION NUMBERS (000S) 14/ 6

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	45344	40128	17369	19736	27477	21446	34880	41350	32237	8740
4	18830	36575	32021	14156	15918	22040	17283	27490	33802	26342
5	7941	13183	26021	22754	10635	12045	16255	13565	21602	25003
6	4158	4212	8515	12973	15180	7565	8422	11595	9829	12074
7	1293	2047	2708	4452	8563	10350	5278	5806	7391	5300
8	468	541	1356	1418	2957	5289	7091	3701	3650	3772
9	486	223	350	870	960	1901	2981	4764	2378	2267
10	132	209	130	234	629	612	1018	1740	3069	1532
11	73	50	125	91	164	430	311	618	926	2031
12	57	23	33	91	67	97	205	181	410	522
3+	78783	97190	88629	76776	82550	81777	93724	110810	115296	87583

	1987	1988	1989	1990	1991	1992	1993	1994
3	6450	12901	12843	5133	5732	17367	6693	789
4	7017	4814	10312	8780	3240	3695	10140	4290
5	18975	5363	3654	6468	3112	2044	1424	5398
6	14659	12376	3010	1632	1368	1648	916	590
7	5931	8885	4390	1324	527	628	795	317
8	2971	3758	3695	1887	702	176	301	361
9	2230	1842	2164	1864	892	242	86	180
10	1351	1061	995	1333	1000	217	108	48
11	917	659	484	604	694	365	62	53
12	1347	390	314	245	359	222	160	6
3+	61849	52051	41861	29270	17626	26602	20685	12032

ADAPT (6 INDEX) TUNING JUNE 1991
3NO CODS 6/14/95 02:01

FISHING MORTALITY 14/ 6.

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
3	0.015	0.026	0.005	0.015	0.021	0.016	0.038	0.002	0.002	0.020	0.093	0.024
4	0.157	0.140	0.142	0.086	0.079	0.104	0.042	0.041	0.102	0.128	0.069	0.076
5	0.434	0.237	0.496	0.205	0.141	0.158	0.138	0.122	0.382	0.334	0.227	0.378
6	0.509	0.242	0.448	0.215	0.183	0.160	0.172	0.250	0.418	0.511	0.301	0.836
7	0.671	0.212	0.447	0.209	0.282	0.178	0.155	0.264	0.473	0.379	0.256	0.677
8	0.541	0.234	0.243	0.190	0.242	0.374	0.198	0.242	0.276	0.325	0.278	0.352
9	0.645	0.339	0.202	0.124	0.250	0.424	0.338	0.240	0.240	0.317	0.543	0.416
10	0.782	0.315	0.156	0.158	0.180	0.479	0.299	0.431	0.213	0.313	0.518	0.584
11	0.963	0.196	0.112	0.102	0.324	0.538	0.340	0.210	0.373	0.211	0.654	0.540
12	0.657	0.274	0.262	0.170	0.238	0.364	0.248	0.294	0.300	0.334	0.399	0.507

	1989	1990	1991	1992	1993	1994
3	0.180	0.260	0.239	0.338	0.245	0.389
4	0.266	0.837	0.261	0.753	0.430	0.890
5	0.606	1.354	0.436	0.603	0.682	0.258
6	0.621	0.931	0.579	0.528	0.863	0.265
7	0.644	0.434	0.896	0.534	0.591	0.389
8	0.485	0.549	0.866	0.514	0.317	0.083
9	0.285	0.422	1.216	0.602	0.387	0.050
10	0.299	0.452	0.809	1.058	0.507	0.023
11	0.483	0.321	0.941	0.623	2.120	0.006
12	0.428	0.464	0.947	0.677	0.450	0.136

Table 18. Cont'd. : Residuals

MEAN SQUARE RESIDUALS : 0.7518550912
MEAN RESIDUAL : 0.000004815315796
SUM OF ALL RESIDUALS : 0.001820189371

LOG RESIDUALS FROM RV1 14/ 6/95

	1977	1978	1979	1980	1981	1982	1984	1985	1986	1987
3	0.259	0.106	-0.220	-0.852	0.125	-1.187	-0.081	-0.153	-0.708	1.028
4	0.583	0.209	0.424	-1.398	-0.718	-0.262	0.624	-0.039	0.437	1.926
5	1.281	0.088	0.645	-1.343	-0.135	-1.405	0.746	-0.370	0.416	2.331
6	0.883	0.301	0.263	-1.645	-0.214	-1.164	1.043	-0.553	-0.131	2.149
7	0.764	0.330	-0.035	-1.543	-0.535	-1.186	0.421	-0.367	-0.466	1.871
8	0.913	-1.054	-0.139	-0.564	-0.309	-0.714	0.233	-0.045	-0.199	1.029
9	-0.250	-1.890	-0.151	-0.496	0.490	-0.856	0.184	0.164	-0.344	1.146
10	0.797	-1.060	-1.114	-0.183	-0.236	-0.503	0.823	-0.006	0.116	0.279
11	-1.110	0.320	-0.282	-0.140	-0.897	-1.233	0.859	0.673	-0.020	0.559

	1988	1989	1990	1991	1992	1994
3	0.072	-0.012	0.258	0.403	0.615	0.349
4	-0.681	-0.488	0.160	0.062	-1.079	0.241
5	-0.752	-0.647	0.520	-0.177	-1.091	-0.107
6	-0.390	-0.357	0.183	-0.075	-0.632	0.339
7	-0.263	-0.129	0.592	0.458	-0.843	0.932
8	0.028	-0.130	0.570	0.405	-0.094	0.072
9	0.435	-0.426	0.308	0.673	0.544	0.470
10	0.807	0.123	-0.016	-0.400	0.727	-0.154
11	0.294	0.937	0.210	-0.437	-0.090	0.358

SUM OF RV RESIDUALS : 0.000381241774 MEAN RESIDUAL : 0.00000264751232

LOG RESIDUALS FROM RV2 14/ 6/95

	1977	1978	1979	1980	1981	1982	1983	1984	1985
3	0.264	0.169	-0.582	-0.758	-0.480	0.181	-0.079	0.723	1.627
4	0.732	0.309	-1.044	-0.715	-0.277	0.308	0.429	0.946	1.467
5	1.218	0.977	-0.729	-1.009	-0.594	0.971	0.380	1.037	1.872
6	1.186	1.117	-0.533	-0.619	-1.398	0.439	1.031	0.497	1.513
7	1.694	0.887	0.032	-0.179	-1.202	-0.304	0.635	0.654	1.166
8	1.811	1.225	-0.095	0.393	-0.875	-2.084	-0.163	0.404	0.877
9	0.585	0.806	0.285	-0.258	-0.699	0.497	0.464	-0.601	0.181
10	0.581	-0.108	0.979	0.391	-1.278	0.844	0.497	-0.091	-0.362
11	0.935	3.244	-0.023	0.287	-0.190	0.052	0.566	-0.881	-0.105

	1986	1987	1988	1989	1990	1991
3	1.295	-0.140	0.365	-0.996	-1.486	-0.103
4	1.540	-0.898	-1.210	-1.184	-1.248	0.847
5	1.150	-1.772	-2.042	-1.544	-1.048	1.134
6	1.135	-1.487	-1.743	-1.353	-0.586	0.801
7	1.075	-0.848	-1.734	-1.046	-1.338	0.508
8	1.274	-0.169	-1.060	-0.754	-1.659	0.874
9	1.002	-0.009	-0.351	-1.494	-1.969	1.562
10	0.464	0.072	0.011	-1.677	-1.200	0.875
11	-0.971	-0.137	-0.375	-1.193	-1.495	0.285

SUM OF RV RESIDUALS : 0.0000645093185 MEAN RESIDUAL : 4.778468037E-7

LOG RESIDUALS FROM RV3 14/ 6/95

	1990	1991	1992	1993	1994
3	-0.396	0.180	1.385	-0.501	-0.668
4	0.038	0.098	0.867	-0.498	-0.505
5	0.108	0.696	0.268	-0.563	-0.508
6	-0.138	0.830	-0.217	-0.268	-0.207
7	-0.124	1.462	0.162	-0.028	-1.472
8	-0.498	1.076	-0.136	0.078	-0.520
9	-0.633	1.806	-0.010	-0.074	-1.089
10	-0.393	0.652	0.353	-0.513	-0.099
11	-1.818	-0.074	0.978	1.345	-0.430

SUM OF RV RESIDUALS : 0.000703197584 MEAN RESIDUAL : 0.00001562661298

LOG RESIDUALS FROM RV4 14/ 6/95

	1989	1990	1991	1992	1993	1994
3	-0.269	0.053	0.195	-0.428	0.080	0.369
4	-0.454	0.569	-0.166	-0.474	-0.008	0.533
5	-0.488	0.598	0.027	-0.471	0.097	0.237
6	-0.505	0.267	0.252	-0.298	-0.010	0.295
7	-0.110	0.039	0.340	0.040	0.086	-0.396
8	-0.291	0.203	0.119	0.016	0.023	-0.070
9	-0.723	0.282	0.821	-0.413	0.052	-0.019
10	-0.348	-0.026	0.140	0.011	0.577	-0.355
11	-0.814	-1.107	-0.691	1.184	1.783	-0.355

SUM OF RV RESIDUALS : 0.0005712406843 MEAN RESIDUAL : 0.00001343038333

Table 19. Cohort population numbers at the beginning of the year (000's) for cod in Div. 3NO, 1959-94.

POPULATION NUMBERS

AGE	1959	1960	1961	1962	1963	1964	1965	1966	1967
3	53837	52942	82277	107848	78583	112439	162502	209951	183247
4	94022	42530	41675	66628	87370	64055	86445	132129	171212
5	19450	65183	28936	30139	51038	66323	38369	63089	91617
6	16417	11339	33416	13108	22680	31643	36660	24520	34500
7	11864	7990	6483	13553	9301	14181	18742	18018	9403
8	4088	6153	4390	3485	7844	5864	9554	6422	7074
9	2828	2087	2772	2082	2154	2948	3798	3454	1216
10	3468	1630	1182	1503	1100	710	1700	2131	1173
11	2306	2002	985	790	839	350	284	263	212
12	340	784	826	784	442	395	253	85	105
3+	208620	192639	202942	239919	261351	298908	358307	460862	499658
4+	154784	139698	120664	132071	182768	186469	195806	250911	316411
5+	60762	97168	78990	65443	95398	122414	109360	118782	145199
6+	41311	31985	50054	35304	44360	56091	70991	54894	53682

AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976
3	100485	127819	80366	84408	62151	34817	36329	22759	27483
4	131855	67468	97271	63893	68247	50823	19405	23930	18026
5	83677	56582	43544	61811	27971	37963	16636	7291	11647
6	29399	24526	21941	25879	23190	11781	17420	3752	2777
7	11491	7344	9955	9385	10602	6833	4227	4425	805
8	3379	3674	4123	4851	4517	3357	3811	1427	857
9	1583	1326	1748	1896	1710	2172	1869	1177	210
10	782	839	617	941	1100	1142	1139	612	130
11	798	479	423	370	590	705	715	321	84
12	109	572	271	141	212	412	453	198	35
3+	363557	290628	260257	253575	200289	150005	102004	65892	62054
4+	263073	162809	179891	169167	138138	115188	65675	43133	34571
5+	131218	95342	82620	105274	69891	64365	46270	19202	16545
6+	47541	38760	39076	43463	41920	26402	29633	11912	4898

AGE	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	45342	40122	17370	19737	27479	21446	34880	41351	32204	8749
4	18833	36574	32017	14157	15919	22041	17282	27491	33803	26315
5	7942	13185	26020	22750	10636	12046	16256	13564	21603	25003
6	4157	4212	8517	12972	15177	7566	8423	11596	9829	12074
7	1293	2046	2708	4454	8562	10347	5279	5807	7391	5300
8	468	541	1355	1418	2958	5289	7089	3701	3650	3772
9	486	223	350	869	960	1902	2980	4762	2379	2267
10	132	209	130	234	629	613	1019	1740	3068	1532
11	73	50	125	91	164	430	311	619	926	2030
12	57	23	33	91	67	97	205	181	411	522
3+	78783	97184	88626	76774	82550	81776	93724	110811	115263	87565
4+	33441	57062	71255	57037	55071	60330	58844	69460	83059	78815
5+	14608	20488	39239	42880	39153	38290	41561	41969	49256	52500
6+	6666	7303	13219	20130	28517	26244	25306	28405	27653	27497

AGE	1987	1988	1989	1990	1991	1992	1993	1994
3	6453	12905	12840	5133	5732	17364	6694	789
4	7025	4816	10315	8778	3240	3695	10138	4292
5	18953	5370	3655	6471	3110	2044	1424	5396
6	14659	12358	3015	1634	1370	1646	916	590
7	5931	8885	4375	1328	528	629	794	316
8	2971	3759	3696	1875	705	177	303	360
9	2231	1842	2164	1864	882	245	87	181
10	1351	1062	995	1333	1000	209	111	49
11	917	659	485	604	694	365	55	55
12	1346	391	315	245	359	222	160	1
3+	61836	52045	41854	29263	17620	26595	20681	12028
4+	55384	39141	29014	24130	11889	9230	13987	11239
5+	48359	34325	18699	15352	8649	5536	3850	6947
6+	29406	28955	15044	8882	5538	3492	2425	1551

Table 20. Cohort population biomass at the beginning of the year (tons) for cod in Div. 3NO, 1959-94.

POPULATION BIOMASS AT BEGINNING OF YEAR

AGE	1959	1960	1961	1962	1963	1964	1965	1966	1967
3	16183	15913	24731	32417	23621	33797	46624	73597	64236
4	62445	24959	24457	39101	51273	37591	50731	81235	112532
5	19466	65993	29296	30513	51672	67147	38846	67220	100876
6	26621	17702	52171	20465	35409	49403	57236	40103	58839
7	30514	18735	15202	31781	21812	33254	43949	44728	24451
8	12790	19024	13575	10776	24253	18132	29539	22127	25801
9	10380	7667	10181	7647	7912	10827	13950	16014	6282
10	15326	7037	5099	6487	4747	3062	7338	11791	8192
11	11166	9923	4881	3916	4157	1737	1408	1654	1712
12	1937	4461	4703	4460	2517	2250	1442	624	975
3+	206826	191415	184297	187563	227374	257201	291064	359093	403695
4+	190644	175501	159565	155145	203753	223403	244439	285496	339460
5+	128199	150543	135108	116044	152479	185812	193709	204261	226928
6+	108733	84550	105813	85531	100807	118665	154863	137041	126051

AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976
3	35224	44806	28172	28501	24663	17536	10482	5589	9717
4	86664	44344	63933	41995	46569	37347	12517	14631	10600
5	92234	62368	47997	68132	31843	44711	18224	7047	13047
6	49970	41688	37293	43987	38860	20922	29165	5998	4795
7	29882	19098	25886	24405	26365	18774	10578	10978	2118
8	12323	13401	15037	17694	15149	12279	15689	4923	3049
9	8179	6849	9029	9795	8556	10247	10879	5982	1108
10	5460	5860	4306	6573	7808	8612	6653	4296	907
11	6434	3865	3411	2985	4717	6643	6407	1721	656
12	1019	5320	2523	1311	1968	4448	4151	1529	281
3+	327389	247598	237585	245376	206497	181519	124745	62693	46278
4+	292164	202792	209414	216875	181834	163982	114263	57105	36561
5+	205500	158448	145480	174880	135266	126635	101746	42474	25961
6+	113266	96079	97483	106748	103423	81924	83522	35426	12913

AGE	1977	1978	1979	1980	1981	1982	1983	1984	1985
3	19042	24761	8926	10478	21690	18069	25489	31309	10657
4	13317	28295	26894	11639	15116	22617	18124	27180	27862
5	9217	16415	31435	29278	14713	16626	24045	18029	27115
6	7773	7686	15329	24181	32360	15222	16730	23944	17293
7	3696	6231	6882	12368	25506	33213	15263	16419	20120
8	1838	2175	5040	5630	13117	22854	31637	14520	13724
9	2614	1209	1640	4724	6009	12019	17114	26060	12317
10	1015	1505	866	1551	5356	4853	7928	11704	21239
11	741	453	950	794	1493	4061	2763	5255	7523
12	580	281	327	918	700	1021	2133	1928	4094
3+	59833	89011	98287	101562	136061	150555	161225	176348	161943
4+	40791	64250	89361	91084	114371	132486	135736	145038	151287
5+	27474	35955	62467	79444	99254	109869	117612	117859	123425
6+	18257	19540	31033	50166	84542	93243	93567	99829	96310

AGE	1986	1987	1988	1989	1990	1991	1992	1993	1994
3	2353	2213	8341	4653	2271	2900	3727	2132	189
4	18323	3973	3371	8739	6300	2215	2209	5143	1746
5	28587	21717	5712	4624	7701	3942	1940	1334	4546
6	20770	24449	18852	5300	3274	2510	2785	1279	875
7	14176	14819	17948	10585	3284	1636	1603	1789	582
8	15817	12110	12406	11849	6897	2748	762	1030	1214
9	13786	13979	9092	11181	8966	4927	1360	464	815
10	12354	11400	7503	6489	10262	6738	1560	727	323
11	18457	9019	6039	3912	5304	6952	3223	444	286
12	4960	15056	4079	3371	2527	4086	2506	1386	5
3+	149583	128735	93344	70704	56786	38654	21675	15728	10581
4+	147230	126521	85004	66050	54515	35754	17948	13596	10392
5+	128908	122549	81632	57311	48215	33539	15738	8453	8646
6+	100321	100832	75920	52688	40514	29598	13799	7119	4099

Table 21. Cohort fishing mortalities for cod in Div. 3NO, 1959-94.

FISHING MORTALITY

AGE	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
3	0.036	0.039	0.011	0.011	0.004	0.063	0.007	0.004	0.129	0.198	0.073
4	0.166	0.185	0.124	0.067	0.076	0.312	0.102	0.167	0.516	0.646	0.238
5	0.340	0.468	0.592	0.084	0.278	0.393	0.248	0.416	0.936	1.027	0.747
6	0.520	0.359	0.702	0.143	0.270	0.324	0.510	0.758	0.899	1.187	0.702
7	0.457	0.399	0.421	0.347	0.261	0.195	0.871	0.735	0.824	0.940	0.377
8	0.472	0.597	0.546	0.281	0.779	0.234	0.817	1.464	1.297	0.736	0.543
9	0.351	0.369	0.412	0.438	0.911	0.350	0.378	0.880	0.241	0.435	0.565
10	0.350	0.304	0.203	0.383	0.944	0.715	1.667	2.107	0.186	0.290	0.485
11	0.879	0.685	0.028	0.380	0.552	0.124	1.005	0.720	0.462	0.133	0.370
12	0.403	0.413	0.393	0.360	0.719	0.372	0.928	1.286	0.633	0.596	0.489

AGE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
3	0.029	0.013	0.001	0.385	0.217	0.033	0.178	0.015	0.026	0.005	0.015	0.021
4	0.253	0.626	0.387	0.917	0.779	0.520	0.620	0.157	0.140	0.142	0.086	0.079
5	0.320	0.780	0.665	0.579	1.289	0.765	0.830	0.434	0.237	0.496	0.205	0.141
6	0.649	0.692	1.022	0.825	1.170	1.339	0.565	0.509	0.242	0.448	0.215	0.183
7	0.519	0.531	0.950	0.384	0.886	1.442	0.342	0.672	0.212	0.447	0.209	0.282
8	0.577	0.843	0.532	0.386	0.975	1.715	0.367	0.541	0.234	0.244	0.190	0.241
9	0.419	0.345	0.204	0.446	0.917	2.000	0.263	0.644	0.339	0.202	0.124	0.250
10	0.311	0.268	0.245	0.268	1.067	1.790	0.376	0.782	0.314	0.156	0.158	0.181
11	0.900	0.355	0.158	0.242	1.083	2.027	0.189	0.963	0.196	0.112	0.102	0.324
12	0.452	0.492	0.480	0.369	0.957	1.736	0.336	0.657	0.274	0.262	0.170	0.238

AGE	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	0.016	0.038	0.002	0.002	0.020	0.093	0.024	0.180	0.260	0.239	0.338
4	0.104	0.042	0.041	0.102	0.128	0.069	0.076	0.266	0.837	0.261	0.753
5	0.158	0.138	0.122	0.382	0.334	0.228	0.377	0.605	1.353	0.436	0.603
6	0.160	0.172	0.250	0.418	0.511	0.301	0.838	0.620	0.930	0.578	0.529
7	0.178	0.155	0.264	0.473	0.379	0.256	0.677	0.648	0.433	0.893	0.532
8	0.374	0.198	0.242	0.276	0.325	0.278	0.352	0.484	0.553	0.859	0.511
9	0.424	0.338	0.240	0.240	0.317	0.542	0.416	0.285	0.422	1.243	0.593
10	0.479	0.299	0.431	0.213	0.313	0.517	0.584	0.300	0.452	0.809	1.135
11	0.539	0.340	0.210	0.373	0.211	0.653	0.540	0.483	0.321	0.941	0.623
12	0.364	0.248	0.294	0.300	0.334	0.399	0.507	0.428	0.464	0.947	0.677

AGE	1993	1994
3	0.245	0.389
4	0.431	0.890
5	0.682	0.258
6	0.863	0.265
7	0.592	0.389
8	0.315	0.083
9	0.383	0.050
10	0.493	0.023
11	4.306	0.006
12	0.450	0.136

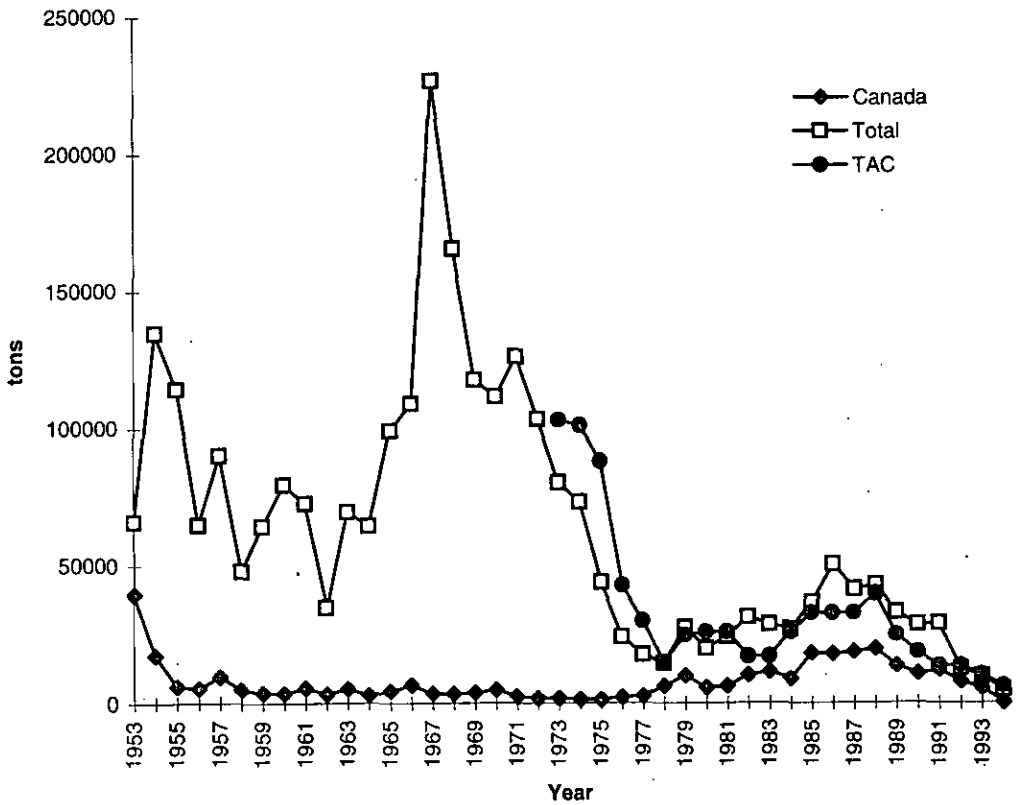


Figure 1. Landings of cod in NAFO Divisions 3NO: 1953-94.

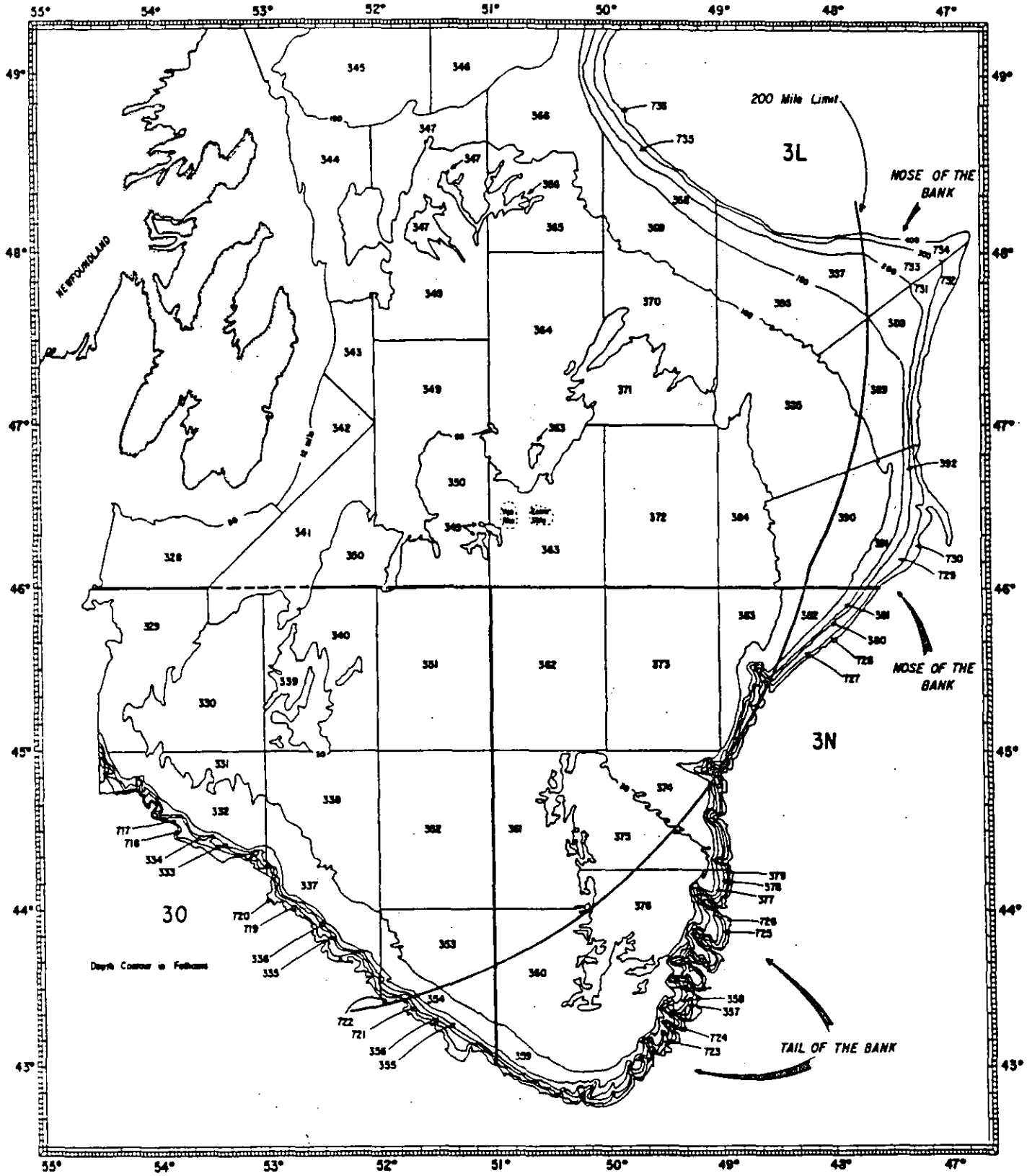
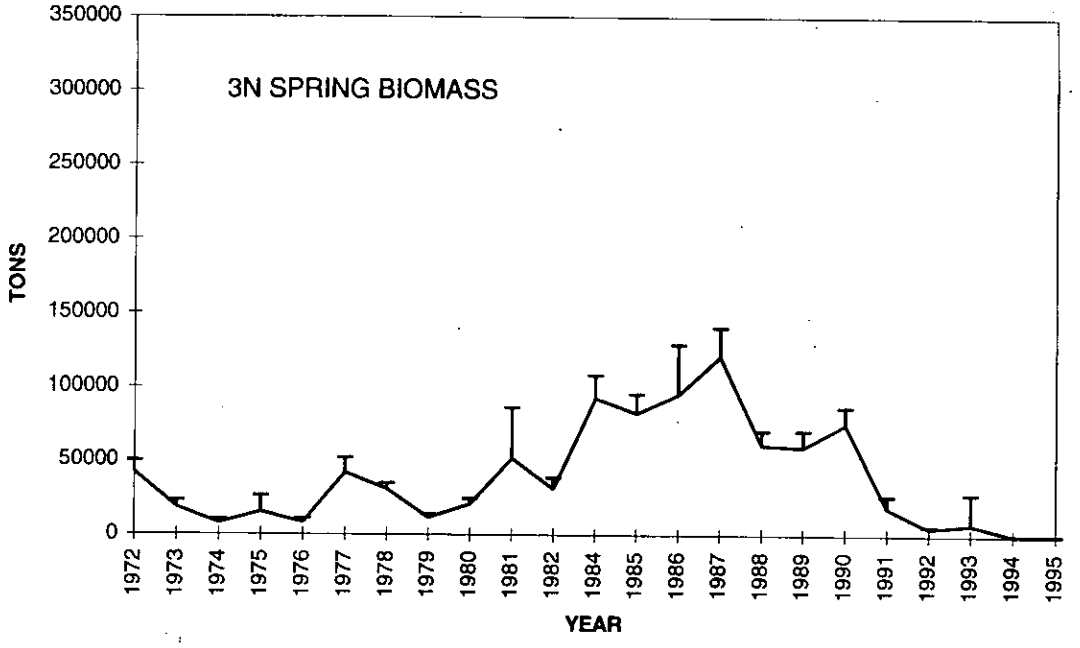


Figure 2. Stratification scheme for NAFO Divisions 3LNO showing the Canadian 200-mile limit.

Fig 3. Biomass estimates from Canadian Spring Rv Surveys.



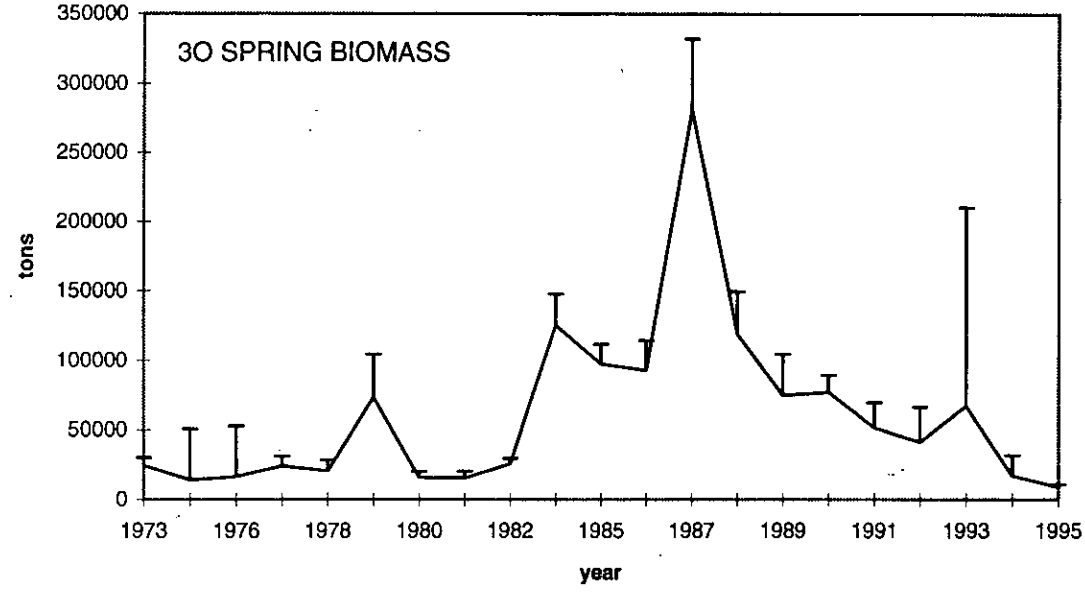
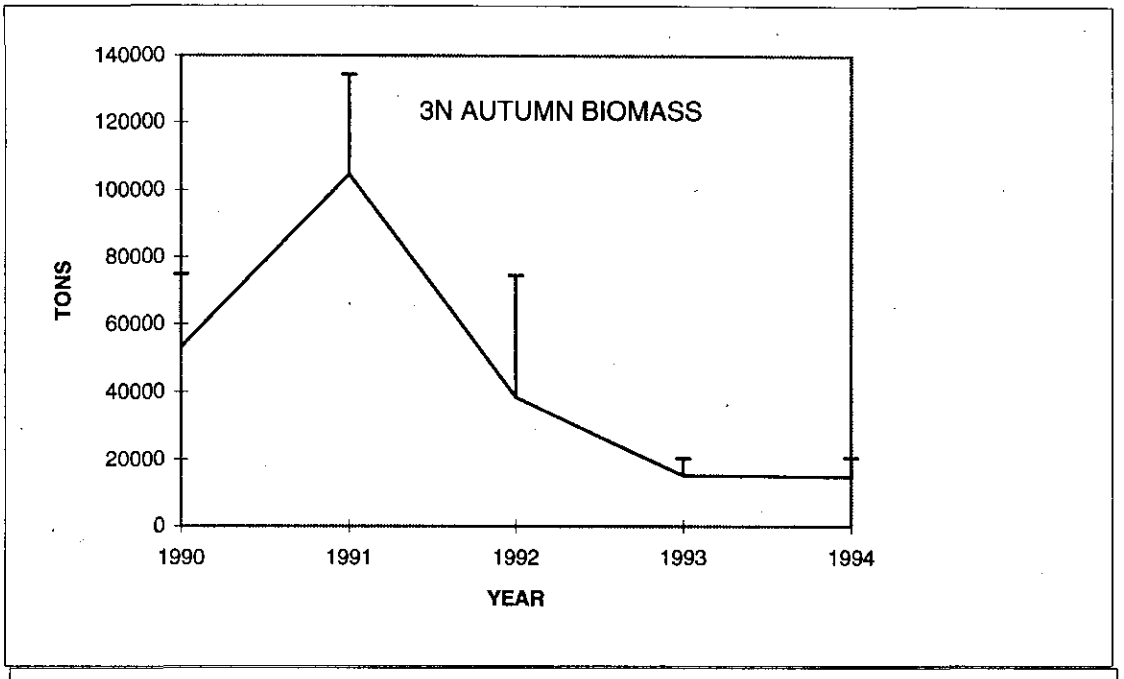
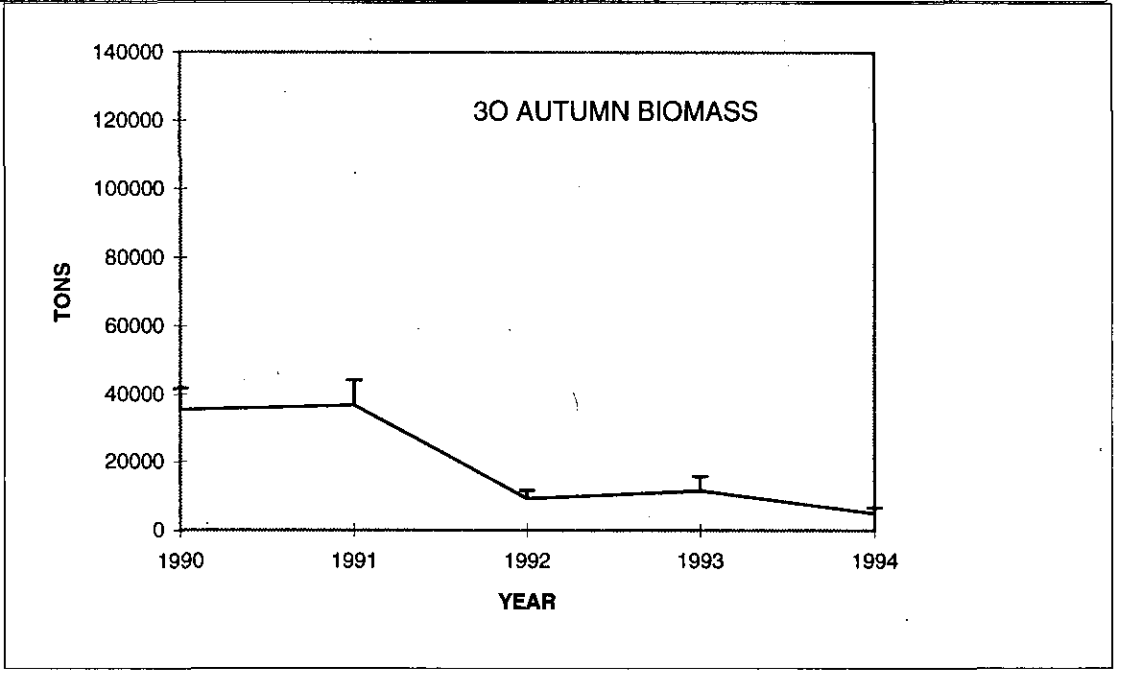


Fig 4. Biomass estimates from Canadian Autumn Rv Surveys.





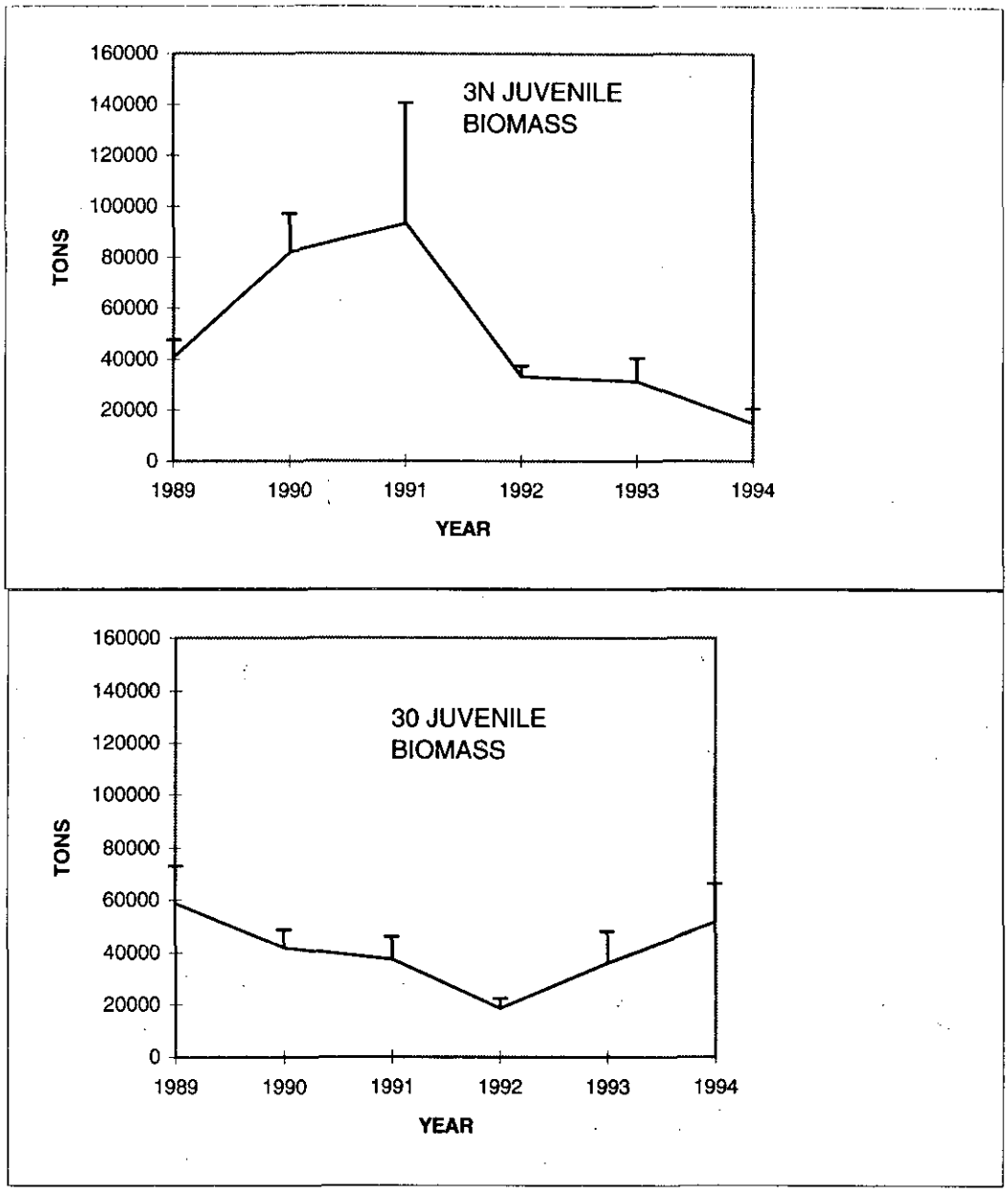


Fig 5. Biomass estimates from Canadian Juvenile Rv Surveys.

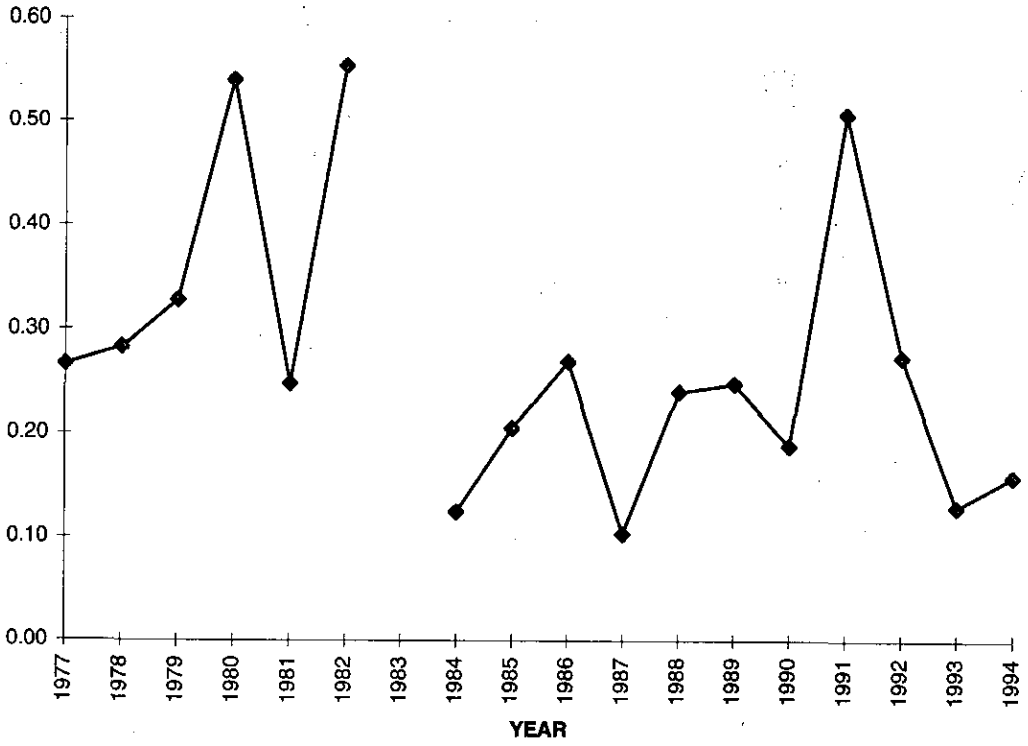


Fig 6. Ratio catch/Canadian Spring RV Biomass estimate.

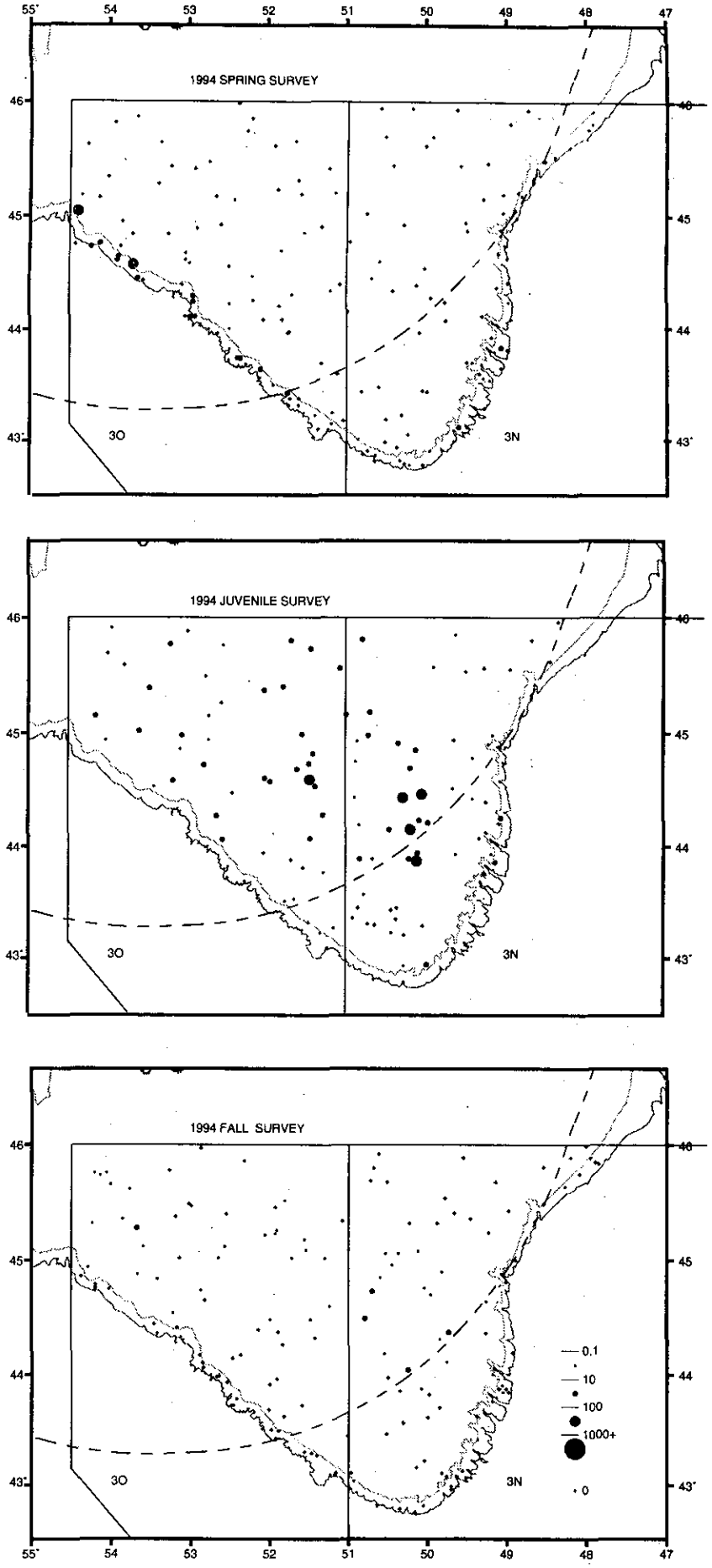


Figure 7. Distribution of Cod (numbers/tow) from Canadian RV Surveys in NAFO Divisions 3NO.

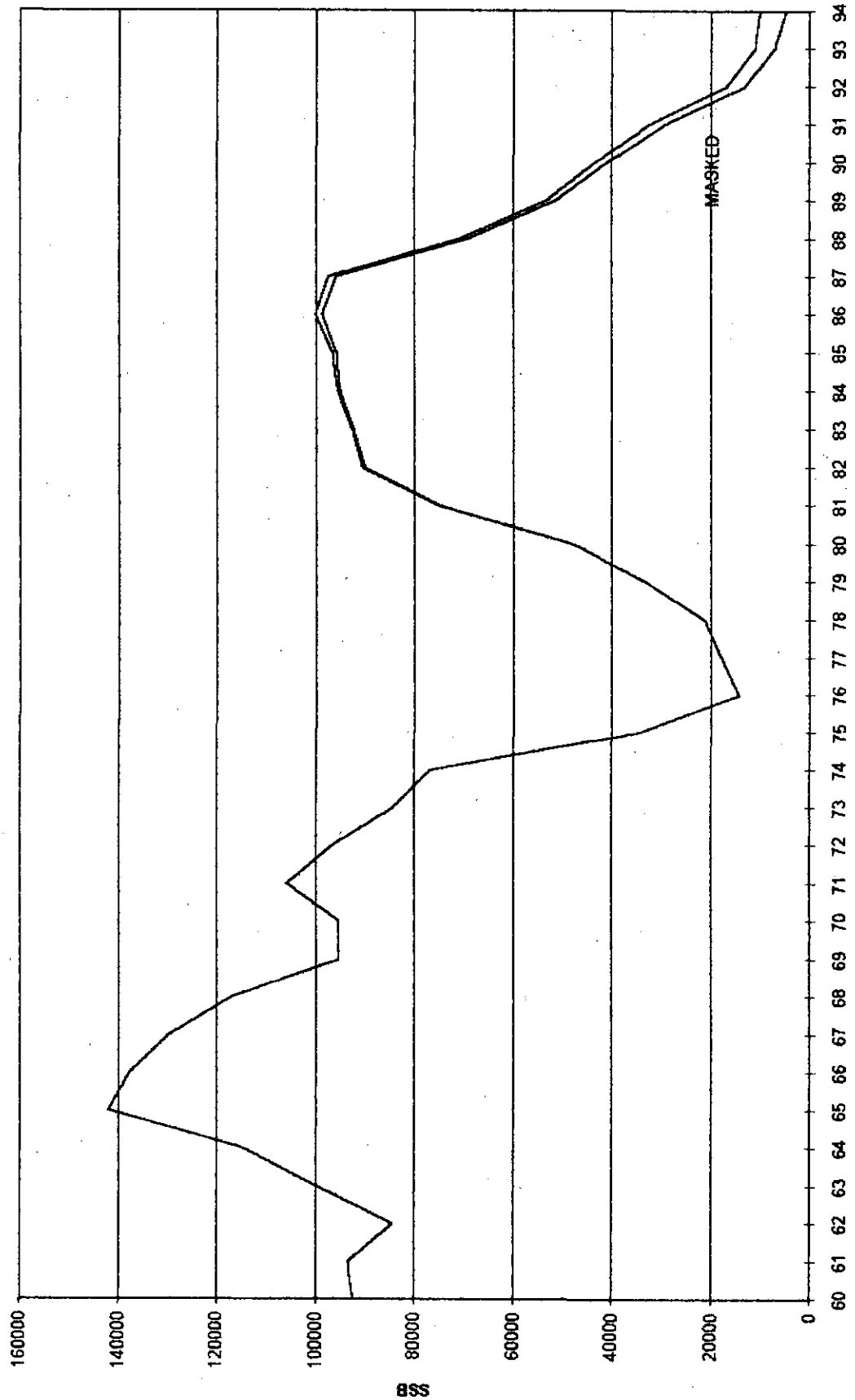


Figure 8. Annual spawning stock biomass for Div. 3NO cod: 1959-94. Populations from ADAPT analysis with and w/o data fro 1993 spring surveys.