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Contribution to the Assessment of the Cod Stock in Subdivision 3Ps

by

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1 Nominal catch and catch at age

Total cod catches by France in Subdivision 3Ps were 24 502 tons (1) in 1987. The offshore trawlers contribute to the main part of landings, their activities being mainly conducted from October to May. Their catches amounted to 23 951 tons (1) close to the 1986 value (Table 1). Cod landings of the inshore fleet (handlines and longlines) of Saint-Pierre et Miquelon were about 551 tons (1). They occurred mainly in summer.

Age compositions for the French fishery (Table 2) derived from the commercial sampling are described in table 3. As in 1986, the 1981 and 1982 year-classes (age 5 and 6 in 1987) were predominant. Estimated mean weights at age (from the landings) are given in table 4.

Catch rates for the OTB2 TC5 and OTB2 TC6-7 are shown in tables 5 and 6 respectively.

2 Survey data

2.1. Biomass and abundance indices

In 1988, a survey was carried out as usual in February-March. The biomass estimates calculated from the stratified random surveys since 1978 are given in table 7 and the corresponding abundance indices in table 8. Abundance estimates for the non sampled strata were filled in using a multiplicative model.

Despite two outstanding values observed in 1984 and 1986, the 1987 and 1988 biomass estimates are close to those observed from 1981 to 1983 (Fig. 1). Despite some variations from year to year, the abundance indices shown a increasing trend over the whole period (Table 9 and Fig. 1).

The estimate of the 1985 year class strength is confirmed in the most recent survey (Table 10 to 12 and Fig. 2 and 3) and the recruiting 1986 year class appears to be the second strongest in the series.

(1) Provisional data.

## 2.2. Biological data

After a decreasing trend observed in the last years, the 1988 mean lengths at age show a slight increase (Table 14 and Fig. 4).

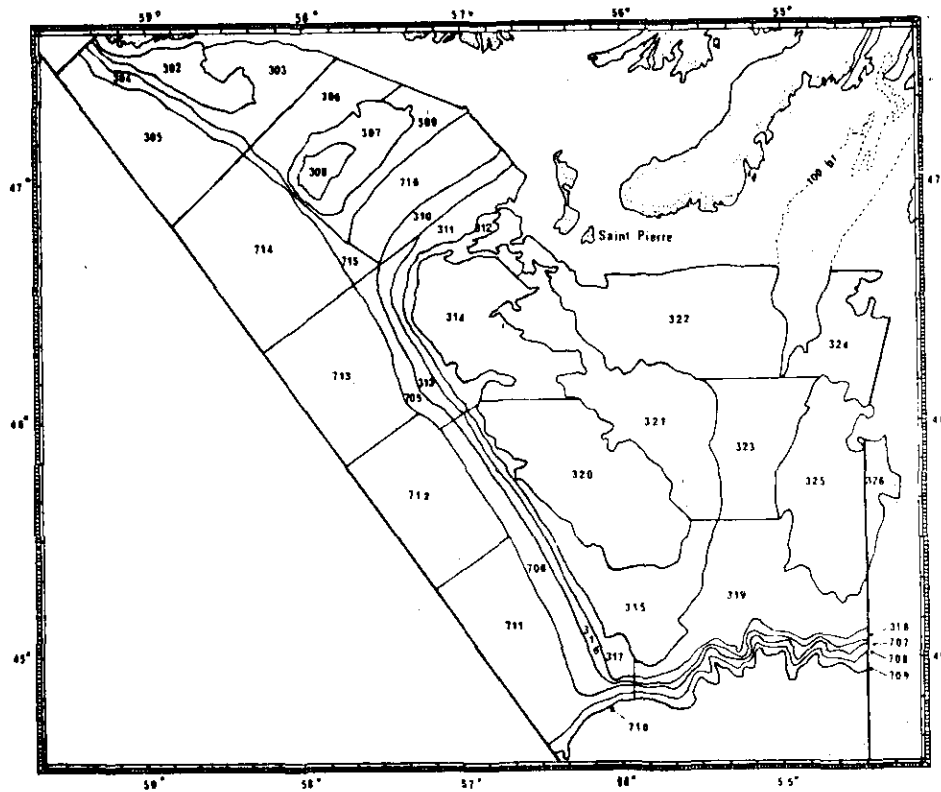
The mean age at sexual maturity has increased steadily from 1985 to 1987 with stabilisation in 1988 (Fig. 5 and Table 14). This may be related to the decreasing trend in average lengths at age.

The decrease of mean length at sexual maturity in 1986 (Fig. 6) illustrates a possible extension in the migration of the Gulf of St. Lawrence cod stock (3Pn, 4RS) as far as Burgeo Bank. (Poulard, 1986; Mabeau *et al.*, 1986). This is not identified with such a magnitude for the last two years.

## References

MABEAU S., POULARD J.C. and MAHE J.C., 1986 - Research survey abundance indices for the cod stock in NAFO Subdivision 3Ps, their reliability and compatibility with results of a cohort analysis - ICES Dem. Fish. Com. G: 38, 9 p + fig.

POULARD J.C., 1986 - Contribution to the assessment of the cod stock in Subdivision 3Ps - NAFO Res. Doc. 86/34, 7 p.



Stratification scheme for NAFO subdivisions 3Pn and 3Ps

Year	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987 <sup>(1)</sup>
Trawlers	4474	5854	4403	7474	5955	9013	10444	17866	25592	25 951
Inshore fishery	360	495	214	333	1009	843	777	642	389	551
Total France	4834	6349	4617	7807	6964	9856	11221	18508	25981	24 502

Table 1.- Evolution of the french catches of cod in Subdivision 3Ps from 1978 to 1987.  
<sup>(1)</sup> Provisional data

Year	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987		
Age	Total	Total	Total	Total	Total	Total	Total	Total	Total	Insh.	Offsh.	Total
2			13									
3	292	25	116	106	44	118	45	96	30		89	89
4	1115	956	186	362	1078	586	1470	2485	1407	9	692	692
5	1466	2152	673	591	1101	2541	1431	4844	6075	121	4842	4662
6	932	1196	1212	919	750	1427	1947	2206	5937	148	5006	5151
7	332	392	414	1262	591	575	940	1525	2126	79	2291	2368
8	87	121	127	238	400	268	217	465	745	12	745	757
9	16	30	28	87	57	163	232	121	205	4	553	557
10	10	19	8	13	5	27	89	112	61	2	127	129
11	5	5	1	3	1	8	38	121	43	1	79	80
12	3	5	2	3	3	3	11	53	33		6	6
13		2	2	2	1		2	6	28		26	26
14						1		6				
15							1					
16									3			
Total	4258	4903	2782	3548	4111	5717	6431	12040	17093	376	14144	14517
Total catches (m. tons)	4834	6349	4617	7807	6964	9856	11221	18508	25981	551	23951	24 502

Table 2.- Age composition (numbers in thousands) of the French catches in NAFO Subdivision 3Ps from 1978 to 1987.

Quarter	Gear	No aged	No measured
I	OTB2 (5)	206	1788
II	OTB2 (5)	167	1431
II	DORY	129	409
III	DORY	28	205
IV	OTB2 (5)	303	2010
IV	OTB2 (6)		2184

Table 3.- Cod sampling of commercial landings from Subdivision 3Ps in 1987.

Age	Mean weight (in kg)	Standard deviation	No of measures
3	0.610	0.091	17
4	0.778	0.237	78
5	1.117	0.388	217
6	1.697	0.521	219
7	2.543	0.617	172
8	3.097	0.771	61
9	4.474	1.444	41
10	4.742	1.346	13
11	5.614	2.118	6
12	4.442	0.416	2
13	7.242	1.823	4
Total			830

Table 4.- Mean weight at age of cod Subdivision 3Ps in 1987 from commercial sampling of landings (gutted-live conversion coefficient = 1.24).

Year	1978			1979			1980			1981			1982			1983			1984			1985			1986			1987 <sup>(1)</sup>		
	Cat. (t)	Eff. (h)	cpue (t/h)	Cat. (t)	Eff. (h)	cpue (t/h)	Cat. (t)	Eff. (h)	cpue (t/h)	Cat. (t)	Eff. (h)	cpue (t/h)	Cat. (t)	Eff. (h)	cpue (t/h)	Cat. (t)	Eff. (h)	cpue (t/h)	Cat. (t)	Eff. (h)	cpue (t/h)	Cat. (t)	Eff. (h)	cpue (t/h)	Cat. (t)	Eff. (h)	cpue (t/h)			
January				297	108	2.75	569	146	3.90	465	265	1.75	126	111	1.14	351	230	1.53	735	251	3.13	980	324	3.02	1453	452	3.21	3886	599	6.49
February	200	79	2.53				5	9	0.56	19	16	1.19										904	327	2.76	715	198	3.61	271	185	1.46
March	190	38	5.00	220	100	2.20	2	14	0.14	17	46	0.37	7	36	0.19							1279	728	1.76	820	396	2.07	1428	926	1.54
April	64	104	0.62	128	186	0.69				150	225	0.67	296	202	1.47	1127	1020	1.10	1235	626	1.97	1034	806	2.04	2451	760	3.23	2395	1332	1.80
May	10	99	0.10	176	585	0.30	152	236	0.67	159	324	0.49	1234	1019	1.21	640	911	0.70	774	633	1.22	1301	888	1.47	1599	1062	1.51	1160	1887	0.61
June							31	32	0.97				248	494	0.50	238	235	1.01	42	87	0.48	639	926	0.69	596	1209	0.49	265	1119	0.24
July										9	20	0.45	1	5	0.20	166	347	0.48	316	438	0.72	344	555	0.62	244	1030	0.24	122	780	0.16
August																									4	50	0.08			
September							33	53	0.62				121	226	0.54	3	12	0.25				152	152	1.00	140	284	0.49			
October	150	185	0.81	1062	730	1.45	215	341	0.63	13	20	0.65	444	921	0.48	397	413	0.96	731	805	0.91	507	986	0.51	756	1599	0.47	1476	1597	0.92
November	850	444	1.91	1269	631	2.01	579	298	1.94	1274	928	1.37	795	1028	0.77	1473	863	1.71	1502	842	1.78	1635	981	1.67	1885	781	2.41	2554	1591	1.61
December	150	169	0.89	632	419	1.51	129	130	0.99	675	569	1.19	406	478	0.85	370	402	0.92	642	287	2.24	430	269	1.60	2680	802	3.34	1659	1206	1.38
Total	1614	1118	1.44	3784	2759	1.37	1721	1259	1.37	2781	2413	1.15	3678	4520	0.81	4765	4433	1.07	5977	3969	1.51	9205	6642	1.39	13337	8622	1.55	15214	11223	1.36

(1) Provisional data

Table 5.- Cod 3Ps : Catches, efforts and c.p.u.e. for OTB2 class 5 french stern trawlers (main species sought: cod).

Year	1982			1983			1984			1985			1986			1987 (1)		
Month	Cat. (t)	Eff. (d)	cpue	Cat. (t)	Eff. (d)	cpue	Cat. (t)	Eff. (d)	cpue	Cat. (t)	Eff. (d)	cpue	Cat. (t)	Eff. (d)	cpue	Cat. (t)	Eff. (d)	cpue
January	180	26	6.9	580	23	25.2	70	3	23.3	294	9	32.7				2541	86	29.5
February				3	0.5	6.0	334	11	30.4	586	8	73.3	2262	103	21.9	3915	216	18.1
March	45	6	7.5	600	13	42.9	219	11	19.9	1138	51	22.3	1942	80	24.3	1259	84	15.0
April				132	3	44.0	221	6	36.8	565	32	17.7	2715	83	32.7	13	2	6.5
May							139	9	15.4	1387	49	28.3	1810	118	15.3			
June							23	2	11.5	181	30	6.0	26	21	1.2			
July																		
August																		
September										106	8	13.3						
October	37	8	4.6	491	20	24.6	755	24	31.4	1282	62	20.7	663	75	8.8	293	32	9.2
November	607	57	10.7	2081	68	30.6	1647	43	38.3	2795	99	28.2	1609	87	18.5	635	28	22.7
December	1315	63	20.9	351	11	31.9	263	7	37.6	111	17	6.5	912	29	31.5	79	12	6.6
Total	2184	159	13.7	4238	138	30.5	3671	115	31.9	8444	364	23.2	11939	596	20.0	8757	460	19.0

(1) Provisional data

Table 6.- Cod 3Ps: catches, efforts and cpue for French OTB2 class 6-7 stern trawlers.

Depth (m)	Strata	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
< 55	314	17	0		1390	111	30	0	7	13	133	
	320	108	814		3797	513	2803	3526	104	14		0
	<b>Total</b>	<b>125</b>	<b>814</b>		<b>5187</b>	<b>624</b>	<b>2833</b>	<b>3526</b>	<b>111</b>	<b>27</b>	<b>133</b>	<b>0</b>
56-90	308	371	9	150	88	299	151	111	65	100	29	6
	312	820	270	112	2304	454	636	1403	145	343	0	28
	315	771	850	0	1076	821	326	16918	8	1813	2058	2134
	321	183	4785	3746	2199	3746	1362	1026	3	543		649
	325				2101		1332	1466	81	259	0	453
	<b>Total</b>	<b>2145</b>	<b>5914</b>	<b>4008</b>	<b>7768</b>	<b>5320</b>	<b>3807</b>	<b>20924</b>	<b>302</b>	<b>3058</b>	<b>2087</b>	<b>3270</b>
91-180	307	3598	2714	4428	1876	9009	6269	5384	2976	23172	8089	565
	311	87	3199	1136	5797	8202	3572	19599	1276	20627	1356	4815
	317	0	260		813	454	421	21353	1502	2562	1049	815
	319	997	5810	1303	4435	4078	11349	8101	2831	3179	5746	5434
	322	605	1945	3381	1793	2404	967	1122	2388	5944	2734	215
	323	91	572	858	822	54	794	803	512	2399	953	311
	324				0		815	964	594	288	99	171
	<b>Total</b>	<b>5378</b>	<b>14500</b>	<b>11106</b>	<b>15536</b>	<b>24201</b>	<b>24187</b>	<b>57326</b>	<b>12079</b>	<b>58171</b>	<b>20026</b>	<b>12326</b>
181-270	306	3080	2660	2162	12197	3716	11967	2296	804	23131	8294	4041
	309	167	2743	804	2176	1122	3318	3852	1581	7434	1901	4827
	310	411	190	19	481	1683	739	229	4675	169	503	739
	313	113	331	1	1099	1279	840	170	1753	142	562	26
	316	91	121	39	282	544	36	332	38395	695	334	320
	318	42	25		593	34	5282	786	1828	28349	259	4558
	<b>Total</b>	<b>3904</b>	<b>6070</b>	<b>3025</b>	<b>16828</b>	<b>8378</b>	<b>22182</b>	<b>7665</b>	<b>49036</b>	<b>59920</b>	<b>11853</b>	<b>14511</b>
271-365	705	321	1115	13	574	4550	984	1661	99	414	354	394
	706	11	0	293	952	4010	375	1141	333	3896	13845	1413
	707		1303		13	10980	652	49	2314	3338	134	102
	715	836	832	1564	827	4159	1261	3806	2282	2613	1908	1772
	716	178	455	1169	554	2104	1934	2326	86	2775	5685	6264
	<b>Total</b>	<b>1346</b>	<b>3705</b>	<b>3039</b>	<b>2920</b>	<b>25803</b>	<b>5206</b>	<b>8983</b>	<b>5114</b>	<b>13036</b>	<b>21926</b>	<b>9945</b>
365-545	708				85	373	44	8	593	849	6136	264
	711				0		296					
	712				0		300					
	713				108							
	714				354		0					
<b>Total</b>				<b>547</b>	<b>373</b>	<b>640</b>	<b>8</b>	<b>593</b>	<b>849</b>	<b>6136</b>	<b>264</b>	
<b>0-545</b>	<b>Total</b>	<b>12899</b>	<b>31002</b>	<b>21178</b>	<b>48787</b>	<b>64699</b>	<b>58856</b>	<b>98433</b>	<b>67235</b>	<b>135061</b>	<b>62164</b>	<b>40316</b>

Tabl. 7.- Cod biomasses (in metric tons) in Subdivision 3Ps from stratified surveys conducted each year in February-March.

Depth (m)	Strata	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
< 55	314	33	0	(73)	267	22	133	0	33	33	67	(354)
	320	36	241	(256)	784	90	572	663	136	45	(785)	0
	<b>Total</b>	<b>69</b>	<b>241</b>	<b>329</b>	<b>1051</b>	<b>112</b>	<b>705</b>	<b>663</b>	<b>169</b>	<b>78</b>	<b>852</b>	<b>354</b>
56-90	308	189	12	35	35	161	46	157	50	134	31	38
	312	605	99	28	677	456	99	6837	155	298	0	75
	315	368	57	0	269	113	85	3597	28	321	868	265
	321	20	896	326	502	387	221	147	16	55	(628)	1222
	325	(108)	(152)	(138)	129	(567)	275	647	65	226	0	485
<b>Total</b>	<b>1290</b>	<b>1216</b>	<b>527</b>	<b>1612</b>	<b>1684</b>	<b>726</b>	<b>11385</b>	<b>314</b>	<b>1034</b>	<b>1527</b>	<b>2085</b>	
91-180	307	1948	1154	3084	640	4662	2958	2624	785	21238	4694	1136
	311	402	1628	1158	4357	3995	4147	15162	1954	18038	9503	16231
	317	0	119	(697)	724	4940	1696	16436	989	1182	8457	5410
	319	1051	4583	1146	3262	3516	7666	5473	3909	2887	5695	3639
	322	939	617	5742	1149	4916	5720	2603	4239	4883	11270	4776
	323	349	226	318	1156	572	3671	3683	2670	4576	1907	1668
	324	(479)	(611)	(570)	0	(1845)	2605	3147	1607	727	237	3164
<b>Total</b>	<b>5168</b>	<b>8938</b>	<b>12715</b>	<b>11288</b>	<b>24446</b>	<b>28463</b>	<b>49128</b>	<b>16153</b>	<b>53531</b>	<b>41763</b>	<b>36024</b>	
181-270	306	765	870	698	9691	2841	6333	947	278	14560	2956	2589
	309	355	1642	264	1453	595	1500	1588	872	4906	831	2859
	310	396	186	15	489	1095	935	105	9513	175	382	2276
	313	130	328	11	859	814	678	83	2359	138	1432	23
	316	65	95	39	165	423	30	173	4088	826	215	667
	318	21	8	(191)	247	34	1182	604	576	5810	101	2786
<b>Total</b>	<b>1732</b>	<b>3129</b>	<b>1218</b>	<b>12904</b>	<b>5802</b>	<b>10658</b>	<b>3500</b>	<b>17686</b>	<b>26415</b>	<b>5917</b>	<b>11200</b>	
271-365	705	254	982	27	423	3286	672	908	69	224	220	274
	706	22	0	98	672	3054	179	532	163	1981	8977	791
	707	(140)	586	(166)	13	2603	183	19	827	1172	81	80
	715	922	597	895	628	2473	588	1636	917	1132	961	882
	716	123	357	923	455	1772	1196	1058	25	2258	5353	4836
<b>Total</b>	<b>1461</b>	<b>2522</b>	<b>2109</b>	<b>2191</b>	<b>13188</b>	<b>2818</b>	<b>4153</b>	<b>2001</b>	<b>6767</b>	<b>15592</b>	<b>6863</b>	
366-545	708	(52)	(68)	(63)	45	353	8	4	315	381	1543	88
<b>Total</b>	<b>52</b>	<b>68</b>	<b>63</b>	<b>45</b>	<b>353</b>	<b>8</b>	<b>4</b>	<b>315</b>	<b>381</b>	<b>1543</b>	<b>88</b>	
<b>0-545</b>	<b>Total</b>	<b>9775</b>	<b>16115</b>	<b>16960</b>	<b>29091</b>	<b>45585</b>	<b>43378</b>	<b>68833</b>	<b>36638</b>	<b>88206</b>	<b>67194</b>	<b>56614</b>
<b>Confidence Interval</b>		7325	10019	14338	16795	31673	34164	113553	24272	39571	42632	35670
		12225	22211	19582	41387	59497	52592	24113	49004	136843	91756	77558

Table 8.- Cod abundances (in thousands) in Subdivision 3Ps from stratified surveys conducted each year in February-March (numbers in parenthesis are estimated for strata not sampled).

Strata computed	Average yield	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Without Burgeo												
310-323, 705, 706, 715, 716	Nb/30 mn	8.11	15.58	16.88	24.15	45.17	41.66	84.39	45.01	63.42	80.32	65.27
	St. deviation	1.49	4.11	1.23	3.76	8.13	5.25	31.51	8.46	13.93	16.77	13.77
Without Burgeo												
310-323, 705-708, 715-716	Nb/30 mn	8.22	16.17	16.86	23.75	48.37	41.10	82.74	45.70	64.31	80.97	64.20
	St. deviation	1.46	4.06	1.21	3.69	7.97	5.15	30.88	8.29	13.71	16.52	13.50
306-323, 705, 706, 715, 716												
	Nb/30 mn	11.37	18.58	20.25	36.54	50.84	50.95	82.18	42.76	108.33	82.58	66.74
	St. deviation	1.53	3.81	1.62	7.77	8.24	5.59	28.22	7.58	30.71	15.45	12.63
306-323, 705-708, 715, 716												
	Nb/30 mn	11.41	19.06	20.18	35.96	53.60	50.28	80.75	43.41	108.32	83.12	65.75
	St. deviation	1.50	3.77	1.60	7.63	8.59	5.49	27.72	7.44	30.19	15.25	12.41
306-325, 705-708, 715, 716												
	Nb/30 mn	10.81	17.83	18.76	32.18	50.43	47.99	76.14	40.53	97.58	74.33	62.62
	St. deviation	1.36	3.37	1.45	6.80	7.70	5.10	24.73	6.84	26.90	13.59	11.58

Table 9.- Abundance indices computed from winter surveys.

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
1		0.07		0.07	1.04	4.92	0.03	0.14	0.09	3.66	5.62
2	0.77	0.45	7.38	0.20	12.10	11.46	12.50	5.79	8.04	22.91	15.84
3	1.65	0.41	1.72	5.57	1.98	5.73	8.25	15.29	4.67	12.79	15.87
4	3.24	2.17	0.50	5.61	8.39	3.16	16.27	7.87	16.86	3.14	9.83
5	2.16	7.60	2.67	5.84	8.03	7.65	9.43	4.14	29.39	9.22	3.86
6	1.26	3.41	4.52	8.46	6.11	6.49	20.47	1.12	24.05	13.88	6.96
7	0.94	1.90	1.66	6.40	4.59	4.83	6.03	2.05	10.13	9.24	5.00
8	0.55	1.00	0.67	1.82	5.34	2.94	2.30	1.20	7.74	3.28	1.71
9	0.32	0.40	0.29	1.35	1.59	2.21	3.34	0.82	4.27	2.15	0.83
10	0.23	0.23	0.22	0.53	0.88	0.80	2.38	0.91	0.88	1.06	0.37
11	0.02	0.30	0.18	0.17	0.42	0.27	0.66	1.15	0.65	0.22	0.37
12	0.04	0.09	0.11	0.16	0.15	0.20	0.17	1.39	0.80	0.40	0.17
13	0.01	0.10	0.08	0.07	0.21	0.08	0.14	0.13	0.34	0.17	0.15
14+	0.03	0.23	0.18	0.15	0.10	0.06	0.13	0.24	0.36	0.29	0.35
3+	10.45	17.84	12.80	36.13	37.79	34.42	69.57	36.33	100.04	55.83	45.46
6+	3.40	7.66	7.92	19.11	19.39	17.88	35.62	9.02	49.12	30.69	15.92
Total	11.28	18.46	20.25	36.49	51.00	50.88	82.15	41.60	108.21	82.48	66.91
Number of sets	69	64	40	83	74	88	74	84	82	69	73
Dates of surveys	Feb. 21 Mar. 25	Feb. 21 Mar. 20	Mar. 03-12	Feb. 24 Mar. 31	Mar. 5- April 2	Feb. 10- Mar. 19	Feb. 15- Mar. 19	Feb. 09- Mar. 10	Feb. 09- Mar. 10	Feb. 04- Mar. 06	Feb. 09- Mar. 11

Table 10.- Average number of cods per set and per age, winter surveys in strata 306 to 323, 705, 706, 715 and 716.



Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
1		0.08		0.08	1.16	5.25	0.03	0.16	0.06	4.00	6.12
2	0.85	0.50	8.38	0.21	13.49	12.44	13.68	6.35	8.59	25.58	16.84
3	1.61	0.44	1.82	5.30	2.09	5.99	9.04	16.63	4.94	14.05	16.75
4	2.88	2.01	0.29	2.80	8.06	2.59	17.63	8.53	9.70	3.16	9.98
5	1.55	6.53	1.50	2.81	6.34	4.80	9.78	4.14	11.78	8.60	3.25
6	0.49	2.65	2.56	4.81	4.03	3.19	19.83	1.00	10.03	12.06	5.78
7	0.20	1.37	0.94	4.40	3.11	2.31	5.54	1.77	5.33	7.49	4.20
8	0.10	0.71	0.44	1.49	3.96	1.96	2.13	1.12	5.90	2.46	1.66
9	0.10	0.30	0.21	1.18	1.39	1.78	3.23	0.85	4.11	1.47	0.64
10	0.10	0.17	0.16	0.46	0.85	0.72	2.30	0.95	0.82	0.67	0.27
11	0.01	0.23	0.16	0.16	0.40	0.25	0.67	1.20	0.63	0.09	0.26
12	0.02	0.07	0.09	0.15	0.15	0.16	0.16	1.40	0.73	0.27	0.13
13	0.01	0.07	0.06	0.06	0.19	0.35	0.15	0.13	0.23	0.05	0.13
14+	0.03	0.22	0.17	0.13	0.07	0.05	0.11	0.25	0.37	0.13	0.28
3+	7.10	15.35	8.42	23.75	30.64	23.86	70.57	37.98	54.57	50.50	42.25
6+	1.06	5.79	4.80	12.84	14.15	10.48	34.12	8.68	28.15	24.68	13.13
Total	8.04	15.44	16.88	24.11	45.36	41.54	84.36	44.50	63.30	80.16	65.20
Number of sets	57	53	29	72	64	77	63	73	72	55	60
Dates of surveys	Feb. 21 Mar. 25	Feb. 21 Mar. 20	Mar. 03-12	Feb. 24 Mar. 31	Mar. 5- April 2	Feb. 10- Mar. 19	Feb. 15- Mar. 19	Feb. 09- Mar. 10	Feb. 09- Mar. 10	Feb. 04- Mar. 06	Feb. 09- Mar. 11

Table 11.- Average number of cods per set and per age, winter surveys in strata 310 to 323,705,706,715 and 716.

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
1		0.07		0.06	1.03	4.63	0.03	0.13	0.08	3.29	5.27
2	0.73	0.43	7.38	0.18	12.00	10.79	11.58	5.49	7.24	20.62	14.86
3	1.57	0.39	1.72	4.91	1.96	5.40	7.64	14.49	4.21	11.51	14.89
4	3.08	2.08	0.50	4.94	8.32	2.98	15.07	7.47	15.19	2.83	9.22
5	2.05	7.29	2.67	5.14	7.97	7.21	8.74	3.93	26.47	8.30	3.62
6	1.20	3.27	4.52	7.45	6.06	6.11	18.97	1.06	21.66	12.49	6.53
7	0.89	1.82	1.66	5.64	4.55	4.55	5.59	1.95	9.12	8.32	4.69
8	0.52	0.96	0.67	1.60	5.30	2.77	2.13	1.14	6.97	2.95	1.60
9	0.30	0.38	0.29	1.19	1.58	2.08	3.09	0.78	3.85	1.94	0.78
10	0.22	0.22	0.22	0.47	0.87	0.75	2.21	0.86	0.79	0.95	0.35
11	0.02	0.29	0.18	0.15	0.42	0.25	0.61	1.09	0.59	0.20	0.35
12	0.04	0.09	0.11	0.14	0.15	0.19	0.16	1.32	0.72	0.36	0.16
13	0.01	0.10	0.08	0.06	0.21	0.08	0.13	0.12	0.22	0.15	0.15
14+	0.03	0.22	0.18	0.13	0.10	0.06	0.12	0.23	0.32	0.29	0.33
3+	9.94	17.12	12.00	31.82	37.49	32.42	64.46	34.43	90.11	50.25	42.64
6+	3.23	7.35	7.92	16.83	19.23	16.84	33.00	8.55	44.25	27.62	14.93
Total	10.72	17.71	20.25	32.14	50.59	47.92	76.11	40.05	97.47	74.24	62.76
Number of sets	69	66	40	94	79	100	85	98	92	80	82
Dates of surveys	Feb. 21 Mar. 25	Feb. 21 Mar. 20	Mar. 03-12	Feb. 24 Mar. 31	Mar. 5- April 2	Feb. 10- Mar. 19	Feb. 15- Mar. 19	Feb. 09- Mar. 10	Feb. 09- Mar. 10	Feb. 04- Mar. 06	Feb. 09- Mar. 11

Table 12.- Average number of cods per set and per age, winter surveys, for strata 306 to 325,705-708,715 and 716 from recomputed mean number per set (table 9) and relative age composition of table 10.

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	
2	Mean length	22.1	21.4	20.5	20.6	20.0	21.1	20.0	19.2	19.6	19.0	18.0
	St. dev.	3.2	2.8	2.1	3.0	2.7	3.5	2.7	2.5	1.9	2.2	
	No. otoliths	46	28	70	12	103	89	73	29	40	73	101
3	Mean length	30.8	28.6	24.5	31.4	31.8	31.1	31.3	28.8	26.3	24.4	30.3
	St. dev.	4.0	5.1	4.7	4.4	4.9	4.0	6.4	3.9	2.5	4.4	
	No. otoliths	80	35	34	118	57	83	71	72	31	92	88
4	Mean length	41.4	43.2	41.6	42.3	43.5	42.8	43.8	39.9	39.0	35.7	38.6
	St. dev.	4.2	5.5	4.6	7.0	4.2	4.9	5.2	3.9	4.6	4.9	
	No. otoliths	164	69	18	68	96	59	64	73	78	49	77
5	Mean length	50.4	49.3	50.9	49.5	49.9	52.4	52.4	50.4	47.7	45.4	47.1
	St. dev.	4.1	5.6	5.8	5.4	4.8	4.1	5.5	5.2	4.9	4.2	
	No. otoliths	130	163	55	55	70	78	31	78	70	71	39
6	Mean length	60.1	58.3	56.5	58.4	58.5	58.4	59.1	58.2	55.1	52.5	54.2
	St. dev.	5.3	8.1	5.9	6.0	4.3	4.7	6.5	6.4	4.9	4.6	
	No. otoliths	77	161	94	122	77	74	110	38	70	78	84
7	Mean length	69.4	71.4	68.2	65.6	63.8	66.7	66.3	67.9	62.3	58.4	60.4
	St. dev.	3.7	8.4	10.8	7.4	6.6	6.1	7.2	7.5	6.3	5.6	
	No. otoliths	65	160	81	205	103	97	65	95	53	76	96
8	Mean length	71.5	77.7	83.9	76.4	72.2	77.1	73.5	78.3	73.7	65.3	68.0
	St. dev.	14.4	11.7	8.5	10.1	7.9	6.2	9.4	6.4	9.2	6.5	
	No. otoliths	42	87	61	101	236	101	42	64	67	41	57
9	Mean length	89.7	87.4	91.7	86.0	84.2	83.3	77.8	88.5	82.3	72.9	77.3
	St. dev.	7.4	5.2	9.1	10.5	8.8	9.4	12.4	8.1	6.7	8.1	
	No. otoliths	28	34	30	92	126	79	76	25	49	37	30
10	Mean length	93.8	94.2	97.3	93.2	94.3	92.9	82.9	92.9	86.7	75.7	82.7
	St. dev.	4.8	10.7	6.4	7.1	7.6	7.5	12.1	6.1	10.0	8.6	
	No. otoliths	21	20	17	40	83	32	71	18	11	23	18

Tabl. 13.- Evolution of mean length (in cm) of cod at age 2 to 10 from 1978 to 1988.  
Strata taken in account: 310-323,705,706,715,716.

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
3	0	1	0	1	0	0	1	0	0	0	0
4	4	8	7	13	5	3	8	3	1	1	3
5	31	40	40	49	36	30	35	26	13	6	13
6	78	81	84	86	82	81	73	73	53	28	19
7	98	98	99	99	98	99	95	97	91	65	57
8	100	100	100	100	100	100	100	100	99	92	88
9	100	100	100	100	100	100	100	100	100	99	100
10	100	100	100	100	100	100	100	100	100	100	100
Number of fishes examined	661	816	492	856	1022	639	482	505	519	634	646
Dates of sampling	Mar. 8-23	Feb.02 Mar. 19	Mar. 4-11	Feb.24 Mar. 31	Mar. 05 April 2	Feb.18 Mar. 14	Feb.15 Mar. 18	Feb.09 Mar. 10	Feb.03 Mar. 12	Feb.02 Mar. 08	Feb.08 Mar. 13
<u>Age at 50% of sexual maturity</u>											
Males	5.0	5.0	4.8	5.1	5.4	5.4	5.1	5.7	6.1	6.6	6.6
Females	5.7	5.3	5.3	5.0	5.2	5.4	5.6	5.4	5.8	6.6	6.9
Males + Females	5.4	5.2	5.2	5.0	5.3	5.4	5.4	5.5	5.9	6.6	6.8

Table 14.- Evolution of sexual maturity with age (in %) in subdivision 3Ps cod.

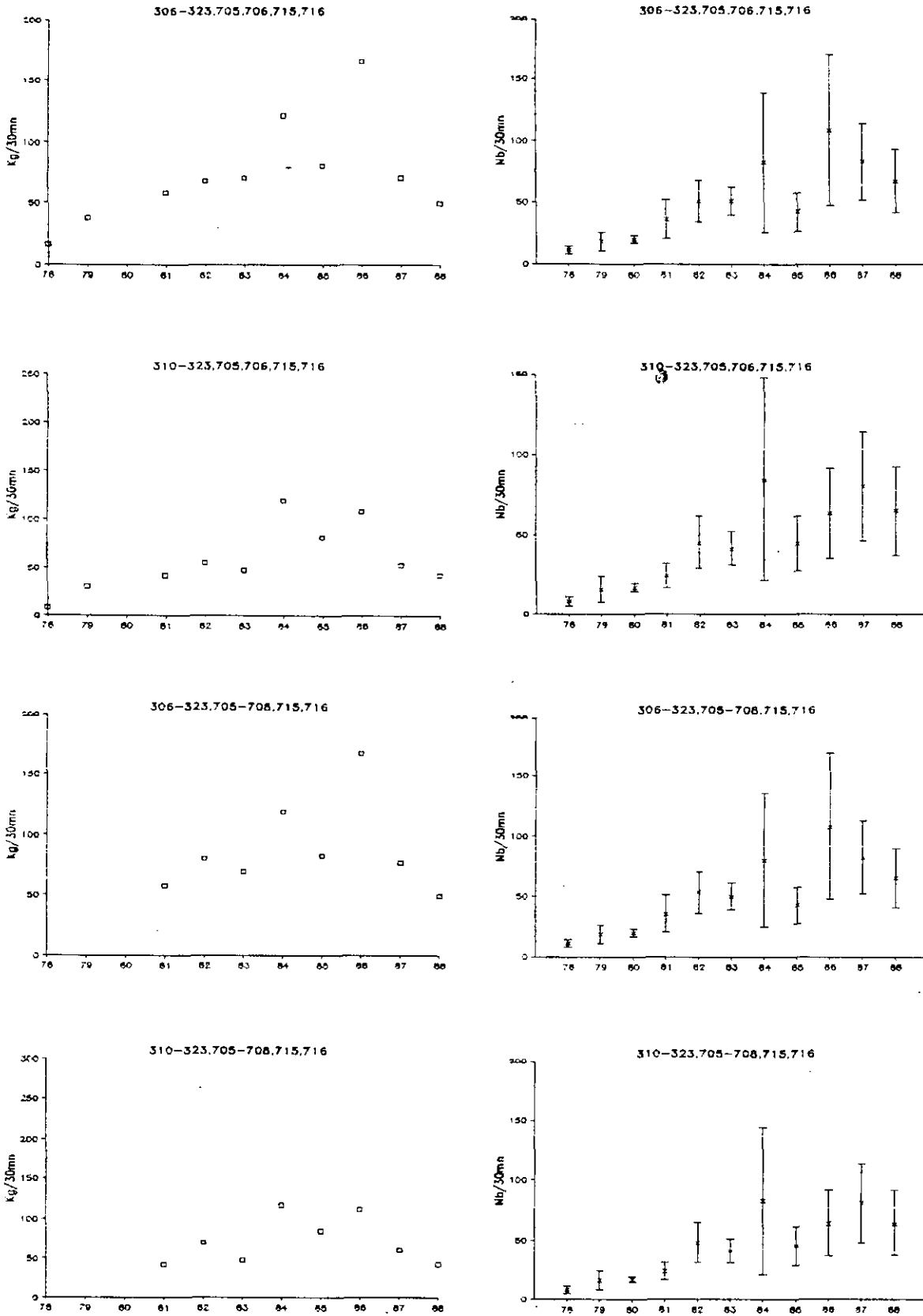


Fig.1 - Cod biomass (left column) and abundance (right column) indices from winter research surveys. Number of selected strata are shown at the top of each graph.

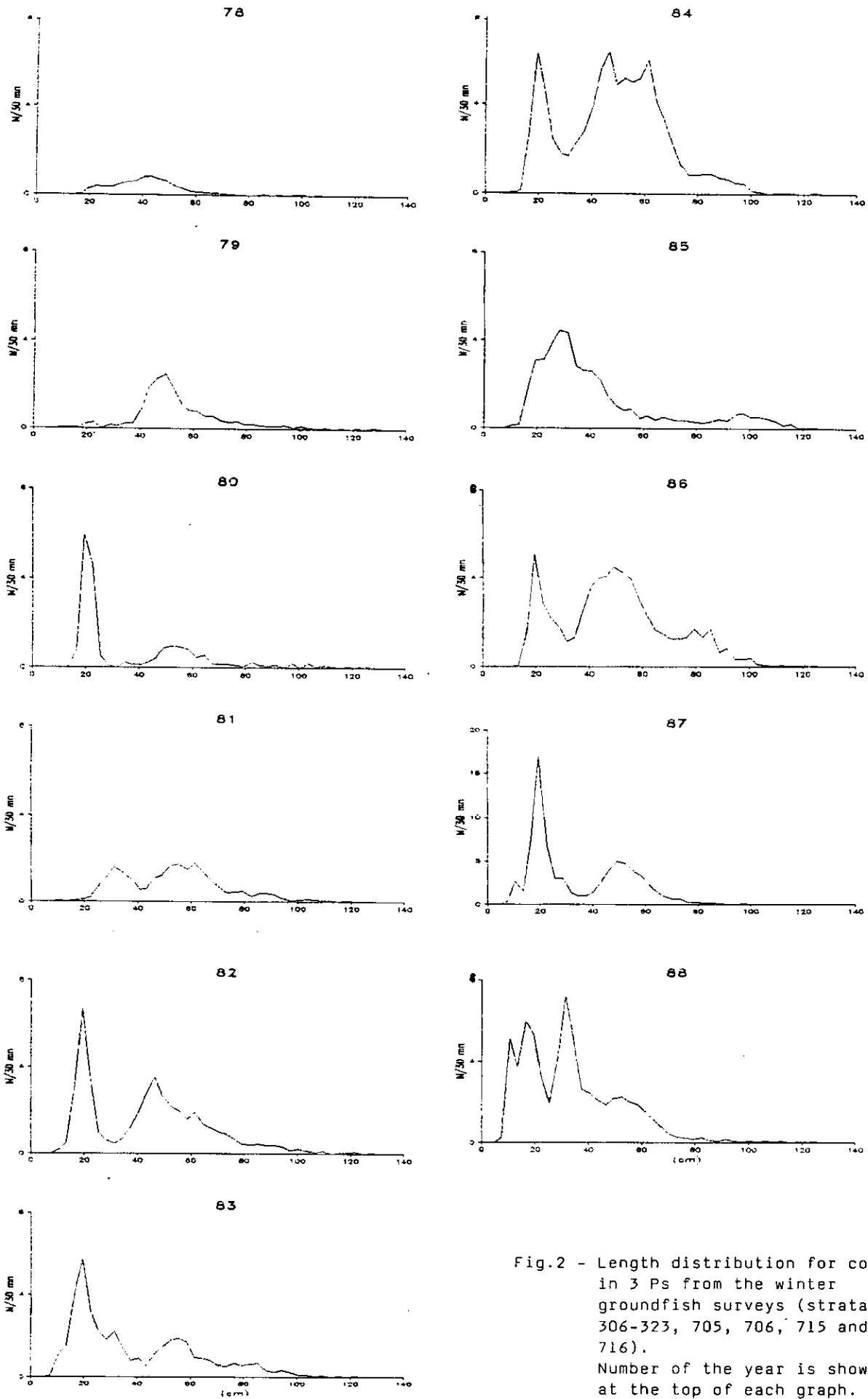


Fig.2 - Length distribution for cod in 3 Ps from the winter groundfish surveys (strata 306-323, 705, 706, 715 and 716). Number of the year is shown at the top of each graph.

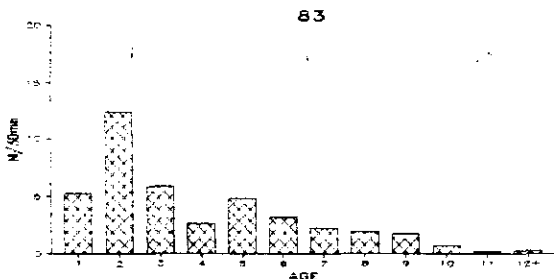
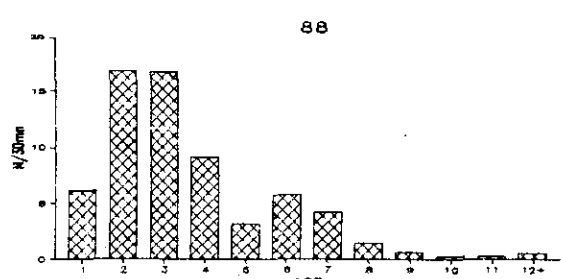
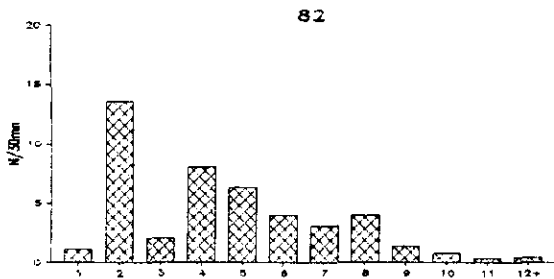
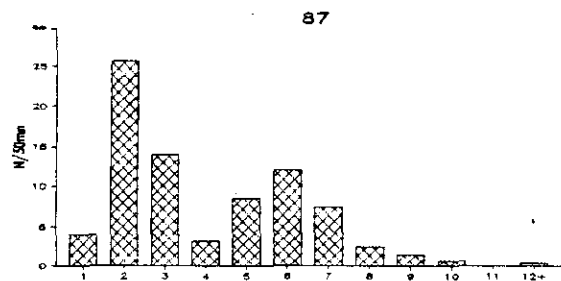
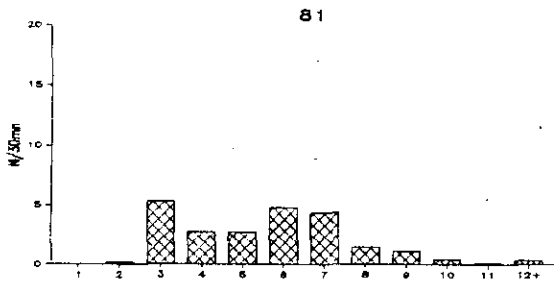
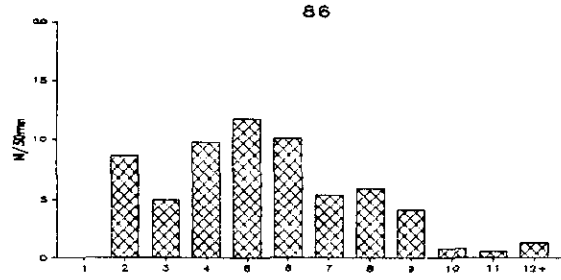
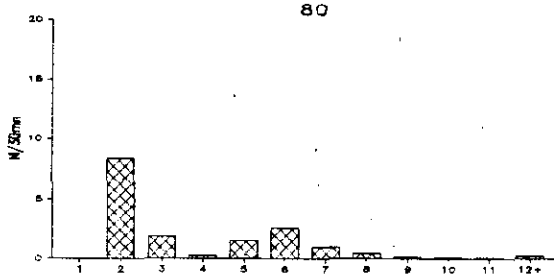
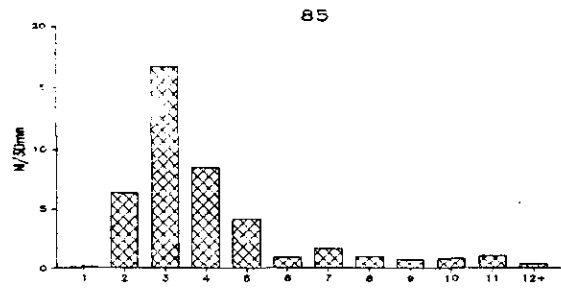
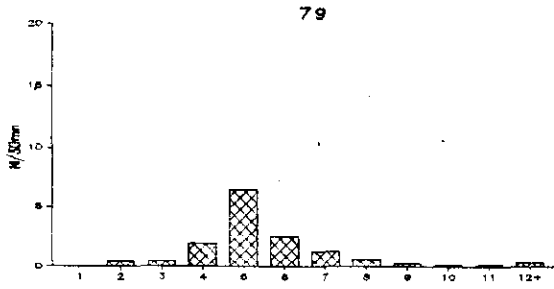
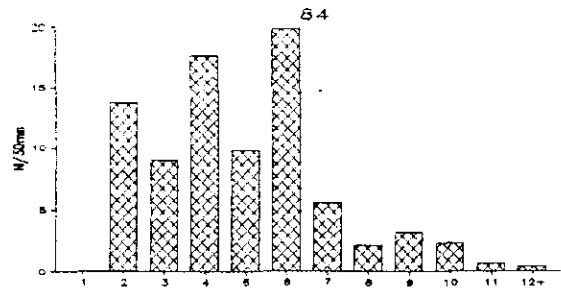
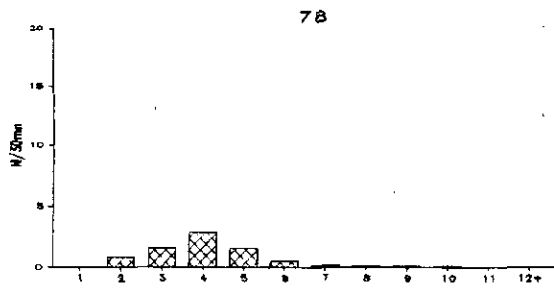


Fig.3 - Age composition for cod in 3 Ps from the winter groundfish surveys (strata 306-323, 705, 706, 715 and 716). Number of the year is shown at the top of each graph.

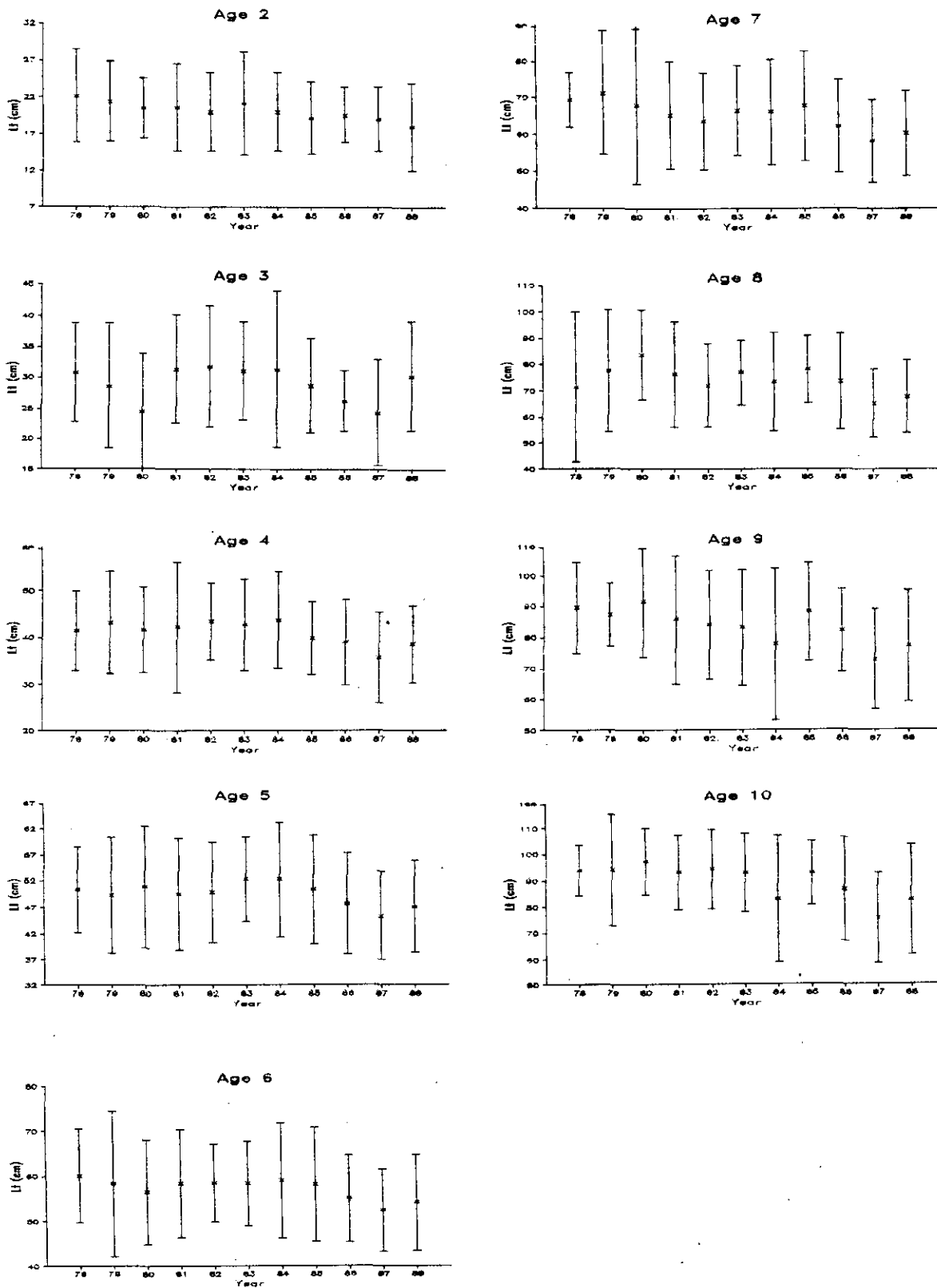


Fig.4 - Mean size by age (total length) for cod in 3 Ps from the 1978-1988 winter groundfish surveys.

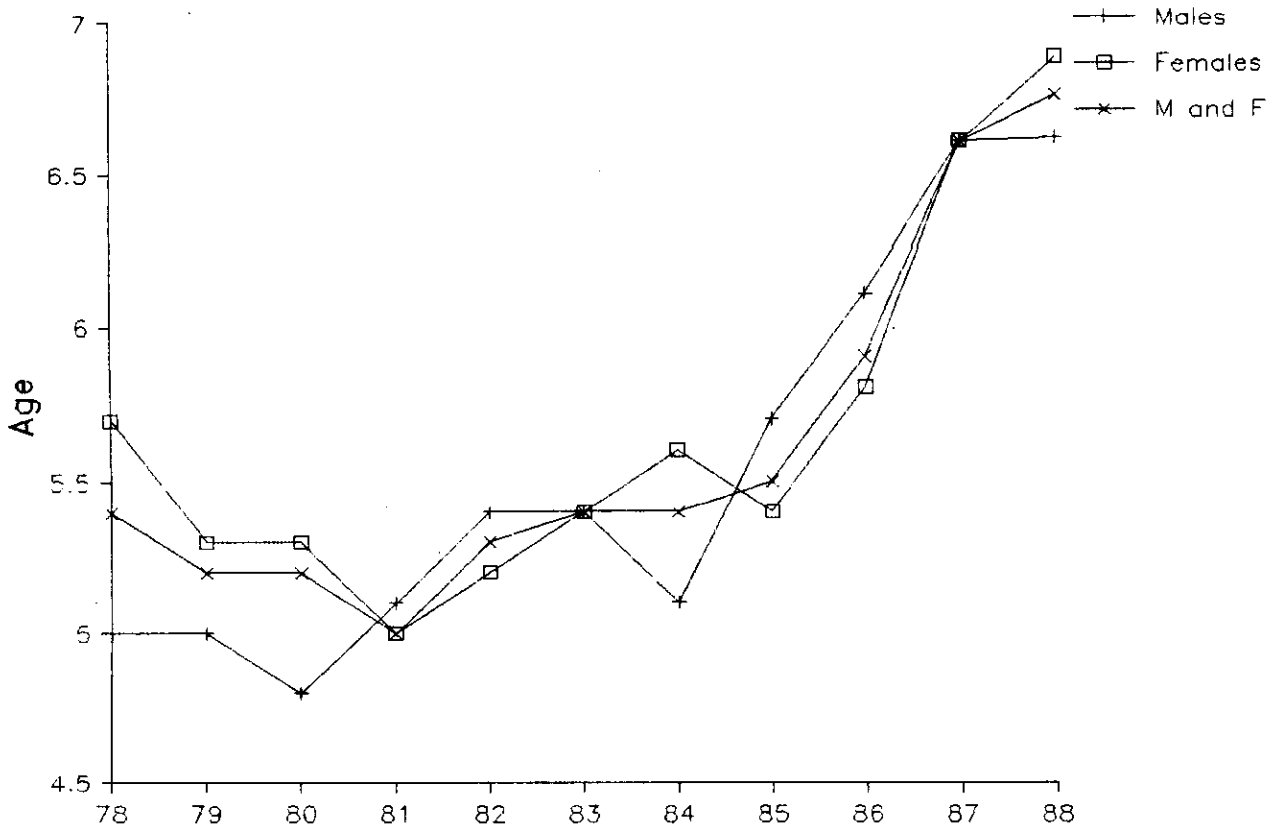


Fig.5 - Age at 50 % of sexual maturity for cod in 3 Ps from the winter groundfish surveys.

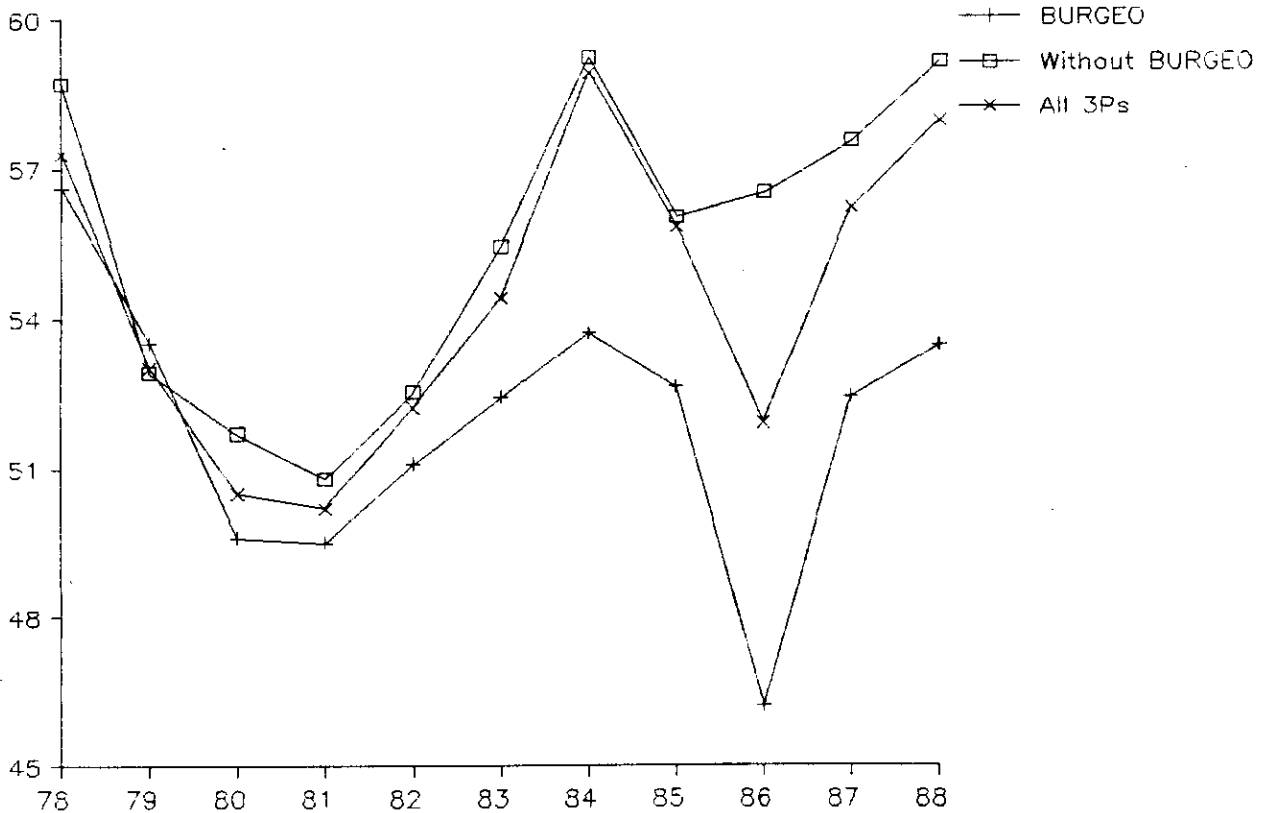


Fig.6 - Length (total length in cm) at 50 % of sexual maturity (males and females) for cod in 3 Ps from the winter groundfish surveys.