



## SCIENTIFIC COUNCIL MEETING – JUNE 2003

A Stock Status Update of American Plaice (*Hippoglossoides platessoides*) in NAFO Division 3M

by

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### Abstract

The objective of this work is just to update the data and verify if the perception of the state of the stock change from the last assessment (2002). The catch at age matrix, EU survey abundance at age and the respective mean weights were updated. The survey indices for abundance and biomass were kept at very low levels in 2002. There are no changes in the perception of the stock status from 2002 to 2003. This stock continues to be in a very poor condition, with only weak year-classes expected to recruit to the SSB at least within the next five years. Although the level of catches since 1992 is extremely low, survey data indicate that this stock continues to be at a very low level with no sign of recovery.

### Introduction

#### Catch trends and TAC regulation

On Flemish Cap American plaice mainly occurs at depths shallower than 600 m.

In the early-1960s catches were relatively low with the exception of 1961. Catches were high between 1964 and 1966, with a peak in 1965 of 5 341 tons. Till the end of the 1960s catches remained at a low level within 80 tons and 150 tons, jumping to a higher 600-1 100 tons level over the early-1970s. Since 1974 this stock became regulated and catches ranged from 600 tons (1981) to 5 600 tons (1987). From 1986 to 1989 catches exceed the TAC. Catches declined to 275 tons in 1993, following the fast decline of the stock biomass and the 1992 reduction of the Spanish directed effort. Catch for 2002 was estimated to be 128 tons (Table 1 and Fig.1).

Since 1974 till 1993 a TAC of 2 000 tons has been in effect for this stock with the exception of 1978 (TAC of 4 000 tons). A reduction to 1 000 tons was agreed for 1994 and 1995, and finally a moratorium was agreed thereafter (Table 1 and Fig.1).

In the recent year catches of 3M American plaice by Contracting Parties are mainly a by-catch of trawl fisheries directed to other species.

### Survey data

#### Biomass and abundance estimates:

The plan of stratification of the Flemish Cap (Bishop, 1994) used by the surveys is presented in Fig. 2.

In the last assessment (Alpoim *et al*, 2002-SCR 02/62) several historical survey data were analysed. During 2002 only two surveys were conducted, the Russian and EU-Spain/Portugal, so only these two series were updated.

## 1 - Russian Survey 2001 - 2002 (Vaskov and Igashov, 2002 - SCR Doc 03/9).

In 2001-2002, the Russian survey covered a larger depth range (127-1280 m) than in previous years, corresponding to an area of 15.8 thousands square miles. The abundance and biomass estimates for these two years are presented in Table 2. In 2001, 42% of the biomass was in strata deeper than 731 m, but in 2002 this proportion returned to 1%, in accordance to what is the usual distribution of this stock.

The total mean weight (or number) per tow is the mean of the mean weight (or number) per tow in each strata weighted by the respective strata area (Fig. 3)

## 2 - EU-Spain/Portugal Survey (1988-2002) (Saborido and Vazquez 2003 - SCR Doc 03/42) (Vazquez, *pers. comm.* 2003)

EU- Spain/Portugal conducted a random bottom trawl survey up to a depth of 730 metres (400 fathoms) on Flemish Cap since 1988. All surveys had a stratified design following NAFO specifications. The surveys were conducted in June-July of each year. Towing speed was around 3.5 knots. Trawling effective time is 30 min. The fishing gear used was a Lofoten gear with effective 30mm mesh size in the codend.

Estimates for biomass and abundance are presented in Table 3.

### Length composition of the stock.

Length frequency of the stock was updated for the EU survey (Vazquez, *pers. comm.* 2003) (Table 4).

### Length weight relationships

Length weight relationships for the 3M American plaice (1988-2002) were calculated with EU survey length/weight data from both sexes (Vazquez, *pers. comm.* 2003) and were used in this update on an annual basis (Table 5).

### Stock abundance and stock mean weights at age

The abundance and mean weights at age matrices of the EU survey series used in the last assessment were updated with the 2002 data and are presented in Tables 6 and 7.

## Commercial data

### Length composition of the commercial by-catch

The length compositions presented in the 2002 national reports (Vargas *et al.*, 2003; Vaskov and Igashov, 2003; Gonzalez *et al.*, 2003) were used to estimate the length compositions for the total catches. From each length distribution available a mean weight in the catch was used to transform the correspondent catch in weight into a catch number. Each mean weight was calculated as:

$$\bar{W} = \frac{\sum (N_{LC} * \bar{W}_{LC})}{\sum N_{LC}}$$

where  $N_{LC}$  is the number observed in length class  $LC$  and  $\bar{W}_{LC}$  is the mean weight of the length class  $LC$ . Mean weights at length were given by the length/weight relationships from the EU bottom trawl survey series (Table 5).

Table 8 shows the breakdown of the 2002 total catches and the various mean weights and length compositions used. In Table 9 are presented the length composition of the commercial catch as a whole for the period 1988-2002.

### **Catch and catch mean weights at age**

In 2002 the age length key from the EU surveys was used to derive the age composition of the catch. The catch and catch mean weights at age matrices used in the last assessment were update with the 2002 data and are presented in Tables 10 and 11.

### **Conclusions**

The results of the last assessment (Alpoim *et al.*, 2002) indicate that the stock has been in a continuous decline while catches have drop to low levels. Despite interannual variability, a general decrease can be observed in the biomass and abundance estimated by the several surveys, all of them ending by 2000-2001 on the lowest level of each series. The same trends are given by the XSA and ICA results (Alpoim *et al.*, *op. cit.*), both declining to very low biomass and SSB levels on the terminal year. Indices from the EU survey, XSA and ICA indicates no sign of recruitment since 1991 with only weak year-classes expected to be recruited to the SSB within at least five years. F estimates from the XSA (age 6-10) have been relatively constant in recent years at levels close to the natural mortality (0.2). EU survey F index (age 8-11) is stable at around 0.1 since 1993.

Despite the biomass and abundance of the Russian survey double from 2001 to 2002, the 2002 value is of the same magnitude of the EU survey, also at a very low level. From the EU survey it can be concluded that again no sign of recruitment was detected in 2002.

The level of catches in 2002 was kept at the level of the previous years.

### **Stock status**

There are no changes in perception of the stock status from 2002 to 2003. This stock continues to be in a very poor condition, with only weak year-classes expected to recruit to the SSB on the next five years. Although the level of catches since 1992 is low, all the analysis indicates that this stock is kept at a very low level with no sign of recovery.

### **Acknowledgements**

This study was supported by the European Commission (DG XIV, Program for the collection of data in fisheries sector), IPIMAR, CSIC, IEO and AZTI

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TABLE 1 - Nominal catches (t) from 1960-2001, Stacfis estimates (t) from 1988-2002 and TAC (t) from 1974-2002 of American plaice from NAFO Division 3M.

Year	Nominal catches (2)									Total	Flatfishes (NS) Total	Yellowtail f. Total	GRAND TOTAL	STACFIS estimates	TAC
	Canada	Japan	USSR/SUN	Country			Other								
				Poland	E/ESP	E/GBR	E/PRT	E/DEU							
1960	-	-	-	-	-	-	-	-	-	0	316	0	316		
1961	-	-	-	-	-	-	-	-	-	0	2282	0	2282		
1962	14	-	-	-	-	-	-	-	-	14	707	0	721		
1963	-	-	51	108	-	20	-	-	-	179	0	0	179		
1964	-	-	1831	8	-	37	-	-	-	1876	0	0	1876		
1965	19	-	4964	216	-	83	-	-	2	5284	57	0	5341		
1966	-	-	4003	17	-	53	-	-	-	4073	0	0	4073		
1967	57	-	-	63	-	33	-	-	1	154	0	0	154		
1968	100	-	121	-	-	4	-	-	-	225	6	0	231		
1969	12	-	113	-	-	-	-	-	-	125	0	0	125		
1970	-	-	62	-	-	-	-	-	-	62	17	0	79		
1971	-	-	1079	-	-	-	-	-	-	1079	0	0	1079		
1972	-	-	665	8	17	65	-	-	106	861	0	0	861		
1973	68	-	312	39	-	85	-	-	-	504	3	127	634		
1974	211	-	1110	-	-	607	-	-	-	1928	3	12	1943		2000
1975	140	-	958	-	8	80	522	-	-	1708	5	31	1744		2000
1976	191	-	809	15	28	-	149	-	-	1192	0	137	1329		2000
1977	30	-	987	7	18	-	457	1	118	1618	0	10	1628		2000
1978	7	49	581	21	36	2	486	100	51	1333	3	0	1336		4000
1979	10	63	457	2	16	-	248	-	-	796	4	0	800		2000
1980	1	1	909	5	3	-	232	34	-	1185	64	0	1249		2000
1981	-	47	309	-	276	-	-	-	-	632	0	0	632		2000
1982	-	53	1002	-	17	-	-	-	-	1072	3	0	1075		2000
1983	-	9	1238	-	434	-	208	-	-	1889	3	0	1892		2000
1984	-	1	711	-	204	-	196	190	-	1302	1	0	1303		2000
1985	-	2	971	-	163	-	266	318	-	1720	0	0	1720		2000
1986	-	3	962	-	1048	-	1741	-	-	3754	0	3	3757		2000
1987	-	-	501	-	4137	-	969	-	-	5607	20	0	5627		2000
1988	-	78	228	-	1608	-	941	-	6	2861	127	1	2989	2800	2000
1989	-	402	88	-	2166	-	1238	-	-	3894	72	0	3966	3500	2000
1990	-	308	-	-	102	-	359	-	21	790	38	94	922	790	2000
1991	-	450	5	-	605	2	996	-	24	2082	3	1	2086	1600	2000
1992	-	50	-	-	390	-	314	-	11	765	0	1	766	765	2000
1993	-	49	-	-	244	-	231	-	181	705	46	20	771	275	2000
1994	-	-	-	-	3	-	251	-	-	254	0	84	338	669	1000
1995	-	-	-	-	125	-	118	-	-	243	14	0	257	1300	1000
1996	-	-	-	-	105	-	29	-	8	142	2	28	172	300	0
1997	-	-	-	-	56	-	52	-	-	108	0	0	108	208	0
1998 (1)	-	-	-	-	140	-	47	-	1	188	3	2	193	294	0
1999 (1)	-	-	4	-	220	-	19	-	1	244	5	0	249	255	0
2000 (1)	-	-	55	-	168	-	27	-	1	251	1	11	263	133	0
2001 (1)	-	-	14	-	22	-	162	-	-	198	25	109	332	149	0
2002 (1)	-	5	4	-	73	-	71	-	1	154	66	33	253	128	0
2003															0

(1) - Provisional

(2) - Recalculated from NAFO statistical data base using the FISHSTAT Plus program by FAO.

Table 2 - Results from the trawl Russian surveys for American place in Div 3M, 2001-2002.

Stratum	Depth range (m)	Area, (sq. n. miles)	Abundance (000s)		Biomass (tons)	
			2001	2002	2001	2002
501	127-146	342	219.6	844.4	138.4	776.1
502	147-183	838	41.4	186.2	39.7	141.1
503	185-256	628	0.0	77.5	0.0	103.1
504	185-256	348	51.6	8.6	23.1	13.2
505	185-256	703	0.0	69.4	0.0	65.1
506	185-256	496	0.0	61.2	0.0	42.9
507	258-366	822	0.0	60.9	0.0	61.7
508	258-366	646	0.0	47.9	0.0	45.9
509	258-366	314	23.3	15.5	19.8	16.2
510	258-366	951	0.0	117.4	0.0	85.7
511	258-366	806	0.0	19.9	0.0	8.8
512	367-549	670	16.5	0.0	3.5	0.0
513	367-549	249	0.0	6.2	0.0	3.6
514	367-549	602	74.3	11.2	48.7	3.7
515	367-549	666	32.9	16.4	19.2	14.1
516	550-731	634	0.0	0.0	0.0	0.0
517	550-731	216	0.0	0.0	0.0	0.0
518	550-731	210	10.4	0.0	9.4	0.0
519	550-731	414	15.3	0.0	13.9	0.0
520	732-914	525	0.0	0.0	0.0	0.0
524	732-914	253	6.2	0.0	7.0	0.0
528	732-914	530	78.5	0.0	79.3	0.0
533	732-914	98	0.0	2.4	0.0	3.8
521	915-1097	517	25.5	0.0	30.3	0.0
525	915-1097	226	0.0	0.0	0.0	0.0
529	915-1097	488	60.2	0.0	71.9	0.0
532	915-1097	238	0.0	0.0	0.0	0.0
534	915-1097	486	24.0	0.0	27.0	0.0
522	1098-1280	533	13.2	0.0	16.5	0.0
526	1098-1280	177	0.0	0.0	0.0	0.0
530	1098-1280	1134	0.0	28.0	0.0	13.4
Total		15760	692.9	1573.2	547.7	1398.4
	127-731	10555	485.3	1542.7	315.7	1381.2
				%	57.6	98.8

Table 3 A - EU-surveys in Div.3M from 1988-2002: estimates of biomass (t) of *A.plaice*.

Stratum	Depth range (m)	Area (sq. n. mi.)	Year														
			1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
501	128-146	342	979	750	379	808	532	809	496	1672	1096	286	117	279	259	782	106
502	148-183	838	2133	2701	1031	1997	1285	950	899	1001	707	555	1190	1357	732	626	946
503	185-256	628	1025	838	1251	935	473	333	244	189	126	371	213	73	16	70	56
504	185-256	348	1649	346	613	240	418	429	640	367	201	152	257	40	75	64	96
505	185-256	703	1949	2319	1372	1055	628	968	922	412	375	464	558	55	42	84	142
506	185-256	496	359	847	715	376	451	229	606	92	24	10	26	30	19	28	47
507	258-366	822	880	398	628	292	479	239	237	187	54	62	35	14	11	21	39
508	258-366	646	313	123	197	188	545	365	128	99	42	92	124	2	0	34	32
509	258-366	314	77	122	257	0	280	154	15	375	41	27	0	0	0	0	1
510	258-366	951	1742	1118	1500	981	1054	1094	1677	531	311	215	27	54	34	71	27
511	258-366	806	889	876	987	301	279	219	227	82	51	24	22	28	17	20	44
512	367-549	670	7	14	34	13	8	11	25	9	24	5	0	0	0	3	0
513	367-549	249	2	0	15	0	0	0	0	2	0	0	0	0	0	0	0
514	367-549	602	6	6	5	292	22	4	18	11	3	0	3	7	0	0	0
515	367-549	666	17	74	2	73	28	82	30	51	17	5	5	0	0	0	0
516	550-731	634	4	0	0	3	7	9	4	0	0	0	0	0	0	0	0
517	550-731	216	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
518	550-731	210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
519	550-731	414	0	0	0	11	3	4	2	8	0	0	0	0	0	0	0
total			12029	10533	8986	7565	6492	5900	6169	5087	3073	2268	2577	1940	1204	1803	1536
s.e.			1387	1533	957	887	719	779	1028	809	681	528	561	654	252	324	546
mean catch per tow (kg)			14.96	13.10	11.17	9.41	8.07	7.34	7.67	6.33	3.82	2.82	3.20	2.41	1.50	2.24	1.91
s.e.			1.72	1.91	1.19	1.10	0.89	0.97	1.28	1.01	0.85	0.66	0.70	0.81	0.31	0.40	0.68

Table 3 B - EU-surveys in Div.3M from 1988-2002: estimates of abundance (000s) of *A.plaice*.

Stratum	Depth range (m)	Area (sq. n. mi.)	Year														
			1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
501	128-146	342	1875	1433	734	1371	902	1278	661	2635	1718	540	203	431	417	1235	190
502	148-183	838	4679	5969	1921	4128	2036	1579	1223	918	871	572	1140	1188	871	609	783
503	185-256	628	2158	2346	2628	1469	795	512	356	246	122	409	225	84	27	102	47
504	185-256	348	2603	643	1068	408	751	638	668	382	212	141	277	48	80	60	74
505	185-256	703	5456	4079	2470	2320	974	1244	1113	501	465	526	733	70	53	120	147
506	185-256	496	1372	1914	1883	894	888	536	895	131	50	31	38	46	31	31	62
507	258-366	822	1776	915	1148	583	668	479	301	269	102	117	65	21	21	28	49
508	258-366	646	493	283	294	213	675	497	148	103	54	105	120	7	0	28	21
509	258-366	314	151	213	379	0	496	261	27	695	84	37	0	0	0	0	8
510	258-366	951	3430	2140	2634	1890	1729	1647	2537	904	536	356	58	100	78	118	46
511	258-366	806	1616	1757	1509	578	470	462	410	161	117	51	27	57	47	27	62
512	367-549	670	26	10	50	27	20	22	36	24	31	8	0	0	0	6	0
513	367-549	249	18	0	18	0	0	0	0	6	0	0	0	0	0	0	0
514	367-549	602	12	7	15	558	44	7	74	22	8	0	6	15	0	0	0
515	367-549	666	36	124	6	150	32	125	55	86	15	8	6	0	0	0	0
516	550-731	634	14	0	0	7	17	23	7	0	0	0	0	0	0	0	0
517	550-731	216	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
518	550-731	210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
519	550-731	414	0	0	0	20	6	18	9	19	0	0	0	0	0	0	0
total			25714	21834	16756	14616	10502	9326	8520	7102	4386	2901	2899	2067	1624	2365	1489
mean number per tow			32	27	21	18	13	12	11	9	5	4	4	3	2	3	2

Table 4: Length composition (absolute frequencies in '000) of the 3M american plaice stock, EU survey 1988-2002.

Length group	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Length group
4							6									4
6				18												6
8				18												8
10				25												10
12	70	36	6	42					7	7		6	7			12
14	577	12		44	42											14
16	1325	90	129	124	199		7	12	6	7						16
18	306	284	356	92	381	17	27	13	28	14			6	7		18
20	58	1047	126	71	218	33	28				14			7	27	20
22	173	2466	163	421	112	171	27		13		14		14			22
24	307	2781	339	756	234	506	37	39	33	26	7	7	7	7	8	24
26	598	1393	597	428	310	555	110	39	21	52	7	13	7	7	27	26
28	969	434	1127	417	337	322	251	98	61	39	39	28	38	46	26	28
30	1490	554	2567	714	389	589	618	183	99	26	13	7	27	20	20	30
32	2556	868	2456	1485	489	504	818	552	254	166	67	47	60	58	26	32
34	3138	1756	1385	2303	952	533	732	573	314	159	190	105	115	170	61	34
36	3030	2472	1216	2042	1578	949	801	908	548	303	290	181	177	252	74	36
38	2243	1860	1262	1688	1432	1020	1181	1187	754	484	282	182	183	473	99	38
40	2339	1398	1015	1038	1115	1059	1052	1007	715	328	355	225	206	309	133	40
42	2487	1218	926	600	909	880	420	670	441	234	273	151	181	188	73	42
44	2359	1492	1101	794	462	714	512	347	270	220	276	152	96	124	68	44
46	717	887	999	706	456	553	596	341	181	166	256	166	167	103	137	46
48	439	415	597	481	469	283	560	316	251	226	223	257	122	136	218	48
50	198	156	236	158	268	334	333	379	195	261	267	212	108	169	242	50
52	164	140	86	104	101	207	226	236	91	131	199	230	65	156	190	52
54	77	42	41	26	35	57	102	162	60	26	80	53	19	85	65	54
56	62	15	20	14	7	23	70	29	32	20	40	33	7		40	56
58	33	6	6	7		16		6	6	7	6	6		6		58
60								6	6			6				60
62																62
64																64
66																66
Total	25714	21834	16756	14616	10502	9326	8520	7102	4386	2901	2899	2067	1624	2365	1489	Total
mean length	36.1	33.7	36.0	36.2	37.1	38.3	39.8	40.8	40.6	41.7	43.5	44.6	41.5	41.9	46.0	

Table 5: Length weight relationships of 3M American plaice (Vazquez, *pers. comm.* 2003)

Year	a	b	n
1988	0.004794	3.2121	1211
1989	0.005519	3.1810	1192
1990	0.004266	3.2420	1314
1991	0.004328	3.2404	1032
1992	0.004770	3.2130	1296
1993	0.002957	3.3362	1036
1994	0.002948	3.3373	1066
1995	0.002732	3.3474	772
1996	0.004766	3.1978	571
1997	0.004553	3.2116	437
1998	0.004370	3.2260	442
1999	0.004288	3.2294	452
2000	0.008201	3.0444	411
2001	0.004410	3.2074	570
2002	0.002935	3.3242	225
All period	0.004418	3.2279	12027

Table 6: Population abundance (000s) at age (yrs) of A. plaice from surveys in Div. 3M during EU survey 1988-2002.

Year/age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	Total
1988	503	1391	1683	4080	3511	3057	4445	2664	1608	1024	599	381	217	335	138	77	25714
1989	48	1587	5756	2306	2150	1883	2807	1886	1203	805	502	325	172	258	96	48	21834
1990	6	576	1369	4591	2012	1379	2074	1530	1063	737	485	328	188	262	104	52	16756
1991	140	322	1487	2286	2321	1548	2089	1457	1012	686	452	302	151	213	77	74	14616
1992	20	685	762	1030	1175	1230	1772	1200	840	596	402	274	145	222	87	61	10502
1993		24	1376	970	647	340	3107	351	596	281	197	229	281	861	29	36	9326
1994	6	40	38	1789	779	647	706	2471	241	476	166	163	194	398	397	8	8520
1995		25	99	631	1617	989	986	664	1130	126	143	119	120	242	183	27	7102
1996	7	34	103	227	471	1248	663	415	310	477	114	65	68	95	62	25	4386
1997	7	14	96	22	98	314	903	201	314	224	374	103	20	77	40	93	2901
1998		21	27	40	60	203	459	657	389	269	237	231	74	94	48	90	2899
1999	6		20	57	61	58	181	346	379	192	264	165	100	103	50	83	2067
2000	13	21	6	73	87	118	87	112	289	314	173	140	59	44	38	49	1624
2001		34	45	50	82	45	81	192	311	417	350	311	144	130	92	83	2365
2002			27	54	14	67	47	89	109	136	220	166	192	112	105	151	1489

Table 7 - Weights at age of the 3M American plaice stock (Kg) from EU surveys, 1988-2002

Year/age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+
1988	0.027	0.048	0.152	0.336	0.485	0.610	0.715	0.784	0.799	0.825	0.888	0.974	1.231	1.247	1.573	1.764
1989	0.013	0.090	0.151	0.292	0.514	0.623	0.720	0.816	0.841	0.864	0.924	1.007	1.201	1.216	1.488	1.663
1990	0.010	0.062	0.189	0.311	0.416	0.550	0.701	0.830	0.859	0.901	0.969	1.044	1.197	1.226	1.436	1.595
1991	0.015	0.070	0.157	0.339	0.469	0.553	0.652	0.768	0.798	0.835	0.897	0.966	1.159	1.185	1.442	1.644
1992	0.029	0.063	0.158	0.312	0.506	0.609	0.681	0.760	0.812	0.842	0.926	1.019	1.199	1.217	1.426	1.787
1993		0.061	0.160	0.295	0.399	0.572	0.726	0.760	0.801	0.885	0.927	0.952	1.098	1.249	1.865	1.629
1994	0.001	0.062	0.163	0.314	0.478	0.557	0.645	0.812	0.961	0.935	1.051	1.049	1.303	1.262	1.565	1.895
1995		0.044	0.191	0.326	0.480	0.620	0.669	0.797	0.901	1.239	1.302	1.482	1.531	1.528	1.571	2.108
1996	0.017	0.055	0.190	0.329	0.461	0.584	0.710	0.828	0.947	0.877	1.104	1.400	1.319	1.540	1.663	1.825
1997	0.017	0.049	0.171	0.236	0.421	0.550	0.668	0.637	0.870	1.017	1.031	1.233	1.277	1.450	1.622	1.526
1998		0.090	0.174	0.259	0.378	0.506	0.647	0.781	0.830	1.043	1.256	1.342	1.544	1.519	1.619	1.665
1999	0.010		0.166	0.315	0.431	0.541	0.560	0.778	0.855	1.013	1.196	1.293	1.470	1.729	1.571	1.599
2000	0.016	0.091	0.115	0.245	0.403	0.511	0.610	0.674	0.760	0.754	0.856	0.960	1.236	1.200	1.316	1.392
2001		0.072	0.211	0.245	0.366	0.426	0.520	0.598	0.621	0.709	0.711	0.866	1.100	1.342	1.451	1.496
2002			0.192	0.287	0.398	0.436	0.665	0.758	0.715	0.880	1.118	1.177	1.318	1.427	1.504	1.535
mean	0.016	0.066	0.169	0.296	0.440	0.550	0.659	0.759	0.825	0.908	1.010	1.118	1.279	1.356	1.541	1.675



Table 8: Criteria applied to convert total catches in weight to total catches in number, 2002.

YEAR	TOTAL CATCH (ton)	BREAKDOWN TOTAL CATCH (ton)	LENGTHS COMPOSITION				Mean Weight (Kg)	TOTAL CATCH IN NUMBER (000's)
			Country	Source	Gear	Paper		
2002	128	89	Portugal	Commercial	OTB	scs 03/7	0.656	135.0
		35	Spain	Commercial	OTB	scs 03/11	1.006	35.2
		4	Russia	Commercial	OTB	scs 03/6	1.233	3.2

Table 9: Length composition (absolute frequencies in '000) of the 3M American plaice catches, 1988-2002.

length group	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
16		19.3	0.8				0.7	3.0							
18		60.5	3.9				2.9	3.2							
20	6.9	126.5	2.0		5.3	1.8	3.3								
22	10.4	88.0	8.2	5.8	1.3	6.9	3.2						0.3	0.1	
24	65.6	35.8	10.4	6.6	1.4	14.3	4.8	9.7	5.1		0.2			0.2	
26	186.5	41.3	20.2	0.0	7.4	16.1	18.3	9.7	0.4		0.2		0.7	0.5	0.3
28	345.3	131.2	43.2	23.2	23.7	17.1	30.6	24.3	10.0		0.5		9.4	3.0	1.1
30	276.2	226.7	91.7	28.2	37.5	23.2	71.1	45.4	31.6		0.7		16.3	10.0	2.2
32	303.9	365.4	131.9	109.7	36.7	23.0	94.4	136.9	63.4		1.8	5.2	21.5	18.1	5.1
34	611.2	569.3	96.5	203.1	61.0	19.9	81.3	142.1	98.4	14.6	4.0	10.4	23.4	22.5	17.9
36	621.5	603.5	86.9	283.0	90.5	28.5	88.0	225.2	86.5	13.0	6.2	25.9	23.6	29.7	27.9
38	372.9	477.8	71.1	147.1	122.7	37.5	128.1	294.5	74.7	24.4	15.6	51.9	24.5	31.1	24.7
40	372.9	356.7	70.6	146.2	108.2	29.4	112.6	249.8	47.4	37.8	22.6	15.6	23.0	28.9	24.1
42	473.1	696.1	82.1	147.7	57.1	34.6	44.9	166.2	47.2	22.8	17.8	20.8	17.1	22.2	22.9
44	397.1	630.2	125.0	320.8	67.8	32.6	55.2	86.1	23.3	8.1	44.0	36.3	12.9	18.1	12.8
46	158.8	405.0	132.8	295.7	79.8	25.6	63.3	84.6	14.1	17.2	36.5	31.1	11.6	14.3	10.7
48	76.0	97.4	73.9	120.1	86.9	23.0	59.4	78.4	12.7	33.5	30.9	46.7	9.8	12.6	9.8
50	62.2	68.0	30.3	106.6	63.2	22.0	35.4	94.0	8.4	24.4	37.8	25.9	6.5	6.5	6.4
52	72.5	35.8	9.6	9.1	33.1	12.7	24.3	58.5	2.8	16.3	36.1	10.4	6.9	3.6	5.4
54	34.5	27.5	6.7	3.0	10.3	3.8	10.8	40.2	0.6	4.1	5.3		0.8	1.5	1.9
56	17.3	13.8	3.4	0.0	5.4	1.6	7.4	7.2	0.3	1.7	4.4		0.4	0.5	0.2
58	3.5		0.8	0.0	4.8	0.7		1.5			0.0			0.1	
60					0.0	0.1		1.5						0.04	
62			0.1			0.0	0.6							0.1	
64														0.01	
Total ('000)	4468.2	5075.7	1102.2	1955.9	904.0	374.5	940.5	1762.1	527.0	218.0	264.8	280.2	208.7	223.8	173.5
mean length	37.9	38.7	39.5	41.6	41.8	39.6	39.5	40.8	37.9	44.6	46.7	43.9	39.3	40.3	41.3

Table 10 - Catch at age (000s) of the 3M American plaice, 1988-2002.

Year/age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	Total
1988		7	311	731	549	440	720	532	386	265	173	118	65	102	43	25	4468
1989		175	209	573	527	482	886	715	520	356	230	148	80	118	39	19	5076
1990		7	49	183	112	87	158	147	110	78	55	39	24	33	13	7	1102
1991		1	19	133	185	168	342	331	243	174	124	84	50	68	23	12	1956
1992		4	17	76	75	76	136	124	100	77	60	46	31	45	23	14	904
1993			47	42	26	11	112	13	24	12	9	11	15	49	2	2	375
1994		4	6	219	98	77	75	254	24	48	16	17	20	40	43	1	941
1995		6	24	167	458	235	231	155	250	31	35	30	30	58	45	7	1762
1996			13	60	101	173	63	41	23	34	6	3	3	3	2	0.4	527
1997					4	17	61	12	28	23	35	13	3	9	4	10	218
1998			0.3	1	2	7	28	57	36	31	32	33	8	14	7	10	265
1999				4	6	8	27	59	60	35	40	21	9	5	3	5	280
2000		0.2	0.1	19	25	25	12	13	33	35	17	13	6	3	3	4	209
2001				5	6	16	8	10	21	30	41	35	29	10	6	3	224
2002				1	8	4	17	13	21	22	23	24	17	12	4	3	174

Table 11 - Mean weight at age of the 3M American plaice catch (Kg), 1988-2002.

Year/age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+
1988		0.097	0.200	0.312	0.449	0.572	0.684	0.762	0.790	0.823	0.886	0.981	1.215	1.271	1.590	1.736
1989		0.079	0.165	0.342	0.479	0.617	0.750	0.842	0.860	0.882	0.928	0.985	1.136	1.185	1.484	1.717
1990		0.072	0.191	0.320	0.424	0.558	0.738	0.889	0.924	0.963	1.031	1.095	1.223	1.262	1.481	1.618
1991		0.115	0.189	0.367	0.480	0.598	0.763	0.891	0.929	0.962	1.035	1.087	1.188	1.206	1.361	1.477
1992		0.086	0.210	0.327	0.487	0.606	0.723	0.855	0.919	0.966	1.074	1.169	1.373	1.381	1.574	1.666
1993			0.162	0.296	0.394	0.580	0.756	0.813	0.865	0.979	1.039	1.059	1.179	1.339	1.819	1.627
1994		0.061	0.155	0.314	0.487	0.562	0.653	0.824	0.969	0.954	1.068	1.065	1.318	1.289	1.561	1.895
1995		0.044	0.190	0.335	0.494	0.626	0.684	0.816	0.925	1.244	1.320	1.474	1.532	1.547	1.571	2.108
1996			0.225	0.331	0.425	0.535	0.671	0.733	0.852	0.825	1.002	1.302	1.202	1.385	1.539	1.333
1997					0.445	0.639	0.726	0.682	0.949	1.059	1.097	1.270	1.261	1.509	1.508	1.513
1998			0.185	0.269	0.396	0.554	0.776	0.889	0.950	1.140	1.337	1.380	1.461	1.509	1.589	1.613
1999				0.365	0.495	0.536	0.581	0.786	0.872	0.943	1.109	1.194	1.337	1.445	1.439	1.389
2000		0.115	0.115	0.268	0.359	0.444	0.566	0.637	0.706	0.692	0.782	0.891	1.225	1.140	1.290	1.389
2001			0.263	0.283	0.340	0.401	0.471	0.595	0.615	0.691	0.703	0.805	0.975	1.150	1.298	1.534
2002			0.231	0.341	0.398	0.436	0.622	0.692	0.658	0.734	0.813	0.850	0.992	1.349	1.378	1.470
mean		0.084	0.191	0.319	0.437	0.551	0.678	0.780	0.852	0.924	1.015	1.107	1.241	1.331	1.499	1.606

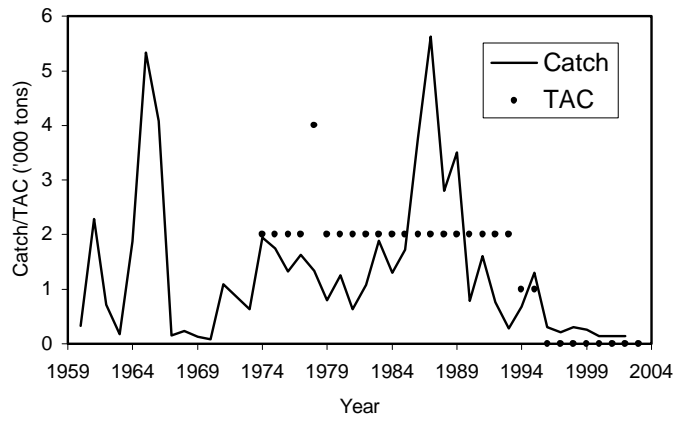


Fig.1 . American plaice in Div.3M: nominal catches and agreed TAC's

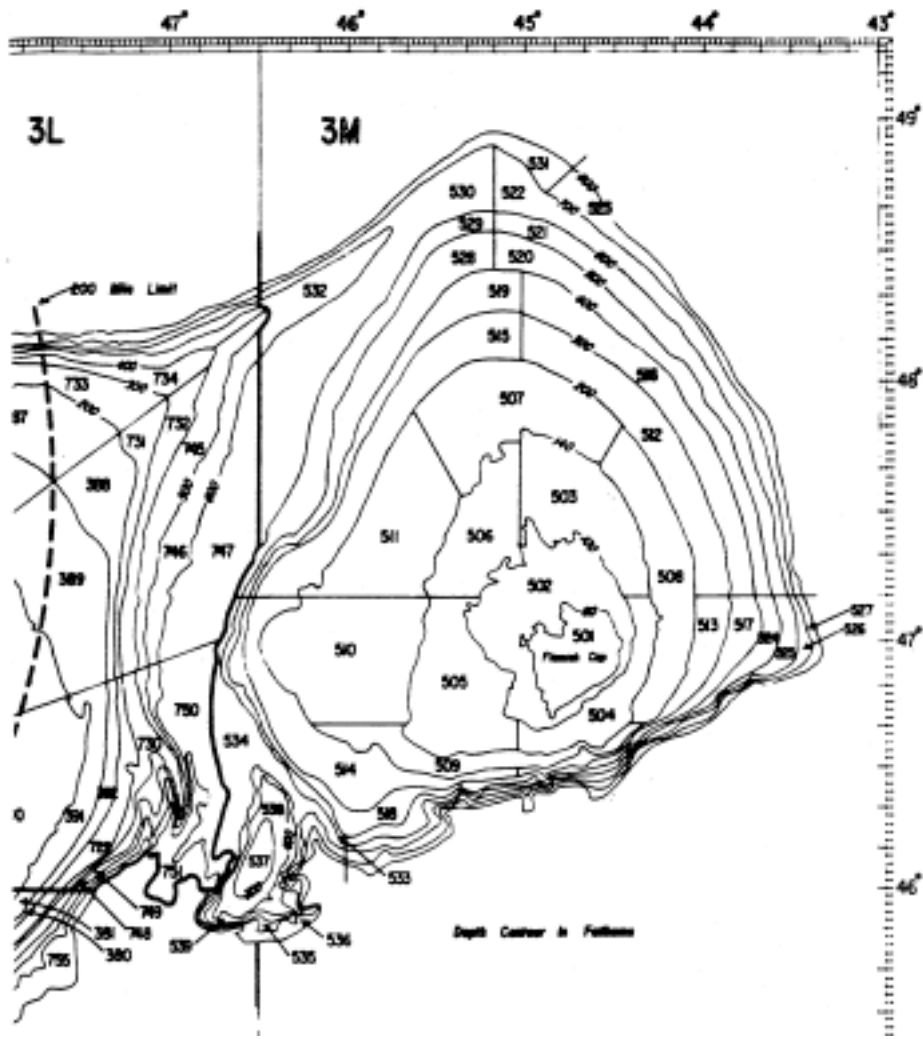


Fig. 2. Stratification scheme for stratified- random groundfish surveys in Div 3M. (Bishop 1994).

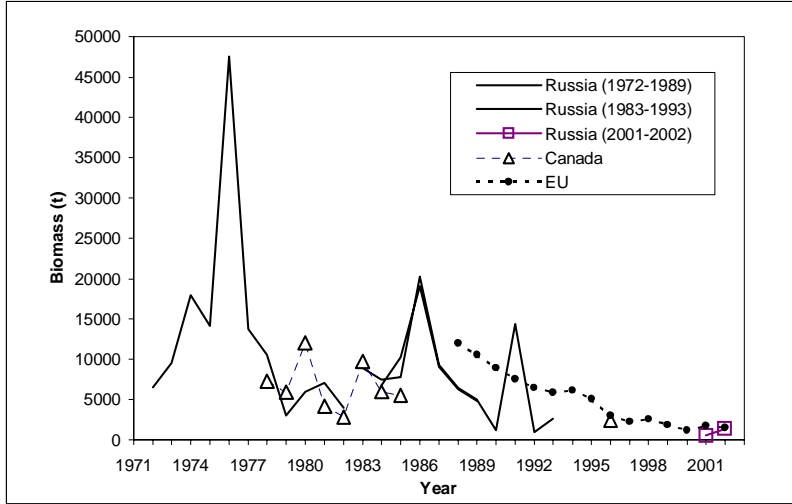


Fig.3A. American plaice in Div. 3M: trends in biomass in the surveys.

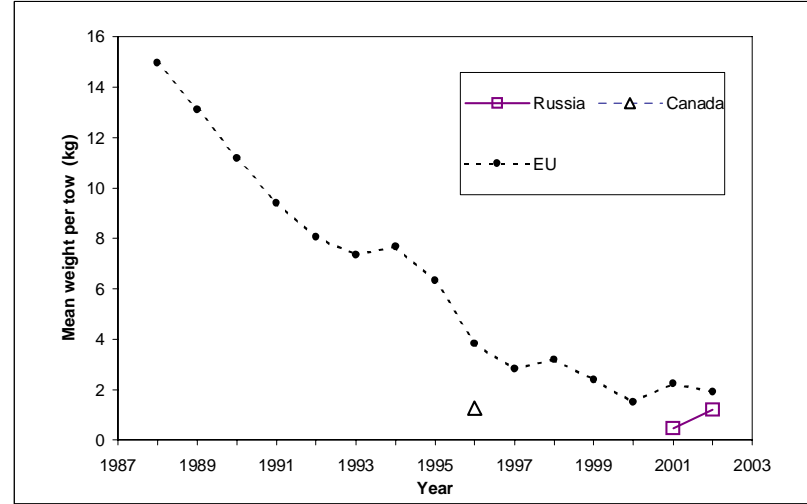


Fig.3C. American plaice in Div. 3M: mean weight per tow in the surveys.

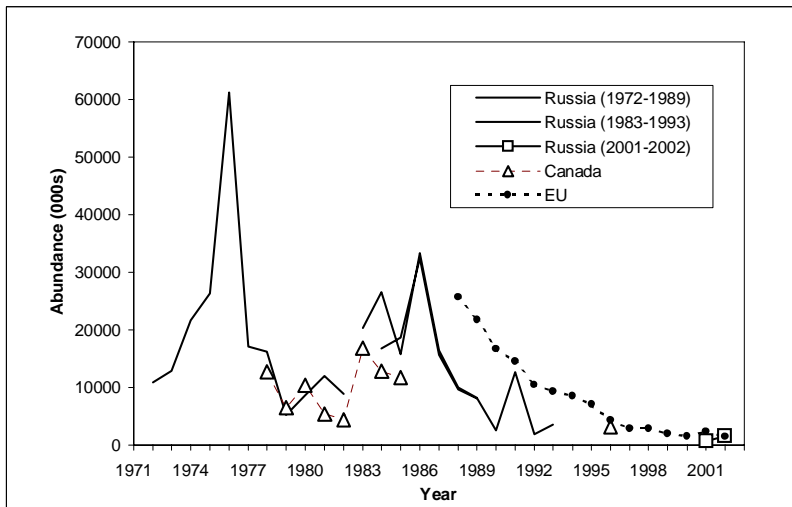


Fig.3B. American plaice in Div. 3M: trends in abundance in the surveys.

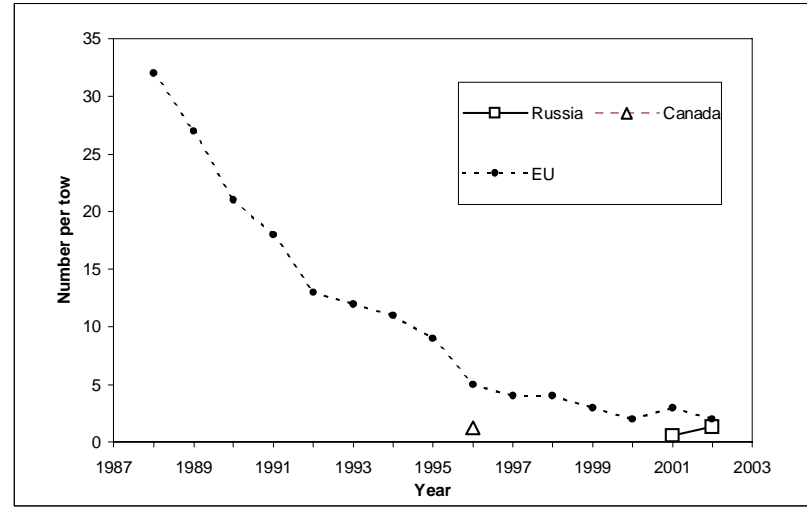


Fig.3D. American plaice in Div. 3M: mean number per tow in the surveys.