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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 made (in 2000). The catch at age matrix, EU survey abundance at age and the respective mean weights were updated. The 1990 year-class (age 10) was still the best represented in the stock. The EU -survey indices for abundance, biomass and SSB declined to the lowest historical values in 2000. The F index (C/B) also shows a declining trend during the series. There are no changes in the perception of the stock status from 2000 to 2001. This stock continues to be in a very poor condition, with only weak year-classes expected to be recruited to the SSB for at least five years. Although the level of catches since 1992 is extremely low, survey data indicate that this stock is kept at a very low level with no sign of recovery. The stock recruitment relationship shows very poor recruitment for an SSB less than 6000 tons. The average of recruits at age 3 produced per Kg of SSB had also suffered a drastic decline since 1991.

Introduction

On Flemish Cap American plaice mainly occurs at depths shallower than 600 m. On this Division catches of Contracting Parties are mainly a by-catch of trawl fisheries directed to other species.

Since 1974, when this stock became regulated, catches ranged from 600 tons (1981) to 5 600 tons (1987). 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 2000 was estimated to be 133 tons.

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 (Fig. 1).

Recent catches ('000 tons) are as follows:

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
TAC	2	2	2	2	2	2	2	2	1 ¹	1 ¹	0	0	0	0	0	0
Catch	3.8	5.6	2.8	3.5	0.8	1.6	0.8	0.3	0.7	1.3	0.3 ²	0.2 ²	0.3 ²	0.3 ²	0.1 ²	

¹ No directed fishing.

² Provisional.

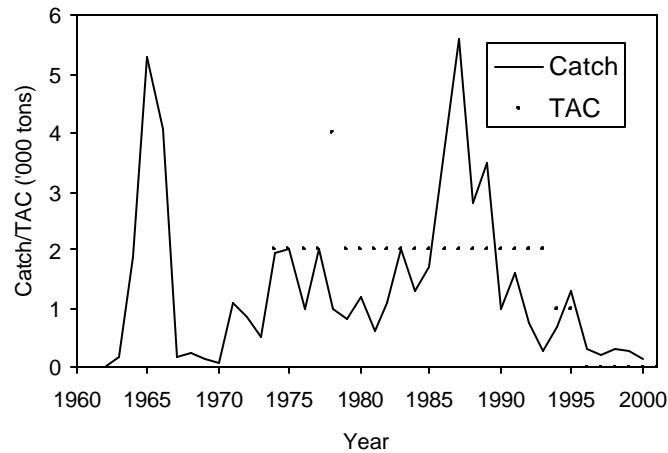


Fig.1 . American plaice in Div.3M: nominal catches and agreed TAC's

Input data

Commercial fishery data

Portugal (Vargas et al. 2001) provided length composition data for the 2000 trawl catches. This information was used to estimate the length and age compositions for the total catch (using the age/length key of the 2000 EU bottom trawl survey, Saborido, 2001). Table 1 show the update of the catch at age matrix (De Cardenas, 1999; Alpoim, 2000).

Table 1.- Catch at age Matrix ('000)

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1													
2													0.2
3											0.3		0.1
4	34	188	11	14	15	27	5	21	10		1	2	22
5	204	150	184	102	30	30	222	166	95				
6	642	507	57	545	86	70	94	445	241	5	1	2	30
7	1161	998	95	288	282	86	77	368	350	14	6	6	49
8	790	1041	169	412	73	79	82	307	95	56	19	29	20
9	1003	499	229	363	148	39	289	217	82	13	47	60	8
10	289	446	156	222	133	23	28	183	40	30	29	64	27
11	93	231	69	63	62	19	55	22	47	24	20	35	19
12	24	169	10	7	36	2	19	36	10	38	25	40	12
13	52	40	2	3	19		19	52	8	13	28	21	8
14	55	20	2		22		22	41	10	3	12	10	5
15	14	8	1				46	24	8	10	12	5	3
16+	27						46	32	5	4	6	3	3
										10	11	5	4

Mean weights-at-age in the catch shows a slowed decreasing trend from 1993 to 1997 for ages older than 8. This trend seems to stop in 1998 but in 1999 and 2000 the mean weights-at-age decreased again, being actually slightly below the average (Table 2).

Table 2.- Mean weight at age in the catch (kg)

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Mean
1														
2								0.037		0.041			0.115	0.064
3	0.181	0.247	0.237	0.117	0.201	0.145	0.144	0.159	0.253	0.152	0.185		0.115	0.178
4	0.264	0.371	0.358	0.304	0.292	0.271	0.282	0.275	0.323	0.212	0.259	0.344	0.267	0.294
5	0.293	0.449	0.488	0.472	0.456	0.377	0.436	0.435	0.442	0.384	0.391	0.517	0.410	0.427
6	0.445	0.681	0.579	0.619	0.649	0.611	0.510	0.577	0.588	0.506	0.543	0.515	0.520	0.565
7	0.619	0.867	0.845	0.873	0.754	0.915	0.594	0.632	0.737	0.617	0.746	0.561	0.566	0.717
8	0.864	0.960	0.992	1.064	0.978	1.303	0.752	0.775	0.823	0.588	0.892	0.780	0.698	0.882
9	1.001	1.156	1.101	1.282	1.183	1.265	0.895	1.023	0.975	0.809	0.941	0.858	0.773	1.020
10	1.198	0.975	1.125	1.380	1.271	1.468	0.868	1.150	0.915	0.949	1.118	0.944	0.772	1.087
11	1.233	1.588	2.006	1.477	1.491	1.731	0.976	1.354	1.158	0.963	1.283	1.102	0.869	1.325
12	1.504		1.887	1.671	1.645		0.976	1.386	1.296	1.155	1.343	1.188	1.070	1.375
13	1.806		1.726		1.997		1.215	1.526	1.172	1.196	1.368	1.319	1.310	1.463
14	1.674		1.758				1.500	1.626	1.383	1.362	1.502	1.444	1.265	1.502
15								1.526	1.537	1.527	1.578	1.438	1.360	1.494
16+								1.709	1.330	1.435	1.622	1.388	1.388	1.479

Research survey data

The series of research surveys conducted by the EU since 1988 was continued in July 2000. The USSR-Russian survey series started in 1983 ending in 1993. A single Canadian survey was conducted in 1996.

A continuous decreasing trend in abundance and biomass indices was observed since the beginning of the EU survey series. The 2000 abundance and biomass were the lowest of the series. The USSR-Russian survey series, although more variable, also showed a decreasing trend between the 1986-93 period. Both indices from the Canadian survey in 1996 were at the same level of the EU survey (Fig. 2).

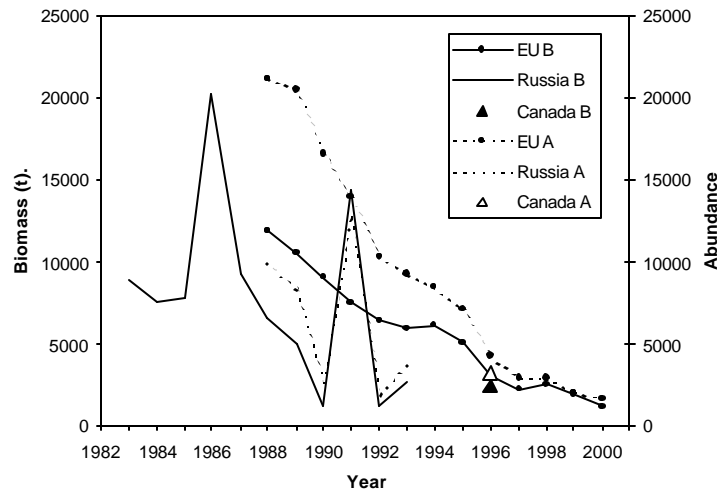


Fig.2. American plaice in Div. 3M: trends in biomass and abundance in the surveys.

During the EU survey series the age reader was changed three times, and age compositions of the survey may reflect different criteria. The process of revisiting the age samples from the former years of the EU survey series with the standard ageing criteria is still going on. Age 10, corresponding to the 1990 year-class, was the best represented (Table 3). Since 1991, all the recruiting year-classes were very poor as shown by EU survey indices. Mean weight at age for this survey series is shown in table 4.

Table 3.- Numbers at age in the EU survey

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	0	0	0	0	0	0	0	0	0	7	0	6	13
2	2284	454	359	309	736	9	34	19	28	14	22	0	22
3	625	6847	775	911	679	1365	40	99	103	96	29	20	6
4	3034	1500	7083	1877	910	969	1789	627	222	22	42	56	74
5	1975	3238	897	4461	1471	643	782	1620	465	99	62	60	88
6	3020	3006	2475	1836	3423	320	651	990	1236	311	202	57	118
7	4154	2868	1717	2009	913	3110	703	988	656	901	457	177	88
8	4258	1691	1657	1566	1090	339	2487	665	411	200	654	339	111
9	1492	587	1030	675	624	592	243	1132	308	312	388	371	289
10	207	261	485	232	289	296	480	128	470	223	267	189	314
11	109	34	90	8	138	198	166	143	113	372	235	260	167
12	61	14	15	48	74	229	164	119	63	103	228	163	141
13	0	0	31	0	16	280	195	119	67	19	73	98	59
14	0	0	17	0	0	865	398	241	90	77	94	100	44
15	0	0	0	0	0	28	397	183	62	38	47	49	38
16+	0	0	0	0	0	35	9	27	20	92	89	82	51

Table 4.- Weight at age in the EU-survey (kg)

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Mean
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.007	0.012	0.011
2	0.036	0.074	0.046	0.045	0.049	0.046	0.052	0.037	0.049	0.041	0.077	0	0.078	0.053
3	0.057	0.144	0.122	0.119	0.139	0.140	0.106	0.159	0.169	0.152	0.154	0.146	0.100	0.131
4	0.261	0.314	0.275	0.250	0.258	0.265	0.305	0.275	0.298	0.212	0.233	0.284	0.221	0.265
5	0.319	0.485	0.407	0.406	0.441	0.363	0.500	0.435	0.421	0.384	0.344	0.393	0.370	0.405
6	0.472	0.624	0.577	0.542	0.592	0.528	0.557	0.577	0.538	0.506	0.463	0.496	0.473	0.534
7	0.657	0.823	0.711	0.723	0.660	0.669	0.771	0.632	0.657	0.617	0.597	0.515	0.567	0.661
8	0.832	0.969	0.854	0.853	0.842	0.691	1.002	0.775	0.769	0.588	0.724	0.721	0.629	0.788
9	0.963	1.236	1.013	1.101	1.073	0.736	1.227	1.023	0.883	0.809	0.770	0.794	0.713	0.949
10	1.130	1.411	1.064	1.087	1.121	0.820	1.217	1.150	0.816	0.949	0.973	0.944	0.707	1.030
11	1.257	1.765	1.419	1.387	1.263	0.861	1.343	1.354	1.033	0.963	1.176	1.119	0.790	1.210
12	1.334	2.125	1.721	1.805	1.324	0.884	1.287	1.386	1.315	1.155	1.259	1.211	0.909	1.363
13	0.000	0.000	1.712	0.000	1.763	1.022	1.384	1.526	1.238	1.196	1.452	1.381	1.173	1.385
14	0.000	0.000	1.610	0.000	0.000	1.165	1.423	1.626	1.406	1.362	1.428	1.629	1.140	1.421
15	0.000	0.000	0.000	0.000	0.000	1.754	1.491	1.526	1.567	1.527	1.523	1.477	1.250	1.514
16+	0.000	0.000	0.000	0.000	0.000	1.529	1.782	1.709	1.746	1.435	1.568	1.504	1.323	1.575

The EU survey spawning stock biomass (50% of age 5 and age 6 plus) was in 1994 at the 1989-90 level, but decreased since then (Table 5). In 2000 SSB dropped to 11% of the 1988 level, being the lowest point observed in the survey series (1988-2000).

Table 5. Evolution of Recruit ('000) and SSB ('000 tons) EU survey index during the period 1988-2000.

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
SSB	9.9	7.8	6.0	5.8	5.2	5.0	6.4	4.6	2.7	2.1	2.4	1.8	1.1
Age 3 recruits	625	6847	775	911	679	1365	40	99	103	96	29	20	6

Estimation of Parameters

Taking into account the deficiencies in the database, only an approximation of the trend in exploitation was obtained, by comparing the catch and survey biomass ratio for ages fully recruited to the fishery (ages 8-11). This index reached its lowest value in 1994 and since then is fluctuating at a low level (Table 6 and Fig. 3). This index could be affected by unreported catches.

Table 6.- Trend of the 3M American plaice F index

	Catch (tons)	Survey (tons)	C/B
1988	1298	5350	0,243
1989	1470	2792	0,526
1990	497	3102	0,160
1991	768	2342	0,328
1992	435	2086	0,209
1993	111	1083	0,102
1994	309	3597	0,086
1995	429	2014	0,213
1996	161	1088	0,148
1997	91	940	0,097
1998	129	1308	0,099
1999	178	1008	0,177
2000	78	630	0,082

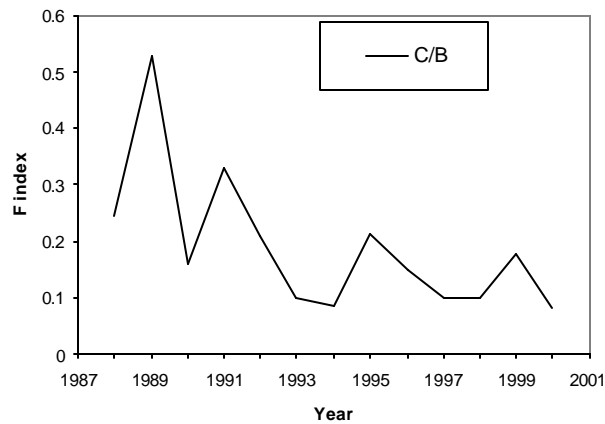


Fig. 3.- Trend of the 3M American plaice F index.

Stock status

There are no changes in perception of the stock status from 2000 to 2001. This stock continues to be in a very poor condition, with only weak year-classes expected to be recruited to the SSB for at least five years. Although the level of catches since 1992 is extremely low, survey data indicate that this stock kept at a very low level with no sign of recovery.

Reference Points

The age 3 is the first age that appears in all the years of the EU survey series, so it was used to evaluate the spawning stock and recruitment relationship. Only 10 points are available (Fig.4), showing very poor recruitment for an SSB less than 6 000 tons.

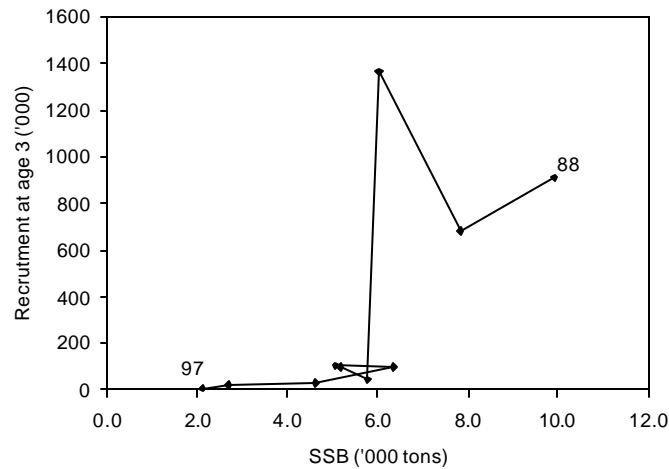


Fig. 4.- SSB-Recruitment scatter plot.

However, it is difficult to assess the effect of the environment on recruitment. In Fig 5 it is represented an index of the egg produced by Kg of SSB (both sexes includes), as the log of the R/SSB ratio for each year class. Two different periods can be shown in this figure, one before 1990 and other one since 1991. During the first period, an average of 0.135 recruits at age 3 were produced per Kg of SSB, while in the second period this average was reduced to only 0.011 recruits per Kg of SSB.

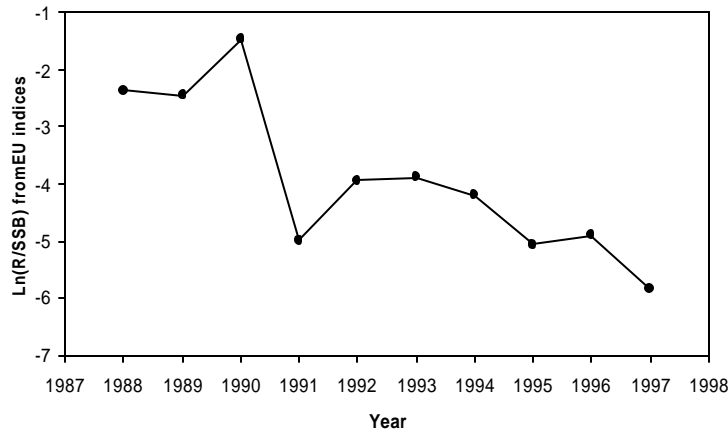


Fig. 5.- Recruit at age 3 produced per Kg of SSB index.

This recruitment failure seems not to be caused by the new shrimp fishery developed in Flemish Cap since the beginning of 90's, because estimation of by-catch give a very low figures for American plaice (Kulka, 1999). Moreover, age 0 and 1 seems to be not accessible to trawl gears as it happen in fact with the trawl gear used in the EU survey (Table 4).

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