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An Assessment of the American Plaice in Division 3M

by

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Introduction

The stock mainly occurs on Flemish Cap at depths shallower than 600 m. Catches of Contracting Parties are mainly by-catches of trawl fisheries directed to other species in this Division.

Since 1974, when this stock became regulated, catches ranged from 600 tons in 1981 to 5 600 tons in 1987. After that catches presented a declining trend to 275 tons in 1993, caused partly by a reduction in directed effort by the Spanish fleet in 1992. Catch for 1997 was estimated to be 208 tons. Half of this catch was made by non-Contracting Parties.

From 1979 to 1993 a TAC of 2 000 tons has been in effect for this stock. A reduction to 1 000 tons was decided for 1994 and 1995 and a moratoria was agreed to thereafter (Fig. 1).

Recent catches and TACs ('000 tons) are as follows:

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
TAC	2	2	2	2	2	2	1 ¹	1 ¹	0	0
Catch	2.8	3.5	0.8	1.6	0.8	0.3	0.7 ²	1.3 ²	0.3 ²	0.2 ²

¹ No directed fishing.

² Provisional.

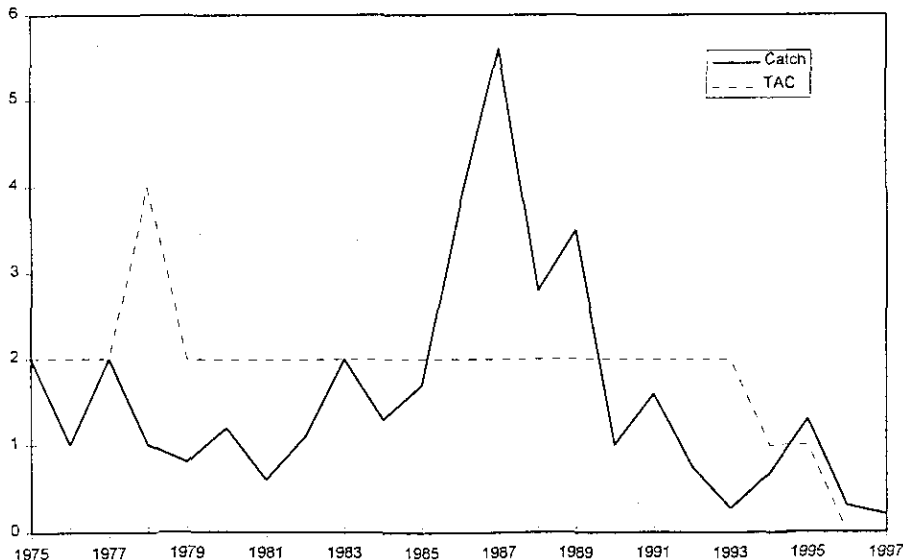


Fig. 1. American plaice in Div. 3M: nominal catches and agreed TACs.

Input Data

Commercial fishery data

EU-Portugal provided length composition of the trawl catches for the second quarter of the year, but only for 2 samples and a total of 102 individual measured. This information was used to estimate the length composition for the total catch (208 tons). The 1990 and 1986 (ages 7 and 11 in 1997) year-classes appear as the most abundant ones (Table 1).

Table 1.- Catch at age matrix for 1988-97

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

Mean weight at age in the catch show a slight decreasing trend since 1993 for ages older than 8 (table 2).

Table 2.- Mean weight at age in the catch for the period 1988-97 (obtained from the survey since 1994)

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Mean
2	0,039	0,039	0,039	0,039	0,039	0,039	0,039	0,037	0,039	0,041	0,039
3	0,181	0,247	0,237	0,117	0,201	0,145	0,144	0,159	0,253	0,152	0,184
4	0,264	0,371	0,358	0,304	0,292	0,271	0,282	0,275	0,323	0,212	0,295
5	0,293	0,449	0,488	0,472	0,456	0,377	0,436	0,435	0,442	0,384	0,423
6	0,445	0,681	0,579	0,619	0,649	0,611	0,51	0,577	0,588	0,506	0,577
7	0,619	0,867	0,845	0,873	0,754	0,915	0,594	0,632	0,737	0,617	0,745
8	0,864	0,96	0,992	1,064	0,978	1,303	0,752	0,775	0,823	0,588	0,910
9	1,001	1,156	1,101	1,282	1,183	1,265	0,895	1,023	0,975	0,809	1,069
10	1,198	0,975	1,125	1,38	1,271	1,468	0,868	1,15	0,915	0,949	1,130
11	1,233	1,588	2,006	1,477	1,491	1,731	0,976	1,354	1,158	0,963	1,398
12	1,504	1,440	1,887	1,671	1,645	1,440	0,976	1,386	1,296	1,155	1,440
13	1,806	1,520	1,726	1,520	1,997	1,520	1,215	1,526	1,172	1,196	1,520
14	1,674	1,551	1,758	1,551	1,551	1,551	1,5	1,626	1,383	1,362	1,550
15	1,530	1,530	1,530	1,530	1,530	1,530	1,530	1,526	1,537	1,527	1,550
16	1,491	1,491	1,491	1,491	1,491	1,491	1,491	1,709	1,33	1,435	1,550

Research survey data

The series of research surveys conducted by the EU since 1988 was continued in July 1997. The Russian survey series started in 1983 was interrupted in 1994. There was a survey carried out by Canada during 1996, but do not continue in 1997. Results of 1996 survey are not comparable with the former Canadian series (1978-85) due to changes in survey gear and timing.

A continuous decreasing trend in both the indices of abundance and biomass was observed since the beginning of the EU series. Russian series, although presenting a higher variability, also showed a decreasing trend between the 1986 - 1993 period (Fig. 2 and Table 3).

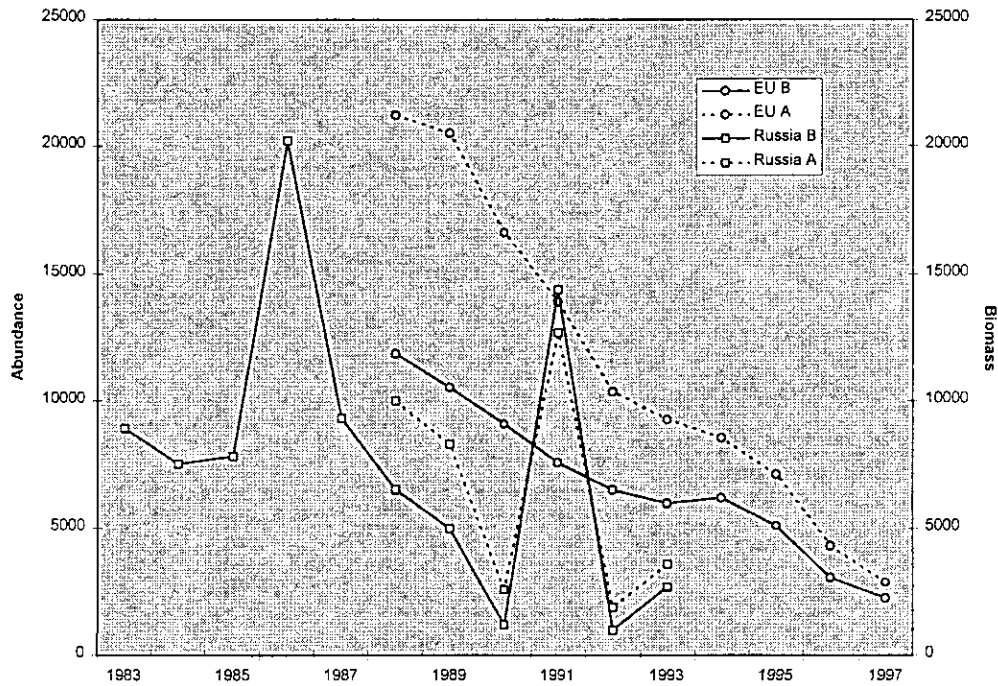


Fig. 2. American plaice in Div. 3M: trends in biomass and abundance in the surveys.

Table 3.- Trends in biomass and abundance in the EU and Russian surveys

	EU Biomass	EU Abundance	Russia Biomass	Russia Abundance
1983			8900	
1984			7500	
1985			7800	
1986			20200	
1987			9300	
1988	11868	21219	6500	10000
1989	10533	20500	5000	8300
1990	9101	16631	1200	2600
1991	7565	13932	14400	12700
1992	6492	10363	1000	1900
1993	5949	9268	2700	3600
1994	6173	8538		
1995	5087	7100		
1996	3073	4321		
1997	2268	2886		

During the survey series the age reader was changed three times, and age compositions of the survey may reflect different criteria. Like in the commercial catches ages 7 and 11, corresponding to the 1986 and 1990 year classes, are the best represented. Since 1991, a series of very poor year classes are recruited to this fishery as shown by EU survey indices in the successive years (Table 4).

Table 4. Age composition of 3M American plaice in the EU survey series.

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
2	2284	454	359	309	736	9	34	19	28	14
3	625	6847	775	911	679	1365	40	99	103	96
4	3040	1500	7083	1877	910	969	1789	627	222	22
5	1975	3238	897	4461	1471	643	782	1620	465	99
6	3020	3006	2475	1836	3423	320	651	990	1236	311
7	4154	2868	1717	2009	913	3110	703	988	656	901
8	4258	1691	1657	1566	1090	339	2487	665	411	200
9	1492	587	1030	675	624	592	243	1132	308	312
10	207	261	485	232	289	296	480	128	470	223
11	109	34	90	8	138	198	166	143	113	372
12	61	14	15	48	74	229	164	119	63	103
13			31		16	280	195	119	67	19
14			17			865	398	241	90	77
15						28	397	183	62	38
16						35	9	27	20	92

The spawning stock biomass (50% of that in age 5 + age 6+), as estimated from the EU surveys, increased in 1993 to a value close to 1991, but decreased since 1995 (table below). The level in 1997 was only 25% of the 1988 level, the lowest point observed in the survey series (1988-97). This decreasing trend is expected to be continued as long as no strong year-classes recruit to the SSB in the near future.

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
SSB	8.5	5.8	5.3	5.7	3.6	5.0	5.0	4.3	2.9	2.1

Estimation of parameters

Taking into account the deficiencies in the data base, only a crude approximation of the trend in fishing mortality could be obtained, by comparing the catch and survey biomass ratio for ages fully recruited to the fishery (8-11). For 1997 the F index was 0.1, attaining the lowest record of the series (table 5; Fig. 5).

Table 5.- American plaice in Div. 3M: trend in F index for the period 1988-97.

Year	Catch	Survey	C/B
1988	1 298	6 066	0.21
1989	1 470	2 573	0.57
1990	497	3 262	0.15
1991	768	2 481	0.31
1992	435	2 141	0.20
1993	111	1 075	0.10
1994	309	2 666	0.12
1995	429	1 580	0.27
1996	161	1 199	0.13
1997	91	940	0.10

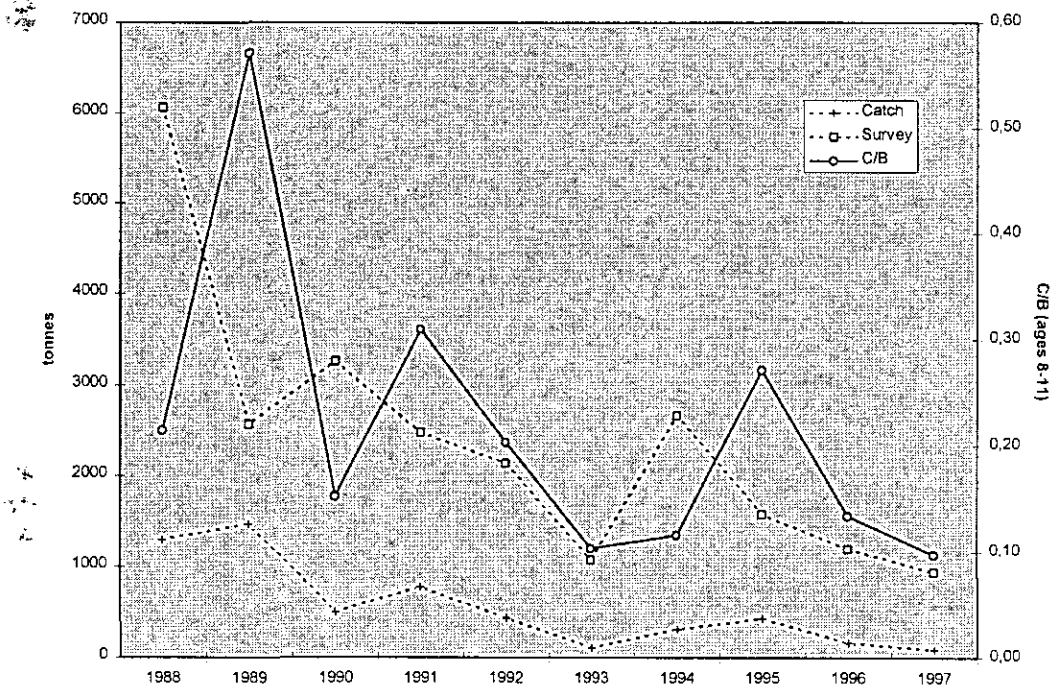


Fig. 5. American plaice in Div. 3M: trend in F index, catch and survey biomass.

Assessment Results

STACFIS noted that this stock continues to be in a very poor condition, with only poor year-classes expected to be recruited to SSB for at least five years. Although the level of catches since 1992 is relatively low, survey data indicate that this stock is at a very low level and there is no sign of recovery.

Stock Recruitment plot

Only 8 point are available for this plot, but as can be seen in Fig. 6, only very poor recruitment appear at SSB bellow 5.5 tones. Besides it is difficult to assess the roll of the environment in those recruitment failures (Fig. 6).

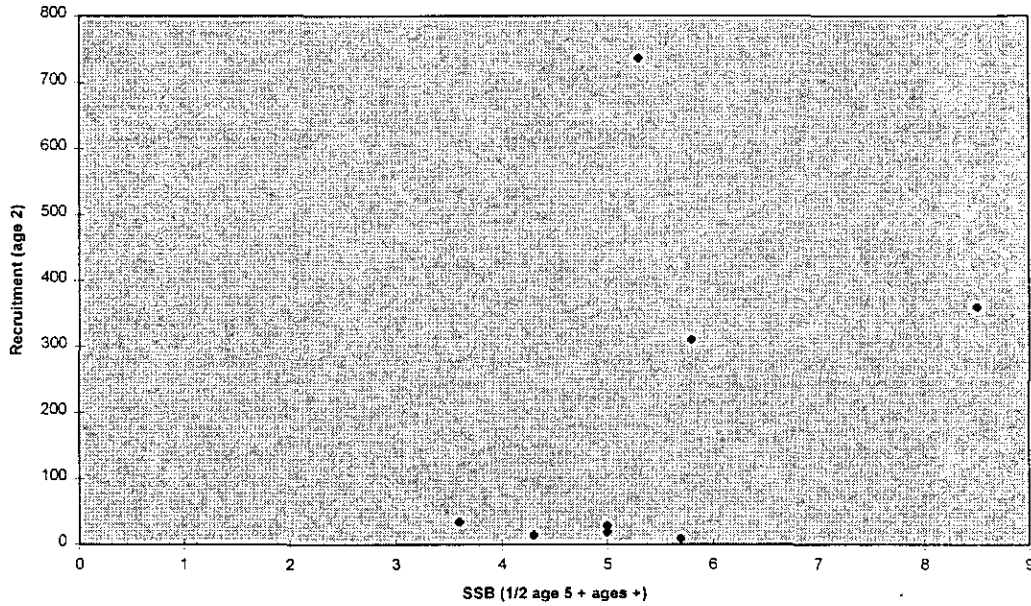


Fig. 6.- SSB-Recruitment scaterplot

Yield per recruit

The following parameters were used to calculate the yield per recruit in this stock: $M = 0.2$; Mean weight at age calculated as the average weight at age for the period 1988-97 (table 4) and partial recruitment data from 3LNO American plaice (Brodie, pers. comm.). This selectivity pattern is as follow:

Age	5	6	7	8	9	10	11+
	0.13	0.2	0.23	0.39	0.61	0.8	1.0

It has been applied because it is known from catch curves that this species is not fully recruited to the fishery until age 9. The results give an $F_{max} = 1.87$, and an $F_{01} = 0.27$ (Fig. 7)

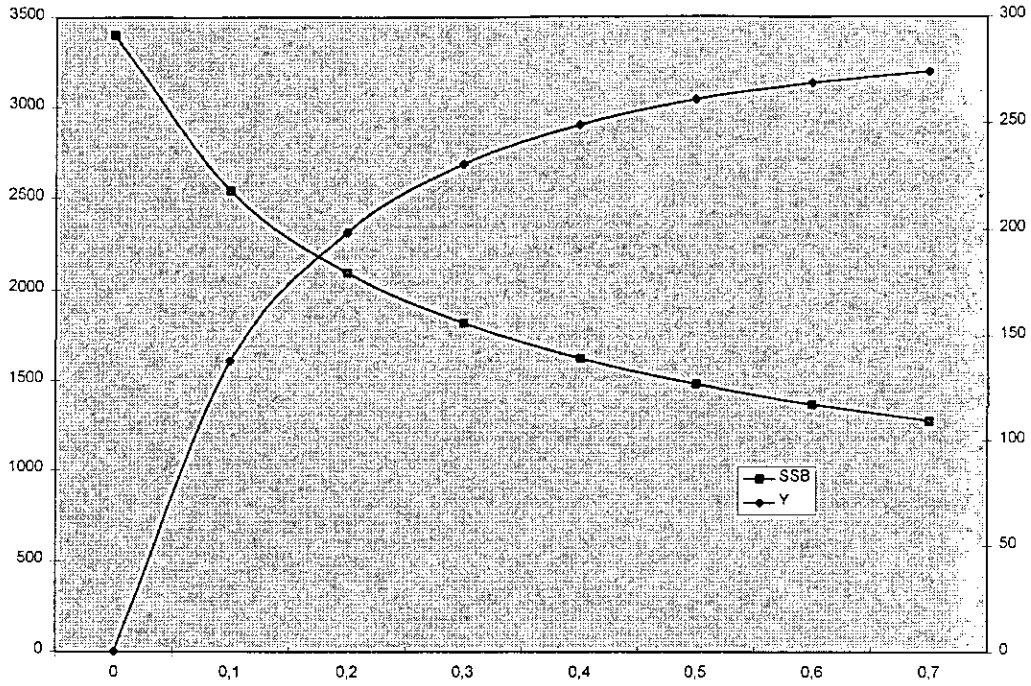


Fig. 7.- Yield per recruit 3M American plaice.