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An Assessment on American Plaice (*Hippoglossoides platessoides*) in Division 3M

by

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Introduction

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

Since 1974, when this stock became regulated, catches ranged from 600 tons (1981) to 5 600 tons (1987). After that catches declined to 275 tons in 1993, caused partly by a reduction in directed effort by the Spanish fleet in 1992. Catch for 1998 was estimated to be 294 tons. A 34% 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 agreed for 1994 and 1995 and a moratorium was agreed to thereafter (*Fig. 1*).

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

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
TAC	2	2	2	2	2	1[1]	1[1]	0	0	0
Catch	3.5	0.8	1.6	0.8	0.3	0.7	1.3[2]	0.3[2]	0.2[2]	0.3[2]

[1] No directed fishing.
[2] Provisional.

Input Data

Commercial fishery data

EU-Portugal (Alpoim et al. 1999) provided length composition data of the trawl catches for the second and thirst quarter of the year. This information was used to estimate the length composition for the total catch (294 tons). The 1990 year-class (ages 8 in 1998) appear as the most abundant one (*Table 1*).

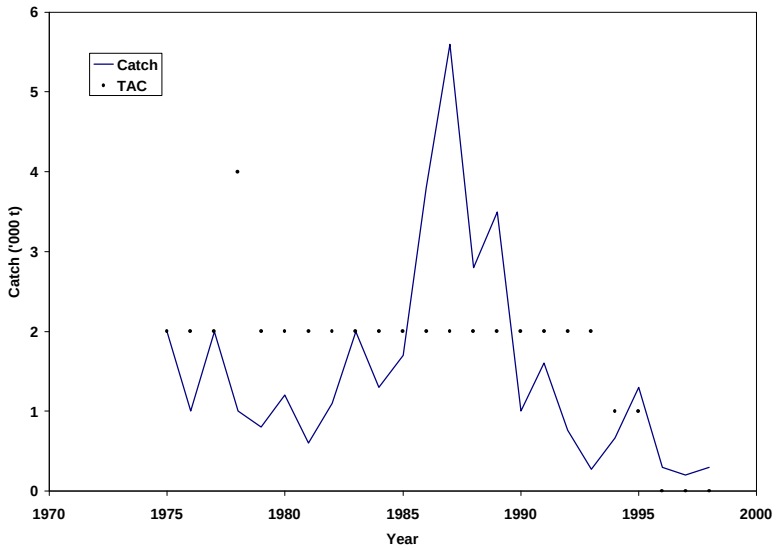

Fig. 1. American plaice in Div. 3M: nominal catches and agreed TACs.

Table 1.- Catch at age Matrix

Catch											
Age	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
3	34	188	11	14	15	27	5	21	10		
4	204	150	184	102	30	30	222	166	95		1
5	642	507	57	545	86	70	94	445	241	5	1
6	1161	998	95	288	282	86	77	368	350	14	6
7	790	1041	169	412	73	79	82	307	95	56	19
8	1003	499	229	363	148	39	289	217	82	13	42
9	289	446	156	222	133	23	28	183	40	30	26
10	93	231	69	63	62	19	55	22	47	24	18
11	24	169	10	7	36	2	19	36	10	38	17
12	52	40	2	3	19		19	52	8	13	21
13	55	20	2		22		22	41	10	3	68*
14	14	8	1				46	24	8	10	
15	27						46	32	5	4	
16										10	

** Plus group*

Mean weight-at-age in the catch shows a slight decreasing trend from 1993 to 1997 for ages older than 8, but this trend seems to stop in 1998, actually the values for these ages are 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	Mean
2	*0,039*	*0,039*	*0,039*	*0,039*	*0,039*	*0,039*	*0,039*	0,037	*0,039*	0,041	*0,039*	*0,039*
3	0,181	0,247	0,237	0,117	0,201	0,145	0,144	0,159	0,253	0,152	0,185	*0,184*
4	0,264	0,371	0,358	0,304	0,292	0,271	0,282	0,275	0,323	0,212	0,259	*0,295*
5	0,293	0,449	0,488	0,472	0,456	0,377	0,436	0,435	0,442	0,384	0,391	*0,423*
6	0,445	0,681	0,579	0,619	0,649	0,611	0,510	0,577	0,588	0,506	0,543	*0,577*
7	0,619	0,867	0,845	0,873	0,754	0,915	0,594	0,632	0,737	0,617	0,746	*0,745*
8	0,864	0,960	0,992	1,064	0,978	1,303	0,752	0,775	0,823	0,588	0,861	*0,910*
9	1,001	1,156	1,101	1,282	1,183	1,265	0,895	1,023	0,975	0,809	0,906	*1,069*
10	1,198	0,975	1,125	1,380	1,271	1,468	0,868	1,150	0,915	0,949	1,091	*1,130*
11	1,233	1,588	2,006	1,477	1,491	1,731	0,976	1,354	1,158	0,963	1,313	*1,398*
12	1,504	*1,440*	1,887	1,671	1,645	*1,440*	0,976	1,386	1,296	1,155	1,320	*1,440*
13	1,806	*1,520*	1,726	*1,520*	1,997	*1,520*	1,215	1,526	1,172	1,196	1,411	*1,520*
14	1,674	*1,551*	1,758	*1,550*	*1,550*	*1,550*	1,500	1,626	1,383	1,362	*1,550*	*1,550*
15	*1,550*	*1,550*	*1,550*	*1,550*	*1,550*	*1,550*	*1,550*	1,526	1,537	1,527	*1,550*	*1,550*
16	*1,550*	*1,550*	*1,550*	*1,550*	*1,550*	*1,550*	*1,550*	1,709	1,330	1,435	*1,550*	*1,550*

Estimated values in italic

Table 3.- Numbers at age in the EU survey

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
1										7	
2	2284	454	359	309	736	9	34	19	28	14	22
3	625	6847	775	911	679	1365	40	99	103	96	29
4	3040	1500	7083	1877	910	969	1789	627	222	22	42
5	1975	3238	897	4461	1471	643	782	1620	465	99	62
6	3020	3006	2475	1836	3423	320	651	990	1236	311	202
7	4154	2868	1717	2009	913	3110	703	988	656	901	457
8	4258	1691	1657	1566	1090	339	2487	665	411	200	654
9	1492	587	1030	675	624	592	243	1132	308	312	388
10	207	261	485	232	289	296	480	128	470	223	267
11	109	34	90	8	138	198	166	143	113	372	235
12	61	14	15	48	74	229	164	119	63	103	228
13			31		16	280	195	119	67	19	73
14			17			865	398	241	90	77	94
15						28	397	183	62	38	47
16						35	9	27	20	92	89

Research survey data

The series of research surveys conducted by the EU since 1988 was continued in July 1998 (Vazquez, 1999).

Age distribution for this survey is shown in *table 3*, mean weight at age for this survey series appear in *table 4*.

The USSR-Russian survey series started in 1983 but was terminated in 1994.

A continuous decreasing trend in both indices of abundance and biomass was observed since the beginning of the EU survey series, in 1998 abundance and biomass was at 1997 level the lowest of the series. The USSR-Russian survey series, although more variable, also showed a decreasing trend between the 1986-93 period (*Fig. 2*).

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

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Mean
1	*0,013*	*0,013*	*0,013*	*0,013*	*0,013*	*0,013*	*0,013*	*0,013*	*0,013*	0,013	*0,013*	*0,013*
2	0,036	0,074	0,046	0,045	0,049	0,046	0,052	0,037	0,049	0,041	0,077	*0,050*
3	0,057	0,144	0,122	0,119	0,139	0,140	0,106	0,159	0,169	0,152	0,154	*0,133*
4	0,261	0,314	0,275	0,250	0,258	0,265	0,305	0,275	0,298	0,212	0,233	*0,268*
5	0,319	0,485	0,407	0,406	0,441	0,363	0,500	0,435	0,421	0,384	0,344	*0,410*
6	0,472	0,624	0,577	0,542	0,592	0,528	0,557	0,577	0,538	0,506	0,463	*0,543*
7	0,657	0,823	0,711	0,723	0,660	0,669	0,771	0,632	0,657	0,617	0,597	*0,683*
8	0,832	0,969	0,854	0,853	0,842	0,691	1,002	0,775	0,769	0,588	0,724	*0,809*
9	0,963	1,236	1,013	1,101	1,073	0,736	1,227	1,023	0,883	0,809	0,770	*0,985*
10	1,130	1,411	1,064	1,087	1,121	0,820	1,217	1,150	0,816	0,949	0,973	*1,067*
11	1,257	1,765	1,419	1,387	1,263	0,861	1,343	1,354	1,033	0,963	1,176	*1,256*
12	1,334	2,125	1,721	1,805	1,324	0,884	1,287	1,386	1,315	1,155	1,259	*1,418*
13	*1,405*	*1,405*	1,712	*1,405*	*1,405*	1,022	1,384	1,526	1,238	1,196	1,452	*1,405*
14	*1,488*	*1,488*	1,610	*1,488*	*1,488*	1,165	1,423	1,626	1,406	1,362	1,428	*1,488*
15	*1,544*	*1,544*	*1,544*	*1,544*	*1,544*	1,754	1,491	1,526	1,567	1,527	1,523	*1,544*
16	*1,689*	*1,689*	*1,689*	*1,689*	*1,689*	1,529	1,782	1,709	1,746	1,435	1,568	*1,689*

Estimated values in italic

During the survey series the age reader was changed three times, and age compositions of the survey may reflect different criteria. As in the commercial catches, ages 8, corresponding to the 1990 year-class, are the best represented. Since 1991, a series of very poor year-classes has recruited to this fishery as shown by EU survey indices in successive years (table 3).

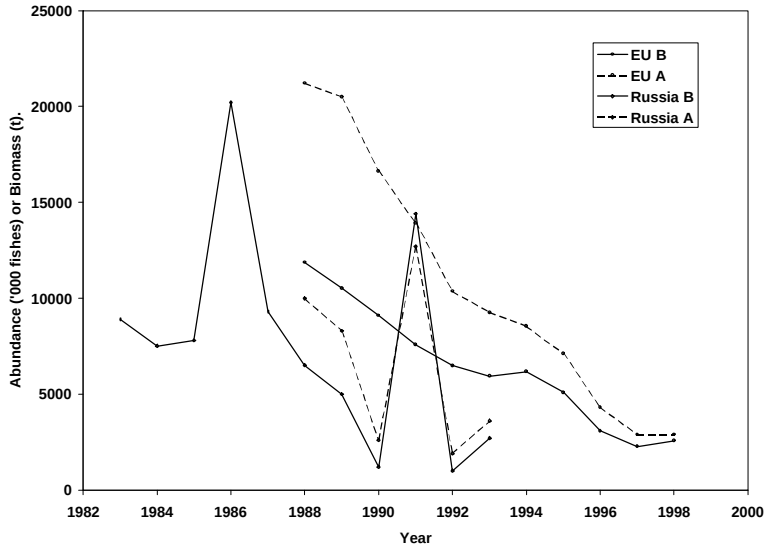

Fig. 2. American plaice in Div. 3M: trends in biomass and abundance in the surveys.

The spawning stock biomass (50% of that in age 5 plus age 6 and older), as estimated from the EU surveys, increased in 1994 to a value between 1989 and 1990, but decreased since this (*Table 5*). The level in 1998 value was only a 24% of the 1988 one, the second lowest point observed in the survey series (1988-98).

Table 5. Evolution of SSB EU survey index during the period 1988-97.

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1988
SSB	9.9	7.8	6.0	5.8	5.2	5.1	6.4	4.6	2.7	2.1	2.4

Estimation of Parameters

Taking into account the deficiencies in the data base, 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). For 1998 the index was 0.1, reaching one of the lowest values in the time series (*Table 6 and Fig. 3*). This index could be affected by unreported catches. Another estimation of F could be obtained by the log of the ratio between ages 6+ in one year, and 7+ the next year, minus 0.2 (natural mortality). This last index, although demonstrate a considerable amount of interannual variability, follow the same trend. For 1997 this index give a negative value.

Table 6.- Trend 3M American plaice in F index

	Catch	Survey	C/B	F(7+/6+)
1988	1298	5350	0,243	0,691
1989	1470	2792	0,526	0,318
1990	497	3102	0,160	0,305
1991	768	2342	0,328	0,507
1992	435	2086	0,209	0,000
1993	111	1083	0,102	0,000
1994	309	3597	0,086	0,253
1995	429	2014	0,213	0,540
1996	161	1088	0,148	0,203
1997	91	940	0,097	0,000
1998	129	1308	0,099	

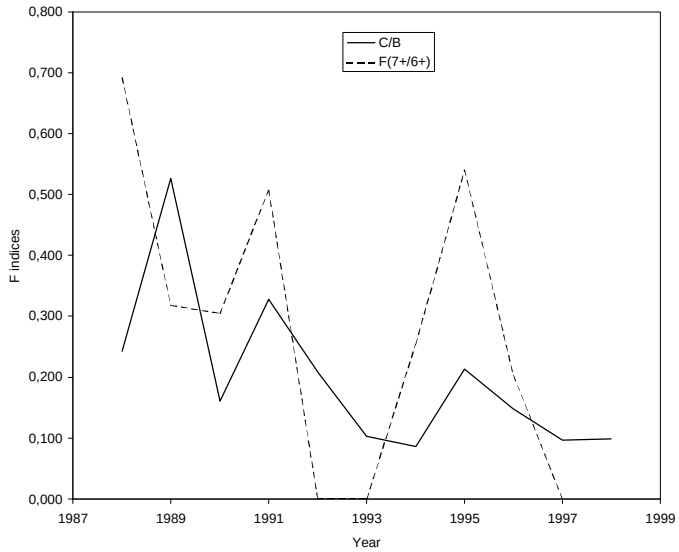

Fig. 3.- Comparison between the trends shown by two indices of F.

Assessment Results

This stock continues to be in a very poor condition, with only poor year-classes expected to be recruited to the 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.

Reference Points

Only 9 points are available to evaluate a spawning stock and recruitment relationship, but as can be seen in Fig. 4, only very poor recruitment appears at an SSB less than 6 000 tons, as estimated by the EU survey.

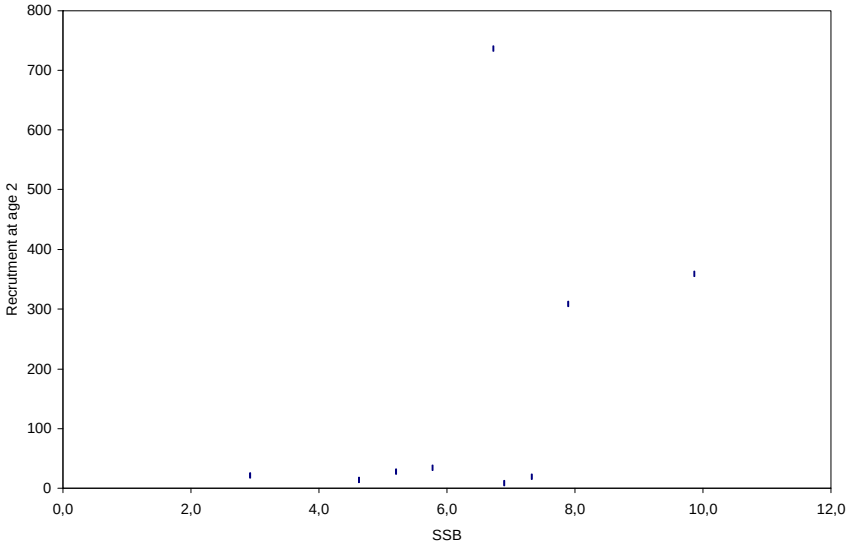

Fig. 4.- SSB-Recruitment scatter plot.

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 0.056 recruits at age 2 were produced per Kg of SSB, while in the second period this average was reduced to only 0.004 recruits per Kg of SSB.

Although it could be argue that this recruitment failure may be due to the new shrimp fishery developed in Flemish Cap since the beginning of 90's, this not seems to be a good explanation because estimation of by catch give a very low capture of American plaice, moreover, ages 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*).

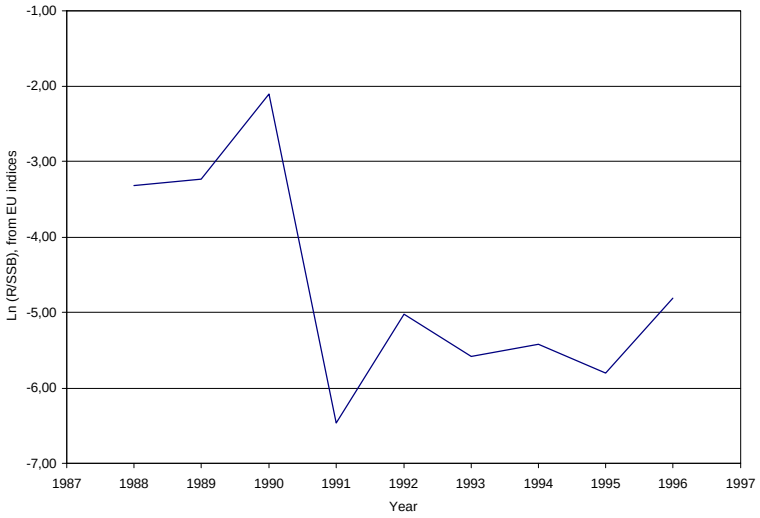

Fig. 5.- Recruit at age 2 produced per Kg of SSB index.

References

Vazquez, A.. 1999. Results from bottom trawl survey of Flemish Cap in July 1998. NAFO SCR Doc. 99/22. N4073. 39 p.

Alpoim, R., E. Santos, J. Vargas, and A. M. Ávila de Melo. 1999. Portuguese research report for 1998. SCS Doc. 99/16. Serial No. N4091. 43p.