International Council for the
Exploration of the Sea

C.M.1979/G:10 - ADDENDUM 1

ERRATA

to

REPORT OF THE NORTH SEA FLATFISH WORKING GROUP

Changes in N.S. Flatfish Report

p.4.- 2.6.1.

p.5.- 2.6.1./2.6.2/2.7.1.

p.6.- 2.7.1/2.7.2

p.10.- 3.8

p.28 and p.29 : tables 2.9 and 2.10 withdrawn

New table 2.9 and 2.10

p.51 :table 4.11

p.64 : table 5.8 in right order and place

p. 68 : table 6.11

Figure 2.8 withdrawn

Due to the changes the numbering of the pages from page 28 has to be altered.

Ostend 30 August 1979

Dr. R. DE CLERCK

Chairman of the Flatfish Working Group

are in very good agreement with each other. For the years 1961, 1962 and 1963 both cpue curves agree with VPA runs in which a high M for 1963 has been taken. This means that it is very likely that the natural mortality in 1963 was of the order of 0.8 - 1.0.

Before 1959 the VPA stock curves shown still do not agree with the cpue curves; however, another simulation on similar lines (Houghton, pers.comm.) suggests that this discrepancy can also be resolved, so cpue and VPA curves match for the whole series.

2.5.2 The effect of the severe winter of 1979 on the natural mortality

De Veen (1969) showed that the effects of a strong or severe winter can be estimated qualitatively by calculating for the North Sea the number of days in which the surface water temperature has been below $3\frac{1}{2}$°C. Surface temperatures probably represent temperature at the bottom because in the area considered the water column is homogenous throughout the year.

Figure 2.5 shows the situation in 1963. As a result of the normal east-west migration of the North Sea sole the fish moved to the deepest and warmest parts of their range but were still overrun by cold temperatures. Thus, the Silverpit and the Deepwater Channel showed the highest mortality rate later in May-June 1963 (Woodhead, 1964b). The area with reported dead or dying soles roughly coincides with 60 or more days line. Figure 2.6 shows the situation in the 1979 winter. Very high catch rates were experienced in the Belgian and Dutch sole fishery during January-March 1979 in the western half of the central and southern North Sea. However, compared with the 1963 situation, the duration of the cold water regime in these deeper parts of the North Sea was much less than in 1963, so that natural mortality owing to the 1979 severe winter may have been considerably less than in 1963.

Figure 2.7 shows the surface temperatures on four selected positions in the North Sea in 1963, 1979 and the average situation. The Galloper lightvessel temperatures in 1979 were slightly below the average in contrast to the low temperatures in 1963. The Smith Knoll lightvessel data for 1979 were below the average, but higher than in 1963. The position 55°05' - 55°14'N, 2°03' - 2°14'E in the central North Sea in the western part showed 1979 temperatures well below average and slightly above the 1963 picture. To conclude, the Elbe I lightvessel data showed 1979 temperatures far below average but somewhat higher than the 1963 situation (Ellett, 1963, 1967; Ellett and Baxter, 1963; D.H.I., 1954-77). Figure 2.7 confirms the findings of Figure 2.6.

At the moment no information on the level of M for 1979 is available. For prognosis purposes a number of values for M_{1979} has been chosen, e.g. 0.1, 0.2, 0.3, 0.4, and 0.5.

2.6 Catch Predictions

2.6.1 Introduction

To assess the order of magnitude of an increased M on catch and stock in 1980 and hence on a range of possible management measures, prediction runs have been made assuming an array of M values between 0.1 and 0.5. In addition, some assumptions on recruit strength have been made. In Option A average recruitment having the same natural mortality as the adults has been taken. In Options B and C the figure for the 1978 year class as taken from the latest 0-group survey has been used. In Option B, this year class had the same M as the adult soles. In Option C an extra 50% natural mortality was assumed for the 1978 year class.

In each of the three Options three levels of F have been taken. In the first run, it was assumed that $F_{80} = F_{78}$, in the second run $F_{80} = 0.80\ F_{78}$, and in the third run $F_{80} = 0.5\ F_{78}$. In all runs it was assumed that the TAC for 1979 will be exceeded, and that $F_{79}=F_{78}$.

The runs were carried out for males and females separately, and the resulting stock and catch biomasses added together. **The imput 1978 catch numbers per age group are taken from tables 2.2 and 2.5.** The weight-at-age data for catch and stock are given in Table 2.8.

2.6.2 Results of catch predictions

Table 2.9 gives the details of the predictions for total and spawning stock and catch biomasses for 1980. To correct for the discrepancies mentioned in para. 2.3.1 all the figures have been raised by 10%.

Table 2.10 is a summary of the resulting total stock biomasses at the beginning of 1981. In Section 2.7 the difficulty to define a long-term objective for management will be given.

In Section 9.4 the absence of a stock/recruitment relationship in the available data is indicated. It is obvious that the stock at the beginning of 1978 was such that the good year class 1978 was produced. A short-term objective might be to restore the sole stock to at least the level at the beginning of 1978, viz., 44 700 tonnes.

Tables 2.9 and 2.10 show for different values of M in 1979 the level of TACs needed to reach the stock of 44 700 tonnes, i.e. the 1978 level, at the beginning of 1981. This will depend on the magnitude of M_{79} of the adult soles and the M_{79} of the year class recruiting in 1980.

2.7 Management Options

2.7.1 The present impossibility of giving an advice on a TAC for 1980

Owing to the effects of the severe winter of this year the level of the stock and the 1978 recruitment are unknown at present.

In 1962 a good year class was born, but it nearly disappeared after the 1963 winter. At the moment the situation is roughly the same. The fate of the good 1978 year class which has to recruit in 1980 is unknown. The international spring 0-group survey this year failed to show the 1978 year class, but this may be the result of retarded migration from deeper water which has happened also after the 1963 winter. Thus, in the months to come more information will become available on the strength of the 1978 year class at present. Another uncertainty is that the level of increased natural mortality on the adult soles is unknown at present.

It is therefore difficult to give any positive advice on a TAC for 1980 in this report. It is imperative to postpone any advice on management until more information on the after-effects of this severe winter become available.

Two possible short-term management options were discussed by the Working Group and are presented below:

(1) that the 1980 TAC should be chosen to return the total stock biomass in 1981 to 44 700 tonnes, which was that observed in 1978;

(2) the 1980 TAC should be chosen to make the 1981 spawning stock biomass equal to the average level of 1970-78, i.e. 46 000 tonnes.

TACs corresponding to these options for a range of values of M are given in the text tables below.

Text Table 1. TACs for North Sea sole for 1980 (in tonnes) to achieve a stock biomass in 1981 = 1978.

M_{79}	Option 1 (Average recruitment)	Option 2 (1978 recruit strength)	Option 3 (0.5 x 1978 recruit strength)
0.1	20 500	(1)	18 000
0.2	16 200	(1)	14 000
0.3	13 600	21 100	10 600
0.4	9 000	17 800	7 500
0.5	6 300	14 800	(1)

Text Table 2. TACs for North Sea sole for 1980 (in tonnes) to achieve a spawning stock biomass in 1981 = average 1970-78.

M_{79}	Option 1 (Average recruitment)	Option 2 (1978 recruit strength)	Option 3 (0.5 x 1978 recruit strength)
0.1	15 300	(24 000)	13 000
0.2	11 700	20 000	10 000
0.3	(7 000)	16 200	(1)
0.4	(1)	12 800	(1)
0.5	(1)	10 000	(1)

(NB. Figures within brackets are less accurate because of extrapolation on the curves.)

(1) : extrapolation on the curves too uncertain

Whatever the effects of the 1979 winter on the stock, management should be aimed at restoring the present stock level immediately to the 1978 level. This short-term objective will certainly mean a reduction in the catch possibilities in 1980. It is necessary to know what the catch possibilities will be in 1980 and this can only be assessed after the missing information has been collected. There is a chance that a sensible assessment can be carried out in October-November this year, not earlier.

2.7.2 The present impossibility of defining long-term management objectives for North Sea sole

De Veen (1976, 1978b) has shown that growth is not constant in the North Sea sole, but that a dependency on the fishery exists. **Houghton (pers. comm.) assumes** that the observed change in growth rate is linked with stock biomass. In both cases a constant parameter yield per recruit

NO UNDER-LINING

3.8 Management Objectives

For both the catch option forecast in Table 3.13, the spawning stock does not change appreciably in the short term because of the level of recruitment, and the yield per recruit curve suggests that the present maximum value of F in the exploitation pattern corresponds to the diagnosis of full exploitation made in previous years.

For the years 1963-76, two year old recruits and the female stock biomass based on the English growth data, are plotted in Figure 3.6. No fit has been made to these data, but the plot suggests that recent year classes are larger, though more variable, than hitherto. On this basis the present management objective should be to maintain present spawning stock levels, and to prevent any further increase in fishing mortality. This would be achieved by adopting a TAC of 112 000 tonnes for 1980.

4. SOLE IN DIVISION VIId

4.1 Catch Trends

Total international landings have risen continuously from 840 tonnes in 1975 to 1 350 tonnes in 1978 (Table 4.1, Figure 4.1.A).

4.2 Age Composition

The 1977 age composition data were updated (Tables4.3 and 4.7). For 1978, Belgium, France and the United Kingdom (England) provided age composition data which accounted for 100% of the reported landings.

It is believed that perhaps 40% of the English landings and an unknown but probably significant proportion of the French landings are unreported in this area. At present, no data are available which could be used to correct for this, and for this reason age compositions have been revised to represent only the reported weights.

No data are available on discards and by-catch.

4.3 Weight at Age

Values of weight at age used in estimation of spawning stock biomass and for predicting catches are shown in Table 4.4. These values are unaltered from those used last year. The sum of products of mean weight at age with numbers caught was 6% below the reported 1978 landings.

4.4 Virtual Population Analysis

It was assumed that M = 0.1 for both sexes at all ages.

Data on fishing effort in the Belgian and United Kingdom (England) fisheries are shown in Table 4.2. Only four years' data are available for Division VIId for English vessels and only seven years' data were available for the Belgian fishery. It proved impossible to find a set of input F at age, for either males or females, such that F in years before 1978 was well correlated with either measure of fishing effort. On this basis, the input F at age for 1978 was based on the mean value for the period 1973-75. This procedure resulted in sets of input F at age which closely resembled those chosen by the Group last year (Tables 4.5 and 4.8).

Values of stock in numbers from VPA are given in Tables 4.6 and 4.9. Historical spawning stock biomasses are shown in Figure 4.1.A. Spawning stock levels declined between 1971 and 1976; the estimated level for 1978 is, however, in excess of that estimated for 1971.

Table 2.9 North Sea SOLE. Catch predictions for 1980 (in tonnes)

	Option A			Option B			Option C		
	Mean Recruitment Fem 43 000 Mal 42 000			Recruitment Females 73 400 Males 71 200			Recruitment Females 36 700 Males 35 600		
	Run I	Run II	Run III	Run I	Run II	Run III	Run I	Run II	Run III
M = .1 in 1979									
Total stock biomass	46 165	46 165	46 165	49 491	49 491	49 491	45 461	45 461	45 461
Spawning stock	41 861	41 861	41 861	41 861	41 861	41 861	41 861	41 861	41 861
Catch	21 141	17 809	12 058	22 652	19 048	12 862	20 787	17 517	11 869
M = .2 in 1979									
Total stock biomass	42 223	42 223	42 223	45 549	45 549	45 549	41 518	41 518	41 518
Spawning stock	37 919	37 919	37 919	37 919	37 919	37 919	37 919	37 919	37 919
Catch	19 333	16 282	11 020	20 839	17 521	11 823	18 983	15 614	10 831
M = .3 in 1979									
Total stock biomass	38 655	38 655	38 655	41 981	41 981	41 981	37 951	37 951	37 951
Spawing stock	34 357	34 357	34 357	34 357	34 357	34 357	34 357	34 357	34 357
Catch	17 699	14 901	10 080	19 208	16 138	10 882	17 351	14 614	9 895
M = .4 in 1979									
Total stock biomass	35 428	35 428	35 428	38 753	38 753	38 753	34 723	34 723	34 723
Spawning stock	31 124	31 124	31 124	31 124	31 124	31 124	31 124	31 124	31 124
Catch	16 219	13 651	9 230	17 729	14 889	10 033	15 863	13 366	9 045
M = .5 in 1979									
Total stock biomass	32 507	32 507	32 507	35 833	35 833	35 833	31 802	31 802	31 802
Spawning stock	28 203	28 203	28 203	28 203	28 203	28 203	28 203	28 203	28 203
Catch	14 878	12 518	8 460	16 390	13 757	9 262	14 535	12 237	8 276

Table 2.10 North Sea SOLE. Stock size in tonnes in 1981

	Mean Recruitment Fem 43 000 Mal 42 000			Recruitment Females 73 400 Males 71 200			Recruitment Females 36 700 Males 35 600		
	Run I	Run II	Run III	Run I	Run II	Run III	Run I	Run II	Run III
M = .1									
Total stock	43 928	47 589	53 957	51 856	55 961	62 994	42 100	45 812	52 039
Spawners	39 624	43 285	49 563	47 552	51 567	58 690	37 906	41 508	47 735
M = .2									
Total stock	41 252	44 647	50 498	49 208	53 017	59 534	39 562	42 869	48 581
Spawners	36 948	40 343	46 194	44 904	48 713	55 230	35 258	38 565	44 277
M = .3									
Total stock	38 555	41 983	47 368	46 812	50 354	56 404	37 166	40 206	45 450
Spawners	34 551	37 679	43 064	42 508	46 050	52 100	32 862	35 902	41 146
M = .4									
Total stock	36 687	39 601	44 536	44 643	47 944	53 572	34 936	37 796	42 618
Spawners	32 383	35 297	40 232	40 339	43 640	49 268	30 632	33 632	38 314
M = .5									
Total stock	34 725	37 393	41 973	42 681	45 764	51 009	33 035	35 616	40 055
Spawners	30 421	33 089	37 669	38 377	41 460	46 705	28 731	31 312	35 751

Table 4.11 SOLE in Divisions VIId and VIIe
Selected catch predictions

	Div. VIId		Div. VIIe	
Spawning stock biomass 1978 (tonnes x 10^{-3})	5.5		3.8	
Catch 1978 (tonnes x 10^{-2})	13.5		7.5	
Spawning stock biomass 1979	3.4		3.8	
Catch 1979	14.5		7.3	
Spawning stock biomass 1980	6.1		4.0	
F_{80}/F_{78}	**Catch 1980**	**Spawning Stock Biomass**	**Catch 1980**	**Spawning Stock Biomass**
0	0	7.1	0	4.7
0.1	1.6	7.9	0.8	4.6
0.2	3.0	6.7	1.7	4.4
0.4	5.9	6.5	3.3	4.3
0.6	8.5	6.1	4.8	4.2
0.8	11.3	5.9	6.3	4.1
1.0	13.8	5.6	7.8	4.0
1.5	19.4	4.9	11.0	3.7
2.0	24.4	4.4		

after 5.7 and not after 6.7

Table 5.8 Division VIIe SOLE (females)

Stock in numbers (thousands)

AGE	1969	1970	1971	1972	1973	1974
2	1116	779	1831	1421	909	1801
3	1357	966	681	1637	1233	781
4	414	1005	747	510	1248	923
5	571	311	743	526	382	863
6	1300	415	238	533	366	275
7	371	1020	297	172	392	264
8	386	320	828	223	137	242
9	273	318	276	615	184	121
10	245	238	272	243	499	146
11	198	206	183	216	201	422
12	257	166	171	148	168	177
13	137	226	140	136	122	134
14	158	123	188	113	120	103
15	66	129	103	157	100	104
16	52	55	101	86	129	86
17	57	42	46	87	71	114
18	29	44	38	39	76	64
19	34	25	39	33	31	57
20	23	28	20	27	28	27
21	9	26	24	14	22	24

AGE	1975	1976	1977	1978
2	1296	1222	2778	2485
3	1588	1155	1042	2419
4	506	1183	889	763
5	729	342	810	596
6	672	544	225	611
7	198	560	404	145
8	212	169	449	318
9	188	157	143	346
10	88	151	119	122
11	112	63	116	93
12	366	91	48	85
13	147	313	79	35
14	111	120	241	60
15	87	85	100	197
16	85	71	65	87
17	72	72	52	47
18	100	56	51	38
19	51	80	46	41
20	46	44	58	39
21	22	39	36	44

Table 6.11 English Channel PLAICE

Prediction of catch and spawning stock biomass. Sexes combined

Year	Option 1			Option 2		
	F	Catch	Spawning Stock Biomass	F	Catch	Spawning Stock Biomass
1978	F_{78}	2 894	3 167	F_{78}	2 894	3 167
1979	F_{78}	2 467	2 935	F_{78}	2 467	2 935
1980	F_{78}	2 350	2 311	$F_{max}=0.8F_{78}$	1 995	2 311
1981			2 119			2 403