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Subarea 1 cod: data for 1974 and estimates of yield for 1975-77.

by

Sv.Aa. Horsted

Grønlands Fiskeriundersøgelser

Charlottenlund - Denmark

1. Introduction

The present paper follows the same lines as papers on Subarea 1 cod presented at the last two years' Annual Meetings of the Commission (Horsted, 1973 and 1974). Data for 1973 have been revised according to final statistics now available. Data for 1974 have been included so far as possible but by 25 March when the paper was produced important statistical information from some countries was still missing, and probably also some further samples will be available later on. It has also been found difficult to work up all material, for example on indices of recruitment. The quality of the analyses and the prognosis is, therefore, not as good as it probably could have been.

2. Nominal catches 1973 and 1974.

Complete statistics for 1973 has now been published in Statistical Bulletin Vol. 23. Generally the quality of data has been improved insofar as the break down by areas, time, gear etc concerns. Whereas for 1972 17% of the total catch was given unspecified as Div. 1NK, in 1973 only 1.7% of the catch is reported as Div. 1NK. This together with a relatively good sampling has made it possible to give numbers landed by age group with a higher degree of confidence than hitherto.

Table 1 gives 1973 nominal catch of cod by division and gear with Div.1NK catches allocated on divisions. Table 6[?] gives the numbers landed by age groups.

For 1974 statistical information was still missing for some important countries by 25 March when the paper was produced. However, looking at the

fishery performance of these countries in previous years and taking their 1974 quota into account a figure for their 1974 catch has been guessed as mentioned in the text to Table 2. Probably the figures are overestimated and the total catch of 1974 may, therefore, rather be close to 40 000 tons than to the 45 000 tons in Table 3.

Anyway, nominal catch in 1974 is a new low record at a level of only 10% of the level in the mid-1960ies.

Of the probable 45 000 tons landed in 1974 about 7 000 tons were taken in local fisheries outside the Convention Area. Thus the catch under the quota regulation may be only 38 000 tons or less as compared to the quota of 95 000 tons. Also the 1974 catch is less than the quota of 51 000 tons set for 1975.

3. Trends in catch per effort, stock size and overall effort.

No figures are yet available for 1974 for analyses of catch per unit effort. However, the catch figures (of cod) for the seven Greenland trawlers do not vary much between 1973 and 1974 and assuming that their effort was about the same in the two years it may indicate that stock (in terms of weight) did not change considerably between the two years.

If this is so then the total catch figures (Tables 1 and 2) indicate that the overall effort have declined from 1973 to 1974, probably by about 1/3. The tables indicate that the decline falls nearly entirely on the northern divisions (1A - 1D). The explanation for this may be that the predominant 1968 year-class now maturing has a tendency to southwards migration, occurring mainly in Divs. 1D and 1E (Danish samples to be presented in the Danish Research Report, 1974).

4. Mean length and weight of age groups in 1974.

Only Danish samples were available to the author in time for this analysis. The material is presented in Table 3. Only the offshore samples have been regarded in the following. For each age group and for each quarter an unweighted mean of the mean weights given in the samples in Table 3 is taken. This unweighted mean is given in the left-hand part of Table 5. An overall mean of the quarterly mean figures is given at the right-hand part of the table. This overall mean has been weighted according to the quarterly catches in 1973-74 given as percentages of the annual catches 1973-74 as shown in Table 4, where the figures in the last line are those used as weighting factor for Table 5.

For analyses up to and including the year 1973 the weight figures used are those given in last year's paper (Horsted, 1974), whereas for 1974 and for the 1975-77 prognosis the figures in Table 5 are used. Both set of figures are given in Table 6. It will be seen that in 1973 and former years there was a

separation between Divs. 1A-1D and Divs. 1E-1F whereas for 1974 the Subarea is represented by a single set of figures. The justification for considering the Subarea as a whole at present is that the 1968 year-class seems to be the predominant one both in Divs. 1A-1D and in Divs. 1E-1F. It seems at present to have its main occurrence in Divs. 1D and 1E. A separation between Divs. 1A-1D and Divs. 1E-1F would require that the analyses incorporated an emigration rate from Divs. 1A-1D and an immigration rate in Divs. 1E-1F here more or less counterbalanced by an emigration of older year classes to East Greenland. The data available do not allow for such refined analyses.

It is well known that growth rate and thereby mean weight varies between year classes and years. Table 6 does for example indicate that the growth rate of year-class 1961 (12 years in 1973, 13 years in 1974) is better than for the following year classes.

5. Numbers landed per age group in 1973 and 1974.

Numbers landed per age group for the years 1965-72 were given in Res.Doc. 73/107 and 74/86 (Horsted, l.c.) and are also found in Summ.Doc. 75/4. Also preliminary figures for 1973 are given in that document. Revised figures for 1973 and preliminary figures for 1974 are found in Table 7. It will be seen that overall mean weight has increased from 1973 to 1974. Again this is an effect of the dominance of the 1968 year-class with no strong recruitment of younger year classes.

6. Information on future recruitment.

Recruitment of Subarea 1 cod to the fisheries starts at an age of 3-4 years. The year classes in question for recruitment in 1974-77 are thus year-classes 1970-74.

Predictions of the strength of the 1974 year-class can at present be made only on hydrographic and plankton observations in 1974. These will be described in details in the Danish Research Report, 1974 and probably in other countries' Research Reports. Temperatures indicate that the year class could be relatively better than those after 1968, but this is not supported by larval surveys, probably because the stock/recruitment relationship is becoming more and more significant by the reduced stock. The 1974 year-class is, therefore, not at present regarded better than the 1973 year-class.

The 1973 year-class was on the basis of water temperatures and larval surveys judged to be slightly better than the 1971 and 1972 year-classes. It has not been observed in any great quantities in the hauls with fine-meshed trawls on the Danish standard stations in 1D nor in any commercial catches. No change can at present be made from the previous judgment.

Also for the year-class 1972 no new data are available to change the judgment of a poor year class.

The year-classes 1971 and 1970 are now showing up in some samples from 1974, especially those representing catches before discarding took place. In Spanish samples from pair trawlers' catches received after the analyses had been carried out the two year classes have about the same frequency ranging from 10 to 30% in Div. 1C and from 1 to 15% in Div. 1D. They seem to occur more frequently in the northern than in the southern divisions as also indicated by Table 7. However, their relatively stronger occurrence in the northern part of the Subarea may also be a consequence of the likely southward migration of the maturing 1968 year-class. Anyway, the amount of fishing itself in the northern divisions does not give reason to change the judgment of both year classes being poor ones.

In the present analyses the number of recruits (thousands of 3 years old fish) have been taken as follows

Year-class	Numbers x 10 ⁻³ at age 3		
	1A-1D	1E-1F	Subarea 1
1969	40 000	10 000	50 000
1970	20 000	5 000	25 000
1971	20 000	5 000	25 000
1972	20 000	5 000	25 000
1973	30 000	10 000	40 000
1974	30 000	10 000	40 000

7. Other parameters for virtual population analyses.

As in the analyses carried out last year (Horsted, l.c.) the natural mortality for all age groups in the fishery is taken as $M = 0.20$. When analyses are made separately for Divs. 1E-1F an extra coefficient of mortality of 0.15 is added for age-group 7 and older to cover the spawning migration to East Greenland - Iceland. When analyses are made for Subarea 1 as a whole this emigration for 7+ group is set at a coefficient of 0.05.

Partial recruitment is taken as in former analyses (Anon., 1972) for separate analyses of Divs. 1A-1D and Divs. 1E-1F respectively, and for Subarea 1 analyses a mean partial recruitment has been taken as follows (values are percentage of F for fully recruited age groups).

Age-group	Divs. 1A-1D	Divs. 1E-1F	Subarea 1
	%	%	%
3	9	1	10
4	27	8	25
5	64	41	50
6	100	67	80
older	100	100	100

Estimated values of F for oldest age groups taken as straight mean F for fully recruited age groups (age 8 and older) is as previously taken from Schumacher (1971) for the years 1965-69. For the years 1970-73 the fishing mortality rate is likely to have decreased somewhat although not relatively so much as catch figures indicate. A further decrease of F by about 30% is likely from 1973 to 1974. The following values of F for oldest age group were taken as input in the virtual population analyses

Year	1965	1966	1967	1968	1969	1970	1971	1972
F	0.70	0.60	0.70	0.77	0.55	0.30	0.30	0.30

For the year 1973 virtual population analyses were made for three alternative values of F , viz. 0.35 and 0.25.

For analyses where the 1974 data were the basis the F for oldest age group in 1973 was considered to be 0.30, and two alternatives were taken for F in 1974, viz. 0.30 and 0.20.

Prognosis have been made for values of F considered to be F_{\max} and $F_{0.1}$. However, since both the quota regulation and the state of the stock itself indicate that fishing may be held at a very low level in 1975-77 prognosis have also been made for an F value of 0.20. Prognoses were made both with the 1973 catch statistic and with the 1974 estimated catch as basis.

8. Results of the analyses.

The virtual population analyses did, of course, give results which varied according to the basic year and to the various alternative assumptions for F in the basic year. However, the results which correspond most closely to figures for previous years as obtained from the 1972 figures are those based on the 1973 figures with $F_{1973} = 0.35$. The stock record data for 1965-73 obtained on this basis are given in Tables 8, 9 and 10 for Divs. 1A-1D, 1E-1F and for SA 1 as a whole, respectively. The resultant values of fishing mortality (F) are given in Table 11 for the years 1970-73.

The prognoses given in Tables 8-10 are those based on 1973 with F for oldest age group in 1973 = 0.40 (alternative a) or 0.30 (alternative b). For 1974-77 F has been chosen as 0.20. Comparison between the prognosis for 1974 and the provisional catch figure for 1974 shows that these values of F could be close to the actual situation with $F_{1973} = 0.40$ as the one which fits best. However, the prognoses are heavily dependent upon the number of recruits and since the recruitment figures are very uncertain the judgement about the reliability of the F values must be taken with great reservation.

Prognosis were also carried out for other values of F in 1974-77. These are given in Table 12 based on $F = 0.40$ in 1973. The spawning stock size

(age 6 and older) that would correspond to the fisheries given in Table 12 is given in Table 13. This demonstrates^{that} fishing beyond a level of F about 0.20 would lead to continued decrease of the spawning stock. If the recruitment estimates are correct then the spawning stock could only be maintained at its present level if fishing continues to be on the same low level as in 1974.

9. Acknowledgement.

The practical computer work in the analyses were done by Mr. Dan Carlsson (same institute as the author) and by Mr. Hans Lassen of the Danish Institute for Fisheries and Marine Research. Their help is greatly appreciated.

10. References.

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Table 1. Nominal catch (metric tons x 10⁻³) of cod in Subarea 1, 1973. Catches reported as Div. 1NK by Norway (11 tons by trawl, 874 by longlines and 235 by nets) have been allocated to divisions in the same proportion as the specified Norwegian catches for these gears (trawl 9639 tons, longlines 3147 tons and nets 1661 tons).

Div.	Otter trawl	Set gill nets	Port.dories	Longliners	Unknown	TOTAL
1A	-	-	-	-	158	158
1B	298	2 043	-	-	1 362	3 703
1C	14 603	2 554	-	598	1 378	19 133
1D	11 161	5 254	6	218	5 871	22 510
1E	6 176	344	-	2 521	3 757	12 798
1F	2 342	19	-	684	1 595	4 640
TOTAL	34 580	10 214	6	4 021	14 121	62 942

Table 2. Preliminary nominal catch (metric tons x 10⁻³) of cod in Subarea 1, 1974. For countries which had not yet reported their catch by 25 March when the table was produced a figure has been guessed (Portugal 8000 tons by gill nets, Spain 7400 tons by trawl, USSR 100 tons by trawl). Allocation on divisions is estimated for 30 000 tons of the catch.

Div.	Otter trawl	Set gill nets	Port.dories	Longliners	Unknown	TOTAL
1A	-	-	-	-	274	274
1B	63	-	-	-	939	1 002
1C	12 800	1 961	-	90	1 105	15 956
1D	6 813	2 937	-	33	2 319	12 102
1E	7 302	3 689	-	380	2 119	13 490
1F	729	13	-	103	1 658	2 503
TOTAL	27 707	8 600	-	606	8 414	45 327

Table 4. Nominal catch of Subarea 1 cod by quarter of the year. Only catches specified by month are used for the percentages

Quarter:		1	2	3	4	Total specified catch
1973	tons	3 689	10 158	7 682	3 184	24 713
	%	14.9	41.1	31.1	12.9	
1974	tons	14 615	14 398	16 460	12 571	58 044
	%	25.2	24.8	28.4	21.7	
1973+74	unweighted mean %	20	33	30	17	-

Table 3. Subarea 1 cod, 1974. Danish samples. Only fish which were aged and weighted are given here, and since these were sampled stratified the table does not give the length nor the age frequency. Overall mean length and weight are, however, calculated on basis of the total (random) length sample. cm = uncorrected mean total length in cm (below) ± standard deviation. kg = mean weight in kg round, fresh ± standard deviation. Most fish were actually weighted as gutted fish, head on. In such cases a factor of 1.22 has been used to convert to round, fresh weight.

Age group	Division	1C offshore		1D offshore		1D offshore		1D offshore	
	Month	FEB		JUN		JUL		AUG	
	Gear	OT		HL		OT		OT	
III	Nos			1		50		8	
	cm			43.0		41.9	2.0	42.0	1.2
	kg			0.45		0.58	0.10	0.73	0.07
IV	Nos	33		3		63		43	
	cm	42.6	3.0	50.0	6.1	45.3	2.8	46.9	2.6
	kg	0.77	0.17	0.88	0.39	0.74	0.17	1.02	0.14
V	Nos	128		4		78		40	
	cm	54.7	5.4	55.3	5.0	55.6	6.9	54.8	4.7
	kg	1.62	0.48	1.31	0.42	1.35	0.53	1.61	0.40
VI	Nos	119		40		179		218	
	cm	63.1	6.0	66.1	5.0	66.9	5.6	67.0	6.3
	kg	2.46	0.70	2.58	0.71	2.28	0.64	2.92	0.84
VII	Nos	55		8		29		29	
	cm	69.8	6.7	71.6	7.5	74.2	4.7	75.0	5.0
	kg	3.33	1.02	3.32	1.17	2.99	0.58	4.06	0.86
VIII	Nos	25		7		42		48	
	cm	81.2	6.8	82.0	4.3	78.5	5.7	82.6	4.9
	kg	5.34	1.40	4.59	0.97	3.50	0.88	5.47	0.97
IX	Nos	18		1		18		47	
	cm	85.1	13.1	81.0		82.8	6.2	87.0	5.4
	kg	6.65	2.97	4.30		4.04	1.04	6.39	1.19
X	Nos			1		1		7	
	cm			88.0		82.0		86.8	5.7
	kg			5.25		3.77		6.15	0.81
XI	Nos					1		5	
	cm					73.0		90.8	4.6
	kg					2.88		7.54	1.31
XII	Nos					2			
	cm					92.5	3.5		
	kg					5.65	1.12		
XIII	Nos	4				1		2	
	cm	86.4	7.6			95.0		100.0	2.8
	kg	6.64	2.00			6.30		10.00	0.52
XIV	Nos	1						3	
	cm	95.0						104.7	9.2
	kg	9.27						11.61	3.13
XIV+	Nos	1							
	cm	100.0							
	kg	10.74							
Overall mean length		59.3		66.8		59.9		68.7	
Overall mean weight		2.20		2.76		2.23		3.35	
Discards		few		none		no inform.		very few	
Nos aged and weighted		384		65		464		450	
Ref.no.		2451		2461, 4913, 4914		2469		2485	

Table 3 cont.

Table 3 continued.

Age	Division	1D+1E offshore		1D+1E offshore		1D inshore		1D inshore	
Group	Month	MAR		DEC		MAR		JUL	
	Gear	OT		OT		SGN		HL	
III	Nos			54					
	cm			45.7	2.3				
	kg			1.04	0.15				
IV	Nos	5		81		22		4	
	cm	44.2	3.9	53.4	3.7	45.1	3.8	47.2	1.6
	kg	0.85	0.21	1.60	0.38	1.06		1.01	0.11
V	Nos	18		53		98		5	
	cm	55.0	5.0	62.1	4.7	51.9	2.3	64.7	1.3
	kg	1.65	0.40	2.80	0.60	1.56		2.49	0.10
VI	Nos	215		190		60		109	
	cm	59.8	5.2	72.2	7.5	62.9	5.5	69.1	6.0
	kg	2.09	0.51	4.02	0.86	2.49		3.02	0.73
VII	Nos	18		19		13		14	
	cm	71.4	4.5	84.4	4.3	67.5	7.2	74.2	5.7
	kg	3.46	0.59	5.89	1.23	3.21		3.63	0.67
VIII	Nos	15		35		8		15	
	cm	69.9	5.0	85.1	5.9	81.5	2.9	78.7	3.4
	kg	3.25	0.71	5.86	1.43	5.83		4.39	0.57
IX	Nos	2		8		45		9	
	cm	81.5	3.5	88.1	4.1	85.6	7.0	86.4	4.4
	kg	4.99	0.62	7.00	1.49	6.83		5.99	0.70
X	Nos	2		4		7		1	
	cm	84.0	4.2	88.3	9.1	83.1	9.6	87.0	
	kg	5.49	0.86	6.01	2.13	6.46		6.00	
XI	Nos	8		3		42			
	cm	76.4	11.6	89.3	7.5	91.3	6.5		
	kg	4.53	2.44	7.08	2.19	8.24			
XII	Nos	2		1		2			
	cm	84.0	8.5	79.0		81.5	14.8		
	kg	5.25	2.44	5.09		5.63			
XIII	Nos	2		5		5		1	
	cm	94.5	10.6	102.4	9.7	89.0	10.8	86.0	
	kg	7.93	2.59	11.31	3.25	7.53		5.70	
XIV	Nos			2		6			
	cm			94.5	3.5	94.8	7.1		
	kg			8.78	1.29	9.28			
XIV+	Nos					2			
	cm					88.5	36.1		
	kg					10.2	10.2		
Overall mean length		60.4		69.1		67.4		69.9	
Overall mean weight		2.18		3.66		3.91		3.23	
Discards		few		very few		none		none	
Nos aged and weighted		287		455		310		156	
Ref.no.		2452		2508		2454		2470,4952	

Table 5. Mean weight (kg round, fresh) by age as obtained from Table 3, off-shore samples and weighted by quarterly mean catch index 1973-74 as given in Table 4.

Age group	Unweighted mean by quarter				Weighted annual mean
	1	2	3	4	
III	-	0.45	0.55	1.04	0.65
IV	0.81	0.88	0.88	1.60	0.99
V	1.64	1.31	1.48	2.80	1.68
VI	2.28	2.58	2.60	4.02	2.77
VII	3.40	3.32	3.53	5.89	3.84
VIII	4.30	4.59	4.49	5.86	4.72
IX	5.82	4.30	5.22	7.00	5.34
X	5.49	5.25	4.96	5.01	5.34
XI	4.53	-	5.21	7.08	5.48
XII	5.25	-	5.65	5.09	5.39
XIII	7.29	-	8.15	11.31	8.70
XIV	9.27	-	11.61	8.78	10.19
XIV+	10.74	-	-	-	10.74

Table 6. Mean weight (kg round, fresh) by age groups used in assessments in the present paper. Figures for Divs. 1E-1F 1973 are taken from Meyer, 1973, for Divs. 1A-1D, 1973 from Horsted, 1974 and for Subarea 1, 1974 from Table 5 in the present paper (age-groups XIV and older with figure rounded off).

Age	3	4	5	6	7	8	9	10	11	12	13	14	14+
Divs. 1A-1D 1973	-	1.28	1.72	2.51	3.52	4.66	5.07	5.68	5.37	8.65	9.58	9.60	9.60
Divs. 1E-1F 1973	0.41	0.82	1.27	1.88	2.68	3.25	3.90	5.02	6.23	6.23	6.23	6.23	6.23
Subarea 1 1974	0.65	0.99	1.68	2.77	3.84	4.72	5.34	5.34	5.48	5.39	8.70	10.00	10.00

Table 7. Numbers of cod ($\times 10^{-3}$) per age group in nominal catches 1973 and provisional figures for 1974.

Age group	1973			1974		
	1A-1D	1E-1F	Sub. 1	1A-1D	1E-1F	Sub. 1
3	127	4	131	162	67	229
4	2242	60	2302	669	172	841
5	11245	5133	16378	1870	280	2150
6	2085	980	3065	4660	3169	7829
7	1600	1005	2605	907	245	1152
8	1152	254	1406	760	285	1045
9	461	742	1203	567	125	692
10	179	373	552	99	127	226
11	102	63	165	52	244	296
12	201	36	237	18	152	170
13	83	10	93	91	63	154
14	37	-	37	37	17	54
14+	34	10	44	33	2	35
Total	19548	8670	28218	9925	4948	14873
Nominal catch (tons)	45504	17438	62942	29334	15993	45327
Calculated mean weight	2.33	2.01	2.23	2.96	3.23	3.05

Table 8.

SPECIES : Cod
 STOCK AREA : 1A-1D
 MSY (W) : 325 000 tons¹
 F_{MAX} : 0.56² F_{0.1} : 0.35²

REFERENCE : Horsted (Res.Doc. 73/107, 74/86, 75/
 LAST YEAR OF DATA : 1973 and partly 1974
 SPAW. STOCK AT MSY (W) : 830 000 tons (age 6+)²
 METHOD : VPA

Age Group	\bar{w}^3 (kg)	Part. Recr.	1965	1966	1967	1968	1969	1970	1971
3	0.65	0.09	137200	113928	40209	69207	51680	31839	103229
4	0.99	0.27	272551	99562	92960	31406	53272	41714	26023
5	1.68	0.64	163698	174136	76212	63482	19435	32597	31810
6	2.77	1.00	22973	91731	104562	37987	28755	10937	18744
7	3.84		13003	12380	43468	43218	13413	12742	6134
8	4.72		32593	6365	6259	18813	14838	3817	5761
9	5.34		3168	16442	3473	3226	8454	524+	1893
10	5.34		1119	1530	9260	1391	1264	3305	3451
11	5.48		748	609	732	3725	506	614	2136
12	5.39		3751	318	315	334	1239	259	448
13	8.70		303	1856	193	200	127	516	173
14	10.00		259	201	809	43	135	91	329
15+	10.00		220	200	68	325	8	57	68
Number (000)			651589	519258	378515	273357	193126	143742	200199
Weight (tons)			986080	942524	825734	585423	371690	270471	294509
CATCH	3		14163	350	1678	3756	662	49	272
	4		54481	5876	14021	6982	12257	2597	2453
	5		47115	42294	27246	25957	5542	8846	9054
	6		7166	35344	47457	19852	12078	3142	7219
	7		4780	4327	18762	23071	8069	5222	1963
	8		11430	1937	2117	7769	7749	1376	3104
	9		1187	4680	1627	1543	4053	936	811
	10		343	582	4320	710	470	633	1184
	11		330	204	297	2034	162	61	746
	12		1359	74	65	164	558	52	68
13		53	795	130	32	14	104	27	
14		13	108	378	31	60	7	105	
15+		171	150	53	258	6	34	41	
Number (000)			142591	96721	118151	92159	51680	23059	27047
Weight (tons)			296204	290545	343728	279539	144331	62447	76448
Fishing effort(f)									
F(mean of ages 6-14)			0.45	0.52	0.68	0.80	0.62	0.29	0.45
TAC (tons)									
Recruitment Prospects: See overleaf									
Comments: See overleaf									

Table 8 continued. - 2 -

Age Group	\bar{w}^3 (kg)	Part. Reor.	1972	1973	1974 (a)	1975 (a)	1976 (a)	1977 (a)
3	0.65	0.09	33301	4447	20000	20000	30000	30000
4	0.99	0.27	84271	27252	15796	16083	16083	24124
5	1.68	0.64	19094	62597	23427	12253	12475	12475
6	2.77	1.00	17915	7745	34669	16876	8826	8986
7	3.84		8884	5943	3804	23240	11312	5916
8	4.72		3261	4279	2919	2550	15578	7583
9	5.34		1953	1712	2102	1957	1709	10442
10	5.34		825	665	842	1409	1311	1146
11	5.48		1764	379	326	564	944	879
12	5.39		1080	747	186	219	378	633
13	8.70		306	308	366	125	147	253
14	10.00		118	137	151	246	84	98
15+	10.00		175	53	68	102	165	56
Number (000)			172947	116264	104657	95621	99013	102593
Weight (tons)			277506	231157	216304	224329	224901	221602
CATCH	3		14	127	324	324	485	485
	4		7095	2242	753	767	767	1150
	5		8834	11245	2557	1337	1361	1361
	6		9802	2085	5715	2782	1455	1481
	7		3344	1600	627	3831	1865	975
	8		1068	1152	481	420	2568	1250
	9		1049	461	347	323	282	1721
	10		331	179	139	232	216	189
	11		781	102	54	93	156	145
	12		649	201	31	36	62	104
13		126	83	61	21	24	42	
14		48	37	25	41	14	16	
15+		103	34	11	17	27	9	
Number (000)			33246	19548	11123	10222	9282	8930
Weight (tons)			86649	45504	29698	32034	31140	29664
Fishing effort(f) F(mean of ages 6-14)			0.65	0.35	0.20	0.20	0.20	0.20
TAC (ton)					4	4		
Recruitment Prospects: See overleaf								
Comments:			See overleaf					

Table 8 continued. - 3 -

	Age Group	\bar{w}^3 (kg)	Part. Recr.	1974 (b)	1975 (b)	1976 (b)	1977 (b)	
STOCK	3	0.65	0.09	20000	20000	30000	30000	
	4	0.99	0.27	15938	16082	16082	24124	
	5	1.68	0.64	24068	12363	12475	12475	
	6	2.77	1.00	47837	17338	8906	8987	
	7	3.84		5357	32066	11622	5970	
	8	4.72		4111	3591	21494	7790	
	9	5.34		2960	2755	2407	14408	
	10	5.34		1184	1984	1847	1613	
	11	5.48		460	794	1330	1238	
	12	5.39		262	308	532	891	
	13	8.70		516	176	207	357	
	14	10.00		213	346	118	139	
	15+	10.00		95	143	232	79	
	Number (000)				123001	107946	107252	108071
	Weight (tons)				275330	275538	265298	251350
CATCH	3			324	324	485	485	
	4			760	767	767	1150	
	5			2626	1349	1361	1361	
	6			7885	2858	1468	1481	
	7			883	5286	1916	984	
	8			678	592	3543	1284	
	9			488	454	397	2375	
	10			195	327	305	266	
	11			76	131	219	204	
	12			43	51	88	147	
	13			85	29	34	59	
14			35	57	19	23		
15+			16	24	38	13		
Number (000)				14094	12247	10640	9833	
Weight (tons)				39351	40464	37800	34568	
Fishing effort(f)								
F(mean of ages 6-14)				0.20	0.20	0.20	0.20	
TAC (tons)				4	4)			

Recruitment Prospects: All year classes after year-class 1968 are poor.

Comments: 1) Rough estimate by 1960.

2) Data from Horsted, 1973 (Res. Doc. 73/107, M=0.20 for all age groups.

3) Based on 1974 figures. For earlier years see Res. Docs. 73/107 and 74/86.

4) TAC for 1974 recommended by STACRES was 80 000 tons for Subarea 1 as a whole. For 1975 the advice was "lowest practical figure". Actual TAC's set by Panel 1 for Subarea 1 as a whole was 107 000 for 1974, and 60 000 for 1975.

a) Forecast based on 1973 statistics assuming $F_{1973}=0.40, F_{1974-77}=0.20$

b) Forecast based on 1973 statistics assuming $F_{1973}=0.30, F_{1974-77}=0.20$

Table 9.

SPECIES: Cod REFERENCE : Horsted (Res.Doc.73/107, 74/86, 75/
 STOCK AREA : 1E-1F LAST YEAR OF DATA : 1973 and partly 1974
 MSY (W) : 150 000 tons¹ SPAWN.STOCK AT MSY (W) : 350 000 tons (age 6+)²
 F_{MAX} : 0.65² F_{0.1} : 0.45² METHOD : VPA

	Age Group	\bar{w}^3 (kg)	Part. Recr.	1965	1966	1967	1968	1969	1970	1971	
STOCK	3	0.65	0.01	66932	113777	40495	11867	15382	11204	68484	
	4	0.99	0.08	106220	54799	92087	33110	9708	12594	9173	
	5	1.68	0.41	35961	84756	43064	74428	26211	7820	10156	
	6	2.77	0.67	6888	24637	51562	32361	51287	18606	5057	
	7	3.84	1.00	13423	3943	16034	29294	17548	28211	12242	
	8	4.72		13592	5263	1477	6531	11190	6949	12656	
	9	5.34		3825	6306	1264	562	2762	4065	2449	
	10	5.34		570	1335	2608	586	246	1342	1333	
	11	5.48		410	219	366	1084	311	138	418	
	12	5.39		1312	159	89	212	505	157	26	
	13	8.70		174	472	66	40	130	235	83	
	14	10.00		246	104	180	17	24	70	86	
	15+	10.00		158	154	48	65	3	15	32	
	Number (000)				249711	295924	249340	190157	135307	91.06	122195
	Weight (tons)				285418	308257	313579	301079	245439	184443	152207
CATCH	3				1180	49	8				
	4			2447	1996	1070	994	142	171	56	
	5			5336	19836	3211	10713	3167	1496	1118	
	6			1889	4597	14391	9972	15355	3323	2064	
	7			5110	1588	5800	11520	6595	8763	3274	
	8			3955	3018	583	2236	3662	2989	6054	
	9			1662	2232	369	182	731	1874	1266	
	10			223	707	917	123	43	647	657	
	11			158	79	55	314	75	88	207	
	12			552	56	28	23	146	33	10	
	13			22	186	36	5	27	97	24	
	14			24	31	75	11	2	20	29	
	15+			105	97	32	45	2	7	15	
	Number (000)				21493	35603	26616	36146	30947	19508	14784
	Weight (tons)				64137	77661	85751	114001	70476	53530	43837
Fishing effort (f)											
F(mean of ages 7-14)				0.49	0.61	0.55	0.51	0.39	0.39	0.62	
TAC (tons)											
Recruitment Prospects: See Table 8											
Comments: Footnotes: See Table 8											

Table 9 continued - 2 -

	Age Group	\bar{w}^3 (kg)	Part. Recr.	1972	1973	1974 (a)	1975 (a)	1976 (a)	1977 (a)	
STOCK	3	0.65	0.01	2928	1263	5000	5000	10000	10000	
	4	0.99	0.08	56070	2396	4077	4086	4086	8171	
	5	1.68	0.41	7451	43250	6473	3285	3292	3292	
	6	2.77	0.67	7308	5242	25947	4882	2478	2483	
	7	3.84	1.00	2294	3993	2868	18580	3496	1774	
	8	4.72		5922	1009	1687	1654	10720	2017	
	9	5.34		3978	2948	426	973	955	6185	
	10	5.34		696	1487	1246	246	562	551	
	11	5.48		404	250	626	719	142	324	
	12	5.39		126	143	106	361	415	62	
	13	8.70		10	40	60	61	208	239	
	14	10.00		39	4	17	35	35	120	
	15+	10.00		37	20	2	10	20	20	
	Number (000)				87263	60945	48534	39892	36407	35258
	Weight (tons)				118620	103054	122648	118865	100434	85001
CATCH	3			1	4	9	9	18	18	
	4			2944	50	59	59	59	118	
	5			952	5133	463	235	235	235	
	6			2218	980	2956	556	282	282	
	7			737	1005	441	2858	538	273	
	8			1482	254	260	255	1649	310	
	9			1611	742	66	150	147	951	
	10			293	373	192	38	86	85	
	11			173	63	96	111	22	50	
	12			60	36	16	56	64	13	
	13			4	10	9	9	32	37	
	14			9	-	3	5	5	19	
15+			17	10	1	2	3	3		
Number (000)				10501	8570	4569	4341	3140	2394	
Weight (tons)				23970	17438	14046	16233	13169	10230	
Fishing effort (f) F(mean of ages 7-14)				0.52	0.35	0.20	0.20	0.20	0.20	
TAC (tons)						4	4			
Recruitment Prospects: See Table 8										
Comments: Footnotes: See Table 8										

Table 9 continued. - 3 -

	Age Group	\bar{w}^3 (kg)	Part. Recr.	1974 (b)	1975 (b)	1976 (b)	1977 (b)	
STOCK	3	0.65	0.01	5000	5000	10000	10000	
	4	0.99	0.08	4081	4086	4086	8171	
	5	1.68	0.41	6525	3289	3292	3292	
	6	2.77	0.67	35354	4921	2480	2483	
	7	3.84	1.00	3963	25316	3524	1776	
	8	4.72		2378	2287	14606	2033	
	9	5.34		601	1372	1319	8427	
	10	5.34		1756	347	792	761	
	11	5.48		883	1013	200	457	
	12	5.39		149	509	585	115	
	13	8.70		85	86	294	337	
	14	10.00		24	49	50	170	
	15+	10.00		2	14	28	29	
	Number (000)				60802	48288	41255	38051
	Weight (tons)				161857	153309	124273	100518
CATCH	3			9	9	18	18	
	4			59	59	59	118	
	5			466	235	235	235	
	6			4028	561	283	283	
	7			610	3894	542	273	
	8			366	352	2247	313	
	9			93	211	203	1296	
	10			270	53	122	117	
	11			136	156	31	70	
	12			23	78	90	18	
	13			13	13	45	52	
	14			4	8	8	26	
	15+			1	2	4	4	
	Number (000)				6076	5631	3886	2823
	Weight (tons)				19029	21527	16835	12617
Fishing effort (f) F(mean of ages 7-14)				0.20	0.20	0.20	0.20	
TAC (tons)				4	4			
Recruitment Prospects: See Table 8								
Comments: Footnotes : See Table 8								

Table 10.

SPECIES : Cod
 STOCK AREA : SA 1
 MSY (W) : 475 000 tons^{1, 5}
 $F_{MAX} = 0.60^5$ $F_{0.1} = 0.40^5$
 REFERENCE : Horsted (Res.Doc. 73/107, 74/86, 75/
 LAST YEAR OF DATA : 1973 and partly 1974
 SPAWN.STOCK AT MSY (W) : 1180 000 tons(age 6+)⁵
 METHOD : VPA

	Age Group	\bar{w}^3 (kg)	Part. 5 ⁵ Recr.	1965	1966	1967	1968	1969	1970	1971	
STOCK	3	0.65	0.10	201127	221283	77835	81640	67016	44535	176970	
	4	0.99	0.25	377592	151892	179789	62166	63444	54271	36418	
	5	1.68	0.50	201717	257876	117255	133589	43711	40788	41935	
	6	2.77	0.80	30823	118035	155293	68640	76444	27952	24103	
	7	3.84	1.00	26023	17108	60834	71799	29541	38010	17074	
	8	4.72		47228	11660	8170	26023	25946	10310	17427	
	9	5.34		6806	23357	4777	4009	11562	9451	4237	
	10	5.34		1752	2825	12157	1986	1624	4847	4908	
	11	5.48		1163	871	1082	4920	823	817	2656	
	12	5.39		5224	482	431	536	1797	434	506	
	13	8.70		473	2405	262	255	254	787	264	
	14	10.00		491	303	1020	61	166	162	437	
	15+	10.00		375	350	115	401	12	75	103	
	Number (000)				900794	808447	619020	456025	322340	232439	327038
	Weight (tons)				1242961	1247092	1133266	902168	632921	457813	427025
CATCH	3			14163	1530	1727	3764	662	49	272	
	4			56928	7872	15091	7976	12399	2768	2519	
	5			52451	62130	30457	36670	8709	10342	10172	
	6			9055	39941	61848	29824	27433	6465	9283	
	7			9890	5915	24562	34591	14664	13985	5237	
	8			15395	4955	2700	10005	12411	4365	9158	
	9			2849	6912	1996	1725	4784	2810	2077	
	10			566	1289	5237	833	513	1280	1841	
	11			488	283	352	2348	237	149	953	
	12			1911	130	93	187	704	85	78	
	13			75	981	166	37	41	201	51	
	14			37	139	453	42	62	27	134	
	15+			276	247	85	303	8	41	56	
	Number (000)				164084	132324	144767	128305	82627	42567	41831
	Weight (tons)				360341	368206	429479	393540	214807	115997	120285
Fishing effort (f)											
F(mean of ages 6-14)				0.46	0.54	0.62	0.69	0.54	0.36	0.49	
TAC (tons)											
Recruitment prospects				see Table 8							
Comments: Footnotes 1-4				see Table 8							

⁵ Mean or sum of figures for Divs. 1A-1D and 1E-1F separately, for partial recruitment estimated figures are used.

Table 10 continued - 2 -

	Age Group	\bar{w}^3 (kg)	Part. ⁵ Recr.	1972	1973	1974 (a)	1975 (a)	1976 (a)	1977 (a)	
STOCK	3	0.65	0.10	36789	4200	25000	25000	40000	40000	
	4	0.99	0.25	144645	30107	19666	20063	20063	32101	
	5	1.68	0.50	27544	109369	29430	15316	15625	15625	
	6	2.77	0.80	25192	13783	66601	21803	11346	11575	
	7	3.84	1.00	11423	9898	7303	46466	15211	7916	
	8	4.72		8727	5342	4624	4656	29628	9699	
	9	5.34		5654	4571	2496	2948	2969	18892	
	10	5.34		1501	2097	2135	1591	1880	1893	
	11	5.48		2220	627	980	1362	1015	1199	
	12	5.39		1239	900	293	625	868	647	
	13	8.70		326	353	421	187	398	554	
	14	10.00		161	141	165	268	119	254	
	15+	10.00		224	75	66	105	171	76	
	Number (000)				265645	181463	159178	140389	139293	140430
	Weight (tons)				396056	353282	357155	363070	344294	321431
CATCH	3			15	131	449	449	718	718	
	4			10039	2302	870	888	888	1420	
	5			9786	16378	2543	1323	1350	1350	
	6			12020	3065	8949	2930	1525	1555	
	7			4081	2605	1176	7484	2450	1275	
	8			2550	1406	745	750	4772	1562	
	9			2660	1203	402	475	478	3043	
	10			624	552	344	256	303	305	
	11			954	165	158	219	163	193	
	12			709	237	47	101	140	104	
	13			130	93	68	30	64	89	
14			57	37	27	43	19	41		
15+			122	44	11	17	28	12		
Number (000)				43747	28218	15787	14964	12897	11667	
Weight (tons)				110619	62942	44307	50296	46611	41519	
Fishing effort (f)										
F(mean of ages 6-14)				0.61	0.35	0.20	0.20	0.20	0.20	
TAC (tons)				107000			4			
Recruitment prospects				see Table 8						
Comments				Footnotes 1-4 see Table 8						

Table 10 continued -3 -

	Age Group	\bar{w}^3 (kg)	Part. ⁵ Recr.	1974 (b)	1975 (b)	1976 (b)	1977 (b)	
STOCK	3	0.65	0.10	25000	25000	40000	40000	
	4	0.99	0.25	19863	20063	20063	32101	
	5	1.68	0.50	30175	15470	15625	15625	
	6	2.77	0.80	91191	22354	11460	11575	
	7	3.84	1.00	10166	63622	15596	7996	
	8	4.72		6513	6483	40567	9945	
	9	5.34		3515	4153	4133	25867	
	10	5.34		3008	2242	2648	2636	
	11	5.48		1380	1918	1429	1689	
	12	5.39		413	880	1223	911	
	13	8.70		593	263	561	780	
	14	10.00		233	378	168	358	
	15+	10.00		93	148	241	107	
	Number (000)				192143	162973	153715	149588
	Weight (tons)				462018	455879	414829	371533
CATCH	3			449	449	718	718	
	4			879	888	888	1420	
	5			2607	1337	1350	1350	
	6			12253	3004	1540	1555	
	7			1637	10247	2512	1288	
	8			1049	1044	6534	1602	
	9			566	669	666	4166	
	10			484	361	427	425	
	11			222	309	230	272	
	12			66	142	197	147	
	13			95	42	90	126	
	14			37	61	27	58	
	15+			15	24	39	17	
	Number (000)				20361	18575	15216	13142
	Weight (tons)				59261	65183	57962	49589
Fishing effort (f)								
F(mean of ages 6-14)				0.20	0.20	0.20	0.20	
TAC (tons)				4	4			
Recruitment prospects				see Table 8				
Comments:				Footnotes 1-4 see Table 8				

Table 11. Fishing mortality rate (F) in 1970-73 as obtained by VPA analyses with 1973 as basic year. (Tables 8-10)

Age Group	Divs. 1A-1D				Divs. 1E-1F				SA 1			
	1970	1971	1972	1973	1970	1971	1972	1973	1970	1971	1972	1973
4	0.07	0.11	0.10	0.10	0.02	0.01	0.06	0.03	0.06	0.08	0.08	0.09
5	0.35	0.37	0.70	0.22	0.24	0.13	0.15	0.14	0.33	0.31	0.49	0.18
6	0.38	0.55	0.90	0.35	0.22	0.59	0.40	0.23	0.29	0.55	0.73	0.28
7	0.59	0.43	0.53	0.35	0.45	0.38	0.47	0.35	0.53	0.42	0.51	0.35
8	0.50	0.88	0.44	0.35	0.69	0.81	0.35	0.35	0.64	0.88	0.40	0.35
9	0.22	0.63	0.88	0.35	0.76	0.91	0.64	0.35	0.41	0.79	0.74	0.35
10	0.24	0.47	0.58	0.35	0.82	0.84	0.67	0.35	0.35	0.54	0.62	0.35
11	0.12	0.48	0.66	0.35	1.31	0.85	0.69	0.35	0.23	0.51	0.65	0.35
12	0.24	0.18	1.05	0.35	0.28	0.59	0.80	0.35	0.25	0.19	1.00	0.35
13	0.25	0.19	0.60	0.35	0.65	0.41	0.60	0.35	0.34	0.25	0.59	0.35
14	0.09	0.43	0.59	0.35	0.41	0.50	0.32	0.35	0.21	0.42	0.51	0.35
15 +	0.30	0.30	0.30	0.35	0.30	0.30	0.30	0.35	0.30	0.30	0.30	0.35
Straight mean for age 6-15	0.29	0.56	0.65	0.35	0.59	0.62	0.52	0.35	0.36	0.60	0.63	0.35

Table 12. Prognosis for nominal catches (thousand of tons) 1974-77 by various levels of fishing mortality. F_{MAX} is taken as 0.56 in Divs. 1A-1D, 0.65 in Divs. 1E-1F, and as 0.60 in SA 1 as a whole. The three respective $F_{0.1}$ values are 0.35, 0.45 and 0.40. Prognosis are based on 1973 catch figures and F in 1973 taken as 0.40.

	Divs. 1A-1D				Divs. 1E-1F				SA 1			
	1974	1975	1976	1977	1974	1975	1976	1977	1974	1975	1976	1977
F_{MAX}	72	57	43	35	39	32	19	12	114	95	67	49
$F_{0.1}$	49	46	40	36	29	28	18	12	82	80	64	51
0.20	30	32	31	30	14	16	13	10	44	50	47	42

Table 13. Prognosis for spawning stock biomass (thousand tons of fish of age 6 or older) on the same basis as for Table 12 for Subarea 1 as a whole.

F	1974	1975	1976	1977
F_{MAX}	272	221	145	99
$F_{0.1}$	272	258	198	151
0.20	272	301	272	237