

International Council for the
Exploration of the Sea

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C.M.1975/F:2
Demersal Fish (Northern) Committee

REPORT OF THE SAITHE (COALFISH) WORKING GROUP

Charlottenlund, 3-7 February 1975



1. Participants

Mr N. Daan	Netherlands
M B. Fontaine	France
Mr K. Hoydal	Denmark
Mr T. Jakobsen	Norway
Mr B.W. Jones (Chairman)	U.K. (England)
Dr H.H. Reinsch	Federal Republic of Germany
Mr J. Richards	U.K. (Scotland)
Dr S.A. Schopka	Iceland
Mr D. de G. Griffith,	ICES Statistician, also took part in the Meeting.

2. Terms of Reference

The Working Group was asked "to assess potential catches for 1975 and if possible total allowable catches for 1976; and to consider the effect of introducing a minimum landing size".

3. Landings

A summary of landings by fishing areas since 1960 is given in Table 1. In the last three years landings have shown only small fluctuations with the average total catch being just under 600 000 tons. The increase since 1970 in landings from the West of Scotland is due to an increase in catches reported by France in 1973 and revised estimates of French catches in 1971 and 1972. Preliminary estimates of landings in 1974 by country and fishing area are given in Table 2. Tables 3-7 give similar data (taken from "Bulletin Statistique") for the main fishing areas for the period 1960-73.

4. Virtual Population Analysis

Since the last (1974) meeting of the Working Group (Doc. C.M.1974/F:2) additional data have become available of age compositions of catches for 1973 and in most cases provisional data for 1974 were provided. In some cases amendments have been made to the data used in previous assessments where additional data have become available. The assessments for the North Sea include catches in Division IIIa, and West of Scotland includes both VIa and VIb. No age composition data of the USSR catches in 1973 or 1974 were made available to the Working Group nor were preliminary estimates of the USSR landings for 1974.

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In the North Sea in recent years USSR landings have constituted about 50% of the total catches of saithe, and the absence of USSR data for the two most recent years limits the possibilities for updating the assessments for this area. In addition the Working Group considered that USSR age composition data for the North Sea for earlier years were inconsistent with the weights of fish landed. The Virtual Population Analysis (VPA) for the North Sea included in this Report is an alternative assessment to that given in the previous Report in that new age compositions have been prepared for USSR landings up to 1972 and estimates of age compositions for USSR landings, based on combined age composition of landings by England, Netherlands and Scotland have been included for 1973 and 1974. The USSR age compositions for the earlier years have been adjusted on the assumption that the landed weights were correct but that the numbers at each age were overestimated. The age distributions in each year were adjusted by a factor:

$$\frac{\text{Recorded weight of landings}}{\text{Calculated weight of landings}}$$

The calculated weight of landings was derived from the sum of products of numbers at age x mean weight at age.

For the other areas the earlier assessments were updated by the addition of data for 1973 and 1974. The estimates of fishing mortality rates from the VPA are given in Tables 8-12. In the North-East Arctic fishery mortality rates appear to have remained relatively steady ($F = 0.3-0.4$) although age groups 3 to 5 tend to suffer higher mortality rates than the older age groups.

The present alternative assessment for the North Sea (Table 9) gives lower values of fishing mortality in the recent years than in last year's analysis (about 0.2 - 0.3 compared with 0.4 - 0.5), and there is no marked trend of increasing fishing mortality. However, estimates of stock sizes at 2 years old (Table 13) are of a similar order of magnitude to those in the earlier analysis. A possible interpretation of these results is that in the earlier years only part of the North Sea saithe stock was being exploited, and as the landings have been increasing the fishery has been expanding to exploit a greater proportion of the total stock. Alternatively, there may have been a real increase in recruitment to the stock in recent years.

At Iceland the updated assessment shows little change from the previous one and the fishery has remained stabilized over the last few years with a fishing mortality of about 0.5 - 0.6 on the fully exploited age groups.

At Faroe the fishing mortality estimates varied very little from 1964-1971 when the average value was 0.2 - 0.3. From 1972 the increase in saithe landings from this area have been accompanied by an increase in the estimated fishing mortality to 0.5 - 0.6.

The assessment for the West of Scotland is influenced in the last three years (1972-74) by the inclusion of age composition data for the Scottish fishery in the Clyde. This fishery takes a greater proportion of young (2 and 3 year old) fish than the fisheries further off the coast. The Clyde fishery has been increasing in importance in recent years. This fishery exploits the younger fish which have an inshore distribution and it seems likely that the survivors migrate into the off-shore fishery as they grow. The fishing mortality rates on the older age groups have mainly been in the range $F = 0.15 - 0.30$ but on the younger age groups the mortality rates are higher having been about 0.3 and probably increasing in the last two years with the growth of the Clyde fishery.

5. The State of the Stocks

Table 14 gives estimates of the present levels of fishing mortality and average age at first capture for each area. Also shown are the values of ages at first capture which would give maximum yield per recruit at current levels of fishing mortality, and the optimum levels of fishing mortality for the present ages at first capture. The indications are that in none of the stocks is the fishing mortality excessive. In many areas, however, the yield could be improved by reducing the amount of fishing on the younger age groups.

6. Estimates of Total Allowable Catches (T.A.C's)

None of the saithe stocks appears to be seriously overexploited at present. However, as catch quota regulations have been introduced, or are being considered, for most of the other major demersal fish resources in the North Atlantic, there are obvious advantages in introducing catch quotas for the saithe stocks to prevent surplus fishing effort being diverted onto saithe and increasing exploitation above the optimum level.

The Working Group considers that, as exploitation levels are generally close to those giving the maximum sustainable yield for the present selection pattern, the present aim should be to set T.A.C's to stabilize the saithe fisheries at the exploitation levels of recent years, and at the same time to prevent any increase in, or preferably to reduce, the mortality on the younger fish. In considering Total Allowable Catches (T.A.C's) the Group based its calculations on the following area groupings:

North-East Arctic (Sub-areas I and II)

North Sea, Kattegat and Skagerak (Sub-area IV, Division IIIa)

Iceland (Division Va)

Faroe Islands (Division Vb)

West of Scotland and Rockall (Sub-area VI).

Landings of saithe from other ICES fishing areas are relatively insignificant.

Estimates of catches which are expected to be taken in 1975 and 1976, if fishing effort is maintained at its present level, have been prepared. Estimates of stock size and catch in numbers were calculated for 1974-76 from the 1973 catch data and estimates of fishing mortality. Catch in numbers at each age were converted into weight using mean weight-at-age data and summed to give an estimate of total catch for each year. Some difficulties were experienced in obtaining good agreement between declared landings in 1973 and landed weight calculated as the sum of products of numbers at each age times average weight at age. There are potential errors in weight-at-age data because of the different selection characteristics of the various national fisheries and even a weighted average of national weight-at-age data is subject to some error since the proportions of the total catch taken by the different countries are variable, and also because there is variation in the age structure of the stock. It is also possible that there are significant errors in the various national estimates of numbers of fish at each age in their landings. No information was available on the size of the year-classes which will be recruiting over the next few years and so average year-class strengths (year-classes 1958-68) of 2-year-old fish have been used in the calculations of predicted catches.

For the North Sea there is some doubt about the quality of some of the catch data and also no data for landings in 1973 and 1974 by the USSR (expected to be about 50% of the total landings) have been provided. As a result it has not been possible to prepare reliable catch predictions. The Working Group recommends that for the North Sea the TAC should be set at about the average of the catches in recent years, i.e. 200 000 tons. For the other areas the predicted catches

for 1975 and 1976 are tabulated below together with recommendations for T.A.C's.

Area	Estimated Catch at Present F (Tons)		Recommended T.A.C's (Tons) for 1976
North-East Arctic	1975	192 000	190 000
	1976	184 000	
North Sea	1975	-	200 000
	1976	-	
Iceland	1975	80 000	75 000
	1976	75 000	
Faroe Islands	1975	51 000	50 000
	1976	58 000	
West of Scotland	1975	29 000	30 000
	1976	22 000	

For the West of Scotland the average year-class strength used in the calculation of predicted catches is probably too low as estimates for recent year-classes have been tending to increase with the expansion of the fishery, and allowance has been made for this in the recommended T.A.C's.

At Iceland the predicted catches are appreciably below catch levels in recent years (average catch 1969-74 = 113 000 tons) and this is due to poorer recruitment in the last few years.

For Faroe there is less certainty about the recent levels of fishing mortality and accordingly a relatively conservative T.A.C's has been recommended until more reliable estimates are available.

In all areas the stock of saithe is liable to vary as a result of migration of fish between the different fishing regions. It is known that, at times at least, very substantial migrations take place but, as no adequate quantitative data are available and as variations in migration from year to year cannot be predicted, no allowance has been made for migration in the present calculations.

7. Effects of a Minimum Landing Size for Saithe

If minimum landing sizes were to be introduced for saithe in the NEAFC region this species would have to be included with those listed in NEAFC Recommendation (4), and it would also become subject to Recommendation (5) which limits the amount of by-catch of Recommendation (4) species which may be taken in industrial landings from Mixed Fisheries (Recommendation 2).

This subject was considered by the Working Group at its 1973 meeting (Doc. C.M. 1973/F:10) and the general conclusions reached then still stand. At present the rate of exploitation on small fish is not excessive and there are now no important industrial fisheries based on saithe. Saithe is, however, taken as a by-catch in some industrial fisheries for other species such as the industrial fisheries for Norway pout in the North Sea. The inclusion of saithe in Recommendation (4) might help to reduce the by-catch in these fisheries not only of saithe but also of other protected species, if the by-catch of total protected species became increased above the proposed 25% maximum by including saithe as a protected species.

As has been mentioned in an earlier section some of the saithe fisheries would benefit from a reduction in fishing on the younger age groups. The development of any fisheries for very small saithe would have undesirable consequences for the established fisheries. The introduction of a suitable minimum landing size would help to prevent such fisheries developing and could help to reduce the fishing mortality on the youngest age groups in the established fisheries. Table 15 gives updated estimates of the percentages by weight in the various national landings of fish less than 30, 35 and 40 cm in length. Lengths of saithe corresponding to various retention percentages for different mesh sizes are given in Table 16.

From a biological point of view little benefit can be expected from a minimum landing size less than 40 cm. For the majority of fisheries a minimum landing size up to 40 cm would involve very little immediate loss. The fisheries which would suffer the greatest losses would be in the Norwegian coastal fisheries in the North Sea (44% of catch <40 cm), and in fishing areas I + IIa (18% < 40 cm). In the latter area it is the Norwegian fisheries in the southern part of the area (NEAFC Region 2, 80 mm minimum trawl cod end mesh size) that are affected to the greatest extent. The Scottish fisheries West of Scotland, especially the Clyde fishery, also have high proportions of fish below 40 cm (16% and 21% respectively).

Table 1. Summary of total landings of saithe from the main fishing areas (metric tons, whole weight). This table is based on biological data supplied to the Working Group and used in the assessments. These figures differ to some extent from the official "Bulletin Statistique" data, which are used for Tables 3-7.

Year	Fishing Area					Total
	NE Arctic	IV+IIIa	Va	Vb	VI	
1960	136 006	31 515	48 120	11 845	8 349	235 835
1961	109 821	35 489	50 826	9 592	6 723	212 451
1962	122 841	24 559	50 514	10 454	7 159	215 527
1963	148 036	30 300	48 011	12 693	6 609	245 649
1964	198 110	58 669	60 257	20 550	13 596	351 182
1965	184 548	73 274	60 177	22 071	18 395	358 465
1966	201 860	95 940	52 003	24 597	18 534	392 934
1967	191 191	76 759	75 712	23 219	16 034	382 915
1968	107 181	98 179	77 549	19 704	12 787	315 400
1969	140 379	115 564	115 853	27 536	17 214	416 546
1970	260 404	179 296	116 601	29 148	14 538	599 987
1971	244 732	219 731	134 127	30 867	19 246	648 703
1972	214 386	219 264	111 301	46 702	24 003	615 656
1973	210 833	191 200	110 888	56 606	35 834	605 361
1974 ^{x)}	192 526	201 874	90 077	44 913	29 180	558 570

x) Preliminary estimate.

Table 2. Preliminary Estimates of Saithe Landings in 1974 (Metric tons, whole weight)

	I	IIa	IIb	IIIa	IV	Va	Vb	VI	VII	Total
Belgium					26	2 008		177	44	2 255
Denmark				5 124	3 149					8 273
Faroe Islands					359	2 227	3 776	6		6 368
France		20	114		25 566		20 924	16 239	153	63 016
German Dem.Rep.*)		(12 000)								12 000
Germany, Fed.Rep.	267	35 269	(732)	9	19 875	17 895	5 919	19		79 985
Iceland						56 000				56 000
Netherlands					12 839			211	47	13 097
Norway	12 513	123 580	10	1 100	13 150		1 606			151 959
Poland	199	2 322			22 203		1 925	125	1	26 775
Spain*)										
UK (England & Wales)	849	2 068	30		4 148	8 839	3 821	1 354		21 109
UK (N. Ireland)*)										
UK (Scotland	57	96			14 326	3 108	6 942	11 049	10	35 588
Sub-Total	13 885	175 355	886	6 233	115 641	90 077	44 913	29 180	255	476 425
USSR*)		(2 400)			(80 000)					82 400
TOTAL		192 526		6 233	195 641	90 077	44 913	29 180	255	558 825

*) No data available for 1974. German Democratic Republic catches in the North-East Arctic assumed to be 12 000 tons.
USSR catches assumed to be similar to 1973.

Estimated catches in brackets.

Table 3. Landings of Saithe from the North-East Arctic (I + IIa + IIb), by country, for the years 1960-1973. Metric tons, whole weight. (Data from Bulletin Statistique).

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Belgium	14	18	4	-	-	-	-	-	-	-	-	-	-	-
Faroe Is.	23	61	2	-	-	-	-	-	-	20	1 057	215	109	7
France	1 700	3 625	544	1 110	1 525	1 618	2 587	9 472	-	193	-	14 536	14 519	11 320
German Dem. Rep.*)	-	-	-	-	-	-	813	304	70	6 744	29 362	16 840	7 474	12 015
Germany, Fed. Rep.	25 548	19 757	12 651	8 108	4 420	11 387	11 265	11 822	4 753	4 355	23 466	12 204	24 558	30 331
Netherlands	-	-	-	-	186	181	41	48	-	23	-	-	-	-
Norway	96 050	77 875	101 895	135 297	184 700	165 531	175 037	150 860	56 641	115 140	151 759	128 459	143 775	148 789
Poland	-	-	-	-	-	-	-	-	-	-	-	6 017	1 111	23
Spain	-	-	-	-	-	-	-	-	-	-	-	13 057	13 125	609
UK (England and Wales)	9 780	4 555	4 655	4 112	6 551	6 741	13 078	8 379	8 780	13 585	15 465	10 361	8 223	6 503
UK (Scotland)	-	20	-	-	-	5	-	-	2	-	221	106	125	248
USSR	-	-	512	-	84	137	563	441	-	-	43 550	39 397	1 278	2 411
Total	133 515	105 951	120 707	148 627	197 506	185 600	203 788	181 326	110 246	140 033	264 924	241 272	214 334	212 263

* German Democratic Republic catch data taken from "Atlantic Fish Catches of the Socialist Countries, 1961-72" (Moscow, 1974).

Table 4. Landings of Saithe from the North Sea, Kattegat and Skagerak (IV + IIIa), by country, for the years 1960 - 1973. Metric tons, whole weight. (Data from Bulletin Statistique).

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Belgium	108	91	154	132	140	126	161	74	94	135	36	44	59	55
Denmark	2 412	1 989	2 679	3 559	3 795	4 934	4 310	5 495	7 756	5 566	17 595	14 200	19 323	10 195
Faroe Is.	-	-	-	-	-	-	-	-	-	2	-	18	182	552
France	-	12 728	-	-	26 082	23 678	19 282	13 559	34 139	24 631	38 873	37 442	26 060	30 595
German Dem. Rep.*	-	-	-	-	-	-	4 085	-	-	5 984	3 994	6 398	10 674	7 668
Germany, Fed. Rep.	8 381	3 138	2 960	2 773	3 391	7 736	7 462	7 036	6 066	7 242	6 022	4 217	8 665	12 003
Iceland	-	-	-	-	-	-	-	-	5	2	18	97	4	24
Netherlands	3 637	2 527	2 656	4 455	4 552	9 000	8 177	13 395	16 482	18 214	20 460	18 136	12 532	9 232
Norway	9 007	5 336	8 358	9 982	9 602	12 330	14 183	10 842	8 683	8 159	11 201	15 184	23 256	13 948
Poland	12	28	112	3	-	-	655	104	43	-	-	4	186	7 512
Sweden	2 135	2 262	2 670	3 206	3 356	6 574	3 643	6 318	8 212	4 322	1 921	4 523	3 899	1 876
UK (England and Wales)	4 219	4 193	3 407	3 821	4 143	5 573	6 172	5 408	3 925	3 819	2 664	3 162	3 744	3 378
UK (Scotland)	1 589	1 033	1 520	2 207	3 099	3 199	3 254	3 911	6 001	3 838	5 293	6 106	10 797	10 834
USSR	-	-	-	-	-	10	22 388	11 527	11 405	32 830	68 062	110 200	99 883	83 333
Total	31 500	33 325	24 414	30 178	58 159	73 160	93 772	77 669	103 171	114 744	176 139	219 731	219 264	191 200

*) German Democratic Republic catch data taken from "Atlantic Fish Catches of the Socialist Countries, 1961-72" (Moscow, 1974).

Table 5. Landings of Saithe from Iceland (Va), by country
for the years 1960-1973. Metric tons, whole weight. (Data from Bulletin Statistique).

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Belgium	2 771	3 354	2 505	2 830	2 144	1 999	2 282	2 739	3 155	3 995	4 153	3 490	2 250	2 131
Faroe Islands	514	893	590	491	45	285	100	39	101	119	2 386	2 046	857	1 467
France	-	105	409	-	-	... ¹⁾	500	5 803	6 701	8 122	2 046	3 951	-	-
German Dem. Rep.*)	...	-	-	-	-	-	154	202	634	357	3 527	2 637	3 471	-
Germany, Fed. Rep.	23 412	22 223	24 015	17 622	21 130	16 708	17 204	24 037	17 327	34 732	27 806	40 628	30 918	38 565
Iceland	12 705	13 675	13 469	14 758	21 665	24 866	21 022	29 021	38 027	53 988	63 882	60 080	59 945	56 342
Netherlands	-	48	37	401	309	409	25	-	-	52	-	-	-	-
Norway	59	-	-	11	4	-	-	-	-	-	-	-	-	-
Poland	-	-	-	-	-	-	-	-	-	-	-	113	150	-
Spain	-	-	-	-	-	-	-	-	-	-	-	59	13	-
UK (England & Wales)	8 454	9 016	8 767	11 262	13 899	14 472	9 857	13 694	11 561	13 665	10 634	21 767	13 152	11 874
UK (Scotland)	120	431	563	1 074	1 221	1 365	920	901	982	1 605	2 402	1 743	545	509
USSR	-	-	-	-	-	3	258	35	90	65	-	5	-	-
Total	42 039	49 795	50 385	48 449	60 417	60 107	52 322	76 471	78 578	116 700	116 836	136 519	111 301	110 888

1)
Inc. in Vb₁

*) German Democratic Republic catch data taken from "Atlantic Fish Catches of the Socialist Countries, 1961-72" (Moscow, 1974).

Table 6. Landings of Saithe from Faroe Islands (Vb), by country, for the years 1960-1973.
Metric tons whole weight. (Data from Bulletin Statistique).

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Faroe Islands	585	929	2 494	2 431	1 338	1 000	1 167	2 242	2 629	4 835	2 694	5 653	5 646	2 973
France	-	-	620	2 207	6 458	8 565 ¹⁾	9 967	5 555	424	7 899	11 036	10 621	28 346	22 241
German Dem. Rep.*)	...	-	-	-	-	-	66	193	-	-	-	-	-	-
Germany, Fed. Rep.	2 583	2 219	985	1 415	6 459	3 557	4 963	5 797	7 433	4 676	2 211	2 254	3 440	9 329
Netherlands	-	-	-	-	-	-	-	-	-	-	-	63	-	-
Norway	-	-	-	-	+	-	2 498	-	-	378	1 495	1 839	470	355
Poland	-	-	-	-	-	-	-	-	-	-	-	-	-	4 050
UK (England & Wales)	6 437	4 230	3 724	3 177	4 329	5 265	3 321	3 536	5 123	4 303	3 066	3 305	2 453	7 527
UK (Scotland)	2 140	2 214	2 631	3 463	3 309	3 794	3 581	3 996	4 778	5 346	8 608	7 198	6 225	10 131
Total	11 845	9 592	10 454	12 693	21 893	22 181	25 563	21 319	20 387	27 437	29 110	30 933	46 580	56 606

¹⁾ Va included.

* German Democratic Republic catch data from "Atlantic Fish Catches of the Socialist Countries, 1961-72" (Moscow, 1974).

Table 7. Landings of Saithe from West of Scotland and Rockall (VIa + VIb), by country, for the years 1960-1973. Metric tons whole weight. (Data from Bulletin Statistique).

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Belgium	94	6	15	61	10	-	168	31	27	40	34	29	125	191
Denmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Faroe Islands	-	-	-	-	-	-	-	-	-	-	-	-	-	4
France	41	33	434	415	2 780	5 059	7 550	7 092	3 841	8 109	5 140	3 300	6 268	20 972
German Dem. Rep.*)	-	-	-	-	-	-	25	-	283	-	-	-	-	-
Germany, Fed. Rep.	122	23	155	15	135	119	62	368	368	1 988	545	1 068	350	52
Iceland	-	-	-	-	-	-	-	-	-	-	1	1	-	-
Netherlands	-	-	-	-	+	12	+	54	59	14	7	32	638	67
Norway	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Poland	-	-	-	-	-	-	-	-	1	-	-	2	-	394
Spain	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sweden	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UK (England & Wales)	6 456	4 484	4 359	4 072	7 455	9 012	7 693	5 796	5 704	4 015	3 615	1 965	2 268	2 138
UK (N. Ireland)	-	43	9	20	22	36	31	17	21	13	19	24	6	14
UK (Scotland)	1 656	2 130	2 187	2 026	3 194	4 157	3 005	2 676	2 433	3 035	5 175	4 620	6 706	11 330
USSR	-	-	-	-	-	-	-	-	-	-	-	105	112	670
Total	8 349	6 724	7 159	6 609	13 596	18 395	18 534	16 034	12 787	17 214	14 536	11 146	16 473	35 834

*) German Democratic Republic catch data from "Atlantic Fish Catches of the Socialist Countries, 1961-72" (Moscow, 1974).

Table 8. Saithe. North-East Arctic.(I+IIa+IIb).

Estimates of fishing mortality from Virtual Population Analysis (M = 0.2)

Year Age	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
1															
2	.07	.02	.00	.03	.06	.17	.03	.04	.02	.01	.07	.11	.03	.10	.10
3	.16	.25	.26	.18	.11	.15	.19	.17	.20	.34	.18	.36	.54	.29	.40
4	.19	.20	.25	.33	.41	.08	.34	.33	.15	.14	.51	.42	.40	.40	.40
5	.50	.27	.14	.20	.24	.32	.31	.39	.10	.20	.24	.40	.35	.34	.40
6	.26	.25	.29	.22	.13	.30	.25	.15	.15	.13	.31	.23	.29	.32	.30
7	.26	.10	.25	.22	.25	.20	.22	.17	.04	.12	.20	.28	.24	.31	.30
8	.20	.08	.10	.17	.23	.24	.14	.21	.08	.07	.29	.15	.17	.24	.30
9	.12	.06	.10	.15	.30	.38	.16	.21	.09	.09	.23	.24	.16	.19	.30
10	.15	.05	.07	.10	.26	.28	.23	.37	.13	.09	.30	.26	.20	.31	.30
11	.18	.11	.08	.09	.21	.34	.31	.32	.17	.06	.21	.41	.29	.20	.30
12	.16	.13	.11	.08	.23	.17	.33	.87	.14	.08	.33	.35	.19	.28	.30
13	.39	.06	.22	.17	.13	.19	.27	.63	.48	.02	.27	.21	.17	.27	.30
14 = F _I	.20	.20	.20	.20	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30

Table 9. Saithe North Sea (IV + IIIa)
Estimates of Fishing Mortality from Virtual Population Analysis (M = 0.2)

Year Age	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00	.06	.01
2	.04	.02	.00	.01	.06	.00	.08	.06	.02	.07	.02	.12	.16	.23	.20
3	.31	.18	.15	.04	.16	.11	.12	.12	.16	.07	.13	.20	.34	.42	.45
4	.40	.62	.33	.30	.21	.37	.34	.19	.23	.19	.31	.25	.36	.35	.45
5	.50	.46	.45	.56	.50	.51	.20	.27	.23	.19	.28	.31	.25	.29	.40
6	.45	.60	.29	.32	.38	.25	.47	.14	.21	.23	.30	.18	.45	.23	.40
7	.19	.48	.13	.17	.43	.19	.23	.35	.06	.22	.23	.19	.23	.16	.30
8	.05	.29	.08	.08	.42	.11	.15	.22	.19	.09	.17	.22	.24	.13	.30
9	.01	.27	.07	.12	.42	.10	.27	.25	.25	.27	.12	.21	.25	.13	.30
10	.02	.20	.11	.06	.15	.12	.21	.33	.21	.24	.31	.10	.23	.12	.30
11	.08	.27	.06	.15	.20	.12	.24	.27	.52	.12	.17	.47	.10	.18	.30
12	.00	1.52	.14	.31	.15	.07	.21	.21	.39	.32	.18	.13	.77	.06	.30
13	.01	.09	.71	.01	.29	.30	.18	.09	.59	.32	.32	.10	.08	.69	.30
14 = F_I	.01	.10	.10	.20	.20	.20	.25	.25	.40	.40	.40	.40	.40	.40	.40

Table 10. Iceland (Va) Saithe
Estimates of Fishing Mortality from Virtual Population Analysis (M = 0.2)

Year Age	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
1															
2	.01	.02	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3	.05	.15	.06	.08	.06	.02	.01	.02	.02	.02	.01	.01	.02	.00	.02
4	.15	.20	.27	.11	.23	.13	.03	.07	.05	.10	.09	.07	.13	.10	.10
5	.29	.34	.31	.21	.25	.23	.13	.11	.09	.16	.17	.22	.23	.27	.20
6	.29	.33	.47	.40	.31	.24	.18	.25	.18	.25	.25	.34	.31	.41	.30
7	.24	.20	.29	.45	.28	.29	.22	.35	.29	.41	.39	.47	.38	.47	.40
8	.25	.13	.21	.38	.24	.24	.26	.33	.37	.45	.51	.64	.46	.44	.40
9	.28	.13	.17	.26	.18	.23	.22	.31	.28	.41	.54	.86	.62	.43	.40
10	.22	.22	.18	.24	.17	.19	.23	.30	.33	.34	.51	.66	.83	.57	.40
11	.18	.26	.19	.29	.14	.18	.23	.26	.33	.15	.39	.91	.58	.61	.50
12	.29	.54	.26	.42	.16	.16	.17	.19	.25	.28	.41	1.10	1.14	.96	.50
13	.32	.29	.24	.39	.22	.21	.29	.43	.32	.12	.39	.41	.84	1.00	.60
14 = F_I	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.40	.50	.60	.60	.60

Table 11. Faroe Vb Saithe.

Estimates of fishing mortality from Virtual Population Analysis ($M = 0.2$).

Year Age	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
1															
2	.03	.01	.00	.01	.00	.01	.00	.01	.01	.00	.02	.02	.01	.03	.01
3	.19	.03	.05	.04	.06	.06	.03	.03	.04	.04	.07	.10	.10	.11	.10
4	.07	.06	.10	.04	.15	.09	.12	.05	.12	.19	.32	.20	.10	.29	.20
5	.12	.11	.13	.08	.25	.19	.19	.12	.12	.24	.21	.48	.29	.61	.40
6	.16	.14	.16	.12	.21	.26	.29	.15	.16	.22	.24	.19	.57	.66	.60
7	.15	.11	.14	.19	.25	.27	.35	.27	.17	.24	.21	.19	.62	.68	.60
8	.15	.11	.09	.14	.30	.28	.32	.29	.29	.29	.24	.15	.62	.55	.60
9	.16	.11	.16	.17	.18	.37	.33	.25	.31	.45	.25	.15	.69	.51	.60
10	.16	.11	.15	.29	.21	.31	.46	.30	.29	.53	.35	.18	.76	.56	.60
11	.20	.13	.14	.18	.30	.35	.42	.33	.27	.45	.37	.22	.85	.45	.60
12	.18	.29	.11	.55	.24	.71	.38	.29	.42	.56	.34	.39	.64	.61	.60
13	1.73	.05	.22	.36	.29	.44	.80	.21	.31	.50	.55	.13	.44	.20	.60
14 = F_I	.20	.20	.20	.20	.30	.30	.30	.30	.30	.40	.40	.40	.60	.60	.60

Table 12. Saithe: West of Scotland (VI).

Estimates of fishing mortality from Virtual Population Analysis ($M = 0.2$)

Age \ Year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
1															
2	.04	.02	.03	.01	.00	.01	.00	.02	.00	.01	.00	.02	.23	.11	.40
3	.27	.14	.17	.12	.22	.16	.19	.15	.13	.15	.15	.14	.29	.84	.60
4	.49	.39	.36	.19	.28	.57	.36	.30	.26	.39	.26	.35	.29	1.11	.50
5	.62	.34	.38	.16	.29	.35	.47	.23	.20	.27	.26	.34	.19	.51	.50
6	.36	.44	.31	.26	.25	.36	.21	.18	.11	.12	.16	.24	.26	.37	.40
7	.33	.36	.44	.21	.30	.33	.15	.22	.14	.14	.08	.18	.22	.46	.30
8	.23	.32	.29	.51	.18	.29	.07	.15	.09	.14	.06	.15	.20	.27	.30
9	.15	.42	.25	.26	.31	.49	.12	.11	.06	.07	.08	.13	.16	.18	.30
10	.05	.21	.52	.05	.32	.41	.15	.19	.07	.06	.07	.12	.14	.14	.30
11	.09	.46	.06	.33	.36	.85	.23	.25	.11	.08	.07	.15	.32	.18	.30
12	.02	.65	.48	.07	.15	.14	.28	.33	.19	.11	.11	.10	.27	.30	.30
13	.19	.17	.90	.19	.09	.41	.16	.61	.19	.35	.23	.24	.22	.24	.30
14 = F_I	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30

Table 13. Estimates from Virtual Population Analysis of Population Size (millions) at 2 years old of each year-class. Estimates of year-class size of the more recent year-classes are less reliable than those of earlier year-classes.

Year-class Area	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
North-East Arctic	115	225	349	121	383	210	263	193	366	368	406	233	405	180	212
North Sea	37	36	50	84	183	137	181	137	308	368	324	163	178	170	72
Iceland	41	38	103	67	114	87	85	74	112	70	51	32	60	90	123
Faroe Islands	10	14	24	17	25	22	25	21	40	30	38	45	32	56	5
West of Scotland	8	8	18	14	31	22	19	27	19	28	14	26	29	42	28

Table 14. Estimates of present Fishing Mortality rates and mean ages at first capture, with corresponding values for maximum yield per recruit.

Area	Estimates present Fishing Mortality	Present Mean Age at First Capture (years)	Optimum Mean Age at First (years) Capture for Present F	Optimum F at Present Age at First Capture
North-East Arctic	0.3 - 0.4	3.0	5.5	0.3
North Sea	0.3 - 0.4	3.0	5	0.3
Iceland	0.5 - 0.6	5.0	6	0.5
Faroe Islands	0.4 - 0.6	4.5	5	0.4
West of Scotland	0.3 - 0.5	3.0	5	0.4

Table 15. Percentages by Weight of Saithe less than 30, 35 and 40 cm in Length in the Landings from the Different Areas*.

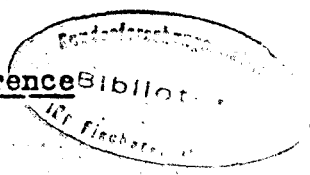
Country	Length	Percentage by Weight				
		I+II	IV	Va	Vb	VI
England	30	0	0	0	0	0
	35	0	0.1	0	0	0.1
	40	0.2	2.4	>0.1	0.1	1.4
Faroe	40			0		
Germany, F.R.	30	0	0	0	0	
	35	0	0	0	0	
	40	>0.1	0.3	0	0	
Iceland	40				0	
Netherlands	30		0			
	35		0.1			
	40		1.0			
Norway	30	0.9	1.3			
	35	5.8	8.8			
	40	18.1	43.5			
USSR	30	<0.1	0			
	35	0.6	0.2			
	40	6.6	2.8			
Scotland	30		0		0	0.1
	35		0.2		>0.1	7.9
	40		4.3		0.4	20.9
					<u>Clyde</u>	<u>North Coast</u>

* Averaged for 1971-73, except USSR and Netherlands (1970-72) and Scotland (1972-73).

Table 16. Lengths of Saithe Corresponding to Different Rates of Retention. Selection Factor: 3.8.

	Mesh Size (mm)		
% Retention	80	130	145
5	18.4	37.4	43.1
25	26.2	45.2	50.9
50	30.4	49.4	55.1
75	35.0	54.0	59.7
95	41.2	60.2	65.9

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International Council for the
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C.M.1975/F: II
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(Northern) Committee

The Arcto-Norwegian Haddock (*Melanogrammus aeglefinus*
(Linne) Fishery and their Stock Status

by
Sonina, M.A.

Abstract

The haddock fishery in the Barents Sea in 1950-1974, their abundance and stock (biomass) are considered in the paper. The relationship between the fishery and stock and growth rate of the species is analysed. The cause of the abundance reduction of immature fish population in 1974 is revealed. The forecast of the stock status and possible optimum yield of haddock in 1975 and 1976 is given due to the assessment of the year classes abundance.

x x x

Immature haddock mainly inhabit in the southern Barents Sea and Bear Island - Spitsbergen area. The species, reached

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the maturity, migrate to the spawning grounds into the Norwegian Sea. As usually, after spawning mature haddock migrate back to the southern Barents Sea in small numbers (Sonina, 1969, 1973).

Haddock start to mature since the age of 3-4 years at the length of 37-42 cm and on the whole they become matured at the age of 5-6 complete years with mean length of 47 cm. Thus, haddock inhabit in the Barents Sea mainly at the age up to 7 years and constitute the bulk of the catches at the age of 3-5 complete years (Konstantinov and Mukhin, 1965; Sonina, 1967). Mean length of haddock in the southern Barents Sea in 1950-1974 was equal to 40.7 cm and their average weight was 795 g (Table 1).

Haddock at the age of 5-10 years with the length of 50-70 cm dominated in the catches taken in the Norwegian Sea.

In 1950-1966 an annual mean yield of haddock taken by all countries and USSR in the southern Barents Sea constituted 102.2 thou.t. 46.6 thou.t. was taken by USSR. Annual mean yield of haddock in the Norwegian Sea was 35.3 thou.t. and in the Bear Island-Spitsbergen area - 4.3 thou.t. (Nizovtsev, Ponomarenko, Sonina, Shestova, 1970). The Soviet Union chiefly undertakes the haddock fishery in the southern Barents Sea.

The investigations showed that the existing fishery does not mainly effect the stock and abundance of haddock, because the commercial mortality is greatly overlapped by

natural fluctuations of the year classes abundance. The haddock stock in the Barents Sea depends mainly upon the abundance of successive year classes, growth and maturity rates (Sonina, 1969, 1970a).

The abundance fluctuations of the Arcto-Norwegian haddock year classes are fairly great: for fry - 250 times.

The abundance of the haddock year classes depends mainly upon the survival conditions of fry (Sonina, 1969; Ponomarenko, 1973; Hysten and Dragesund, 1973) and at present time it does not depend upon the parents stock value, size-age composition and sex composition of spawners, ratio between recruits and second spawners in population and extruded eggs (Sonina, 1969, 1970a, 1972, 1973).

The efficiency of haddock fishery in the southern Barents Sea depends upon the stock state, distribution and behaviour of fish, chiefly (Sonina, 1969, 1970b). The coefficient of correlation between the yield taken by the Soviet steam trawlers and their catch (stock index) per one hour trawling taken in the southern Barents Sea in 1950-1963 constituted $+0.89 \pm 0.05$. The greatest catches of haddock for the period analysed were taken in those years (1954, 1955, 1956, 1957, 1961, 1962, 1965, 1966, 1967, 1968, 1972, 1973), when the stock was fairly great. In 1952-1968 in most cases the abundance and stock of commercial stock of haddock were on the average and good levels, because in these years the abundant year classes dominated in stock.

In 1950-1964 one strong, six rich, four average and four poor year classes were registered (Table 2). The year classes with the greatest abundance we refer to the "strong" ones. The next symbols for year classes are: "rich", "average" and "poor". In 1969-1971 the abundance and biomass of the commercial haddock stock in the Barents Sea sharply decreased because of scanty of the 1965, 1966 and 1968 year classes. In these years the haddock yield in the Barents Sea considerably reduced. However, in 1972 and 1973 the abundance and biomass considerably increased because the haddock of the abundant 1969 year class reached the commercial size and their yield was record. In 1972 and 1973 the Soviet vessels took 176 and 186 thou.t. of haddock, that exceeded the maximum yield taken in 1956, when the species of the abundant 1950 year class at the age of 6 years constituted the bulk of catches. In 1973 the haddock abundance in the Barents Sea was on considerably high level. 546 specimens were registered in the mean weighted catch per one hour trawling, that exceeded the indexes of relative abundance of population in all the previous years since 1927 (Sonina, 1969). The 1969 year class of haddock was greater than the 1950 one, which up to the present time was considered to be the most abundant for the last 35 years. So, if the species of the 1950 year class at the age of 3 complete years constituted 137*7 specimens in the mean weighted catch per one hour trawling and at the age of 4 years - 193*7 specimens, then the 1969

year class haddock at the adequate age constituted 252.5 and 300.2 specimens, respectively (Table 3). The average catch per one hour trawling taken by the Soviet steam trawlers in 1972 and 1973 was twice higher than in 1953 and 1954 - 2.3 and 3.2 against 1.1 and 1.6 centners.

Compared to the previous year in 1974 the abundance of population considerably decreased. So, if in 1973 in May and June in the coastal areas 666 specimens were registered in the mean catch per one hour trawling, then in 1974 - 193 specimens.

In 1973 the species of the abundant 1969 and rich 1970 year classes of 31-50 cm long dominated in population. The species of the 1969 year class constituted 68.0% in the catches, and those of 1970 - 20.7%.

In 1974 the catches of haddock in the southern Barents Sea mainly consisted of the 1969-1971 year classes species of 31-55 cm long. The species of the abundant 1969 and rich 1970 year classes constituted the same percentage : 39.5 and 39.9%. The haddock of the 1969 year class was registered in greater quantities than those of 1970 and 1971 year classes. Consequently, in 1974 the abundance of species of the strong 1969 year class considerably decreased, that caused the abundance reduction of immature fish population. The investigations showed that this took place mainly in consequence of early sex maturity of the 1969 year class species and transport of mature fish into the spawning stock.

It is known that sex maturity of fish depends upon their growth rate. Faster the haddock grow, at earlier age they become to be matured and earlier migrate from the Barents Sea (Sonina, 1967, 1969).

In the fifties-sixties the slowest growth was observed for the 1950 and 1951 year classes haddock (Table 4). In this connection the species of these year classes as a whole reached the maturity at the age of 6-7 years and inhabited in the Barents Sea up to 8-9 years old. Comparatively low growth rate was typical for the species of the rich 1959-1961 year classes and they also matured later than those of fast growing year classes and occurred in the Barents Sea up to 7-8 years old. On contrary, the haddock of the 1956, 1957, 1963-1969 year classes had the high growth rate. The species of the 1956, 1957, 1963 and 1964 year classes reached their maturity at the age of 5-6 years. Much earlier the haddock of the 1967 year class matured. The males of this year class at the age of 4 years constituted among the recruits on spawning grounds over 50%, and females - about 25% in samples collected (Sonina, 1972).

The 1969 year class species were characterized with approximately the same growth rate as the haddock of the 1967 year class and they reached their maturity also early. They started to spawn at the age of 3 years, a lot of fish matured at the age of 4 years and, on the whole, they became matured at the age of 5 complete years.

The studying of the spawning population of haddock showed that in 1973 the species of the 1969 year class at the age of 4 years constituted among the recruits 85·5%. Besides, the haddock of this year class at the age of 4 years spawned for the second time (4·1%). In 1974 the haddock of the 1969 year class also dominated among the recruits population (94·5%), and among the second spawners the species of this year class constituted 32·7%.

If in 1973 the "remainder" in the spawning population (59·8%) exceeded the recruitment (40·2%), then in 1974 the recruitment (77·9%) was considerably greater than the "remainder" (22·1%); that was the evidence of significant recruitment of the spawning haddock population with the species of the most abundant 1969 year class, which the recruits population was mainly consisted of (94·5%). In spring 1974 during the ichthyoplankton survey an extraordinary great number of extruded eggs of haddock was observed, that was also the evidence of fairly great abundance of the spawning fish, and it was considerably higher than that of 1959-1973. Thus, the main mass of fish of the 1969 year class reached their maturity at the age of 5 years and migrated away from the Barents Sea. In 1975 the species of the rich 1970 and average 1971 and 1972 year classes constituted the bulk of haddock catches in the Barents Sea. In 1976 the population will recruit with the species of the rich 1973 year class. Thus, in 1975 and 1976 the haddock stocks will be on the average level and in interests of rational exploration the annual yield in the Barents Sea

in these years can constitute 100-120 thou.t.

CONCLUSIONS

1. In 1950-1974 the abundance and stock (biomass) of haddock in the Barents Sea were on the comparatively high level. The population was rather regularly recruited with the abundant year classes. From 1950 to 1973 two strong, eight rich, seven average and seven poor year classes were registered.

2. Commercial stock of haddock depends upon the abundance of successive year classes, recruited the commercial stock and upon the growth rate of species. The higher the growth rate, earlier haddock reach the sex maturity and migrate from the Barents Sea.

3. A close relationship exists between the haddock stocks and their annual yield ($r = +0.89 \pm 0.05$).

4. The 1969 year class was more abundant than the 1950 one, that was considered up to present to be the most abundant for the last 35 years. In consequence of this in 1972 and 1973 the abundance of the commercial stock of haddock in the Barents Sea was the highest for the period analysed. However, the 1969 year class haddock had the high rate of growth and on the whole reached their maturity at an age of 5 years and transported into the spawning stock. Considerable abundance reduction of the immature fish in the Barents Sea in 1974 was explained mainly by this fact.

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Table 1

The indexes of abundance and stock of the Arcto-
Norwegian haddock in the Barents Sea

Year	Mean length of one speci- men, cm	Mean weight of one speci- men, g	Number of speci- mens in average- weighted catch per 1 hour- trawling	Mean catch per one hour trawl- ing, centners
I950	33,0	625	I28	0,8
I95I	33,8	480	I28	0,6
I952	30,2	380	264	I,0
I953	34,8	500	223	I,I
I954	37,5	630	255	I,6
I955	40,I	700	329	2,3
I956	44,8	950	3I5	3,0
I957	43,8	860	232	2,0
I958	42,4	880	I02	0,9
I959	37,0	700	I29	0,9
I960	38,I	700	I87	I,3
I96I	42,9	950	I47	I,4
I962	42,8	930	I6I	I,5
I963	40,9	760	I32	I,0
I964	38,3	590	237	I,4
I965	4I,6	765	236	I,7
I966	42,4	850	I77	I,5
I967	46,6	III0	I62	I,8
I968	46,2	980	I49	I,5
I969	49,8	I350	4I	0,6
I970	4I,5	840	75	0,7
I97I	46,3	II35	62	0,7
I972	40,6	700	330	2,3
I973	38,7	590	546	3,2
I974	43,2	925	I60	I,5
I950- I974	40,7	795	I96	I,5

Table 2

The abundance of haddock year classes due to the
data of young determination and fishery in 1950-1973

Strong	Rich	Average	Poor
I950		I951	I952
I969	I953	I958	I954
	I956	I963	I955
	I957	I964	I962
	I959	I967	I965
	I960	I971	I966
	I961	I972	I968
	I970		
	I973		

Table 3

Number of the 1950-1970 year classes haddock at different age in the average-weighted catch per one hour trawling (in specimens)

Year class	Age, years								
	2	3	4	5	6	7	8	9	Over 9
I950	157,2	137,7	193,7	245,7	207,3	75,9	13,2	2,4	2,2
I951	27,8	13,9	29,4	22,6	13,6	4,4	1,3	0,8	0,3
I952	4,3	13,4	10,3	12,7	4,2	0,7	0,6	0,1	0,1
I953	17,9	46,7	96,0	39,6	11,9	2,3	1,2	0,9	0,2
I954	10,1	18,5	9,5	5,1	1,5	0,5	0,5	0,1	-
I955	3,4	6,7	8,8	7,9	1,9	1,0	0,3	0,1	-
I956	21,1	70,8	84,2	39,5	17,5	5,0	1,2	0,6	-
I957	26,5	67,4	55,0	38,0	7,1	1,7	0,6	0,4	0,2
I958	9,9	27,5	27,6	11,6	3,8	0,8	0,4	0,1	-
I959	19,2	59,9	64,0	39,9	13,0	3,0	1,2	0,2	0,2
I960	14,0	39,0	115,7	80,1	27,4	10,0	1,7	0,3	1,1
I961	4,1	69,0	119,3	64,6	28,5	4,6	1,4	0,7	1,0
I962	4,4	13,4	23,4	17,9	3,3	1,3	1,0	0,4	0,2
I963	7,4	48,7	70,0	31,4	6,6	3,7	1,8	0,6	0,2
I964	9,1	33,9	107,0	23,1	9,4	2,5	0,7	0,2	
I965	0,2	0,8	1,2	1,3	0,5	0,6	-		
I966	-	2,2	2,7	1,7	2,6	0,1			
I967	4,8	54,6	37,6	30,4	2,4				
I968	0,6	2,9	19,5	25,2					
I969	13,7	252,5	300,2						
I970	21,3	170,0							

Table 4

Mean length of the 1950-1972 year classes haddock at
different age in the southern Barents Sea (cm)

Year class	A g e, y e a r s						
	2	3	4	5	6	7	8
I950	29,2	33,0	40,0	43,0	48,0	52,4	58,8
I95I	25,4	33,6	36,6	43,4	49,2	56,0	6I,5
I952	26,4	30,8	38,3	44,2	49,3	56,0	62,6
I953	25,I	34,5	40,5	45,2	5I,I	57,7	65,9
I954	32,0	34,6	40,9	45,9	5I,4	63,0	68,7
I955	26,5	34,5	40,5	45,4	55,7	62,4	63,6
I956	29,6	37,I	42,3	5I,0	57,5	60,0	69,4
I957	30,0	37,8	45,5	5I,0	55,5	64,4	69,6
I958	28,4	38,5	43,9	47,7	54,I	58,8	62,6
I959	29,5	37,0	4I,0	45,4	49,6	53,8	60,9
I960	28,4	35,0	38,7	44,0	49,2	56,4	60,9
I96I	28,8	34,I	40,7	45,9	53,9	59,I	65,I
I962	28,9	37,5	43,0	5I,0	56,4	62,7	66,8
I963	32,I	36,9	46,0	52,0	57,7	64,3	67,9
I964	29,5	39,4	44,9	52,3	59,5	65,4	67,2
I965	33,7	38,4	46,I	54,7	63,2	66,8	-
I966	-	37,5	45,3	52,8	59,2	62,4	78,0
I967	3I,3	39,8	48,5	54,I	60,6	64,3	
I968	30,I	39,3	45,5	50,7	58,7		
I969	32,8	39,8	43,2	54,0			
I970	30,8	35,2	43,8				
I97I	30,3	35,6					
I972	29,5						

