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REPORT OF THE NORTH-WESTERN WORKING GROUP

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INTRODUCTION

Following the request made at the 1965 meeting of the North-East Atlantic Fisheries Commission, the North-Western Working Group was re-convened under the chairmanship of Mr. J. Jónsson. Preliminary discussions were held during the 1965 I.C.E.S. meeting in Rome, and the Group met in Copenhagen from 6th to 10th December. The following members took part in the meeting:-

J. Jónsson	Iceland (Chairman)
H. Knudsen	Denmark
J.S. Joensen	Faroes
A. Meyer	Germany
A. Schumacher	Germany
A. Hylen	Norway
B.W. Jones	United Kingdom
R. Jones	United Kingdom
J.A. Gulland	Secretary of the Liaison Committee

The primary task of the Group was concerned with the effect of extending the 130 mm mesh, already recommended for the north-eastern part of Region I of the Commission to the whole of the region, but where appropriate the effects of larger meshes (up to 160 mm) were considered. Also, where possible, the effect of changes in the total fishing effort were considered. In assessing the effect of mesh increases the Group had to take into account the widespread use of chafers; these must reduce the selectivity, so that the true selectivity of the cod-ends in use at Iceland must be below the nominal 120 mm, probably by as much as 20% (I.C.E.S. 1966), so that the true selectivity is probably equivalent to a manila cod-end of 100 mm. This value of 100 mm has therefore been taken as the present mesh size in all assessments of the effect of changes in the mesh size at Iceland.

As in similar reports the assessments in this report compare future catches with increased mesh size or changed effort with catches that would have been taken in the future with unchanged mesh size and effort. The actual

level of the catches in the future may also differ from the present catches for other, environmental, reasons independent of fishing (e.g. good or poor year classes), but these will generally not alter the benefit from e.g. a mesh increase.

As in the previous report (I.C.E.S. 1962) the fisheries at Faroes, Iceland and East Greenland have been treated separately. The stocks of fish in these areas are distinct, though there is some mixing of cod between Iceland and East Greenland, and of coalfish between Iceland and Faroes (and also the Norwegian coast). The calculations have been restricted to the four most important demersal species - cod, haddock, redfish and coalfish, but as is shown in the table below, giving the total catches of demersal fish from the area in 1964, these species account for the major part of the catch.

Table 1. Landings of demersal fish in 1964

	Iceland	Faroes	E. Greenland	Total	%
Cod	429,284	24,978	34,306	488,568	52.4
Redfish	95,160	7,644	42,786	145,590	15.6
Haddock	99,047	19,490	150	118,687	12.7
Coalfish	60,127	21,473	691	82,291	8.8
Catfish	17,192	145	559	17,896	1.9
Plaice	9,368	305	1	9,674	1.0
Halibut	3,733	1,205	276	5,214	0.6
Others ⁋	45,575	16,414	2,436	64,425	6.9
Total	759,486	91,654	81,205	932,345	100.0

⁋ Includes unsorted and unidentified

Of the species not considered in detail most are large in relation to mesh sizes up to 130 mm, and consequently will not be affected to any extent by increases in mesh size up to this size. However, several, e.g. the plaice, are known to be heavily fished (Gulland 1961) and the stocks would benefit from a reduction of fishing effort. Included as an appendix to this report

are detailed tables of the landings from the major stocks. These statistics differ to some extent from other published statistics, including the Bulletin Statistique, because of corrections made from later information available to members of the Group. In particular adjustments have been made to some German data to allow for landings made from more than one statistical area, and to some British data, where most published statistics for the years before 1951 refer to landed weight (usually gutted), and not to round fresh weight. All the statistics in this report refer to round fresh weight unless specifically stated otherwise.

ICELAND COD

The trends in total catch of cod are shown in Figure 1 and are tabulated in Appendix Table 1. After the war there was a steady increase in catches, which reached a peak of rather more than half a million tons in 1954, but since then they have tended to decrease. The total catches have been influenced by immigration of cod from Greenland. In particular the peak catches in the thirties and around 1954 were partly due to the influx of strong year-classes (the 1945 year-class in 1954 and the 1922 year-class in the thirties). A similar immigration seems to have occurred in 1964. The cod fisheries consist of two distinct groups; those on the mature spawning stock, carried out almost entirely by Icelandic fishermen with a variety of gears - nets, lines, trawl and, more recently, purse-seines, and those on the immature fishes, mainly by trawlers, particularly from England. Unlike the Arctic cod fishery, where the spawning fishery had taken only a small part of the total catch, at Iceland rather more than half the total catch is taken in the spawning fishery.

The only long series of effort data available are for the trawl fisheries of England and Germany. The catch per unit effort data for these fisheries, expressed as proportions of the average catch per unit for each fishery over the whole period, are plotted in Figure 2. The data are also given in Appendix Table 2. The English figures, which were calculated as catch per ton/hour, and therefore contain some allowance for the increasing size and power of the ships, show a steady and marked decline since the war,

the 1964 figure being only about a quarter of that in 1946. The German data were calculated as catch per day fished, with no allowance for size or power of vessel; they probably also give a less reliable measure of the stock abundance because cod is not the primary objective of the German trawlers, and their catches of cod depend very much on the availability of other species such as redfish. However, the fact that despite their increased power, German trawlers have not increased their catch per day of cod, is some supporting evidence that the stock of cod has seriously declined since 1946. The shorter series of data from Icelandic trawlers also shows a rapid decline since 1960.

The total fishing effort on the stock has been estimated from the statistics of English effort, raising this effort by the ratio of total catch to English catch. These estimates have also been plotted in Figure 1 and are tabulated in Appendix Table 3: this shows that since the war the effort has steadily risen. The increase in English fishing has been caused both by the increased size of the individual vessels, and by increased fishing time; though detailed Icelandic statistics were not available it seems that the increased Icelandic fishing has been caused less by increased fishing time than by increased efficiency, such as the introduction of purse-seining and especially the introduction of synthetic fibres into the gill-net fishery. Up till 1954 the increase in effort was accompanied by a rather slower increase in catch; since 1956 the catch has decreased, despite the increase in effort.

A long series of data on the composition of the Icelandic spawning fishery by age-groups and spawning classes shows clearly how the mortality rates have increased following the increase in effort. In Figure 3 the average mortality rates calculated from spawning classes 1 to 6, in five-year periods from 1930 onwards have been plotted against the corresponding fishing effort (c.f. Jónsson, 1960). Because the mortality calculated from percentage age or spawning class distribution refers to the period when the fish concerned entered the fishery, and not to the period of sampling, the effort has been calculated for the period 2 years earlier (e.g. 1948 - 1952 for the 1950 - 1954 mortality). This shows a very clear

relation, and gives an estimate of the natural mortality, (at zero effort) of about 20%; at present, however, the total mortality is about 70%, and the mature stock now consists mainly of fish spawning for the first time. German data from the fishery off N.W. Iceland gives a similar total mortality of about 70% among the fish over 9 years old. English data on the age-composition of the immature stock are available from 1955 onwards and also show a high apparent mortality of around 60% per year. The period is too short to permit grouping, and the estimates of mortality for individual years are too variable to show any clear relation between fishing effort and mortality. However, if the 20% natural mortality applies also to the immature fish, then it is likely that fishing accounts for some two thirds of the deaths among the immatures.

Assessments of mesh size increase

In assessing the effects of mesh changes three sources of length-composition data were available; from English and German trawlers, and from the Icelandic spawning fishery. The English trawlers, fishing mainly for cod, catch smaller fish than do the Germans, fishing in deeper water for redfish. Six groups of vessels were therefore distinguished - English and other trawlers; German trawlers and Iceland trawlers outside the spawning season; Faroes liners and Icelandic Danish seiners, fishing for small cod, for which the English data were used; other gears outside the spawning season, for which German data were used; Icelandic trawlers in the spawning season; other gears in the spawning season. The average catches of these groups in the period 1960 - 1964 are tabulated below; the length composition of the landings of these groups, expressed as the total numbers landed during the period, is given in Appendix Table 4.

Trawl A	England, Scotland, Belgium etc.	118,109	tons
Trawl B	Germany, Iceland (non-spawning)	41,309	tons
Danish seine	Faroes	13,790	tons
Other gears	Outside spawning season	44,354	tons
Trawl C	Iceland, spawning	17,171	tons
Other gears	In spawning season	183,418	tons
	Total	418,151	tons

A selection factor of 3.2 was used in the calculation (I.C.E.S. 1965a). As explained in the introduction a present effective mesh size of 100 mm has been assumed, and all the calculations are made in terms of changes in mesh size of nets with a selectivity equal to that of manila of the nominal mesh size, without chafers. In calculating the long-term efforts, values of E, the ratio of fishing to total deaths of 0.6 and 0.8 have been taken; these are rather larger than those used in the previous report (0.5 and 0.7), because of the increase in effort since then. Mesh sizes of up to 160 mm have been considered. Discards by English trawlers were estimated as 10% by numbers. The resulting estimates of immediate and long-term effects are given in Table 2. This table shows that gains in total catch by all methods of up to 10% will be obtained by increasing the mesh size up to 160 mm; larger meshes may give even larger gains. For mesh sizes up to 130 mm all groups of vessels will gain, but for larger meshes the gain to the trawler group A will decrease, and may become a loss if 160 mm were used.

It is probable that the values in this table under-estimate the gain to the trawlers. Tagging and other data show that the immature cod are relatively static in separate groups, only mixing when they mature and migrate to the spawning grounds. The method used assumes that the benefit occurs equally throughout the stock, but in fact the catches from the groups of immature fish fished by the trawlers will increase more than the average. Also the benefit will take some time to appear in the spawning fishery, as there is a difference of some 4-5 years between the age of fish which would be released (about 4 years old) and the average age at first spawning (8-9 years).

Changes in effort

The Group was not able to make any very precise assessment of the effects of changes in effort, especially as these effects will depend on whether the effort changes in the mature or immature fisheries. However, the contrast between the recent trends in total catch and total effort as shown in Figure 1 suggest that any further increase in effort for a given mesh size will lead to a long-term decrease in average catch. Theoretical

considerations agree with this conclusion. A moderate reduction in total effort may possibly lead to a slight increase in total catch, and certainly would not cause any appreciable decrease. The catch per unit effort would certainly benefit, roughly in proportion to the decrease in effort.

Table 2. Mesh assessments for Iceland cod: percentage change from present landings

Gear Group		E	Changing effective mesh size from 100 mm to				
			110	120	130	140	160
Trawl A (England, Belgium etc.)	Imm. loss		0.7	1.8	3.8	6.2	13.3
	Long-term gain	.6	0.4	0.8	0.8	0	-2.8
		.8	0.5	1.7	2.4	2.1	0.7
Trawl B (Germany)	Imm. loss		0.1	0.3	0.7	1.3	3.3
	Long-term gain	.6	1.0	2.4	4.1	5.2	8.4
		.8	1.4	3.3	5.7	7.3	12.4
Trawl C Iceland spawning fishery	Imm. loss		-	-	0.1	0.2	0.5
	Long-term gain	.6	1.1	2.7	4.7	6.4	11.6
		.8	1.5	3.6	6.3	8.6	15.6
Other gears	Imm. loss		-	-	-	-	-
	Long-term gain	.6	1.1	2.7	4.8	6.6	12.1
		.8	1.5	3.6	6.4	8.8	16.2
Total	Imm. loss		0.3	0.7	1.4	1.9	4.2
	Long-term gain	.6	0.8	2.0	3.3	4.6	7.4
		.8	1.2	2.9	4.9	6.7	11.3

ICELAND HADDOCK

The total catches of haddock since 1924 (except for the war years) are shown in Figure 4 and Appendix Table 5. The striking feature has been the substantial increase in total catch in recent years. This increase is in apparent conflict with the recent increase in total effort, and the fact that even before the war the haddock stocks were known to be severely reduced by fishing (Russel, 1942). Though the total effort has not been calculated explicitly, partly because there is no substantial fishery primarily directed towards haddock, it has almost certainly been following the same trends as the effort on cod. The total English fishing, for which haddock is very important, has been steadily increasing, while the Icelandic fishermen are paying more attention to fishing for haddock. However, since the war, and especially

since the early nineteen fifties, there have been substantial changes in the pattern of fishing, which would be expected to give protection to the small fish, and hence benefit the stock and long-term catches. These changes included a minimum mesh size, and various extensions of the fishery limits. The general effect may be seen from the changes in catch per unit effort given in Appendix Table 6. Until 1964 the post-war catch per unit effort was higher than that immediately before the war, even though the effort (Appendix Table 3) was greater.

There was no information available to the Group concerning the mesh size in use before the war, but it was probably quite small, perhaps around 70 mm; though the 110 mm mesh did not come into legal force until 1954, it probably came into practical use gradually over the years after the Convention was agreed in 1946. The effects of both the 110 mm, and later the 120 mm mesh have been reduced by the very widespread use of chafers, which reduce the effective mesh size to perhaps 100 mm, but this is still probably very much larger than the mesh size previously used.

Quantitative assessments of the effects of the limits changes are even more difficult. Though the distribution of the different sizes of fish does not follow at all closely lines drawn on a geographical basis, the limits do include several nursery grounds where small fish are particularly abundant. I.C.E.S. scientists have recommended as long ago as 1948 that fishing should be stopped on such well-known nursery grounds as the inside of Faxa Bay (I.C.E.S., 1948). There is no doubt that to the extent that fishing was stopped inside Faxa Bay, and on other nursery grounds, e.g. along the north coast, the extension of fishing limits has given additional protection to the small fish.

A very important factor in the success of the haddock fishery is the strengths of the year-classes. The fluctuations in the year-class strengths are very large, and can be detected in the catches of research vessel surveys when the fish are only one or two years old. Thus the peak in the catches in 1962 was due to the pair of good year-classes of 1956 and 1957. There is, however, no good reason to suppose that the increase in the average level of catches since the war has been due to an increase in the average strength of year-classes. This can to some extent be checked from the data of the

trawling surveys which have been carried out in Faxa Bay since 1928. In Figure 5 the average catch per hour of each size of fish for the two periods 1928-1938 (from I.C.E.S., 1948) and 1955-1964 from Icelandic data supplied to the Working Group have been plotted. The data are not completely comparable, as they were collected by various ships using different gears. In particular, since 1955 a mesh size of about 80 mm mesh has been used in the research survey, which accounts for the absence of fish below about 25 cm. Around 30 cm, which is the smallest size fully represented in the recent samples, there is no very big difference between the two periods; the big difference lies in the very much greater numbers of big fish in the recent samples, which is due to the reduced local fishing.

Another factor which can change the catches is the growth rate. Data on the growth of haddock is given in Table 3, which shows the average lengths of each age of haddock, before the war, as given by Thompson (1929), and in the 1958-64 English landings, as given in data supplied to the Working Group; (only the larger individuals among the 2- and 3-year-old fish will appear in the English landings, so these lengths will be over-estimated). Precise comparison is difficult since there is considerable variation in

Table 3. Average lengths (cm) of Icelandic haddock

	Age								
	2	3	4	5	6	7	8	9	10
Thompson (1929)	31	40	48	55	60	64	69	72	75
English landings 1958-64	(38)	(44)	51	57	62	67	71	69	76

growth rate of both cod and haddock from different areas round Iceland, but these data, as well as other data on haddock growth, and also data on cod growth (e.g. Saemundsson, 1923, Jonsson, 1954, and data supplied to the Working Group) show that for neither species have there been appreciable changes in the growth rate, which could explain the observed changes in the stocks and catches.

The big increase in total catches since the war can, therefore, be mainly ascribed to the better protection of small fish, partly from the larger mesh, and partly by the limits change.

The large benefits which can accrue from protection of small haddock are due to their very fast growth. A haddock of 30 cm will more than double its weight in a year (and smaller haddock grow even faster). As the natural mortality is probably 20-30% per year, the total weight of a year-class will, when the individual fish are some 30 cm long, increase in the absence of any fishing by about 75% in the year; this gives a fair measure of the possible benefit from protecting the fish of this size for a year. The benefit may be still greater if in fact quantities of the very small fish are discarded and there is no immediate loss in releasing them. However, the haddock do not now appear in the catches in substantial numbers until they are 40-45 cm; their relative growth is slowing down, to about 70% per year. Allowing for natural deaths, the total weight of a year-class will increase by only 30% per year. Thus the benefits of protecting fish of 40-45 cm are not so large, as is shown in the detailed mesh assessments below.

The increase in haddock catches may be contrasted with the small change in cod landings. The cod caught by the trawlers are generally too large to be released by an effective mesh of 100 mm (c.f. the small initial losses even up to 140 mm) and a smaller proportion of the cod are found inside the limit; in fact the limits change had to some extent the opposite effect by diverting English trawlers from the spawning fishery on large fish onto the smaller fish. Therefore the mesh change and the extension of the limits would be expected to have a smaller effect on cod than on haddock. The difference in effect is of course very similar to the predicted long-term changes at Faroes for changes from 75 mm to 100 mm, especially at the higher discard rates.

Data for mesh assessment

Length-composition data for Iceland haddock were available for landings by English, German and Scottish trawlers, and by Icelandic Danish seiners. For the purposes of assessment it was believed that the length composition

of the other groups of vessels (Faroese and Belgian trawlers, and other Icelandic gears) were best represented by the English data; this gave the following five groups of vessels (with their average annual landings in the period 1960-1964).

Trawl Group A	England and others	54,050 tons
Trawl Group B	German trawlers	3,880 tons
Trawl Group C	Scottish trawlers	3,190 tons
	Danish seine	6,850 tons
	Other gears	35,760 tons
	Total	103,730 tons

The detailed length compositions, in terms of the total numbers landed by each group in the period 1960-1964 are given in Appendix Table 7. A selection factor of 3.35 was used, with a range of 9 cm. It was assumed that the selectivity of the Danish seines would change as much as the trawls; in fact the present selectivity of the Danish seines is probably greater than that of 100 mm manila, so that the estimates of immediate loss are too large; as they only take a small proportion of the total catch the long-term effects will be virtually unaffected. No allowance has been made for discards; these are believed to be very small, but to the extent that there are some discards the estimates of the long-term gain may be too small. Two values of E have been used; .6 and .8.

Assessments of mesh size increases

The results of the assessments are given in Table 4 below. The total catch increases with increased mesh size up to at least 120 mm, but further increases may lead to losses at lower values of E. Non-regulatory gears and German trawlers will gain from any increase up to 140 mm; the Danish seiners will gain up to 120 mm, but the gain will be less, or even become a loss with larger meshes. British trawlers will probably lose from any increase, but up to 120 mm this loss will be very small, possibly less than 1% (and would be a gain if there was any degree of discarding). Above 120 mm the loss would increase up to around 10% with a 140 mm mesh.

Table 4. Mesh assessments for Iceland haddock: percentage change from present landings

Gear Group		E	Changing effective mesh size from 100 mm to			
			110	120	130	140
Trawl A (England etc.)	Imm. loss		2.5	8.0	15.9	25.1
	Long-term gain	.6	-0.9	-2.6	-6.7	-12.3
		.8	-0.3	-0.7	-3.6	-8.0
Trawl B (Germany)	Imm. loss		0.0	4.1	6.9	12.5
	Long-term gain	.6	1.1	1.6	3.2	2.5
		.8	1.7	3.5	6.7	7.4
Trawl C (Scotland)	Imm. loss		3.1	8.2	14.5	21.5
	Long-term gain	.6	-2.4	-2.8	-5.2	-8.1
		.8	-1.8	-0.9	-2.0	-3.6
Danish seine	Imm. loss		0.3	3.5	8.2	16.4
	Long-term gain	.6	1.4	2.2	1.7	-2.1
		.8	2.0	4.1	5.2	2.7
Other gears	Imm. loss		-	-	-	..
	Long-term gain	.6	1.7	5.9	10.9	17.1
		.8	2.3	7.9	14.6	22.8
TOTAL	Imm. loss		1.5	4.7	9.6	15.3
	Long-term gain	.6	0.2	0.9	0.0	-0.8
		.8	0.8	2.8	3.6	4.0

Changes in effort

No direct estimates were made of the effect of changes in total effort. However, theoretical considerations suggest that in such a heavily, or moderately heavily fished stock, with a not excessively small size at first capture, moderate increases or decreases in total fishing effort will have little effect on the average landings.

ICELAND SAITHE (COALFISH)

The Iceland saithe (coalfish) stocks have been studied by the I.C.E.S. Coalfish Working Group (I.C.E.S., 1965b). This Group found it difficult to come to definite conclusions regarding the state of stocks of coalfish, partly because of the interchange that occurs between the different areas, and also because of the absence of any long series of data on a fishery primarily for coalfish. However, they concluded that the coalfish was probably less heavily exploited than cod or haddock. The present Group could not add substantially to these conclusions, though recent tagging

experiments suggest that the fishing mortality can be high locally in the purse-seine fishery off north Iceland. The trends in landings of coalfish from Iceland are given in Appendix Table 8 and are shown in Figure 6.

From the length-composition data of English landings the immediate effects of mesh changes up to 140 mm have been calculated, assuming a selection factor of 3.5, as follows:-

Increase from 100 mm to	Immediate loss %	Minimum value of E for long-term gain
110	1.9	0.16
120	4.8	0.20
130	9.0	0.24
140	14.1	0.31

Long-term effects could not be calculated, but calculations were made of the minimum value of E required to turn these losses into long-term gains. These are very small compared with the estimates for cod and haddock - even for a 140 mm mesh there will be a gain if fishing mortality is as little as half the natural mortality. Thus there will very probably be a long-term gain in coalfish catches from using meshes up to 130 mm, though these gains cannot be assessed quantitatively.

ICELAND AND EAST GREENLAND REDFISH

The catch statistics of redfish are given in Appendix Table 9 and in Figure 7. The catches increased rapidly after the war to a peak of 170 thousand tons in 1951, but declined thereafter to a fairly steady level of 80 to 90 thousand tons per year over the past ten years.

The longest series of effort data is from the German trawler fleet. As stated in the cod section these data may be unreliable because of changes in attention between the different species; they show that the average catch per day of redfish declined from 9.8 tons in 1953 to 6.2 in 1957, though recovering to 7.0 tons in 1964. Allowing for the increase in size of trawlers these data strongly suggest that fishing has caused a real decline

in the abundance of the stocks. Icelandic catch per effort data in tons per million ton hours are available since 1960. They show a rise in catch per unit effort in 1962 and 1963 and a fall in 1964.

The size composition of redfish landings are very similar from Iceland and East Greenland, so that it is convenient to consider the two areas together for mesh assessment. Selectivity data for redfish are very variable; the average of the values of the selection factor given in the Iceland Mesh Selection Report is 2.7 However there is a strong tendency for the selection factor to decrease with increasing catch, and most of the catches during the selection experiments were substantially smaller than those in the commercial fishery. The actual selection factor under commercial conditions has, therefore, been taken as 2.2, with a selection range of 15 cm. Using this value of the selection factor, and selection ranges between the 25 and 50% points, and between the 50 and 75% points, as shown in the table, and the average size composition for 1960-1963 of German and Icelandic catches, the following estimates of immediate loss were obtained:-

Redfish 1961-64: immediate losses in % (S.F. = 2.2)

Area	Iceland		East Greenland		Faroes
sel. range 25-50%	12.0 cm		8.3 cm		See Iceland
sel. range 50-75%	4.2 cm		5.9 cm		
Changing from 100 mm to	Icelandic catches	German catches	Icelandic catches	German catches	German catches
110 mm	0.6	0.2	1.3	1.9	0.01
120 mm	1.8	0.6	3.0	2.4	0.04
130 mm	4.0	1.5	5.4	4.3	0.2
140 mm	7.8	3.6	8.5	6.7	0.8

As for coalfish a break-even value of E, such that in the long term these losses would be exactly made up, has been calculated. The values are very similar for the two areas, and range from 0.35 at 30 cm (corresponding to

a 110 mm mesh) to about 0.6 at 38 cm (corresponding to a 140 mm mesh). These are not large in comparison to the values for cod and haddock, and suggest that, at worst, most of the immediate loss will be made up in the long term, and there may even be a gain, especially from the intermediate mesh sizes.

No further evidence on meshing of redfish was available to the Group, who cannot add to conclusions of von Brandt, mentioned in the previous North-Western Working Group report, that meshing would not be a serious problem in the commercial fisheries with mesh sizes up to 130 mm.

EAST GREENLAND COD

The fisheries in this area have developed very recently (see Appendix Tables 10 and 11). The main part of the catches are taken by German fishermen, who initially fished almost entirely for redfish, but turned to cod when the redfish catches declined. The catch per day of all species by German trawlers has declined from 35 tons in 1955 to 21 tons in 1964, but because of increased attention the catch of cod increased from less than 2 tons to 11 tons per day in 1964. Probably therefore the redfish stocks have been reduced by fishing, but it is not yet possible to say much about the state of the cod stocks.

Length data of German landings show that the cod caught at East Greenland are very large, and the use of larger mesh sizes up to at least 140 mm will have negligible effects on the catches.

FAROES COD

The total cod landings and the landings per unit effort from 1924-1964 (excluding the war years) are shown in Appendix Tables 12 and 13. From these data, total effort statistics in English and Aberdeen trawler units have been determined and these are summarised for various periods (Table 5). Catches per unit effort for 1959-1964 in steam-trawl units were estimated from motor-trawl data with a correction for the greater efficiency of motor trawlers.

From 1959-1963, total landings and landings per unit effort were lower than they had been from 1924-1958 (excluding the war years). Total effort on the other hand was higher.

In 1964 total effort declined since many British trawlers that previously fished at Faroes instead fished off the Scottish west coast and at Iceland.

Table 5. Faroes cod statistics

Years	Total landings (metric tons)	English trawlers		Aberdeen trawlers	
		Landings per unit effort (1)	Total effort (2)	Landings per unit effort (3)	Total effort (4)
1924-36	37,918	563	67	237	320
1949-58	31,811	576	55	226	282
1959-63≠	28,076	228	98	128	439
1964≠	24,978	357	70	123	406

(1) tons per million ton hours by steam trawlers.
(2) millions of ton hours.
(3) cwt per 100 hours
(4) thousands of hours by steam trawlers.

≠ estimated from motor trawler data using a correction for the greater efficiency of motor trawlers.

The 12-mile limit at Faroes

The six-mile fishing limit at Faroes came into force in April 1959. Subsequently in March 1964 the fishing limit was further extended to 12 miles for all other than Faroes vessels. At this stage it is not possible to predict the long-term effect with any certainty. All that can be said is that this will ultimately depend on the ratio of the quantity of fish outside to that inside the limit. There are various possibilities to consider but the most likely is that trawlers cause the density of fish outside the limit to drop below the density inside. If that were to happen the fishing mortality rate on the stock as a whole caused by the trawler fleet would be less than if it were deployed all over the stock.

The restrictions placed on the operation of trawlers due to the extension of the limit is therefore likely to cause the effective trawler fishing effort to decrease.

The effect of this would then depend on the extent to which it was reduced, and this in turn will depend on the rate of movement of fish back and forth across the limit. The greater the rate of mixing, the smaller will be the ultimate difference between the density of fish inside and outside the limits.

In the case of cod, published tagging data (Strubberg 1916, 1933; Tåning, 1940) plus more recent unpublished English tagging data clearly indicate that cod move extensively around the islands both inside and outside the 12-mile limit. It is unlikely, therefore, that the effect of the limit would be other than to reduce the effective fishing mortality rate by a small extent.

The data in Table 5 suggest that small decreases in fishing effort below the 1959-1963 level should, if anything, tend to be beneficial. The only way in which benefits would become lower is by the effective fishing effort becoming so low that the stock as a whole was being underfished. This, however, would only happen if the rate of interchange of fish across the limit was extremely low and, although it is not possible to calculate the effect at this stage, there is no reason to suppose that this would be the case for cod.

Estimation of parameters

Estimates of the total mortality rate of Faroes cod have been made from various sets of data. B.W. Jones (1966b) gives an estimate of 1.06 using British trawler age-composition data for the period 1959-1962. Unpublished data from the same source for the period 1962-1964 give a value of 0.83. Using Faroes line-boat data for the period 1961-1965 a value of 0.89 was obtained. Precise estimates of the natural mortality rate of Faroes cod are not available but it is concluded by B.W. Jones (1966b) that these should be of the order of 0.3. From these data therefore the value of 0.7 for E was calculated. For assessment purposes values of E = 0.6 and 0.8 have therefore been used.

Recent selectivity data summarised by B.W. Jones (1966a) indicate that with a double manila cod-end, a selection factor of 3.4 is appropriate for Faroes cod. Selection curves were constructed using this selection factor,

and by allowing the selection ranges to increase from 4 cm for a 75 mm net to 10 cm for a 130 mm net.

Age/length data for Faroes cod are given by B.W. Jones (1966b). A length/weight relationship for Faroes cod is given in Appendix Table 14.

The mean length compositions of the total cod landed by English, Scottish and Faroes vessels from 1959-1963 are shown in Appendix Table 15. This period was adopted as being the longest recent period during which the condition of the fishery remained unchanged.

No account has been taken of discards in the assessments since the few data from Scottish and English trawlers indicate that discards of cod amount to only a few percent by numbers of the catch.

Assessments of mesh size increases

Taking the mesh size for the period 1959 to 1963 as being equivalent to 75 mm double manila assessments have been made for increases of trawl mesh to 100 mm, 110 mm, 120 mm and 130 mm.

Length compositions of the landings by English trawlers from Faroes Bank and Faroes Plateau have been determined separately; for this purpose Faroese line-boat data were separated in the ratio of 85% to Faroes Plateau and 15% to Faroes Bank. All Scottish trawl data were treated as though they had come only from Faroes Plateau. Assessments for Faroes Bank and Faroes Plateau were then made separately and the results were finally combined to give results for the whole Faroes area. These are given in Table 6 and lead to the following conclusions. Total landings would experience small long-term gains up to perhaps 9% with a 130 mm mesh, but there may be little or no gain in the increase from 120 mm to 130 mm. The long-lines will gain from any increase in mesh. British trawlers will have gains up to at least 120 mm, but for Scottish trawlers the further increase to 130 mm will probably reduce the gain, and may even cause a very small loss.

Minimum landing size

The present minimum landing size for cod from Faroes is 30 cm. If this were increased to 34 cm as recommended by the North-East Atlantic Fisheries Commission only negligible quantities would have to be discarded from mesh sizes of 110 mm and greater. A 100 mm cod-end would retain as many as 21% of

the present landings of cod of 31 cm in length and 40% of cod of 33 cm in length, which would have to be discarded, but these amout to less than 1% of the total numbers landed.

Table 6. Faroes cod mesh assessment

Fleet		E	Changing effective mesh size from 75 mm to			
			100	110	120	130
English trawl	Imm. loss		0.1	0.7	2.2	5.0
	Long-term	.6	1.0	2.5	5.2	5.5
	gain	.8	1.3	3.7	6.5	9.0
Scottish trawl	Imm. loss		1.0	3.1	6.6	11.7
	Long-term	.6	0.5	1.0	2.2	-0.2
	gain	.8	1.0	2.3	3.5	3.6
Total trawl	Imm. loss		0.9	2.2	4.8	9.1
	Long-term	.6	0.7	1.6	3.4	2.0
	gain	.8	1.1	2.8	4.7	5.7
Long-lines (Faroe)	Imm. loss		-	-	-	-
	Long-term	.6	1.3	3.7	8.4	12.0
	gain	.8	1.7	5.0	9.7	15.9
Total (all gears)	Imm. loss		0.5	1.5	3.4	6.4
	Long-term	.6	0.9	2.2	4.9	4.9
	gain	.8	1.3	3.7	6.1	8.7

FAROES HADDOCK

The total landings, and the landings per unit effort from 1924-1964 (excluding the war years) are shown in Appendix Tables 16 and 17. From these data, total effort statistics in English and Aberdeen trawler units have been determined and these are summarised for various periods in Table 7.

Table 7. Faroes haddock statistics

Years	Total landings (tons)	Data from English trawlers		Data from Aberdeen trawlers	
		Landings per unit effort (1)	Estimated total international effort (2)	Landings per unit effort (3)	Estimated total international effort (4)
1924-36	12,324	221	56	78	316
1949-58	16,772	262	64	146	230
1959-63*	24,402	178	137	122	400
1964*	19,491	181	108	120	325

(1) tons per million ton hours by steam trawlers.
(2) millions of ton hours.
(3) cwt per 100 hours.
(4) thousands of hours by steam trawlers.

* estimated from motor-trawler data using a correction for the greater efficiency of motor trawlers.

A striking feature of the Faroes landings is that they have shown a tendency to increase from a level of 11,000 tons in 1924 to a maximum value of 27,600 tons in 1963. During the period 1959-1963 both the landings and the total fishing effort were at their highest levels.

The 12-mile limit at Faroes

The arguments put forward for Faroes cod apply equally to haddock. Again the essential thing is to determine whether the interchange of fish across the 12-mile limit is sufficient to maintain the quantity of the stock outside the limit. As for the cod, an exact numerical effect cannot actually be calculated. Recent Scottish tagging results do however clearly show that haddock tagged inshore at Faroes are recaptured from positions all round the islands, both inside and outside the 12-mile limit. There is nothing in the tagging results to suggest that the haddock stock outside the limit would not be recruited from inside the limit.

Estimation of parameters

Estimates of the total mortality rate of Faroes haddock have been made from Scottish trawler age-composition data. These are shown in Table 8.

Table 8. Estimates of total mortality rates of Faroes haddock

Age-group / Period	1950-1959	1960-1964
2-6 years	0.99	0.82
6-9 years	0.53	1.02
9-10 years	0.86	1.34

These show that for the period concerned and for the ages 2-6 years, which account for over 90% of the Scottish landings, the total mortality rate is 0.82. For a natural mortality rate of 0.2, this gives a value of E = 0.76. Less direct methods of computation using the method of Jones, R. (1961) to allow for the differences in mortality with age, give a value of E = 0.65. In the assessment, values of E = 0.6 and 0.8 have therefore been used.

A selection factor of 3.4 has been adopted from the data available on haddock in general and Faroes haddock in particular. The selection range was varied from 4 cm for a 75 mm cod-end to 10 cm for a 130 mm cod-end (on the basis of data summarised by R. Jones (1963)).

The age/length relationship of haddock over the selection range of the meshes considered has been determined from recent Scottish research vessel and market data. Over the period 1959-1963, this is similar to that adopted in the first report of the Working Group. Length/weight data have been taken from tables published by Russel (1914).

The mean length composition of the haddock landed by English and Scottish trawlers from 1959-1963 are shown in Appendix Table 18. Only a few length compositions from Faroes liners are available from samples taken in 1961 and 1962. These show that Faroes line boats land about 880 haddock per ton of fish and this value has been used for converting weights into numbers landed by Faroes line boats.

Discards

Several trips have been made by observers on board Scottish trawlers to determine the percentage of haddock discarded at sea. These showed in contrast to those of earlier years when up to 60% by numbers were sometimes discarded, that from 1962-1965 there were much lower rates of discarding of about 8-12% by number. The rate of discarding varies greatly, both seasonally within a year, and also between years, the latter depending greatly on the strength of the year-class just less than marketable size. Whereas the low rates of discarding in 1965 could be explained by the existence of a poor year-class in 1964, the low rates observed on trips in 1962 and 1963 cannot be explained this way. It seemed appropriate for this report therefore to calculate mesh assessments assuming discard rates of 10% and 30% by number instead of 30% and 60%.

Assessments of mesh size increase

Taking the mesh size for the period 1959-1963 as being equivalent to 75 mm double manila, assessments have been made for increases of trawl mesh to 100 mm, 110 mm, 120 mm and 130 mm.

Length compositions from landings of English trawlers from Faroes Bank and Faroes Plateau have been used for making assessments for these sub-areas separately. The results have then been combined to give assessments for the whole Faroes area. Faroes and Scottish haddock landings were treated as though all had come from the Faroes Plateau. The proportion of the Scottish landings that actually come from Faroes Bank is less than 5%. In the case of Faroes liners the proportion is also very small but not known for certain. Overall the proportion of haddock taken from Faroes Bank by these two classes of vessel is small enough to be neglected in these calculations.

The results of the assessments are shown in Table 9 and these lead to the following conclusions.

Total landings would increase with increases of mesh size up to 110 mm. Increases to 130 mm would give no further gains if E = 0.6. There would, however, be further very small gains up to 120 mm if E = 0.8.

Faroes long-line catches would experience considerable benefits. These would become progressively greater for each increase in mesh size up to 130 mm.

Total British trawler landings would increase with increasing mesh size up to 100 or 110 mm. Further increases up to 130 mm would only reduce these gains.

Scottish trawler landings would benefit from a mesh increase to 100 mm. A further increase to 110 mm would leave the gain effectively unchanged if E = 0.8, but would reduce the gain if E = 0.6. A subsequent increase to 130 mm would reduce the gain and possibly even lead to losses.

English trawler landings would benefit from increases up to 110 mm. Subsequent increases would reduce the gain if E = 0.6. If E = 0.8 the mesh size could be increased to 120 mm without effectively altering the gain, but any further increase would reduce it.

These results differ from those reached in the previous report of the Working Group mainly in the magnitudes of the expected gains. They are largely dependent on the magnitude of the discards and the adoption of smaller discard rates has led to smaller gains. Also changes in the length composition of the landings have contributed to the differences in the calculated effects.

There is still uncertainty, however, whether to place the rate of discarding as nearer the 10% level or the 30% level and for this reason there is still uncertainty regarding the actual magnitude of the benefits.

Table 9. Mesh assessments for Faroes haddock

Fleet	Immediate loss %			
	75 to 100 mm	75 to 110 mm	75 to 120 mm	75 to 130 mm
Trawl (England)	6	15	30	43
Trawl (Scotland)	13	24	37	50
Trawl (Total)	11	22	36	48
Long-line (Faroes)	-	-	-	-
Total (all gears)	8	15	24	33

(a) Discards = 10% by numbers

Fleet	E	Long-term gain %			
		75 to 100 mm	75 to 110 mm	75 to 120 mm	75 to 130 mm
Trawl (England)	.6	+10	+12	+ 7	0
	.8	+16	+21	+20	+15
Trawl(Scotland)	.6	+ 3	0	- 8	-18
	.8	+ 9	+ 8	+ 2	- 7
Trawl (Total)	.6	+ 5	+ 3	- 4	-13
	.8	+11	+11	+ 6	- 2
Long-line (Faroes)	.6	+19	+31	+47	+63
	.8	+25	+42	+63	+84
Total (All gears)	.6	+ 9	+12	+12	+11
	.8	+15	+21	+25	+26

(b) Discards = 30% by numbers

Fleet	E	Long-term gain %			
		75 to 100 mm	75 to 110 mm	75 to 120 mm	75 to 130 mm
Trawl (England)	.6	+29	+31	+27	+19
	.8	+41	+47	+46	+41
Trawl(Scotland)	.6	+19	+12	+ 7	- 4
	.8	+30	+30	+22	+11
Trawl (Total)	.6	+22	+20	+12	+ 2
	.8	+33	+34	+28	+19
Long-line (Faroes)	.6	+37	+52	+71	+90
	.8	+50	+70	+95	+121
Total (All gears)	.6	+27	+30	+31	+30
	.8	+39	+46	+50	+52

Minimum landing size

The present minimum landing size for haddock from Faroes is 27 cm. If this is increased to 31 cm as recommended by the North-East Atlantic Fisheries Commission, no fish would have to be discarded with mesh sizes of 110 mm or more. With a 100 mm mesh, 12% of the fish caught at present of 30 cm length would have to be discarded. These, and any smaller fish caught, would amount to less than 1% by weight of Scottish landings and even less of English landings.

FAROES SAITHE (COALFISH)

Statistics of Faroes coalfish landings and landings per unit effort are given in Appendices Tables 19 and 20. These are summarised for various periods in Table 10.

Table 10. Faroes coalfish statistics

Years	Total landings (tons)	English trawlers	
		Landings per unit effort (1)	Total effort (2)
1924-1936	8,773	174	50
1949-1955	6,816	228	30
1956-1958	16,746	219	76
1959-1963≠	11,826	187	63
1964≠	21,473	174	123

(1) tons per million ship ton hours by steam trawlers.
(2) millions of ship ton hours.

≠ estimated from motor-trawler data, using a correction for the greater efficiency of motor trawlers.

The particularly high landings experienced in 1956-1958 were due to exceptionally heavy landings by German trawlers fishing specifically for coalfish. Again, in 1964, the high value was due to heavy landings by German and French trawlers.

Length compositions of English and German landings are given in Appendix Table 21. The larger proportion of small fish in the English landings is due to differences in the distribution of the two fleets, the German vessels fishing in deeper water where they catch larger fish.

For the purpose of the mesh assessment a selection factor of 3.6 was used. English data on mortality rates indicate that an appropriate value of E would be 0.6. Immediate losses for increases in mesh size up to 130 mm will be negligible for German trawlers and would be only 3 or 4% for English trawlers. Long-term gains to be derived from using a 130 mm mesh would be about 1% for English trawlers and 5% for German trawlers and for the Faroes fishery.

FAROES REDFISH

Redfish landings from the Faroes area in post-war years have been fairly steady although a higher value was recorded for 1964. German fishing accounted almost entirely for the total redfish landings. A length composition of German redfish landings is given in Appendix Table 22.

Using the same selection curves as used for redfish at Iceland, the immediate losses were calculated. These are given in the earlier table and are very small, reaching less than 1% for a 140 mm mesh.

RECOMMENDATIONS

The North-Western Working Group wishes to make the following recommendations:-

1. Experiments should be made on the selectivity of redfish under commercial conditions, as regards both size of catch and length of tow.
2. Further discard data are urgently required, especially of haddock at Faroes, where the long-term effect depends critically on the rate of discard.
3. Data on selectivity of coalfish are desirable, but this is less urgent.

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Years	Iceland	England	Germany	Faroes	Scotland	France	Norway	Holland	Belgium	Denmark	Sweden	T o t a l
1923	1o6,391	-	15,45o	35,868	26,882	2,862	287	8o1				188,541
1924	146,237	75,12o	32,662	31,481	2,448	2,841	468	1,315				292,572
1925	159,o3o	86,414	3o,98o	29,185	1,4o2	3,487	445	1,593				312,536
1926	126,89o	81,347	37,292	38,6o8	1,997	3,967	519	1,3o8				291,928
1927	164,783	96,517	4o,o71	37,651	1,451	2,5o5	391	918		25		344,312
1928	177,328	1o1,o66	33,33o	49,563	1,328	3,567	322	841	677	17		368,o39
1929	2o1,o74	98,24o	37,467	54,223	2,642	2,813	1,o85	746	2,1o6	22	65	4oo,483
193o	261,278	119,12o	45,o34	53,oo2	3,4o3	5,23o	6,691	1,444	1,581	15	-	496,798
1931	224,5o4	14o,898	49,345	53,67o	2,83o	8,739	7,339	1,339	1,o82	36	-	489,782
1932	2o8,o81	164,837	55,413	48,387	5,741	17,623	3,476	6o5	1,o35	173	4	5o5,375
1933	247,329	157,639	49,935	46,148	4,174	15,271	16,163	-	1,2o4	67	-	537,93o
1934	223,729	145,597	28,442	28,o28	1,259	16,413	14,899	45	626	77	-	459,115
1935	182,926	153,444	36,44o	28,776	1,819	6,218	15,284	-	1,283	13o	-	426,32o
1936	1o2,354	14o,639	39,184	13,866	2,248	5,156	8,31o	-	1,511	49	1	313,318
1937	111,285	144,312	36,294	19,7o6	1,955	11,727	1,18o	-	1,395	47		327,9o1
1938	114,359	128,16o	42,136	22,4o5	1,95o	6,o7o	5,18o	6o	1,86o	25		322,2o5
1946	199,165	36,846	11,o11	15,ooo*)	4,756		188	27	894			267,887
1947	2oo,242	52,369	1o,817	15,ooo*)	4,o68	1,9o5	57	-	5,15o			289,6o8
1948	213,177	9o,7o2	11,193	15,ooo*)	4,147	2,83o	13	242	3,184	8		34o,496
1949	221,419	91,125	24,12o	15,ooo*)	4,954	1,538	1o8	-	4,387	16		362,667
195o	197,433	1o8,9o1	3o,327	15,ooo*)	5,218	98	892	97o	4,249	267		363,355
1951	183,252	1o3,485	33,8o6	15,ooo*)	2,652	579	3,831	342	5,591	45		348,482
1952	237,314	94,568	41,8o8	15,614	1,56o		4,1o8	99	4,94o	16	16	399,943
1953	263,516	173,798	56,oo5	16,215	1,418		7,465	-	7,634	-	1o	526,o61
1954	3o6,191	165,694	45,253	15,365	1,467		7,224	116	6,22o	-		547,53o
1955	315,438	138,7o5	48,236	18,667	1,o28		7,o53	-	9,oo2	1		538,13o
1956	292,586	127,786	3o,o71	16,187	2,529		4,575	-	6,975			48o,7o9
1957	247,o87	144,265	23,292	2o,924	1,36o		8,231	2	6,748			451,9o9
1958	284,4o7	15o,517	37,849	17,875	1,2o4		6,829	-	9,946		56	5o8,683
1959	284,259	112,74o	35,562	7,68o	1,347		5,46o	-	5,456			452,5o4
196o	295,668	1o9,414	37,939	11,781	1,236		3,429	-	5,556			465,o23
1961	233,874	96,539	21,776	1o,6o2	2,o66	77	4,214	7o	5,427			374,645
1962	221,82o	1o5,144	34,157	8,657	3,112	1oo	4,7oo	453	8,199			386,342
1963	232,839	123,185	33,o34	6,254	3,18o		3,51o					4o2,oo2
1964	273,584	122,2o7	19,336	6,887	4,582		2,688					429,284

*) Estimated.

Appendix Table 1. Total landings of cod from Iceland

(Round fresh weight in metric tons)

Appendix Table 2. Catches per unit effort of Iceland cod.

Years	A England	B Germany	C Iceland	Relative C.P.U.E. England	Relative C.P.U.E. Germany
1924	1,337	2.5		1,096	0,746
1925	1,559	2.2		1,278	0,657
1926	1,327	2.6		1,088	0,776
1927	1,209	2.9		0,991	0,866
1928	1,073	2.3		0,880	0,687
1929	1,021	2.7		0,837	0,806
1930	1,343	3.3		1,101	0,985
1931	1,328	3.5		1,089	1,045
1932	1,635	4.7		1,340	1,403
1933	1,562	4.3		1,280	1,284
1934	1,390	2.6		1,139	0,776
1935	1,416	3.2		1,161	0,955
1936	1,398	3.0		1,146	0,896
1937	1,088	3.2		0,892	0,955
1938	1,361	3.4		1,115	1,015
1946	2,310	5.1		1,893	1,522
1947	1,766	3.8		1,448	1,134
1948	1,527	3.0		1,252	0,896
1949	1,397	3.3		1,145	0,985
1950	1,190	3.3		0,975	0,985
1951	1,155	3.2		0,947	0,955
1952	1,116	3.2		0,915	0,955
1953	1,353	4.0		1,109	1,194
1954	1,237	3.2		1,014	0,955
1955	1,272	4.5		1,043	1,343
1956	1,249	3.5		1,024	1,045
1957	993	2.6		0,814	0,776
1958	980	3.8		0,803	1,134
1959	822	4.2		0,674	1,253
1960	701	3.8	1,185	0,575	1,134
1961	569	2.7	663	0,466	0,806
1962	611	4.3	462	0,501	1,284
1963	626	4.0	365	0,513	1,194
1964	546	2.1	411	0,448	0,624

A: Tons per million ton hours

B: Tons per day fished

C: Tons per million ton hours.

Appendix Table 3. Estimates of fishing effort on Iceland cod

Years	A England	B Germany	C Iceland	Total effort
1924	53,599	12,962		208,768
1925	53,553	13,899		194,183
1926	59,178	14,617		212,390
1927	76,918	13,834		274,367
1928	89,909	14,526		327,449
1929	91,540	14,055		373,209
1930	85,773	13,833		357,698
1931	103,807	14,003		360,833
1932	99,717	11,726		305,732
1933	100,325	11,691		342,309
1934	104,202	10,840		328,549
1935	107,724	11,278		299,257
1936	100,420	12,966		223,736
1937	132,650	11,432		301,381
1938	94,167	12,274		236,736
1946	15,952	2,174		115,971
1947	29,543	2,858		163,373
1948	59,306	3,725		222,635
1949	65,202	7,117		259,504
1950	91,510	8,851		305,369
1951	89,109	9,957		300,030
1952	83,825	11,732		354,496
1953	128,143	13,349		387,889
1954	133,521	13,546		441,153
1955	108,789	10,442		422,101
1956	101,840	8,307		383,122
1957	144,229	8,375		451,725
1958	153,601	9,865		519,171
1959	137,455	8,683		551,744
1960	157,309	9,731	38,300	668,563
1961	171,282	7,795	46,139	664,745
1962	177,962	7,938	28,038	653,832
1963	210,897	8,371	39,116	688,157
1964	234,447	9,185	36,735	823,612

A: Thousand ton-hours. Motor and steam trawlers combined.

B: Days fishing

C: Thousand ton-hours.

Total effort = English effort x $\frac{\text{Total catch}}{\text{English catch}}$

Appendix Table 4. Length composition of Iceland cod landings.
(Total numbers of fish, 196o-64 in thousands)

Length	Trawl A England etc.	Trawl B Germany etc.	Danish Seine and Faroes	Other Gear Non-spawning	Trawl C Spawning	Other Gear Spawning
25-29	-	3	-	4	-	-
3o	199	36	27	39	3	12
35	3,831	64	47o	69	17	82
4o	19,782	328	2,378	364	65	279
45	32,346	1,561	3,86o	1,676	118	458
5o	4o,267	3,998	4,671	4,254	256	969
55	36,3o8	5,3o2	4,188	5,599	383	1,44o
6o	32,324	6,21o	3,761	6,549	615	2,267
65	23,735	6,4o2	2,759	6,8o8	771	3,467
7o	21,27o	7,777	2,481	8,22o	1,395	8,976
75	14,483	7,97o	1,713	8,388	1,998	15,255
8o	11,593	7,2o5	1,361	7,658	2,897	25,619
85	7,2o2	4,533	843	4,926	3,29o	3o,o47
9o	5,o41	2,829	585	3,151	3,158	28,118
95	2,455	1,327	285	1,476	2,148	18,854
1oo	1,562	67o	184	746	946	9,o21
1o5	511	285	61	316	453	4,582
11o		95		1o5	222	2,5o4
115	755	31	9o	37	151	1,561
12o		3o		36	87	1,o12
125+		4		4	77	891
Total	253,664	56,66o	29,717	6o,425	19,o56	155,914

Years	Iceland	England	Germany	Faroes	Scotland	France	Norway	Holland	Belgium	Denmark	Sweden	T o t a l
1923	1o,ooo*)		5,729		5,986			3				21,718
1924	1o,ooo*)	2o,131	7,777		294			267				38,469
1925	1o,ooo*)	2o,317	6,821		7o	9		272				37,489
1926	6,26o	23,24o	9,136		12	9		213				38,87o
1927	9,834	36,2o5	11,824		166	-		226		1o		58,265
1928	11,o88	37,35o	1o,9o1		349	-		229	234	8o	4	6o,235
1929	13,o55	32,963	1o,313	1	427	45		257	426	42	23	57,552
193o	1o,863	3o,125	9,584	75	468	-	7	365	3o4	1oo	-	51,891
1931	7,118	27,446	8,o62	45	438	17	51	148	119	21o	-	43,654
1932	4,933	22,4o9	7,124	96	478	264		32	14o	296	3o	35,852
1933	4,883	16,824	6,284	29	22o	242		-	225	341	1o	28,858
1934	5,937	17,777	4,724	51	256	174		6	2o6	545		29,676
1935	6,313	18,762	4,o37	35	275	99		-	342	569		3o,432
1936	4,2o5	17,428	4,866	118	364	49		-	366	84o		28,363
1937	4,o53	17,47o	5,146	134	379	71		-	372	695		28,32o
1938	4,6o9*)	17,78o	4,6o8	115	3o1	75		6	442	644		28,58o
1946	14,12o	12,o78	4,6o1	15o*)	1,679			45	472			33,145
1947	18,6o1	14,9o1	3,762	15o*)	2,246			-	2,o19			41,679
1948	24,862	23,61o	7,553	15o*)	2,9o7			35o	1,314	57	21	6o,824
1949	3o,264	28,683	1o,499	15o*)	3,96o			-	2,12o	96	179	75,951
195o	27,o99	26,886	7,3oo	15o*)	2,271			759	1,64o	6o3	41	66,749
1951	22,173	21,576	7,326	15o*)	1,365			22o	2,857	362		56,o29
1952	15,166	18,571	7,734	168	66o			41	4,o63	84		46,487
1953	14,954	28,268	6,384	219	7o8			-	4,295	-		54,828
1954	21,322	28,872	6,133	435	611			89	5,1o7	3		62,652
1955	21,7o3	27,936	7,153	359	683			-	7,1o5	6		64,945
1956	22,o54	23,748	8,75o	61o	98o			-	6,147			62,289
1957	31,3o2	28,663	7,796	1,168	1,137			29	6,631			76,726
1958	28,624	27,483	6,311	1,376	966				5,738			7o,498
1959	26,534	3o,oo2	3,794	1,o25	811				2,412			64,578
196o	41,988	31,8o3	6,238	1,33o	936				5,198			87,493
1961	51,36o	47,164	4,o67	77o	2,314	125		49	4,237			11o,o86
1962	54,288	51,862	3,965	919	4,o24	164		2o4	4,189			119,615
1963	51,834	39,538	3,o64	2,1o8	3,818			198	1,884			1o2,444
1964	56,586	33,269	2,o77	1,2oo	4,877			181	857			99,o47

*) Estimated.

Appendix Table 5. Landings of haddock from Iceland

(Round fresh weight in metric tons)

Appendix Table 6. Landings per unit effort of haddock from Iceland

Years	A England	B Germany	C Iceland	Relative C.P.U.E. England	Relative C.P.U.E. Germany
1924	373	0.6		1,323	0,870
1925	378	0.5		1,340	0,724
1926	391	0.6		1,387	0,870
1927	469	0.9		1,663	1,304
1928	414	0.8		1,468	1,159
1929	359	0.7		1,273	1,014
1930	350	0.7		1,241	1,014
1931	264	0.6		0,936	0,870
1932	224	0.6		0,794	0,870
1933	167	0.5		0,592	0,724
1934	170	0.4		0,603	0,580
1935	173	0.4		0,613	0,580
1936	172	0.4		0,610	0,580
1937	131	0.5		0,464	0,724
1938	189	0.4		0,670	0,580
1946	757	2.2		2,684	2,899
1947	496	1.3		1,759	1,884
1948	393	2.0		1,393	2,899
1949	435	1.4		1,543	2,029
1950	288	0.8		1,021	1,159
1951	238	0.5		0,844	0,724
1952	220	0.6		0,780	0,870
1953	220	0.4		0,780	0,580
1954	216	0.5		0,760	0,724
1955	258	0.6		0,915	0,870
1956	233	1.1		0,826	1,595
1957	201	0.7		0,713	1,014
1958	178	0.6		0,631	0,870
1959	219	0.5		0,777	0,724
1960	211	0.3	221	0,748	0,435
1961	260	0.5	212	0,922	0,724
1962	268	0.5	274	0,950	0,724
1963	152	0.4	223	0,539	0,580
1964	111	0.2	227	0,394	0,290

A: Tons per million ton hours

B: Tons per day fished

C: Tons per million ton hours

Appendix Table 7. Length composition of Iceland haddock landings.
(Total numbers of fish landed, 1960-1964, in thousands)

Length (cm)	Trawlers			Danish seine	Other gears
	A (England etc.)	B (Scotland)	C (Germany)		
25-29	8	66			5
30-34	2,540	1,059	17	4	1,691
35-39	20,088	1,728	443	112	13,195
40-44	44,550	1,660	769	705	29,274
45-49	44,950	1,912	1,911	4,340	29,389
50-54	48,240	2,051	2,648	7,305	30,088
55-59	32,395	1,872	2,707	4,273	20,789
60-64	17,807	1,306	1,860	1,522	12,035
65-69	7,308	647	762	754	5,325
70-74	2,301	314	376	282	1,701
75-79	670	102	99	95	472
80-84	178	31	7	30	141
85-89	25				17
90+	3				3
Total	221,063	12,748	11,599	19,422	144,905

Years	Belgium	England	Faroes	Germany	Holland	Iceland	Norway	Scotland	France	T o t a l
1924		4,392		9,767	229	9,ooo*)		232		23,62o
1925		4,3o8		12,936	243	9,ooo*)		439		26,926
1926		3,632		19,195	189	8,492		27		31,535
1927		5,411		21,552	1o9	18,99o		38		46,1oo
1928	117	7,o38		22,242	161	32,344		1[illegible]		61,921
1929	33o	7,7o5		22,423	144	19,356		77		5o,o35
193o	295	7,426		22,287	2o6	13,124	2	112		43,452
1931	315	8,526		19,73o	98	4,779		139		33,587
1932	48o	7,882		25,641	93	6,838		243		41,177
1933	3o9	9,426		23,164		4,438		146		37,483
1934	346	13,771		25,472	22	7,o9o		13o		46,831
1935	336	12,584		31,792		5,628		85		5o,425
1936	561	14,136		38,291		7,311		116		6o,415
1937	1,141	15,153		34,3o2		6,929		2o9		57,734
1938	1,184	13,325		45,876	3	14,o72		118		74,578
1946	543	4,916		14,47o		23,792		831		44,552
1947		1o,222		2o,982		32,587		57o		34,361
1948	1,542	17,o27		18,568	15o	79,634		959		117,88o
1949	1,499	13,532		28,o22		48,3o9		1,o63		92,425
195o	1,532	12,485		4o,434	385	7,471		1,o58		63,365
1951	2,9o3	1o,97o		5o,o48	15o	19,o97		615		83,783
1952	4,718	9,4o5		51,82o	39	31,639		357		97,984
1953	2,611	12,752		33,361		3o,382		134		79,24o
1954	3,159	13,o39	771	36,41o	1o1	16,47o		119		7o,o69
1955	3,831	8,275	411	23,146		12,298		162		48,123
1956	3,213	7,828	516	3o,338		25,25o		226		67,371
1957	3,326	8,814	2,o99	28,217		19,o45		94		61,595
1958	3,o55	9,148	1,4o2	24,125		14,961		97		52,788
1959	2,112	7,598	395	22,892		14,975		137		48,1o9
196o	2,771	8,454	514	23,417		12,721	59	12o		48,o56
1961	3,354	9,o16	893	22,212	48	13,675		481	1o5	49,784
1962	2,5o5	8,767		24,o45	87	13,469		563	4o9	5o,435
1963	2,83o	11,262	491	17,918	4o1	14,758	11	1,o74		48,745
1964	2,144	13,899	44	2o,841	3o9	21,665	4	1,221		6o,127

*) Estimated.

Appendix Table 8. Total landings of coalfish from Iceland.
(Round fresh weight in metric tons)

Years	Belgium	England	Germany	Iceland	Scotland	Others	Total
1924			8,961		3,826	16	12,8o3
1925			11,516		3,433	26	14,975
1926			9,228		1,864	3	11,o95
1927			8,314		1,333		9,647
1928			9,432			7	9,439
1929	38o		11,8o2			11	12,193
193o	388		14,166			2	14,556
1931	335		17,374			9	17,718
1932	345		14,288	357		3	14,993
1933	254		13,226	15			13,495
1934	233		11,531	6o7		4	12,375
1935	275	1,598	19,731	4,oo2			25,6o6
1936	298	1,661	34,9o6	25,o53			59,918
1937	446	2,181	32,749	12,15o			47,526
1938	511	2,496	51,356	13,791		1	68,155
1946	4o	719	3,458	4,245			8,422
1947	191	1,798	3,763	8,226			13,787
1948	5o4	3,1o6	5,525	25,12o		8	34,263
1949	5o2	3,424	25,295	33,51o			62,731
195o	6o5	2,493	54,786	72,897		24	13o,8o5
1951	938	5,o26	67,455	97,213	273	18	17o,923
1952	782	5,o86	81,764	44,243	78	3	131,956
1953	845	5,385	126,592	32,894	54		165,77o
1954	826	6,865	1o8,983	28,85o	52	3o	145,6o6
1955	85o	4,o55	75,719	32,724	35		113,383
1956	1,375	2,698	54,o85	33,713	28		91,899
1957	1,644	5,ooo	49,5o9	27,914	55		84,122
1958	1,726	8,oo7	6o,275	2o,439	5o		9o,497
1959	1,8oo	5,314	55,261	19,914	54		82,344
196o	1,836	7,429	52,859	2o,356	82		82,561
1961	2,419	7,364	44,4o7	15,345	273	45	69,822
1962	4,182	9,o24	43,151	13,185	414	161	75,277
1963	3,983	9,363	52,932	22,8o3	295	953	9o,132
1964	3,486	9,688	63,612	18,o96	53o	892	95,16o

Appendix Table 9. Total landings of redfish from Iceland.
(Round fresh weight in metric tons)

Appendix Table 1o. Landings of cod from East-Greenland.

(Round fresh weight in metric tons)

Years	England	Germany	Iceland	Greenland	Spain	Faroes	Scotland	U.S.S.R.	T o t a l
1955		3,721							
1956		9,214							
1957		7,339							
1958	-	5,646	4,o99	882	15	-			1o,642
1959	4	12,o17	5,385	6o7	4o	543			18,596
196o	274	19,o69	2,543	1,6o9	-	425			23,92o
1961	796	13,928	1,381	1,199	-	1,221	48		18,573
1962	1,745	14,246	298	9o3	-	-	5o		17,242
1963	728	13,614	1,8o4	9o4	-	-	47	5,697	22,294
1964	958	29,352	2,846	1,12o	-	-	3o	-	34,3o6

Appendix Table 11. Total landings of redfish from East-Greenland.

(Round fresh weight in metric tons)

Years	England	Germany	Iceland	Scotland	U.S.S.R.	Norway	T o t a l
1955		43,814					
1956		35,411					
1957		14,593					
1958		9,5o5	14,617	1			24,123
1959		2o,529	1o,62o	3	-	-	31,152
196o	11	32,368	5,764	-	-	-	38,143
1961	123	25,992	1,o95	6	-	5	27,221
1962	16o	24,72o	2,489	3	-	-	27,372
1963	156	3o,916	5,941	2	23o	-	37,245
1964	222	37,294	5,27o	-	-	-	42,786

Appendix Table 12. Total landings of cod at Faroes
(Round fresh weight in metric tons)

Years	England	Scotland	Faroes	Germany	Others	Total
1924	33,000	8,252	3,942			45,194
1925	25,825	5,324	6,507		636	38,292
1926	27,590	10,366	5,331		894	44,181
1927	26,894	10,724	6,782		768	45,168
1928	18,894	7,295	4,078		42	30,309
1929	18,140	5,599	1,783		979	26,501
1930	20,794	7,843	2,146		2,238	33,021
1931	32,209	10,538	1,482		1,189	45,418
1932	29,765	10,057	4,308		611	44,741
1933	25,729	9,200	2,153		639	37,721
1934	25,183	8,500	1,807		7	35,497
1935	23,230	7,195	1,621		74	32,120
1936	23,897	9,382	1,187		304	34,770
1937	15,678	7,862	2,954		149	26,643
1938	14,585	6,457	2,641		71	23,754
1946	15,819	9,664	5,000 x)		-	30,483
1947	17,075	8,886	5,000 x)		29	30,990
1948	7,318	8,392	5,000 x)		-	20,710
1949	11,827	11,305	5,000 x)		-	28,132
1950	15,781	15,167	5,000 x)		22	35,970
1951	15,603	14,471	5,000 x)		-	35,020
1952	12,247	13,283	4,550		175	30,225
1953	12,380	10,535	4,137		-	27,052
1954	15,974	14,238	5,190	38	724	36,164
1955	17,374	12,380	7,902	222	700	38,578
1956	8,419	10,610	7,938	657	-	27,624
1957	10,022	13,413	6,920	1,034	-	31,389
1958	9,780	10,523	6,535	965	-	27,803
1959	9,989	10,522	4,676	665	-	25,812
1960	13,746	16,300	8,723	451	-	39,220
1961	3,891	12,954	9,521	408	168	26,942
1962	5,521	11,052	6,751	252	605	24,181
1963	4,558	10,875	7,428	376	867	24,104
1964	5,845	7,791	8,888	1,132	1,322	24,978

x) Estimated.

Appendix Table 13. Landings per unit effort of cod from Faroes

Years	English Trawl (Tons per million ton hours)		Scottish Trawl (Cwt per loo hours fishing)		Faroes line (kg per looo hooks)
	Steam	Motor	Steam	Motor	
1924	588		258		
1925	568		222		
1926	8oo		34o		
1927	7oo		3o8		
1928	544		227		
1929	558		289		
193o	638		236		
1931	615		288		
1932	5o8		24o		
1933	461		2o2		
1934	46o		214		
1935	4o6		142		
1936	459		163		
1937	417		172		
1938	438		128		
1946	1,149		36o		
1947	945		223		
1948	633		184		
1949	845		234		2o7
195o	728		234		332
1951	554		213		142
1952	472		231		311
1953	522		212		192
1954	642		277		246
1955	734	1,o96	238	296	37o
1956	461	475	2o9	277	338
1957	472	484	232	272	229
1958	331	371	182	223	23o
1959	333	38o	15o	2o9	131
196o	351	343	143	183	134
1961	141	221	114	143	73
1962	338	272		124	114
1963	292	3o3		135	91
1964				154	79

Appendix Table 14. Length/weight relationship of cod and coalfish at Faroes (English data)

Length cm	Whole weight gm	
	Cod	Coalfish
22.5	110	160
27.5	180	220
32.5	320	370
37.5	500	550
42.5	740	780
47.5	1,000	1,080
52.5	1,400	1,420
57.5	1,850	1,850
62.5	2,400	2,330
67.5	3,000	2,900
72.5	3,750	3,550
77.5	4,600	4,300
82.5	5,600	5,150
87.5	6,650	6,050
92.5	7,900	7,150
97.5	9,300	8,250
102.5	10,850	9,550
107.5	12,500	11,000
112.5	14,400	12,500
117.5	16,400	14,150

Appendix Table 15. Average length composition of cod at Faroes 1959-1963 (Numbers landed in thousands)

Length cm	England		Scotland	Faroes
	Plateau	Bank		
25-29			6	
3o-34	11	1	3oo	46
35-39	95	26	862	173
4o-44	212	83	911	29o
45-49	267	118	1o68	4o3
5o-54	312	132	965	37o
55-59	291	86	772	23o
6o-64	261	77	595	299
65-69	2oo	52	426	273
7o-74	175	44	3oo	287
75-79	129	38	189	218
8o-84	11o	27	119	174
85-89	58	17	67	91
9o-94	28	17	29	55
95-99	9	16	12	21
1oo-1o4	5	16	>25	12
1o5-1o9	2	7		4
11o-114	1	3		3
115+	1	4		2
Total	2,167	764	6,646	2,951

Appendix Table 16. Total landings of haddock from Faroes.
(Round fresh weight in metric tons)

Years	England	Scotland	Faroes	Germany	Others	Total
1924	9,167	1,74o			-	1o,9o7
1925	7,547	1,4o7			-	8,954
1926	7,88o	2,314			17	1o,211
1927	9,o18	2,278			-	11,296
1928	9,888	1,618			3o	11,536
1929	7,994	1,o18			3	9,o15
193o	8,753	1,933			4	1o,69o
1931	11,o26	2,68o	3		2	13,711
1932	14,478	2,782	1o		86	17,356
1933	1o,314	2,3o6	1		15	12,636
1934	1o,3o9	2,18o	2		4	12,495
1935	11,755	3,o88	1		-	14,844
1936	12,5o6	4,o21	21		5	16,553
1937	11,447	3,932	81		2	15,462
1938	13,o62	4,172	145		1	17,38o
1946	11,o93	5,937	x)			17,o3o
1947	8,413	7,337	x)			15,75o
1948	4,758	7,325	x)			12,o83
1949	3,8o1	7,514	x)			11,315
195o	4,722	9,o54	x)			13,776
1951	6,687	7,944	x)			14,631
1952	7,714	6,653	3,225			17,592
1953	5,964	6,4o4	2,788			15,156
1954	6,o69	6,832	2,645	1		15,547
1955	5,148	7,667	3,865	34		16,714
1956	5,945	7,512	4,221	2o		17,698
1957	7,1o7	9,6o2	4,453	38		21,2oo
1958	7,639	9,573	6,85o	19		24,o81
1959	5,536	9,22o	5,67o	1o		2o,436
196o	7,3o2	1o,943	7,772	6	-	26,o23
1961	2,769	9,59o	8,454	11		2o,824
1962	3,766	16,159	7,o42	16	166	27,149
1963	4,655	15,766	6,336	22	792	27,571
1964	3,442	7,o87	6,952	32	1,977	19,49o

x) No data: assumed nil.

Appendix Table 17 Landings per unit of effort of haddock from Faroes

Years	English trawl (Tons per million ton-hours)		Scottish trawl (Cwt per loo hrs fishing)		Faroese line (Kilo per looo hooks)
	Steam	Motor	Steam	Motor	
1924	163		66		
1925	166		79		
1926	229		lol		
1927	235		99		
1928	285		75		
1929	246		6o		
193o	269		73		
1931	211		73		
1932	247		83		
1933	186		62		
1934	188		69		
1935	2o5		89		
1936	24o		91		
1937	3o5		121		
1938	392		12o		
1946	8o6		24o		
1947	466		182		
1948	412		172		
1949	272		156		78
195o	218		149		144
1951	232		124		62
1952	293		124		127
1953	247		137		174
1954	245		136		125
1955	226	16o	161	273	188
1956	316	49o	164	3ol	12o
1957	324	384	164	25o	111
1958	248	3ol	146	213	19o
1959	171	218	152	171	161
196o	181	184	125	116	111
1961	169	142	lo2	119	88
1962	194	188		186	85
1963	236	319		187	69
1964				154	37

Appendix Table 18. Average length composition of haddock from Faroes 1959-1963 (thousands of fish)

Length cm	England		Scotland
	Plateau	Bank	
25-29	5	3	644
3o-34	219	193	4,763
35-39	838	854	5,143
4o-44	955	572	3,874
45-49	612	319	2,636
5o-54	345	149	1,275
55-59	139	72	597
6o-64	58	33	246
65-69	18	15	97
7o-74	7	11	33
75-79	1	5	5
8o+	1	1	1
Total	3,198	2,227	19,314

Appendix Table 19. Total landings of coalfish from Faroes
(Round fresh weight in metric tons)

Years	England	Scotland	Faroes	Germany	Others	Total
1924	6,812	1,142	141		.	8,o95
1925	6,767	81o	9o		.	7,667
1926	4,53o	733	4		33	5,3oo
1927	5,555	962	4		.	6,521
1928	6,952	6o7	.		16	7,575
1929	6,985	55o	.		8	7,543
193o	7,179	548	.		.	7,727
1931	8,o44	691	2		.	8,737
1932	9,327	785	14		89	1o,215
1933	11,338	8o9	13		.	12,16o
1934	1o,o76	635	2		4	1o,717
1935	1o,538	424	.			1o,962
1936	9,938	894	1			1o,833
1937	6,114	31o	2			6,426
1938	6,595	557	.			7,152
1946	4,538	787	x)			5,325
1947	7,277	1,481	x)			8,758
1948	2,52o	1,o49	x)			3,569
1949	3,82o	2,294	x)			6,114
195o	3,478	1,888	x)			5,366
1951	6,8o1	1,897	x)			8,698
1952	5,663	1,188	47			6,898
1953	6,o87	1,o88	9			7,184
1954	5,543	652	4	14		6,213
1955	5,643	1,o18	89	49o		7,24o
1956	4,673	1,176	37	4,919	.	1o,8o5
1957	3,869	928	979	2o,748	.	26,524
1958	6,88o	1,46o	339	4,231	.	12,91o
1959	5,688	1,54o	536	6,674	.	14,438
196o	6,437	2,14o	685	2,583	.	11,845
1961	4,33o	2,214	929	2,392	.	9,765
1962	3,724	2,631	2,494	976	62o	1o,445
1963	3,177	3,463	2,431	1,471	2,2o7	12,749
1964	4,329	3,3o9	1,338	6,o39	6,458	21,473

x) No data; Assumed nil.

Appendix Table 2o. Landings per unit effort of coalfish from Faroes.

Years	English trawl (tons per million ton hours)	
	Steam	Motor
1924	121	
1925	149	
1926	131	
1927	145	
1928	2oo	
1929	215	
193o	22o	
1931	154	
1932	159	
1933	2o3	
1934	184	
1935	184	
1936	191	
1937	163	
1938	198	
1946	33o	
1947	4o3	
1948	218	
1949	273	
195o	16o	
1951	236	
1952	216	
1953	255	
1954	219	
1955	239	4oo
1956	256	3o3
1957	172	231
1958	25o	235
1959	198	2o6
196o	159	163
1961	211	228
1962	169	187
1963	191	216

Appendix Table 21. Average length compositions of coalfish landings from Faroes 1959-63 (England) and 196o and 1962 (Germany).
(Thousands of fish)

Length (cm)	England	Germany
3o-34	1	
35-39	23	
4o-44	1o8	
45-49	117	2
5o-54	2o9	1o
55-59	126	28
6o-64	94	37
65-69	98	63
7o-74	161	76
75-79	164	1o7
8o-84	181	141
85-89	112	132
9o-94	65	91
95-99	36	63
1oo-1o4	26	32
1o5-1o9	1o	19
11o+	13	5
T o t a l	1,544	8o6

Appendix Table 22. Average length composition of German landings of redfish from Faroes 1961-64.
Numbers landed x $1o^{-3}$.

Length (cm)	
3o-34	-
35-39	2
4o-44	169
45-49	12o4
5o-54	88o
55-59	1o1
6o-64	9
	2.365

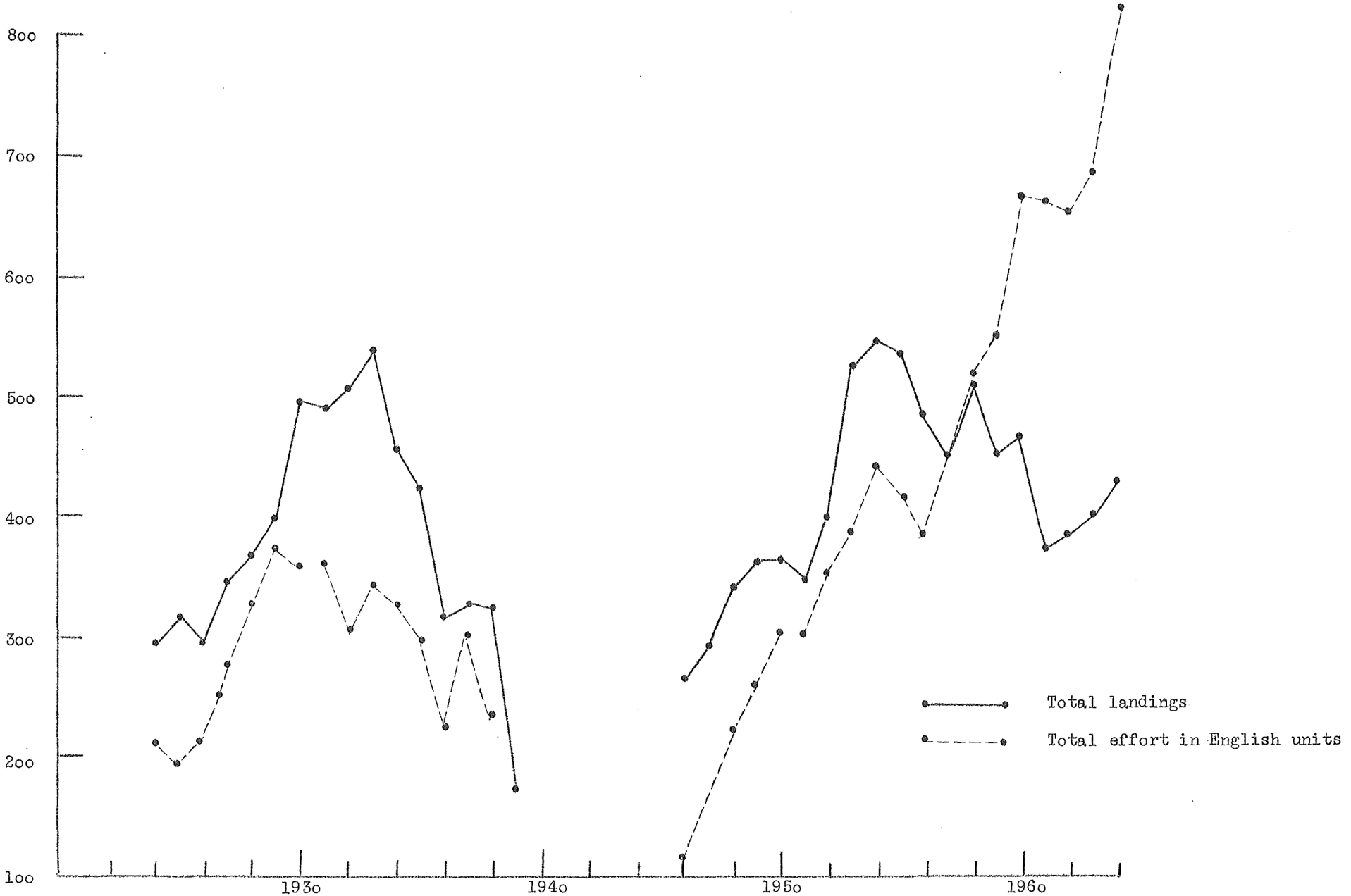

Figure 1. The landings of cod from Iceland in metric tons (round fresh weight) (full line), and estimated total fishing effort (broken line).

Figure 2. Estimates of catch per unit effort of German and English trawlers, expressed as proportions of the mean catch per unit effort.

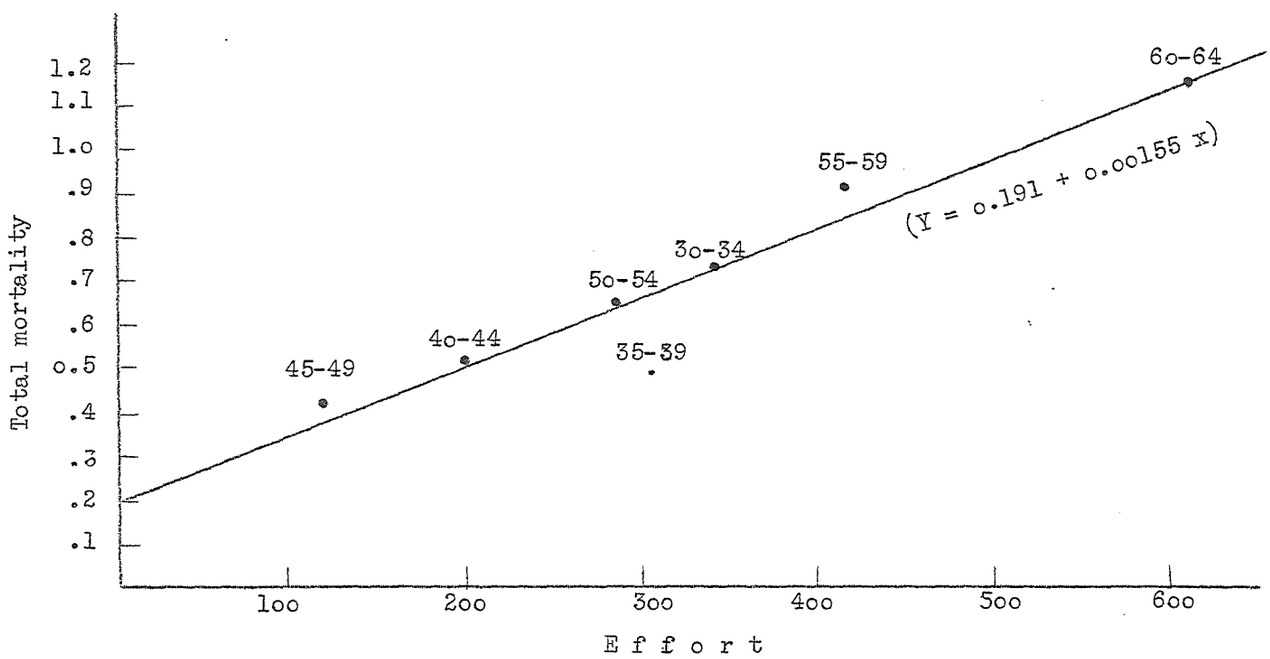

Figure 3. Relation between the total mortality among mature Iceland cod and estimated total effort (data grouped in 5-year periods).

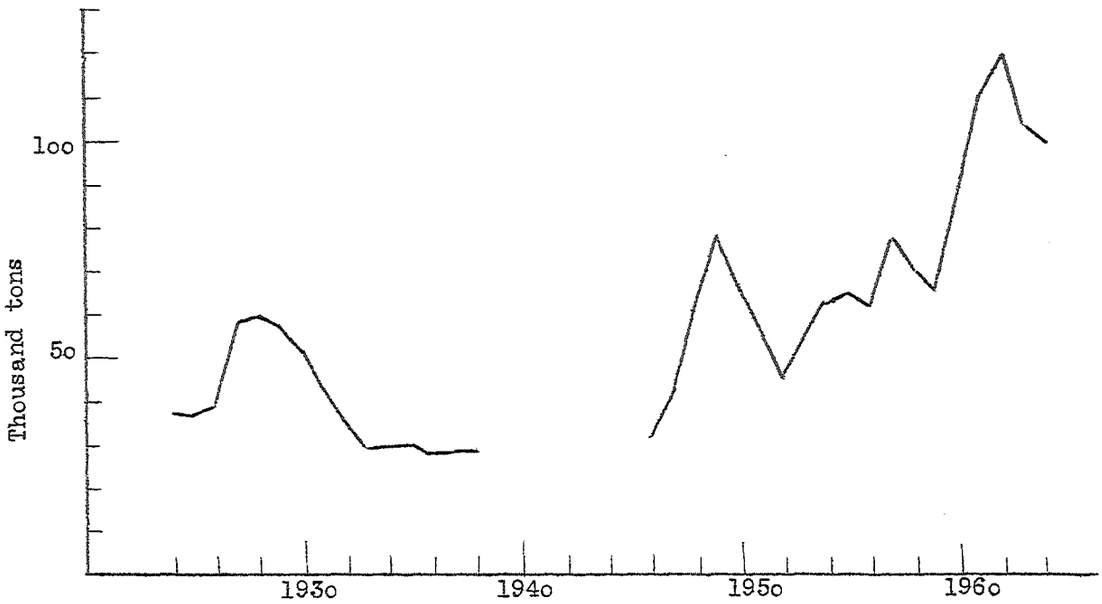

Figure 4. Total landings of haddock from Iceland.

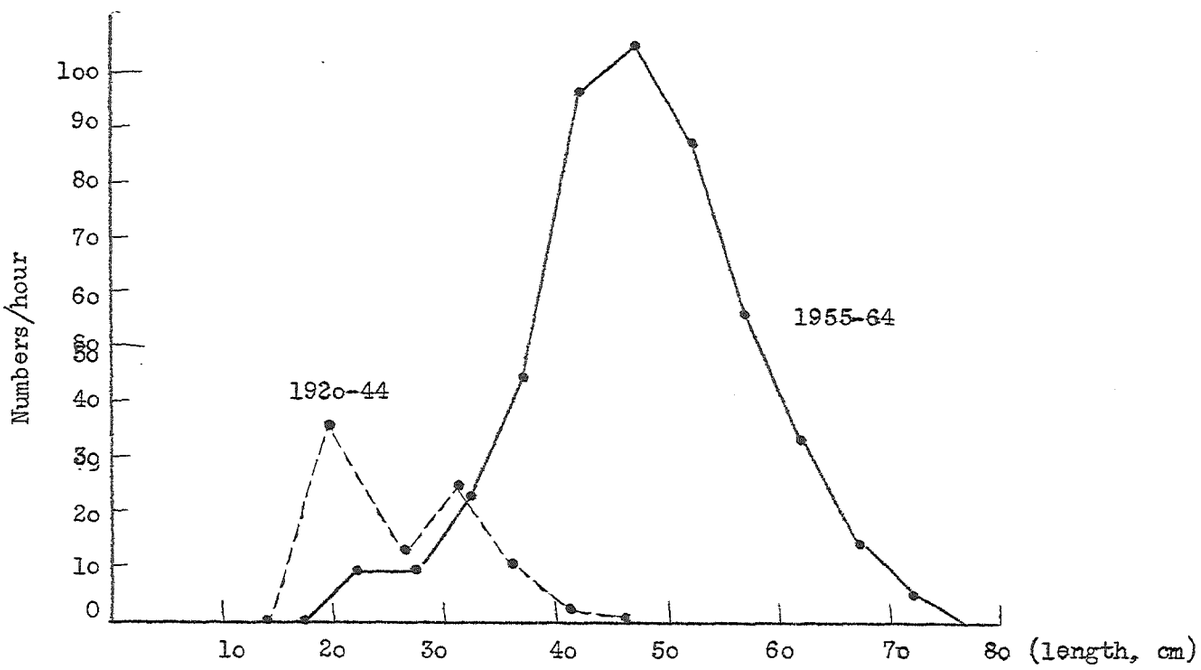

Figure 5. Numbers of haddock of each length caught per hour's fishery by research vessels, 1920-44 and 1955-64.

Figure 6. Total landings of coalfish from Iceland.

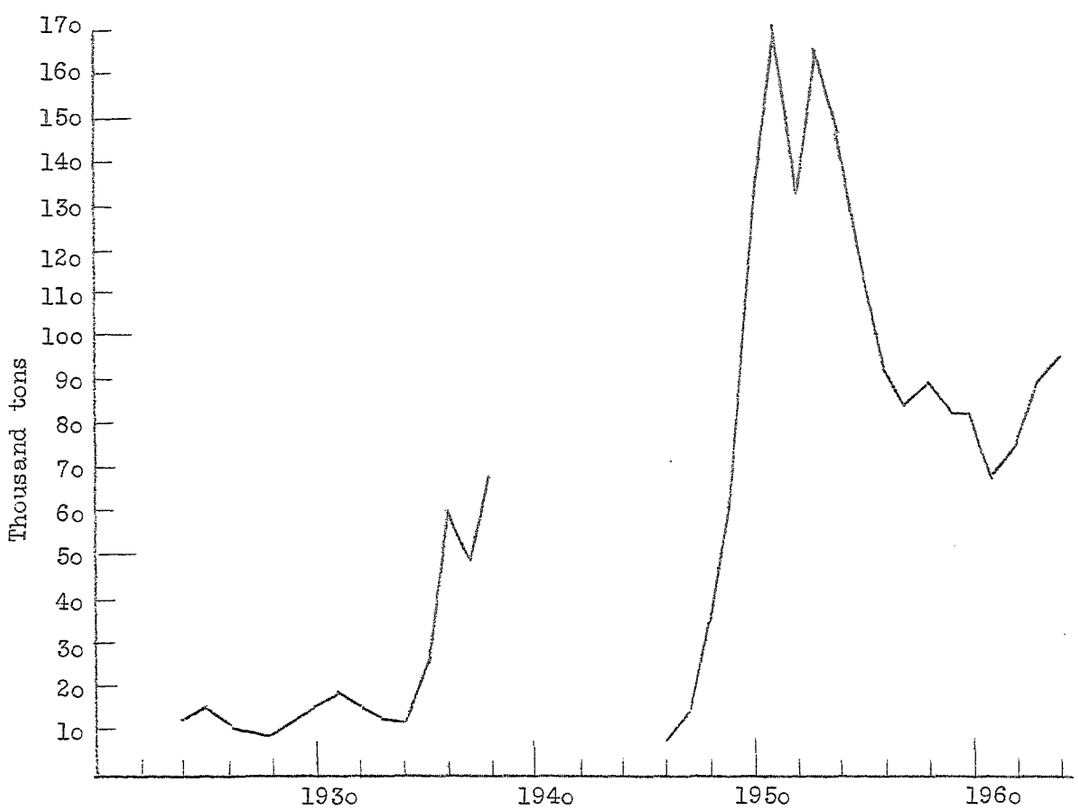

Figure 7. Total landings of redfish from Iceland.