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Report of the ICES/ICNAF Joint Working Party on North Atlantic Salmon

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Report of the ICES/ICNAF Joint Working Party on North Atlantic Salmon

February 1970

A. INTRODUCTION

The Working Party met in London on 2-5 February 1970. Those present were:

A.W.May	Canada
O. Christensen	Denmark
I.R.H.Allen	England and Wales
A. Swain	England and Wales
R. Vibert	France
F. Thurow	Federal Republic of Germany
Miss E. Twomey	Republic of Ireland
L. Rosseland	Norway
B.B.Parrish (Chairman)	Scotland
K.A.Pyefinch (Rapporteur)	Scotland
W.R.Munro	Scotland
B. Carlin	Sweden
J.B.Kimsey	USA
V. Anthony	USA
A. Bogdanov	USSR
A. Volkov	USSR
Y. Riazantsev	USSR

K.U.Vickers (Northern Ireland) attended on the first day of the meeting and A.J.Aglen (Scotland) attended some of the sessions. Sv. Aa. Horsted (Denmark) was unable to attend because of illness.

Representatives from France and USSR attended for the first time.

During the four days of the meeting, the Working Party reviewed the latest information available on the West Greenland and the Norwegian Sea salmon fisheries and considered further the assessment of the effects of these fisheries on total and home-waters catches. In particular, results are presented in this report of a first, preliminary assessment of the effects of the Norwegian Sea fishery.

B. WEST GREENLAND FISHERY

1. Catch and Fishing Effort

The salmon catches taken at West Greenland in the years 1960-68, and provisional data for 1969 are given in Table 1. As in last year's report (ICNAF Res. Doc.69/33; ICES C.M. 1969/M:5), the catches in the inshore (set gill net) and offshore (drift net) fisheries are given separately. However, it should be noted that an accurate division of the catch into inshore and offshore components cannot be made for 1969 owing to some locally registered vessels taking part in the drift net fishery. Catches from these vessels were landed in Greenland and reported together with the set gill net catches. The data for the two components in 1969, given in Table 1, are therefore only approximate.

These data indicate that there was a large increase in total salmon catch in 1969 to over 2,000 tonnes (1 tonne=1 metric ton=1,000 kg). Despite the uncertainty about the division of the total catch into its inshore and offshore components, it is clear that the drift net fishery increased considerably and is now the larger component. In 1969 it exceeded 1,000 tonnes.

Although full information on the size and age composition of the salmon stock at West Greenland in 1969 is not yet available, the indications are that the main part of the exploited stock consisted, as in former years, of fish which had spent one winter in the sea and which, if returning to home waters, would do so as two or more sea-winter fish.

The number of fishing vessels taking part in the drift net fishery also increased substantially in 1969. The latest information available indicates that about 34 non-Greenland vessels (15 Danish, 6 Faroese, 11 Norwegian and 2 Swedish) took part in this fishery, as compared with totals of 17 in 1968 and 11 in 1967. In addition, some offshore drift-netting took place by about 30 Greenland registered vessels, although they had much less fishing power per vessel than the non-Greenland ones. Thus the numbers of drift-net vessels has increased steadily since 1966 in parallel with the increase in drift-net catch. Another significant change in 1969

is that a few of these vessels were using some monofilament nets and it seems likely that the use of these nets will increase. If this occurs, it would have a significant effect on fishing efficiency as recent observations in Greenland, both of monofilament nets fished from a commercial vessel and from a research vessel, have shown that these nets are at least twice as effective as the polyfilament nets used previously.

In contrast to the drift-net fishery, the fishing effort in the set gill-net fishery is unlikely to have increased significantly in 1969.

2. Distribution of Fishing

The distribution of the offshore drift-net fishery along the Greenland coast, based on information in 1969 and the main centres of the inshore set gill-net fishery are shown in Fig. 1.

The set gill-net fishery is carried out along a large part of the west coast of Greenland from Nanortalik (latitude 60°N) in the south to Disko Island (latitude approx. 70°N) in the north with some limited fishing extending to as far as Upernavik (lat. 72°45'N). The main centres of fishing are in the vicinity of the larger towns (shown in Fig. 1), the most important being the Arsuk-Frederikshaab area, Fiskenasset, the area around Godthaab, the Sukkertoppen district (including Sukkertoppen, Napassoq and Kangamiut) and the Holsteinsborg area. The success of the fishery in the various districts varies from year to year, and in some years has failed completely in certain areas, especially in the south where drift ice often prevents nets being set.

Prior to 1969, the drift-net fishery, prosecuted almost entirely by European-registered vessels, was mainly confined to the area of the Store Hellefiske Bank, extending as far south as Kangamiut (latitude 66°N) in the early part of the season but tending to be concentrated on the Store Hellefiske Bank itself in the remainder of the season. In 1969, the fishery spread over a rather wider area than in previous years, extending from Sukkertoppen in the south to the Disko area in the north (hatched area in Fig. 1). In addition, some Greenland-registered vessels fished with drift nets in this general area. Therefore, the drift-net fishery has been mainly confined to an area between 65°N and 70°N and extending outwards to about 40 n.m. from the coast. However, exploratory fishing voyages have demonstrated that salmon are present over a wider area than this.

3. Origin and Destination of Salmon

3.1 Tag Recaptures at West Greenland

The recaptures, during 1963-68, of salmon tagged in home waters as smolts (either natural or hatchery) and as adults are shown in Tables 2, 3 and 4. These tables include revisions of data presented in earlier reports of the Working Party. In addition, information is presented, in Table 5, for parr tagged in home waters.

In 1969, as in previous years, the smolt tag returns show that the great majority of the fish taken at Greenland were derived from smolts which had entered the sea during the previous year and, if surviving, would have returned to home waters as salmon of two or more sea winters. Tags were again recorded at West Greenland from a number of North American (mostly Canadian) and European (mostly UK) river systems including, for the first time, single recaptures of fish tagged as hatchery-reared smolts in Norway and Denmark respectively. Also, following tagging in 1968 of adults ascending a Newfoundland river, two of these fish were recaptured at Greenland in 1969.

Comparison of returns from tagged hatchery-reared and natural smolts, including returns from both West Greenland and other areas, indicates that survival in the sea is usually much less for the tagged, hatchery-reared fish. Therefore, the return rates from natural smolts are likely to be a better guide to the national contributions to the West Greenland stock. For those countries in which most or all of the smolts tagged were from hatcheries, it is possible that the return rates from Greenland underestimate the relative contributions of different countries.

While separation of the smolt tagging data into hatchery-reared and natural components eliminates one source of variation in year-to-year recapture rates at West Greenland, it is evident that a good deal of variation still remains, both between and within countries. Thus, returns from West Greenland of smolts tagged in

the United States were relatively high for fish tagged in 1966, but were low for the 1967 and 1968 taggings. The return rate from West Greenland from Canadian-tagged smolts was highest for the 1965 tagging (both hatchery-reared and natural) and declined substantially for smolts tagged in 1966, even though the Greenland catch increased slightly from 1966 to 1967. On the other hand, smolts tagged in 1966 have given the highest return rate at West Greenland from Scottish tagging, while for England and Wales the highest return rates were obtained from the 1967 and 1968 taggings. In addition, the rates of return from Greenland may vary for tagging in different home river systems (e.g. in Canada) and the relative numbers of smolts tagged is known to have varied between these rivers from year to year. It is therefore evident that more detailed evaluation of tag returns in the countries concerned is urgently needed, particularly with respect to possible bias in some years relative to the area of tagging, type of tag applied, etc.

In addition to the above sources of variation and error, the non-reporting of tags, especially from the drift-net fishery poses a major problem. It is known that the reporting efficiency from this fishery is low so that, with the increase in its size relative to the set gill-net fishery, the magnitude of this source of error is likely to have increased progressively. Therefore, in view of the importance of tag recapture data in these studies, the Working Party strongly recommends

that all possible steps be taken to increase the efficiency of reporting of tag recaptures from the drift-net fishery.

Despite the above factors, which preclude any accurate estimation of the relative contributions of salmon from different countries in the West Greenland stock, the recapture data over the whole period suggest that the major part of the stock has been derived from rivers in Canada and the UK.

3.2 Biochemical and Parasite Studies

Investigations were continued in 1969 on biochemical characters and parasite fauna (as biological tags) in relation to the study of the origin and mixing of salmon at West Greenland. Although these investigations have not yet progressed far enough to provide reliable estimates of the origin and rate of mixing of the exploited stock in this area, recent Canadian investigations of blood serum proteins, in association with parasite studies, have provided very promising results. Analyses of a sample of 242 salmon caught by drift-net mainly in the Disko Bay area indicated, for example, that 43% of these fish were of North American origin. The Working Party considers that this and similar investigations in other countries should be continued as intensively as possible.

3.3 Tagging at West Greenland

Further liberations of tagged fish were made at West Greenland in 1969 in the course of experiments by Canada, and by Denmark and the UK.

In the Canadian experiment, the salmon were captured by drift-net in daylight and tagging was conducted from a small boat patrolling the nets continuously throughout the fishing period so that the fish could be removed from the nets and tagged soon after capture. Between 6 September and 2 October, a total of 627 salmon, ranging in length between 55-88 cm (average 67 cm) was caught, of which 385 were tagged, 355 in Disko Bay and 30 off the coast further south; 134 of the fish liberated were graded as being in 'excellent' condition, 199 in 'good' condition and 52 in 'fair' condition on the basis of classifications made in earlier experiments conducted off the Newfoundland coast, when the same fishing, handling and tagging methods were used.

In the joint Danish-UK experiments, fishing was conducted by longline in a number of localities off the West Greenland coast between the Store Hellefiske Bank and Disko Bay during the period 11 October to 14 November 1969. A total of 65 salmon was caught during the experiment, of which 43 were tagged and liberated, all of the tagged fish being judged to be in very good condition. A notable feature of the salmon taken in this experiment, which may account for the small number caught was their relatively large size (range 60-100 cm; average 76 cm) compared with those taken in drift nets both in the commercial fishery and by research vessels. Another joint Danish-UK experiment was made to attempt to assess the viability of tagged and untagged fish caught by gill net, but the numbers caught were too low to provide a reliable test. Fifteen tagged fish were, however, liberated.

The subsequent recaptures in the West Greenland fishery and in other areas of salmon tagged in these and earlier experiment are given in Table 6. These data

show that, during the period 1965-1969, a total of 1,817 salmon was tagged, of which 55 have been recaptured locally and, to date, 11 have been recaptured in home waters (5 in Canada, 4 in Scotland and 2 in Ireland). The overall recapture rate of 3.2% in the West Greenland fishery in 1969 was approximately the same as the average for the experiments in previous years. However, the recapture rate of the fish in the 'excellent' condition category in the Canadian experiment was substantially higher at 6.0%.

As indicated in last year's report, the accuracy with which tag recapture data from these experiments can be used in estimating the rate of exploitation of salmon in the West Greenland fishery is governed by (a) the magnitude of the mortality due to tagging and, (b) the extent to which recaptured fish are recovered from the catch and reported. Unfortunately, insufficient information is available for the magnitude of these factors to be estimated accurately. As indicated in Section 3.1, it is known that the efficiency of tag recovery and/or reporting in the drift-net fishery is relatively very low. Since the proportion of the total catch taken by the drift-net fishery has increased in recent years, and especially in 1968 and 1969, the magnitude of this source of error in the use of tag recapture data for estimating rate of exploitation has also increased. While an accurate adjustment of the recapture data for these experiments cannot be made in the absence of detailed information on the distribution of the catches taken by the gill-net and drift-net fisheries respectively, it seems likely that, from this and other sources of error (e.g. through no account being taken of tagging mortality), the estimated 6% recapture rate of the fish in the 'excellent' condition category in the Canadian experiment represents an underestimate of the rate of exploitation for that part of the total fishery within which tagged fish were present.

4. Assessment of Effects of West Greenland Fishery on Total and Home-Waters Salmon Stocks and Yields

4.1 Total Salmon Yields

The results of previous assessments reported by the Working Party indicated that the development of the West Greenland fishery has resulted in an increase in the total catch (West Greenland plus home-waters) of European origin in the West Greenland stock, and that, with the possible exception of fish originating from some river systems in Canada, where the rate of exploitation is known to be high, this probably also applies to the salmon originating from North American home waters.

The latest data available to the Working Party on the growth of salmon between their occurrence in the West Greenland stock and their return to home-waters and on the rates of exploitation in home-waters, provide no grounds for modifying these conclusions. It is emphasized, however, that they are based on the assumption that the exploitation at West Greenland has not reduced spawning stocks so much as to cause a direct reduction in the number of smolts and subsequent recruitment of salmon. At present, too few data are available on the relationship between adult stock size and smolt production and between smolt production and the subsequent recruitment of grilse and older salmon for the validity of this assumption to be tested. The Working Party therefore stresses the need for such studies to be conducted within river systems in both Europe and North America, especially in the light of the salmon catch data for home-waters fisheries in 1968 and 1969, which point to a reduction, in these years, in the quantities of two or more sea-winter salmon entering the river systems in both regions.

4.2 Home-waters Salmon Stocks and Yields

In last year's report, the Working Party presented estimates of the possible magnitude of the losses in weight to the salmon stocks and catches in home-waters resulting from the West Greenland fishery, based on a) the average catch level in that fishery in the years 1964-1967; b) data on the increase in weight of salmon between their appearance in the West Greenland fishery and their return to home waters; c) limiting values of their natural mortality rate during this time and d) an estimate of the overall average exploitation rate of salmon in the home-waters fisheries in countries to which the salmon at West Greenland return. On the assumption that the salmon at West Greenland, if surviving, will return to home waters in the following year as two sea-winter salmon, the estimated losses to the home-waters stocks, for an average catch of 1,340 tons for the years 1964-1967 lay between 667 and 1,667 tonnes and to the home-water catches between 400 and 1,000 tonnes (using an average rate of exploitation in all home-waters fisheries of 0.6).

It is evident from Table 1 that, with the exception of 1968, the total catch at West Greenland has tended to increase during the period since 1965 due to the steady growth of the drift-net fishery, to reach over 2,000 tonnes in 1969. Estimates of the losses to the home-waters stocks and catches were therefore made for the 1969 level of catch at West Greenland, using the same estimates of increase in weight (50%), upper and lower limits of natural mortality rate (0.02 and 0.1 per month) and home-waters exploitation rate (0.6), as in the previous assessment. These estimates ranged between approximately 1,100-2,700 tonnes and 650-1,600 tonnes for the home-waters stocks and catches respectively.

Although no further information has become available since the previous assessment was made to justify any modification of the parameters used in the estimation of these losses, the Working Party noted the conclusions of the Baltic salmon experts that, after Baltic salmon reach exploitable size, the natural mortality rate is very low, i.e. about 10% per year ($M=0.1$). This value is considerably less than the lower of the values used in the present assessment.

In the absence of accurate estimates of the proportions of salmon in the West Greenland catch which, if not caught and, if surviving, would have returned to each country, it is not possible to estimate reliably the losses in individual countries. However, the latest data available provide no clear basis for modifying the previous tentative conclusion that the largest proportion of the losses have been experienced in Canada and the UK.

C. NORWEGIAN SEA FISHERY

In last year's report, information was presented on the longline fishery for salmon which has developed in recent years in the Norwegian Sea, off the Norwegian west coast. The latest information available to the Working Party on the growth of this fishery, its distribution, the composition, origin and subsequent destination of the exploited stock and assessments of its effects on total and home-waters salmon catches are summarized below:

1. Catch and Fishing Effort

Data on the catches taken and the number of vessels operating in the Norwegian Sea fishery in the years 1965-1968 and provisional statistics for 1969 are given in Table 7. These data show that this fishery has grown rapidly during the short period of its existence to reach, in 1969, a total catch in excess of 900 tonnes. This development has been due mainly to an increase in the number of Danish and Norwegian vessels participating in the fishery, these together taking almost the whole of the catch in 1969. However, in 1969, a small number of German vessels participated in the fishery for the first time. The data on the number of vessels participating in the fishery indicate that the fishing effort increased at least ten-fold between 1966 and 1969.

Information on the catch-per-unit-effort in this fishery in 1968 and 1969 is given in Table 8. These data indicate an average fishing rate in 1969 of about 40 salmon per 1,000 hooks for the Danish and German vessels during the main fishing months April-June; this would appear to be lower than the catch rates in 1968, as indicated by the limited data available for Danish vessels in that year. The March data for the Danish vessels also indicate that salmon were present in the fishing area and available for capture by longline before the commencement of the main fishing season in April, and the Danish and German data point to a decrease in the abundance and/or availability of salmon in the fishing area in June, compared with the two preceding months.

2. Distribution of Fishing

The area within which longline fishing took place in 1969 is shown in Fig. 2. This shows that fishing took place off the Norwegian coast between latitudes 63°00'N and 72°30'N from the 12 miles fishery limit along the coast to as far as 200 miles offshore in the region between latitude 68°30'N and 72°00'N where the main fishery was concentrated, and where 90-95% of the total catch taken by Danish, Swedish, German and Faroese vessels was taken; it was also one of the principal areas fished by Norwegian vessels, although their fishing was much more widely distributed along and closer to the coast than the vessels of the other countries.

Although a small number of Danish vessels started fishing in March and continued into July, as in previous years, with more than 50% of the catch being

taken in May. The available information on the distribution of catches provides no indication of any major changes in the distribution of fishing during the season.

In addition to the information on the distribution of salmon in the Norwegian Sea provided by the fishery itself, catches have been made in the course of exploratory fishing surveys conducted during the same months in other parts of the Norwegian Sea, to the southwest of Bear Island, near Spitzbergen and east of the North Cape to as far as Novaya Zemlya. These indicate that salmon are available for capture by longline over a much wider area than that in which the fishery has taken place so far. However, little is known of their abundance, composition and inter-relations with the concentrations currently exploited.

It was also noted that a small fishery was conducted by Faroese longliners in the vicinity of the Faroe Islands in the spring of 1968 and 1969.

3. Composition of Stock

In last year's report it was pointed out, on the basis of age-readings of salmon taken from the Norwegian longline fishery, that about 90% of the exploited stock in the Norwegian Sea had already spent two or more winters in the sea. Further age data collected between mid-March and mid-July 1969 from Norwegian and Danish catches confirmed these results for the salmon exploited during the main season (April to early June), but samples taken in mid-June and mid-July from Danish landings contained 11% and 60% of smaller, one sea-winter fish respectively. This points to a progressive recruitment of these younger fish to the exploited area during June and early July.

As in 1968, a notable feature of the two sea-winter salmon caught in the longline fishery in 1969 was their widely varying but, on average, low condition factor (average = 0.79) compared with salmon of the same sea age caught at various localities in the Norwegian coastal fishery, the condition factors of which, in 1969, ranged from 0.96 to 1.04. In 1968 the condition factors of the salmon in the Norwegian Sea (average = 0.85) and in Norwegian home waters (average = 1.0-1.2) were somewhat higher than in 1969.

The age analysis of samples taken by a research vessel in the vicinity of the Faroes in April 1968 and 1969 showed that, in contrast to the Norwegian Sea fishery in April, one sea-winter salmon predominated in that area.

4. Origin and Destination of Salmon

Information on the recapture in the Norwegian Sea fishery in 1968 and 1969 of salmon tagged as smolts in Norwegian, Swedish and Danish rivers are given in Tables 2 and 3. Although full details of the recaptures in 1969 are not yet available, these data show that, to date, 57 recaptures have been reported, of which 49 were tagged as smolts and 3 as parr in Norway, 4 as smolts in Sweden and 1 as a smolt in Denmark. No recaptures have so far been reported from this area of salmon tagged as smolts in the UK or Ireland (one recapture of a fish tagged as a smolt in Scotland has, however, been made at the Faroes). It is important to point out that smolt tagging experiments have not been conducted in rivers in the USSR entering the Barents Sea in the years since this Norwegian Sea fishery commenced so that the possible contribution to the Norwegian Sea stock of salmon originating from them cannot be gauged from the smolt tagging data.

In addition to this evidence concerning the origin of salmon in the Norwegian Sea, information relating to their subsequent home-waters destination is available from the recaptures of salmon tagged in this area in 1968 and 1969. In May 1968, 238 salmon caught in the longline fishery were tagged and 5 recaptures were reported from Norway later that year, 3 from the coastal and 2 from the river fishery. No further recaptures from these liberations were recorded during 1969. Between the end of March and mid-June 1969 (but mostly during April and May), a further 932 fish were tagged in the longline fishery and 50 recaptures have so far been reported, including 3 from the longline fishery (though it is known that more have been caught). All the remaining recaptures have come from the Norwegian coastal and river fisheries. Most of the fish tagged had spent two winters in the sea.

Although in the absence of smolt tagging experiments in USSR rivers and because of deficiencies in the reporting of tag recaptures from the longline

fishery it is not possible to determine, from the tag recaptures, the relative proportions of salmon originating from the rivers of different countries, the available data suggest that most of the exploited stock in the Norwegian Sea in 1968 and 1969 originated from Norwegian rivers. They also suggest that most of the returning salmon migrate to Norwegian home waters, mainly as two sea-winter salmon.

In addition to the evidence from tagging data, during 1968 reports were received from Norway, the USSR and Scotland of fish in their catches with hooks still attached which were the same as those used in the Norwegian Sea fishery. A considerable number of similar records have been reported in Norway in 1969 but none from either the USSR, Scotland or elsewhere.

5. Assessment of Effects of Norwegian Sea Fishery on Total and Home-waters Salmon Stocks and Yields

As indicated in Section C.3, the age composition data from samples taken during the main longline fishing season (April-early June) in 1968 and 1969, showed that about 90% of the exploited stock in the Norwegian Sea consisted of fish which had spent two or more winters in the sea. Therefore, as with the West Greenland fishery, any effects which this fishery, as currently prosecuted, might have on total and home-waters stocks and yields will be mainly confined to adult salmon of two or more sea-winters.

5.1 Total Salmon Yields

The assessment of the effect of the Norwegian Sea fishery on total salmon yield (Norwegian Sea plus home-waters) can be approached in the same general way as that adopted for the West Greenland fishery, using information on (a) the increase in weight of the fish between their appearance in the Norwegian Sea and home-waters fisheries respectively and, (b) the proportion of the fish present in the fished area which, if not caught there, would be subsequently caught in the home-waters fisheries.

Although accurate, direct measures of the increase in weight of salmon between their appearance in the Norwegian Sea and home-waters fisheries were not available for this assessment, data on the difference in condition factor between two sea-winter salmon in the Norwegian Sea at the peak of the fishery in May and in Norwegian coastal waters one month later, in June, were used. On the assumption that these data were representative of the same population of salmon, exploited first in the Norwegian Sea and subsequently in Norwegian home waters, they indicate an average increase in weight of about 25% during this interval. On this basis it is estimated that, if more than 80% of the two sea-winter salmon in the exploited area in the Norwegian Sea are subsequently caught in home waters, the Norwegian Sea fishery will have resulted in a lower total (Norwegian Sea plus home waters) catch of these fish than would have been obtained in its absence, while if less than 80% are subsequently caught it will have resulted in a higher total catch.

Reliable measures of the rates of exploitation of two sea-winter salmon in home waters are not available for all of the home-waters areas in Norway and elsewhere to which two sea-winter salmon in the Norwegian Sea may return so that it is not possible to assess with any degree of certainty whether the Norwegian Sea fishery has increased or decreased the overall total catch (by weight). It is known, however, that the rate of exploitation of two sea-winter salmon in some Norwegian home-waters areas is high and probably in excess of 80% also, in the absence of evidence of large concentrations of known predators in this area, it is probable that the natural mortality rate of these salmon between their appearance in the Norwegian Sea fishery and their return to home waters is small. Therefore, it seems likely that, for the salmon returning to these areas the Norwegian Sea fishery may have resulted in a lower catch than would have been obtained in its absence. On the other hand, for those salmon returning to other home-waters areas it has probably increased the total catch.

It should be noted that, because of the low average condition factor for the salmon exploited in the Norwegian Sea fishery, the overall average 'quality' of the total catch will be lower in the presence than in the absence of this fishery.

5.2 Home-waters Salmon Stocks and Yields

In order to estimate the effects of the Norwegian Sea fishery on the home-waters stocks and catches of all countries combined and of each country

separately, measures are required of (a) the natural mortality occurring between the time the salmon are exploited in the Norwegian Sea and their arrival in home waters, (b) their increase in weight during this time, (c) the relative contributions to the Norwegian Sea catch of salmon which, if surviving, would return to the river systems in different countries and, (d) the exploitation rate in each country's home-waters fishing. Insufficient is yet known of the magnitude of these factors for the effects to be estimated reliably. However, as indicated in the previous section, the loss in weight due to natural mortality during the interval between the exploited phase in the Norwegian Sea and their return to home waters is likely to be small and probably no greater than the average increase in weight of the individual fish. On this basis, and on the assumption that all the salmon in the Norwegian Sea stock, if not caught and if surviving would return to home waters in the same year, the loss (in weight) to the home-water salmon stocks of all countries combined would be of roughly the same magnitude each year as the catch of salmon taken in the Norwegian Sea fishery, i.e. about 50 and 300 tonnes in 1967 and 1968 respectively, and, provisionally, not less than 800 tonnes in 1969.

The corresponding losses to the home-waters catches in these years again cannot be estimated accurately in the absence of full information on the exploitation rates in the home-waters fisheries of all of the countries to which salmon in the exploited stock in the Norwegian Sea return. However, from the data which are available, it seems likely that the overall average rate for these fisheries is not less than 0.5. Using this value gives rough, provisional estimates of the losses to the catches of all countries combined of about 25, 150 and not less than 400 tonnes in 1967, 1968 and 1969 respectively.

In the absence of accurate measures of the relative proportions of the salmon in the exploited stock in the Norwegian Sea which return to the river systems of individual countries, it is not possible to apportion these estimated losses between countries but it seems clear that the biggest loss would be that to the stocks and catches in Norwegian home waters.

The above rough estimates concern only the immediate direct effects of the Norwegian Sea fishery on total and home-water catches and take no account of its possible longer-term effects on smolt production and hence on future recruitment to the salmon stock as a result of a reduction in spawning stock size. As indicated in relation to the effects of the West Greenland fishery, too little is known, at present, of the relation between adult stock size, smolt production and subsequent recruitment of Atlantic salmon and grilse for these effects to be estimated.

D. HOME-WATERS CATCHES

Catch statistics for the home-waters fisheries in Canada, England and Wales, Ireland, Norway, Scotland, Sweden and USA were presented in last year's report for the years 1960-1968. These figures have been revised in the light of new data presented to the Working Party and are given in Table 9, together with provisional estimates of the catch in 1969. Catch data are also given, for the first time, for France, Northern Ireland and the USSR. Whereas in the years up to 1968, statistics for salmon and grilse were presented separately only for Scotland, for 1969 they are also presented separately for England and Wales and Norway. Catch-per-unit-effort data are given in Table 10 for Canada, the Irish Republic, the Foyle area, Norway and Scotland and these data also have been revised and brought up to date as far as possible.

The provisional statistics for 1969 indicate that, in the countries with substantial home-waters fisheries, the total catches (salmon plus grilse) were similar to those in 1968; they were slightly higher in England and Wales, Ireland and Scotland but slightly lower in Canada and Norway. Although complete statistics on the division of the total catch into grilse and salmon is not available for all countries, data presented from Canada, Scotland and the Irish Republic indicated that the salmon component of the catch in 1968 and 1969 was lower than the average of the previous five years. However, it should be noted that the catches in 1968 and 1969 fell within the long-term range in years before the high seas fisheries developed. In these years the grilse catch remained at least at the same relatively high level.

Information presented to the Working Party on the seasonal breakdown of home-waters catches indicated that, in England and Wales, Scotland and Ireland catches have decreased in the spring fishery (to May), when the catch is composed almost exclusively of salmon, and have increased in the summer fishery (after May) when the main component is grilse. In Scotland the decline in catch in the spring

fishery has taken place steadily from about 500 tonnes in the early 1950's to around 180 tonnes in 1967-1968, while in England and Wales and Ireland it has taken place more recently, mainly since 1965. This decline is in general accord with statistics supplied to the Working Party on the quantities of salmon passing through Billingsgate Fish Market, London, in the months February-April during the years 1950-1969 which, although not representing total salmon production in these months, showed a general decline from 1954 to 1963 and a more rapid decline thereafter.

Scottish data for the summer fishery, on the other hand, indicate a marked increase in both salmon and grilse catches during the 1960's, the increase in the salmon catch in this season resulted in the maintenance of a relatively high salmon catch throughout the 1960's. These data point, in fact, to a change in the timing of the main salmon runs in Scottish rivers during the 1960's. The Working Party noted, however, that the division of the total catch into salmon and grilse in the Scottish fishery is usually made on a weight basis and it has always been recognized that, if the weight of grilse at capture increased, this method of dividing the catch would tend to overestimate the salmon and underestimate the grilse catch. The results of a comparison of the proportions of salmon and grilse in the catches in two Scottish rivers in 1969, estimated on the basis of weight and from direct readings of age from scale samples respectively did, in fact, point to a substantial overestimation of the salmon catch taken in them in that year. However, such data as are available for previous years indicate that the extent of the overestimation for the years prior to 1969 was relatively small.

E. RESEARCH PROGRAM

The Working Party considered the future research programs to be conducted at West Greenland, in the Norwegian Sea and in home waters in relation to the problems of assessing the effects of the open sea fisheries on total and home-waters stocks and yields.

The main features of these programs in 1970 are summarized below:

1. West Greenland

(a) Collection of catch statistics and sampling of the catches for length, weight and age in both the set gill-net (inshore) and drift-net (offshore) fishery will be continued throughout the fishing season.

(b) A further joint tagging program between Denmark and the UK will be conducted in the course of the West Greenland fishery, using pelagic longlines to catch salmon in good condition; further experiments to determine the viability of salmon caught by both longlines and gill nets will also be conducted.

(c) An exploratory drift-net fishing survey will be made in the Davis Strait and Labrador Sea by Canada, to determine the distribution, abundance and composition of salmon in areas outside that currently fished by the drift net fleets off the West Greenland coast; comparative tests will also be made (by Canada, Denmark and the UK) between the relative catching capacities of drift nets and longlines and of the condition of salmon caught by the two methods.

(d) The biochemical and parasite studies of salmon at West Greenland and in home waters in North America and Europe will be continued in relation to determining the home-waters origin and rates of mixing of salmon in the exploited stock at West Greenland.

2. Norwegian Sea

(a) Collection of catch statistics and routine sampling of the catches for length, weight and age will be continued throughout the fishing season by Norway, Denmark and Sweden.

(b) If possible, tagging of salmon caught by longline will again be conducted by Norway in the exploited area during the course of the season to provide further information on the rate of exploitation and destination of the salmon in the exploited stock. In addition, tagging will be conducted by Faroese and Scottish workers in the vicinity of the Faroes.

(c) Biochemical and parasite studies, similar to those conducted in relation to the West Greenland fishery, will be conducted on salmon in the Norwegian Sea and home-waters stocks.

3. Home Waters

(a) Collection of catch and fishing effort statistics and routine sampling of catches for length, weight and age will be continued.

(b) Tagging of natural and/or hatchery-reared smolts (and, in some countries, parr) will again be conducted in North American and European rivers. It is hoped that smolt tagging in USSR rivers entering into the Barents Sea will be included in this program.

(c) Biochemical and parasite studies will be continued.

(d) Studies of the relationship between spawning stock size, smolt production and subsequent recruitment of grilse and salmon will be continued in river systems in North America and Europe.

In addition to the above research program in 1970, the Working Party also considers that, in relation to determining the exploitation rate of salmon in the West Greenland fishery and obtaining more information on their home-waters destination, a larger scale tagging experiment at West Greenland than those conducted hitherto would be necessary to ensure a wide distribution of a sufficiently large number of tags throughout the exploited stock. It therefore recommends

that consideration be given by ICNAF and ICES to arranging a large-scale international experiment to be carried out at West Greenland, if possible in 1971.

It considers that an experiment organized in the same general way as that currently being undertaken on young herring in the North Sea would be very appropriate. It also recognized, in relation to this and the other tagging programs on salmon (e.g. in Norwegian Sea and of smolts in home waters), that there is an urgent need to improve the efficiency of tag recovery and reporting, and it accordingly further recommends

that countries with fisheries at West Greenland and in the Norwegian Sea be urged to take all steps possible to achieve maximum efficiency in tag recovery and reporting.

F. FUTURE MEETING

The Working Party recommends

that it should meet for four days at a suitable venue in late March-early April 1971.

Table 1 Catches at West Greenland, 1960-69, in metric tons and round fresh weight. (Based on data available on 28 February 1970)

<u>Year</u>	<u>Drift-net (Offshore)</u>				<u>Set Gill-net (Inshore)</u>		<u>Total</u>
	<u>Norway</u>	<u>Faroes</u>	<u>Denmark</u>	<u>Sweden</u>	<u>Total</u>	<u>Total</u>	
1960	0	0	0	0	0	60	60
1961	0	0	0	0	0	127	127
1962	0	0	0	0	0	244	244
1963	0	0	0	0	0	466	466
1964	0	0	0	0	0	1539	1539
1965	a	36	0	0	36+	825	861
1966	32	87	0	0	119	1251	1370
1967	78	155	85	0	318	1283	1601
1968	138	134 ^c	272 ^d	4	548	579 ^d	1127
1969	250 ^b	184 ^c	740 ^d	30 ^c	1204 ^c	940 ^d	2144

a - Figures not available, but catch is known to be less than Faroes

b - Estimated

c - Provisional

d - Estimated. As the offshore catch includes some fish caught by residents of Greenland, a firm breakdown into offshore and inshore catches is no longer possible. The breakdown quoted is a minimum offshore fraction and a maximum inshore fraction.

Table 2 Number of natural (wild) smolts tagged in the years 1963-1969 and recaptured in Greenland and in other areas, including home-waters, up to the end of 1969. Figures in brackets are returns per thousand tagged.

Country	Year of Tagging	Number Tagged	Recaptures					Grand Total
			West Greenland	Norwegian Sea and Faroes	Grilse	Salmon	All Other Areas Total	
Canada	1963	5850	11 (1.9)	0	70	20 (3.4)	90	101
	1964	15013	9 (0.6)	0	203	71 (4.7)	274	283
	1965	16485	72 (4.4)	0	175	191(11.6)	366	438
	1966	9509	25 (2.6)	0	122	98(10.3)	220	245
	1967	17810	18 (1.0)	0	96	148 (8.3)	244	262
	1968	55982	108 (1.9) ^a	0	1203	-	1203	1311
	1969	45417	-	-	-	-	-	-
Scotland	1963	10998	10 (0.9)	0	172	92 (8.4)	264	274
	1964	9200	6 (0.7)	0	110	66 (7.2)	176	182
	1965	9239	9 (1.0)	0	74	49 (5.3)	123	132
	1966	15406	28 (1.8)	0	281	42 (2.7)	323	351
	1967	20993	22 (1.0)	1	168	66 (3.1)	234	254
	1968	15695	14 (0.9)	0	127	-	127	141
	1969	15963	-	-	-	-	-	-
England and Wales	1963	9485	8 (0.8)	0	15	38 (4.0)	53	61
	1964	17129	10 (0.6)	0	30	97 (5.7)	127	137
	1965	5873	12 (2.0)	0	35	57 (9.7)	92	104
	1966	3219	5 (1.6)	0	28	37(11.5)	65	70
	1967	4118	10 (2.4)	0	23	49(11.9)	72	82
	1968	5790	16 (2.8)	0	43	-	43	59
	1969	8611	-	-	-	-	-	-
Norway	1963	97	0	0	0	4(41.2)	4	4
	1964	1465	0	0	67	24(16.4)	91	91
	1965	2120	0	0	41	18 (8.5)	59	59
	1966	1362	0	2	27	16(11.7)	43	45
	1967	3434	0	2	59	19 (5.5)	78	80
	1968	3564	0	2	103	-	103	105
	1969	3571	-	-	-	-	-	-
Iceland	1966	82						
	1967	153						
	1968	59						
	1969	15						
Recaptures included in Table 3								
Ireland	1968	625	0	0	18	-	18	18
	1969	0	0	0	0	0	0	0
Sweden	1966	0	0	0	0	0	0	0
	1967	0	0	0	0	0	0	0
	1968	0	0	0	0	0	0	0
	1969	800	-	-	-	-	-	-

a Provisional

Table 3 Number of hatchery smolts tagged in the years 1963-1969 and recaptured in Greenland and in other areas, including home waters, up to the end of 1969. Figures in brackets are returns per thousand tagged.

Country	Year of Tagging	Number Tagged	Recaptures					Grand Total
			West Greenland	Norwegian Sea and Faroes	All Other Areas			
					Grilse	Salmon	Total	
Canada	1963	7332	4 (0.5)	0	132	29 (4.0)	161	165
	1964	46659	9 (0.2)	0	101	83 (1.8)	184	193
	1965	45988	67 (1.5)	0	378	214 (4.7)	592	659
	1966	70881	70 (1.0)	0	239	293 (4.1)	532	602
	1967	112317	63 (0.6)	0	276	190 (1.7)	466	529
	1968	113992	140 (1.2) ^a	0	289	-	289	429
	1969	128280	-	-	-	-	-	-
Scotland	1963	6750	0	0	3	3 (0.4)	6	6
	1964	3000	0	0	7	7 (2.3)	14	14
	1965	3000	0	0	19	0	19	19
	1966	8000	1 (0.1)	0	13	4 (0.5)	17	18
	1967	4451	0	0	1	0	1	1
	1968	5335	0	0	4	-	4	4
	1969	3694	-	-	-	-	-	-
England and Wales	1963	1970	1 (0.5)	0	0	0	0	1
	1964	0	0	0	0	0	0	0
	1965	0	0	0	0	0	0	0
	1966	9668	0	0	0	1 (0.1)	1	1
	1967	18522	0	0	0	1 (0.1)	1	1
	1968	28266	3 (0.1)	0	4	-	4	7
	1969	7420	-	-	-	-	-	-
Norway	1963	10999	0	0	88	95 (8.6)	183	183
	1964	9182	0	1	135	87 (9.5)	222	223
	1965	8072	0	12	71	20 (2.5)	91	103
	1966	13812	0	33	411	149(10.8)	560	593
	1967	18393	1 (0.1)	47	240	53 (2.9)	293	341
	1968	12983	0	22	173	-	173	195
	1969	16967	-	-	-	-	-	-
Iceland	1966	8367	2 (0.2)	0	66	14 (1.7)	80	82
	1967	10061	0	0	24	6 (0.6)	30	30
	1968	9985	0	0	45	-	45	45
	1969	7586	-	-	-	-	-	-
Ireland	1966	15000	0	0	0	0	0	0
	1967	5000	1 (0.2)	0	1	0	1	2
	1968	222	0	0	0	-	0	0
	1969	5199	-	-	-	-	-	-
Sweden	1966	11181	7 (0.6)	1	690	137(12.2)	827	835
	1967	4000	1 (0.2)	4	364	47(11.8)	410	414
	1968	4298	1 (0.2)	1	586	-	586	588
	1969	6381	-	-	-	-	-	-
USA	1966	82250	37 (0.4)	0	91	168 (2.0)	259	296
	1967	80717	0	0	30	10 (0.1)	40	40
	1968	73730	2 (0.03)	0	54	-	54	56
	1969	73418	-	-	-	-	-	-
Denmark	1965	1886	0	0	1	2 (0.1)	3	3
	1966	4270	0	4	19	44(10.3)	63	67
	1967	2696	0	1	13	7 (3.0)	20	21
	1968	5173	1 (0.2)	1	30	-	30	32
	1969	3837	-	-	-	-	-	-

a Provisional

Table 4 Number of kelts tagged in the winters 1962/63 - 1969/70 and recaptured in Greenland and in other areas, including home-waters, up to the end of 1969.

<u>Country</u>	<u>Winter of Tagging</u>	<u>Number Tagged</u>	<u>Greenland</u>	<u>Recaptures Other Areas</u>	<u>Total</u>
Canada ^a	1962-63	653	2	65	67
	1963-64	1519	0	90	90
	1964-65	1995	1	144	145
	1965-66	7170	0	650	650
	1966-67	7510	1	689	690
	1967-68	3742	0	419	419
	1968-69	3627	3	120	123
	1969-70	4521	-	-	-
England and Wales (River Axe only)	1962-63	159	1	12	13
	1963-64	185	2	10	12
	1964-65	184 ^b	1	11	12
	1965-66	109 ^b	1	7	8
	1966-67	178 ^b	1	11	12
	1967-68	188	2	6	8
	1968-69	80	0	2	2
	1969-70	3 ^c	-	-	-
Ireland	1962-63	2264	2	31	33
	1963-64	2351	2	70	72
	1964-65	2695	2	34	36
	1965-66	2972	1	40	41
	1966-67	3175	0	77	77
	1967-68	1034	0	24	24
	1968-69	410	0	13	13
	1969-70	-	-	-	-
Scotland	1962-63	-	-	-	-
	1963-64	134	-	2	2
	1964-65	233	0	5	5
	1965-66	1435	3	31	34
	1966-67	901	3	21	24
	1967-68	117	0	3	3
	1968-69	152	0	1	1
	1969-70	-	-	-	-
USA	1962-63	151	1	13	14
	1963-64	123	1	10	11
	1964-65	160	0	23	23
	1965-66	146	2	16	18
	1966-67	578	5	75	80
	1967-68	340	4	51	55
	1968-69	218	1	(8)	-
	1969-70	-	-	-	-

a Ascending adults tagged during any year are included in the totals tagged for the corresponding winter (i.e. those tagged in 1962 are included under 1962-63, those tagged in 1963 under 1963-64 etc.), but recaptures of these adults in the year of tagging have not been included.

b In addition, 180 kelts were tagged by the Dee and Clwyd River Authority in 1965-66 and 291 kelts in 1966-67. No recaptures were reported from the first experiment and two (from 'Other Areas') from the second.

c Provisional.

Table 5 Number of parr tagged in the years 1964-1969 and recaptured in Greenland and in other areas, including home-waters, up to the end of 1969. Figures in brackets are returns per thousand tagged.

Country	Number Tagged	Year of Tagging	Year of Assumed Migration	West Greenland	Recaptures				Grand Total
					Norwegian Sea and Faroes	All Other Areas			
						Grilse	Salmon	Total	
Canada	1971 (H)	1964	1965	0	0	0	4 (2.0)	4	4
	0 (W)	1964		0	0	0	0	0	0
	1882 (H)	1965	1966	0	0	0	0	0	0
	0 (W)	1965		0	0	0	0	0	0
	4694 (H)	1966	1967	0	0	0	0	0	0
	15 (W)	1966	1967	0	0	0	0	0	0
	999 (H)	1967	1968	1	0	0	-	0	0
	58 (W)	1967	1968	0	0	0	-	0	0
	995 (H)	1968	1969	-	-	-	-	-	-
	385 (H&W)	1968	1969	-	-	-	-	-	-
	1999 (H)	1969	1970	-	-	-	-	-	-
	147 (W)	1969	1970	-	-	-	-	-	-
Scotland	0 (H)	1966		0	0	0	0	0	0
	564 (W)	1966	1967	0	0	0	0	0	0
	0 (H)	1967		0	0	0	0	0	0
	3651 (W)	1967	1968	0	0	3	-	3	3
	222 (H)	1968	1969	-	-	-	-	-	-
	4865 (W)	1968	1969	-	-	-	-	-	-
	2043 (H)	1969	1970	-	-	-	-	-	-
	4314 (W)	1969	1970	-	-	-	-	-	-
England and Wales	4939 (H)	1966	1967	0	0	0	0	0	0
	0 (W)	1966		0	0	0	0	0	0
Wales	2050 (H)	1967	1968	0	0	0	-	0	0
	0 (W)	1967		0	0	0	0	0	0
	2121 (H)	1968	1969	-	-	-	-	-	-
	0 (W)	1968		-	-	-	-	-	-
	2512 (H)	1969	1970	-	-	-	-	-	-
0 (W)	1969		-	-	-	-	-	-	
Norway	996 (H)	1965	1966	0	0	1	1 (1.0)	2	2
	0 (W)	1965		0	0	0	0	0	0
	2000 (H)	1966	1967	0	3	3	0	3	6
	1000 (W)	1966	1967	0	0	6	3 (3.0)	9	9
	1995 (H)	1967	1968	0	4	7	-	7	11
	831 (W)	1967	1968	0	0	0	-	0	0
	1000 (H)	1968	1969	-	-	-	-	-	-
	0 (W)	1968		0	0	0	0	0	0
	1000 (H)	1969	1970	-	-	-	-	-	-
	0 (W)	1969		0	0	0	0	0	0
Ireland	0 (H)	1969		0	0	0	0	0	0
	821 (W)	1969	1970	-	-	-	-	-	-
Sweden	0 (H)	1965		0	0	0	0	0	0
	327 (W)	1965	1966	0	0	25	3 (9.2)	28	28
	0 (H)	1966		0	0	0	0	0	0
	591 (W)	1966	1967	0	0	57	5 (8.5)	62	62
	0 (H)	1967		0	0	0	0	0	0
	300 (W)	1967	1968	0	0	19	-	19	19
	500 ^a (H)	1968	1968	0	0	10	-	10	10
	0 (W)	1968		0	0	0	0	0	0
	0 (H)	1969		0	0	0	0	0	0
	0 (W)	1969		0	0	0	0	0	0

a Tagged as 'one-year-old smolts', but recapture records suggest they should be included in this table rather than in Table 4.

H Hatchery reared.

W Natural (wild)

Table 6 Recaptures (to February 1970) of fish tagged at West Greenland.

<u>Year Tagged</u>	<u>Number Tagged</u>	<u>Local Recaptures</u>		<u>Number</u>	<u>Distant Recaptures</u>
		<u>Number</u>	<u>Days Absence</u>		<u>Location</u>
1965	223	3	1, 3, 26	1	Canada (1, SW Newfoundland)
1966	729	28	1-8 (24) 10-50 (4)	4	Canada (1, Miramichi Estuary) Scotland (3, River Tweed (2), River Spey)
1967	375	6	1-2 (3) not known (3)	4	Canada (1, Indian Head, Labrador) Ireland (2, River Slaney, River Barrow) Scotland (1, River Tay)
1968	47	4	1-3 (3) < 1 month (1)	1	Canada (1, Eagle River Labrador)
1969	443	14	< 2 months	1 ^a	Canada (Northeast Newfoundland)

a Recaptured in the year of tagging.

Table 7 Catches in the Norwegian Sea longline fishery and in the drift-net fishery within Norwegian fishery limits, 1965-69.
Metric tons, round fresh weight.

Year	Norwegian Sea Longline Fishery										Drift-net Fishery within Norwegian Fishery Limits	
	Denmark		Faroes		Germany		Norway		Sweden		Total	
	Number of Ships	Catch	Number of Ships	Catch	Number of Ships	Catch	Number of Ships	Catch	Number of Ships	Catch	Number of Ships	Catch
1965	1-2	^a	0	0	0	0	0	0	0	0	1-2	^a
1966	10	^a	0	0	0	0	0	0	^a	0	10+	^a
1967	22	78	0	0 ^b	0	0	0	0	6	0	28+	78+
1968	28	184	2	5 ^b	0	0	100 ^d	126	16	126	46+	415
1969	40	427	4	7 ^c	5	21	70+	450 ^e	2	24	121+	929

- a Not known.
- b Roughly 70% of catch taken in vicinity of Faroes.
- c All taken in vicinity of Faroes.
- d Estimated catch.
- e Preliminary figures, based on reports from two-thirds of the Fishery Boards.

Table 8 Estimates of catch-per-unit-effort in the Norwegian Sea longline fishery.

<u>Year</u>	<u>Month</u>	<u>Country</u>	<u>No. of Salmon Sampled</u>	<u>No. of Salmon Caught per 1000 hooks</u>
1968	April	Denmark	1104	92
1968	May	Denmark	4435	100
1968	April-Aug.	Sweden	32751	42
1969	March	Denmark	25891	43
1969	April	Denmark		57
1969	May	Denmark		44
1969	May	Denmark		13 ^a
1969	June	Denmark		29
1969	April	Germany		5459
1969	May	Germany	46	
1969	June	Germany	23	

a This catch, which comprised only 196 fish, was taken a short distance south of the area mainly fished by Danish vessels in 1969.

Table 9 Catches in home waters, 1960-69 (salmon plus grilse except where shown separately) in metric tons, round fresh weight.
(Based on data available on 28 February 1970).

Year	England and Wales		France	Iceland	Irish ^b		Northern ^b		Norway		Scotland		Sweden ^c	USSR ^f	Canada	USA
	Salmon	Grilse			Republic	Ireland	Salmon	Grilse	Salmon	Grilse	Total	Total				
1960	-	283	50-100	200	743	139	-	1659	960	476	1436	40	50-100	1635	< 2	
1961	-	232	50-100	200	707	132	-	1533	820	376	1196	27	50-100	1580	< 2	
1962	-	318	50-100	100	1459	356	-	1935	1015	725	1740	15	50-100	1717	< 2	
1963	-	325	50-100	200	1458	306	-	1786	1286	412	1698	16	50-100	1848	< 2	
1964	-	307	50-100	200	1617	377	-	2147	1216	698	1914	16	50-100	2066	< 2	
1965	-	320	50-100	?	1457	281	-	2000	1042	560	1602	17	50-100	2113	< 2	
1966	-	387	50-100	120	1238	287	-	1863	1069	555	1624	17	50-100	2356	< 2	
1967	-	420	50-100	120	1463	449	-	2052	1245	888	2133	23	50-100	2859	< 2	
1968	- ^a	282 ^a	50-100	171	1413	312	-	1593	1020	543	1563	?	50-100	2111	< 2	
1969	255 ^a	111 ^a	50-100	147	1707	267	800	1480	975	944	1919	?	50-100	1918 ^a	< 2	

Angling catch	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Not Inc. ^d	Not Inc. ^d	Inc.	Inc.
percentage	10-40 (by no.)	- ^e	53	80-90 (by no.)	90 (by no.)	15 (by wt.)	75	- ^e	?	?	?
grilse			(in 1969)	70-80 (by wt.)	80+ (by wt.)		(by no.)				

- a Provisional
- b Catch in River Foyle allocated on basis of 50% Irish Republic and 50% Northern Ireland
- c West coast catch only
- d Angling catches (mainly grilse) about 10% additional (by weight)
- e Mainly salmon
- f To be confirmed

Table 10 Estimates of catches per unit effort for some home-water fisheries.

	Canada ^a (Drift Nets and Traps) (lbs)	Irish Republic (Drift Nets) ^c (numbers)	(Licences) ^d (lbs)	Foyle Area ^b (Drift Nets) (numbers)	Norway ^e (Bag Nets) (kg)	Fixed Engines) ^f (numbers)	Scotland (Net and Coble) ^g (numbers)
1960	169	325	950	104 _h	172	12.8	84.1
1961	159	224	1030	— _h	158	12.3	60.9
1962	178	563	2210	297	175	14.8	83.6
1963	193	456	1940	334	177	19.9	109.3
1964	266	430	1720	392	195	23.2	98.6
1965	262	520	1700	361	172	17.8	84.0
1966	249	516	1250	375	154	19.4	95.0
1967	248	733	1650	524	154	21.6	130.2
1968	186 _h	552	1650	482	129	17.3 _h	97.9 _h
1969	— _h	491	1960	455	140 _i	— _h	— _h

a Miramichi area, salmon only. Average of mean monthly catch/unit effort for both types of gear throughout open seasons for each type. Units of effort taken as 1 trap net or 200 fathoms of drift net, as defined in FRB Tech. Rept. No. 29.

b Irish Republic and Northern Ireland; drift nets in the open sea only.

c Salmon and grilse per drift net.

d Pounds salmon and grilse per licence.

e Salmon and grilse per bag net.

f Salmon only, catch/net/month.

g Salmon only, catch/crew/month.

h Not available.

i Preliminary estimate only.

FIG. 1 DISTRIBUTION OF WEST GREENLAND SALMON FISHERY, 1969

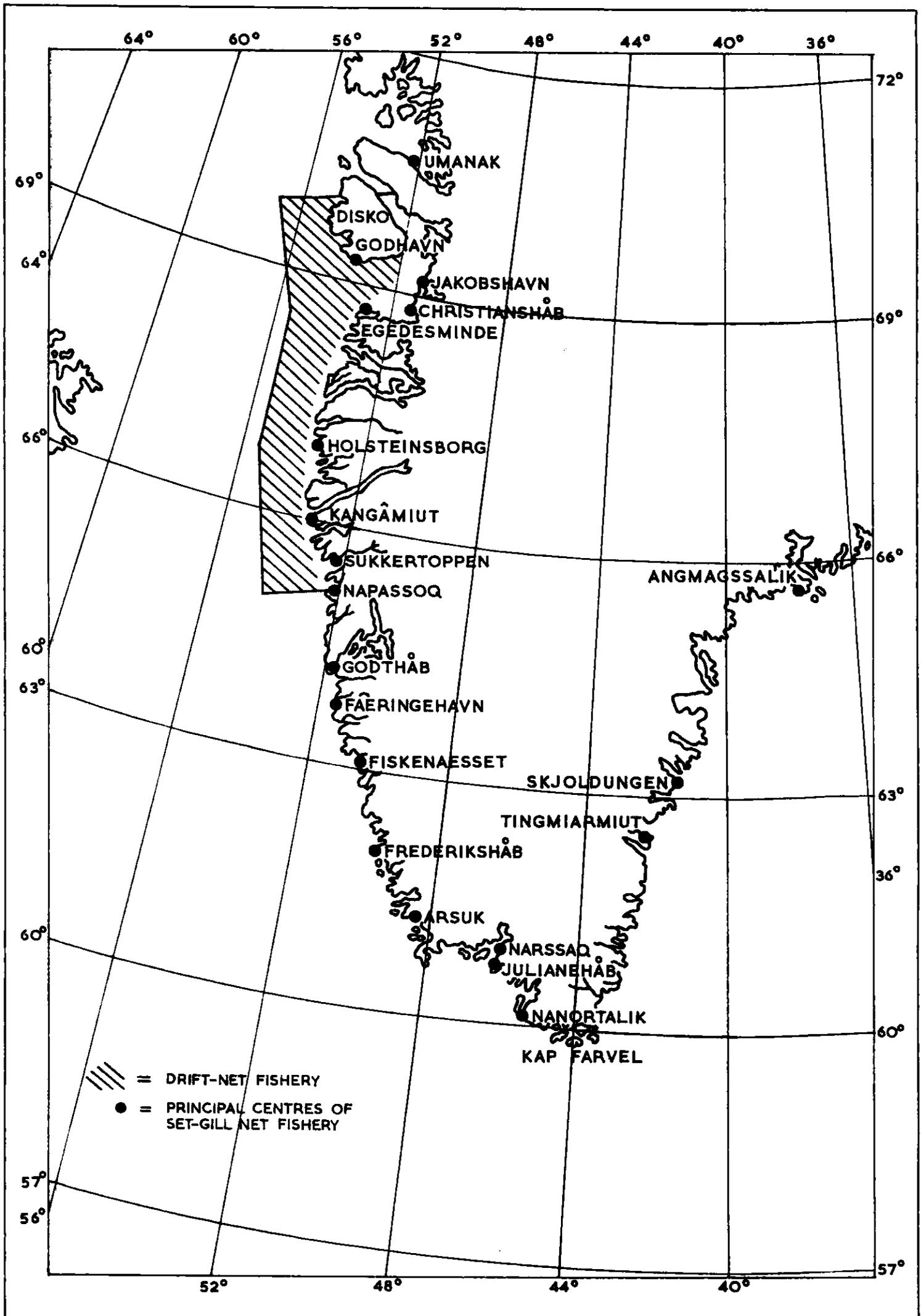


FIG. 2. DISTRIBUTION OF NORWEGIAN SEA SALMON FISHERY, 1969

