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Exploration of the Sea

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Anadromous and Catadromous Fish Committee

REPORT OF THE ICES/ICNAF JOINT WORKING PARTY

on

NORTH ATLANTIC SALMON

11 - 15 March 1974

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CONTENTS

| | <u>Page</u> |
|--|-------------|
| A. INTRODUCTION | 2 |
| B. WEST GREENLAND FISHERY | 2 |
| 1. Statistics and Composition of the Fishery | 2 |
| 2. Countries of Origin and Mixing of Stocks at West Greenland | 4 |
| a) Smolt tag recaptures | 5 |
| (i) North America | 5 |
| (ii) Europe | 6 |
| b) Adult tagging at West Greenland | 7 |
| c) Biochemical studies | 9 |
| d) Scale studies | 10 |
| e) Parasite studies | 10 |
| f) Summary | 11 |
| 3. Assessments of Effects of West Greenland Fishery on Home Waters Stocks and Catches | 11 |
| C. NORWEGIAN SEA FISHERY | 14 |
| 1. Statistics of Fishery and Composition of Catches in Long Line Fishery in Norwegian Sea | 14 |
| 2. Origin and Destination of Salmon in Norwegian Sea Stock | 15 |
| 3. Assessment of Effects of Norwegian Sea Fishery on Home Waters Stocks and Catches | 16 |
| 4. Long Line Fishing at the Faroes | 16 |
| D. HOME WATERS FISHERIES | 17 |
| a) Canada | 17 |
| b) Scotland | 18 |
| c) England and Wales | 18 |
| d) Ireland | 19 |
| e) Northern Ireland | 19 |
| f) Norway | 19 |
| E. PREPARATION OF SCIENTIFIC REPORT ON INTERNATIONAL TAGGING EXPERIMENT | 20 |
| F. FUTURE RESEARCH | 21 |
| G. NEXT MEETING | 21 |
| H. TABLES 1 - 11 | 22 |
| I. APPENDIX - List of Working Papers | 34 |
| J. FIGURES 1, 2 and 3 | 37 |

A. INTRODUCTION

1. The ICES/ICNAF Joint Working Party on North Atlantic Salmon met at Charlottenlund, Denmark, from 11 March to 15 March 1974, after preliminary discussions on 8 and 9 March between the Chairman, and Messrs Horsted, May and Møller Jensen on assessments. The following were present at the Working Party meeting:-

| | |
|---------------------------------|---|
| Canada: | W H Lear A W May C P Ruggles |
| Denmark: | O Christensen Sv. Aa. Horsted J Møller Jensen |
| England & Wales: | I R H Allan (Rapporteur) A Swain |
| France: | R Vibert |
| Federal Republic of Germany: | F Thurow |
| Ireland: | Miss E Twomey A E J Went |
| N. Ireland: | K U Vickers |
| Norway: | L Rosseland |
| Scotland: | B B Parrish (Chairman) W R Munro |
| Sweden: | P C Larsson |
| U.S.A.: | V C Anthony |

Mr D Griffith (ICES Statistician) also attended the meeting.

2. The Working Party reviewed the latest information on the West Greenland and Norwegian Sea fisheries and examined the analyses so far carried out on the data provided by the International Salmon Tagging Experiment at West Greenland in 1972. It also considered the latest information on home water catches and future research requirements in relation to its main assessment objectives.
3. Further consideration was given to the preparation of a scientific publication embodying the results of the 1972 International Salmon Tagging Experiment at West Greenland.

B. WEST GREENLAND FISHERY

1. Statistics and composition of the fishery
4. The salmon catches at West Greenland in the years 1960-1972, and the provisional catch for 1973 are given in Table 1. As in recent years, it was not possible to separate the catch by Greenlandic vessels into its drift-net and set gill-net components, but it is likely that the former

was the greater. The provisional catch in 1973 at 2,335 metric tons was 14% higher than the catch in 1972.

5. The number of vessels (excluding Greenland registered vessels) which have taken part in the West Greenland drift-net fishery each year since 1965 are shown below:

| Year | Number of vessels | | | | Total |
|------|-------------------|--------|--------|--------|-------|
| | Denmark | Faroes | Norway | Sweden | |
| 1965 | 0 | 1 | 1 | 0 | 2 |
| 1966 | 0 | 1 | 1 | 0 | 2 |
| 1967 | 4 | 4 | 3 | 0 | 11 |
| 1968 | 10 | 2 | 4 | 1 | 17 |
| 1969 | 15 | 6 | 11 | 2 | 34 |
| 1970 | 13 | 7 | 10 | 1 | 31 |
| 1971 | 11 | 3 | 8 | 0 | 22 |
| 1972 | 12 | 4 | 8 | 0 | 24 |
| 1973 | 11 | 4 | 7 | 0 | 22 |

6. These data show that the number of non-Greenlandic vessels taking part in the drift-net fishery in 1973 was nearly the same as for the two previous years. The catch of these vessels in 1973 was at the same level as in 1972 (761 and 720 metric tons respectively). There was, however, a difference between the non-Greenlandic fisheries in 1972 and 1973 in so far as the distribution of catch per unit effort with time differed: in 1972 this decreased markedly at the end of August, whereas in 1973 the decline was spread more uniformly over the fishing season. In 1972, the fishing effort in October was small and fishing ended in mid-October due to low catch rates, whereas in 1973 fishing activity was high until the fishery ceased in mid-October. Furthermore, whereas the fishery in 1972 started on 1 August (due to uncertainty about the regulations regarding restrictions on the start of the fishing season), in 1973 it started in mid-July.
7. The fishery by Greenlandic vessels was stopped on 27 September to meet ICNAF regulations. Its catch at 1,574 metric tons was 254 metric tons greater than in 1972. The landings by these vessels showed that salmon were rather evenly distributed along the coast. Although fishing effort data are not available for them, their very high catch rates in September could indicate that salmon concentrated in coastal waters at that time. With the closure of the fishery, no information is available from commercial catches on the distribution and abundance of salmon after that date, but fishing surveys by the research vessel "Tornaq" showed them to be present in the Godthab area (Fishing Area IV in Figure 1) until mid-December when

the surveys ceased. This is an unusually late date compared with previous years.

8. The results of age analysis of 3,693 scales collected during the international tagging experiment in 1972 (1,756 from research vessels and 1,937 from commercial vessels) showed a sea-age composition of the exploited salmon stock very similar to that in previous years; 93% of the total research vessel sample and 91% of the commercial vessel sample had a sea age of one sea-winter, the remainder consisting mainly of maiden two-sea-winter fish. The proportion of one-sea-winter salmon decreased, and that of two-sea-winter salmon increased from south to north throughout the total fishing area. In the northern areas (areas I and II of Figure 1) one- and two-sea-winter salmon averaged 86% and 13% respectively, whereas in areas V and VI they averaged 97% and 2% respectively. No two-sea-winter salmon were present in the samples taken from the Labrador Sea (to the south of latitude 60°N). 84% of the fish sampled in the main fishing areas had migrated to sea as two or three year-old smolts, but the samples taken in the Labrador Sea contained a much larger proportion of fish migrating as three, four and five year-old smolts. As in previous years, females predominated in the sampled catch; a sex ratio of 2.8 to 1 in favour of females was found for the one-sea-winter fish and 7.6 to 1 for the two-sea-winter fish.
9. Length measurements and scale samples for age analysis were also collected during the 1973 fishing season, but the latter have yet to be analysed. However, the length data suggest that the age composition of the exploited stock in 1973 was similar to that in 1972 and previous years; ie that one-sea-winter salmon constituted nearly the whole of the stock and catch.

2. Countries of Origin and Mixing of Stocks at West Greenland

10. The results of further investigations and analyses to measure the countries of origin of the salmon stock at West Greenland, and their rates of mixing, were examined by the Working Party. These comprised the analysis of smolt and adult salmon tag recaptures, and studies of blood serum, protein polymorphism, scale characteristics and the parasite fauna of salmon at West Greenland and in home waters.

a) Smolt tag recaptures

11. Recaptures at West Greenland in 1972 of salmon tagged as wild and hatchery reared wild smolts in home waters are given in Tables 2 and 3 respectively, along with those in previous years (the figures in these tables for previous years, presented in earlier reports, have been revised in the light of the most recent recapture data).
12. The Working Party noted in previous reports large variations in recapture rates at West Greenland from different smolt tagging experiments and concluded that a more detailed evaluation of tag returns was needed. A critical review of North American and European smolt tagging experiments has begun with a view to determining their relevance in determining stock origins and mixing at Greenland. Although not completed, preliminary results are reported below.

(i) North America

13. A total of 437 separate smolt tagging experiments has been conducted in North America since 1959. From these, 53 were selected on the basis of number of tagged salmon recaptures (at least 15 salmon recaptures) for detailed analysis. In order to compare these experiments, in which large variations in recapture rates occurred, the recaptures at West Greenland were expressed as a percentage of total tags recaptured from salmon (grilse recaptures were excluded) in all fisheries and from home river escapements. This enabled direct comparison of a wide variety of experiments using both wild and hatchery smolts and eliminated the need to account for the variable nature of tagging mortality and tag loss between different experiments.
14. In the North American salmon examined, the recaptures of smolt tags at Greenland since 1969 have varied from 11 to 75 per cent of the total salmon tag recaptures. Although variations in the Greenland proportion between stocks were noted, the differences are not extreme in any one year, and year to year fluctuations followed similar trends. The proportion of tags recaptured in Greenland varied directly with the size of the Greenland catch.
15. In order to examine the mixing of fish of different North American origins in West Greenland, the expected tag recaptures based on random distribution in the 1972 total Greenland catch in three separate Greenland areas was compared with the observed recaptures from three

separate North American area groups. The North American groups considered were USA, Miramichi and part-Quebec (including Restigouche). Recaptures from the USA and Miramichi groups were taken in greater frequencies in Area VI (Figure 1) than would be expected on the basis of catch figures and random distribution ($p. <.001$). In addition, there was a significant difference ($p. <.01$) between the Miramichi group and the USA group in terms of the degree to which they departed from the ratios expected on the basis of catches. The Miramichi group contributed at about twice the rate in Area VI as did the USA group. Each of the three North American groups differed significantly ($p. <.01 > .001$) in their distribution from the others at West Greenland.

16. The expected frequency of occurrence in the Greenland fishery during three time periods (August, September and October) was also examined for the three area groups described above. The expected frequencies were calculated on the basis of the non-Greenlandic drift-net fishery in 1972 which represented about 33% of the total Greenland catch. All three groups were taken at lower than expected frequencies during August and higher than expected frequencies during September ($p. < .001$). The individual groups examined did not differ significantly among themselves with respect to the expected time of recapture at West Greenland. The October recaptures of USA and Miramichi groups were taken at higher than expected frequencies for that month ($p. < .001$).

(ii) Europe

17. Smolt tagging experiments relevant to the West Greenland salmon fishery have been carried out in Europe for a number of years. Since 1960, wild smolts have been tagged annually in appreciable numbers in Scotland, England and Wales and Norway, and more recently smaller numbers in Ireland, France, Iceland and Sweden.
18. During these years, the largest European contributions of salmon to the West Greenland fishery, on the evidence of tag recaptures, have been from Scotland and England and Wales. In Scotland, all the smolt tagging experiments have been carried out on east coast rivers while in England and Wales most of the tagging was done in rivers in the south and south-west of the country. In recent years a high tag recapture rate off West Greenland has been reported from smolts tagged in a river in south-

west France, but the overall French contribution to the West Greenland fishery cannot be very large.

19. In some of the rivers in the United Kingdom where tagging experiments have been carried out over a number of years, the proportion of tags recaptured at Greenland has, like some of the North American stocks examined, varied directly with the size of the Greenland catch. In one of the rivers in southwest England, however, this feature is not evident over the period since 1960. In the Greenland catch for 1971, for instance, the recapture rate of smolts tagged in 1970 was considerably lower than the corresponding figure for the previous year, although the commercial catch off Greenland was appreciably higher in 1971.
20. By comparing the expected tag recaptures based on random distribution in the 1972 total Greenland catch with the observed data, it was seen that the stock from the combined England and Wales rivers was taken in a greater frequency in Area VI than would be expected and in a lower frequency in the middle Areas III to V. A similar distribution was found for a number of Scottish rivers.
21. Although large numbers of hatchery-reared smolts have been tagged in some European countries during the same period the recapture rate of these fish off West Greenland has been extremely low. Except for Scandinavian countries (especially Norway and Sweden) the recapture rate in home waters has also been significantly lower than for wild smolts. The recapture rate of hatchery-reared smolts in home waters, particularly as grilse, in Norway and Sweden has been high.

b) Adult tagging at West Greenland

22. As reported last year, an International Salmon Tagging Experiment was conducted at West Greenland in the period 30 July to 16 October 1972. A detailed report on it is in preparation, but the results of analyses of the recaptures obtained so far, relating to the home waters origin and mixing of salmon at West Greenland, are summarised below.
23. A total of 2,364 salmon were tagged in the period 30 July to 16 October from five research vessels and eight commercial fishing vessels. Reported recaptures from this experiment up to 31 December 1973 are given in the following table.

Recaptures from the 1972 tagging experiment by country, the recaptures outside Greenland being from the year 1973.

| <u>Country</u> | <u>Number</u> | | <u>Percentage</u> |
|-----------------|---------------|-------------|-------------------|
| | <u>1972</u> | <u>1973</u> | |
| West Greenland | 153 | 4 | 76.5 |
| Canada | | 11 | 5.4 |
| England & Wales | | 8 | 3.9 |
| France | | 2 | 1.0 |
| Ireland | | 7 | 3.4 |
| Scotland | | 19 | 9.3 |
| Spain | | 1 | 0.5 |
| Total | <u>153</u> | <u>52</u> | <u>100.0</u> |

24. These data show that of the total number of reported recaptures at West Greenland, 153 were made during the 1972 fishing season and four during the 1973 season. This was in accordance with expectation from the observed age composition of the exploited stock at West Greenland (see section 2), which comprised mainly fish in their second sea-year, with a small proportion in their third sea-year.
25. As shown above, the total number of recaptures outside Greenland in 1973 was 48, 11 from Canada, and 37 from Europe. Although it is possible that a small proportion of the fish recaptured in European coastal waters may have been intercepted en route to other home waters, in view of the fact that earlier experiments have indicated a relatively low level of exchange of adult fish as between, for example, Great Britain and Ireland and Great Britain and Norway, one can assume that each of the recoveries in each European country represents a return to the rivers of that country.
26. The proportions of North American and European recaptures, 23% and 77% respectively, in the total home waters recaptures in 1973 are very close to those found from the results of biochemical studies on salmon at West Greenland in 1972 (see Section 2.c). It must be borne in mind, however, that since the numbers of recaptures in home waters will be a function of the exploitation rate in each country's fishery a direct comparison of the proportions recaptured in each country may well not provide a correct measure of the mixing rates of their salmon at West Greenland except where exploitation rates are the same. Too few data are available on these rates in different countries for reliable adjustments to be made to the recapture data.
27. In addition to the home waters recaptures in 1973, by 15 March four additional fish had been recaptured as three-sea-winter salmon in 1974,

one in England and three in Scotland (further home waters recaptures may be taken in the home waters fisheries in 1974).

28. The home waters recaptures of salmon tagged at West Greenland in experiments conducted in the years 1965-1971, prior to the 1972 experiment, are given in Table 5. The combined recaptures from these experiments show a higher proportion from North American than from the 1972 experiment. In these earlier experiments Canadian recaptures amounted to 44% of the total from home waters compared with 23% for the 1972 experiment. This suggests that the composition of the stock exploited at West Greenland (as regards country of origin) may vary widely.

29. Tags were recaptured from the 1972 and earlier experiments at West Greenland in each of the main European salmon producing countries except Norway, Sweden, Iceland and the USSR. This is in conformity with the smolt tag recapture data at West Greenland, reported previously, and provides further evidence that salmon from these countries, especially Norway, constitute a very small part of the West Greenland stock. The recaptures again confirm that the stock is composed principally of salmon originating from and, if surviving, returning to Canada and the British Isles.

c) Biochemical Studies

30. In a previous report (ICES Coop. Res. Rep. No. 35) provisional results were presented of Canadian blood serum protein studies relating to the mixing rates at West Greenland of salmon of North American and European origin. They suggested that in 1970, the West Greenland stock was composed of North American and European salmon in about equal proportions. Since that time new investigations have been undertaken in Canada, on the polymorphism of serum transferrins. Results of these studies giving the proportions of North American and European salmon in the West Greenland stock were presented in document No. 14. The method utilises geographical discontinuities in the distribution of the alleles at the Tf locums in home river salmon populations.

31. The results of these investigations show marked annual variations in the proportions of salmon of North American origin in the West Greenland stock. They give estimates of 23%, 53% and 20% for the years 1970, 1971 and 1972 respectively, indicating that the major contribution to the stock in recent years has been from European rivers, although other sources

suggest that the North American proportion was much higher in earlier years. The results also suggest that the contribution from different salmon-producing regions in Europe and North America also varies from year to year; in 1970 there was a higher than usual contribution from SW England, and in 1971 there was a larger than usual contribution from Labrador rivers.

32. Preliminary results of English investigations suggest that it may also be possible to identify stocks of salmon on the basis of biochemical differences in serum enzymes. Malate and lactate dehydrogenase and phosphohexose isomerase appear to be the most promising in this regard.

d) Scale Studies

33. A discriminant function analysis based on two scale characters: viz:- width of the first sea zone and the number of circuli in the first sea zone, with a theoretical efficiency of 85.6% was applied to salmon scales collected at West Greenland and the Labrador Sea during autumn 1969-72 and Labrador Sea during spring 1970-72. Estimates of the proportions of North American salmon at West Greenland were as follows: 46% (1969), 34% (1970), 32% (1971) and 35% (1972). The discrepancy between the estimates from biochemical and scale studies during 1971 is possibly due to sampling error since no blood samples were collected from 80 fish taken in the northern area, for which there were scale samples and of which 82% were estimated from the scales to be of European origin. Estimates of the North American proportions in the Labrador Sea samples during autumn were 50% (1969), 32% (1970), 29% (1971) and 74% (1972). North American proportions in the Labrador Sea during spring were estimated at 83% (1970), 89% (1971) and 72% (1972).

e) Parasite Studies

34. Analysis of the series of observations on the parasite fauna of salmon in home waters in North America and Europe show that none of the species of parasites which had discontinuous geographic distributions were abundant enough to serve as biological tags for estimating the proportions of North American and European salmon stocks off West Greenland. Two species which were abundant enough for detailed statistical analysis (Eubothrium crassum and Anisakis simplex) displayed too much geographic and annual variations to be of any value in the study. Therefore, despite the discontinuities observed,

parasites must be considered to be of little value in estimating the proportions of major home waters salmon stocks in the West Greenland fishery.

f) Summary

35. The results of the different investigations presented above suggest that the proportions of North American and European salmon making up the West Greenland stock has varied widely during the period since the commencement of the fishery in the early 1960's. Although the estimates of their respective proportions in the stock are not the same from all sources of data, the overall results suggest that in the years 1970 and 1972 the proportions of North American fish present ranged possibly from as low as 20% to as high as 50%. Evidence from smolt ages and from home waters recaptures of salmon tagged at West Greenland suggest that prior to 1970 this proportion may have been higher than 50%. It must be emphasised that these estimates refer only to the changes in the relative amounts of North American and European salmon in the West Greenland stock, and therefore do not necessarily reflect changes in the absolute quantities from each region present in the stock.

3. Assessments of Effects of West Greenland Fishery on Home Waters Stocks and Catches

36. Previous assessments by the Working Party of the direct effects of the West Greenland fishery on home water stocks and catches have been based on estimating the changes in weight, through natural mortality and growth, which would have occurred to the number of salmon in the West Greenland catch had they not been caught there and, if surviving, had returned to home waters in North America or Europe as two or more sea-winter salmon. The precision with which these effects could be estimated was limited by lack of knowledge of the natural mortality occurring between the time the salmon leave the West Greenland fishing area and their return to home waters, and it was, therefore, necessary to use lower and upper limiting values for this parameter, within which the true value was considered to lie. Instantaneous natural mortality rates of 0.01 and 0.1 per month respectively were used in the assessment which, for a West Greenland catch of 2,000 tons, gave lower and upper estimates of the losses in weight to the combined North American and European home waters stocks, supplying salmon to the exploited stock at West Greenland of 1,100 and 2,700 metric tons respectively, and to

- their combined catches of 650 and 1,600 metric tons respectively (ICES Coop. Res. Rep., Nos. 8, 11 and 35).
37. These assessments were reviewed by the Working Party in the light of the latest data available at the present meeting, especially the recaptures at West Greenland and in home waters of salmon tagged in the International Tagging Experiment in 1972. An analysis of these recaptures was made using a simulation model of the population of tagged fish (details given in Doc. No. 18). This gave a best estimate of the exploitation rate by the West Greenland fishery (i.e. the proportion of the salmon population present at the beginning of the West Greenland fishing season caught by the fishery) in 1972 of 33%. Values of exploitation rate around this level and lower and upper values of other parameters (see Table 6) were then used in a further simulation study, giving estimates of home waters catches of two or more sea-winter salmon and of the natural losses between West Greenland and home waters (details of this simulation model, modified in the present report, are given in ICNAF Res. Doc. 71/72).
38. The results of these calculations, given in Table 6, show a wide range of estimated natural loss rates for the different combinations of parameters used in the analysis. However, the above estimate of exploitation rate from the analysis of the tag recapture data, and the available information on the other parameters suggest that these estimates are not all equally likely. It suggests that the estimates corresponding to a West Greenland exploitation rate of between 30 and 35%, an increase in weight between West Greenland and home waters of 50%, a home waters exploitation rate of 60% and the proportion of the stock not visiting West Greenland of 10-20% are in closest conformity with the available facts. This indicates that the natural mortality rate between West Greenland and home waters probably lies in the range of 15-40%. Further support for these values was provided by the results of back calculations of the West Greenland catch from a total home waters catch of 3,000 metric tons and a range of values of natural loss rate between West Greenland and home waters and of exploitation at West Greenland. They showed that a West Greenland exploitation rate of between 30 and 40% and natural loss rates between about 15 and 40% provide a reasonable fit to the observed catch data in recent years. In addition, the observed recaptures at West Greenland in 1973 and in home waters in

1974 of fish tagged in the international experiment in 1972 are in keeping with these values of parameters.

39. These values of natural loss rates between West Greenland and home waters were therefore used to provide revised lower and upper limiting estimates of the direct effects on home water stocks and catches for different levels of catch taken by the West Greenland fishery, using the same method of estimation as in the earlier assessments referred to in paragraph 36. The results are shown graphically in Figure 2. They indicate that the West Greenland fishery causes losses in home waters stocks and catches, which are directly proportional to the magnitude of the West Greenland catch and that for a catch of 2,000 metric tons, the approximate level in recent years, the estimated loss to the total home waters stock of two or more sea-winter salmon lies between 1,800 and 2,550 metric tons, and to the catch of all countries combined between 1,080 and 1,530 metric tons. This range of losses is considerably narrower than that estimated previously.
40. It is emphasized that these estimates of losses represent the differences between the home waters stocks and catches of each year class of two or more sea-winter salmon in the presence of the West Greenland fishery and what they would have been in its absence. They therefore constitute only the immediate direct effects of the West Greenland fishery and take no account of its possible longer-term effects on smolt production and year class strength through decreases in spawning stock size. As previously reported (ICES Coop. Res. Rep. No. 35) significant decreases in spawning stock size and smolt production have been observed in some river systems in recent years, especially in Canada, which might be due in part to exploitation at West Greenland, but too few data are available on these parameters in the home waters stocks as a whole for these longer-term effects to be assessed.
41. Though it is not possible to assign the above home waters losses among countries or river systems, the Working Party has in the past assigned these between North America (mainly Canada) and Europe (mainly the British Isles) on the basis of evidence indicating a roughly equal contribution to West Greenland from each of these areas. However, evidence presented at this meeting indicates that the relative contribution to the West Greenland stock is variable from year to year.

between North America and Europe. As indicated in Section B.2, in 1972 the estimated proportion present from North America ranged from a low of 20% (based on biochemical analysis of blood and on tag returns from the International Tagging Experiment) to a high of 35% (based on scale analysis). On this basis the estimated loss to the North American home waters catch of two or more sea-winter salmon in 1973 as a result of the catch at West Greenland of 2,040 tons in 1972 was between 220 and 546 metric tons and that for the European home waters catch was between 715 and 1,248 metric tons. It must be emphasized that the apportionment of the losses between North America and Europe will vary from year to year depending on the relative proportions of the salmon at West Greenland originating from the two continents, which does not appear to be constant.

C. NORWEGIAN SEA FISHERY

1. Statistics of Fishery and Composition of Catches in Long Line Fishery in Norwegian Sea

42. In 1973 the long-line fishery in the Norwegian Sea (outside Norwegian fishery limits) was pursued principally by Norwegian and Danish vessels in the area between latitudes 68° and 73° N and between the Greenwich meridian and longitudes 20° E. The area fished by Danish vessels is shown in Figure 3. The fishing area similar to the two previous seasons, i.e. since the introduction of regulatory measures for the long-line fishery. The regulation also involved a restriction of the fishing season to the period 6 May-30 June.
43. Provisional catch statistics and the number of vessels participating in the fishery in 1973 are given in Table 7, together with the corresponding data for previous years. These data indicate that the catch in 1973 (561 metric tons), in spite of a decrease in number of vessels was somewhat larger than in 1971 and 1972 (488 and 515 metric tons respectively), but considerably smaller than in the years immediately before the introduction of closed season/area and other regulations in 1971.
44. Estimates of average catch-per-unit-effort, expressed as number of salmon per 1,000 hooks, are given below for Danish vessels fishing in the "open" fishing area between latitudes 68 and 74° N and longitudes 0 and 22° E in May and first half of June in each of the years 1969-73 (in the years 1971-73 when owing to the closed season regulation the fishery did not open until 6 May, the catch-per-unit-effort in the period 1-5 May was

assumed to be the same as in the following week, 6-10 May). Figures in brackets refer to the number of salmon caught by the sampled vessels.

| Year | Period | |
|------|------------|-------------|
| | 1 - 31 May | 1 - 15 June |
| 1969 | 44(17,378) | 28(4,721) |
| 1970 | 41(10,791) | 17(257) |
| 1971 | 40(23,285) | 26(6,584) |
| 1972 | 42(31,337) | 30(6,814) |
| 1973 | 80(28,139) | 48(6,555) |

45. These data show that in 1973 the catch-per-unit-effort was approximately double that in the previous four years, during which it showed little variation. This accounts for the larger catch in 1973 than in the two previous years despite the decrease in the number of vessels taking part in the fishery. Unusually favourable weather conditions for long-lining in May-June 1973 contributed to the high catch rates but they probably also reflect a higher stock abundance in 1973.
46. The catch taken in the long-line fishery in 1973 consisted principally (about 85%) of two-sea-winter salmon; one sea winter fish constituted about 12% of the catch. These data are in conformity with those of previous years and indicate that the effects of the long-line fishery on the numbers and weight of salmon returning to home waters are mainly confined to the two-or-more-sea-winter component of the total stock.

2. Origin and Destination of Salmon in Norwegian Sea Stock

47. Further recaptures in the long-line fishery in 1973 of salmon tagged as smolts in Norwegian rivers (given in Tables 2 and 3), and in home waters of salmon tagged in the long-line fishery (Table 8), indicate that, as in previous years, the salmon stock exploited in the Norwegian Sea was composed of fish originating and returning to rivers in Norway, and, to a smaller extent, the USSR. The component of USSR-salmon in the Norwegian Sea may however be slightly larger than reflected by the proportion of recaptures in USSR home waters of salmon tagged in the sea, as the rate of exploitation in the home water fishery is probably higher in Norway than in the USSR. No smolts tagged in other major European salmon producing countries have been recaptured subsequently in the Norwegian Sea fishery (excluding that at the Faroes - see below), and no recaptures of salmon tagged in the long-line fishery have been reported from these countries. These data, and the relative small

numbers of recaptures at West Greenland of salmon tagged as smolt in Norwegian rivers (Tables 2 and 3) suggest that most of the salmon returning to Norwegian and USSR rivers as two-sea-winter fish have a different sea distribution in their second sea-year to those returning to other major European salmon producing countries and that therefore the effects of the Norwegian Sea long-line fishery will be confined mainly to the Norwegian, USSR, and possibly also to a limited extent, the Swedish west coast stocks.

3. Assessment of Effects of Norwegian Sea Fishery on Home Waters Stocks and Catches

48. In previous years the assessment of the direct effect of the long-line fishery off Norway on home water catches was approached, using data on the increase in weight of the fish from the period of peak fishing offshore to the period of peak fishing in Norwegian coastal waters and on the proportion of the fish present in the fished area which, if not caught there, would subsequently be caught in the home waters fishery. On this basis it was concluded that the long-line fishery caused a loss to the total weight of fish returning to home waters which was approximately equal to the magnitude of the long-line catch. New information for 1973 on the growth between the fish being exploited in the long-line fishery and their return to home waters provide no grounds for modifying this conclusion. It therefore follows that the long-line fishery in 1973 resulted in a loss of about 550 metric tons in the quantity of salmon returning to home waters (mainly in Norway), compared with what it would have been in the absence of that fishery. The corresponding losses to the home waters catches is estimated at between 275 and 410 metric tons (using lower and upper values of home-waters exploitation rates of 0.5 and 0.75 respectively.

4. Long-Line Fishing at the Faroes

49. In addition to the main long-line fishery in the Norwegian Sea, in May-June 1973 a catch of 28 metric tons was taken by five Faroese long-line vessels fishing in the vicinity of the Faroe Islands (fishing area shown in Figure 2). This was a larger catch from this area than in previous years. The average weight of the salmon in the catch indicates that it was comprised mainly of two-or-more-sea-winter salmon. This is in contrast with a research catch made in Faroese waters in April-May which consisted mainly (85%) of 1-sea winter fish, as was the case with

research catches made in previous years.

50. The recapture of a fish tagged as a smolt in Sweden was reported from the commercial catch and one tagged as a smolt in Norway was reported from the research vessel catch, bringing the total number of reported smolt recaptures from the Faroes in the years 1968-73 to 22 (10 liberated in Norway, 6 in Sweden (west coast), 4 in Scotland, 1 in Ireland and 1 in Iceland).
51. As shown in Table 9, a further 280 salmon were tagged from a research vessel catch at the Faroes in April-May 1973. Of these, 11 were subsequently recaptured in home waters (5 in Norway, 1 in England, 3 in Scotland and 2 in Ireland). These data provide additional evidence to that reported previously that the salmon stock in the Faroes area is of mixed origin and subsequent destination.

D. HOME WATERS FISHERIES

52. Provisional catch statistics for the home waters salmon fisheries in 1973, and those for the years 1960-1972, are given in Table 10; data on catch-per-unit-effort are given in Table 11. Features of the fisheries and exploited stocks in each of the main salmon producing countries are summarised below.

a) Canada

53. In 1973 the total home water commercial (salmon plus grilse) catch increased to 2,165 metric tons from the 1972 level of 1,525 metric tons. This was due to the increased catch of both salmon and grilse at Newfoundland and Labrador. Catches in Quebec and the Maritimes were low due to a commercial fishing ban in the most productive fishing areas of New Brunswick and Quebec, including the Miramichi, Restigouche and St. John rivers. In areas where the commercial fishing ban was in effect, spawning escapements of early-run large salmon decreased slightly below the 1972 level. However, the late-run of large salmon to the Miramichi increased over the 1972 level but was still much below the 1954-60 average. Spawning escapements into the Miramichi, Restigouche and St John river systems are still well below those believed to be necessary for adequate seeding of the rivers.

b) Scotland

54. The provisional statistics for 1973 indicate that the catches of both grilse and salmon were larger than in 1972. The grilse catch, at 824 metric tons, was the highest since the peak grilse year 1969, while the salmon catch, at 1,103 metric tons, was the highest since 1967. The combined grilse and salmon catch, at 1,927 metric tons, was also the highest since 1969.
55. An analysis of Scottish grilse and salmon catch statistics in the period from 1952 (presented in Doc. No. 1) showed a significant upward trend in the annual catch of grilse during the period, which reached peaks in 1967 and 1969, while salmon catches fluctuated annually without trend, although they declined from 1967-71. As a result of the increase in grilse catch, there was a significant upward trend in the combined grilse and salmon catches and in the grilse/salmon ratio during this period.
56. Monthly catch data during this period show that there has been a significant decrease in the catches of salmon in the "spring" fishery (February-April) but an increase in the "summer" (July-September) fishery. While the average weight of salmon has not varied significantly during the period, that of grilse has increased.

c) England and Wales

57. The total salmon and grilse catch for the 1973 season in England and Wales amounted to approximately 453 metric tons which was 11 tons more than in 1972. As in previous years, a large proportion of the total catch was taken by nets in the northeast of England. With this northeast contribution excluded, the net catch for the remainder of England and Wales changed very little in the years 1962 to 1973. The angling catch, however, was considerably reduced from 1968 onwards, which may be due, at least in part, to the advent of UDN disease.
58. An estimate of the proportions of grilse and salmon in the catches has only been possible since 1969. The proportions for the years 1969 and 1971 to 1973 have been fairly constant with ratios (by weight) varying between 2.3 and 2.7 to 1 in favour of salmon. However, in 1970 the grilse catch increased to an extent such that the proportion of salmon to grilse was reduced 1.4 to 1. It must be emphasized, however, that the estimates are very approximate for all years so that only well-marked changes in the grilse-salmon proportion could be reported with any degree of reliability.

d) Ireland

59. Catches in 1973 showed a further increase of 123 metric tons over those for 1972, and this was reflected in both the salmon and grilse catches. The increase was 22% for salmon and 4% for grilse. The peak of the run of grilse was in June almost three weeks earlier than in a number of previous years. The coastal drift-nets had the highest recorded catch to date and this was attributed to the fact that grilse were more abundant in coastal waters than hitherto. The estuarine nets, however, showed a reduction in catch and this could be attributed to a decrease in effort and to operational difficulties owing to high water which prevailed during most of the fishing season. The escapement into fresh water in most areas was also considered to be above average, based on counts in a number of river systems. Accurate statistics of rod catches are difficult to obtain but on the best information available they appear to have been less in 1973 than in 1972.

e) Northern Ireland

60. The 1973 commercial catch of salmon and grilse which includes 50% of the Foyle catch, fell to 182 metric tons, compared with 232 metric tons for 1972 and with the 10 year average of 292 metric tons. The catch was almost entirely grilse, the salmon element not exceeding 10% of the total. The decreased catch in 1973 was due to the continuing reduction in the Foyle catch and poor catches in the Rivers Bann and Bush. Coastal fixed net catches were, however, good.

f) Norway

61. In the years 1967-1970 the Norwegian home waters catch dropped from 1,960 tons in 1967 to 1,170 tons in 1970. In 1971 it increased slightly and in 1972 by as much as about 360 tons, from 1,208 in 1971 to 1,568 tons in 1972. The provisional statistics for 1973 indicate a further substantial increase to 1,735 tons. This increase of about 170 tons seems to be due mainly to a larger component of two-sea-winter fish in the stocks and improved catches in the rivers. The grilse catches were at about the same level in 1973 as in the previous year. The drift-net catches, however, decreased by some 30 tons from those taken in 1972. The catch per bag net decreased slightly, from 158 kg per net in 1972 to 151 kg in 1973.

62. In summary, the total (grilse + salmon) catches in the main home waters fisheries on both sides of the North Atlantic were appreciably larger in 1973 than in 1972. Only in Northern Ireland, where the catches consist almost entirely of grilse, was the total catch appreciably lower than in 1972 (although statistics of 1973 catches are not available for Iceland and USSR). In most countries for which the grilse and salmon catches are recorded separately, the catches of both the grilse and salmon components increased in 1973, but the increase in salmon catch was particularly marked in Canada, Norway and Scotland.

E. PREPARATION OF SCIENTIFIC REPORT ON INTERNATIONAL TAGGING EXPERIMENT

63. The Working Party considered further and endorsed the provisional plans drawn up at its last meeting for the preparation of a detailed scientific publication on the international West Greenland tagging experiment in 1972 and other associated investigations, including the assessment work. The Working Party noted that sufficient money remains in the tagging fund to meet the cost of 200-250 pages and it recommends that it be issued as a special volume of the ICES Rapports et Proces Verbaux.
64. The main topics to be included in the publication, and the authors of the contributions on them were decided. It was agreed that these should include a survey by the ICES Hydrographic Office of the hydrographic situation in the West Greenland area in 1972 in comparison with previous years, a summary of which was presented at the Working Party meeting (Document No. 37). This showed that surface temperatures in 1972 were low, as in recent years, and that there was a marked change in the depth of the homogenous water layer (mixed layer depth) at the end of August, which coincided with a sharp decrease in catch-per-unit-effort in the offshore drift-net fishery.
65. Mr Horsted, Dr May and Mr Parrish were appointed to form an editorial group for the publication. It was agreed that the group, in consultation with members of the Working Party, should also consider the preparation of a brief popularised account of the Working Party's work for publication in the Trade Press.

F. FUTURE RESEARCH

66. The Working Party endorsed the recommendations made in its 1973 Report (ICNAF Summ. Doc. 73/7) on research priorities relating to the assessment of the effects of the high seas fisheries on home waters stocks and catches. Of particular importance in this respect are the following:-
- (a) the measurement of exploitation rates in home waters fisheries.
 - (b) the relationship between stock size and recruitment and the genetic and other factors governing the production of grilse and salmon.
 - (c) the identification of unit stocks and their rates of mixing in the sea fishing areas.
67. The Working Party recommends that results of research on these problems be reported at the annual meetings of ICES and ICNAF.

G. NEXT MEETING

68. The Working Party agreed that unless some specific requests for further scientific information and advice relating to its main remit arise at the forthcoming meetings of ICNAF or ICES, it would be unnecessary for it to meet in the coming year.

Table 1. Catches at West Greenland, 1960-73, in metric tons, round fresh weight. (Based on data available at 15 March 1974).

| Year | Drift Net | | | | Gill Net and Drift Net | |
|-------------------|----------------|--------|--------|---------|------------------------|-------------------|
| | Norway | Faroes | Sweden | Denmark | Greenland ^d | Total |
| 1960 | 0 | 0 | 0 | 0 | 60 | 60 |
| 1961 | 0 | 0 | 0 | 0 | 127 | 127 |
| 1962 | 0 | 0 | 0 | 0 | 244 | 244 |
| 1963 | 0 | 0 | 0 | 0 | 466 | 466 |
| 1964 | 0 | 0 | 0 | 0 | 1539 | 1539 |
| 1965 | - ^a | 36 | 0 | 0 | 825 | 861 |
| 1966 | 32 | 87 | 0 | 0 | 1251 | 1370 |
| 1967 | 78 | 155 | 0 | 85 | 1283 | 1601 |
| 1968 | 138 | 134 | 4 | 272 | 579 | 1127 |
| 1969 | 250 | 215 | 30 | 355 | 1360(385) ^d | 2210 |
| 1970 | 270 | 259 | 8 | 358 | 1244 | 2146 ^c |
| 1971 | 340 | 255 | 0 | 645 | 1449 | 2689 |
| 1972 | 175 | 144 | 0 | 401 | 1320 | 2040 |
| 1973 ^b | 212 | 164 | 0 | 385 | 1574 | 2335 |

- a - Figures not available, but catch is known to be less than Faroos
- b - Provisional
- c - Including 7 metric tons caught on long-line by one of two Greenland vessels in the northern Labrador Sea early in 1970.
- d - Up to 1968, gill net only, after 1968 gill net and drift net. The figures in brackets for the 1969 catch are an estimate of the minimum drift net catch.

Table 2. Number of natural (wild) smolts tagged in the years 1963-1973 and recaptured in West Greenland and in other areas, including home waters, up to March 1974. Figures in brackets are returns per thousand tagged. (0 = No smolts tagged, or no recaptures made; - = no information available).

| Country | Year of Tagging | Number Tagged | West Greenland | Recaptures | | All Other Areas | | Grand Total |
|----------|-----------------|---------------|----------------|--------------------------|--------|-----------------|-------|-------------|
| | | | | Norwegian Sea and Faroos | Grilse | Salmon | Total | |
| Canada | 1963 | 5,850 | 11(1.9) | 0 | 70 | 20(3.4) | 90 | 101 |
| | 1964 | 15,013 | 9(0.6) | 0 | 204 | 72(4.8) | 276 | 285 |
| | 1965 | 16,485 | 73(4.4) | 0 | 175 | 193(11.7) | 368 | 441 |
| | 1966 | 9,509 | 25(2.6) | 0 | 120 | 105(11.0) | 225 | 250 |
| | 1967 | 17,809 | 17(1.0) | 0 | 121 | 167(9.4) | 288 | 305 |
| | 1968 | 55,784 | 132(2.4) | 0 | 1,216 | 425(7.6) | 1,641 | 1,773 |
| | 1969 | 42,879 | 85(2.0) | 0 | 376 | 183(4.3) | 559 | 644 |
| | 1970 | 37,124 | 168(4.5) | 0 | 313 | 151(4.1) | 464 | 632 |
| | 1971 | 45,564 | 100(2.2) | 0 | 418 | 139(3.1) | 557 | 657 |
| | 1972 | 23,752 | 19(0.8) | 0 | 201 | - | 201 | 220 |
| | 1973 | 17,308 | - | - | - | - | - | - |
| Scotland | 1963 | 10,998 | 10(0.9) | 0 | 172 | 92(8.4) | 264 | 274 |
| | 1964 | 9,200 | 6(0.7) | 0 | 110 | 66(7.2) | 176 | 182 |
| | 1965 | 9,239 | 10(1.1) | 0 | 73 | 49(5.3) | 122 | 132 |
| | 1966 | 15,406 | 30(1.9) | 0 | 280 | 39(2.5) | 319 | 349 |
| | 1967 | 21,002 | 23(1.1) | 1 ^a | 169 | 71(3.4) | 240 | 264 |
| | 1968 | 15,695 | 16(1.0) | 0 | 127 | 33(2.1) | 160 | 176 |
| | 1969 | 15,958 | 51(3.2) | 0 ^b | 217 | 55(3.4) | 272 | 323 |
| | 1970 | 32,071 | 152(4.7) | 2 ^b | 560 | 174(5.4) | 734 | 888 |
| | 1971 | 20,706 | 137(6.6) | 2 ^c | 615 | 216(10.4) | 831 | 970 |
| | 1972 | 19,883 | 137(6.9) | 0 | 757 | - | 757 | 894 |
| | 1973 | 26,949 | - | - | - | - | - | - |

^a Faroos

^b one from Norwegian coast and one reported from France as having been received from Norway

^c one Faroos; one reported from Norway (site of capture not known)

/continued

Table 2 (Continued)

| Country | Year of Tagging | Number Tagged | Recaptures | | | | | Grand Total |
|-------------------|-----------------|------------------|----------------|--------------------------|--------|----------|-------|------------------|
| | | | West Greenland | Norwegian Sea and Faroes | Grilse | Salmon | Total | |
| England and Wales | 1963 | 9,485 | 8(0.8) | 0 | 15 | 38(4.0) | 53 | 61 |
| | 1964 | 17,105 | 10(0.6) | 0 | 30 | 97(5.7) | 127 | 137 |
| | 1965 | 5,873 | 12(2.0) | 0 | 35 | 57(9.7) | 92 | 104 |
| | 1966 | 3,219 | 5(1.6) | 0 | 28 | 37(11.5) | 65 | 70 |
| | 1967 | 4,117 | 10(2.4) | 0 | 23 | 56(13.6) | 79 | 89 |
| | 1968 | 5,789 | 24(4.1) | 0 | 44 | 51(8.8) | 95 | 119 |
| | 1969 | 8,515 | 49(5.8) | 0 | 35 | 41(4.8) | 76 | 125 |
| | 1970 | 7,304 | 28(3.8) | 0 | 29 | 29(4.0) | 58 | 86 |
| | 1971 | 5,680 | 20(3.5) | 0 | 30 | 16(2.8) | 46 | 66 |
| | 1972 | 2,473 | 7(2.8) | 0 | 10 | - | 10 | 17 |
| 1973 | 2,680 | - | - | - | - | - | - | |
| Norway | 1963 | 97 | 0 | 0 | 0 | 4(41.2) | 4 | 4 |
| | 1964 | 1,485 | 0 | 0 | 67 | 26(17.5) | 93 | 93 |
| | 1965 | 2,178 | 0 | 0 | 40 | 18(8.3) | 58 | 58 |
| | 1966 | 1,362 | 0 | 2 | 27 | 16(11.7) | 43 | 45 ^x |
| | 1967 | 3,601 | 0 | 4 | 59 | 26(7.2) | 85 | 93 ^x |
| | 1968 | 3,562 | 0 | 3 | 106 | 21(5.9) | 127 | 134 ^x |
| | 1969 | 4,273 | 3(0.7) | 3 | 83 | 30(7.0) | 113 | 124 ^x |
| | 1970 | 7,603 | 3(0.4) | 4 | 234 | 93(12.2) | 327 | 337 ^x |
| | 1971 | 5,573 | 0 | 3 | 319 | 62(11.1) | 381 | 386 ^x |
| | 1972 | 4,445 | - | 8 | 323 | - | 323 | 331 |
| 1973 | 5,500 | - | - | - | - | - | - | |
| Iceland | 1963 | 63 | 0 | 0 | 2 | 0 | 2 | 2 |
| | 1964 | 63 | 0 | 0 | 0 | 1(15.9) | 1 | 1 |
| | 1965 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1966 | 83 | 0 | 0 | 0 | 2(24.0) | 2 | 2 |
| | 1967 | 154 | 0 | 0 | 2 | 1(6.5) | 3 | 5 |
| | 1968 | 59 | 0 | 0 | 1 | 1(17.0) | 2 | 2 |
| | 1969 | 15 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1970 | 16 | 0 | - | - | - | - | - |
| Ireland | 1968 | 606 | 0 | 0 | 21 | 0 | 21 | 21 |
| | 1969 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1970 | 1,403 | 5(3.6) | 0 | 1 | 1(0.7) | 2 | 7 |
| | 1971 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1972 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1973 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweden | 1969 | 885 | 0 | 0 | 69 | 16(18.0) | 85 | 85 |
| | 1973 | 400 | - | - | - | - | - | - |
| USSR | 1969 | 500 | 0 | 0 | 0 | 0 | 0 | 0 |
| France | 1969 | 2,089 | 15(7.1) | 0 | 0 | 4(1.9) | 4 | 19 |
| | 1970 | 3,968 | 27(6.8) | 0 | 3 | 13(3.3) | 16 | 43 |
| | 1971 | 4,702 | 10(2.1) | 0 | 0 | 5(1.1) | 5 | 15 |
| | 1972 | 1,983 | 0 | 0 | 0 | - | - | - |
| | 1973 | 3,903 | - | - | - | - | - | - |
| Greenland | 1970 | 155 ^b | 7(45.2) | 0 | 0 | 0 | 7 | 7 |
| | 1971 | 136 ^b | 0 | 0 | 0 | - | 0 | 0 |
| | 1973 | 21 ^b | - | - | - | - | - | - |

x) including some fish from unknown localities.

b) -wild parr

Table 3. Number of hatchery-reared smolts tagged in the years 1963-1973 and recaptured in West Greenland and in other areas, including home waters, up to March 1974. Figures in brackets are returns per thousand tagged. (0 = No smolts tagged, or no recaptures made; - = no information available).

| <u>Country</u> | <u>Year of Tagging</u> | <u>Number Tagged</u> | <u>West Greenland</u> | <u>Recaptures</u> | | | <u>Total</u> | <u>Grand Total</u> |
|-------------------|------------------------|----------------------|-----------------------|---------------------------------|------------------------|---------------|--------------|--------------------|
| | | | | <u>Norwegian Sea and Faroes</u> | <u>All Other Areas</u> | | | |
| | | | | | <u>Grilse</u> | <u>Salmon</u> | | |
| Canada | 1963 | 7,332 | 4(0.5) | 0 | 133 | 32(4.4) | 165 | 169 |
| | 1964 | 46,659 | 9(0.2) | 0 | 101 | 85(1.8) | 186 | 195 |
| | 1965 | 45,988 | 67(1.5) | 0 | 379 | 225(4.9) | 604 | 671 |
| | 1966 | 70,875 | 70(1.0) | 0 | 238 | 301(4.3) | 539 | 609 |
| | 1967 | 112,288 | 68(0.6) | 0 | 278 | 228(2.0) | 506 | 574 |
| | 1968 | 113,368 | 190(1.7) | 0 | 315 | 320(2.8) | 635 | 825 |
| | 1969 | 137,832 | 260(1.9) ^b | 0 | 377 | 237(1.7) | 614 | 874 |
| | 1970 | 184,962 | 219(1.2) ^b | 0 | 293 | 98(0.5) | 391 | 610 |
| | 1971 | 200,689 | 133(0.7) | 0 | 171 | 188(0.9) | 359 | 492 |
| | 1972 | 212,768 | 106(0.5) | 0 | 294 | - | 294 | 400 |
| 1973 | 113,440 | - | - | - | - | - | - | |
| Scotland | 1963 | 6,750 | 0 | 0 | 3 | 3(0.4) | 6 | 6 |
| | 1964 | 3,000 | 0 | 0 | 7 | 7(2.3) | 14 | 14 |
| | 1965 | 3,000 | 0 | 0 | 19 | 0 | 19 | 19 |
| | 1966 | 8,000 | 1(0.1) | 0 | 13 | 4(0.5) | 17 | 18 |
| | 1967 | 4,451 | 0 | 0 | 1 | 0 | 1 | 1 |
| | 1968 | 5,335 | 0 | 0 | 4 | 3(0.6) | 7 | 7 |
| | 1969 | 3,694 | 0 | 0 ^a | 1 | 2(0.5) | 3 | 3 |
| | 1970 | 7,836 | 9(1.1) | 2 ^a | 35 | 10(1.3) | 45 | 56 |
| | 1971 | 5,247 | 2(0.4) | 0 | 39 | 14(2.7) | 53 | 55 |
| | 1972 | 12,968 | 2(0.2) | 0 | 36 | - | 36 | 38 |
| 1973 | 7,500 | - | - | - | - | - | - | |
| England and Wales | 1963 | 1,970 | 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 | 9,668 | 0 | 0 | 0 | 1(0.1) | 1 | 1 |
| | 1967 | 18,522 | 0 | 0 | 0 | 1(0.1) | 1 | 1 |
| | 1968 | 28,266 | 4(0.1) | 0 | 4 | 5(0.2) | 9 | 13 |
| | 1969 | 7,420 | 3(0.4) | 0 | 4 | 0 | 4 | 7 |
| | 1970 | 4,493 | 3(0.7) | 0 | 1 | 3(0.7) | 4 | 7 |
| | 1971 | 12,030 | 9(0.7) | 0 | 8 | 5(0.4) | 13 | 22 |
| | 1972 | 11,461 | 17(1.5) | 0 | 34 | - | 34 | 49 |
| 1973 | 4,826 | - | - | - | - | - | - | |
| Norway | 1963 | 10,999 | 0 | 1 | 88 | 95(8.6) | 183 | 184 |
| | 1964 | 9,182 | 0 | 1 | 135 | 87(9.5) | 222 | 223 |
| | 1965 | 8,071 | 0 | 13 | 71 | 33(4.1) | 104 | 117 |
| | 1966 | 13,812 | 0 | 29 | 403 | 145(10.5) | 548 | 593 ^x |
| | 1967 | 18,393 | 2(0.1) | 50 | 229 | 81(4.4) | 310 | 386 ^x |
| | 1968 | 12,983 | 0 | 44 | 171 | 103(7.9) | 274 | 343 ^x |
| | 1969 | 16,967 | 4(0.2) | 38 | 138 | 63(4.0) | 206 | 260 ^x |
| | 1970 | 18,673 | 2(0.1) | 15 | 187 | 110(5.9) | 297 | 321 ^x |
| | 1971 | 16,777 | 3(0.2) | 19 | 189 | 71(4.2) | 260 | 286 ^x |
| | 1972 | 22,472 | 1(<0.1) | 21 | 269 | - | 269 | 291 |
| 1973 | 25,550 | - | - | - | - | - | - | |

^x including some fish from unknown localities

^a Norwegian coast

^b two recaptured at East Greenland in 1971, not included

/continued

Table 3 (Continued)

| Country | Year of Tagging | Number Tagged | Recaptures | | | | | Grand Total |
|------------|-----------------|---------------------|----------------|--------------------------|-----------------|-----------|-------|-------------|
| | | | West Greenland | Norwegian Sea and Faroes | All Other Areas | | Total | |
| | | | | | Grilse | Salmon | | |
| Iceland | 1966 | 8,367 | 1(0.1) | 1(0.1) | 66 | 14(1.7) | 80 | 82 |
| | 1967 | 10,061 | 0 | 0 | 24 | 6(0.6) | 30 | 30 |
| | 1968 | 9,985 | 0 | 0 | 45 | 0 | 45 | 45 |
| | 1969 | 7,586 | 0 | 0 | 246 | 10(1.3) | 256 | 256 |
| | 1970 | 10,014 | 0 | 0 | 1 | - | - | 1 |
| | 1971 | 11,087 | 0 | 0 | 0 | - | - | - |
| N. Ireland | 1973 | 275 | - | - | - | - | - | - |
| Ireland | 1966 | 15,000 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1967 | 5,000 | 1(0.2) | 0 | 1 | 0 | 1 | 2 |
| | 1968 | 220 | 0 | 0 | 1 | 0 | 1 | 1 |
| | 1969 | 7,194 | 2(0.3) | 0 | 22 | 2(0.3) | 24 | 26 |
| | 1970 | 4,788 | 0 | 1 | 11 | 0 | 11 | 12 |
| | 1971 | 2,281 | 0 | 0 | 1 | 0 | 1 | 1 |
| | 1972 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1973 | 2,922 | - | - | - | - | - | - |
| Sweden | 1966 | 11,181 | 7(0.6) | 1 | 690 | 193(17.2) | 883 | 891 |
| | 1967 | 4,999 | 1(0.2) | 4 | 364 | 62(12.4) | 426 | 431 |
| | 1968 | 4,798 | 1(0.2) | 1 | 586 | 37(7.7) | 623 | 625 |
| | 1969 | 7,381 | 4(0.5) | 3 | 465 | 43(5.8) | 508 | 515 |
| | 1970 | 5,000 | 7(1.4) | 1 | 345 | 30(6.0) | 375 | 383 |
| | 1971 | 4,997 ¹⁾ | 4(0.8) | 0 | 341 | 7(1.4) | 348 | 352 |
| | 1972 | 4,000 | 0 | 1 | 138 | - | 138 | 139 |
| | 1973 | 4,509 | - | - | - | - | - | - |
| | | | | | | | | |
| U.S.A. | 1966 | 82,250 | 39(0.4) | 0 | 69 | 168(2.0) | 237 | 276 |
| | 1967 | 80,717 | 1 | 0 | 12 | 10(0.1) | 22 | 23 |
| | 1968 | 73,730 | 7(0.1) | 0 | 9 | 12(0.2) | 21 | 28 |
| | 1969 | 73,415 | 65(0.9) | 0 | 32 | 79(1.1) | 111 | 176 |
| | 1970 | 47,835 | 404(8.4) | 0 | 55 | 285(6.0) | 340 | 744 |
| | 1971 | 29,900 | 87(2.9) | 0 | 12 | 181(6.1) | 193 | 280 |
| | 1972 | 52,535 | 88(1.7) | 0 | 29 | - | 29 | 117 |
| | 1973 | 38,045 | - | - | - | - | - | - |
| | | | | | | | | |
| Denmark | 1965 | 1,880 | 0 | 0 | 1 | 2(1.1) | 3 | 3 |
| | 1966 | 4,270 | 0 | 3 | 19 | 49(11.5) | 66 | 69 |
| | 1967 | 2,696 | 0 | 1 | 13 | 9(3.3) | 23 | 24 |
| | 1968 | 4,984 | 1(0.2) | 1 | 36 | 1(0.2) | 36 | 38 |
| | 1969 | 3,837 | 0 | 0 | 6 | 0 | 5 | 5 |
| | 1970 | 1,376 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1973 | 2,976 | - | - | - | - | - | - |
| | | | | | | | | |
| U.S.S.R. | 1969 | 600 | - | - | - | - | - | - |
| France | 1970 | 549 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1971 | 326 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1972 | 4,469 | 0 | 0 | 0 | - | - | - |
| | 1973 | 18,157 | - | - | - | - | - | - |
| | | | | | | | | |

1) In addition 1200 smolts, reared in Norway, were released in the River Lagan, from which 12 grilse recaptures have so far been reported.

Table 4. Number of kelts tagged in the winters 1962/63 - 1972/73 recaptured in Greenland and in other areas, including home waters, up to the end of 1973.
(0 = No kelts tagged, or no recaptures made; - = no information available)

| Country | Winter of Tagging | Number Tagged | Recaptures | | | In Year of Tagging |
|------------------------------------|-------------------|------------------|------------|-------------|-------|--------------------|
| | | | Greenland | Other Areas | Total | |
| Canada ^a | 1962-63 | 653 | 2 | 65 | 67 | 219 |
| | 1963-64 | 1 518 | 0 | 91 | 91 | 588 |
| | 1964-65 | 1 995 | 1 | 142 | 143 | 481 |
| | 1965-66 | 7 169 | 0 | 654 | 654 | 1 879 |
| | 1966-67 | 7 510 | 1 | 689 | 690 | 958 |
| | 1967-68 | 3 706 | 2 | 288 | 290 | 660 |
| | 1968-69 | 3 848 | 5 | 86 | 91 | 526 |
| | 1969-70 | 4 726 | 9 | 145 | 154 | 599 |
| | 1970-71 | 5 392 | 22 | 308 | 330 | 780 |
| | 1971-72 | 5 166 | 10 | 375 | 385 | 824 |
| | 1972-73 | 6 932 | 16 | 166 | 182 | 1 408 |
| | 1973-74 | 7 758 | - | - | - | 1 362 |
| 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 | 81 | 0 | 3 | 3 | |
| | 1969-70 | 113 | 0 | 12 | 12 | |
| | 1970-71 | 7 | 0 | 0 | 0 | |
| | 1971-72 | 23 | 0 | 1 | 1 | |
| | 1972-73 | 10 | 0 | 0 | 0 | |
| 1973-74 | 12 | - | - | - | | |
| Faroes | 1963-73 | 103 | 0 | 8 | 8 | |
| | 1973-74 | 41 | - | - | - | |
| Iceland | 1962-63 | 114 | 0 | 14 | 14 | |
| | 1963-64 | 167 | 0 | 9 | 9 | |
| | 1964-65 | 154 | 0 | 5 | 5 | |
| | 1965-66 | 357 | 0 | 15 | 15 | |
| | 1966-67 | 745 | 0 | 75 | 75 | |
| | 1967-68 | 441 | 0 | 17 | 17 | |
| | 1968-69 | 369 | 0 | 19 | 19 | |
| | 1969-70 | 314 | 0 | 21 | 21 | |
| 1970-71 | 785 | 0 | 105 | 105 | | |
| N. Ireland | 1972-73 | 103 | 0 | 8 | 8 | |
| Ireland | 1962-63 | 2 264 | 2 | 31 | 33 | |
| | 1963-64 | 2 351 | 2 | 70 | 72 | |
| | 1964-65 | 2 695 | 2 | 34 | 36 | |
| | 1965-66 | 2 972 | 1 | 40 | 41 | |
| | 1966-67 | 3 175 | 0 | 77 | 77 | |
| | 1967-68 | 1 034 | 0 | 24 | 24 | |
| | 1968-69 | 498 | 0 | 10 | 10 | |
| | 1969-70 | 1 088 | 0 | 28 | 28 | |
| | 1970-71 | 477 | 0 | 39 | 39 | |
| | 1971-72 | 289 | 0 | 15 | 15 | |
| 1972-73 | 540 | 1 | 58 | 59 | | |

/Cont'd

Table 4 (Continued)

| Country | Winter of Tagging | Number Tagged | Recaptures | | | In Year of Tagging |
|----------|-------------------|---------------|------------|-----------------|-------|--------------------|
| | | | Greenland | Other Areas | Total | |
| Scotland | 1962-63 | 413 | 1 | 2 | 3 | |
| | 1963-64 | 134 | 0 | 2 | 2 | |
| | 1964-65 | 233 | 0 | 6 | 6 | |
| | 1965-66 | 1 376 | 4 | 19 | 23 | |
| | 1966-67 | 901 | 3 | 18 ^c | 21 | |
| | 1967-68 | 117 | 0 | 3 ^d | 3 | |
| | 1968-69 | 152 | 0 | 1 | 1 | |
| | 1969-70 | 133 | 0 | 1 | 1 | |
| | 1970-71 | ? | 0 | 1 | 1 | |
| | 1971-72 | 54 | 0 | 1 | 1 | |
| | 1972-73 | 0 | 0 | 0 | 0 | |
| | 1973-74 | 0 | - | - | - | |
| | 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 | 5 | 56 | 61 | |
| 1968-69 | | 218 | 1 | 16 | 17 | |
| 1969-70 | | 315 | 1 | 12 | 13 | |
| 1970-71 | | 400 | 2 | 13 | 15 | |
| 1971-72 | | 240 | 2 | 6 | 8 | |
| 1972-73 | | 460 | 8 | 12 | 20 | |
| 1973-74 | 225 | - | - | - | | |
| USSR | 1968-69 | 566 | 0 | 10 | 10 | |
| | 1969-70 | 1 147 | 0 | 0 | 0 | |

a - Ascending adults and fish tagged from coastal fisheries 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.).

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 - Includes 1 recapture at Faroes.

d - Recaptured at Faroes.

Table 5. Recaptures up to 31 December 1973 of Fish Tagged at West Greenland and in the Labrador Sea from 1965-1971.

| Year Tagged | Number Tagged | Number of Local Recaptures | Numbers of Distant Recaptures | | | | | | Total Number Distant Recaptures |
|-------------|-----------------|----------------------------|-------------------------------|----------|-----------------|-----------------|--------|-------|---------------------------------|
| | | | Canada | Scotland | England & Wales | Ireland | France | Spain | |
| 1965 | 225 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1966 | 729 | 28 | 1 | 3 | 0 | 0 | 0 | 0 | 4 |
| 1967 | 375 | 6 | 1 | 1 | 0 | 2 | 0 | 0 | 4 |
| 1968 | 47 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1969 | 444 | 17 ^b | 6 ^a | 1 | 3 | 2 | 2 | 0 | 13 |
| 1970 | 27 ^c | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 |
| | 224 | 3 | 2 | 1 | 0 | 1 | 0 | 0 | 4 |
| | 59 ^c | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 8 |
| 1971 | 226 | 5 | 4 ^d | 0 | 2 | 3 ^{ef} | 0 | 0 | 10 |

a - One recaptured in year of tagging.
 b - Three recaptured in Greenland in 1970.
 c - Labrador Sea in spring.
 d - One recaptured and released at Millbank research trap on R. Miramichi and subsequently recaptured upstream at Blackville by angling.
 e - One tagged in Labrador Sea 58°09'N 52°26'30"W in the autumn.
 f - One recaptured in N. Ireland.

Table 6

Simulation of home water salmon catches and natural losses between Greenland and home waters based on ranges of values of exploitation rate at West Greenland, weight increase between Greenland and home waters, exploitation rate in home waters and proportions of initial stock of salmon (1 sea winter or more) not occurring at West Greenland. Actual home water catch taken as 3 000 tons.

| Catch at West Greenland | Exploitation at West Greenland % | Number in West Greenland stock escaping fishery there | Weight increase between Greenland and home waters % | Home water exploitation % | Simulated home water catch of fish having been in Greenland tons | Losses between Greenland and home waters as % of numbers escaping fishery at West Greenland | | | |
|-----------------------------------|----------------------------------|---|---|---------------------------|--|---|-----|-----|----|
| | | | | | | Proportion of initial stock outside Greenland waters | | | |
| | | | | | | 10% | 20% | 30% | |
| 2 000m tons or 625 000 fish | 25 | 1 875 000 | 40 | 60 | 5 040 | 4.8 | 55 | 62 | |
| | | | | | 6 720 | 61 | 67 | 72 | |
| | | | | | 5 400 | 52 | 58 | 65 | |
| | | | | 50 | 80 | 7 200 | 63 | 69 | 72 |
| | | | | | | 3 919 | 34 | 44 | 53 |
| | | | | | | 5 225 | 50 | 58 | 64 |
| | | | 40 | 60 | 4 200 | 38 | 47 | 56 | |
| | | | | | 5 600 | 54 | 60 | 67 | |
| | | | | | 3 121 | 18 | 30 | 46 | |
| | 35 | 1 161 000 | 50 | 80 | 4 161 | 38 | 48 | 57 | |
| | | | | | 3 344 | 24 | 35 | 46 | |
| | | | | | 4 458 | 43 | 51 | 59 | |

Table 7 Catches in the Norwegian Sea long-line fishery and in the drift-net fishery within Norwegian fishery limits, 1965-73. Metric tons, round fresh weight.

| Year | Denmark | | Faroes | | Germany | | Norwegian Sea Long-Line Fishery | | Sweden | | Total | | Drift-net Fishery within Norwegian Fishery Limits | |
|------|-------------------|-------|-------------------|-------|-------------------|-------|---------------------------------|-------|-------------------|-------|-------------------|----------|---|-------|
| | Number of Vessels | Catch | Number of Vessels | Catch | Number of Vessels | Catch | Number of Vessels | Catch | Number of Vessels | Catch | Number of Vessels | Catch | Number of Vessels | Catch |
| 1965 | 1-2 | a | 0 | 0 | 0 | 0 | ? | 0 | 0 a | 0 a | 1-2 | a | 1 | 283 |
| 1966 | 10 | -a | 0 | 0 | 0 | 0 | " | 0 a | -a | -a | 10+ | -a | 10+ | 312 |
| 1967 | 22 | 77 | 0 | 0 b | 0 | 0 | " | -d | -a | -a | 28+ | 77+ | 28+ | 333 |
| 1968 | 28 | 177 | 2 | 5 b | 0 | 0 | " | 100 d | 16 | 126 | 46+ | 408 d | 46+ | 228 |
| 1969 | 40 | 413 | 4 | 7 b | 24 | 24 | " | 450 d | 2 | 24 | 51+ | 918 d | 51+ | 234 |
| 1970 | 60 | 481 | 5 | 12 b | 21 | 21 | " | 420 d | 1 | 24 | 70+ | 958 d | 70+ | 183 |
| 1971 | 20 | 162 | 0 | 0 c | 9 | 9 | " | 300 d | 1 | 17 | 23+ | 488 d, f | 23+ | 263 |
| 1972 | 20 | 182 | 2 | 9 c | 4 | 4 | ? | 300 d | 1 | 20 | 25+ | 515 d, f | 25+ | 404 |
| 1973 | 15 | 233 | 5 | 28 c | 0 | 0 | ? | 250 d | 2 | 50 | 22+ | 561 | 22+ | 375 |

- a. not known
- b. roughly 70% of catch taken in vicinity of Faroes
- c. all taken in vicinity of Faroes
- d. estimated catch
- e. precise number unknown, but large numbers of small and medium-sized vessels participated
- f. excluding catches discarded because undersized

Table 8 Recaptures of salmon tagged in the long-line fishery in the Norwegian Sea (to March 1974)

| <u>Year Tagged</u> | <u>Number Tagged</u> | <u>Year Recaptured</u> | <u>Norwegian Sea</u> | <u>Recaptures Home Water</u> | | <u>Total</u> |
|--------------------|----------------------|------------------------|----------------------|------------------------------|-----------------|--------------|
| | | | | <u>Norway</u> | <u>U.S.S.R.</u> | |
| 1968 | 238 | 1968 | 0 | 5 | 0 | 5 |
| | | 1969 | 0 | 0 | 1 | 1 |
| | | Total | 0 | 5 | 1 | 6 |
| 1969 | 932 | 1969 | 5 | 49 | 6 | 60 |
| | | 1970 | 2 | 13 | 2 | 17 |
| | | 1971 | 0 | 2 | 0 | 2 |
| | | Total | 7 | 64 | 8 | 79 |
| 1970 | 1,118 | 1970 | 10 | 118 | 9 | 137 |
| | | 1971 | 2 | 10 | 3 | 15 |
| | | 1972 | 1 | 7 | 0 | 8 |
| | | 1973 | 0 | 0 | 1 | 1 |
| | | Total | 13 | 135 | 13 | 161 |
| 1971 | 1,824 | 1971 | 4 | 135 | 17 | 156 |
| | | 1972 | 3 | 22 | 6 | 31 |
| | | 1973 | 1 | 4 | 0 | 5 |
| | | Total | 8 | 161 | 23 | 192 |
| 1972 | 795 | 1972 | 3 | 45 | 16 | 64 |
| | | 1973 | 0 | 9 | 4 | 13 |
| | | Total | 3 | 54 | 20 | 77 |

Table 9 Recaptures of fish tagged in Faroes waters to March 1974

| <u>Year Tagged</u> | <u>Number Tagged</u> | <u>Norway</u> | <u>England</u> | <u>Recaptures</u> | | <u>U.S.S.R.</u> | <u>West Greenland</u> |
|--------------------|----------------------|---------------|----------------|-------------------|----------------|-----------------|-----------------------|
| | | | | <u>Scotland</u> | <u>Ireland</u> | | |
| 1969 | 74 | 1 | 0 | 2 | 0 | 0 | 0 |
| 1970 | 233 | 2 | 1 | 5 | 3 | 1 | 1 |
| 1971 | 359 | 4 | 1 | 8 | 2 | 0 | 1 |
| 1972 | 307 | 1 | 2 | 4 | 5 | 0 | 1 |
| 1973 | 280 | 5 | 1 | 3 | 2 | 0 | 0 |

Table 10 Catches in home waters, 1960-73 (salmon plus grilse except where shown separately) in metric tons, round fresh weight.

| Year | England and Wales | | France | | Iceland | | Ireland ^b | | Northern Ireland ^b | | Norway | | | Scotland | | | Sweden ^c | | USSR ^e | | Canada | | USA | | | |
|---------------|-------------------|-----|--------|-------|--------------------|---------------------|----------------------|------|-------------------------------|-------------------|--------|------|------|----------|-------|-------------------|---------------------|-------------------|-------------------|----------|--------|-------------------|------------------|----------|-------|-------------------|
| | S | T | S | T | S | T | S | T | S | T | S | G | T | S | G | T | S | T | S | T | S | G | T | S | T | |
| 1960 | - | 283 | 50-100 | 100 | - | - | 743 | 139 | - | 1659 ^f | 950 | 476 | 1436 | 40 | - | 1635 | 1100 | - | - | - | - | - | - | - | - | - |
| 1961 | - | 232 | 50-100 | 127 | - | - | 707 | 132 | - | 1533 ^f | 820 | 376 | 1196 | 27 | - | 1580 | 790 | - | - | - | - | - | - | - | - | - |
| 1962 | - | 318 | 50-100 | 125 | - | - | 1459 | 356 | - | 1935 ^f | 1015 | 725 | 1740 | 15 | - | 1717 | 710 | - | - | - | - | - | - | - | - | - |
| 1963 | - | 325 | 50-100 | 145 | - | - | 1458 | 306 | - | 1786 ^f | 1286 | 412 | 1698 | 16 | - | 1848 | 480 | - | - | - | - | - | - | - | - | - |
| 1964 | - | 307 | 50-100 | 135 | - | - | 1617 | 377 | - | 2147 ^f | 1216 | 698 | 1914 | 16 | - | 2066 | 590 | - | - | - | - | - | - | - | - | - |
| 1965 | - | 320 | 50-100 | 133 | - | - | 1457 | 281 | - | 2000 | 1042 | 560 | 1602 | 17 | - | 2113 | 590 | - | - | - | - | - | - | - | - | - |
| 1966 | - | 387 | 50-100 | 106 | - | - | 1238 | 287 | - | 1791 | 1069 | 555 | 1624 | 17 | - | 2356 | 570 | - | - | - | - | - | - | - | - | - |
| 1967 | - | 420 | 50-100 | 146 | - | - | 1463 | 449 | - | 1960 | 1245 | 888 | 2133 | 23 | - | 2859 | 883 | - | - | - | - | - | - | - | - | - |
| 1968 | - | 282 | 50-100 | 162 | - | - | 1413 | 312 | - | 1514 | 1020 | 543 | 1563 | 14 | - | 2104 | 827 | - | - | - | - | - | - | - | - | - |
| 1969 | 264 ^a | 377 | 50-100 | 133 | (260) ^g | (1470) ^g | 1730 | 267 | 801 | 582 | 1383 | 987 | 1947 | 9 | 360 | 1546 ^a | 360 | 1546 ^a | 411 ^a | 1957 | 360 | 1546 ^a | 411 ^a | 1957 | 360 | 1546 ^a |
| 1970 | 313 ^a | 527 | 50-100 | 195 | 268 | 1519 | 1787 | 297 | 816 | 355 | 1171 | 802 | 1424 | ? | (460) | 1468 ^a | (460) | 1468 ^a | 629 ^a | 2097 | (460) | 1468 ^a | 629 ^a | 2097 | (460) | 1468 ^a |
| 1971 | 299 ^a | 426 | 50-100 | 204 | 175 | 1464 | 1639 | 234 | 773 | 435 | 1208 | 715 | 1419 | 56 | (443) | 1440 ^a | (443) | 1440 ^a | 394 ^a | 1834 | (443) | 1440 ^a | 394 ^a | 1834 | (443) | 1440 ^a |
| 1972 | 323 ^a | 442 | 50-100 | (224) | 200 | 1604 | 1804 | 232 | 1054 | 514 | 1568 | 987 | 1693 | 35 | (465) | 1106 ^a | (465) | 1106 ^a | 419 ^a | 1525 | (465) | 1106 ^a | 419 ^a | 1525 | (465) | 1106 ^a |
| 1973 | 327 ^a | 453 | 45 | ? | 244 | 1683 | 1927 | 182 | 1223 | 512 | 1735 | 824 | 1927 | 25 | ? | 1470 ^a | ? | 1470 ^a | 695 ^a | 2165 | ? | 1470 ^a | 695 ^a | 2165 | ? | 1470 ^a |
| Angling Catch | Included | | Inc. | Inc. | Inc. | Inc. | Inc. | Inc. | Inc. | Inc. | Inc. | Inc. | Inc. | Not Inc. | Inc. | Not Inc. | Inc. | Not Inc. | Inc. | Not Inc. | Inc. | Not Inc. | Inc. | Not Inc. | Inc. | Not Inc. |

S - Salmon; G - Grilse; T - Total (Salmon plus Grilse)

a - Estimated

b - Catch in River Foyle allocated on basis of 50% Ireland and 50% Northern Ireland

c - West Coast catch only, from Bulletin Statistique. Figures doubtful

d - Angling catches (mainly grilse) about 10% additional (by weight)

e - Mainly salmon

f - Including sea trout and sea char catches; less than 5% of total

g - Estimated on basis of 1970 catches

h - Provisional

j - Figures in Brackets for Iceland and USSR taken from published statistics in Bulletin Statistiques

Table 11. Estimates of catches per unit effort for some home water fisheries. 1960 - 1973.

| Year | C a n a d a | | | I r e l a n d | | Foyle Area | Northern Ireland | |
|------|--|------------------------|-------------------------|---|--------------------------------|--|--------------------------------|--|
| | (Drift Nets and Traps) ^a lbs | Trap Nets ^h | Drift Nets ^h | (Open Sea Drift Nets) ^b (Numbers) | (Licences) ^c lbs | (Sea Drift Nets) ^b (Numbers) | Bag Nets ^b (lbs) | Fixed Draft Nets ^b (lbs) |
| 1960 | 169 | | | 325 | 950 | 104 | - | - |
| 1961 | 159 | | | 224 | 1 030 | - | - | - |
| 1962 | 178 | | | 563 | 2 210 | 297 | - | - |
| 1963 | 193 | | | 456 | 1 940 | 334 | - | - |
| 1964 | 266 | | | 430 | 1 720 | 392 | - | - |
| 1965 | 262 | | | 520 | 1 700 | 361 | - | - |
| 1966 | 249 | | | 516 | 1 250 | 375 | - | - |
| 1967 | 300 | | | 733 | 1 650 | 524 | - | - |
| 1968 | 183 | | | 552 | 1 650 | 482 | 1 462 | 2 675 |
| 1969 | 159 | | | 491 | 2 077 | 404 | 4 632 | 1 842 |
| 1970 | 153 | 13.3 | 85.9 | 422 | 1 899 | 565 | 4 269 | 2 460 |
| 1971 | 80 | 8.4 | 50.2 | 420 | 1 683 | 353 | 3 306 | 4 529 |
| 1972 | - | - | - | 353 | 1 662 | 344 | 3 684 | 2 229 |
| 1973 | i | - | - | 350 | 1 815 | 308 | 4 564 | 2 320 |

| Year | Norway ^d | England and Wales | | Scotland | | | |
|------|---------------------|--------------------------------------|--------|---|--------|---|--------|
| | (Bag Nets) kg | Drift Nets NE Area g (numbers) | | (Fixed Engines) ^e (numbers) | | (Net and Coble) ^f (Numbers) | |
| | | Salmon | Grilse | Salmon | Grilse | Salmon | Grilse |
| 1960 | 172 | 84.8 | 79.8 | 12.8 | 20.3 | 84.1 | 77.4 |
| 1961 | 158 | 54.3 | 46.1 | 12.3 | 17.2 | 60.9 | 61.4 |
| 1962 | 175 | 92.8 | 75.5 | 14.8 | 29.6 | 83.6 | 134.9 |
| 1963 | 177 | 49.4 | 42.7 | 19.9 | 21.8 | 109.3 | 62.3 |
| 1964 | 195 | 52.6 | 58.0 | 23.2 | 35.6 | 98.6 | 113.8 |
| 1965 | 172 | 83.6 | 47.9 | 17.8 | 26.6 | 84.0 | 99.0 |
| 1966 | 154 | 66.6 | 58.9 | 19.4 | 30.4 | 95.0 | 104.0 |
| 1967 | 154 | 110.5 | 90.9 | 21.6 | 49.9 | 130.2 | 170.4 |
| 1968 | 129 | - | - | 17.3 | 29.8 | 97.9 | 92.4 |
| 1969 | 137 | 134.5 | 166.5 | 15.9 | 49.7 | 123.4 | 194.5 |
| 1970 | 117 | 170.3 | 245.3 | 12.3 | 35.2 | 98.9 | 137.5 |
| 1971 | 116 | 84.1 | 83.4 | 11.6 | 39.9 | 69.5 | 118.4 |
| 1972 | 158 | 138.3 | 152.1 | 17.0 | 38.6 | 129.7 | 138.0 |
| 1973 | 151 ^j | 162.0 | 190.0 | - | - | - | - |

- 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.Rep.No.29.
- b - Salmon and grilse per net.
- c - Pounds salmon and grilse per licence (for drift nets, draft nets and other commercial methods).
- d - Salmon and grilse per bag net.
- e - Catch per net per month.
- f - Catch per crew per month.
- g - Catch per net licence issued.
- h - Miramichi area, salmon only, pounds/unit day.
- i - Local fishery closed in 1972; see footnote a.
- j - Provisional.

APPENDIX

List of Working Papers

| <u>No.</u> | <u>Author</u> | <u>Title</u> |
|------------|--|--|
| 1. | Chalmers & Munro | Trends in Scottish salmon grilse catches, 1952-1971. |
| 2. | (D.A.F.S., Pitlochry) | Data for updating tables in the 1973 Report. |
| 3. | A Swain | Salmon catches for England and Wales. |
| 4. | A Swain | Recaptures of tagged salmon off Greenland and in home waters, England and Wales. |
| 5. | A Swain | The recaptures in England and Wales of salmon tagged off Greenland in 1972. |
| 6. | A R Child | Biochemical differences in serum enzymes from North America and the British Isles. |
| 7. | A Swain | A report on the smolt tagging carried out in European countries with particular reference to recaptures made off Greenland in 1972 and comparable home water recaptures. |
| 8. | A Swain | Further report on the analysis of age, length and weight data collected during the International Salmon Tagging Experiment 1972. |
| 9. | C P Ruggles, J Ritter and R Harger | Some preliminary tables and graphs summarizing North American smolt tagging experiments. |
| 10. | C P Ruggles | Abundance of Atlantic salmon in New Brunswick rivers in 1973. |
| 11. | W H Lear and E J Sandeman | Use of scale characters and a discriminant function for identifying continental origin of Atlantic salmon. |
| 12. | W H Lear and O Christensen | Selectivity and relative efficiency of salmon drift nets. |
| 13. | J H C Pippy | The value of parasites as biological tags in Atlantic salmon at West Greenland. |
| 14. | R H Payne | The use of serum transferrin polymorphism to determine the stock composition of Atlantic salmon in the West Greenland fishery. |
| 15. | (Canada) | Tables for updating 1973 Report. |

| <u>No.</u> | <u>Author</u> | <u>Title</u> |
|------------|-------------------------------|---|
| 16. | O Christensen and W H Lear | Distribution and abundance of salmon at West Greenland (including tables showing (a) distribution by areas and time of effort, catch and catch-per-unit-effort in the 1973 West Greenland drift-net fishery, (b) list of recaptures reported to ICES or to the Greenland Fisheries Investigation, from 1 January to 11 March 1974). |
| 17. | O Christensen and W H Lear | By-catches in salmon drift-nets at West Greenland in 1972. |
| 18. | J Møller Jensen | Report on recaptures from the International Salmon Tagging Experiment at West Greenland, 1972. Analysis of smolts tagged in home waters and recaptured at West Greenland 1972. |
| 19. | J Møller Jensen | Salmon survey in the Irringer Sea 1973 (Anacat Cttee paper C.M.1973/M:27). |
| 20. | A E J Went | Movement of salmon to and from Irish waters (The Fish Biology Reprint). |
| 21. | A E J Went | Interesting recaptures of tagged salmon in 1973 (Fishery Leaflet No. 58, 1973, Dublin). |
| 22. | C Christensen | The Danish salmon fishery in the Norwegian Sea in 1973. |
| 23. | A E J Went | Survival rates from the natural smolt production in the Burrishoole River. |
| 24. | D J Piggins | The relationship between salmon and grilse. |
| 25. | Miss E Twomey | Salmon catch by different methods, for Ireland in 1972 and 1973. |
| 26. | P O Larsson | Migrations of the Swedish west coast salmon stocks. |
| 27. | (D.A.F.S.) | Scale analysis of salmon caught off the Faroes 25 April - 20 May 1973. |
| 28. | L Rosseland | Average weights of salmon caught in the Norwegian home water fisheries, 1969-1972. |
| 29. | L Rosseland | Recaptures of salmon tagged in the long-line fishery in the Norwegian Sea. |
| 30. | L Rosseland | Recaptures in 1973 of salmon tagged in the long- line fishery in the Norwegian Sea 1971-72. |

| <u>No.</u> | <u>Author</u> | <u>Title</u> |
|------------|---------------|---|
| 31. | L Rosseland | Salmon smolts tagged and released in Norwegian rivers, 1970-1973. |
| 32. | L Rosseland | Average weights of salmon tagged as smolts in Norwegian rivers 1966-1969, and recaptured in the Norwegian Sea and in home waters. |
| 33. | L Rosseland | Weights of salmon caught in Norwegian coast bagnets, 1973 (with map and graph). |
| 34. | L Rosseland | Length distribution of salmon - bagnets, 1973. |
| 35. | L Rosseland | Weights and condition factors of salmon bagnets 1973. |
| 36. | L Rosseland | Diagram of recaptures of Norwegian tagged smolts at West Greenland. |
| 37. | J Smed | The temperature of the waters off West Greenland during the Salmon Tagging Experiment in 1972. |

Fig.1 CHART SHOWING ICNAF DIVISIONS AND FISHING AREAS (I-VI) USED IN ANALYSIS OF SALMON FISHERY DATA

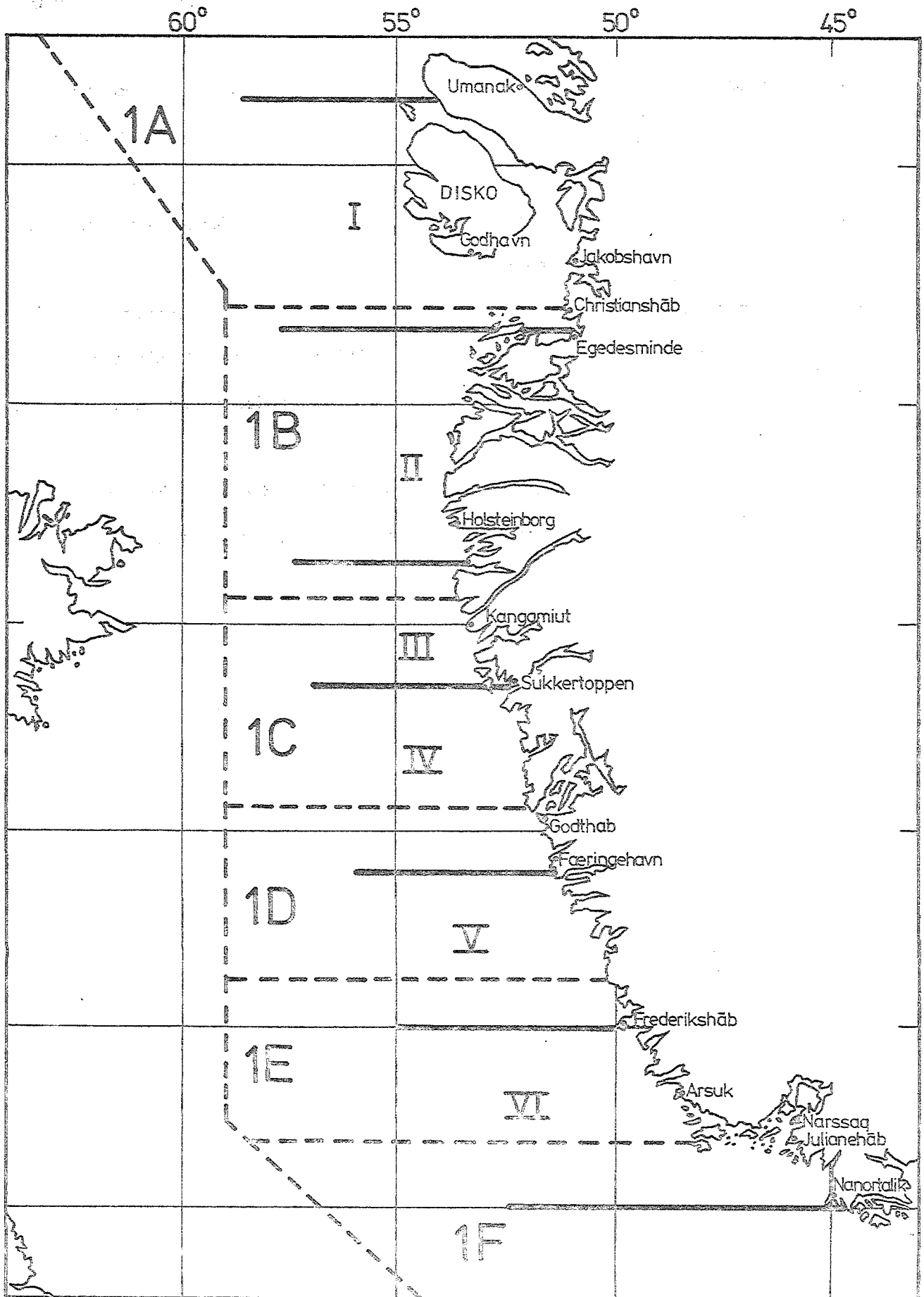


Fig.2 ESTIMATED LOSSES (metric tons) TO HOME WATERS STOCKS AND CATCH OF 2 or MORE SEAWINTER SALMON DUE TO CATCHES AT WEST GREENLAND

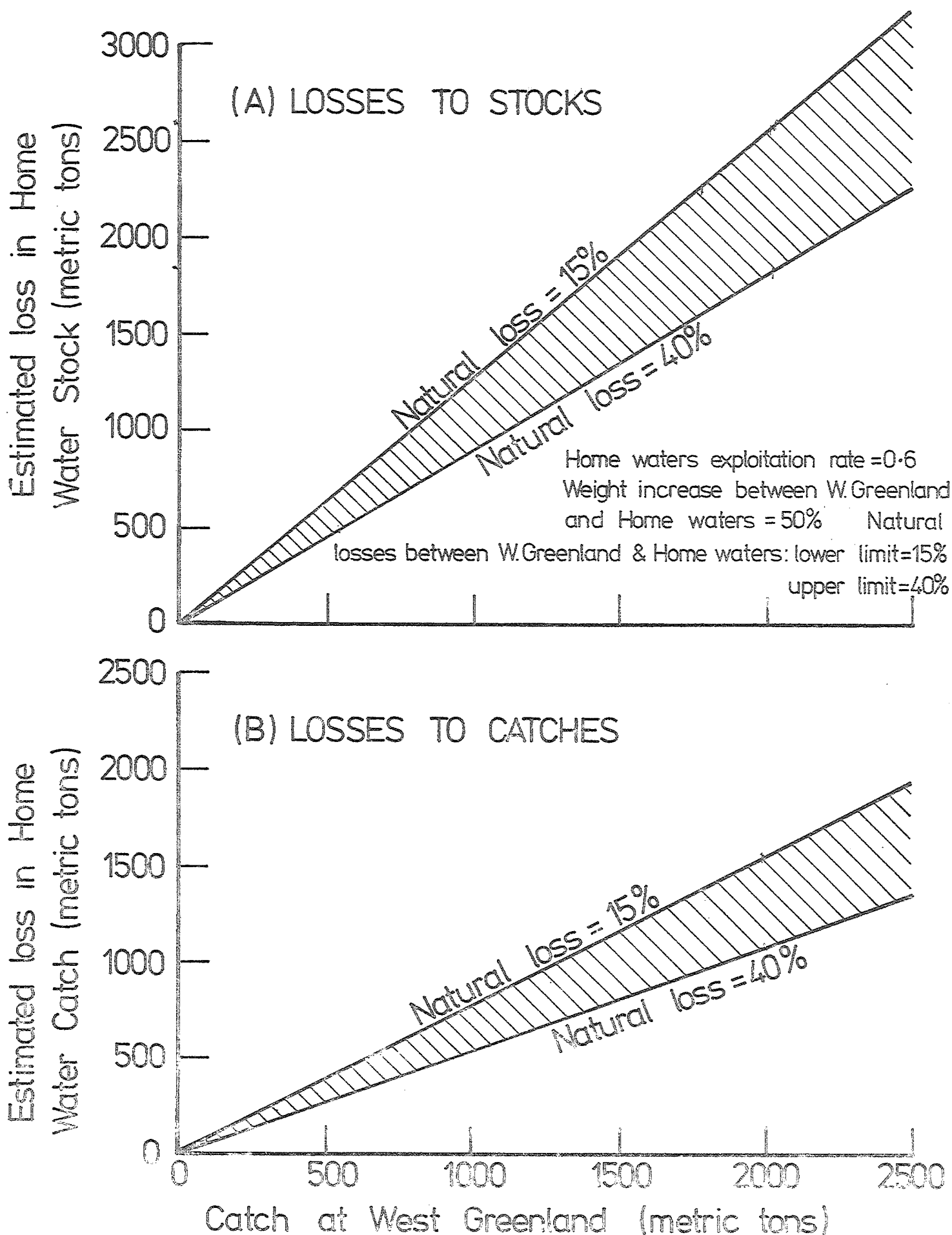


Fig. 3 CHART SHOWING AREA FISHED BY DANISH VESSELS IN NORWEGIAN SEA AND BY FAROESE VESSELS IN VICINITY OF FAROE ISLANDS IN 1973

