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Anadromous and Catadromous Fish Committee



REPORT OF THE WORKING GROUP ON NORTH ATLANTIC SALMON

Charlottenlund, 30 April - 3 May 1979

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x) General Secretary,
ICES, Charlottenlund Slot,
2920 Charlottenlund,
Denmark.

REPORT OF WORKING GROUP ON NORTH ATLANTIC SALMON

Participants

1. The following scientists from ICES member countries participated in the meeting of the Working Group, which took place at ICES Headquarters, Charlottenlund, from 30 April - 3 May 1979.

Y Côté	Canada
W G Doubleday	"
N E MacEachern	"
J H Pippy	"
D G Reddin	"
J R Ritter	"
O Christensen	Denmark
S A Horsted	"
R Vibert	France
E Twomey	Ireland
K W Jensen	Norway
D Møller	"
P O Larsson	Sweden
K A Mitchell	United Kingdom
B B Parrish (Chairman)	" "
E C E Potter	" "
A Swain	" "
K Vickers	" "
J A Posgay	USA

Origin and Terms of Reference

2. The Working Group was established at the 1978 Annual Meeting of ICES in response to a request to the Council from the Canadian Government for information on the state of the fisheries and stocks of North Atlantic salmon. This request was considered by the Anadromous and Catadromous Fish Committee and the ACFM at the Annual Meeting and the following terms of reference for the Working Group's deliberations were drawn up:-

"to review the status of North Atlantic salmon stocks in relation to fisheries, and in particular to assess the impact of Greenlandic and Norwegian Sea fisheries on home-waters fisheries and stocks.

In addition to this review, to describe the regulations for the control of commercial and sports fisheries for North Atlantic salmon".

3. Since this remit was essentially the same as that of the previous ICES/ICNAF Joint Working Party on North Atlantic Salmon, the Working Group directed its attention especially to reviewing ^{the} information contained in that Working Party's reports (Coop. Res. Reports Nos. 8, 12, 24 and 35 and Doc. CM 1974/M:2), with particular reference to the biological features and composition of the salmon stock at West Greenland, and the assessment of the effects of the West Greenland fishery on home-waters stocks and catches, in the light of the latest fishery data and results of research.

A. WEST GREENLAND FISHERY

1. Statistics and Composition of the Fishery

4. The salmon catches at West Greenland in the years 1960-78 are given in Table 1.
5. These data show that the total catch at Greenland decreased after 1973 in accordance with the ICNAF recommendation (ICNAF Meeting Proc. 1972, No. 13, App. II). The fishing by Norwegian, Danish and Faroese vessels was phased out through 1972-75, while the fishery by Greenlanders was regulated by a total quota of 1,191 tonnes annually.
6. As shown in Table 1 the agreed quota for the Greenland fishery has been met rather precisely in most years. The overrun in 1977 was due to good fishing especially in the last few days before a closure of the fishery was ordered.
7. No good data on fishing effort are available since 1975. However, one of the elements in the regulatory measures introduced for the fishery by Greenlanders has been an opening date (since 1975) for the fishery and a partitioning (since 1974) of the overall quota into a "free component" (ie for free competition amongst the licensed fishermen) and a component allocated to small vessels on a district basis. The "free component" has been around 900 tonnes annually. In 1974, when no opening date was in force, it was fished by 4 September. In 1975 it was fished within the period 20 August - 12 September, in 1976 between 20 August and 15 September, and in 1977 (when the overall quota was exceeded) between 10 August and 5 September. Assuming no significant changes in effort, these data would

suggest a rather steady and good fishery situation (ie combination of stock abundance and catchability) from 1974 to 1976 and an extremely good fishery in 1977. In contrast, the 1978 catch of close to 1,000 tonnes was below the overall quota, reflecting a lower stock abundance and/or catchability of fish. Research catches have shown salmon to be present much later (into November) than the actual closing dates.

8. The rate at which the "free component" has been fished each year suggests that the major part of it is taken by boats operating drift nets. Information obtained from some boats in 1975 and general observations in the following years indicates that the drift net fishing has taken place rather close to the shore, some of it taking place in Divisions 1A and 1E inside the base line. Inshore set gill nets are operated mainly by smaller boats fishing the allocated component of the quota.

9. As shown in Table 2, in the years 1973-75 Division 1E was the most important fishing area for the Greenland vessels. In 1976-78, however, the main fishing centres were in the more northerly Divisions 1B and 1C, the fishery in Divisions 1E and 1F decreasing markedly, especially in 1978 when only 10 tonnes were taken in the latter area. Throughout the period small catches (below 10 tonnes annually) are reported from East Greenland (Angmagssalik), caught by set gill nets.

2. Origin of Salmon at West Greenland

10. The results of previous analyses of tag recaptures, (of which the up-dated data are given in Tables 3, 4 and 5), scale characteristics and biochemical characters reported by the ICES/ICNAF Joint Working Party (Coop. Res. Repts and Doc. CM 1974/M:2) showed that the exploited stock at West Greenland in the years up to 1973 was composed of salmon originating in both North America and Europe. They suggested that in the period since the commencement of the fishery there the proportions of the two components in the stock have varied widely from year to year, the North American component ranging from as low as 20% in 1972 to over 50% in the years prior to 1970.

11. The results of a more recent detailed, discriminant function analysis of scale characteristics of salmon caught at West Greenland in the years 1969-1978 were presented to the Working Group. The relative proportions of the North American and European origin salmon obtained from it are tabulated below:-

Proportions (in numbers) of North American Salmon in Research Vessel Catches at West Greenland 1969-1978

	Percentage North American Wild plus hatchery fish	95% Confidence interval		Percentage North American Hatchery fish	Percentage European	95% Confidence interval	
		Upper	Lower			Upper	Lower
1969	51	57	44	8	49	43	56
1970	35	43	26	14	65	57	74
1971	34	40	28	5	66	60	72
1972	36	37	34	7	64	63	66
1973	49	59	39	1	51	41	61
1974	43	46	39	6	57	54	61
1975	44	48	40	4	56	52	60
1976	43	48	38	6	57	52	62
1977*	41	-	-	6	59	-	-
1978	44	47	41	4	56	53	59

* Unweighted average for years 1969-76 and 1978

12. While these results confirm the earlier findings in showing annual variations in the proportions of the two components, they indicate a higher proportion of North American salmon than that reported previously. Since, owing to gear selectivity, salmon of North American origin were probably under-represented in the samples on which the scale analysis was made they suggest, on average, approximately equal proportions (by number) of North American and European salmon in the exploited stock at West Greenland, at least in the years since 1972. This is in general conformity with the amounts of two-or-more sea winter salmon caught in the North American (Canadian) home waters fishery and in the European fisheries for the countries whose salmon are known to go to Greenland.
13. The results of the scale analysis showed that the relative proportions of North American and European salmon in the stock fished on inshore and offshore grounds were approximately the same at the same latitude along the West Greenland coast. Similarly, there were no clearly defined changes in their relative

proportions with latitude, except in 1972, when the proportion of North American fish decreased from south to north. Limited evidence from research vessel data suggested that in 1974 the proportion of North American salmon in the stock increased between August and October.

14. In addition to its use in distinguishing between salmon of North American and European origin in the West Greenland stock, the discriminant function analysis of scale characteristics shows promise in the identification of specific areas of origin of the North American component of the West Greenland stock. Thus, the results of preliminary analyses of material collected in 1978, together with smolt tag recapture data provide evidence of clustering of certain river stocks in the West Greenland area; North American salmon in Division 1B tended to be of Newfoundland and Quebec origin whilst those in Division 1C originated mainly from rivers in Labrador, New Brunswick and Nova Scotia.

3. Biological Characteristics of West Greenland Stock

15. The results of the earlier investigations by the ICES/ICNAF Joint Working Party showed that the exploited stock at West Greenland was composed almost entirely (averaging over 90%) of one-sea-winter fish, which if surviving and returning to home-waters would do so as two or more sea-winter salmon, and that it consisted principally of females, the female/male sex ratio being approximately 3:1. The results of more recent analyses confirmed those earlier findings with respect to the sea-age composition and sex ratio. They showed, in fact, that the proportion of multi sea-winter fish (ie fish with two or more scale winter rings) showed a downward trend from approximately 10% in 1969 to 7% in 1972 and 3% in 1978. It is noteworthy that a similar trend is also evident in Scottish and Newfoundland commercial catches of three or more sea-winter fish in home waters.
16. An important feature of the salmon at West Greenland, revealed by the analysis of scale characteristics, ^{length and weight data} was that, on average, one-sea-winter salmon of European origin were significantly larger and heavier than those of North American origin. This is shown by the data in Table 6, which gives the fork length

compositions, mean lengths and mean weights of fish at West Greenland in 1978, identified as North American and European respectively. A similar difference is evident from the length compositions at the time of tagging of salmon liberated at West Greenland in the international tagging experiment in 1972 and subsequently recaptured in Europe and North America respectively. Thus, the European component were approximately 3 cm longer and 0.5 kg heavier than the North American component in the West Greenland stock. This indicates that the proportions of the two components, given in Section A.2 in terms of numbers of fish overestimate slightly the proportion of North American origin salmon and underestimate the European salmon proportion in the West Greenland catch by weight.

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

17. The ICES/ICNAF Joint Working Party's assessments of the effects of the West Greenland fishery on home-waters stocks and catches were based on the estimation of the weight that the quantity of salmon caught at West Greenland would constitute on its return to home waters and be caught there using the best information then available on growth in weight and natural mortality rate between West Greenland and home waters and on the exploitation rate in the home waters fisheries. It also conducted a simulation analysis of the West Greenland and home-waters fisheries using values of these and other relevant parameters. The results of these assessments, given in the 4th Report of that Working Party (CM 1974/M:2) indicated that a catch of 2,000 tonnes at West Greenland generated a direct loss to the two-sea-winter salmon stock returning to home waters in North America and Europe combined of between 1,800 and 2,550 tonnes, and to home waters catches in all countries combined of between 1,080 and 1,530 tonnes. The corresponding estimates of losses for the present allowed West Greenland catch of 1,191 tonnes are 1,070-1,520 tonnes and 640-910 tonnes respectively.

18. The Working Group reviewed these results, and especially the parameters used in their earlier assessment, in the light of the latest data and results of recent studies. Attention was paid first to three factors which could affect the results

of the earlier assessments of the losses to home-waters stocks.

- (a) the mortality generated directly by fishing but not recorded as catch; termed non-catch fishing mortality;
- (b) the magnitude of the natural mortality rate of salmon during its sea phase;
- (c) differences in the size (weight) and subsequent growth of North American and European origin in the West Greenland catch.

Non-Catch Fishing Mortality

19. Fish mortalities generated directly or indirectly by fishing which are not included in the recorded catch probably occur in all fisheries. They include

- a) fish which encounter and are caught temporarily by the gear but escape from it and subsequently die from the injuries (eg scale loss) or stress suffered during the capture and escapement process, or increased predation due to their greater vulnerability
- b) fish which are caught and killed by the gear but drop out from it either before or during hauling
- c) fish which are caught and subsequently attacked and removed by predators from the gear
- d) unreported discards, especially of small fish or fish caught in a damaged or unmarketable condition.

20. The Working Group considered the likely magnitude of this form of mortality in the fisheries for North Atlantic salmon, especially by gill net, in the light of published results for principally the fisheries for species of Pacific salmon. reviewed by Ricker (1976), These results indicated that the magnitude of mortality differed between the kinds of fishery (fishing gear), environmental conditions (eg salinity, sea state) and the size (age) and physiological state of the fish. Ricker concluded it was twice as large in the oceanic drift-net fisheries for "immature" feeding salmon than for mature salmon approaching spawning, which are hardier physically and physiologically.

21. Although the results of the Pacific studies are not directly applicable to the North Atlantic salmon fishery situation and there are insufficient direct observations and measurements for its magnitude to be estimated reliably, the Working Group concluded that non-catch fishing mortality certainly occurs in the various North Atlantic salmon fisheries. As in the Pacific salmon fisheries, it is probably highest in the gill-net fisheries for feeding concentrations and least for the coastal non gilling trap-net fisheries. It is probably also small in the long-line fishery in the Norwegian Sea.

22. No account was taken of non-catch mortality in the earlier assessments of the effects of the West Greenland fishery on home water stocks and catches. This suggests that those assessments may have underestimated the home water losses, especially for the West Greenland fishery. Since the magnitude of this bias is unknown, but may be significant, the Working Group strongly recommends that investigations of non-catch mortality, its magnitude and the factors contributing to it, should be carried out in the main North Atlantic salmon fisheries.

Natural Mortality Rate in the Sea

23. The natural mortality rate of salmon occurring during the period between their appearance in the fishery at West Greenland and their return to home waters is an important parameter in assessing the effects of these fisheries on home water stocks and catches. At the time of the earlier assessments no reliable estimate of this parameter was available so that in them lower and upper levels of 0.02 and 0.1 per month, within which the true value was considered to lie, were used.

24. The results of a new method of estimating natural mortality rate from smolt tag recapture data were considered by the Working Group. The method is based on (Mathews and Buckley, 1976) an hypothesis by S B Mathews that the natural mortality rate of Pacific salmon in the sea varies inversely with weight at age. A model based on this hypothesis can be used to estimate the natural mortality rates from smolt tag recaptures in fisheries exploiting successive sea age groups, given measures of the numbers of

tagged and untagged fish in returns to the river. Estimates of the natural mortality occurring between the ages associated with West Greenland and home-waters fisheries of Sandhill river (Labrador) fish entering the sea in 1969, 1970 and 1971 of 12%, 11% and 14% respectively were obtained using this method. A provisional analysis of recapture data for the river Bush (N. Ireland) smolts entering the sea in 1974, 1975 and 1976, gave corresponding estimates of 5%, 5% and 3% respectively. These estimates are in broad agreement with the value obtained for Baltic salmon (Coop. Res. Rep. No. 45), but below the range of values used in the earlier West Greenland fishery assessment. However, the Working Group considered that these results should be treated with caution pending further evaluation of the validity of the basic hypothesis underlying the method, and its applicability for North Atlantic salmon.

Change in Weight of Salmon between West Greenland and Home Waters

25. In the earlier assessment the average weight of salmon of North American and European origin in the West Greenland stock were assumed to be the same, and a value of 50% was used for the increase in mean weight of salmon between their occurrence in the West Greenland fishery and their return to home waters in both North America and Europe. As indicated in Section A.2 the results of the recent analysis of scale characteristics showed a significant difference between the mean weights of North American and European origin fish at West Greenland, their mean weight in 1978 being 2.94 kg and 3.50 kg respectively (Table 6). This difference may be attributed to the different time the two groups of fish have spent at sea before appearing in the fishery at West Greenland. North American smolts migrate to sea in May and June while those in Europe do so mainly in April-May, thus allowing more time for growth.

26. The mean weights of two-sea-winter salmon in the home-waters fisheries in North America (Canada) in 1977 and Europe (Scotland) in the years 1973-1977 were 4.71 kg and 5.32 kg respectively. Thus while the recent data corroborate the 50% increase in weight for salmon returning from West Greenland to home waters in Europe, they indicate a higher percentage increase in mean weight, of 60%, for salmon returning to North America.
27. Although the present information on the factors considered above is insufficient to allow reliable revisions of the earlier estimates of losses to home-waters stocks to be made, it provides no basis for considering them to be over-estimates; in fact, it suggests that the losses to the home-water stocks, per tonne of reported catch at West Greenland, would be closer to the upper than the lower estimated limit. It also suggests that the loss to the home-waters stock per tonne of North American fish caught at West Greenland would be somewhat higher than that of European salmon.
28. As pointed out by the ICES/ICNAF Joint Working Party, these assessments refer only to the direct, immediate effects. They take no account of any possible longer-term effects on smolt production and year-class strength through an increase in spawning stock size.

Exploitation Rate in Home-Waters Fisheries

29. An assumption implicit in the ICES/ICNAF Joint Working Party's assessments of the effects of the West Greenland fishery on home-waters catches was that changes in the West Greenland catch (and hence in the numbers of salmon returning to home waters) would not affect the exploitation rate in home waters. Thus, only a proportion of any additional salmon returning to home waters due to a reduction in West Greenland catch would be taken in the home-waters fisheries, the remainder contributing to additional spawning escapement. The Working Group noted that one of the main principles of managing salmon stocks is to limit catches so as to permit optimal spawning escapement. Insufficient spawning escapement has led to a ban on home-waters commercial fishing in several Canadian river stocks, and

restrictions on fishing other stocks are being studied due to observed low spawning escapements. Should sufficient additional salmon return to home waters from Greenland, due to a reduction in the West Greenland catch, the desired level of spawning escapement could be achieved without continued or further reduction in home-waters exploitation rates; or alternatively if the spawning escapement was sufficient the home-waters exploitation rates could be increased. The Group noted therefore, that the previous assumption may not correspond with the realities of management of home-waters salmon fisheries and may lead to an underestimation of the effects of changes in the West Greenland fishery on home-waters fisheries. Since the estimation of their effects on the stocks returning to home waters is unaffected by this factor, the Working Group concluded that the estimated changes in the quantity of salmon returning to home waters with changes in the West Greenland catch provide a more appropriate indication of effects on home-waters fisheries than the estimates of changes in home-waters catches, using a constant value of exploitation rate.

B. NORWEGIAN SEA LONG-LINE FISHERY

1. Statistics and Changes in Fishery

30. The reported catches taken in the long-line fishery in the Norwegian Sea and Faroese waters in the years 1965-78 are given in Table 7. These data show that the fishery grew rapidly following its commencement in 1965, to reach over 900 tonnes in 1969 and 1970. It decreased sharply in 1971 following the introduction of closed areas and closed season regulations, in accordance with a NEAFC recommendation, the total catch dropping to about half the peak catch in 1970. Thereafter, up to 1975 the fishery was pursued by Danish, Norwegian, Swedish and to a small extent Federal Republic of Germany vessels in May and part of June in the area between latitude 68° and 75°N and between the Greenwich meridian and longitude 20°E. Small catches were also taken by Faroese vessels in the southern part of the Norwegian Sea, between 30 and 70 n. miles from the Faroes.

31. A Norwegian Government ban on long-line fishing by Norwegian vessels in 1976 led to a further decrease in catch. This was followed in 1977 by the extension of the Norwegian fishery limits to 200 miles, which resulted in a shift of the fishery westwards to an area, shown in Figure 1, between 200 and 360 n. miles from the Norwegian baselines, and mainly between latitudes 67° and 74° N, but with some sporadic fishing between this area and the area around the Faroes. In 1977 fishing in the northern area was conducted exclusively by Danish vessels, while Faroese vessels operated in the vicinity of the Faroe Islands. In 1978, however, a mixed fleet of Danish and Faroese vessels fished in both the northern and Faroese areas. Although in these years the start of the fishing season was advanced to April, and in 1978 some fishing took place in the vicinity of the Faroes in the autumn (November), the total fishing effort and catch decreased further, the catch (175 tonnes) amounting to less than 20% of the peak level in 1969-70.

32. Estimates of average catch-per-unit-effort for Danish vessels fishing in the northern area between latitudes 67° and 74° N in May, expressed as the numbers of salmon per 1,000 hooks are given below for the year 1969-1978. Similar data are given for fishing in the vicinity of the Faroes in November-December 1978.

	<u>Year</u>	<u>1-31 May</u>	<u>1-15 June</u>
<u>Norwegian Sea</u>	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)
	1974	57 (16,914)	19 (1,280)
	1975	68 (17,280)	44 (3,217)
	1976	51 (5,613)	No fishing
	1977	25 (3,318)	"
	1978	53 (7,130)	"

Nov.-Dec.

<u>Faroes Area</u>	1978	43 (3,979)
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(Figures in brackets refer to the numbers of salmon caught by vessels to which the catch-per-unit-effort estimates refer).

33. Although the Norwegian Sea data in 1977 and 1978 refer to a fishery entirely outside the Norwegian 200 mile fishery limit, the estimates suggest a population density on these grounds similar to that in the area fished previously.

2. Biological Features and Composition of Exploited Stock

34. Biological sampling and tag recapture data for the main Norwegian Sea fishery on the northern grounds in the years prior to its shift westwards in 1977 indicate that the exploited stock was composed mainly of two-sea-winter salmon, returning in the same year to rivers in Norway and, to a lesser extent, the USSR (C.M. Doc. 1974/M:2). Recaptures in 1977 and 1978 of salmon tagged as smolts suggest the same countries of origin on the more westerly grounds fished in these two years. But, in the absence of corresponding biological sampling data it has not been possible to ascertain whether there were differences in the sea-age compositions of the exploited populations in the former and present fishing areas and hence of the likely timing of their return to home waters. The Working Group emphasises the need for such information for assessing effects of the present Norwegian Sea fishery on home waters stock and catches.

35. Further recaptures in the fishery in the vicinity of the Faroes of salmon tagged as smolts in home waters, and in home waters of salmon tagged at the Faroes (Table 8) confirmed earlier findings that the exploited population in the Faroes area is of mixed sea-age and country of origin and subsequent destinations (including Norway, Sweden, England, Scotland, Ireland, Northern Ireland, Iceland, Denmark, USSR). The recaptures suggest that some of the salmon in the area are en route to more distant feeding grounds (at West Greenland and Norwegian Sea) prior to their return to home waters, while others return to home waters in the same year as one or two sea-winter salmon.

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

36. In its earlier assessment (CM 1974/M:2) the ICES/ICNAF Joint Working Party estimated that the long-line fishery in the Norwegian Sea caused an immediate, annual loss to the total weight of fish, mostly two or more sea-winter fish,

returning to home waters approximately equal to the magnitude of the long-line fishery catch. That estimate referred to the long-line fishery prior to the extension of Norwegian fishery limits to 200 miles which, as indicated above, resulted in the fishery moving westwards, and a change in the timing of the commencement of the fishery. In the absence of data on the sea-age of the fish exploited in the present fishery it is not possible to assess its effects reliably, although it seems unlikely that the losses per tonne of fish caught by it would be any greater than those estimated previously.

C. HOME WATERS FISHERIES

37.

The reported catch statistics for the home-waters fisheries for Atlantic salmon (excluding those in the Baltic) in Europe and North America for the years 1960-1968 are given in Table 9. These figures up-date, and are revisions of, the data presented in previous reports (eg Coop. Res. Repts Nos. 8, 12, 24 and 35 and Docs. CM 1974/M:2, 1976/M:18 and 1978/M:22). This applies particularly to the data for salmon and grilse components of the Scottish catches (see Section C.5). Catch-per-unit-effort data for some countries' fisheries are given in Table 10 .

38.

The data in Table 9 show that during the period under review, the total catch (salmon plus grilse) for all countries combined increased during the early 1960's to a level of around 9,000 tonnes in 1964. Thereafter it fluctuated annually without any marked trend up to 1975, following which it decreased sharply. The increase in the early 1960's took place in the fisheries of all of the principal Atlantic salmon producing countries, and the decrease after the mid 1970's was a feature of the main European fisheries (catch data for the USSR not available), but not for the North American (Canadian) fishery for which the catch remained high up to and including 1977. Catches in 1978 were, however, low in both the European and Canadian fisheries, suggesting low survival of the 1977 smolt age-class. This is supported by the relatively small catch taken in the West Greenland fishery in that year (Table 1).

39. In some of the European countries supplying them, the decrease in catches since the mid 1970's is reflected in their catch-per-unit-effort data (Table 10), suggesting that it was mainly due to a decrease in stock abundance. However, the Working Group wishes to emphasise that the use of catch-per-unit-effort data to assess the status of stocks in any broad area can be very misleading; severe overfishing of important river stock may be masked by natural fluctuations in the abundance of larger stocks. Assessment of the stocks should, preferably, be done on the basis of individual stocks or neighbouring groups of stocks.

40. More detailed information on the changes in the fisheries and exploited stocks in each country is given below.

1. France

41. There are mainly three regions in France with salmon rivers: Brittany and South Western Normandy, with twenty coastal salmon streams; the river Loire and its main tributary the river Allier; the river Adour (with its tributaries Gave d'Oloron and Nive) and the little river Nivelle near to the Spanish border. Practically no salmon fishing takes place in the sea. Fishing with seine and drift nets occurs in the estuaries and sport fishing takes place upstream.

42. During the past ten years the total salmon catch has decreased from about 75 tonnes to about 20 tonnes. This reflects a decline in stock, caused by a number of factors. These include increased pollution, the erection of dams, heavy UDN infection, increased rate of exploitation in home waters, and exploitation on the feeding ground at West Greenland (three to four tagged salmon have been caught at West Greenland for one caught back in its home waters). Since 1977, however, the stock of the Nivelle river, previously nearly extinct has shown some improvement following planting of hatchery smolts of Scottish origin marked by fin clipping and cold branding (31 salmon returns from 8,930 smolts liberated in 1976, and already 10 returns from 1,050 smolts liberated in 1977).

2. Ireland

43. The catch of salmon in Irish waters, 98% of which is taken commercially and 2% by sport fishermen, increased during the early 1970's to reach an all time high

level of 2,128 and 2,276 ^{tonnes} in 1974 and 1975 respectively. The increase was associated with an increase in effective effort in the drift-net fishery which has accounted for 75% to 80% of the catch since 1974. The fishing capacity of the gear was increased by the use of longer and deeper nets and by the introduction of a more efficient net material. The inshore seine (dræft) and fixed nets also had a substantial catch during this time and the escapement into fresh water was average or a little above average. After 1975, however, the recorded catch declined and in 1978 it was only 55% of the 1975 catch, the Foyle area being the exception. Associated with the decline in catch was a decrease in the escapement into fresh water. In two rivers, the River Shannon and Burrishoole system the escapement in 1978 was 33% and 50% respectively of the average for the previous 10 years. In the latter the smolt run has also declined.

44. The commercial catch comprises approximately 90% grilse (one-sea-winter salmon) and the main fishing period is from mid-May to mid-July, the peak of the run in recent years being in the second half of June. In 1973, 1974 and 1975 for the first time feeding salmon were taken up to 20 miles from the shore. Associated with this phenomenon was the appearance in the catches of a number of fish tagged as smolts in other countries. In the period from 1973 to 1976, 54 fish tagged as smolts in Great Britain, 6 in Denmark, 3 in Sweden and 4 in France were recaptured. These recaptures were not confined to any particular area, but were taken, mostly by the drift net fishery all around the Irish coast, some quite close inshore.

3. Northern Ireland

45. As shown in Table 9, catches (rod catch not included) taken by the Northern Ireland fishery showed a downward trend during the 1970's, the five yearly averages after 1963 being as follows:-

1964-68	341 tonnes
1969-73	290 "
1974-78	241 "

This reflects a decrease in Northern Ireland stocks, including that in the Foyle area which is of major importance to the coastal net fishery. It is not possible to

divide the total catch into its one- (grilse) and two-or-more-sea-winter salmon components. It is known, however, that the two-or-more-sea-winter component amounts to between 10% and 20% of the total. It is expected that the continued accumulation of data from the census studies in the river Buck will throw more light than is currently available on the fluctuations and relationships between smolt and adult salmon runs in the river.

4. Great Britain; England and Wales

46. Since the early 1960's, a significant proportion of the catch in England and Wales has been taken in the north-east coast drift net fishery. Initially, this fishery produced about 25% of the total catch, but it increased to about 50% with the introduction of monofilament nets towards the end of the 1960's. Since 1970 there has been a slight decline in the catches in this fishery. The salmon/grilse ratio of this catch has been estimated using a weight split. Although this is known to give a bias in favour of salmon, it is clear that the salmon/grilse ratio has decreased, mainly as a result of declining salmon catches and not changes in the grilse runs. Tagging experiments have shown that many of the fish taken in this fishery are on their homeward migration to Scottish rivers.

47. The catches in the commercial net fishery in the remainder of England and Wales have shown little change over the past ten years. It seems possible, however, from a small number of scale samples, that, as in the drift net fishery, the salmon/grilse ratio has decreased in these catches also.

48. The rod catches were at a peak in the mid 1960's but dropped, probably largely as a result of UDN, in 1968 and 1969. Subsequently the total rod catch increased until 1975, but fell dramatically again in 1976, a very dry year, and had not fully recovered in 1977.

5. Great Britain: Scotland

49. In the ICES/ICNAF Joint Working Party's and subsequent reports the breakdown of the Scottish catches into the salmon (two or more sea-winter fish) and grilse (one sea-winter fish) components was based on the returns of the two components

by fishery owners most of whom use weight to divide them. However, age and weight analyses of catch samples from a group of east coast rivers have shown that owing to an increase in the number of large grilse since the early 1960s these returns have over-reported the salmon and under-reported the grilse components, respectively during the summer fishery each year. The extent of this reporting error, which is based on an analysis of monthly catches in association with the age data (see Doc. CM 1978/M:23) is shown in the following Table which gives the reported and corrected catches, by number, of the commercial net fishery in spring (February-May) and summer (June-September) respectively for the years 1952-1976.

Reported and Corrected Scottish Commercial Salmon and Grilse
Catches By Number: 1952-1977

	Reported Catches					Corrected Catches			
	GRILSE	Spring	SALMON Summer	Total		GRILSE	Spring	SALMON Summer	Total
1952	145,091	128,219	72,683	200,902	↑ As Reported ↓	↑ As Reported ↓	↑ As Reported ↓	↑ As Reported ↓	
1953	135,509	102,067	65,625	167,692					
1954	113,063	132,138	70,755	202,893					
1955	131,970	99,166	106,249	205,415					
1956	109,300	74,709	76,342	151,051					
1957	186,978	79,599	75,225	154,824					
1958	192,588	77,986	84,811	162,797					
1959	112,518	119,127	103,328	222,455					
1960	183,431	67,589	80,893	148,482					
1961	150,027	60,933	67,879	128,872					
1962	270,335	48,305	102,973	151,278	296,477		76,831	125,136	
1963	157,675	100,260	97,026	197,286	171,900		82,801	183,061	
1964	272,235	60,082	142,148	202,230	326,348		88,035	148,117	
1965	205,115	56,785	98,758	155,543	228,837		75,036	131,821	
1966	205,278	52,935	111,220	164,155	255,146		61,352	114,287	
1967	328,147	40,848	157,608	198,456	394,341		91,414	132,262	
1968	207,178	42,883	125,445	168,328	251,438		81,185	124,068	
1969	340,691	26,510	140,701	167,211	427,841		53,551	80,061	
1970	213,296	27,735	89,990	117,725	255,172		48,114	75,849	
1971	254,869	28,911	91,937	120,848	289,447		57,359	86,270	
1972	243,444	43,177	128,228	171,405	315,783		55,889	99,066	
1973	282,009	37,149	139,948	177,097	361,091		60,866	98,015	
1974	265,380	27,899	103,928	131,827	311,809		57,499	85,398	
1975	209,693	42,114	101,597	143,711	257,749		53,541	95,655	
1976	181,118	19,768	51,860	71,628	205,897		27,081	46,849	

50. Corrected figures of salmon and grilse catches combined for the Scottish fishery as a whole (including the catch angling) are given, by weight, in Table 9.
51. The data in Table 9 show that during the period 1960-1978 the total catch of salmon and grilse combined increased, with annual fluctuations, during the 1960's, to over 2,000 tonnes in 1967. It fluctuated between about 1,300 and 1,900 tonnes up to 1975, but thereafter it decreased sharply to just over 1,000 tonnes, suggesting a significant decrease in stock abundance. It must be noted, however, that the catch data do not include substantial catches taken illegally by drift net off the Scottish coast in the period 1974-77 and hence may not provide a correct index of the abundance of salmon entering Scottish waters in these years.
52. The data for the separate salmon and grilse components show that the grilse catch increased sharply in 1962 and thereafter fluctuated about a relatively high level, at least up to 1975. The catches of salmon, on the other hand, decreased markedly during the period from the levels in the 1950's. These changes in catches, which probably reflect changes in the stocks, resulted in a marked shift in the salmon/grilse ratio from the earlier level. Information was presented to the Working Group (see Doc. CM 1978/M:26) showing that the decrease in salmon catches was coincident with the increase in the West Greenland fishery and was more apparent in the spring (February-May) than the summer fishery.

6. Norway

53. The salmon catches in the Norwegian fishery increased substantially in the early 1960's to a level of about 2,000 tonnes in 1964-1967, and after some fluctuation again 1,800 tonnes in 1973. Thereafter it declined and in 1978 dropped dramatically to only 1,083 tonnes (provisional figure) which is the lowest since 1951. This was due to a reduction in the drift net fishing effort and a marked reduction in the catch-per-unit-effort in the inshore fisheries.
54. Increases in the number of registered drift nets (to 30,000 drift nets in 1977) was associated with a decline in the numbers of bagnets from more than 7,000

in 1967 to less than 2,000 in 1978. While the bagnets in 1966 took 69% of the sea catch of salmon, the proportion of the catch taken by them decreased gradually to only 29% in 1977.

55. There was a downward trend, with some fluctuations, in the catch-per-unit-effort of both the bagnet and drift net fisheries, during the period of declining catches since 1973. This suggests that the decrease in total catch was due to a decline in the stocks.

7. Canada

56. The river stocks on which Canada's Atlantic salmon fishery is based cover a wide geographical range, from Ungava bay in the north to southern New Brunswick. The stocks exhibit a large variety of biological characteristics, including river and sea ages and migratory routes. Their migratory patterns, and consequently the fisheries for them, may be affected significantly by local ice conditions. The mixture of river stocks migrating through common migration/feeding areas has been the basis of a traditional, mixed stock fishery, centred principally in Newfoundland coastal waters for many years.

57. Table 9 shows ^{that} since 1972 the total Canadian salmon catch, approximately 88% of which by weight is taken by commercial fishermen and 12% by sport fishermen, has remained relatively constant at about 2,500 tonnes. An increase in the commercial catch of 100 tonnes occurred in 1974 and 1975, but it then decreased to the 1973 level of 2,154 tonnes by 1977. Since 1973, the sport catch has increased from 96,979 fish to 127,694 fish in 1977, the greater part of the increase occurring in the multi-sea winter fish component. Provisional catch figures for 1978 (commercial fishery, 1,271 tonnes; sport fishery 80,784 fish) show a substantial decline from 1977 in both the commercial and sport fisheries.

58. In the rivers in New Brunswick and the Gaspé area of Quebec, where a commercial fishery ban has been in operation for seven years, there are good indications that escapements of multi sea-winter salmon are approaching satisfactory spawning requirements in most rivers, but with limited surplus for exploitation. Stock levels which

will allow a return to regular commercial fishing are not expected to be reached before the early 1980's, so the present commercial fishing ban in these areas will continue in 1979. Some of the benefits from the ban have been negated by increases in incidental catches of salmon in other inshore fisheries, by poaching and by Indian fisheries for food.

59. Results of biological studies over several years have identified a number of other Canadian rivers which have experienced severe declines in spawning escapement, especially of the multi-sea-winter fish component. These rivers are located on the west coast of Newfoundland, the north shore of Quebec and in several areas of Nova Scotia. Severe restrictions, and a cut back in the commercial and sport fishing seasons, particularly in Newfoundland, have been implemented to improve spawning escapements to these rivers. The stocks in other Canadian rivers, mainly on the south and east coasts of Newfoundland and Labrador appear, at present, to be in a relatively satisfactory state, although their actual status is currently under review.

8. United States

60. All of United States home water fisheries for Atlantic salmon occur in rivers in the State of Maine. In spite of many years of stream rehabilitation and stocking of hatchery reared smolts, catches, all taken by anglers, seldom rose above 200-300 fish until 1973 when about 500 fish were taken. In 1974, the recorded catch dropped to 186 fish, and it was 346 in 1975, 165 in 1976 and 479 in 1977. In 1978 it increased again to 821 fish^(4.1 tonnes), 98% of which comprised two or more sea-winter fish.
61. Efforts are underway to rehabilitate and restock two other river systems in New England, the Connecticut and the Merrimack. Historically, both of these rivers had salmon runs which were extinguished by the installation of power dams. Over 78,000 smolts, over 50,000 of which marked by cold branding and fin clipping, have been liberated in the Merrimack since 1977 with no returns reported as yet. The situation in the Connecticut is much more encouraging. Since 1974 about 480,000 smolts, 175,000 of them tagged, have been released. About 550 tags have been

returned from New England waters, the Bay of Fundy, the shores of Nova Scotia and Newfoundland and the west Greenland fishery (see Table 4). During 1978 about 100 adult salmon were taken in the mouth of the river.

D. BIOLOGICAL IMPLICATIONS OF SALMON FISHERY REGULATIONS

62. Information presented to the Working Group on the kinds of regulatory measures used in some of the main salmon producing countries showed that they include restrictions and controls on the fishing gear used, limitations on the season and areas of capture as well as other measures. The Working Group noted that the regulatory regime influences the harvestable yield from the stocks, the maintenance of optimal spawning escapements, the statistical base for resource assessment, and the seasonal distribution of the salmon biomass in the sea. The Working Group limited its considerations to the implications of the different kinds of regulatory measures with respect to these biological factors; socio-economic factors which are important in the consideration of regulatory measures were deliberately excluded. No detailed examination of national regulations was attempted by the Working Group in this context but the following general conclusions were drawn:-

1. The maintenance of optional spawning escapement is made more difficult as the ratio of exploitation on stocks after their return to their rivers of origin to exploitation in mixed stock fisheries decreases. The stocks from less productive rivers may be seriously depleted or eliminated if they are exploited together with other, larger river stocks in a large mixed fishery.
2. Not all salmon which die due to fishing are retained as catch. There is evidence that losses due to "non-catch fishing mortality" (see section A.4) are higher when fishing takes place on feeding grounds than when maturing salmon approach their home rivers, due to physiological changes.
3. Sea fisheries remote from the rivers of origin reduce the biomass of salmon returning to them.

4. Mixed fisheries reduce the accuracy with which catch statistics can be obtained for individual river stocks.
 5. Exploitation of salmon during a period when they are growing rapidly is likely to reduce the yield which can be taken per recruit.
63. Information on the methods of regulating salmon fisheries in some countries is given in Appendix 1.

E. FUTURE RESEARCH AND DATA REQUIREMENTS

64. The Working Group considered the current deficiencies in the scientific data base and gaps in current knowledge of aspects of the biology of Atlantic salmon in relation especially to the assessment of the effects of the West Greenland and Norwegian Sea fisheries on the salmon stock returning to home waters. Special attention is drawn to the following items on which additional work is recommended.
1. The investigation of "non-catch fishing mortality" in the drift net and set gill net fishery at West Greenland, the long-line fishery in the Norwegian Sea, and in the home-waters fisheries by different types of gear.
 2. Further scale characteristics and other studies of the river stock composition of the salmon exploited at West Greenland, and of their differences in weight and length.
 3. The comparability of age readings, especially of river ages, made in different countries. The attention of the ANACAT Committee is drawn to the possible need in this regard to establish a salmon scale exchange programme or workshop.
 4. The size selectivity of salmon by gill nets of different mesh sizes in the West Greenland and home-waters fisheries.
 5. The estimation of natural mortality of salmon during their sea phase. Further consideration should be given especially to the applicability to Atlantic salmon of Mathews' hypothesis that natural mortality rate varies inversely with weight.

6. The use of fishing effort, and catch-per-unit-effort data as a basis for measuring changes in effective fishing effort and stock abundance respectively.
7. Sampling and, if possible, tagging of catches in the Norwegian Sea and Faroes long-line fishery to provide information on length, age and countries of origin of the exploited stock.

The Working Group considered that a further meeting should be arranged in 1980 to appraise the results of these further studies,

F. REFERENCES

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Table 1

Salmon catches at West Greenland, 1960-78, in tonnes, round fresh weight. 1960-71 from Table 1 in CM 1974/M:2. 1972-77 from ICNAF Stat. Bulletin

	Drift net				Gill net and drift net	TOTAL
	Norway	Faroese	Sweden	Denmark	Greenland ^{d)}	
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	158	144	0	401	1410	2113
1973	200	171	0	385	1585	2341
1974	140	110	0	505	1162	1917
1975	217	260	0	382	1171	2030
1976	0	0	0	0	1175	1175
1977	0	0	0	0	1420	1420
1978	0	0	0	0	992 ^{b)}	992

a) Figures not available, but catch is known to be less than the Faroese

b) Provisional

c) Including 7 metric tons caught on long line by one of two Greenland vessels in the 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

Distribution of catches (tonnes) taken by Greenland vessels
in 1973-1978 by ICNAF Divisions

	1973	1974	1975	1976	1977	1978
Division						
1A	182	44	124	166	201	186
1B	194	116	168	302	393	238
1C	145	229	175	262	336	245
1D	385	290	204	225	207	186
1E	487	395	315	182	237	127
1F	192	88	185	38	46	10
Total	1585	1162	1171	1175	1420	992
East Greenland	+	+	+	+	6	8
TOTAL	1585	1162	1171	1175	1426	1000

Table 3 Number of natural (wild) smolts tagged in the years 1963-1978 and recaptured in west Greenland and other areas including home waters, up to April 1979.
 Figures in brackets are returns per 1000 tags
 (0 = No smolts tagged or no recaptures made; - = no information available)

Country	Year of Tagging	Number Tagged	R E C A P T U R E S				All Other Areas		Grand Total
			West Greenland	Norwegian Sea & Faroes	1 SW	Multi SW	Total		
Canada	1963	5,850	11 (1.9)	0	70(12.0)	20(3.4)	90	101	
	1964	15,013	9 (0.6)	0	204(13.6)	72(4.8)	276	285	
	1965	16,485	73 (4.4)	0	175(10.6)	193(11.7)	368	441	
	1966	9,509	25 (2.6)	0	120(12.6)	105(11.0)	225	250	
	1967	17,854	17 (1.0)	0	121(6.8)	164(9.2)	285	302	
	1968	56,132	132 (2.4)	0	1,218(21.7)	419(7.5)	1,637	1,769	
	1969	42,973	85 (2.0)	0	379(8.8)	184(4.3)	563	648	
	1970	37,812	173 (4.6)	0	316(8.4)	156(4.1)	472	645	
	1971	45,564	103 (2.3)	0	415(9.1)	186(4.1)	601	704	
	1972	24,476	34 (1.4)	0	226(9.2)	73(3.0)	299	333	
	1973	18,400	69 (3.8)	0	115(6.3)	116(6.3)	231	300	
	1974	13,215	75 (5.7)	0	161(12.2)	154(11.7)	315	390	
	1975	13,992	13 (0.9)	0	57(4.1)	44(3.1)	101	114	
	1976	12,838	12 (0.9)	0	51(4.0)	34(2.6)	85	97	
	1977	720	0	0	8(11.1)	-	8	8	
	1978	16,974	-	-	-	-	-	-	
Scotland	1963	10,998	10 (0.9)	0	172(15.6)	92(8.4)	264	274	
	1964	9,200	6 (0.7)	0	110(12.0)	66(7.2)	176	182	
	1965	9,239	10 (1.1)	0	73(7.9)	49(5.3)	122	132	
	1966	15,406	30 (1.9)	0	280(18.2)	39(2.5)	319	349	
	1967	21,002	23 (1.1)	1	169(8.0)	71(3.4)	240	264	
	1968	15,692	17 (1.1)	0	127(8.1)	33(2.1)	160	177	
	1969	15,590	51 (3.3)	0	216(13.9)	55(3.5)	271	322	
	1970	32,070	155 (4.8)	1(0.03)	560(17.5)	179(5.6) ^b	739	895	
	1971	20,089	146 (7.3)	1(0.05)	612(30.5)	238(11.8) ^c	850	997	
	1972	19,577	200(10.2)	2(0.1)	757(38.7)	252(12.9)	1,009	1,211	
	1973	26,846	156 (5.8)	2(0.07)	1,035(38.6) ^d	432(16.1) ^{d,e}	1,467	1,625	
	1974	20,271	37 (1.8)	0	394(19.4)	126(6.2)	520	557	
	1975	19,300	15 (0.8)	0	117(6.1)	45(2.3)	162	177	
	1976	18,810	32 (1.7)	0	e217(11.5)	127(6.8)	344	376	
	1977	11,426	5 (0.4)	2(0.2)	54(4.7)	-	54	61	
	England & Wales	1963	9,485	8 (0.8)	0	15(1.6)	38(4.0)	53	61
1964		17,105	10 (0.6)	0	30(1.8)	97(5.7)	127	137	
1965		5,873	12 (2.0)	0	35(6.0)	57(9.7)	92	104	
1966		3,219	5 (1.6)	0	28(8.7)	37(11.5)	65	70	
1967		4,117	10 (2.4)	0	23(5.6)	56(13.6)	79	89	
1968		5,789	24 (4.1)	0	44(7.6)	51(8.8)	95	119	
1969		8,515	50 (5.9)	0	35(4.1)	41(4.8)	76	126	
1970		7,304	28 (3.8)	0	29(4.0)	29(4.0)	58	86	
1971		5,680	20 (3.5)	0	30(5.3)	16(2.8)	46	66	
1972		2,429	8 (3.3)	0	10(4.1)	0	10	18	
1973		2,676	5 (1.9)	0	10(3.7)	3(1.1)	13	18	
1974		3,000	64(21.3)	0	3(1.0) ^f	4(1.3)	7	71	
1975		1,352	6(4.4)	0	2(1.5)	3(2.2) ^e	5	11	
1976		1,257	4 (3.2)	0	1(0.8)	3(2.4)	4	8	
1977		246	0	0	0	-	-	0	
1978		144	-	-	-	-	-	-	

a = Includes maturing and non-maturing one sea-winter salmon in Canada

b = One caught near Alesund, Norway

c = One tag returned by Norwegian consumer

d = One caught in Norwegian river

e = One caught off Newfoundland

f = One caught on coast of Labrador

Table 3
(continued)

R E C A P T U R E S

Country	Year of Tagging	Number Tagged	West Greenland	Norwegian Sea & Faroes	All Other Areas			Grand Total
					1 SW	Multi SW	Total	
Norway	1963	97	0	0	0	4(41.2)	4	4
	1964	1,485	0	0	67(45.1)	26(17.5)	93	93
	1965	2,178	0	0	40(18.4)	18(8.3)	58	58
	1966	1,362	0	2 (1.5)	27(19.8)	16(11.7)	43	45
	1967	3,601	0	4 (1.1)	59(16.4)	26(7.2)	85	93g
	1968	3,562	0	3 (0.8)	106(29.8)	21(5.9)	127	134g
	1969	4,273	3 (0.7)	3 (0.7)	83(19.4)	30(7.0)	113	124g
	1970	7,603	3 (0.4)	4 (0.5)	234(30.8)	93(12.2)	327	337g
	1971	5,573	0	3 (0.5)	319(57.2)	73(13.1)	392	398g
	1972	4,445	0	10 (2.2)	336(75.6)	104(23.4)	440	450
	1973	5,500	3 (0.5)	5 (0.9)	582(105.9)	110(20.0)	692	701g
	1974	3,751	1 (0.3)	6 (1.6)	286(76.2)	69(18.4)	355	362
	1975	1,562	0	1 (0.6)	113(72.3)	22(14.1)	135	136
	1976	1,751	0	1 (0.6)	65(37.1)	17(9.7)	82	83
	1977	2,340	2 (0.9)	0	109(46.6)	-	109	111
	1978	2,787	-	-	-	-	-	-
Iceland	1963	63	0	0	2(31.7)	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(13.0)	1(6.5)	3	3
	1968	59	0	0	1(16.9)	1(17.0)	2	2
	1969	15	0	0	0	0	0	0
	1970	16	0	0	0	0	0	0
	1971-78		Data not available					
N Ireland ^{h1}	1974	2,330	1 (0.4)	1 (0.4)	44(18.9)	2(0.8)	46	48
	1975	1,600	1 (0.6)	0	17(10.6)	2(1.3)	19	20
	1976	1,300	0	0	20(15.4)	2(1.5)	22	22
	1977	919	0	0	4(4.4)	-	4	4
	1978	-	-	-	-	-	-	-
N Ireland ^{h2}	1974	2,330	1 (0.4)	1 (0.4)	87(37.3)	10(4.3)	97	99
	1975	1,600	1 (0.6)	0	56(35.0)	5(3.1)	61	62
	1976	1,300	0	0	46(35.4)	6(4.6)	52	52
	1977	919	0	0	9(9.8)	-	9	9
	1978	-	-	-	-	-	-	-

g = Including some fish from unknown localities

h1 = All tagged on R Bush but no R Bush trap recaptures included

h2 = All tagged on R Bush and including R Bush trap recaptures

Table 3
(continued)

R E C A P T U R E S

Country	Year of Tagging	Number Tagged	West Greenland	Norwegian Sea & Faroes	All Other Areas			Grand Total
					1 SW	Multi SW	Total	
Ireland	1968	606	0	0	21(34.7)	0	21	21
	1969	0	0	0	0	0	0	0
	1970	1,522	5 (3.3)	0	1(0.7)	1(0.7)	2	7
	1971	1,425	2 (1.4)	0	2(1.4)	0	2	4
	1972	204	0	0	2(9.8)	0	2	2
	1973	490	0	0	0	0	0	0
	1974	361	0	0	14(38.8)	1(2.8)	15	15
	1975	1,360	1 (0.7)	0	2(1.5)	0	2	3
	1976	147	0	0	1(6.8)	0	1	1
	1977	0	0	0	0	0	0	0
	1978	3,767	-	-	-	-	-	-
Sweden	1969	885	0	0	69(78.0)	16(18.0)	85	85
	1970	0	0	0	0	0	0	0
	1971	0 _i	0	0	0	0	0	0
	1972	1,375 _i	0	NS 2(1.5)	2(1.5)	29(21.1)	31	33
	1973	409 _j	1 (2.4)	0	37(90.5)	2(4.9)	39	40
France	1969	2,089	15 (7.1)	0	0	4(1.9)	4	19
	1970	3,968	27 (6.8)	0	3(0.8)	13(3.3)	16	43
	1971	4,702	10 (2.1)	0	0	5(1.1)	5	15
	1972	1,983	2 (1.0)	0	0	0	0	2
	1973	3,903	3 (0.8)	0	0	0	0	3
	1974	0	0	0	0	0	0	0
	1975	67	0	0	0	0	0	0
	1976	864	0	0	0	0	0	0
USSR	1969	500	0	0	0	0	0	0
Greenland (All Parr)	1970	155	7(45.2)	0	0	0	0	7
	1971	136	0	0	0	0	0	0
	1972	0	0	0	0	0	0	0
	1973	21	0	0	0	0	0	0

i = Smolts from a northern river

j = " " a southern river

Table 4 Number of hatchery reared smolts tagged in the years 1963 - 1978 and recaptured in West Greenland and in other areas including home waters up to April 1979. Figures in brackets are returns per 1000 tags. (0 = No smolts tagged or no recaptures made; - No information available.)

RECAPTURES

Country	Year of Tagging	Number Tagged	West Greenland	Norwegian Sea & Faroes	All Other Areas			Grand Total
					1 SW	Multi SW	Total	
Canada	1963	7,332	4 (0.5)	0	133(18.1)	32(4.4)	165	169
	1964	46,659	9 (0.2)	0	101(2.2)	85(1.8)	186	195
	1965	45,988	67 (1.5)	0	380(8.3)	225(4.9)	605	672
	1966	70,875	70 (1.0)	0	238(3.4)	301(4.3)	539	609
	1967	112,288	70 (0.6)	0	278(2.5)	299(2.0)	507	577
	1968	113,368	190 (1.7)	0	315(2.8)	320(2.8)	635	825
	1969	137,832	260 (1.9)	0	377(2.7)	237(1.7)	614	874
	1970	184,962	217 (1.2)	0	295(1.6)	100(0.5)	395	612
	1971	200,689	136 (0.7)	0	172(0.9)	192(1.0)	364	500
	1972	208,966	197 (0.9)	0	315(1.5)	150(0.7)	465	658
	1973	121,940	171 (1.4)	0	766(6.3)	251(2.1)	1,017	1,188
	1974	66,403	77 (1.2)	0	608(9.2)	147(2.2)	755	832
	1975	92,008	110 (1.2)	0	641(7.0)	279(3.0)	920	1,030
	1976	178,757	90 (0.5)	0	843(4.7)	273(1.5)	1,116	1,206
	1977	150,509	67 (0.4)	0	357(2.4)	-	357	424
	1978	119,193	-	-	-	-	-	-
Scotland	1963	6,750	0	0	3(0.4)	3(0.4)	6	6
	1964	3,000	0	0	7(2.3)	7(2.3)	14	14
	1965	3,000	0	0	19(6.3)	0	19	19
	1966	8,000	1 (0.1)	0	13(1.6)	4(0.5)	17	18
	1967	4,451	0	0	1(0.2)	0	1	1
	1968	5,335	0	0	4(0.7)	3(0.6)	7	7
	1969	3,694	0	0	1(0.3)	2(0.5)	3	3
	1970	7,836	9 (1.1)	2(0.3)k	35(4.5)	10(1.3)	45	56
	1971	5,247	2 (0.4)	0	39(7.4)	20(3.8)	59	61
	1972	12,968	2 (0.2)	0	36(2.8)	0	36	38
	1973	7,500	9 (1.2)	1(0.1)	71(9.5)	16(2.1)	87	97
	1974	2,727	4 (1.5)	0	11(4.0)	7(2.6)	18	20
	1975	7,458	1 (0.1)	1(0.1)	16(2.1)	0	16	18
	1976	4,386	2 (0.5)	3(0.7)	87(19.8)	1(0.2)	88	93
	1977	3,914	0	0	2(0.5)	-	2	2
	1978	-	-	-	-	-	-	-
England & 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(0.1)	5(0.2)	9	13
	1969	7,420	3 (0.4)	0	4(0.5)	0	4	7
	1970	4,493	3 (0.7)	0	1(0.2)	3(0.7)	4	7
	1971	12,030	9 (0.7)	0	8(0.7)	5(0.4)	13	22
	1972	11,218	24 (2.1)	0	36(3.2)	12(1.1)	48	72
	1973	4,826	5 (1.0)	0	3(0.6)	2(0.4)	5	10
	1974	6,290	2 (0.3)	0	9(1.4)1	1(0.2)	10	12
	1975	11,200	0	0	7(0.6)	1(0.1)	8	8
	1976	0	0	0	0	0	0	0
	1977	9,025	0	0	4(0.4)	-	4	4
	1978	13,521	-	-	-	-	-	-

k = Norwegian Coast

1 = One pre-grilse caught off Norwegian coast

Table 4 (continued)

RECAPTURES

Country	Year of Tagging	Number Tagged	West Greenland	Norwegian Sea & Faroes	All Other Areas			Grand Total
					1 SW	Multi SW	Total	
Norway	1963	10,999	0	1(0.1)	88(8.0)	95(8.6)	183	184
	1964	9,182	0	1(0.1)	135(14.7)	87(9.5)	222	223
	1965	8,071	0	13(1.6)	71(8.8)	33(4.1)	104	117
	1966	13,812	0	29(2.1)	403(21.9)	145(10.5)	548	593g
	1967	18,393	2(0.1)	50(2.7)	229(12.5)	81(4.4)	310	386g
	1968	12,983	0	44(3.4)	171(13.3)	103(7.9)	274	343g
	1969	16,967	4(0.2)	38(2.2)	138(8.1)	68(4.0)	206	260g
	1970	18,673	2(0.1)	15(0.8)	187(10.0)	110(5.9)	297	321g
	1971	16,777	3(0.2)	24(1.4)	188(11.2)	86(5.1)	274	304g
	1972	22,472	1(0.1)	39(1.7)	279(12.4)	309(13.8)	588	638g
	1973	25,550	1(0.05)	26(1.0)	302(11.8)	195(7.6)	497	528g
	1974	15,853	0	10(0.6)	95(6.0)	89(5.6)	184	194g
	1975	9,631	0	2(0.2)	62(6.5)	21(2.2)	83	85
	1976	20,205	1(0.05)	8(0.4)	135(6.7)	84(4.2)	219	228
	1977	23,890	0	7(0.3)	245(10.3)	-	245	252
	1978	20,601	-	-	-	-	-	-
Iceland	1966	8,367	1(0.1)	1(0.1)	66(7.9)	14(1.7)	80	82
	1967	10,061	0	0	24(2.4)	6(0.6)	30	30
	1968	9,985	0	0	45(4.5)	0	45	45
	1969	7,586	0	0	246(32.4)	10(1.3)	256	256
	1970	10,014	0	0	-	-	-	-
	1971	11,087						
	1972-78	Data not available						
N Ireland h1	1973	181	0	0	1(5.5)	0	1	1
	1974	1,946	0	0	17(8.7)m ₁	1(0.5)	18	18
	1975	3,568	0	0	0	0	0	0
	1976	5,600	0	0	15(2.7)	1(0.2)	16	16
	1977	0	0	0	0	-	0	0
	1978	3,656	-	-	-	-	-	-
N Ireland h2	1973	181	0	0	4(22.1)	0	4	4
	1974	1,946	0	0	32(16.4)m ₂	1(0.5)	33	33
	1975	3,568	0	0	0	0	0	0
	1976	5,600	0	0	15(2.7)	1(0.2)	16	16
	1977	0	0	0	0	0	0	0
	1978	3,656	-	-	-	-	-	-

g = Including some fish from unknown localities

h₁ = All tagged on R. Bush but no R. Bush trap recaptures includedh₂ = All tagged on R. Bush and including R. Bush trap recapturesm₁ = One pre-grilsem₂ = Three pre-grilse

Table 4 (continued)

RECAPTURES

Country	Year of Tagging	Number Tagged	West Greenland	Norwegian Sea & Faroes	All Other Areas			Grand Total
					1 SW	Multi SW	Total	
Ireland	1966	15,000	0	0	0	0	0	0
	1967	5,000	1(0.2)	0	1(0.2)	0	1	2
	1968	220	0	0	1(4.5)	0	1	1
	1969	7,194	2(0.3)	0	22(3.1)	2(0.3)	24	26
	1970	4,788	0	1(0.2)	11(2.3)	0	11	12
	1971	2,281	0	0	1(0.4)	0	1	1
	1972	0	0	0	0	0	0	0
	1973	2,936	4(1.4)	0	27(9.2)	3(1.0)	30	34
	1974	0	0	0	0	0	0	0
	1975	9,000	3(0.3)	0	20(2.2)	1(0.1)	21	24
	1976	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0
	1978	1,769	-	-	-	-	-	-
Sweden	1966	11,181	7(0.6)	1(0.1)	690(61.7)	193(17.2)	883	891
	1967	4,999	1(0.2)	4(0.8)	364(72.8)	62(12.4)	426	431
	1968	4,798	1(0.2)	1(0.2)	586(122.1)	37(7.7)	623	625
	1969	7,381	4(0.5)	3(0.4)	465(63.0)	43(5.8)	508	515
	1970	6,000	8(1.3)	1(0.2)	412(68.7)	39(6.5)	451	460
	1971	4,997	4(0.8)	1(0.2)NS	341(68.2)	31(6.2)	372	377
	1972	4,000n	2(0.5)	7(1.8)NS	235(58.8)	23(5.8)	258	267
	1973	4,458	7(1.6)	5(1.1)NS	569(127.6)	59(13.2)	628	640
	1974	1,000	1(1.0)	1(1.0)NS	95(95.0)	4(4.0)	99	101
	1975	984	0	0	52(52.8)	5(5.1)	57	57
	1976	4,974	2(0.4)o	1(0.2)NS	191(38.4)	38(7.6)	229	233
	1977	2,577	0	0	155(60.1)	-	155	155
USA	1966	82,250	39(0.4)	0	69(0.8)	168(2.0)	237	276
	1967	80,717	1(0.01)	0	12(0.1)	10(0.1)	22	23
	1968	73,730	7(0.1)	0	9(0.1)	12(0.2)	21	28
	1969	73,415	65(0.9)	0	32(0.4)	79(1.1)	111	177
	1970	47,835	404(8.5)	0	55(1.1)	285(6.0)	340	744
	1971	29,900	93(3.1)	0	12(0.4)	206(6.9)	218	311
	1972	52,535	129(2.4)	0	30(0.6)	191(3.6)	221	350
	1973	38,045	339(8.9)	0	113(3.0)	402(10.6)	515	854
	1974	91,750	114(1.2)	0	111(1.2)	161(1.8)	272	386
	1975	92,403	38(0.4)	0	105(1.1)	89(1.0)	194	232
	1976	26,370	8(0.3)	0	17(0.6)	84(3.2)	101	109
	1977	96,303	13(0.1)	0	11(0.1)	-	11	24
	1978	25,000	-	-	-	-	-	-
	1979	60,000	-	-	-	-	-	-

n = In addition, 1300 smolts reared in Norway were released into R. Lagan (No recaptures in Greenland or Norwegian Sea & Faroes; 30 1SW and 20 MSW fish recaptured in 'all other areas')

o = In addition, one recaptured in east Greenland.

Table 4 (continued)

R E C A P T U R E S

<u>Country</u>	<u>Year of Tagging</u>	<u>Number Tagged</u>	<u>West</u>	<u>Norwegian Sea</u>	<u>All Other Areas</u>		<u>Total</u>	<u>Grand Total</u>
			<u>Greenland</u>	<u>& Faroes</u>	<u>1 SW</u>	<u>Multi SW</u>		
France	1970	549	0	0	0	0	0	0
	1971	326	0	0	0	0	0	0
	1972	4,469	4(0.9)	0	0	1(0.2)	1	1
	1973	17,938	21(1.2)	1(0.05)	6(0.3)	27(1.5)	33	55
	1974	4,450	0	0	0	0	0	0
	1975	9,088	0	0	-	-	1	1
	1976	4,059	0	0	0	0	0	0
	1977	9,705	0	1(0.1)	-	-	4	5
	1978							
Denmark	1965	1,880	0	0	1(0.5)	2(1.1)	3	3
	1966	4,270	0	4(0.9)	24(5.6)	41(10.0)	65	69
	1967	2,696	0	2(0.7)	16(5.9)	6(2.2)	22	24
	1968	5,173	1(0.2)	1(0.2)	36(7.0)	1(0.2)	37	39
	1969	3,837	0	0	6(1.6)	6(1.6)	12	12
	1970	1,376	0	0	0	0	0	0
	1971	0	0	0	0	0	0	0
	1972	0	0	0	0	0	0	0
	1973	2,976	0	0	136(45.7)	11(3.7)	147	147
	1974	1,974	0	3(1.5)	57(28.9)	2(1.0)	59	62
	1975	4,171	0	1(0.2)	119(28.5)	7(1.7)	126	127
	1976	3,966	0	0	65(16.4)	9(2.3)	74	74
	1977	1,998	0	1(0.5)	80(40.0)	-	80	81
	1978							
USSR	1969	600	0	0	0	0	0	0

Table 5 Number of kelts tagged in the winters 1962/63 to 1978/79 recaptured in Greenland and in other areas including home waters up to the end of 1978
(0 = No kelts tagged or no recaptures made; - = No information available).

Country	Winter of Tagging	Number Tagged	R E C A P T U R E S			In Year of Tagging
			Greenland	Other Areas	Total	
Canada p	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	3,950	2	288	290	660
	1968-69	3,860	5	84	89	526
	1969-70	4,830	9	148	157	598
	1970-71	5,392	22	309	331	780
	1971-72	5,346	10	397	407	840
	1972-73	6,946	28	296	324	1,486
	1973-74	7,854	3	266	269	1,801
	1974-75	7,962	4	337	341	2,460
	1975-76	4,592	2	268	270	467
	1976-77	2,916	1	184	185	215
	1977-78	2,603	0	63	63	348
	1978-79	2,285	-	-	-	12
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	907	3	18	21	
	1967-68	117	0	3 q	3	
	1968-69	152	0	1 q	1	
	1969-70	133	0	1	1	
	1970-71		0	1	1	
	1971-72	54	0	1	1	
	1972-78	No kelts tagged				
England & Wales (R. Axe only)	1962-63	159	1	12	13	
	1963-64	185	2	10	12	
	1964-65	184	1	11	12	
	1965-66 r	109	1	7	8	
	1966-67 r	178	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	18	0	1	1	
	1974-75	18	0	0	0	
	1975-76	23	0	0	0	
	1976-77	4	0	0	0	
	1977-78	0	0	0	0	

Table 5 (contd.)

<u>Country</u>	<u>Winter of Tagging</u>	<u>Number Tagged</u>	R E C A P T U R E S		
			<u>Greenland</u>	<u>Other Areas</u>	<u>Total</u>
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
	1971-78	Data not available			
N. Ireland h1	1972-73	103	0	2	2
	1973-74	471	0	10	10
	1974-75	586	1	22	23
	1975-76	365	0	15	15
	1976-77	244	0	0	0
	1977-78				
N. Ireland h2	1972-73	103	0	8	8
	1973-74	471	0	30	30
	1974-75	586	1	91	92
	1975-76	365	0	39	39
	1976-77	244	0	4	4
	1977-78				
Ireland	1962-63	2,264	2	31	33
	1963-64	2,301	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	438	1	53	54
	1973-74	986	0	24	24
	1974-75	912	0	32	32
	1975-76	455	0	10	10
	1976-77	805	0	16	16
	1977-78	271	-	3	3
Faroes	1963-73	103	0	8	8
	1973-74	41			
	1974-78	Data not available			

p = Ascending adults and fish tagged from coastal fisheries are included in the totals, ^{tagged} for the corresponding winter (ie those tagged in 1962 are included under 1962-63, those tagged in 1963 under 1963-64, etc).

q = One recapture at Faroes

r = In addition: 1965-66 180 kelts tagged in Dec & Clwyd area - No recaptures
 1966-67 291 " " " " " " " " - Two recaptures in other areas

h1 = All tagged on R. Bush but no R. Bush trap recaptures included.

h2 = All tagged on R. Bush and including R. Bush trap recaptures.

Table 5 (contd.)

<u>Country</u>	<u>Winter of Tagging</u>	<u>Number Tagged</u>	R E C A P T U R E S		
			<u>Greenland</u>	<u>Other Areas</u>	<u>Total</u>
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	10	15	25
	1973-74	220	0	12	12
	1974-75	445	0	15	15
	1975-76	722	0	10	10
	1976-77	658	0	15	15
	1977-78	337	0	1	1
	1978-79	1,347	-	-	-
USSR	1968-69	566	0	10	10
	1969-70	1,147	0	0	0

Table 6

Percentage fork length compositions of one-sea-winter salmon identified from scale analysis as of European and North American origin in catches at West Greenland in 1978

Fork Length (cm)	European Origin Salmon	North American Origin Salmon
52-53	0.3	1.6
54-55	0.3	1.1
56-57	0.3	6.4
58-59	0.3	7.5
60-61	2.4	14.4
62-63	5.9	19.2
64-65	17.0	18.7
66-67	25.3	13.4
68-69	25.3	11.8
70-71	15.1	3.2
72-73	4.8	1.6
74-75	2.1	1.1
76-77	0.3	-
78-79	0.6	-
No. of fish	371	187
Mean Length (cm)	67.3	63.4
Mean Weight (kg)	3.50	2.94

Table 7

Catches in the Norwegian Sea Long-line Fishery: 1965-1978; in metric tonnes round fresh weight

Year	Norwegian Sea Long-line Fishery										
	Denmark		Faroes		Fed.Rep.Germany		Norway		Sweden		Total Longline Catch
	No. of Vessels	Catch	No. of Vessels	Catch	No. of Vessels	Catch	No. of Vessels ^e	Catch	No. of Vessels	Catch	
1965	1-2	- ^a	0	0	0	0	0	0	0	0	- ^a
1966	10	- ^a	0	0	0	0	0	0	-	- ^a	- ^a
1967	22	77	0	0	0	0	-	- ^a	6	- ^a	77+
1968	28	177	2	5 ^b	0	0	-	100 ^d	16	126	408 ^d
1969	40	413	4	7 ^c	5	24	-	450 ^d	2	24	918 ^d
1970	60	481	5	12 ^b	4	21	-	420 ^d	1	24	958 ^d
1971	20	162	0	0	2	9	-	300 ^d	1	17	488 ^{d f}
1972	20	182	2	9 ^c	2	4	-	300 ^d	1	20	515 ^{d f}
1973	15	233	5	28 ^c	0	0	-	250 ^e	2	50	561 ^{d f}
1974	10	148	5	20 ^c	0	0	-	200 ^d	1	25	393 ^{d f}
1975	15	245	6	28 ^c	0	0	-	200 ^d	1	30	503 ^{d f}
1976	20	264	9	40 ^c	0	0	0	0	1	25	329 ^f
1977	24	192	9	40 ^c	0	0	0	0	0	0	232 ^f
1978	15	138 ^g	8	37 ^b	0	0	0	0	0	0	175 ^f

a. Catch not known

b. Roughly 70% of catch taken in vicinity of the 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

g. Small part of catch taken in vicinity of Faroes

Table 8

Recaptures of fish tagged in Faroese waters to March 1976

<u>Year</u> <u>tagged</u>	<u>Number</u> <u>tagged</u>	R e c a p t u r e s						<u>West</u> <u>Greenland</u>	<u>North of</u> <u>Faroes</u>
		<u>Norway</u>	<u>Sweden</u>	<u>England</u>	<u>Scotland</u>	<u>Ireland</u>	<u>USSR</u>		
1969	74	1	0	0	2	0	0	0	0
1970	233	2	0	1	5	3	1	1	0
1971	359	4	0	1	8	2	0	1	0
1972	307	1	0	2	4	4	0	1	0
1973	280	5	0	1	5	2	0	0	0
1974	429	16	2	0	5	2	0	0	0
1975	69	0	0	0	2	0	0	0	1

Table 9

Salmon Catches in Home Waters (in tonnes round fresh weight) 1960-1978

	FRANCE	ENGLAND & WALES	SCOTLAND ^a			IRELAND ^b			NORTHERN ^{bc} IRELAND	NORWAY ^d			SWEDEN ^c (WEST COAST)	USSR ^e	ICELAND	CANADA			USA	TOTAL ^f ALL COUNTRIES
	T	T	S	G	T	S	G	T	T	S	G	T	T	T	T	S	G	T	T	T
1960	50-100	283	927	509	1,436	-	-	743	139	-	-	1,659	40	1,100	100	-	-	1,636	<2	7,212
1961	50-100	232	772	424	1,196	-	-	707	132	-	-	1,533	27	790	127	-	-	1,583	<2	6,403
1962	50-100	318	808	932	1,740	-	-	1,459	356	-	-	1,935	15	710	125	-	-	1,719	<2	8,453
1963	50-100	325	1,168	530	1,698	-	-	1,458	306	-	-	1,786	16	480	145	-	-	1,851	<2	8,141
1964	50-100	307	913	1,001	1,914	-	-	1,617	377	-	-	2,147	16	590	135	-	-	2,069	<2	9,248
1965	50-100	320	835	728	1,563	-	-	1,457	281	-	-	2,000	17	590	133	-	-	2,116	<2	8,553
1966	50-100	387	788	836	1,624	-	-	1,238	287	-	-	1,791	17	570	106	-	-	2,359	<2	8,455
1967	50-100	420	857	1,276	2,133	-	-	1,463	449	-	-	1,960	23	883	146	-	-	2,863	<2	10,415
1968	50-100	282	783	780	1,563	-	-	1,413	312	-	-	1,514	14	827	162	-	-	2,111	<2	8,273
1969	50-100	377	539	1,408	1,947	-	-	1,730	267	801	582	1,383	9	360	133	-	-	2,202	<2	8,483
1970	50-100	527	503	826	1,329	-	-	1,787	297	815	356	1,171	?	448	195	1,562	761	2,323	<2	(8,153)
1971	50-100	426	496	923	1,419	-	-	1,639	234	771	436	1,207	56	417	204	1,482	510	1,992	<2	7,669
1972	34	442	588	1,105	1,693	200	1,604	1,804	210	1,054	514	1,568	35	462	(224)	1,201	558	1,759	<2	8,232
1973	12	453	661	1,303	1,964	244	1,686	1,930	182	1,220	506	1,726	25	772	256	1,651	783	2,434	2.7	9,757
1974	13	383	578	1,053	1,631	170	1,958	2,128	184	1,149	484	1,633	30	709	225	1,589	950	2,539	0.9	9,475
1975	25	447	669	892	1,561	274	1,942	2,216	164	1,038	499	1,537	30	811	266	1,573	912	2,485	1.7	9,542
1976	9	208	328	682	1,010	109	1,452	1,561	113	1,063	467	1,530	15	?	225	1,721	785	2,506	0.8	(7,177)
1977	19	350	369	762	1,131	145	1,227	1,372	110	1,018	466	1,484	15	?	230	1,883	662	2,545	2.4	(7,226)
1978 ^a	20	361	?	?	1,098	147	1,082	1,230	150	693	390	1,083	10	?	?				4.1	

S = Salmon (two or more sea winter fish) G = Grilse (one sea winter fish) T = S+G

g Salmon and grilse figures are estimated (see Section C).

a Provisional figures

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

c Not including angling catch (mainly grilse)

d Before 1966 sea trout and sea char included (5% of total)

e USSR catch mainly salmon (2 or more sea winter fish)

f French catch taken as 75 tonnes from 1960-1971, and USA catch as 1 tonne from 1960-1972

Table 10

Catch-per-unit-effort data for some home waters fisheries
1960-1978

Year	<u>Ireland</u>			<u>England & Wales</u>			<u>Norway</u>
	Catch per licence issued (Nos. of fish)			Catch per licence issued (Nos. of fish)			Average catch per unit of fishing gear in bag- net fishery (kg)
	Drift net	Seine or drift net	Fixed trap nets	Northumbrian drift-net fishery			
				Salmon	Grilse	Total	
1960				104.2	98.1	202.3	172
1961				77.8	62.6	140.4	158
1962				131.6	107.1	238.7	175
1963				71.0	46.9	117.9	177
1964				73.9	81.5	155.4	192
1965				83.6	47.9	131.5	169
1966				66.5	58.9	125.4	154
1967				110.5	90.9	201.4	154
1968				36.4	34.1	70.5	130
1969				134.5	166.5	301.0	137
1970	305	257	526	170.3	245.3	415.6	118
1971	262	231	674	83.6	83.9	177.5	117
1972	271	165	470	138.3	152.1	290.4	158
1973	322	160	439	190.3	175.3	365.6	155
1974	429	170	416	117.4	194.3	311.7	152
1975	445	224	483	160.0	173.4	333.4	131
1976	314	132	385	33.7	56.1	89.8	143
1977	296	115	199	111.6	196.2	307.8	130
1978 ^a	261	109	180	153.8	218.8	372.6	96

a Preliminary figures

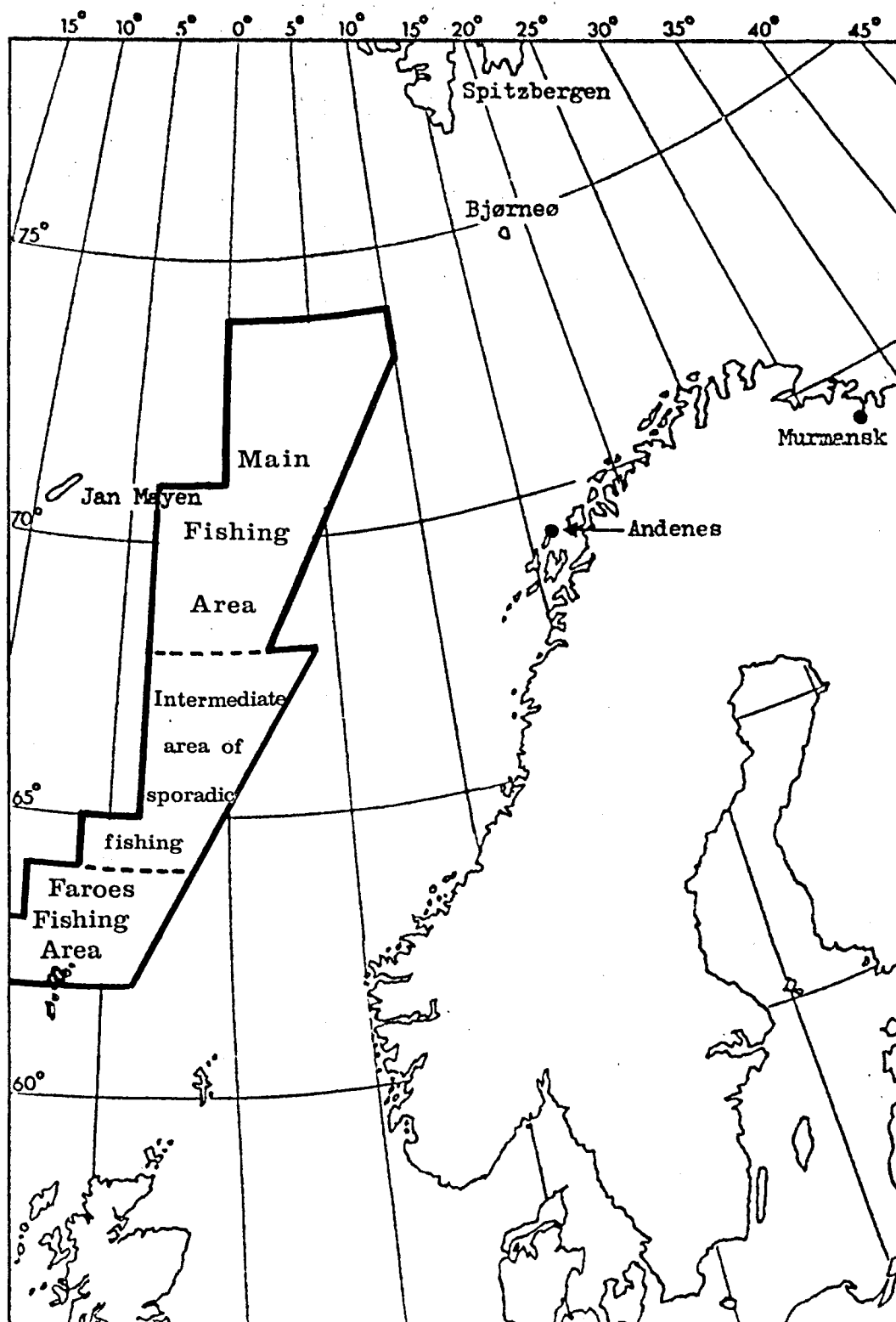


Figure 1 Chart showing area fished by Danish and Faroese vessels in Norwegian Sea and in vicinity of Faroe Islands in 1977 and 1978.

APPENDIX 1

NATIONAL SALMON FISHERY REGULATIONS

1. Salmon Fishery in Greenland Waters

At the June 1972 Annual Meeting of ICNAF Panels 1-5 made a recommendation (ICNAF Meeting Proceedings 1972, No. 13, App. II) according to which the salmon fishery in the Convention Area by Danish and Faroese vessels were to be phased out through the years 1972-75 while the catch by Greenland vessels was limited to 1,100 tonnes as from 1972, catches in territorial waters of West Greenland to be included in the said figure. At the 1974 Annual Meeting Panels 1-5 took note of the Danish adjustment of the 1,100 tonnes to 1,191 tonnes the actual annual catch for the period 1964-71.

An order issued 19 December 1975 by the Danish Minister of Fisheries (concerning waters outside the Greenland Fishing Zone, 12 n. miles at that time) and an order issued by the Minister for Greenland on 21 January 1976 (concerning the Greenland Fishing Zone and territorial waters) stopped salmon fishing in the Convention Area by Danish and Faroese vessels by 1 January 1976, and no such fishing by these vessels has occurred since at Greenland.

Orders issued annually since 1973 by the Ministry for Greenland have aimed at limiting the Greenland take of salmon to the 1,191 tonnes.

The general features of the regulatory scheme are

- i) A licensing system. No commercial salmon fishing allowed without a licence issued by the Greenland Central Administration (the Governor).
- ii) Fishing industries are not allowed to buy salmon except from fishermen with a licence, and all industries (by far most of them run by the government through the Royal Greenland Trade Department) are obliged to report frequently (as ordered by the central office) the accumulated catch.
- iii) Fishing has to stop immediately when so ordered by the Governor. The order is cabled to all industries and announced over the radio.

Besides these general features some other elements of the regulations have been included, varying somewhat from year to year in the light of experience. Thus the experience in 1973 and especially in 1974 was, that with an overall, unallocated quota and without any opening date, fishermen in certain districts got the opportunity to catch the major part of the quota before fish were available in the same amounts in the other districts. Also, fish caught later in the season were known to be generally somewhat bigger and thereby higher priced per unit weight than the smaller fish early in the season. From this economic point of view and to achieve a more uniform distribution of the fishery, and recognising that a total catch of about 1,191 tonnes would account for less fish if the mean weight of fish increased, it was considered advisable to introduce an opening date for the fishery. The opening date was 20 August in 1975 and 1976 but was advanced to 10 August in 1977 and 1978.

Furthermore, taking into account that salmon fishing is a major contributor to the income for a number of small-boat fishermen, especially in districts where the decline in the cod stock is most pronounced, a part of the quota has (from 1974) been set aside for small boats and for certain districts. Thus the quota is split into a part to be taken (after the opening date and by licensed fishermen only) in free competition amongst fishermen. This so-called "free quota" has varied somewhat from year to year, but has been around 900 tonnes (959 tonnes in 1978).

Closing dates, ordered by the Governor, for the years 1973-1978 have been as follows (for the free quota):

1973	25-30 September
1974	4 "
1975	12 "
1976	15 "
1977	5 "
1978	no closing date (quota not fulfilled)

A minimum mesh size of 50 mm (bar length, approximately 100 mm stretched mesh) has been in force for a number of years for fisheries for arctic char and Atlantic salmon. The mesh size in the salmon fishery nets will nearly always be larger than this (60-70 mm bar length).

Fishing for kelts is prohibited.

Sport fishing (not including netting) is allowed in the sea, but local restrictions normally occur in rivers (only 1 river known to house salmon). Non-residents must buy licences for sport fishing. It does, however, seem very difficult to catch salmon in the sea on sport fishing gear, and landings by sport fishermen are negligible (arctic char is caught frequently).

2. Norway

The Norwegian salmon fisheries include all fisheries both in the sea and in fresh water of salmon, sea trout, anadromous char and pink and chum salmon (caught after Russian introductions). The salmon fisheries and all inland fisheries are administered by the Ministry of Environment Control while the fisheries for marine species are administered by the Ministry of Fisheries.

The legal basis for the regulation of the salmon fisheries is the Salmon and Inland Fisheries Act of 6 March 1964. This law gives the administration wide powers to regulate the salmon fisheries. Most important are the following restrictions:

Closed time in the sea 5th August-30th April, in rivers 1st September-30th April.

All salmon fishing except with rods or trolling is forbidden from 1800 hrs on Friday to 1800 hrs on Monday.

Minimum mesh size for salmon gear 58 mm from knot to nearest knot (about 116 mm stretch mesh).

Longlining and purse-seining for salmon is forbidden.

Driftnetting for salmon only allowed between the baselines and 12 miles out.

Closed areas of differing extent outside the mouths of salmon rivers.

Fishing (and sale etc) of kelts prohibited.

In autumn 1978 the Norwegian parliament gave the Ministry authority to regulate the salmon fisheries further by introducing a licensing system. This was used in 1979 to regulate the drift net fishery. Only persons with fishing or the combination farming-fishing as their main source of living can obtain a licence for drift-netting for salmon. At the same time all set-net fishing for salmon was banned, and trolling for salmon and sea trout allowed only from 1st June.

The reasons for the new regulations of the salmon fisheries are the increasing driftnet fishing and the expansion of the set-net fishing. Especially set-nets are commonly used by amateurs who are fishing during vacations and other spare time as a kind of recreation. There is a strong feeling in Norway that recreational salmon fishing ought to be done as sport fishing, and that the commercial exploitation of the salmon stocks should be reserved for professional fishermen and fishermen-farmers - both groups being dependent on the income from the salmon fisheries. Besides, the official salmon statistics do not reflect the great increase in the number of set nets during the last years, so much of this fishing has been illegal.

The enforcement of the salmon fishery regulations is conducted mainly by plane and fast patrol boats in the sea and by local inspectors in the rivers. The break-through in enforcement of the law took place in the 1950's when the plane inspection of the weekly closed time took effect for the bag net fishery.

The aim of the salmon fisheries regulations is two-fold: to distribute the salmon catch between the different groups of fishermen, and to ensure a sufficient spawning escapement. The last object is very difficult to attain because most of the exploitation takes place remotely from the river of origin.

3. Scotland

Fishing for salmon and sea trout from boats by drift-net or other gill-net, trawl-net, seine net, trolling and long-lining is prohibited within 12 miles off the Scottish coast (including the Tweed). Outside the 12 mile limit, British-owned fishing boats are prohibited from catching salmon in the Atlantic Oceans by any method. The landing in Britain of salmon or sea trout caught by prohibited methods in the specified areas is also prohibited.

In the territorial sea of Scotland (ie within three miles from base lines) the rights of salmon fishing are private property, as they are in inland waters, and are exercised by the owners (who may be individuals, companies or the Crown Estate) or by their lessees. Fishing is by any lawful method and, in view of the above prohibitions, is mainly by stake-nets, set out from the shore, bag-nets

(similar in shape and principle to stake-nets but set floating, close to the shore) and, less frequently, by shore-seines.

In inland waters and estuaries (as defined in salmon fisheries law) methods are limited by statute to rod-and-line and net-and-coble (a type of shore-seining), with a proviso that ancient cruive (trap) and other rights are not extinguished.

There is an annual close time of 168 days (153 days on the Tweed) and a weekly close time (over the weekend) of 42 hours, which apply in both the sea and inland waters. The annual close time for rod fishing is shorter, and the weekly close time only 24 hours (Sunday). There are provisions in the statutes for prohibiting use of poisons, explosives etc, and other conservation measures which apply equally in the sea and fresh water. There are regulations governing the mesh size of salmon nets and the way in which stake-nets and bag-nets are put out of operation in the weekly close time.

There are special regulations of local significance, for the fisheries of the Solway Firth. In Orkney and Shetland there is a public right to fish in the sea but the orders banning drift-netting etc are in force there, and the difference in ownership has no practical significance at present.

There are no quota systems or statutory limitations on fishing effort but, since the fisheries are in private ownership, there is an effective restriction of effort within each river system by the owners themselves in their own interest (eg many salmon netting stations are not fished, and the numbers of rods on specific beats are limited). The owners of the fisheries in each river system manage the Fisheries through District Boards set up under statute for the purpose. (Boards have not been convened for some of the smaller river systems).

4. France

SITUATION ACTUELLE

Période de Pêche

La période effective de pêche est fixée par les dispositions du décret du 16 septembre 1958 modifié par le décret du 15 octobre 1970. Depuis 1973

un arrêté Ministeriel pris en vertu de l'article 9-3 du décret du 16 septembre 1958 permet de retarder l'ouverture chaque année.

Bassin fluvial	Ouverture prévue par le décret	Ouverture fixée 1979	Observations
Normandie Bretagne	3eme vendredi de février	1er vendredi de mars	
Bassin de la Loire (basse Loire)	10 décembre	8 janvier	haut du Bassin Allier 1er vendredi de mars
Bassin de la Garonne	19 janvier	1er vendredi de mars	
Bassin de l'Adour	14 février	1er vendredi de mars	

La date de fermeture de la pêche au Saumon est fixée au 15 juin.

Les dates sus indiquées font l'objet de décisions analogues de retard de l'ouverture dans les estuaires qui sont sous la juridiction du Ministère des Transports.

L'effet attendu du retard de l'ouverture est de permettre aux populations de gros saumons de remonter plus facilement sur les frayères. Pour plus de détail se reporter au rapport du 15 mars 1978.

Néanmoins sous peine de voir disparaître les pêcheurs de saumons (3000 pêcheurs en moyenne) il ne pourra pas être demandé de retard supplémentaire dans la date d'ouverture sans contre partie.

Cette contre partie pourrait être le report de la date de fermeture du 15 juin au 15 juillet en n'autorisant que la pêche à la mouche. Cette proposition qui n'a pas encore été soumise à l'examen du Conseil Supérieur de la Pêche permettrait de protéger les populations des grands saumons et d'exploiter les populations de castillons ou madeleineaux (grilses).

Protection des saumons à l'aval d'ouvrages difficiles à franchir

Un arrêté annuel du Ministre de l'Environnement et du Cadre de Vie institue des réserves spécifiques annuelles à l'aval de tous les obstacles.

Protection des frayères

Les zones de frayères les plus importantes sont mises en réserve spécifique pour interdire toute pêche du saumon reproducteur, du saumon bécart (retournant en mer après la fraie) du tacon. Dans certaines de ces zones la pratique du lancer est interdite.

Protection général

La taille limite de capture est fixée à 50 cm.

Dans l'avenir un projet de Loi soumis au Parlement permettra d'instituer une limitation du nombre de capture et une interdiction de commercialisation par les pêcheurs amateurs.

5. Great Britain, England and Wales

The regulations concerning the fishing for salmon and sea trout under the Salmon & Freshwater Fisheries Act 1975 are administered and enforced by the Regional Water Authorities of which there are ten in England and Wales.

Unlike Scotland, fishing for salmon in the sea within three miles from the base lines is a public right but it is only allowed under licence. The licences issued by the individual Water Authorities for their respective areas allow the fishermen to fish for salmon (and sea trout) in the sea up to the six mile limit. Between six miles and twelve miles British and foreign boats are prohibited from catching salmon and outside the twelve mile limit British-owned vessels are prohibited from catching salmon.

A Water Authority may by order confirmed by the Minister limit for a period not exceeding ten years the number of net licences to be issued in any year for fishing for salmon in any part of their area.

Although seine nets, gill nets, drift nets and bag nets together with other types of nets are used in various parts of England and Wales, Water Authorities have the power to make byelaws specifying the nets and other instruments (not being fixed engines) which may be used for taking salmon and imposing requirements as to their construction, use, design, material and dimensions, including in the case of nets the size of mesh. The use of an unauthorised fixed engine for taking salmon in any inland or tidal waters is prohibited. This means other than one certified to be a privileged fixed engine under the Salmon Fishery Act 1865 or one which was in use for taking salmon during the open season of 1861 in pursuance of an ancient right or mode of fishing.

Water Authorities make byelaws fixing for their respective areas or parts of their areas the annual close season and weekly close time for fishing by any method for salmon. This is subject to the minimum duration of:- (a) 153 days for the salmon close season, (b) 92 days for the close season for the fishing for salmon with rod and line. (c) 242 days for the close season for fishing for salmon with putts and putchers (types of fixed engines), (d) 42 hours for the weekly close time for salmon all of these periods being specified in the Salmon and Freshwater Fisheries Act 1975.

There are provisions in the Act prohibiting the use of poisons, explosives, etc.