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REPORT OF MEETING OF THE WORKING GROUP ON NORTH ATLANTIC SALMON

ICES Headquarters, 13-16 April 1982

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The Working Group on North Atlantic Salmon met at ICES Headquarters from 13-16 April 1982. The following members participated:

W G Doubleday	Canada
L Marshall	"
J H C Pippy	"
D Reddin	"
J A Ritter	"
O Christensen	Denmark
Sv. A. Horsted	"
J Møller Jensen	"
H Jakupsstovu	Faroe Islands
R Mooritsen	" "
M Thibault	France
Th. Gudjonsson	Iceland
J Browne	Ireland
L P Hansen	Norway
M Holm	"
P O Larsson	Sweden
B B Parrish	UK (Chairman)
E C E Potter	"
W M Shearer	"
K U Vickers	"
B E Skud	USA
M Jakovenko	USSR
S Voronovskaya	"

The ICES Statistician, Mr K Hoydal, also attended some of the Working Group's sessions.

Main Tasks

In addition to reviewing the latest information on the interception salmon fisheries and exploited stocks at West Greenland and in the Norwegian Sea, and the fisheries and stocks in home-waters, the Working Group considered specific requests for ICES advice on the following items concerning the management of North Atlantic salmon stocks.

1. A request from the Canadian Government for advice, presented in the form of a graph, on "what quota should apply to the West Greenland fishery in 1982 to ensure that the mortality of salmon of Canadian or Community origin does not exceed the mortality resulting from a quota of 1,190 tonnes taken in accordance with the fishing patterns in 1976/77

for different opening dates falling between 10 August and 10 September and on the assumption that the mesh size will be , (a) the same as during the 1981 fishing season, (b) 140 mm?"

2. A request from the Faroese Home Government (through the Danish Foreign Ministry) for advice on the following questions:-

"1(a) Is ICES in a position to advise on a TAC for salmon, which would guarantee a certain survival rate, which would maintain the home-water stocks and safeguard the spawning in the rivers on some optimal level

(b) What the effect of smolt releases on this would be.

2 Is ICES in the position to calculate the increase in stock weight during the feeding season of the part of the salmon stock that migrates to the waters around the Faroe Islands."

The Working Group also considered further the proposals for a cooperative programme of research on the salmon fishery and exploited stock in the Faroes area which had been prepared by a Study Group established in accordance with ICES Resolution CM.1981/2:7 .

A. WEST GREENLAND FISHERY

1. Statistics and Composition of the Fishery

The reported nominal catches of salmon at West Greenland in years 1960 to 1981 are given in Table 1. In 1981 the fishery took place in the period 25 August to 31 October. and the nominal catch was 1,264 tonnes, which is 6 tonnes below the quota of 1,270 tonnes set by the European Community.

As in previous years, the total quota was divided into two components; a "free component" which for which all licensed fishermen can take part, and a "small boat component" which is allocated to small vessels on a district basis.

The free component was fished during the period 25 August to 13 September and the catches amounted to only 968 tonnes. The remaining part of the quota, the "small boat component", was fished for thereafter from 14 September to 1 October, but the catches in that period amounted only to 132 tonnes. In order to fulfil the quota of 1,270 tonnes it was necessary to re-open the fishery for all licensed fishermen, and from 2 October to 31 October 164 tonnes were taken.

The distribution of the fishery between NAFO Divisions in 1981 was different from that in the years 1979 and 1980 (Table 2). In 1981 the fishery had a more northerly distribution than in those years, which may be due to the later opening date and the extended duration of the fishing season.

2. Origin of Salmon at West Greenland

Further information presented to the Working Group on the identification of North American and European origin salmon in the West Greenland population from scale characteristics, indicated changes relative to earlier years in the growth patterns of scales from some European salmon belonging to the 1979 and possibly also the 1980 smolt year-classes. These changes were characterised by lower numbers of circuli in the first sea growth zone than those observed in the original 1968-1970 scale material used to calculate the discriminant functions by which the relative proportions of North American and European origin salmon at West Greenland were estimated. Although this difference was only investigated in home-water samples the possibility exists that it was also present in salmon at West Greenland in 1980 and 1981, and would result in some of the European salmon in the population being erroneously identified as North American salmon. The Working Group accordingly recommends that the possible inaccuracies in the discriminant function classifications resulting from these changes should be investigated further for 1980 and 1981, and also for the period 1975-79 for which no validation studies for European salmon have been conducted.

The Working Group noted that this new information does not affect the assessment of the West Greenland quota in relation to changes in the timing of the fishery and

the mesh size used, as that was based on the mean continental proportions for the years 1972-1978.

3. Biological Characteristics

The results of earlier investigations by the ICES/ICNAF Joint Working Party on North Atlantic Salmon showed that the exploited salmon population at West Greenland was composed almost entirely (>90%) of one sea-winter salmon which if surviving and returning to home-waters would do so as two or more sea-winter fish. They also showed that it consisted principally of female salmon, the female: male ratio being about 3:1. The results of more recent analyses reported to the Working Group were in conformity with the earlier observations with respect to the sex ratio. However they showed that the proportion of two or more sea-winter salmon in the population, which if surviving would return to home-waters as three or more sea-winter fish had decreased from about 10% in 1969 to a mean of less than 3% in the period 1979-1981.

4. Gill-net Mesh Selectivity Factors

At its last meeting in April 1981 the Working Group considered estimated mesh selectivity factors for monofilament nylon gill-nets in the West Greenland salmon fishery. The differences between estimates from three experiments in 1972. 1978. and 1980 suggested uncertainties of 3-4% in the selectivity factor. This observation was confirmed by an analysis presented at the present meeting. using a statistical model which calculated 95% confidence intervals of $\pm$ 3% for the value obtained from the 1980 experiment.

The Working Group also considered a theoretical analysis of the implications of two types of uncertainty on mesh size recommendations. Uncertainty in the estimated selectivity factor has a direct impact on the achievement of a target catch composition. Calculations carried out in 1981 suggested that a 1% change (or error in estimation of the K factor) in mesh size results in about a 1% change in the proportions of North American and European origin salmon in the catch. If, however, the mesh sizes in use vary about a mean mesh size corresponding exactly to the target mesh size according to a normal probability distribution, the

percentage composition of the catch is not affected, but the effective selectivity curve for the fishery is broadened, with reduced efficiency at the modal selected size. In the West Greenland fishery this would lead to an increase in the number of fish encountering the gear corresponding to a given catch and would be expected to be associated with higher escapement mortality than would occur if all nets had mesh sizes equal to the target. No estimates were available of the magnitude of the increased escapement mortality.

Based on these analyses, the Working Group reiterates its suggestion in last year's report that a regulated range of acceptable mesh sizes of ± 5% of the 140 mm target value could be established without excessive potential deviation from the goal of equalising the proportions of continent of origin in the catches and the exploited population. This means that if several meshes of a net are measured, all should be within 5% of the target mesh size.

5. Measurement of Mesh Size of Gill-nets

A small group met in Copenhagen in December 1981 to consider calibrating the method of measurement of mesh sizes on which the Working Group had based its advice in 1981 with methods used by net manufacturers and by fishery officers. The following procedure was proposed for salmon gill net mesh size measurement:

> "A triangular gauge 2 mm in thickness as used by the Danish Fisheries Inspectorate should be inserted into the mesh lumen parallel to the head rope so that its sides are in contact with the net material. A 0.5 kg weight should then be suspended from the bottom of the gauge and the gauge allowed to fall as far as possible into the lumen and the measurement taken to the nearest mm."

Comparison between the new method and the method used in the assessment shows some differences, and some of these are significant when tested statistically. R e s u l t s of regression analyses indicate that within a range of 90 to 150 mm mesh size no conversion is necessary. A conversion factor between the new method and the method for measuring nets in the factory was also calculated.

The Working Group reviewed several methods of measuring mesh sizes of salmon gill nets and the relationship between them. Variation in the load elongation properties of gill nets depends not only on the nylon netting yarn used but also on the shape (oval or round) and thickness of the filaments, the construction of the net and the duration of use. For three samples of monofilament nylon nets tested, the mean size of mesh measured with zero load was up to 2.5% larger when wet than when dry; under tension, the difference was up to 6%.

English experimental results presented at the meeting suggest that the mean tension in a net mesh when a salmon is caught, is probably at least 3.5 kg. The mean mesh sizes of the three monofilament samples when measured wet with a load of 3.5 kg were between 8% and 15% larger than for the same samples measured dry with zero load.

The Working Group considered that in fisheries where a wide variety of types of nets may be used, it might be appropriate for regulatory purposes to measure meshes when wet and with a load of 3.5 kg. However, if, as is expected to be the case in the West Greenland fishery in the future, there is little variation in the type of net used, a simpler measurement technique may be applied.

The Working Group considers on the basis of the data from the English experiments that the target mesh size of 140 mm measured by new methods proposed by the small group of experts, indicated above, is applicable to nets similar to those used in the mesh selectivity experiments at West Greenland, which were made of monofilament nylon twine having a diameter of 0.6 mm.

6. Request for ICES advice by Canadian Government and EEC Commission

The Working Group considered the request by the Canadian Government and EEC Commission for advice on the West Greenland quota in relation to timing of fishery and mesh size as set out in (1) under Main Tasks. In doing so it interpreted the meaning of the word "mortality" to be the mortality attributed to both fishing and natural causes such that losses to the home-water stocks would not differ from that

attributed to a 1,190 tonnes quota, under conditions of an August 10 opening date and fishing patterns similar to 1976/77. This interpretation is consistent with the underlying conditions applying in the provision of previous advice on this subject.

The Working Group, after considering the request in the context of the advice provided in its 1981 report, and in the light of new information reviewed at the present meeting, concluded that no basis existed for altering the parameter values adopted in last year's assessment. Key parameters included the assumption of a "normal" gill-net selectivity curve, an average stock composition of 42.85% North American and 57.15% European origin salmon, growth curves for both stock components and a monthly natural mortality rate of 1%. Allowable catch (quota) levels for opening dates spanning the period 10 August to 1 September were determined by interpolation of data used to provide estimates of optimal* mesh size and allowable catches for similar opening dates. Allowable catches for dates extending from 1-10 September were estimated by extrapolation of the values calculated for opening dates 10 August to 1 September.

Estimation of allowable catches for the mesh size used in 1981 was not possible because of lack of information on the mesh sizes presently in use and their relative quantities. It was however noted that the predominant mesh size sold was 67 mm nominal bar length, or in terms of measured mesh size, 134 mm. Hence, allowable catches for 134 mm mesh size were calculated and are presented below and in Figure 1 for opening dates extending from 10 August to 10 September. These catches represent a potential situation should phasing-in of the 134 mm mesh size at West Greenland be continued. Also presented are the corresponding allowable catches for nets of 140 mm, the target mesh size recommended by ICES in 1981. Quadratic curves were used for interpolation and extrapolation.

*The optimal mesh size for a given opening date gives the proportions of North American and European salmon in catches equal to their proportions in the exploited population.

	Estimated Allowable Catch (tonnes)	
	134 mm	140 mm
Opening date	Mesh size	Mesh size
10 August	1,091	1,189
20 August	1,114	1,235
25 August	1,125	1,253[1]
1 September	1,139	1,271
10 September	1,154	1,285

[1] Recalculation and interpolation of allowable catch data resulted in a 25 August value of 1,253 tonnes rather than 1,256 tonnes as advised by ICES in 1981.

The "optimal" mesh size for a 10 September opening date was estimated to be 141.2 mm by extrapolation of the daily increase in previously calculated "optimal" mesh size for opening dates from 10 August to 1 September. Since the difference between 140 mm and this value is within the bounds of accuracy of the detailed calculations pertaining to season opening date and mesh size, the 140 mm target mesh size previously recommended by the Working Group for opening dates extending from 10 August to 1 September would also apply to this extended period.

The Working Group noted that its calculations on this subject were based on parameter values derived through an averaging of data for several years. Since these data indicate annual variations in conditions within the fishery and the exploited population the advice of the Working Group must therefore be considered as relating to an average situation or year. Relative variation from year to year, for example in the composition and growth rates of the exploited population, are of the same order of magnitude as the calculated change in catch for different opening dates.

Recognising the continuing and increased uncertainties in the estimates of selectivity factors and of mesh sizes in use, and also the observed changes in the growth of European origin salmon in 1980 and 1981 and in the composition of the exploited population, the Working Group examined the sensitivity of its estimates of allowable catches to these factors. Calculations carried out in 1981 showed that the calculated equivalents to the reference catch are rather insensitive to the composition of the exploited stock since an increase in the proportion of North American origin salmon in the population from 42.85% to 50% led to a decrease of only 1½ tonnes in the calculated allowable catch. Errors in estimation of the selectivity factor have a direct impact on the composition of the catch with a 1% error in that factor leading to about a 1% change in the catch composition.

Growth rates are also important in determining the calculated catch since increased catches for later fishing seasons are due to the rapid growth of salmon at West Greenland. A 1% change in the growth increment of either component would lead to about a ½% change in the calculated catch increment for a given opening date.

As a cautionary note, the Working Group wishes to point out that while the selection curves used in the assessment were based on limited data, they represent the best estimates available. It considers that further studies of the selectivity of the gear used on the fishery are needed.

3. NORWEGIAN SEA LONG LINE FISHERY

1. Catch Statistics and Characteristics of Fishery

The reported nominal catches taken in the long line fishery in the northern Norwegian Sea (north of latitude 67°N) in the years 1965-1981, and in the Faroes area in 1968-1981 are given in Tables 3 and 4 respectively.

Northern Norwegian Sea

The data in Table 3 show that in 1981 the reported nominal catch taken in the northern Norwegian Sea, at 213 tonnes, was 62 tonnes higher than in 1980, but

was still considerably lower than during the period 1969-1976. The Danish fishery in this area, prosecuted in 1981 by 8 vessels, was carried out mainly in April and May in the "international" waters zone to the north of the Faroes, where a part of the Faroese fishery also took place. Age and weight data for fish landed from this fishery in 1981 gave an estimated sea-age composition of 85% two-sea-winter and 15% three-sea-winter salmon respectively, and an estimated mean weight of 3.84 kg.

Faroes Area

The data in Table 4 show that from a moderate increase in catch in the Faroes area in the mid 1970's, the fishery, prosecuted by Faroese and Danish long-liners, escalated substantially from 1979. to reach a yield slightly above 1,000 tonnes in 1981. The increase in these years was due partly to an extension of the fishing season and partly to an increase in the number of vessels taking part in the fishery.

The present fishing season in the Faroes area extends from October to June, with the greatest intensity of fishing in February-March. Faroese and Danish vessels taking part in the fishery do so under licence.

Although the 1981/82 fishing season started in October 1981. the catches in the period October-December were poor, probably due mainly to squid (Todaris sagittatus) competing with salmon for bait on the long lines. By January 1982. the squid had migrated from the area and the catch rate of salmon increased considerably. The Faroese fishery in the 1981/82 season has taken place mostly in the northern part of the Faroese 200 mile zone and. as indicated above, has extended to some extent into international waters to the north of it. In this regard, the Working Group noted that the Norwegian Sea fishery will presumably in the future be restricted to waters within the Faroese economic zone in accordance with the provisions of the new "Convention for the Conservation of Salmon in the North Atlantic Ocean".

2. Countries of Origin of Salmon caught in the Northern Norwegian Sea and Faroes Area Fisheries

As indicated in previous reports (ICES Docs. C.M.1980/M:10. Tables 3 and 4 and C.M.1981/M:10. Table 6) information on the countries of origin of the salmon population exploited in the northern Norwegian Sea and Faroes area fisheries is

available from the recaptures in these fisheries of fish tagged as smolts in home waters, and for the Faroes area population on recaptures in home waters of salmon tagged in the vicinity of the Faroes in the years 1969-76. Further data on the recaptures in the Faroese area of salmon tagged as smolts in home waters are given in Table 5 for the years 1975-1982 (up to 16 April).

The Working Group noted that while these data provide a qualitative indication of the countries of origin of the exploited population in the area, they are not sufficient by themselves to estimate reliably the relative proportions of the different country of origin components of the population. In order to estimate these proportions, information is required of the total smolt runs in each country together with information on the smolt tagging (number tagged and estimates of tagging mortality, tag loss etc).

3. Biological Characteristics

Further data on the length, weight and age compositions of salmon caught in the Faroese fishery were obtained by scientific observers aboard commercial vessels during March and December 1981 and in January. February and March 1982. These data indicate that as in previous years the catch comprised salmon which entered the sea as smolts 1, 2 and 3 years earlier, their estimated contribution to the total catch in 1981 being 2%, 71% and 27% respectively. They also gave an estimate of the discarded catch below the minimum landing size of 5% by number. This represents a substantially higher proportion of 2 and 3 year-class fish in the catch and a lower proportion of discards than estimated for the fishery in previous years, and used in the Working Group's preliminary assessment of the effects of the fishery on home-waters stocks at last year's meeting (C.M.1981/M:10, Appendix 1). The mean weight of all fish landed in 1981 was estimated to be 4.66 kg. to be 1.3 kg, giving a mean weight of the total catch of approximately 4.6 kg.

4. Request for ICES advice from Home Government of Faroe Islands

The Working Group considered the request for advice from the Home Government of the Faroe Islands as set out in 2 under Main Tasks.

Item 1(a) TAC for salmon

In considering this part of the request the Working Group took the question to refer to a single TAC for the total salmon population in the North Atlantic, and for the combined home-waters and interception fisheries in that area. The Working Group recognised that whilst the adoption of a single TAC, as a basis for stock management is possible in principle for salmon as for other fish stocks, its determination for the total North Atlantic salmon population, satisfying the criteria specified in the request presents a number of major problems and difficulties. Of particular importance is the fact that the total population is composed of many separate discrete spawning stocks of widely different sizes and having different biological characteristics, distributions and population dynamics in their freshwater and marine life history phases. Hence, the determination of a TAC for the population as a whole, which safeguards the individual stocks would necessitate the identification of the individual stock components and their population parameters throughout their exploited life history phases, and especially in mixed stock feeding areas remote from their home rivers, in which the main interception fisheries are centred and which may exploit different size and age components of individual stocks.

For the Baltic salmon population, the Baltic Salmon Assessment Working Group adopted a model of the following form for the change in stock size in a given area in a set time period.

Stock in area A at time t+1 = Stock in area A at time t
+ recruitments
+ growth
+ immigration into area A
- emigration from area A
- fishing mortality in area A
- natural mortality

While such a model could form the basis of a North Atlantic salmon assessment model, unlike the situation in the Baltic, the estimation of the various population

parameters for the complex stock situation outlined above presents formidable difficulties. These are considered below.

(i) Recruitment

In a simple system a salmon fishery management policy might aim to control exploitation levels so as to leave only the "optimal spawning escapement". ie the number of spawners required for the maintenance of maximum smolt production. However, the relationship between the number of returning adult spawners and the production of smolts is poorly understood for the North Atlantic salmon stocks. What data there are suggest that it is probably very variable both within and between river systems. The "optimal spawning escapement level" is relatively easily defined if the stock and recruitment curve is domed. that is to say if, as the number of spawners increases the smolt production rises to a maximum level (the optimal point) and then decreases. However, it seems more likely that for North Atlantic salmon having no cannabalism and no interaction between the spawning and juvenile stocks. the stock and recruitment curve will be asymptotic, approaching a plateau at the maximum parr or smolt carrying capacity of the river. With fluctuations in density independent factors (eg environmental conditions) there may be large annual variations in the maximum carrying capacity. Thus. depending to some extent on the shape of the curve and the relative levels of the equilibrium position and the maximum carrying capacity, it is likely that an "optimal" or "required" spawning escapement will be very difficult to determine.

These problems are relatively unimportant in the Baltic where 70% of the annual smolt production originates from hatcheries. Consequently a large part of the smolt production can be precisely counted and fairly accurate predictions of smolt runs may be made some time in advance. Such a system is tolerant to "accidental over-fishing" or periods of poor natural production. This has been demonstrated by the maintenance of fairly steady total smolt production in the Baltic during the 1970s despite an estimated 50% decline in the spawning escapement obtained from parr surveys. The North Atlantic system, in which the overwhelmingly greater part of the smolt production is from natural spawning, does

not share this tolerance in recruitment characteristics. Some of the component stocks are probably not operating at "optimal levels" in that, given greater spawning escapement, they could support considerably increased smolt production.

(ii) Growth

In the North Atlantic salmon population there are significant differences in the growth patterns of salmon from different areas, resulting from differences in the mean age or size of the smolts, variations in the timing, distance and routes of their migrations and other factors. The effect of these differences has been demonstrated at West Greenland where the different growth patterns of North American and European origin salmon influence the relative exploitation rates of the drift net fishery on these two components. Therefore, in estimating a TAC separate sets of growth data would be required for salmon from different stocks or areas. If continuous growth curves cannot be described, monthly mean weight data may be necessary, particularly during the periods of the interception fisheries remote from home-waters, when small changes in the timing of the fishing seasons may significantly affect the yield (by numbers or weight) or the fishing mortality for a given allocated catch.

(iii) Migration

In contrast to the situation in the Baltic relatively little is known about the migration patterns of salmon in the North Atlantic. A number of "production areas" may be described whose populations have quite different migratory behaviour (routes and timing), resulting from both their geographic location and the different age distribution of the returning adults.

(iv) Natural mortality

In its assessments of the effects of the West Greenland and Norwegian Sea fisheries on home-water stocks the Working Group has used estimates of natural mortality rates occurring during the period between the salmon's occurrence in those fisheries and their return to home-waters, based on the hypothesis that the natural mortality rate varies inversely with weight at age. While this is likely to provide more reliable estimates than the one of a constant M value, it

does not take account of mortality causing factors at different life history stages. The inverse weight model also implies that the total natural mortality is likely to depend to some extent on the size and age of the smolts leaving the rivers, and hence may differ considerably between river stocks.

(v) Sex ratio

In the Baltic assessment model the proportion of females in the total population is determined at recruitment and assumed constant over the whole life span; grilse are not thought to contribute to the reproductive potential of the stock and are therefore excluded from all spawning stock calculations. This approach would not be appropriate for the North Atlantic salmon since in many river stocks grilse form a significant and sometimes the only component of the spawning stock. There is also good evidence in many of the stocks that a strong bias exists in favour of males returning as grilse and females as multi-sea-winter fish. Male and female salmon may therefore tend to go to different feeding grounds and be exposed to different exploitation pressures. Thus the sex ratio may vary throughout the sea phase and differ between river stocks.

These considerations indicate that the values of most of the parameters required to estimate a TAC for the total North Atlantic population are likely to vary considerably between different river stocks. It is currently not possible to identify and measure accurately the proportions and population parameters of each individual spawning stock in each mixed stock fishery. Hence it is unlikely to be possible through a single TAC regulation to ensure that the exploitation of the individual stocks is maintained at optimal levels and that some of them are not over exploited without sacrificing the potential total yield from the population as a whole.

The Working Group concluded on the basis of the above factors and considerations that it would not be possible at the present time to estimate and advise on a single TAC for the North Atlantic salmon population as a whole, which would satisfy the specified criteria guaranteeing a certain survival rate which would maintain the home-water stocks and safeguard the spawning in the rivers at some optimal level.

Furthermore a TAC regulation does not seem to be an appropriate method to adequately protect individual stocks which are harvested at least in part in mixed stock fisheries.

Item 1(b) Effect of Smolt Releases

If their survival and growth characteristics are the same as those of natural smolts the release of hatchery reared smolts to the natural system would be equivalent to an increase in natural recruitment and hence in the total biomass of the exploited population. However, the results of smolt release programmes conducted in a number of countries in the North Atlantic have shown that in general the survival of hatchery reared smolts is considerably lower than that of natural smolts entering the same sea water system. So, proportionate increases in biomass may not be achieved, at least under present smolt rearing practices.

While enhancement of North Atlantic salmon is possible by releasing hatchery smolts, exploitation rates in the mixed stock fisheries cannot be increased without increasing the exploitation rate on the wild stock. Hence, catches in a mixed stock fishery can only be increased in proportion to the relative abundance of the released fish in the total exploited population for that fishery.

Item 2 Increase in Stock Weight during Feeding Season in Waters around Faroe Islands

The Working Group recognised that for the calculation of the increase in the weight of the salmon population present in the waters around the Faroe Islands during the feeding season information is required on

a) the time of entry and departure (and hence residence time) of the various stock units and age groups of salmon occurring in the area in the course of each feeding and growing season

b) their average abundance throughout the residence period

c) the change in average weight of the different components during this time.

Although some information relating to a) and c) has been obtained during the past two fishing seasons from commercial catch sampling in the area, the intensity and coverage of which is

planned to be increased, reliable measures of b) are not yet available. Consideration is currently being given to the estimation of population abundance in the area through catch/effort analyses and by the development of tagging programmes (see Section B.5), the results of which, together with information on items a) and c) will, it is hoped, permit estimates of the increase in population weight to be made.

5. Plans for Joint Research in Faroes Area

The Working Group considered the report (attached as Annex 1) of the special Study Group set up at the 1981 Annual Meeting of ICES to draw up plans for a cooperative programme of data collection in the Faroes and northern Norwegian Sea fishery, and research on aspects of the biology of the exploited stock relevant to assessments. In endorsing the main elements of the proposed data collection programme, involving scientific observers making voyages on commercial fishing vessels, the Working Group recognised the need for a supplementary programme of shore-based market sampling to provide length, weight and age data of the landings. It was agreed that the Faroese coordinator of the programme would prepare in the first instance a detailed specification of the scientific observer and market sampling programme to be conducted in the 1982/83 fishing season (although it was recognised that it would probably also be required to be pursued in subsequent years), based on the manpower and/or financial involvement already offered by the participating countries, and would submit it to the participants for their approval as soon as possible. It was also agreed that this would include detailed specifications of the items of information to be collected by the participating scientists and of the standard recording forms to be used.

The following allocation of responsibilities for the compilation and analysis of material collected in the programme was also agreed.

1) Routine length/weight, maturity, sex, discards, etc data (U.K. Laboratories).
2) Age and scale characteristics analysis (Scottish laboratory).
3) Blood samples for maturity at age investigation (Scottish laboratory).
4) Tissue samples for racial investigations (Republic of Ireland laboratory).

The Working Group considered in detail the relative advantages and disadvantages of tagging programmes based on salmon tagged in the Faroe area and on smolts in home-waters respectively, in relation to the information requirements for assessment purposes. It concluded that whilst there was merit in the former approach, it was very doubtful if an experiment of sufficient size to ensure an adequate number of tag releases could be mounted at reasonable cost. Hence, it endorsed the Study Group's proposal that, at least as a first step, the second approach, involving smolt tagging with internal micro coded wire tags should be followed.

The Working Group accordingly recommends that all of the European salmon producing countries should develop such smolt tagging programmes covering all of their smolt hatcheries and as many of their natural smolt producing river systems as possible, and that arrangements for the detection of tags in the catches taken in the Faroes area fishery form part of the data collection programme referred to above. It is further recommended that all coded wire tags collected in the Faroes fishery should be sent by the Faroes Fishery Laboratory to the Irish Laboratory for reading. Countries are also requested to supply information to the Working Group on the numbers of hatchery reared fish released, and of all adipose fin-clipped fish, hatchery reared and natural.

The Use of Scale Characteristics

In last year's report (ICES Doc. C.M.1981/M:10) the Working Group recommended that a study be made of the feasibility of using scale characteristics for identifying the country of origin of the salmon exploited in the northern Norwegian Sea and Faroese area. As a first stage in this study the characteristics of scales from stocks in northern Norway, Ireland and Scotland were examined. None of the scale material available for this initial examination was collected for the purpose of scale character analysis, and it is not suitable for use as reference standards, but its analysis serves to indicate the potential value of the technique.

Since only the Irish and Scottish samples contained fish which had smoltified after one river year, two separate analyses, one for two or more river year fish from the three countries, and one for one river year fish from Scotland and Ireland were conducted.

The scale characteristics chosen for investigation were:-

1) the number of circuli in the first river year (CR1)
2) the number of circuli in the second river year (CR2)
3) the river age at smolt migration (RA)
4) the number of circuli in the first sea year (Cs1).

For two or more river year fish two discriminant functions were constructed, each using all four characters, but for one-river-year fish a single discriminant function was constructed, using only the numbers of circuli in both the first year (CR1) and the first sea year (CS1). The adequacy of the discriminant functions constructed were tested by re-classifying the individual scales according to their scale characteristics. For two or more river year fish, the percentage of the scales correctly classified was 81% and the comparable figure for one river year fish was 92%.

Since the results of this initial analysis were encouraging, the Working Group recommends that as the next step in the investigation scale samples should be collected for use as reference standards. These should then be used to investigate the adequacy of this method to classify, according to country of origin, the fish being exploited in the northern Norwegian Sea and Faroese area. In addition, these reference standards should be used to update the discriminant functions used to identify the stocks of salmon exploited at West Greenland.

Samples should be collected annually in the manner described in Appendix 1 and samples of scales from 50 fish from selected major river systems within each country should be sent to the Freshwater Fisheries Laboratory, Pitlochry where they will be used as reference standards. In stocks where there are one and multi sea winter components, the sample should contain 50 sets of scales of each

component. It will be the responsibility of individual countries to satisfy themselves that the selected rivers adequately describe their stocks for the purpose of this investigation. Once discrimination functions have been constructed, it is important that their adequacy in classification be assessed annually.

In relation to assessments, the Working Group also recognised the need for further studies of the source and magnitude of the various components of non-catch-fishing mortality, including unreported catches, in both the home-waters and interception fisheries. It recommends that such studies be undertaken in each country, and their results and all other available information be reported to the next meeting of the Working Group.

C. HOME WATER FISHERIES

The reported nominal catches for the home water fisheries for Atlantic salmon (excluding Baltic) in the years 1960-81 are given in Table 6. These data update, and in some instances are revisions of, the statistics in last year's report (C.M.1981/M:10). The figures for 1981 are provisional.

The data indicate that the total provisional reported catch of salmon and grilse combined in 1981 at 7,226 tonnes was approximately 720 tonnes lower than in 1980. In the Irish fishery, although the catch of multi sea winter salmon was slightly less than that reported in 1980, the grilse catch decreased by more than 200 tonnes to its lowest recorded level since 1972, this resulted in the combined catch for the fishery falling to its lowest level in the series. In the Icelandic fishery the reported combined catch in 1981 was 86 tonnes lower than that recorded in 1980 and the lowest figure reported since 1969. Other countries whose fisheries reported decreased catches in 1981 compared with the previous year were Norway, Canada, USSR, France and Northern Ireland. In contrast the England and Wales fishery reported combined catch for 1981 was approximately 150 tonnes higher than in 1980, and the highest catch recorded since 1970, and the Scottish catch was almost 100 tonnes greater than the corresponding figure for 1980.

The Working Group noted that the reported catches in most countries are underestimates of the quantities of fish caught due either to their not including

the catches taken by one or more components of the total fishery (eg catch taken by anglers) or through incomplete reporting of them. Of the catches reported in Table 6 only those from Canada include at least a partial adjustment for non-catch-fishing mortality. In view of the importance of catch data in stock assessment the Working Group strongly urges all countries to take steps to improve the accuracy of their salmon catch reporting systems including, where possible, the breakdown of the total catch into grilse and multi sea winter salmon respectively. The Working Group also draws attention to the need for further investigation of the magnitude of non-catch-fishing mortality in home waters, as indicated in Section B5 above.

At its 1981 meeting of the Working Group members were urged to provide data on the sea-age, length and weight composition of home waters stocks for use in assessments. The data on the weight of fish returning to home waters was considered to be of particular importance as it was one of the parameters to which the models used in the assessments were most sensitive. Tables 7 and 8 summarise such information which was available on the weight of salmon returning to home waters in 1981. The Working Group noted the importance of such data for assessments and recommends that representative weight data should be collected for all home-waters salmon fisheries.

Information was presented to the Working Group on changes in the abundance, composition and other characteristics of the Pechova river salmon stock in the USSR since the 1950's. It showed a marked decrease in total abundance, the proportion of 3-sea-winter salmon and egg production potential during the period 1969-75 relative to earlier years. This coincided with the growth of the Norwegian Sea long-line fishery during those years. At the same time, the occurrences of tagged and hook-damaged fish increased. Thereafter, in the period 1976-1980 stock abundance and egg production potential increased. and the occurrence of tagged hook-damaged fish decreased, which coincided with the reduction in the long-line fishery. In 1981, the spawning stock decreased and the incidence of damaged fish increased again following the regrowth of the long-line fisheries, mainly in the Faroes area.

List of Working Documents

Reddin, D. G. Some general information on discriminant functions and accuracy for identifying North American and European Atlantic salmon caught at West Greenland.

Reddin, D. G. et al. Continental proportion of North American and European Atlantic salmon in samples collected from the 1981 West Greenland commercial fishery.

Reddin, D. G. and Stansbury, D. E. Biological characteristics of Atlantic salmon (Salmo salar) of North American and European origin sampled at West Greenland in 1981.

Doubleday, W. G. Confidence limits for gillnet selectivity factors estimated by Holt's method.

Cross, T. F. The possible use of biochemical genetics to distinguish stocks of salmon in the Faroes fishery.

Browne, J. The use of coded wire tags in assessing the Faroes salmon fishery.

Møller Jensen, J. The salmon fishery at West Greenland 1981.

Anon. Report of meeting to calibrate methods of measurement for salmon gill-nets at West Greenland.

Antonova, V. P. and Chuksina, N. A. The effect of foreign fisheries on the abundance of Atlantic salmon commercial stocks from the Pechora river.

Antonova, V. P. and Chuksina, N. A. Changes in the structure of the Pechora salmon stocks, rates of reproduction.

Hansen, L. P. Atlantic salmon tagged in Norway and recaptured at the Faroes.

Hansen, L. P. Size and age distribution at the Faroes and in Norwegian home waters of Atlantic salmon tagged as smolts.

Guðjónsson, Th. Data collection on board M/S Hamrafossur 10 February to 3 March 1982.

Shearer, W. M. The length, weight age composition of the salmon catches from the Rivers North Esk and Spey (Scotland) 1981 together with some comparisons between the 1981 North Esk catch and catches taken during the period 1963-1980.

Pratten, D. J. The length and weight of one and two sea-winter salmon in Scottish commercial salmon fisheries 1981.

Shearer, W. M. and Pratten, D. J. Fluctuations in the mean lengths attained by North Esk salmon at the end of their first winter in the sea 1963-1981.

Pratten, D. J. The use of scale characteristics and multivariate analysis to distinguish between stocks of fish originating from Southern Ireland, the east coast of Scotland and Norway.

Pratten, D. J. Biological characteristics of Atlantic salmon taken from the commercial long liner m/s Hvitiklettur in the Faroes fishery 1981-1982.

Potter, E.C. E. Assessment of North Atlantic salmon stocks.

Potter, E.C. E. The physical properties of gill-nets in relation to mesh regulations.

Potter, E. C. E. Notes on the Faroes research programme.

Lassen, H. Interpretation of selectivity experiments: two types of uncertainties in North Atlantic salmon gill-net mesh size recommendations.

Anon. Report of meeting of Special Study Group of North Atlantic Salmon Working Group Torshaven 15-16 December 1981.

Anon. North Atlantic salmon catch statistics.

Rideout, S. G. Connecticut river salmon returns for ICES.

Baum, E. T. Tag returns to State of Maine, U.S.A.

Skud, B. Non-catch fishing mortality of salmon in West Greenland.

Appendix 1

Instructions for the collection of scale samples

1. The preferred site for the removal of a scale sample should be on the left-hand side of the fish 3-6 rows above the lateral line and on a line extending from the anterior edge of the anal fin to the posterior edge of the dorsal fin. If a site other than that specified is used please state on scale packet, eg right-hand side.

2. Prior to sampling, excess mucus should be removed from the recommended area using the back of the knife, which should be cleaned before the scale sample is removed.

3. The scale sample should be placed inside the scale envelope and allowed to dry slowly before being stored.

4. The following information should be recorded on each scale packet.

    1. Code number
    2. Whole weight
    3. Gutted weight
    4. Fork length
    5. Total length
    6. Sex
    7. Date
    8. Position
    9. Remarks eg Tag number (if a recapture)

Table 1

Reported Nominal Salmon Catches at West Greenland, 1960-80
(in Tonnes, Round Fresh Weight)

	Drift-net				Gill-net and drift-net	
	Norway	Faroese	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	2145[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	984	984
1979	0	0	0	0	1395	1395
1980	0	0	0	0	1194	1194[b]
1981	0	0	0	0	1264	1264

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

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

Factor used for converting landed catch to round fresh weight in fishery by Greenland vessels = 1.11. Factor for Norwegian, Danish and Faroese drift-net vessels = 1.10.

Table 2

Distribution of Nominal Catches (tonnes) taken by Greenland vessels in 1973-1980 by NAFO Divisions

Year / Division	1973	1974	1975	1976	1977	1978	1979	1980	1981[1)]
1A	182	44	124	166	201	81	120	52	160
1B	194	116	168	302	393	349	343	275	347
1C	145	229	175	262	336	245	524	404	346
1D	385	290	204	225	207	186	213	231	202
1E	487	395	315	182	237	113	164	158	158
1F	192	88	185	38	46	10	31	74	31
Not known									20
Total	1585	1162	1171	1175	1420	984	1395	1194	1264
East Greenland	+	+	+	+	6	8	+	+	+
TOTAL	1585	1162	1171	1175	1426	992	1395	1194	1264

[1)] Provisional figures

Table 3

Reported nominal catches in the northern Norwegian Sea long-line fishery north of latitude 67°N: 1965-1980 (tonnes round fresh weight)

Danish catches converted from gutted weight with a factor 1.16

Year	Denmark		Faroes		Germany, Fed. Rep.		Norway		Sweden		Total Longline Catch
	No. of vessels	Catch	No. of vessels	Catch	No. of vessels	Catch	No. of vessels	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	-	-[b]	0	0	-	100[c]	16	126	403[c]
1969	40	413	0	0	5	24	-	450[c]	2	24	911[c]
1970	60	481	-	-[b]	4	21	-	420[c]	1	24	946[c]
1971	20	162	0	0	2	9	-	300[c]	1	17	488[c]
1972	20	182	0	0	2	4	-	300[c]	1	20	506[c]
1973	15	233	0	0	0	0	-	250[c]	2	50	533[c]
1974	10	148	0	0	0	0	-	200[c]	1	25	373[c]
1975	15	245	0	0	0	0	-	200[c]	1	30	475[c]
1976	20	264	0	0	0	0	0	0	1	25	289
1977	24	192	0	0	0	0	0	0	0	0	192
1978	13	124	0	0	0	0	0	0	0	0	124
1979	10	118	0	0	0	0	0	0	0	0	118
1980	7	127	?	28	0	0	0	0	0	0	155
1981	8	213	-	-[b]	0	0	0	0	0	0	213

a Catch not known

b See Table 5

c Estimated catch

Table 4

Reported nominal catches in the Faroese Area long-line fishery 1968-1980
(tonnes round fresh weight)

Converted from gutted weight with a factor 1.11

Year	Denmark		Faroes		Total Longline Catch
	No. of vessels	Catch	No. of vessels	Catch	
1968	0	0	2	5[a]	5
1969	0	0	4	7	7
1970	0	0	5	12[a]	12
1971	0	0	0	0	0
1972	0	0	2	9	9
1973	0	0	5	28	28
1974	0	0	5	20	20
1975	0	0	6	28	28
1976	0	0	9	40	40
1977	0	0	9	40	40
1978	2	14	8	37	51
1979	2	75	7	119	194
1980	6	150	22	568	718
1981[b]	6	100	38	927[a]	1,027

[a] A small part of the catch taken more than 200 miles from the Faroese baseline

[b] Preliminary data

Table 5

External tag recoveries in the Faroese fishery reported to the Faroes Laboratory up to 16 April 1982 from fish tagged as smolts in various countries

	Year of recapture							
Country	1975	1976	1977	1978	1979	1980	1981	1982
Norway	4	0	4	23	4	5	9	36
Sweden	1	0	3	12	6	6	3	4
UK - Scotland	0	0	3	2	0	0	3	3
UK - N. Ireland	1	0	0	0	0	0	0	0
UK - England & Wales	0	0	0	1	0	0	1	3
France	0	0	0	1	0	0	0	0
Denmark	2	1	0	0	0	0	0	0
Iceland	2	0	0	0	0	0	0	0

Table 6

Nominal catches of salmon in home waters (in tonnes round fresh weight) 1960-1981

Year	France	England & Wales	Scotland[g]			Ireland[b]			Northern Ireland[bc]	Norway[d]			Sweden (west coast)	USSR[e]	Iceland	Canada			USA	Total[f] all Countri
	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	42	7,212
1961	50-100	232	772	424	1,196	-	-	707	132	-	-	1,533	27	790	127	-	-	1,583	42	6,403
1962	50-100	318	808	932	1,740	-	-	1,459	356	-	-	1,935	45	710	125	-	-	1,719	42	8,483
1963	50-100	325	1,168	530	1,698	-	-	1,458	306	-	-	1,786	23	480	145	-	-	1,851	42	8,148
1964	50-100	307	913	1,001	1,914	-	-	1,617	377	-	-	2,147	36	590	135	-	-	2,069	42	9,268
1965	50-100	320	835	728	1,563	-	-	1,457	281	-	-	2,000	40	590	133	-	-	2,116	42	8,576
1966	50-100	387	788	836	1,624	-	-	1,238	287	-	-	1,791	36	570	106	-	-	2,359	42	8,475
1967	50-100	420	857	1,276	2,133	-	-	1,463	449	-	-	1,960	25	883	146	-	-	2,863	42	10,417
1968	50-100	282	783	780	1,563	-	-	1,413	312	-	-	1,514	20	827	162	-	-	2,111	42	8,279
1969	50-100	377	539	1,408	1,947	-	-	1,730	267	801	582	1,383	22	360	133	-	-	2,202	42	8,496
1970	50-100	527	503	826	1,329	-	-	1,787	297	815	356	1,171	20	448	195	1,562	761	2,323	42	8,173
1971	50-100	426	496	923	1,419	-	-	1,639	234	771	436	1,207	18	417	204	1,482	510	1,992	42	7,631
1972	34	442	588	1,105	1,693	200	1,604	1,804	210	1,054	514	1,568	18	462	250	1,201	558	1,759	42	8,241
1973	12	450	661	1,303	1,964	244	1,686	1,930	182	1,220	506	1,726	23	772	256	1,651	783	2,434	2.7	9,752
1974	13	383	578	1,053	1,631	170	1,958	2,128	184	1,149	484	1,633	32	709	225	1,589	950	2,539	0.9	9,477
1975	25	447	669	892	1,561	274	1,942	2,216	164	1,038	499	1,537	26	811	266	1,573	912	2,485	1.7	9-538
1976	9	208	328	682	1,010	109	1,452	1,561	113	1,063	467	1,530	20	NA	225	1,721	785	2,506	0.8	(7,122)
1977	19	345	369	762	1,131	145	1,227	1,372	110	1,018	470	1,488	10	NA	230	1,883	662	2,545	2.4	(7,252)
1978	20	349	780	510	1,290	147	1,082	1,230	148	668	382	1,050	10	NA	291	1,225	320	1,545	4.1	(5,937)
1979	10	261	697	528	1,225	105	922	1,097	99	1,150	681	1,831	12	430	225	705	582	1,287	2.5	6,480
1980	30	348	807	283	1,090	202	745	947	122	1,352	478	1,830	17	631	249	1,763	917	2,680	5.5	7,950
1981[a]	20	492	816	372	1,188	164	521	685	101	1,191	467	1.658	26	450	163	1,619	818	2,437	6.0	7,226

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

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 1960-1971
g = Salmon and grilse figures for 1962-1977 corrected for grilse error

Table 7

Mean ungutted weights of salmon returning to home waters in Norway, Republic of Ireland and England and Wales

	1 s.w.		2 s.w.		3 s.w.	
	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.
Norway[1]						
R. Numedalslagen	3.2	60	6.2	33	15.4	1
R. Drammenselv	2.6	15	4.7	11	6.5	5
R. Glomma	2.7	292	5.7	124	9.0	15
R. Vefsna	2.5	128	5.2	107	8.2	25
R. Surna/Grip	2.5	141	5.5	67	9.5	18
R. Gaula	2.5	38	5.8	22	8.2	5
Republic of Ireland[2]						
April	-	-	4.6	44	-	-
May	-	-	5.1	34	-	-
June	3.0	37	5.2	11	-	-
July	3.2	122	-	-	-	-
England and Wales						
Drift net fishery[3]	3.1	100	5.8	60	9.5	4
Rod fishery[4]	2.9	-	5.4	-	8.2	-

[1] Data from recaptures of salmon tagged as reared smolts in the period 1963-1979.

[2] Data from mixed-stock drift net fishery off Donegal in 1981

[3] Data from mixed-stock drift net fishery off Yorkshire in 1981

[4] Estimates from 4 rod fisheries in SW England and Wales in 1981

Table 8

Mean ungutted weight (kg) of salmon returning to home waters in Scotland
1981 Data

One-Sea-Winter Salmon

Site	Gear	February		March		April		May		June		July		August		September	
		Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (Kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.
Tweed	Net & Coble	-	-	-	-	-	-	-	-	-	-	2.2	208	2.4	302	3.3	3
Tay	Net & Coble	-	-	-	-	-	-	-	-	2.5	56	2.5	225	2.9	285		
North Esk	Net & Coble	-	-	-	-	-	-	2.2	1	2.3	67	2.5	121	2.8	133		
Macduff	Fixed Engine	-	-	-	-	-	-	-	-	2.1	12	2.4	160	2.7	325		
Spey	Net & Coble	-	-	-	-	-	-	-	-	2.6	129	2.7	550	3.0	570		
Kyle of Sutherland	Net & Coble	-	-	-	-	-	-	-	-	2.6	42	2.7	530	2.8	175		
Strathy	Fixed Engine	-	-	-	-	-	-	-	-	2.5	156	2.7	344	2.8	117		
Achiltibuie	Fixed Engine	-	-	-	-	-	-	-	-	2.6	53	2.7	187	3.0	8		
Eastriggs	Fixed Engine	-	-	-	-	-	-	-	-	-	-	2.5	39	2.6	20	3.1	

Two-Sea-Winter Salmon

Tweed	Net & Coble	-	-	-	-	-	-	-	-	-	-	5.5	105	6.2	86	7.1	1
Tay	Net & Coble	-	-	-	-	-	-	-	-	5.5	134	6.0	107	6.5	95	-	
North Esk	Net & Coble	3.6	288	3.8	277	4.0	179	4.3	452	4.9	276	5.6	38	6.3	16	-	
Macduff	Fixed Engine			-	-	-	-	-	-	5.2	23	5.1	83	5.6	54	-	
Spey	Net & Coble	3.9	20	4.1	21	4.1	49	4.5	126	5.4	230	6.1	158	6.8	134	-	
Kyle of Sutherland	Net & Coble	-	-	-	-	-	-	-	-	5.6	36	5.6	57	5.5	10	-	
Strathy	Fixed Engine	-	-	-	-	-	-	-	-	4.9	27	5.6	41	5.8	7	-	
Eastriggs	Fixed Engine	-	-	-	-	-	-	-	-	-	-	5.6	32	6.1	14	6.3	

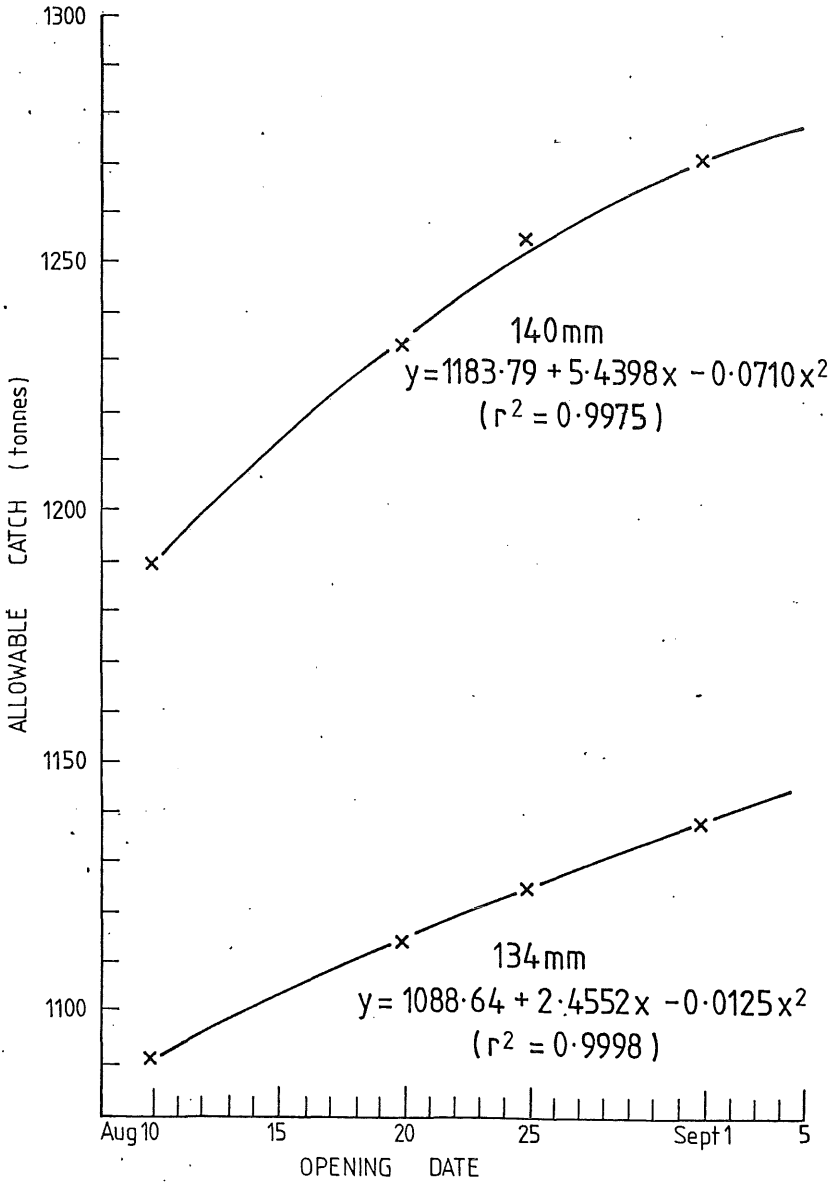

FIGURE 1 Allowable catch levels for the West Greenland salmon fishery in relation to season (opening date August 10 = day 1) for mesh sizes of 134 mm and 140 mm

ANNEX 1

Report of Meeting of Special Study Group of North Atlantic Salmon Working Group.

Tórshavn, 15. - 16. December 1981.

A Special Study Group was convened by the Chairman of the Working Group (Mr. B.B. Parrish) and met, under the chairmanship of Mr. H. í Jákupsstovu at Tórshavn, Faroe Islands, from 15. - 16. December 1981. The following representatives of ICES member countries participated:

D. Reddin	Canada
O. Christensen	Denmark
H. í Jákupsstovu	Faroe Islands
A. Reinert	- -
O. Justinussen	- -
R. Mouritsen	- -
Th. Gudjónsson	Iceland
K.W. Jensen	Norway
P.O. Larsson	Sweden
E.C.E. Potter	U K

Unfortunately, due to bad weather contitions, Messrs. W.M. Shearer and K.U. Vickers of UK and J. Browne of Ireland were unable to attend the meeting. These delegates were kept informed of the proceedings by telephone.

Terms of reference:
The Special Study Groups remit, as set out in recommendation C. Res 1981/2: 7 passed at the 1981 Annual Meeting of ICES, was to plan the acquisition of data required for the assessment of the effects of the Norwegian Sea and Faroes fisheries on home-water stocks.

The group adopted the following agenda for the meeting.

1. Data necessary to assess the effects of the Norwegian Sea and Faroese Sea fisheries on home-water stocks.

2. Cooperation in the research on the different fisheries.

3. Presentation of programs related to the open sea fisheries.

4. The feasibility of a new marking experiment.

5. Conclusions and recommendations.

1. Data necessary to assess the effects of the Norwegian Sea fisheries on home water stocks.

The Study Group agreed that, in pursuing its remit, it was appropriate to consider the collection of additional data that might be used in more complex assessments of North Atlantic salmon fisheries. The Group discussed the list of parameters prepared by Parrish (1973) in relation to the West Greenland fishery assessment and the parameters used in the preliminary assessment of the Norwegian Sea fisheries in the 1981 Working Group Report (Anon 1981). The following topics were identified and discussed:

a. Total fishery induced mortality (landings, discards and non catch fishing mortalities) for high seas and home water fisheries.

b. The composition of the exploited stocks in the high seas fisheries by country of origin (and subsequent destination).

c. The age composition of total catches in the high seas fisheries and the proportion of each sea age class returning to home waters in the same and subsequent years.

d. Natural mortality rates for Atlantic salmon during the sea phase of the life cycle.

e. Growth rates for different Atlantic salmon stocks dur-

ing the sea phase of the life cycle.

f. Migration pattern.

g. Exploitation rates within the high seas and home water fisheries.

h. The relationships between the size of spawning stocks and the number of smolt migrating to sea.

The Group considered what data could be collected for the investigation of each of these topics. These possible study areas are shown in table I.

The Study Group strongly urged all countries to pursue programmes of research on the aspects of these topics relating to home waters. In particular it was agreed that all countries should attempt to collect data on the timing of returns of different age classes to home waters and also sample returning stocks on a monthly basis for length, weight and age data.

The Group then went on to discuss the collection of data in the Northern Norwegian Sea and Faroes fisheries.

2. Cooperation in the research on the different fisheries.

It was recognized by the group that at present it was only practicable to cooperate in research on the open sea fisheries as conducted by Faroes and Denmark. It might, however, be possible at a later stage to pool a similar effort in the study of other nations salmon fisheries in order to get a full picture within a short period.

The data that might be collected in a cooperative research programme on the open sea fisheries were indentified from table I as length-, weight-, scale-, blood and gonad samples-, landings and additional losses and efforts. The data can be grouped into a) data which must be recorded by licencees (obligatory) b) data which will have to be collected.

a) Obligatory data.

Both Faroese and non Faroese vessels fishing for salmon within the faroese fishery zone require licences.

Landings from the fishery are recorded in numbers by weightgroups (gutted) and total weight by trip. Given conversion factors on round weight gutted weight, the Faroese catches could be raised to round fresh weight.

In addition to recording the catch for each trip the skippers are enforced by law to fill out daily log-books giving, by sets, position, number of hooks and the catch in numbers. This information can be used for measures of effort and catch per unit effort by area and time.

b) Data collection.

Data which have to be collected by observers at sea or at fishing plants are length, weight, scale, blood samples and gonads and observations on additional losses and tag recaptures.

Based on similar efforts in the Greenland salmon fishery and on sampling sheets and sampling envelopes in use at the different laboratories the group proposed to produce a special envelope to use for the scale and length/weight sampling and a sampling sheet to record set details. These together with explanations are appended as appendix 2 and 3 respectively.

The group recommends that a limited number of specimens are sampled every month for blood and gonads. The aim of this would be to establish a maturity key based on visual observations which could be correlated to the hormone levels in blood.

It was suggested that a sampling level of about 5 per cent of the catch should provide sufficient data for the assessment of the effects of the Norwegian Sea Fisheries on home water stocks. Such sampling levels could probably be achieved by placing observers aboard one or two vessels throughout the period of the fishery. However, the Group noted that there may be

considerable variation in the exploited population between different parts of the large fishery area. It was suggested that, to assess the extent of these variations, observers should, at certain times, be placed aboard a larger number of vessels fishing in different areas. The Group agreed that the normal sampling work should be undertaken by a single observer but that two observers would be needed for tagging or when blood and gonad samples are to be taken. The total sampling programme will therefore require an average of about two observers per month.

3. Presentation of programs, related to the open sea fisheries.

Faroese fishery.

Faroes presented to the group their sampling program for the salmon fishery in the fishing season 1981/82 including observers on fishing vessels throughout the season (appendix III).

In addition to this the following countries expressed their intention to send observers to participate in a cooperative research program on the open sea fisheries, and made very tentative suggestion of the manpower they could supply.

Country	Man weeks	Remarks
Denmark		
Iceland	4	
Norway	4-8	1)
Sweden	3	
Ireland	24	
UK	12	

1) Due to budgetary difficulties this may be substituted by the equivalent in money to hire faroese observers.

As the commitment by country to take part in a cooperative research program, both with relation to manpower and time was preliminary the group was unable to draw up a detailed program. The group, however, felt that this should be done as soon as possible after the final commitments have been made to the convenor (rec. 2) by the coordinator (rec 4) and passed on to the participating countries.

4. Tagging.

The Study Group discussed five marking techniques that could be used in the study of the topics listed under item 1, internal and external tagging of smolt and adults and dye marking of adults. Dye marking was only suggested as a simple short term marking technique to be used within the fisheries. The group tabulated points for and against the various techniques (table 2) and then discussed the application of these techniques to the study af these topics.

Topic b. The group noted that neither smolt nor adult tagging data could be used to estimate the composition of stocks in the high sea fisheries by country of origin until reliable estimates of exploitation rates were available.

The group also considered the problems of tagging representative samples of smolts within and between different countries. It was therefore agreed that under this topic, adult tagging could only be considered to validate the discriminate function analysis of scale characteristics.

Topic c. The group discussed the possibility of using adult tagging to estimate the timing of returns from the high seas fishery areas to home waters. It was suggested that tagging may effect the rate of maturation and that tagging mortalities might occur over a long time. It was also thought that there could be differential mortalities related both to size and the state of maturation of the fish. The group therefore agreed that, under this topic also, tagging could only be used to validate other techniques (e.g. blood and gonad sampling).

Topic d. The group agreed that smolt tagging would be necessary to improve our understanding of natural mortality rates in the sea. In view of the lower handling and tag mortalities associated with internal tags, the group recommended this as the best approach.

Topic e. The group discussed earlier tagging experiments and noted, that the growth of adult salmon appeared to be seriously affected by the high seas capture and tagging procedures. In view of the evidence from Icelandic experiments it was recommended that internal tagging of smolts should be used to establish growth curves for different stocks.

Topic f. In the investigation of migration patterns, particulary between different feeding areas, easy observation of marks and the occurence of incidental (or unexpected) recaptures were considered to be important.

The group therefore considered that, although it would only provide qualitative data, this topic would have to be studied by external tagging of adults.

Topic g. Adult tagging was discussed as a method of assessing the exploitation rates within the open seas fisheries. However, it was thought unlikely that reliable estimates could be made.

Topic h. The group generally favoured the use of internal tags for large scale tagging experiments on smolts.

The group recommended that tagging of salmon smolts (both wild and reared) should be increased. In this they favoured the use of internal microtags. However it was recognized that tagging programmes should be coordinated with programmes for scanning catches in all open seas and home water fisheries The Study Group suggested that Irish and Icelandic tagging programmes should be used as pilot projects and that this should be discussed in detail by the full working Group.

The group concluded that adult tagging was mainly of use for the validation of other sampling and analysis techniques. No adult tagging technique was considered to have particular

advantages on scientific grounds.

It was the opinion of the group that approximately 50 recaptures in each of four areas would be required for a validation of the disciminant function analysis. To achieve this approximately 5000 fish would have to be tagged in the Faroes fishery area. The group estimated that assuming approx. 1/3 of the fish caught were fit for tagging a maximum of 1500 fish could be tagged per fishing vessel in the period March to May. At any other time the numbers of fish tagged could be substantially reduced. Two assistants would be required to carry out tagging work.

Cost of a tagging programme has been estimated roughly:

1) Faroese assistants will cost approximately d.kr. 13.000 per month (subsistance included). A 60' - 70' vessel with crew can be hired for approximately d.kr. 150.000 per month and fishing gear (long-lines) for approximately d.kr. 20.000 per month.

   Based on this the cost of tagging 5000 fish would be in the order of danish kr. 2.000.000,00. The sale of fish unsuitable for tagging could, however, substantially reduce the above costs.

2) Alternativily live salmon could be bought and tagged aboard a fishing vessel. The price will probably be d.kr. 50,00 per kg on average (estimated to d.kr. 200,00 per fish). For 5000 tagged fish these costs will be of the order of d.kr. 1.000.000,00. In addition come expences for the tagging crew (d.kr. 26.000,- per month for two hired Faroese assistants.

5. Conclusions and recommendations.

   1. The Study Group concludes that a cooperative research program on the salmon fishery in the Faroe area is desirable and should commence as soon as possible.

   2. In order to facilitate rec. 1. countries intending to participate in the program should send to the convener (Mr. B.B. Parrish), before the end of January 1982 information on: a) Amount of manpower they are

able to allocate, b) at what time this could be available and c) to what extent they can assist in working up the data and analyse samples.

3. The research program should cover at least one full fishing season (October - May). Any research done in the beginning of 1982 could be regarded as a pilot project.

4. The cooperative research program should be coordinated by a person appointed by the Faroese Fisheries Institute.

5. Smolt tagging by countries of origin should be continued and expanded. Special emphasis should be given to use of internal tags. The coordination of micro tagging programs and programs for scanning catches for tags in all fisheries should be considered at thc next meeting of the full North Atlantic Salmon Working Group.

6. Because of the high costs involved tagging of adult salmon in the Faroe area should be discussed by the full North Atlantic Salmon Working Group.

References.

Anon 1981: Report of meeting of North Atlantic Salmon Working Group. Copenhagen 1. - 6. April 1981. ICES C.M. 1981/M: 10.

Parrish, B.B. 1973: International Atlantic Salmon Symposium 1973.

Table I. Data that could be collected for the investigation of topics listed by the Study Group

	Topics listed by study Group							
	Fishery induced mortalities	Stock composition by country of origin	Age	Natural mortality	Growth	Migration	Exploitation rates	Stock and recruitment
Data relevant to topics	a	b	c	d	e	f	g	h
Lenght Weight/ data			x		x		x	
Scale samples		x	x	x	x	x	x	x
Blood samples			x					
Gonads			x					
Landings, discards and additional losses	x			x			x	x
Effort				x			x	
Tagging		x	x	x	x	x	x	x
Up & downstream river counts								x

Table II

A relative assessment of points (+) for and against (÷) various tagging techniques

	Smolt internal Tags	Smolt external Tags	Adult internal Tags	Adult external Tags	Adult dye Tags
Reduced growth	+	–	–	–	–
Tag mortality	+	–			
Handling mortality	–	– (high)	– (high)	– (high)	–
Tag loss	+	–	+	–	
Biased returns in high sea fisheries	+	–	+	–	?
Biased returns in home water fisheries	–	+	–	+	–
Lack of "incidental" recoveries	–	+	–	+	–
Ease of observation of mark (e.g. by fishermen)	–	+	–	+	?
Ease of identification of mark (e.g. time & cost)	–	+	–	+	?
Cost of equipment etc.	–	+	–	+	+

Appendix 1 Scale envelope with records to be noted from fish sampled at fish plants and aboard commercial fishing boats.

Size 5,5 x 9 cm

SALMON

Observer No	Set No	Sp. No

x Boat name/number
x Date of setting/sampled
x Where caught/sampled

FL	TL
WW	GW
SEX	Maturity

Scales area

Remarks

Information to be recorded on scale envelopes

Observer No	From predetermined codes.
Set No.	To be recorded by observers from 01 onwards.
Specimen No.	To be recorded by observers from 001 onwards. For fish sampled that particular set.
Boat name/number	Name of boat and register number.
Where caught/sampled	If observer, see set details. If commercial samples, then use information from skipper. Location of sample if commercial plant sample.
FL - Fork length	To be measured in cm to the nearest cm below from tip of snout to mid-fork of tail.
TL - Total length	To be measured in cm to the nearest cm below from tip of snout to end of tail.
WW - Whole weight of fish	To be weighed to the nearest 1/1o th of kg below. At sea using a steelyard.
GW - Gutted weight of fish	To be weighed with head-on and kidneys removed to the nearest 1/1o th of kg below. At sea using a steelyard.
SEX -	M-male or F-male.
Maturity	As a preliminary approach observers should record an U for fish which are seemingly unmaturing and an M for fish which are seemingly maturing.
Scales area -	Location from which scale sample is removed from if other than standard location (GBA - general body area or RS - right side). Standard location is on the left side 3-6 scale rows above the lateral line on a line extending from the posterior base of the dorsal fin. About 25 scales per fish are required to be removed after first cleaning fish with the edge of a knife.
Remarks -	To include comments on tag number or other marks such as finclips, eroded dorsal fins or twisted vertebrate. If blood sample/gonad sample was taken it should be noted here.
X	It is not necessary to repeat this information on each envelope.

Appendix II

SET DATAILS

Observer No	Set No
Number and name of boat	Surface Temp Start °C End °C
Year Month Date	Light end of set
Start Position / N W	Wind Direction Start End
End Position / N W	Wind Force Start End
Mid-point N W	Observers (names)
Begin setting End setting Mid-point GMT	
Begin hauling End hauling Mid-point GMT	Duration of fishing (Hrs. and tenths)

Number of hooks	Total number of salmon caught	Catch per 1000 hooks	Salmon tagged

Non-catch fishing mortalities - category of loss

Discards less than 60 cm		Discards greater than 60 cm	Haul back losses
Alive	Dead		

Remarks:

Other species caught (by-catch)		Tags Recovered		
Species	number	Tag number	colour	origin

Information to be recorded on the set detailform.

Observer No. From predetermined codes. See appendix I.

Set No. To be recorded by observers from 01 onwards. See appendix I.

Start Position. Record position when setting first buoy. In Loran C time differences and convert to coordinates.

End Position. Record position when taking in last buoy, in Loran C time differences and convert to coordinates.

Mid-point Position. Calculated from positions recorded above.

Begin setting. Time when first buoy is set in GMT - Greenwich Mean Time.

End setting. Time when all buoys are out.

Begin hauling. Time when first buoy is taken on board.

End hauling. Time when all buoys are on board.

Mid-point and Duration of Fishing. Calculated from mid-point of setting to mid-point of hauling. Not done by the observer.

Light. Standard code attacted. Record at end of setting.

Wind Direction & Force. Standard codes attached. Record at beginning of set and end of haul.

Effort, and Catch per 1000 hooks. Calculated catch per 1000 hooks fished. Not done by the observers.

Non-catch fishing mortalities - category of loss.

Discards (less than 60 cm): Fish thrown overboard because they are smaller than legal size defined as dead or alive.

Discards (greater than 60 cm): Fish thrown overboard because they are damaged or in poor condition.

Haulback losses: Fish that fall off hooks during process of hauling back.

Standard Codes - Light, Wind Force and Sea

Light

Darkness	- 0	Dull (overcast, fog, rain)	- 3
Moonlight	- 1	Bright, but hazy	- 4
Dark-Dawn or Dusk-Dark	- 2	Bright sunlight	- 5

Wind Force Code

The Beaufort force of the wind is estimated from the appearance of the sea surface, according to the table below. This table is only intended as a guide to show roughly what may be expected on the open sea, remote from land. Factors which must be taken into account are the "lag" effect between the wind increasing and the sea getting up; and the influence of "fetch", depth, swell, heavy rain and tide effect on the appearance of the sea. Estimation of the wind force by this method becomes unreliable in shallow water or when close inshore, owing to the tidal effect and the shelter provided by the land.

Code	Appearance of sea if fetch and duration of the blow have been sufficient to develop the sea fully	Description
00	Sea like a mirror	Calm
01	Ripples with the appearance of scales are formed, but without foam crests.	Light Air
02	Small wavelets; crests have a glassy appearance and do not break.	Light Breeze
03	Large wavelets; crests begin to break; foam of glassy appearance; perhaps scattered white horses.	Gentle Breeze
04	Small waves, becoming longer, fairly frequent white horses.	Moderate breeze
05	Moderate waves; many white horses are formed (chance of some spray)	Fresh Breeze
06	Large waves; white foam crests everywhere (probably some spray)	Strong Breeze
07	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind.	Near Gale
08	Moderately high waves; edges of crests begin to break into the spindrift; foam is blown in well-marked streaks along the direction of the wind.	Gale

Appendix III

TENTATIVE PLAN FOR SAMPLING THE FAROESE CATCHES

Landed weights, totals	from landing statistics
Landed weight by weight category	(conditional for getting
Number landed by weight category	a license)
Catches by statistical rectangles	From logbooks
Effort by statistical rectangles	
Additional information on fishery conditions	

Observer program.

Fiskirannsóknarstovan intends to place observers on board on vessels to sample length, length-weight, securing scale samples, estimate discards and length distribution of discards, securing tags.

The intensity of the scheme is based on the distribution of the fishery in 1980, which outlined 3 main areas. (fig 1)

I The area to the North of the Faroes, fished during the whole season.

II The area appr. between 4° W and 4° E, and 70° N to 71° 30' N (fished in April-May)

III The area appr. between 3° W and 2° E and 67° N and 69° N (fished in May)

Observers will be placed aboard vessels to cover the areas as follows:

	I	II	III
November	1		
December	1		
January	1		
February	1		
March	1		
April	1	1	
May	1	1	1

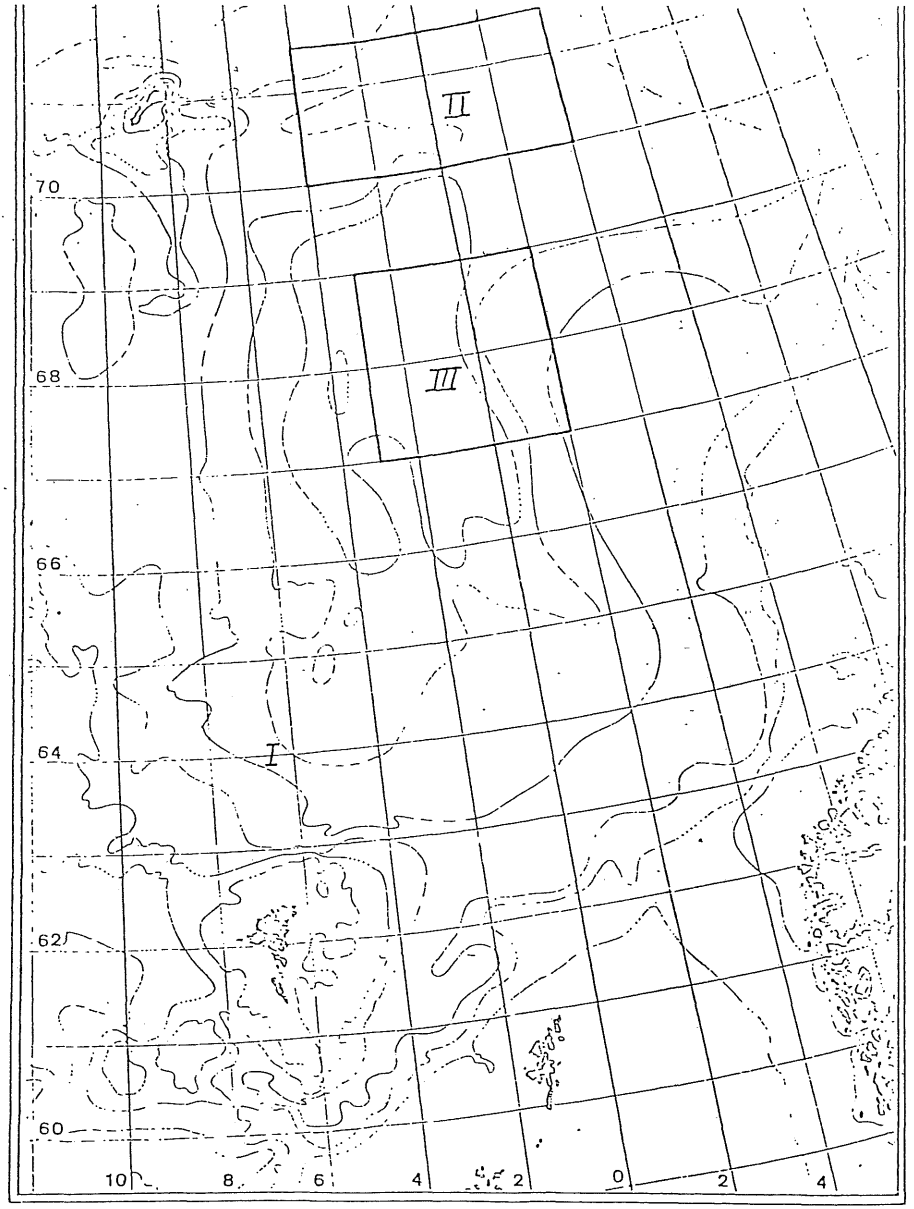

Fig I. Sampling areas Faroese program for sampling Faroese fishery on Atlantic Salmon