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

Pitlochry, March 29 - April 1, 1971

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

March 1971

A. INTRODUCTION

1. The Working Party met at the Freshwater Fisheries Laboratory, Pitlochry on 29th March - 1st April 1971. The following were present:

A.W. May	Canada
O. Christensen	Denmark
Sv. Aa. Horsted	Denmark
I.R.H. Allan	England and Wales
A. Swain	England and Wales
A. Reinert	Faroe
R. Vibert	France
F. Thurow	Federal Republic of Germany
Miss E. Twomey	Irish Republic
A.E.J. Went	Irish Republic
L. Rosseland	Norway
W.R. Munro	Scotland
B.B. Parrish (Chairman)	Scotland
K.A. Pyefinch (Rapporteur)	Scotland
J.B. Kimsey	USA
G.J. Ridgway	USA
L.R. Day	ICNAF

Apologies for absence were received from B. Carlin (Sweden) and A. Bogdanov (USSR). A representative from Faroe attended for the first time.

2. This meeting was preceded by that of a Planning Group, under the Chairmanship of A.W. May (Canada) which met on 26th and 27th March, to discuss the arrangements for the international tagging experiment which, it is hoped, will be carried out in 1972. The report of this Group forms an appendix to this report.
3. During the four days of this meeting, the Working Party reviewed the latest information available on the West Greenland and Norwegian Sea Salmon fisheries, considered further the assessment of the effects of these fisheries on total and home-waters catches and discussed the plans put forward by the Tagging Planning Group.

B. WEST GREENLAND FISHERY

1. Statistics and Composition of the Fishery

4. The salmon catches at West Greenland in the years 1960-69, with provisional records for 1970, are shown in Table 1. These data show that the total catch in 1970 (estimated at 2 150 tonnes) was about the same as in 1969. Although it was not possible to separate the drift-net and gill-net catches for the Danish-Greenlandic fishery (only an approximate separation was possible also for 1969) it is almost certain that the former was the major component of the catch.

5. The size and age compositions of the salmon stock exploited at West Greenland were very similar to those of previous years, and they indicated that the stock consisted mainly of fish which had spent one winter in the sea and which, if they returned to home waters, would do so as two- or more sea-winter fish. As in previous years, the sex ratio showed a marked preponderance of females. This ratio, based on a sample of drift-net caught fish, was female: male 2.6 : 1.0. Since 1965 this ratio has varied between 2.1 : 1.0 and over 4.0 : 1.0.

6. The number of vessels taking part in the West Greenland drift-net fishery, from its commencement in 1965, are given below. These data show that, excluding Greenland registered vessels (which are not included) the number of vessels taking part in this fishery in 1970 was about the same as in 1969.

Year	Number of vessels				
	Denmark	Faroe	Norway	Sweden	Total
1965	0	1	1	0	2
1966	0	1	1	0	2
1967	4	4	3	0	11
1968	10	2	4	1	17
1969	15	6	11	2	34
1970	13	7	10	2	32

7. A notable feature of the drift-net fishery in 1970 was that some Danish vessels fished in the Arsuk area (Fig. 1) and that fishing took place near the coast in this area. Further, it should be noted that, in January - April 1970, two vessels from Greenland fished for salmon, mainly by long line, in the northern part of the Labrador Sea between latitudes 58-60°N and longitudes 53-58°W. Seven tonnes of salmon were caught by one of these vessels (the catch of the other vessel is not available) and about two-thirds of this catch consisted of two-sea-winter fish and one-third three-sea-winter fish. This age composition corresponds with that of the long-line catches made by a research vessel at West Greenland the previous autumn.

### 2. Recaptures of Tagged Fish at West Greenland

8. The recaptures during 1963-9 of salmon tagged in home waters as smolts (either natural (wild) or hatchery-reared) and as adults are shown in Tables 2, 3 and 4. These tables include revisions of data presented in earlier reports of the Working Party.

9. The Working Party draws attention to the first recoveries in Greenland of salmon tagged in France. These salmon were tagged as wild smolts in the extreme south-west of France in 1969. Six additional tags were reported from Norway bringing the total for that country to eight recaptures from the West Greenland area. Thus, salmon occurring in West Greenland are now known to originate on the European side from about latitude 63°N to about latitude 44°N, which is almost the southern limit of the species.

10. The Working Party came to the conclusion that since there are many factors affecting the rate of return of tagged smolts, as discussed in details in the Working Party's last Report, (ICNAF Commission Document 70/13, ICES Document C.M. 1970/M:4), it is not possible to obtain from the tag recapture data accurate estimates of the proportions of the salmon stock at West Greenland originating from individual countries. Nevertheless, the smolt recapture data obtained in 1970 confirm that the major part of the West Greenland salmon stock has been derived from rivers in Canada and the U.K.

### 3. Biochemical and Parasite Studies

11. Investigations were continued in 1970 on biochemical characters and parasite fauna (as biological tags) in relation to the study of the origin and mixing of salmon at West Greenland.

12. As indicated in the last report, recent Canadian investigations of blood serum protein in association with parasite studies have provided promising results. Blood samples of an additional 204 Atlantic salmon taken in the Labrador Sea and the West Greenland area in the autumn of 1970 were analysed by Canadian scientists, using methods reported previously. Forty-nine per cent of the fish were identified as North American in origin and fifty-one per cent as European. This result is similar to the proportionate returns of salmon tagged at West Greenland.

and recaptured in home waters (Table 5.). In view of the importance of these studies in identifying the origins of the salmon at West Greenland further work is in progress to confirm these results.

13. Research on transferrin polymorphism in progress in the United Kingdom indicates that a certain proportion of the salmon can be distinguished as to continent of origin. The Working Party considers that this approach to the problem is promising and is glad to learn that work in this field is being continued.

#### 4. Recaptures of Fish Tagged at West Greenland

14. In 1970 Canadian scientists conducted tagging experiments with the 'A.T. Cameron' over a wide area of the Labrador Sea and near West Greenland using drift nets. A total of 147 salmon was tagged at West Greenland and three local recaptures were made. Three of 27 fish tagged in the Labrador Sea in the spring were recaptured in Canadian waters. Experiments in 1970 were again carried out at West Greenland with drift nets, gill nets and long lines by Danish and British scientists. Seventy-seven fish were tagged and liberated. No local recaptures were made, but one fish was recaptured in Scotland in March 1971.

15. Table 5 has been updated to include returns from the 1969 and 1970 taggings (recaptures so far reported in 1971 from the 1970 tagging are also included). One fish tagged in 1969 was recaptured later that year in Canada and a further eleven were recaptured in 1970 from home waters (Canada 5, United Kingdom 4 and Ireland 2). Two further fish were recaptured, after intervals of 390 and 398 days respectively, at West Greenland.

#### 5. Assessments of the Effects of the West Greenland Fishery

16. The Working Party noted that, following French smolt tagging experiments in 1969 (para. 9) there was now evidence that part of the West Greenland stock in 1970 was of French origin. Although the recapture rate at West Greenland for these fish was the highest so far recorded for any country the Working Party considered that, taking into account the relatively low salmon catch in France, the proportion of salmon of French origin in the West Greenland stock is small and does not have any significant influence on the results of earlier assessments of the overall effects of the West Greenland fishery on total salmon stocks and yields.

17. New information regarding the increase in weight of salmon between their occurrence at West Greenland and, for those returning in home waters points to the fact that the 50% weight increase used in earlier assessments is an upper limit. Salmon (in their second sea winter) found in January-April in the northern Labrador Sea (at the northern part of the border between ICNAF Divisions 1F and 2G) are likely to include salmon which occurred off West Greenland in the previous autumn. These salmon had evidently not increased their weight since they left West Greenland in October or November previously. On the other hand, if salmon (two-sea-winter-fish) entering Canadian waters in mid-year have spent the winter and the spring in the Labrador Sea, then there is evidence of a very rapid weight increase between their occurrence in the Labrador Sea and in Canadian waters. For salmon caught near the home rivers this weight increase may be as much as 50%, but many salmon are caught in Canadian coastal waters distant from their rivers of origin and these show a weight increase well below the 50%. The Working Party therefore concluded, on the basis of this evidence, that the average overall weight increase between West Greenland and home waters probably lies between 25% and 50%.

18. Earlier assessments of the effects of the West Greenland fishery on home waters stocks and catches have set out to describe the changes in weight which have taken place (i.e. the resultant of growth and natural mortality) to the group of fish caught at West Greenland had they not been caught. In a new approach to the assessment (see ICNAF Res. Doc. 71 for details) an attempt was made, on the basis of a range of exploitation

rates at West Greenland and of various other parameters, (growth, exploitation rate in home waters, proportion of salmon returning to Canada and the UK) to simulate home water catches of salmon which were present at West Greenland but not caught there. This approach may, to some extent, allow the estimation of the minimum natural loss between West Greenland and home waters or, in some cases, the minimum proportion of the home water salmon catches which is based on fish which have not been part of the stock exploited at West Greenland. The results of these calculations are given in Table 6.

19. On the basis of this new approach, the Working Party concluded that the exploitation rate for the West Greenland stock in recent years has been less than 30% but probably higher than 10%. The natural mortality compatible with the results for this range of exploitation rates lies within the range set for natural mortality in earlier assessments. Taking the combination of parameters given in Table 6, for a catch at Greenland of 2 000 tonnes, the loss for all home waters catches combined is estimated to be in the range 500 to 1 900 tonnes, which is comparable with the loss estimated in the earlier assessment and presented in last year's report. It must be stressed however, that this calculation is based on the assumption that all salmon have been inside the area fished at West Greenland. Since this assumption probably does not hold, the range of losses to home waters catches given above may be over-estimated. It must also be stressed that as indicated in previous reports, these estimates refer only to the immediate, direct losses to the home waters' catches and take no account of any possible effects of the West Greenland fishery on smolt production, and hence future recruitment, through a decrease in spawning stock size.

20. The Working Party noted a decline in numbers of late-run salmon and, therefore, a tendency towards a higher grilse/salmon proportion in the Miramichi River in Canada. Although the West Greenland fishery may have influenced this proportion the Working Party noted that like that of the spring run of salmon in some European countries, this decline actually started before the West Greenland fishery could have had any significant influence. The Working Party did, however, note that changes in the grilse/salmon ratio might be the result of the operation of genetic factors.

21. The Working Party also noted, with considerable interest, that the sex ratio of Canadian home water salmon in the Miramichi River is about 1:1, whereas there is a significantly higher proportion of females than males at West Greenland (para. 5). The Working Party had no information on the sex ratio of tagged smolts of Canadian origin recaptured at West Greenland but recommends that careful studies be conducted on the sex ratio of adult salmon in home waters. Such a study could lead to further information about natural mortality between West Greenland and home waters and of the numbers of salmon occurring outside the area fished at West Greenland.

### C. NORWEGIAN SEA FISHERY

#### 1. Catch and Fishing Effort

22. Data on the catches taken in the long-line fishery in the Norwegian Sea and the number of vessels participating in the years 1965-69 and provisional statistics for 1970 are given in Table 7. These data show that in 1970 there was a further increase in the catch in this rapidly growing fishery. This was mainly due to an increase in number of Danish and Norwegian vessels which, as in previous years, together took almost the whole of the catch.

23. Information on the catch-per-unit-effort in this fishery in 1968, 1969 and 1970 is given in Table 8. These data suggest a somewhat greater abundance of salmon in 1970 than in 1969, but less than in 1968. The data also indicate that, at least in 1970, a considerable number of salmon were present in the fishing area as early as February. Judged from the catches of the last two years, abundance and/or availability of salmon in the fishing area seems to rise gradually from February until April and decline during the remaining part of the season.

24. As indicated by the limited data available from a research vessel long-lining in the vicinity of the Faroe Islands a significant number of salmon were present in this area in April.

## 2. Distribution of Fishing

25. The area within which long line fishing took place in 1970, shown in Figure 2, did not differ significantly from the fishing area in 1969 (see ICNAF Comm. Doc. 70/13). This shows that fishing took place off the Norwegian coast between latitude 63°00'N and 74°00'N from the 12 miles fishery limit along the coast to as far as 250 miles offshore in the northern part of this region. In the northern part of the area (between latitudes 71°N and 72°N) the fishing area extended from longitudes 8°00'E to 36°00'E. The main fishery was concentrated in the area between longitudes 69°00'N and 74°00'N and latitudes 10°00'E-20°00'E during the whole season, but with a more southerly concentration of fishing effort at the beginning and at the end of the season.

26. As in previous years fishing surveys were conducted in 1970 outside the area regularly fished. Catches by Norwegian vessels near Spitzbergen indicated that salmon were also present in this area, though little is known about their abundance, composition and inter-relations with the concentrations currently exploited.

27. A small fishery was conducted by Faroese long-liners in the vicinity of the Faroe Islands, in spring in 1968, 1969 and 1970, information on the catches of which are included in Table 7.

## 3. Composition of Stock

28. In 1970, about 90% of the salmon caught in the Norwegian Sea in the period February-mid-May had already spent two or more winters in the sea. However, a relatively high proportion (about 30%) of one-sea-winter fish was caught by a Norwegian research vessel in a limited area of the main fishing region in April 1970. This age group appears to form an increasing proportion of the exploited stock from mid-May to the end of the season according to data collected from Norwegian and Danish catches. This points to a progressive recruitment of these younger fish to the fishing area towards the end of the season.

29. A notable feature of the two-sea-winter salmon caught in the long-line fishery in the Norwegian Sea is their widely varying but, on average, low condition factor compared with salmon of the same sea age caught at various localities in the Norwegian coastal fishery. In 1970 the condition factors of salmon from both areas were lower than in the two previous years.

30. The salmon caught by a research vessel in the vicinity of the Faroes in April 1970 consisted mainly of one-sea-winter fish. A somewhat similar, but even more pronounced, preponderance of this age group was found in research catches from the same area in the previous two years.

## 4. Origin and Destination of Salmon

31. Information on the recaptures in the Norwegian Sea fishery of salmon tagged as smolts in Norwegian, Swedish, Danish, Icelandic and UK rivers are given in Tables 2 and 3. To date, 186 recaptures of salmon tagged as smolts have been reported from the long-line fishing area off the Norwegian coast, of which 173 were tagged in Norway, 6 in Sweden and 7 in Denmark. No recaptures have been reported from this area of salmon tagged as smolts in the UK or Ireland. Smolt tagging experiments have not been conducted in the rivers in the USSR but there are records of a small number of salmon, tagged as kelts in rivers entering the Barents Sea being recaptured in the Norwegian Sea long-line fishery.

32. Further evidence concerning the destination of salmon in the Norwegian Sea is available from the recaptures shown in Table 9, of salmon tagged in this area in 1968, 1969 and 1970. A total of 183 recaptures from tagging experiments in 1967, 1968, 1969 and 1970 has been reported from the coastal and river fisheries, one from the USSR and the remaining 182 from Norway. Of the 67 salmon reported from home waters from the 1968 and 1969 experiments, 54 were recaptured in the same year as tagging, while 13 were recaptured in the following year.

33. As indicated in last year's report even if, in the absence of smolt tagging experiments in USSR rivers, the relative proportions of salmon in the Norwegian Sea stock originating from different countries cannot be estimated accurately, these data clearly suggest that most of the returning salmon migrate to Norwegian home waters, mainly as two-sea-winter fish. During 1968 reports were received from Norway, the USSR and Scotland of fish in their catches with hooks still attached which were the same as those used in the Norwegian Sea fishery. A considerable number of similar records were reported from Norway in 1969 and 1970, but none from the USSR, Scotland or elsewhere.

34. From the long-line fishing area immediately around the Faroe Islands 15 recaptures of salmon tagged as smolts or kelts in home-waters have been reported. Of these, 6 were tagged in Norway, 5 in Sweden, 3 in Scotland and 1 in Iceland. These included 12 tagged as smolts and 2 tagged as kelts, both of the latter in Scotland (information on the origin of one of the recaptures is not available).

35. These data and information, shown in Table 10, on the recaptures in home waters of salmon tagged in the vicinity of the Faroes suggest that Faroese waters are a feeding and/or transition area of salmon originating from and returning to northeast Atlantic rivers. A total of 307 salmon tagged in 1969 and 1970 in this area resulted in 13 recaptures in home waters, 2 in Norway, 1 in England, 7 in Scotland and 3 in Ireland. An additional recapture of a salmon tagged in this area was made at West Greenland in 1970.

## 5. Assessments of the Effects of the Norwegian Sea Fishery

36. The 1970 data on the age composition of samples taken during the offshore long-line fishing season showed that as in the previous two years about 90% of the exploited stock in the Norwegian Sea consisted of fish which had spent two or more years in the sea. The effects of this fishery on home-waters stocks and yields are therefore confined almost entirely to adult salmon of two or more sea-winters in age.

### 5.1 Total Salmon Yields

37. The assessment of the effect of the Norwegian Sea fishery on total salmon yield (Norwegian Sea plus home-waters) was approached, as in the preliminary assessment presented in last year's report, using data on

a) the increase in weight of the fish from the period of peak fishing in the Norwegian Sea to the period of peak fishing in Norwegian coastal waters;

b) the proportion of the fish present in the fished area which, if not caught there, would be subsequently caught in the home-waters fisheries. Accurate measures of each of these two factors are not available; however, a range within which the true value of each almost certainly lies can be set.

38. As regards a), the most recent data suggest that the weight increase between the Norwegian Sea and Norwegian home-waters fisheries is likely to lie between 20% and 30%. As regards b), while the home-waters exploitation rate is more difficult to determine, the results of long-term adult tagging experiments in Norwegian coastal waters indicate that a value of 50% would be a minimum and one of 80% a probable maximum.



39. Using the above upper and lower estimates of weight increase it is estimated that the presence of the Norwegian Sea fishery would result in an increase in the total catch (Norwegian Sea plus home-waters) from that component of the open sea stock of two-sea-winter salmon, returning to home-waters in the same year if the exploitation rate in home-waters is less than 77% (for a growth increase of 30%) or 83% (for a growth increase of 20%). It seems likely, therefore, on the basis of the above information on home-waters exploitation rate that the Norwegian Sea fishery has resulted in an overall increase in the total catch by weight (Norwegian Sea plus home-waters) of the stocks being fished. It should, however, be pointed out that the overall average 'quality' of the total yield will be lower in the presence of an offshore fishery because of the low average condition factor of fish taken offshore.

## 5.2 Home-waters Salmon Stocks and Yields

40. In last year's report the Working Party presented the results of a first, provisional assessment of the order of magnitude of the losses to home-waters stocks and catches resulting from the long-line fishery in the Norwegian Sea. This indicates that, on the assumption that losses due to natural mortality between the time the salmon are exploited in the open sea fishery and their return to home waters are about the same as the increase in weight due to growth, the losses to the home-waters stocks would be roughly equal to the long-line catch. With a view to providing more reliable estimates this assessment was extended, in the same general manner as for the West Greenland fishery, by simulating the home-waters catches (of two-sea-winter salmon), using ranges of the better known factors (i.e. exploitation rates in the long-line fishery and in home-waters and the increase in weight of salmon) governing the catch in home-waters and comparing these estimates with the known home-waters catch. The results of these calculations, taking the long-line catch as 1 000 tonnes and the Norwegian home-waters catch of two-sea-winter and older fish as 800 tonnes, and assuming that 80% - 90% of the exploited stock in the Norwegian Sea return to Norway, are given in Table 11. They provide support for the assumption made in the earlier provisional assessment that the natural mortality between the time that the salmon are taken in the offshore fishery and the time they are fished in coastal waters is low, and certainly not greater than the gain achieved by increase in weight of the fish which would have occurred had they not been taken in the offshore fishery. They also indicate that the exploitation rate in home-waters is likely to lie within the range 50-80%. Using these values it is estimated that the loss to home-waters catches, mostly in Norwegian home-waters, for a long-line catch of 1 000 tonnes, is in the range 500 to 1 040 tonnes. These catches are similar to those made in last year's report.

41. These estimates concern only the immediate and direct effects of the Norwegian Sea fishery in total and home-waters yields. The Working Party has still not found it possible to estimate long-term effects since, at present, too little is known of the relation between spawning stock size, smolt production and subsequent recruitment of grilse and salmon.

### D. HOME-WATERS CATCHES

42. Catch statistics for the home-water fisheries are given in Table 12 and catch per unit effort data in Table 13. These data show that the total catches (salmon and grilse) were larger in 1970 than in 1969 in Canada, England and Wales, Ireland and Northern Ireland but substantially less in Norway and, particularly in Scotland. The increase in the total catch of England and Wales was attributable to a substantial increase in a drift net fishery off the north-east coast of England in the summer of 1970.

43. The salmon component of the catch in Scotland in 1970, as in 1969 was lower than in the previous seven years and, though separate records of salmon and grilse catches were not previously available for Ireland, it seems likely that the Irish salmon catch also decreased in 1970. It was higher in England and Wales and in Norway but in England and Wales, as in Scotland, there was a decrease in the spring component of the salmon catch. Data are not yet available on the breakdown of the Canadian catch into salmon and grilse.

44. In the last report of the Working Party, attention was drawn to a source of error in the classification of the Scottish catch into salmon and grilse. As most of the commercial Scottish catch is classified on a weight basis, if the weight of grilse at capture increased, the catch of the latter would be underestimated whereas the salmon catch would be over-estimated. Although this error may have been large in 1969 (when there was a substantial proportion of large grilse in the Scottish catch) there is evidence that this situation was unusual. This is supported by the data for 1970, which indicate that the error in that year was smaller and probably similar to that in years prior to 1969.

#### E. FUTURE RESEARCH

##### 1. International Tagging Experiment at West Greenland

45. The Working Party noted that, although replies had not been received from all ICES and ICNAF member countries concerning their participation in the proposed, large-scale international salmon tagging experiment at West Greenland in 1972, Denmark, Canada, Ireland and the UK had already intimated their intention to participate, and France and Norway had indicated that they hoped to be able to do so.

46. In accordance with the decision taken at the special meeting of the Working Party in Copenhagen in September 1970, initial plans for the organisation, costing and conduct of the experiment were drawn up by an ad-hoc group, which met for two days in advance of the Working Party meeting. These initial plans, as approved by the Working Party, are set out in detail in the Appendix (H.1). It was agreed that, should it be decided by the countries concerned to go ahead with the experiment, a further meeting of an ad-hoc planning group should take place towards the end of 1971 or early in 1972. It was also agreed that the joint programme of research at West Greenland in 1971 should have, as its main objective, trial tagging experiments of drift-net caught salmon from the Danish research vessel 'Adolf Jensen' and the provision of experience for observers, aboard commercial drift-net vessels. In addition, it was hoped that, prior to the international experiment in 1972, the research vessels which would participate in it would be able to conduct drift-net fishing trials, either at West Greenland or in home waters, to acquire experience in their use.

#### F. FUTURE MEETING

47. The Working Party recommended that they should next meet during the week beginning 20th March 1972. The representatives of the Irish Republic invited the Working Party to hold this meeting in Dublin.

Table 1. Catches at West Greenland, 1960-70, in metric tons and round fresh weight. (Based on data available at 31 March 1971)

<u>Year</u>	<u>Norway</u>	<u>Faroes</u>	<u>Sweden</u>	<u>Denmark &amp; Greenland</u> <u>(Drift net, Offshore)</u>	<u>Greenland</u> <u>(Gill net, Inshore)</u>	<u>Total</u>
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	1 539	1 539
1965	<sup>a</sup>	36	0	0	825	861
1966	32	87	0	0	1 251	1 370
1967	78	155	0	85	1 283	1 601
1968	138	134	4	272	579	1 127
1969	250	215	30	740 <sup>c</sup>	975 <sup>c</sup>	2 210
1970	270 <sup>b</sup>	259 <sup>b</sup>	8	-	1 602 <sup>b,d</sup>	2 146 <sup>b,e</sup>

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

b - Provisional

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

d - Offshore and Inshore. This includes a known catch, by Danish drift-netters, of 358 tonnes.

e - Including 7 tonnes caught on long-line by one of two Greenland vessels in the northern Labrador Sea early in 1970.

Table 2 Number of natural (wild) smolts tagged in the years 1963-1970 and recaptured in Greenland and in other areas, including home-waters, up to March 1971. Figures in brackets are returns per thousand tagged.

Country	Year of Tagging	Number Tagged	West Greenland	Recaptures				Grand Total
				Norwegian Sea and Faroes	All Other Areas			
					Grilse	Salmon	Total	
Canada	1963	5 850	11 (1.9)	0	70	20 (3.4)	90	101
	1964	15 013	9 (0.6)	0	204	72 (4.8)	276	285
	1965	16 485	73 (4.4)	0	175	193 (11.7)	368	441
	1966	9 509	25 (2.6)	0	120	104 (10.9)	224	249
	1967	17 809	17 (1.0)	0	121	166 (9.3)	287	304
	1968	55 722	123 (2.2)	0	1 198	391 (7.0)	1 589	1 712
	1969	50 416	60 (1.2)	0	397	-	397	457
	1970	42 231	-	-	-	-	-	-
Scotland	1963	10 998	10 (0.9)	0	172	92 (8.4)	264	274
	1964	9 200	6 (0.7)	0	110	66 (7.2)	176	182
	1965	9 239	10 (1.1)	0	74	49 (5.3)	123	133
	1966	15 406	30 (1.9)	0	281	39 (2.5)	320	350
	1967	21 002	23 (1.1)	1	169	72 (3.4)	241	265
	1968	15 695	15 (1.0)	0	127	31 (2.0)	158	173
	1969	15 958	33 (2.1)	0	213	-	213	246
	1970	32 071	-	-	-	-	-	-
England and Wales	1963	9 485	8 (0.8)	0	15	38 (4.0)	53	61
	1964	17 129	10 (0.6)	0	30	97 (5.7)	127	137
	1965	5 873	12 (2.0)	0	35	57 (9.7)	92	104
	1966	3 219	5 (1.6)	0	28	37 (11.5)	65	70
	1967	4 118	10 (2.4)	0	23	56 (13.6)	79	89
	1968	5 790	19 (3.3)	0	43	48 (8.3)	91	110
	1969	8 611	40 (4.6)	0	37	-	37	77
	1970	7 320	-	-	-	-	-	-
Norway	1963	97	0	0	0	4 (41.2)	4	4
	1964	1 485	0	0	67	26 (17.5)	93	93
	1965	2 178	0	0	40	18 (8.3)	58	58
	1966	1 362	0	2	27	16 (11.7)	43	45
	1967	3 601	0	4	61	25 (6.9)	86	90
	1968	3 562	0	2	107	17 (4.8)	124	126
	1969	4 273	3 (0.7)	5	83	-	83	91
	1970	7 603	-	-	-	-	-	-
Iceland	1966	82						
	1967	153						
	1968	59						
	1969	15						
Ireland	1968	606	0	0	18	0	18	18
	1969	0	-	-	-	-	-	-
	1970	1 522	-	-	-	-	-	-
Sweden	1969	800	-	-	-	-	-	-
USSR	1969	500	-	-	-	-	-	-
France	1969	2 500 <sup>a</sup>	12 (4.8)	-	0	-	0	12
	1970	4 000 <sup>a</sup>	-	-	-	-	-	-

a Provisional

Table 3 Number of hatchery-reared smolts tagged in the years 1963-1970 and recaptures in Greenland and in other areas, including home-waters, up to March 1971. Figures in brackets are returns per thousand tagged.

Country	Year of Tagging	Number Tagged	Recaptures					Grand Total
			West Greenland	Norwegian Sea and Faroes	All Other Areas			
					Grilse	Salmon	Total	
Canada	1963	7 332	4 (0.5)	0	133	32 (4.4)	165	169
	1964	46 659	9 (0.2)	0	101	85 (1.8)	186	195
	1965	45 988	67 (1.5)	0	379	224 (4.9)	603	670
	1966	70 875	70 (1.0)	0	238	299 (4.2)	537	607
	1967	112 288	66 (0.6)	0	275	226 (2.0)	501	567
	1968	113 368	167 (1.5)	0	296	267 (2.4)	563	730
	1969	137 912	172 (1.3)	0	303	-	303	475
	1970	180 629	-	-	-	-	-	-
Scotland	1963	6 750	0	0	3	3 (0.4)	6	6
	1964	3 000	0	0	7	7 (2.3)	14	14
	1965	3 000	0	0	19	0	19	19
	1966	8 000	1 (0.1)	0	13	5 (0.6)	18	19
	1967	4 451	0	0	1	0	1	1
	1968	5 335	0	0	4	1 (0.2)	5	5
	1969	3 694	0	0	1	-	1	1
	1970	7 836	-	-	-	-	-	-
England and Wales	1963	1 970	1 (0.5)	0	0	0	0	1
	1964	0	0	0	0	0	0	0
	1965	0	0	0	0	0	0	0
	1966	9 668	0	0	0	1 (0.1)	1	1
	1967	18 522	0	0	0	1 (0.1)	1	1
	1968	28 266	4 (0.1)	0	4	5 (0.2)	9	13
	1969	7 420	1 (0.1)	0	4	-	4	5
	1970	4 493	-	-	-	-	-	-
Norway	1963	10 999	0	1	88	95 (8.6)	183	184
	1964	9 182	0	1	135	87 (9.5)	222	223
	1965	8 071	0	13	71	33 (4.1)	104	117
	1966	13 812	0	32	413	149 (10.8)	562	594
	1967	18 393	2 (0.1)	51	236	86 (4.7)	322	375
	1968	12 983	0	40	182	82 (6.3)	264	304
	1969	16 967	3 (0.2)	24	125	-	125	152
	1970	18 673	-	-	-	-	-	-
Iceland	1966	8 367	2 (0.2)	0	66	14 (1.7)	80	82
	1967	10 061	0	0	24	6 (0.6)	30	30
	1968	9 985	0	0	45	-	45	45
	1969	7 586	-	-	-	-	-	-
Ireland	1966	15 000	0	0	0	0	0	0
	1967	5 000	1 (0.2)	0	1	0	1	2
	1968	222	0	0	0	0	0	0
	1969	7 194	2 (0.3)	0	20	0	20	22
	1970	3 787	-	-	-	-	-	-
Sweden	1966	11 181	7 (0.6)	1	690	137 (12.2)	827	835
	1967	4 000	1 (0.2)	4	364	47 (11.8)	410	414
	1968	4 298	1 (0.2)	1	586	-	586	588
	1969	6 381	-	-	-	-	-	-
USA	1966	82 250	39 (0.4)	0	69	168 (2.0)	237	276
	1967	80 717	0	0	12	10 (0.1)	22	22
	1968	73 730	7 (0.1)	0	9	12 (0.2)	21	28
	1969	73 418	52 (0.7)	0	30	-	30	82
Denmark	1965	1 880	0	0	1	2 (1.1)	3	3
	1966	4 270	0	4	18	44 (10.3)	62	66
	1967	2 696	0	2	13	10 (3.7)	23	25
	1968	5 173	1 (0.2)	1	36	0	36	38
	1969	3 837	0	0	5	-	5	5
	1970	2 376	-	-	-	-	-	-
USSR	1969	600	-	-	-	-	-	-

Table 4 Number of kelts tagged in the winters 1962/63 - 1970/71 and recaptured in Greenland and in other areas, including home-waters, up to the end of 1970.

Country	Winter of Tagging	Number Tagged	Recaptures		
			Greenland	Other Areas	Total
Canada <sup>a</sup>	1962-63	653	2	65	67
	1963-64	1 518	0	91	91
	1964-65	1 995	1	141	142
	1965-66	7 169	0	653	653
	1966-67	7 510	1	688	689
	1967-68	3 557	2	393	395
	1968-69	3 564	5	175	180
	1969-70	4 467	9	146	155
	1970-71	5 476	-	-	-
England and Wales (River Axe only)	1962-63	159	1	12	13
	1963-64	185	2	10	12
	1964-65	184	1	11	12
	1965-66	109 <sup>b</sup>	1	7	8
	1966-67	178 <sup>b</sup>	1	11	12
	1967-68	188	2	6	8
	1968-69	81	0	3	3
	1969-70	113	0	11	11
Faroes	1970-71	24	-	-	-
Ireland	1962-63	2 264	2	31	33
	1963-64	2 351	2	70	72
	1964-65	2 695	2	34	36
	1965-66	2 972	1	40	41
	1966-67	3 175	0	77	77
	1967-68	1 034	0	24	24
	1968-69	498	0	9	9
	1969-70	625	0	28	28
Scotland	1962-63	413	1	2	3
	1963-64	134	0	2	2
	1964-65	233	0	6	6
	1965-66	1 376	4	19	23
	1966-67	901	3	18	21
	1967-68	117	0	3	3
	1968-69	152	0	1	1
	1969-70	153	0	1	1
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	0	8+	8+
	1970-71	400	-	-	-
USSR	1968-69	566	0	10	10
	1969-70	1 147	-	-	-

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

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

Table 5 Recaptures (to March 1971) of fish tagged at West Greenland

Year Tagged	Number Tagged	Local Recaptures		Distant Recaptures	
		Number	Days Absence	Number	Location
1965	223	3	1, 3, 26	1	Canada (SW Newfoundland)
1966	729	28	1-8 (24) 10-50 (4)	4	Canada (Miramichi - 1) Scotland (River Tweed - 2) (River Spey - 1)
1967	375	6	1-2 (3) not known (3)	4	Canada (Labrador - 1) Ireland (River Slaney - 1) (River Barrow - 1) Scotland (River Tay - 1)
1968	47	4	1-3 (3) 1 month (1)	1	Canada (Labrador)
1969	444	15 2 <sup>b</sup>	4-35 days 390-398 days	12	Canada (Labrador - 1) (NE Newfoundland - 4 <sup>a</sup> ) (Miramichi - 1) England (Torr & Torridge Estuary - 1) (River Wye - 1) Ireland (Waterwille - 1) (River Slaney - 1) Scotland (near Montrose - 1) Wales (River Teify - 1)
1970	27 <sup>c</sup>	0	-	3	Canada (Chaleur Bay - 1) (River St. Jean - 1) (Escuminac - 1)
	224	3	4-22 days	1	Scotland (Solway Firth)

a One recaptured in year of tagging

b Recaptured at Greenland in 1971

c Labrador Sea April 1970

Table 6

Simulation of home-waters catches; estimation of natural losses and proportions of home-water salmon not present at West Greenland, based on ranges of values of exploitation rate at West Greenland, weight increase between West Greenland and home-waters and exploitation rates in home-waters.

Catch at West Greenland	Exploitation Rate at West Greenland (%)	Numbers in West Greenland stock escaping fishery at West Greenland	Weight increase between West Greenland and home-waters (%)	Home-water exploitation rate	Simulated home-water catch in Canada + the UK (metric tonnes) <sup>a</sup>	Minimum loss between West Greenland and home-waters as percentage of numbers escaping the fishery at West Greenland <sup>b</sup>	Minimum proportion of home-water salmon catches (Canada + UK) based on non-Greenlandic fish in percentage of actual catch <sup>c</sup>
2 000 tonnes or 625 000 fish	10	5 625 000	25	50	9 000	61	-
				65	11 700	70	-
				80	14 400	76	-
	20	2 500 000	50	50	10 800	68	-
				65	14 040	75	-
				80	17 280	80	-
	30	1 458 000	25	50	4 000	13	-
				65	5 200	33	-
				80	6 400	45	-
	30	1 458 000	50	50	4 800	27	-
				65	6 240	44	-
				80	7 680	54	-
30	1 458 000	50	50	2 333	-	33	
			65	3 033	-	13	
			80	3 733	6	-	
30	1 458 000	50	50	2 799	-	20	
			65	3 639	4	-	
			80	4 479	22	-	

a It is assumed that 80% of salmon present at West Greenland are destined for Canada and the UK combined. The actual recorded catches of salmon in Canada and the UK is taken as about 3 500 tonnes.

b The losses are minimum, because it is supposed that all salmon caught in home waters have been in the West Greenland stock.

c The proportion is minimum because no natural mortality between Greenland and home waters is taken into account.



Table 7 Catches in the Norwegian Sea long-line fishery and in the drift-net fishery within Norwegian fishery limits, 1965 - 70. Metric tons, round fresh weight.

Year	Norwegian Sea Long-line Fishery											Drift-net Fishery within Norwegian Fishery Limits	
	Denmark		Faroes		Germany		Norway		Sweden		Total		
	Number of Vessels	Catch	Number of Vessels	Catch	Number of Vessels	Catch	Number of Vessels	Catch	Number of Vessels	Catch	Number of Vessels		Catch
1965	1-2	- <sup>a</sup>	0	0	0	0	0	0	0	0	1-2	- <sup>a</sup>	263
1966	10	- <sup>a</sup>	0	0	0	0	0	0	- <sup>a</sup>	- <sup>a</sup>	10+	- <sup>a</sup>	312
1967	22	77	0	0	0	0	- <sup>a</sup>	- <sup>a</sup>	6	- <sup>a</sup>	28+	77+	333
1968	28	177	2	5 <sup>b</sup>	0	0	- <sup>a</sup>	100 <sup>d</sup>	16	126	46+	408	228
1969	40	413	4	7 <sup>c</sup>	5	24	70 <sup>f</sup>	450 <sup>d</sup>	2	24	121+	918	234
1970	60	481	5	12 <sup>b</sup>	4	21	70 <sup>f</sup>	420 <sup>e</sup>	9 <sup>e</sup>	30 <sup>e</sup>	140+	964	174 <sup>e</sup>

a Not known.

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

c All taken in vicinity of Faroes.

d Estimated catch.

e Preliminary figures.

f In addition, a number of mainly smaller vessels have been long-lining in the Norwegian Sea.

Table 8 Estimates of catch-per-unit-effort in the Norwegian Sea long-line Fishery 1968-70.

Year	Country	No. of Salmon/1000 Hooks caught in						No. of salmon sampled
		February	March	April	May	June	Total season	
1968	Denmark			92	100			5 539
1969	Denmark		43	57	44	29	39	25 891
	Germany			50	46	23	42	5 459
1970	Faroe			79 <sup>a</sup>				
	Denmark	42	50	67	35	27	49	72 000
	Germany			66	35	16	46	6 313
	Faroe			40 <sup>a</sup>				366

a - Research catch, 20-80 nautical miles NE of Faroe Islands.

Table 9 Recaptures of salmon tagged in the long-line fishery in the Norwegian Sea.

Year Tagged	Number Tagged		Recaptures			
			Norwegian Sea	Home Waters		Total
				Norway	Elsewhere	
1968	238	1st year	0	5	0	5
		2nd year	0	0	1 <sup>a</sup>	1
		Total	0	5	1	6
1969	932	1st year	6	49	0	55
		2nd year	2	12	0	14
		Total	8	61	0	69
1970	1 118	1st year	8	116	0	124

a In U.S.S.R.

Table 10 Recaptures of fish tagged in Faroe waters.

Year Tagged	Number Tagged	Recaptures				
		Norway	England	Scotland	Ireland	Elsewhere
1969	74	-	-	2	-	-
1970	233	2	1	5	3	1 <sup>a</sup>

a In Greenland

Table 11 Simulation of catches of two sea water salmon in the Norwegian home waters; estimation of natural losses and proportion of the Norwegian stock not present in the Norwegian Sea, for different values of main parameters,

Norwegian Sea Offshore Catch (tonnes)	Offshore Exploitation Rate (%)	Surviving Offshore Stock (tonnes)	Weight Increase (%)	Home Waters Exploitation %	Home Waters Exploitation tonnes	Estimated Norwegian Catch for proportion returning to Norway		Estimated Norwegian Salmon not present in fished area	Estimated Proportion of Norwegian Salmon not present in fished area		
						80%	90%				
1 000	40	1 500	20 (1 800 tonnes)	50	900	720	870	-	7	10	-
				80	1 440	1 152	1 296	31	38	-	-
				50	975	780	877	-	10	3	-
	50	1 000	30 (1 950 tonnes)	80	1 560	1 248	1 404	36	45	-	-
				50	600	480	540	-	-	40	33
				80	960	768	864	-	7	4	-
1 000	50	1 000	30 (1 300 tonnes)	50	650	520	585	-	-	35	27
				80	1 040	832	936	3	14	-	-

Table 12 Catches in home-waters, 1960-70 (salmon plus grilse except where shown separately) in metric tons, round fresh weight.

Year	England and Wales		France	Iceland	Ireland <sup>b</sup>		Northern Ireland <sup>b</sup>		Norway			Scotland			Sweden <sup>c</sup>	USSR	Canada	USA
	Salmon	Grilse			Salmon	Grilse	Total	Salmon	Grilse	Total	Salmon	Grilse	Total	Salmon				
1960	-	-	50-100	200	-	743	139	-	1 659	960	476	1 436	40	1 100	1 635	<2		
1961	-	-	50-100	200	-	707	132	-	1 533	820	376	1 196	27	790	1 580	<2		
1962	-	-	50-100	100	-	1 459	356	-	1 935	1 015	725	1 740	15	710	1 717	<2		
1963	-	-	50-100	200	-	1 458	306	-	1 786	1 286	412	1 698	16	480	1 848	<2		
1964	-	-	50-100	200	-	1 617	377	-	2 147	1 216	698	1 914	16	590	2 066	<2		
1965	-	-	50-100	?	-	1 457	281	-	2 000	1 042	560	1 602	17	590	2 113	<2		
1966	-	-	50-100	120	-	1 238	287	-	1 863	1 069	555	1 624	17	570	2 356	<2		
1967	-	-	50-100	120	-	1 463	449	-	2 052	1 245	888	2 133	23	883	2 859	<2		
1968	-	-	50-100	171	-	1 413	312	-	1 593	1 020	543	1 563	14	827	2 104	<2		
1969	264	113	50-100	147	-	1 730	267	582	1 383	987	954	1 941	9	360	1 961 <sup>d</sup>	<2		
1970 <sup>a</sup>	310	200	50-100	?	268	1 787	297	334	1 170	719	541	1 260	?	?	2 253	<2		
Angling Catch	Inc.		Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.			Not Inc.	Inc.	Not Inc.	Inc.	Inc.	
Percentage Grilse			- <sup>e</sup>	53 in 1969	80-90 (by no.) 70-80 (by wt.) (for 1960-1969)	90 (by no.) 80+ (by wt.)	15 (by wt.)	(for 1960-1968)				75 (by no.)	- <sup>e</sup>	?				

a Provisional  
b Catch in River Foyle allocated on basis of 50% Ireland, and 50% Northern Ireland.  
c West Coast catch only, from Bulletin Statistique.  
d Angling catches (mainly grilse) about 10% additional (by weight).  
e Mainly salmon

Table 13 Estimates of catches per unit effort for some home-water fisheries.

Year	Canada <sup>a</sup>		Ireland		Foyle Area (Estuary Drift Nets) <sup>b</sup> (numbers)	Norway (Bag Nets) (kg)	Scotland	
	(Drift Nets and Traps) lbs	New Series	(Open Sea Drift Nets) <sup>b</sup> (numbers)	(Licences) <sup>c</sup> (lbs)			(Fixed Engines) <sup>e</sup> (numbers)	(Net and Coble) <sup>f</sup> (numbers)
1960	169		325	950	104	172	12.8	84.1
1961	159		224	1 030	-	158	12.3	60.9
1962	178		563	2 210	297	175	14.8	83.6
1963	193		456	1 940	334	177	19.9	109.3
1964	266		430	1 720	392	195	23.2	98.6
1965	262		520	1 700	361	172	17.8	84.0
1966	249		516	1 250	375	154	19.4	95.0
1967	248	300	733	1 650	524	154	21.6	130.2
1968	186	183	552	1 650	482	129	17.3	97.9
1969		159	491	2 077	455	137	15.9	123.4
1970		153	422	1 940	464	120		

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

b Salmon and grilse per drift net.

c Pounds salmon and grilse per licence.

d Salmon and grilse per bag net.

e Salmon only, catch/net/month.

f Salmon only, catch/crew/month.

H. APPENDIX

1. Report of the Planning Group for the International Tagging Experiment at West Greenland, proposed for 1972.

This Group met on 26th and 27th March 1971, immediately prior to the main meeting of the ICES/ICNAF Joint Working Party on North Atlantic Salmon, held during the following week. Those present were:

O. Christensen	Denmark
L.R. Day	ICNAF
Sv. Aa. Horsted	Denmark
J.B. Kimsey	USA
A.W. May (Chairman)	Canada
W.R. Munro (Rapporteur)	Scotland
G.J. Ridgway	USA
A. Swain	England and Wales
R. Vibert	France

The group began by reviewing the proposals on this topic set out in the document submitted by the Joint Working Party to the Anadromous and Catadromous Fish Committee of ICES. (C.M.1970/M:13).

They agreed that the main objectives of this experiment were as set out in this document. These are:

- (1) to provide further information on the 'home-waters' areas to which salmon present at West Greenland will, if surviving, subsequently return, including estimates of the relative proportions returning to the respective areas,
- (2) to estimate the fishing mortality rate and rate of exploitation generated by the West Greenland fishery,
- (3) to estimate the size of the exploited population at West Greenland,
- (4) to provide data for estimating the natural mortality rate of salmon between the time of their appearance in the West Greenland fishery and their return to home-waters,
- (5) to study the movement of salmon within the exploited stock at West Greenland, with special reference to the interchange of salmon between the inshore and offshore areas and changes in distribution with time within the exploited area.

They also felt that the opportunities provided by the greatly increased research effort to be expended at Greenland in 1972 should be fully utilised to augment the accumulating evidence of the presence of salmon outside the area normally fished and to extend the collection of blood and other biological material which showed promise of contributing towards a quantitative assessment of the origins of the Greenland stock.

The Group next considered the methods suggested by the Joint Working Party for attaining these objectives (C.M.1970/M:13, p.2) and agreed that, in addition to tagging all suitable fish caught by research vessels, as many as possible of the fish caught by commercial vessels, on which observers would be placed, should be purchased and tagged by these observers.

They then proceeded to consider more detailed plans under the following headings:

- Research Vessel Participation
- Fishing Methods
- Tagging Methods
- Observers - Commercial Vessels
- Inshore Tagging
- Communications
- Publicity
- Reporting and Analysis of Data
- Budget and Financing
- Further Meetings of the Group

Research Vessel Participation

As far as could be ascertained from those present, the following research vessels would be available for the period stated below.

The Group considered that this represented the minimum research vessel effort with which it could be hoped to achieve the objectives of this experiment and emphasised that further offers of research vessel participation would be welcomed.

<u>Country</u>	<u>Research Vessel</u>	<u>Fishing Time at Greenland</u>
Denmark	'Adolf Jensen'	12 weeks
Canada	'A.T. Cameron'	8 weeks (maximum)
England and Wales	'Cirolana' (or possibly 'Corella')	4 weeks
Scotland	'Explorer' or 'Scotia'	4 weeks
France	'Cryos'	3 weeks

If these commitments are confirmed a total of 31 research vessel-weeks would be available and the Group considered how these could be most usefully allocated to achieve the objectives listed above. It was agreed that it was important to spread the tagging throughout the fishing season and, as far as possible with the resources available, throughout the area fished.

Considering the available information on the distribution of the fishery and its duration which, in 1972, would probably not extend outside the period August through November, it was decided that the available effort should be spread over the period from 1st August to 31st October, with the heaviest concentration of effort during the period from mid-August through September, when the commercial catch was usually greatest.

On this basis, they outlined a tentative programme of research vessel participation which is given below. It was considered that the programme should be coordinated from the 'Adolf Jensen', which would collect information on the progress of other vessels and on the movements and success of the commercial fleet and that she should, therefore, be stationed centrally while other research vessels were operating. The programme was also designed so that each visiting research vessel would be within reasonable proximity of Faeringehavn, for refuelling, shortly before her departure.

<u>Quarter-Months</u>	<u>August</u>		<u>September</u>		<u>October</u>	
	<u>Research Vessel from:</u>	<u>Fishing<sup>a</sup> Area</u>	<u>Research Vessel from:</u>	<u>Fishing<sup>a</sup> Area</u>	<u>Research Vessel from:</u>	<u>Fishing<sup>a</sup> Area</u>
1	Denmark Canada	I & II III & IV	Denmark Canada Scotland France	II I III IV	Denmark England	I & II III & IV
2	Denmark Canada	I & II III & IV	Denmark Canada Scotland France	II I III IV	Denmark England	I & II III & IV
3	Denmark Canada Scotland	III & IV II I	Denmark Canada France England	III II IV I	Denmark	I-IV
4	Denmark Canada Scotland	III & IV II I	Denmark Canada England	II III&IV I	Denmark	I-IV

a Area I 68°N to 70°N  
 II 66°N to 68°N  
 III 64°N to 66°N  
 IV 61°N to 64°N



It was agreed that it would be undesirable to adhere too rigidly to such a programme if fishing were poor in a particular area and that a decision might have to be made that a research vessel should move out of its assigned area, after consultation with the 'Adolf Jensen'.

In order to assess the spatial distribution of salmon throughout the season, it was decided that a series of fixed stations (perhaps 3-5) should be fished in each area during the first week of each month, by the research vessel present. When a research vessel arrived at its assigned area it would be advised on the best position at which to fish by the 'Adolf Jensen' but, in case it could not communicate with the latter immediately, it would be provided, in advance, with likely fishing positions within its area. Mr Horsted undertook to draw up a list of fixed stations and likely fishing stations.

#### Fishing Methods

It was agreed that no new information had come to hand which modified the earlier decision by the Joint Working Party that drift netting was the only method likely to achieve the suggested target of 1 500 fish tagged by research vessels.

The group considered that it was important that the gear used by each vessel should be standardized, as far as possible, and that a standard fishing technique should be followed by each vessel, based on patrolling the nets by small boats to remove and tag fish, whenever the weather permitted. With this aim in view the following decisions were reached, based largely on Canadian experience while fishing drift nets from the 'A.T. Cameron' off West Greenland during 1969 and 1970.

- (a) Both monofilament and multifilament nets should be used, in equal proportions.
- (b) Only two mesh sizes should be used and present evidence suggested that these should be 130 mm (approx. 5") and 150 mm (approx. 6") stretched mesh. However, it was felt that the use of a smaller mesh size might result in an improvement in the condition and numbers of fish suitable for tagging and the Group recommended that 120 mm mesh nets should be tested during the 1971 research programme at West Greenland before a final decision was reached on the mesh size to be used in 1972.
- (c) Nets of standard design should be used and, since the 'A.T. Cameron' already had her fleet of nets, their design should be taken as the standard. The standard net would be 25 fathoms long and 10 feet deep and Dr. May undertook to provide a detailed specification.
- (d) There could be both financial and administrative advantages in ordering the necessary nets in bulk from a single manufacturer and this possibility should be explored.
- (e) The arrangement of nets in a fleet should also be standardized and the basic unit should be one of 40 nets (approx. 1 nautical mile), made up as follows: 10 multifilament, 130 mm; 10 monofilament, 130 mm; 10 multifilament, 150 mm; 10 monofilament, 150 mm.
- (f) Experience on the 'A.T. Cameron' indicated that a fleet of 120 nets (3 miles) was likely to provide the optimum number of taggable fish in good condition and this should be accepted as the maximum number of nets to be used by any research vessel. Where vessel size limited the number of nets which could be operated, to less than this number, the fleet should be reduced proportionately, on the basis of (e) above.
- (g) Canadian experience was that, although fishing the nets overnight was likely to produce a greater total catch, it did not provide the optimum number of fish in suitable condition for tagging and the Group, therefore, recommended that the nets should be shot at about 0400 hours each day and patrolled from daybreak to darkness or until fish ceased to enter the nets. However, at the fixed stations fished during the first week of the month in each area, it might be desirable to fish overnight if possible, to provide the best possible information on the density of the stock at these stations.
- (h) Each country sending a research vessel should seek permission to fish within territorial waters at Greenland.

### Tagging and Sampling

The group discussed the type of tag and tagging technique to be used and the following points were noted:

- (a) The tag used by Canada in West Greenland in 1969 and 1970 should be adopted as standard. The tag should be yellow and should bear on one side, a number preceded by 'X' and followed by 'State where, when and how caught'.
- (b) After considerable discussion it was agreed that tagging records should be centralised at the ICES headquarters at Charlottenlund and, therefore, that the tag might carry the following message on the reverse side - 'Return to ICES, 2920 CHL, Denmark. Reward'.
- (c) Canada would arrange for the manufacture of these tags and would supply the necessary ancillary equipment for tagging.
- (d) To cover all contingencies, 10 000 tags should be ordered at an estimated cost of £ 600. A further £ 50 would cover the cost of tagging equipment.
- (e) It was agreed that there were sound reasons why the reward for the return of these tags in Greenland or home waters should be at the same rate as at present.
- (f) Rewards for tags recovered in Greenland and in home waters and sent to local fishery authorities should be paid by them and the ICES Secretariat informed of the detailed recapture. Where tags were sent direct to ICES, they should send an acknowledgement to the captor and forward the details to the appropriate local authority, who should pay the reward.
- (g) Dr. May undertook to produce a document giving details of the tagging technique and setting out a standard method of classifying the condition of tagged fish on release.
- (h) The minimum information required from fish tagged by research vessels would be:
  - Scale sample (from midway between the posterior edge of the dorsal fin and the adipose fin, above the lateral line)
  - Fork and total length (measured to the cm below)
  - Condition on release
  - Mesh size and type of net in which caught.
- (i) To facilitate the recording and processing of data, standard forms should be provided for both research vessels and observers on commercial vessels.
- (j) It was decided that it would be impracticable to investigate tagging mortality by holding fish in an impoundment during the 1972 experiment but Canada planned to carry out such experiments in 1971.
- (k) The Danish/UK programme in 1971 would be concerned with gaining experience in the appropriate netting and tagging techniques.

The Group also considered that the fullest possible use should be made of the fish which were unsuitable for tagging and suggested that the additional observations made on dead fish should include:

- (a) Determination of weight and sex, in addition to the items listed in (h) above.
- (b) Any other samples or measurements required by individual scientists.

### Observers - Commercial Vessels

It was concluded that observers should be placed on six drift net vessels, if possible, and that for each selected vessel an observer should be present for the period mid-August to mid-November. It was recognised that this could mean that 12 people would be involved, each for a six-week period. Considering the present composition of the fleet and the desirability of individual observers being of the same nationality as the commercial vessel, it was concluded that it would be most appropriate to place observers on 4 Danish and Faroese vessels and on 2 Norwegian vessels, if this could be arranged.

The salaries of observers assigned from national Fishery Institutions would, presumably, be paid by these Institutions. The salaries of observers specially recruited for the 1972 experiment should be met from the fund to be provided for the experiment. Additionally, and for all observers, this fund would provide for travel expenses to and from Greenland; subsistence at Greenland at the current national rate for comparable employees; incidental expenses related to the provision of protective clothing; payment for accommodation on the vessel; and shipment of equipment and specimens.

Basic equipment would be supplied by the employing Institution. Tags and tagging equipment would be supplied from the International Fund. Other specialised equipment (e.g. for blood sampling) would be supplied by the Institution requesting the material.

As of the present moment, it is estimated that Denmark can supply three and Norway one (perhaps two) observers from the staff of national Institutions. Additional observers, if recruited for a six-week period at Greenland, would have to be employed for 9 or 10 weeks to allow time for training, travelling and reporting at the end of the period.

In order that Danish staff may participate as fully as possible as observers on Danish commercial vessels, it may be desirable that available scientists from countries not sending research vessels, be assigned to the 'Adolf Jensen'. It seems probable that Ireland will be able to provide one scientist for six weeks and U.S.A. two teams of two scientists for a similar period.

Observers would be expected to carry out the following functions:

- (a) Examine all fish in the catch for tags.
- (b) Tag viable fish.
- (c) Collect scales, length and weight data, and sex from samples of the commercial catch.

The Group concluded that it was essential that one or two observers from national Institutions should be placed on vessels for a period during the 1971 fishing season, to assess the practicality of performing these various functions, so that an assessment of the quality and quantity of information which observers might be expected to produce, would be available well in advance of the final preparation of plans for 1972.

#### Inshore Tagging

Since all available effort would be concentrated on offshore work in 1971 and 1972, no formal programme of inshore tagging would be undertaken in either year but gill-net sampling would probably continue in the Godthåb area.

#### Communications

The Group felt that good communications were vital to the success of the experiment. It would, therefore, be essential that all participating vessels had appropriate radio frequencies available on board. Mr Horsted agreed to provide the necessary details for these as part of a more comprehensive 'guide' for visiting research vessels, which he undertook to prepare. As mentioned earlier, the 'Adolf Jensen' would collect and collate information from research vessels, observers on commercial vessels and from the commercial fleet.

While radio would, inevitably, be the main means of communication, research vessels should take every opportunity of meeting for more detailed discussion.

#### Publicity

The Group also felt that the value of adequate publicity at all stages of the experiment could not be overstressed as it was of vital importance in ensuring the best possible return of tags.

It was suggested that a pamphlet, in appropriate languages, should be produced and that this should be financed from the International Fund. Dr. May agreed to prepare a first draft in English. This document would form the basis of the publicity in each country but it would be left to individual countries to arrange for its distribution and for the best use of other channels (press, radio, television, posters etc.) to ensure maximum publicity.

#### Reporting and Analysis of Data

The Group agreed that the overall results of the experiment should be analysed and reported in two stages. Immediately following the experiment scientists in charge of research vessels and the Institutions providing observers should prepare reports detailing the work accomplished and such preliminary analyses of results as possible, for presentation to the Joint Working Party early in 1973.

Following this, individuals from various participating countries would undertake to carry out in-depth analysis and reporting for specific topics or subject areas. These reports would be presented at a Joint Working Party meeting early in 1974 and should eventually be published together, probably as an ICES Cooperative Research Report. Publication late in 1974 should be possible, having regard to the fact that home-waters tag returns should be complete by that time.

The only exception to this general scheme would be that Denmark, as well as reporting early in 1973 on its own research vessel and observer effort, would also undertake a first analysis of the 1972 tag returns at Greenland.

Subjects to be analysed in detail and reported on early in 1974, with preliminary assignment of responsibility for such reports, are listed below:

- (a) Tag return data and analysis of exploitation rate at West Greenland; proportions returning to home-waters; natural mortality between Greenland and home-waters; changes in size between Greenland and home-waters - DENMARK.
- (b) Age interpretation from all scale collections; reporting and analysis of size and age data - UNITED KINGDOM.
- (c) Analysis of research vessel catch and effort data for information on distribution and abundance; gear efficiency and selectivity; reporting of catches of other species - CANADA.
- (d) Analysis of data on commercial fishing effort; distribution of fishing; catch and catch/unit effort data; commercial gear selectivity - DENMARK.
- (e) Analysis of other biological data, e.g. blood, parasites, food etc. - APPROPRIATE EXPERTS from various countries for whom such collections might be made.
- (f) Hydrographic, weather and ice data.

It was anticipated that information on these subjects would also be collected by agencies and countries other than those participating directly in the experiment and it would be useful and appropriate if a hydrographer could undertake to summarize appropriate hydrographic, weather and ice data in the West Greenland and Davis Strait area in 1972 (collected from all sources), for presentation to the Joint Working Party in 1974, along with the other reports, mentioned above.

To facilitate the preparation and publication of the above reports, an editor should be appointed, who might also prepare an introduction and summary for the published report.

#### Budget and Financing

The Special Meeting of the Joint Working Party held at Charlottenlund on 26th September 1970, estimated that a sum of £ 20 000 (D. kr. 350 000) would be necessary to cover the costs of the experiment, apart from research vessel and fishing gear costs and scientists salaries. Estimated expenditures from this amount are detailed below:

	£
(1) Tags, tag preparation and tagging equipment	650
(2) Travel for observers including subsistence on shore at Greenland (12 round trips £ 200)	2 400
(3) Subsistence on board commercial vessels (6 vessels £ 100 + £ 50)	1 000
(4) Clothing allowances for observers	250
(5) Salaries for specially recruited observers (8 observers for 10 weeks £ 600/Observer)	4 800
(6) Shipment of material and specimens	500
(7) Payment for tagged fish (1 500 fish £5)	7 500
(8) Training observers	1 000
(9) Equipment on commercial vessels (tanks, measuring boards, etc.)	400
(10) Publicity (printed pamphlet)	500
(11) Contingencies	1 000
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	£ 20 000

#### Further Meetings of the Group

Assuming that the plans for this experiment are approved, it was agreed that a planning group of representatives from participating countries should meet at Charlottenlund in early December 1971 or late January 1972 to produce final detailed plans for the experiment, for submission to the ICES/ICNAF Joint Working Party.

This would allow sufficient time for ordering of gear and equipment and general preparations for the research vessel operations. It would also permit attendance at the meeting by the Captain of the 'Adolf Jensen'. This is considered highly desirable from the point of view of discussing practical details, as well as the 'Adolf Jensen's' responsibilities for overall co-ordination and liaison during the experiment.

Additionally, in view of the proposed responsibility of ICES for collecting and disseminating tag recapture data, it would be appropriate that a member of the ICES Secretariat should attend the meeting.

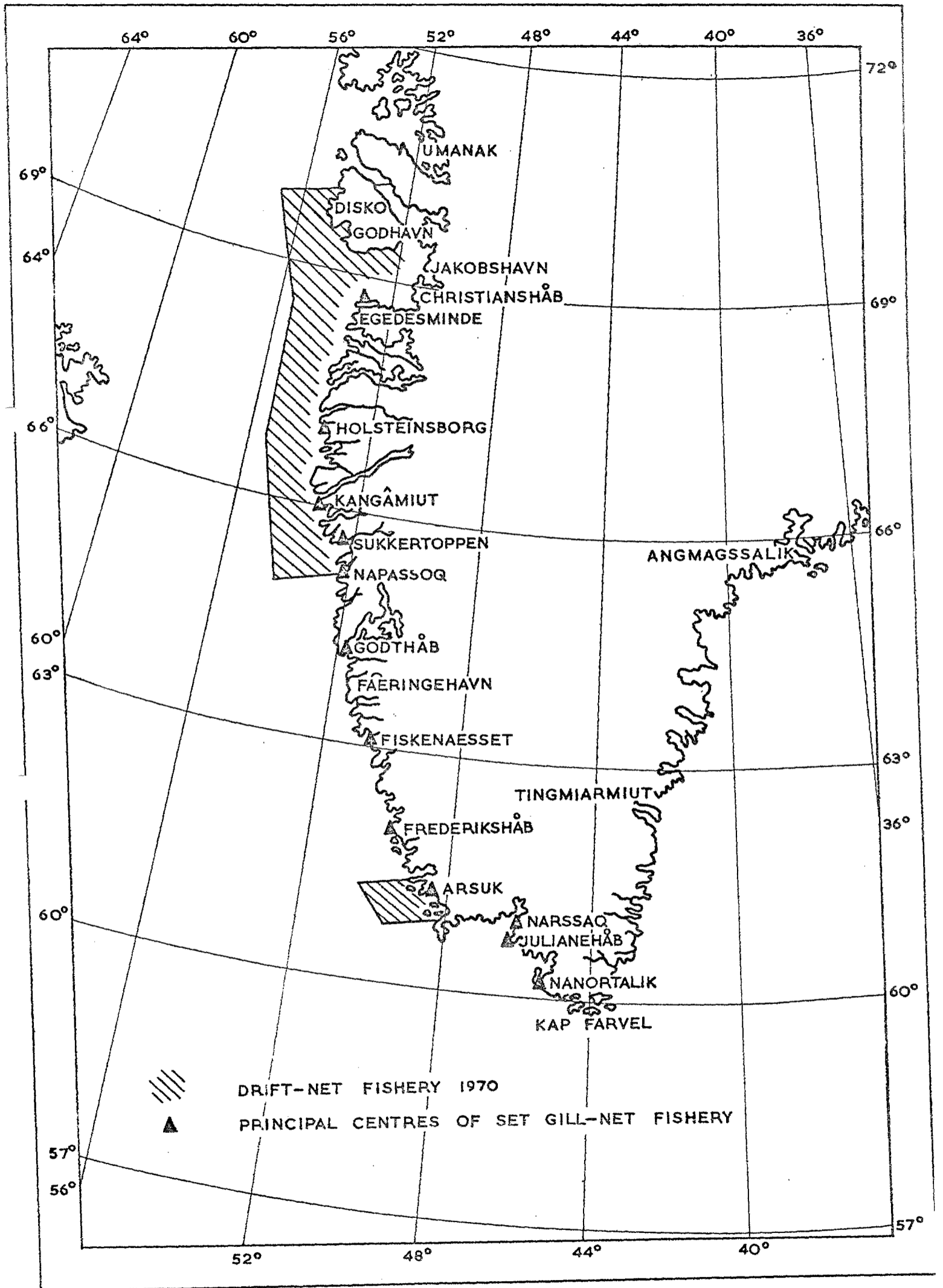
2. List of Working Papers

Note. In this list, reference numbers are quoted only for those papers to be circulated to the International Commission for the Northwest Atlantic Fisheries.

1. Catch statistics and age/length distribution of Atlantic salmon from the southern part of the Davis Strait, by Per Kanneworff. (ICES/ICNAF Salmon Doc. 70/19).
2. The Danish drift net fishery for salmon in West Greenland, 1970, by J. Møller Jensen. (ICES/ICNAF Salmon Doc. 71/5).
3. Length and age distribution of Atlantic salmon from the offshore fishery at West Greenland 1970, by J. Møller Jensen. (ICES/ICNAF Salmon Doc. 71/4).
4. The size-composition of salmon landed during the autumn 1969 in Fiskenaesset, Div. 1D, West Greenland, by J. Møller Jensen. (ICES/ICNAF Salmon Doc. 71/6).
5. Size and age data for Atlantic salmon from West Greenland and Canadian fisheries, by A.W. May. (ICES/ICNAF Salmon Doc. ).
6. A report on the salmon scale samples collected by the Danish research vessel 'Tornak' in 1969, by D.A.F.S., Pitlochry. (ICES/ICNAF Salmon Doc. ).
7. Observations on selectivity and relative efficiency of salmon drift nets in connection with population studies on salmon at West Greenland, by O. Christensen (ICES/ICNAF Salmon Doc. ).
8. Canadian drift-net fishing and tagging of Atlantic salmon in the Labrador Sea and at West Greenland in 1970, by A.W. May. (ICES/ICNAF Salmon Doc. ).
9. West coast of Greenland. Inshore gill netting and tagging of salmon, 'Tornak', 1970, by A. Swain. (ICES/ICNAF Salmon Doc. ).
10. Greenland Salmon research programme, 1970, 'Adolf Jensen', by W.R. Munro. (ICES/ICNAF Salmon Doc. ).
11. Techniques to identify continental origin of salmon caught at sea, by O.L. Nynan and J.H.C. Pippy. (ICES/ICNAF Salmon Doc. ).
12. Continental origin of Atlantic salmon from West Greenland and the Labrador Sea in 1970, by O.L. Nynan, A.W. May and A.L. Meister. (ICES/ICNAF Salmon Doc. ).
13. Food and feeding of Atlantic salmon at sea by W. H. Jear (ICES/ICNAF Salmon Doc. ).
14. Notes on recent research progress at the M.A.F.F. Salmon and Freshwater Fisheries Laboratory Population Genetics Unit, by R. Payne. (ICES/ICNAF Salmon Doc. ).
15. Summary of recaptures of salmon tags from U.S.A. stocks in I.C.N.A.F. waters, by A.L. Meister. (ICES/ICNAF Salmon Doc. ).
16. Scottish salmon tagging data, by D.A.F.S., Pitlochry
17. M.A.F.F. tagging data, by M.A.F.F., London.
18. A report on recaptures from a 1968 native salmon smolt tagging project on the Miranichi River, by Gary E. Turner. (ICES/ICNAF Salmon Doc. ).
19. On the interrelationship between some parameters used for assessing the effects of the West Greenland salmon fishery, by Sv. Aa. Horsted. (ICES/ICNAF Salmon Doc. ).
20. Some aspects of Canadian Atlantic salmon fisheries in relation to the new Greenland and high seas fisheries, by P.F. Elson.
21. The Danish salmon fishery in the Norwegian Sea in 1970, by O. Christensen. (ICES/ICNAF Salmon Doc. ).
22. The German long-line fishery off Norway, 1970.
23. Report on salmon long-lining cruise off the Faroes during April 1970, by G. Struthers. (ICES/ICNAF Salmon Doc. ).

24. Effect on the Norwegian Sea fishery on total yield, by F. Thurow.
25. Salmon catches for England and Wales (including grilse), by M.A.F.F. London. (ICES/ICNAF Salmon Doc. ).
26. Scottish salmon catch statistics, 1952-1969, by W.R. Munro. (ICES/ICNAF Salmon Doc. ).
27. Salmon and grilse catch, Ireland, 1970, by Fisheries Division, Dublin.
28. The length, weight and age composition of the commercial catches from the Rivers Tweed, Tay and Spay in 1969, by W.R. Munro and I.J.R. Hynd. (ICES/ICNAF Salmon Doc. ).
29. The length, weight and age composition of the commercial catches from the Rivers Tweed, Tay and Spay in 1970, by W.R. Munro and I.J.R. Hynd. (ICES/ICNAF Salmon Doc. ).
30. The length, weight and age composition of the salmon catch of the North Esk (Scotland) from 1967 to 1970 and the estimated number of two-sea-winter salmon occurring in the catches from 1962-1970, by W.M. Shearer. (ICES/ICNAF Salmon Doc. ).
31. Norwegian catch statistics, by L. Rosseland.
32. Methods of estimating Atlantic salmon catch per unit effort for the Maritime Provinces of Canada, by Colin E. Wykes. (ICES/ICNAF Salmon Doc. ).
33. Third report of the ICES/ICNAF Joint Working Party on North Atlantic Salmon, December 1970.
34. Report by the Planning Group for the International Tagging Experiment at West Greenland, proposed for 1972.
35. Salmon tagged in the Norwegian Sea, 1968-1970, by L. Rosseland.
36. Weight and length changes of salmon tagged in the Norwegian Sea, 1970, by L. Rosseland.
37. Norwegian smolt tagging data, 1965-1969, by L. Rosseland.
38. Length distribution of salmon and grilse caught during long-line tagging experiments in the Norwegian Sea, 1968-1970, by L. Rosseland.

**FIG. 1 DISTRIBUTION OF WEST GREENLAND SALMON FISHERY, 1970**





**FIG. 2.**

**DISTRIBUTION OF NORWEGIAN SEA SALMON FISHERY, 1970**

