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

London, May 1968

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A. INTRODUCTION

1. The first report* indicated the reasons for the appointment of this Working Party and gave an account of the first two meetings, which were held in Madrid and Copenhagen in May and October 1966. This report reviews the information received and describes the investigations made since 1966 and gives a record of the two subsequent meetings of the Working Party, held in Hamburg in October 1967 and in London May 1968.

2. Some changes have taken place in the composition of the Party since 1966. Mr. Gulland's retirement from the Chairmanship of the Party and Mr. Allen's election as his successor were recorded in the first report. Unfortunately, Mr. Allen was not able to take the Chair at a meeting of the Working Party because his appointment as Director of the Biological Station at Nanaimo in May 1967 compelled him to resign his Chairmanship during the interval between the second and third meetings. Mr. Allen was succeeded as Chairman by Mr. B. B. Parrish.

3. The following countries and organisations were represented at the Third and Fourth Meetings of the Joint Working Party, as follows:

	<u>October 1967</u>	<u>May 1968</u>
Canada	R. L. Saunders	F. D. McCracken A. W. May G. F. M. Smith
Denmark	Sv. Aa. Horsted	Sv. Aa. Horsted
England and Wales	I. R. H. Allan	I. R. H. Allan
Ireland	Miss E. Twomey A. E. J. Went	A. E. J. Went
Scotland	B. B. Parrish (Chairman) K. A. Pyefinch (Rapporteur)	B. B. Parrish (Chairman) K. A. Pyefinch (Rapporteur)
Norway	L. Rosseland	Unable to attend
Sweden	B. Carlin	Unable to attend
U.S.A.	B. Kimsey J. A. Posgay G. J. Ridgway	B. Kimsey J. A. Posgay G. J. Ridgway
ICNAF	L. R. Day	L. R. Day

* Report of the ICES/ICNAF Joint Working Party on North Atlantic Salmon, 1966. International Council for the Exploration of the Sea, Co-operative Research Report, Series A, No. 8, 27 pps. (1967).

B. CATCH STATISTICS

(a) West Greenland Catches

4. Details of the catches in West Greenland, from 1960-1967, are given in Table 1A. This table shows (a) the rapid increase in the inshore catch from 1960 to 1964 and the maintenance of a high level of catch in subsequent years, and (b) the beginning of an offshore fishery in 1965 and its rapid development over the following two years. The figures quoted do not include fish consumed locally but this is a small part of the total catch (estimated as 50-100 tons in 1966).
5. Over recent years there has been a tendency for the inshore fishery to extend further northwards; this was particularly noticeable in 1966 and 1967. The mean size of the fish caught inshore in 1967 increased and the data from the research catch suggest that this was due to an increase in the growth rate of the salmon in the area rather than to a difference in the distribution of the fish along the West Greenland coast. The examination of scale samples from fish caught in the nets fished for research purposes in 1965, 1966 and 1967 (supported by samples from fish caught over a wider area of coast in 1966) indicate that all the salmon in this fishery have already spent at least one winter in the sea and that nearly all were entering upon their second winter in salt water. If they return to home waters, they will be salmon which have spent at least two winters in the sea. On the basis of the catches made in the inshore fishery from 1965 onwards, however, there is no evidence of any major change in fishing activity for this part of the West Greenland fishery over this period. The number of nets sold each year is a rough indication of major changes in fishing activity and Denmark undertook to bring this information, at present available only up to 1964, up to date if at all possible.
6. The records from the gill-nets fished for research purposes in 1965, 1966 and 1967 have been analysed to ascertain whether the catch per unit effort for these nets would be of value in estimating the abundance of the exploited salmon stock but this study failed to produce clear cut results.

7. The catch taken offshore has increased from 1965 onwards and, in terms of the number of boats taking part in this fishery, activity in 1967 was at least twice that in 1966.

(b) Home Water Catches

8. Details of catches in home waters, over the period 1960-1967 are presented in Table 1B. It should be particularly emphasised that, with the exception of the Scottish catches, where separate figures are given, the figures quoted refer to catches of salmon* (i.e. fish which have spent two winters, or more, in the sea) and *grilse (i.e. fish which have spent only one winter in the sea). This point is particularly important in the light of the information given in para. 5, which indicates that the fish which form the grilse fishery in home waters are not caught on the west coast of Greenland.

9. The figures given in Table 1B do not indicate any marked trend in home water catches over a period which covers five years (1960-64, inclusive) before the West Greenland fishery attained its present level of catch or since. Further, if the records shown in Table 1B are adjusted (following the footnotes to this table), so as to show only the catches of fish with two sea winters or more, much the same picture emerges. Estimates of the total weight of these fish caught in Ireland, England and Wales, Sweden, Norway and Scotland over the period 1960-66 are given in Table 1C.

10. Detailed information about home water catches is clearly an important element in the assessment of the effects of the West Greenland fishery and it is therefore

recommended

that all countries should make every effort (a) to provide separate returns for catches of salmon and grilse, and (b) to obtain more detailed records of the size, age composition and sex ratio of their salmon stocks in home waters, even if these could only be obtained for limited areas.

* In the remainder of this report salmon refer to fish which have spent two or more winters in the sea, and grilse to fish in home waters which have spent one winter in the sea.

11. One other change in home water catches which deserves mention is the decline in salmon catches during the spring, in Ireland and Scotland. In Ireland, this decline has been apparent for many years but in Scotland the decrease began in about 1956. In Scotland, the decrease in salmon catches during the spring has come to be compensated by increased salmon catches during the summer so that, overall, the Scottish salmon catches have tended to increase over recent years. In Ireland the decrease in the spring salmon catch has led to an overall decrease, since Irish summer salmon runs have been small for at least the last twenty-five years. In general terms, many Irish rivers have become predominantly grilse rivers.

12. The information available on catch per unit effort for the home water fisheries (Table 2) provided by some countries has been examined. Although these estimates have their limitations, they confirm the impression given by the catch statistics summarised in Table 1B.

It is

recommended

that as many countries as possible should make further and more detailed studies of past catch per unit effort data.

(c) The Development of Sea Fisheries in other Areas

13. The Working Party's attention has been drawn to a fishery which is developing off the Norwegian coast, from Bergen northwards to Finmark. This fishery started as a drift net fishery in the early 1960s but, in 1966, six or seven Danish long line boats had participated. In 1967, perhaps over 20 Danish long liners had taken part, together with one or two Swedish and some Faroese and Norwegian boats. Fishing took place from 12-200 miles offshore and had started in April, continuing during May and most of June. Full details of the catches taken in this fishery are not yet available, but reports from commercial fishermen suggest that 100-200 tons of grilse and salmon (including kelts) were caught. It seems likely that this fishery will develop further in 1968, but information on this point is not yet available.

14. The Working Party was also informed about a catch which had been landed in Scotland, a day or so before their meeting in May 1968. This catch was landed by a Danish boat, the Faro Bank, which had been fishing in an area from $67^{\circ}30'N$ to $70^{\circ}N$ and 8° to $10^{\circ}E$ (about 100-200 miles west of the Lofoten Islands). Approximately 1,400 fish, weighing $3\frac{1}{2}$ -4 metric tons, were landed and the fish ranged in length from 50-100 cm. The skipper reported that about 25 boats were fishing in the area while he was fishing and that salmon appeared to be plentiful.

15. Reports from Thorshavn have given preliminary details of the results of a cruise of a Faroese research ship which, during the period April 8-23, 1968, caught 182 salmon (including one carrying a Scottish tag). This catch was made from seven settings of long lines, made to the north of the Faroes. In all, 3,580 hooks were fished and the efficiency ranged from 1 fish/9 hooks to 1 fish/100 hooks (mean 1 fish/20 hooks). Drift nets were also set on one occasion, but did not catch any fish. It was reported that two or three commercial boats were now fishing in the area.

C. RESULTS OF RESEARCH

(a) Recaptures in the West Greenland Fishery of Smolts tagged in Home Waters

16. Paras. 17 to 30 below summarise the research undertaken in connection with the investigation of the West Greenland fishery, both in home waters and in West Greenland. The latter have largely been possible because of the active co-operation of the staff of the Greenland Fishery Investigations. They have put two research vessels at the disposal of the investigators for the whole of their periods of stay; they have arranged laboratory facilities and living accommodation; they have arranged for the transport of gear, and, by their active participation, have given every assistance to all the investigations in Greenland.

17. These recaptures are summarised in Table 3, which gives details of the results from the smolt tagging experiments started during the period 1963-1966 (inclusive). It will be noted that full results are not yet available for the later experiments.

18. The number of fish caught in the West Greenland fishery which had been tagged as smolts in Canada and the number caught per thousand fish tagged, increased sharply in 1966 and the data available suggest that the return for 1967 will be similar. These results suggest that the proportion of fish of Canadian origin in the West Greenland fishery has increased during recent years. This indication must be accepted with some reserve because different types of tag were used in Canada and some other countries.

19. It should be noted, however, that, although this difference may affect the relationship between the numbers of Canadian and other tags detected on fish in Greenland, it should not affect the recaptures of Canadian tags over successive years in Greenland, since the Canadians have used the same type of tag throughout the period covered in the table. Nevertheless, it is clearly most important that the type of tag used should be standardised and it is therefore recommended that steps should be taken to achieve this. It was noted that, in 1968, the tags used for smolts by England and Wales and by Scotland are of the Canadian type, so that a substantial degree of standardisation has already been achieved.

20. The Working Party noted the significant returns from the West Greenland fishery of smolts tagged in the U.S.A. in 1966. The ratio of returns from the West Greenland fishery to the number tagged is about 4 for 10,000, roughly similar to the ratio for England and Wales and Sweden.

(b) Recaptures in the West Greenland Fishery of Kelts tagged in Home Waters

21. Though most of the fish tagged in home countries have been smolts, some adults have been tagged, usually as kelts after spawning or stripping. Some of these have been recaptured subsequently in Greenland, usually in the year following tagging, and this information is given in Table 5.

(c) Recaptures of Fish tagged in West Greenland

22. Tagging experiments were undertaken on the west coast of Greenland in 1965, 1966 and 1967. Most of the fish for tagging have been caught in gill-nets, set from the shore in a similar manner to the local gill-net fishery, but tests were made of a Norwegian kilenot in 1965; in 1967 some Northumberland T-nets (which are basically similar in design to the kilenot) were fished. The gill-nets caught

many more fish than the other types of net but they were generally in a poor condition and only a small proportion (one-third or less) were tagged. The poor performance of the gill nets in this respect in 1965 was the main reason why Northumberland T-nets were tried in 1967 since, as these are a form of trap net, the fish caught in them should be in better condition for tagging. This proved to be the case, as over 50 per cent of the T-net catch was taggable, but unfortunately these nets only caught a small number of fish (about 2 per cent of the total research catch in 1967). As weather conditions were unfavourable for part of the last period and as it was not always possible to fish these nets in the most advantageous sites, further tests are to be made in 1968.

23. During the three years, 1,326 salmon have been tagged on the coast of West Greenland and, so far, 35 of these have been recaptured in the West Greenland fishery and 6 at distant sites. Most of the West Greenland recaptures have been made in the vicinity of the tagging site and within ten days of tagging. Of the distant recaptures, 3 have been made in Scotland, 2 in Canada and 1 in Ireland. These details are summarised in Table 6.

(d) Blood and other Biochemical Studies

24. One of the most important requirements of the Working Party's study is the identification of the origin of the salmon exploited at West Greenland and the home waters to which they return. In relation to this problem, in addition to tagging experiments, research has been conducted on the biochemical properties of blood and other tissues and on parasites.

25. Work on the blood characteristics and the biochemical characteristics of other tissues is being carried out by England and Wales and by Scotland. In England and Wales attention was initially concentrated on the use of iso-immune reagents to ascertain whether polymorphism was present but more attention had recently been given to a study of eye lens proteins. Eye lenses are easy to collect, can be removed from the fish without affecting its saleable value and can be preserved for examination later. Eye lenses have been collected from Greenland and three sites in the United Kingdom and arrangements have been made for samples from Canada.

26. Scottish workers have examined five possibilities, (i) variations in the haemoglobins in salmon from different areas, (ii) variations in the lactic dehydrogenases, (iii) variations in the liver esterases, (iv) blood groups, and (v) serum proteins. Of these, (iii) and (iv) seem to be the most promising and work is now being concentrated on these investigations.

27. Some of these investigations are producing interesting results, but their full interpretation is hampered by lack of knowledge of these characteristics among salmon in home waters. In general, however, there are several indications that the biochemical characteristics of many salmon in the West Greenland fishery resemble those of Canadian rather than European stocks.

(e) Work on Parasites

28. Work on the parasite fauna of Atlantic salmon is going on in Canada, Ireland and Scotland to discover whether there is a parasite which could serve as a reliable biological tag. So far, no fresh water parasite has been found which seems likely to be suitable and the most promising possibilities seem likely to be among the marine parasites. As in biochemical investigations, this work is hampered by lack of knowledge of the parasite fauna and its variations among home water stocks.

(f) Other Investigations

29. In addition to the cruise of the A.T. Cameron (Canada), in July and August 1965, which was noted in the first report, two other research vessel cruises have been made to the West Greenland - Davis Strait area. In October 1966, the Ernest Holt (England and Wales) visited the Davis Strait to fish for tagging. In all, 24 salmon were caught in gill nets, (mainly off Disko Fjord) but only one proved suitable for tagging. In September and October 1967, the A.T. Cameron visited West Greenland to gather information on the fishery and to make catches for tagging and for other studies. Drift nets and long lines were used and 54 salmon were caught, 53 in the drift nets and one on long line. None of these fish proved suitable for tagging. Further oceanic catches, east of the northern Labrador Shelf, were made by the A.T. Cameron in March-April, 1968. Twenty-three fish were taken in five overnight gillnet sets.

30. Denmark has investigated the meristic and morphometric characters of tagged fish recaptured at West Greenland, but the results obtained do not suggest that this is likely to be a particularly useful means of analysing the West Greenland stock, though differences in the numbers of fin rays in the dorsal fins may be significant. Work on meristic characters of smolts has been started in Canada.

D. FURTHER ASSESSMENT OF THE EFFECTS OF THE WEST GREENLAND FISHERY ON TOTAL AND HOME-WATERS SALMON CATCHES

31. In the first report of the Working Party some preliminary conclusions were reached, on the basis of the few data available at that time, relating to the origin and composition of the stock exploited at West Greenland and the effects of this fishery on total and home-waters catches. Further detailed consideration has been given to these conclusions in the light of new scientific information and data which have been collected in the course of investigations carried out since then and summarised in the preceding sections. Of major importance amongst these have been (a) the very extensive programmes of smolt tagging in the river systems in both North America and Europe, which have provided additional information on the home-waters sources from which the stock exploited at West Greenland are derived; (b) the tagging programmes conducted in 1965, 1966 and 1967 at West Greenland which, although not providing a large tagged population in good condition, have provided conclusive evidence that at least some of the fish at West Greenland subsequently return, as two-sea-winter fish to home waters in the year following their presence at West Greenland; (c) the development of improved, catch statistics collection systems for the home-waters fisheries, including in some countries separate statistics of grilse and salmon catches and estimates of catch-per-unit-effort.

32. Although these new data do not permit firm estimates to be made of the magnitude of the effects of the West Greenland fishery on home-waters catches, especially in the river systems of individual countries, they allow some further conclusions to be drawn in confirmation or elaboration of those presented in the first report of the Working Party. They are summarised below:-

(a) The numbers of pre-grilse exploited in the West Greenland fishery are negligible, and the few which are caught are likely to be of local origin. Therefore, the West Greenland fishery can have no direct adverse effect on the numbers of grilse returning to home-waters, and hence on the fisheries for them. Therefore, any assessment of the effects of the West Greenland fishery on the total catches in home waters must take into account the relative proportions of grilse and salmon in the exploited stocks. From the data in Table 1B, it is evident that in the Irish and Swedish west coast fisheries, grilse make up over three-quarters of the total catch by weight. The potential, direct effect of the West Greenland fishery on the total catches (grilse plus salmon) in these countries is therefore likely to be less than in those other countries to which salmon exploited at West Greenland return, where the proportion of grilse in the total home-waters catch is much smaller.

(b) Data obtained from the small numbers of fish tagged at West Greenland and recaptured in home waters show them all to have spent two winters in the sea. This suggests that the major part of the stock exploited at West Greenland is composed of fish which, if returning to home waters, would belong to the two sea-winters component of the exploited stock there. This component makes up the greater part of the exploited stock of salmon in most countries.

(c) The recaptures at West Greenland in 1966 and 1967 of fish tagged as smolts in home waters confirm the results of the earlier investigations in suggesting that the proportion of the exploited stock at West Greenland, originating from Canadian river systems is higher than from any other country; indeed the proportion originating from Canada would appear to have increased in these years (although differences in the efficiency of recovery of the tags used in different countries may have caused some bias in the estimates).

The more recent data also confirm the earlier results in showing no recaptures at West Greenland of fish liberated as smolts off the west coast of Norway. It seems clear, therefore, in view of the large numbers of smolts tagged in Norway that

very few, if any, of the salmon exploited at West Greenland originate from Norwegian rivers in which smolts have been tagged.

(d) In the earlier assessments it was estimated that the presence of a West Greenland fishery would result in a lower total salmon catch by weight (West Greenland plus home-waters), than it would have been in the absence of a West Greenland fishery, only if the exploitation rate in home-waters of the fish which have visited West Greenland (i.e. the proportion of the fish present at West Greenland which were subsequently caught in home waters) exceeded about 70 per cent (assuming no significant changes in recruitment, growth and natural mortality rate resulting directly from the fishery). If it was less than this, the West Greenland fishery would increase the total catch by weight. This was based on a preliminary estimate using the mean weights of fish at West Greenland and of two sea-winter salmon in Canada and assuming that they apply to the fish returning from West Greenland to home waters, of an average increase in weight of 50 per cent between a fish in the West Greenland fishery and its return to Canadian home waters. Similar Scottish data suggest that the estimate of 50 per cent was too high for the salmon returning to European river systems. This suggests that the estimate of 70 per cent for the "break-even" value of the exploitation rate in European home waters is too low and that the appropriate value for them would be about 80 per cent.

The available information on exploitation rates in the home waters fisheries in those European countries from which salmon are known to move to West Greenland points to a rate of exploitation for even the fish entering the river system lower than the 70-80 per cent break-even values, so it seems clear that it will be much lower than this for the fish which have returned from West Greenland, bearing in mind that the natural losses between West Greenland and home waters have to be taken into account in the estimate. The evidence therefore suggests that at the present rate of exploitation in the European fisheries, the West Greenland fishery has resulted in an increase in the total catch (West Greenland plus home-waters) by weight, of those salmon from European rivers which visit West Greenland.

The situation regarding the effect of the West Greenland fishery on the total catch by weight (West Greenland plus home-waters) of those salmon of Canadian origin is less clear. As indicated in the first report of the Working Party, data for the fish entering home-waters in one of the major Canadian salmon river systems (Miramichi) gave estimates for the rate of exploitation of over 90 per cent in 1964 and 1965. Thus it is possible that, if the losses between West Greenland waters and Canadian home rivers are small, the break-even value and the exploitation rate of the fish returning from West Greenland might have been exceeded. Unfortunately the magnitude of the natural losses is not known. Further, there are no reliable estimates of the rates of exploitation in the fisheries in other Canadian river systems, although they are thought to be lower than that given above for the Miramichi.

(e) The records of the recaptures in home waters of salmon tagged at West Greenland have established that at least some of the salmon present in the exploited stock there subsequently return to home waters in North America and Europe. This indicates that the presence of the fishery at West Greenland will tend to reduce the numbers of salmon available to the fisheries in home waters in those countries and river systems to which fish present at West Greenland return. In the first report it was estimated that this reduction would probably be greater in North America than in Europe and that for a West Greenland catch of 1,000 tons the reduction in the European catches would be less than 100 tons in each country (in some countries it would be much less). As the data in Table 1A show, the catch at West Greenland has not increased greatly since that time so that these estimates represent, for the size of the West Greenland fishery since 1963, very roughly the upper limit of the losses of salmon catches in European home waters due to the West Greenland fishery. It is evident from the catch statistics in Table 1B that, in fact, the home waters catches of salmon have increased during this time. This however is not in conflict with the statement above since the losses are estimated in relation to the catches which would have been taken in the absence of a West Greenland fishery.

The catch taken in any year is influenced by factors affecting the abundance and availability of the stocks in home-waters, e.g. year class fluctuations. It seems likely that in recent years the stocks of salmon have experienced above average recruitment, which has increased the abundance above its previous level.

33. In summary, therefore, although only rough estimates of the effects of the West Greenland fishery on total and home-waters fisheries can be made, the available data suggest that the West Greenland fishery at the size it had reached in the years 1964-1967, resulted in an increase in total (West Greenland plus home-waters) yields of salmon and relatively small losses in home-waters catches in most, if not all, countries. It is evident however that while the inshore fishery at West Greenland has become stabilized at the level of 1,000 - 1,200 tons annually, the offshore fishery is increasing rapidly and seems likely to continue to do so both off West Greenland and in other areas. Clearly, the losses to the home-waters stocks of the salmon which have visited West Greenland and the other exploited areas in the open sea will increase as the magnitude of the offshore fisheries increases. It should be noted that while the offshore fishery at West Greenland is currently being conducted close to the inshore one and is exploiting members of the same salmon stock, it is possible that further extensions of this fishery might include the exploitation of other components of the total stock occurring in the open sea, especially pre-grilse. Indeed, the fishery which has developed recently off the west coast of Norway is reported to exploit a wide range of sizes and ages, including pre-grilse.

E. FUTURE RESEARCH PROGRAMMES

(a) Programmes for 1968 - 1969

34. The research programme for 1968 is largely a continuation of projects which have already been started and most of these have been mentioned or described in Section C (paras. 17-30) of this report. It is therefore only necessary to summarise them in this section. The list is set out below.

(i) Investigations in West Greenland

1. Continuing of the inshore tagging programme, using Northumberland T-nets. Some gill-nets will be fished but the catch will be used to supply material for items 4 and 5 below and not as a source of fish for tagging. (Denmark, England and Wales, Scotland).
2. Investigation of long lining as a method of obtaining taggable fish, both in the offshore and the inshore fishery (Denmark, England and Wales, Scotland).
3. Sampling of the salmon catches at points on the West Greenland coast other than those covered by the research fishery (Denmark).
4. Continuation of biochemical investigations on salmon caught inshore (Scotland).
5. Continuation of parasite studies on West Greenland salmon (Scotland).
6. Investigation of the offshore fishery by means of observers on the commercial vessels taking part in this fishery (Canada, England and Wales and Scotland if possible).

Although Ireland cannot take part directly in this part of the programme, they could contribute one worker if required.

(These items are not necessarily mutually exclusive, e.g. the fish used for biochemical investigations can also be used for parasite studies, and there are some projects, e.g. the collection of eye lenses (England and Wales) which can be covered by a number of the items listed above).

(ii) Investigations in Home Waters

1. Continuation of smolt and, where practicable, kelt tagging programmes (Canada, England and Wales, Iceland, Ireland, Norway, Scotland, Sweden, USA).
2. Maintenance of records of home water catches and provision of further information about these catches (particularly catch composition and sex ratio) in as much detail as possible. (Canada, England and Wales, Iceland, Ireland, Norway, Sweden, USA).

3. Continuation of biochemical investigations (England and Wales, Scotland).
4. Continuation of work on the parasite fauna (Canada, Ireland, Scotland).
5. Investigation of meristic characters of freshwater stages (Canada).

(iii) Investigations in other Sea Areas

It is clear that the sea fishery off the Norwegian coast and the catches made this year to the north of the Faroes should be investigated as soon as possible although this cannot be readily undertaken with the present research resources while maintaining detailed studies in the West Greenland area. It is, however, of major importance that as an essential first step statistics of catches and data on their composition should be collected for these fisheries.

(b) Programmes for 1969 onwards

35. Information of major importance for an assessment of the effects of the West Greenland (or any other) sea fishery is (a) a reliable estimate of the size of the population being fished (in West Greenland estimates may be needed for the inshore and offshore populations), and (b) a reliable estimate of the proportion of the Greenland salmon population which returns to home waters. Therefore, research effort is likely to have to continue to be directed towards these problems.
36. It is possible to make calculations which give rough estimates of these quantities but, as these calculations all involve several arbitrary assumptions, the results cannot be regarded as reliable and, indeed, it is possible to produce a wide range of results by manipulation of the assumptions involved. The only method available for making these estimates directly is by tagging enough fish, in good condition, throughout the fishery. So far, none of the methods used for catching salmon in West Greenland have measured up to these requirements and the immediate essential, therefore, is to discover some method which will do so. It is clear that this is not an easy task. Gill netting or drift netting have so far proved inadequate and the first tests with T-nets were not outstandingly successful.

The possibilities of long-lining are to be investigated this year and, if this does not prove successful, trolling or some other method of trapping might be investigated.

37. If it is possible to tag enough fish to produce the estimates mentioned in para 35, the value of these estimates depends upon the assumption that a tagged salmon behaves, grows and migrates in very much the same way as an untagged fish. This assumption is, of course, made in all tagging experiments but the dangers of making it may be especially critical when the fish to be tagged are at a different stage in their life cycle to that previously studied. Most tagging experiments with adult salmon have been concerned with fish which have stopped feeding and were approaching the end of their sojourn in the sea, while the fish in the West Greenland area (and probably elsewhere also) are feeding actively and have long migrations to complete when returning to home waters. It is, of course, difficult to decide the likely effect of these factors but one example may serve to indicate the dangers of uncritical acceptance of evidence from tagged fish. As already mentioned, there is evidence of an increase in weight of about 50 per cent between Greenland and Canadian home waters and a comparison of the mean weight of salmon in West Greenland and that of Scottish salmon indicates an increase of about 20 per cent.

F. FUTURE MEETINGS

38. It was agreed that national representatives to the Working Party who will attend the meeting of the International Council for the Exploration of the Sea in Copenhagen in October 1968 should meet during the course of that meeting (prior to the last meeting of the Anadromous and Catadromous Fish Committee) to discuss progress and that the next full meeting of the Working Party should be held, in Copenhagen or London, immediately before the meetings of the International Commission for the Northwest Atlantic Fisheries in Warsaw in May 1969.

G. RECOMMENDATIONS

39. The following recommendations were made:

- (a) That efforts should be made to provide separate records of grilse and salmon catches in home waters. Where possible, more detailed records of home water catches (covering net catches and catches made by rod and line) should be provided, including information on the length and weight of the fish

- caught, sex ration and age composition of the catch.
- (b) That, where possible, more detailed information should be provided on catch per unit effort for home water catches.
 - (c) That efforts should be made to standardise the type of tag used for smolts in those countries which contribute fish to the West Greenland fishery.
 - (d) That the Working Party should next meet shortly before the next meeting of the Research and Statistics Committee of the International Commission for the Northwest Atlantic Fisheries and that arrangements should be made for those members of the Working Party attending the next meeting of the International Council for the Exploration of the Sea to meet during the course of that meeting.

Table 1 Catches at West Greenland and from the home waters of some countries, 1960-67, in metric tons and round fresh weight.

A. West Greenland Area.

	<u>Drift Nets</u>			<u>Greenland</u>	<u>Total</u>
	<u>Norwegian</u>	<u>Faroese</u>	<u>Danish</u>	<u>Inshore Fishery</u>	
1960	-	-	-	?	?
1961	-	-	-	127	127
1962	-	-	-	244	244
1963	-	-	-	466	466
1964	-	-	-	1,539	1,539
1965	+	36	-	825	861
1966	+	87	-	1,251	1,338
1967	220a		85	1,283	1,588

+ Figures not available, but catch known to be less than Faroes.

a Unconfirmed figure

B. Home Waters. (Salmon and grilse, except where shown separately)

	<u>Ireland</u> ^a	<u>England and Wales</u> ^b	<u>Sweden</u> ^d	<u>Norway</u> ^f
	1960	514	281	30-50
1961	522	231	30-50	1,533
1962	1,180	318	30-50	1,935
1963	1,130	324	30-50	1,786
1964	1,188	305	30-50	2,157
1965	1,112	319	30-50	2,000
1966	1,090	379	30-50	1,842
1967	1,226	342c	? e	? e

	<u>Scotland</u>			<u>Canada</u> ^g	<u>USA</u>
	<u>Salmon</u>	<u>Grilse</u>	<u>Total</u>		
1960	945	468	1,413	1,635	less than 2
1961	807	370	1,177	1,581	less than 2
1962	999	713	1,712	1,718	less than 2
1963	1,266	406	1,672	1,855	less than 2
1964	1,197	687	1,884	2,126	less than 2
1965	1,048	542	1,590	2,182	less than 2
1966	1,049	546	1,595	2,311	less than 2
1967	1,223	868	2,091	2,916	less than 2

a. Grilse seem to be about 70-80% by weight or 80-90% by number in total Irish catches. Commercial catches only.

b. Salmon and grilse. Proportions of grilse in regional catches vary from 10% to 40% and average 22%.

c. Estimated.

d. Estimated 75% grilse. West coast catch only.

e. Not available.

f. Estimated 15% grilse based on (i) returns from fish merchants and, (ii) tagging data.

g. Commercial catches only; angling catches (mostly grilse) are about 10% additional. Very few grilse are taken in Nova Scotia and New Brunswick but form a significant part of Newfoundland catches.

C. (see attached over)

C. Combined catches, by weight, of salmon in England and Wales, Sweden, Norway and Scotland, 1960-1966.

<u>Year</u>	<u>Weight of Salmon caught</u> (metric tons)
1960	2,719
1961	2,435
1962	3,203
1963	3,336
1964	3,581
1965	3,291
1966	3,201

Table 2. Estimates of catches per unit effort for some home water fisheries.

	<u>Canada</u> ^a	<u>Ireland</u>		<u>Scotland</u>	
	<u>(Drift Nets and Traps)</u>	<u>(Drift Nets)</u> ^b	<u>(Licences)</u> ^c	<u>(Fixed Engines)</u> ^d	<u>(Net and Coble)</u> ^e
	(lbs.)	(Numbers)	(lbs.)	(Numbers)	(Numbers)
1960	191	325	950	12.8	84.1
1961	165	224	1,030	12.3	60.9
1962	160	563	2,210	14.8	83.6
1963	197	456	1,940	19.9	109.3
1964	255	430	1,720	23.2	98.6
1965	254	520	1,700	17.8	84.0
1966		516	1,250	19.4	95.0
1967		733	1,801	21.6	130.2

- a. Miramichi area, salmon only. Approximate pooled monthly means for all years per unit of gear.
- b. Salmon and grilse per drift net.
- c. Pounds salmon and grilse per licence.
- d. Salmon only, catch/net/month.
- e. Salmon only, catch/crew/month.

Table 3 Number of smolts tagged and recovered in Greenland and home waters

Country	Year of Tagging	No. Tagged	Greenland ^a	Recoveries		Total ^b
				Grilse	Salmon	
Canada	1963	13,182	15	202	48	265
	1964	64,912	16	306	141	453
	1965	62,829	135	553	324	1,012
	1966	65,550	ca.100	323	-	-
Scotland	1963	17,748	10	307	188	505
	1964	12,180	6	299	233	538
	1965	13,239	9	160	125	294
	1966	25,407	23	461	-	-
England and Wales	1963	9,485	9	16	32	57
	1964	17,129	10	33	99	142
	1965	5,974	12	35	59	106
	1966	12,999	5	20	-	-
Norway ^c	1963	10,975	0	88	94	182
	1964	10,653	0	203	84	287
	1965	11,080	0	118 ^d	29	147
	1966	18,174	? ^d	? ^d	-	-
Iceland	1966	? 8,300	1	48	-	-
Ireland	1966	15,000	-	-	-	-
Sweden	1966	11,180	8	? ^d	-	-
USA	1966	82,000	32	24	-	-

a Including recoveries inshore and offshore

b All recoveries, Greenland and home waters

c Data from Rosseland 'Norwegian Salmon Tagging Data'; the number of salmon recaptured from 1964 and 1965 is almost certainly incomplete. Over the period 1964-67, 79,766 smolts were tagged in Norway and, to date, 2,162 have been recaptured as grilse or salmon. Of these, 15 were recaptured in Sweden, 2 in Denmark and 2,145 in Norway.

d Figures not available.

Table 4. Numbers of smolts tagged, 1966 and 1967

<u>Country</u>	<u>Hatchery</u>	<u>Number Tagged</u>				
		<u>1966</u> <u>Wild</u>	<u>Total</u>	<u>Hatchery</u>	<u>1967</u> <u>Wild</u>	<u>Total</u>
Canada	?	?	65,550	63,000	19,500	80,000 (approx)
Denmark	4,270	0	4,270	2,696	0	2,696
England and Wales	9,668	3,331	12,999	18,522	4,218	22,740
Iceland	78,300	0	78,300	710,500	0	710,500
Ireland	15,000	0	15,000	10,000	0	10,000
Norway	16,163	2,041	18,174	?	?	22,000
Scotland	8,000	17,407	25,407	4,451	20,993	25,444
Sweden	11,180	0	11,180	4,000	0	4,000
USA	82,000	0	82,000	80,700	0	80,700

Table 5. Recaptures in Greenland of Kelts tagged in Home Waters*

<u>Country</u>	<u>No. Recaptured</u>
Canada	7
England and Wales	6
Ireland	7
Scotland	11
U.S.A.	7

* This table will be expanded in the printed version of this report.

Table 6. Recaptures of Fish tagged in West Greenland

<u>Year tagged</u>	<u>Number tagged</u>	<u>Local Recaptures</u>		<u>Distant Recaptures</u>	
		<u>Number</u>	<u>Days Absence</u>	<u>Number</u>	<u>Location</u>
1965	223	2	3, 26	1	Canada
1966	728	28	1- 8 days (24) 10-50 days (4)	4	Canada (1) Scotland (3)
1967	375	5	1-21	1 ^a	Ireland

^a To date (May 1968)