Atlantic Salmon Trust

PROBLEMS AND SOLUTIONS IN THE MANAGEMENT OF OPEN SEAS FISHERIES FOR ATLANTIC SALMON

by Derek Mills

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The Working Group on Fisheries in the European Parliament held a special meeting on Atlantic Salmon in Brussels during July 1983 when a number of salmon experts presented their views on the problems facing the conservation of this valuable species. One of the contributors to that meeting was Dr. D.H. Mills of the University of Edinburgh, who made a submission based on the paper which the Atlantic Salmon Trust now has pleasure in publishing.

Dr. Mills' review of the North Atlantic Salmon Fisheries comes shortly before the North Atlantic Salmon Conservation Organisation, which has been established under the 1982 Reykjavik Salmon Convention, is due to have its first formal meeting. Since the Organisation's role is to promote the conservation, restoration, enhancement and rational management of salmon stocks in the North Atlantic, Dr. Mills' paper should prove to be a most useful reference document for everyone with an interest in future discussions on the international management of salmon stocks.

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INTRODUCTION

Up until the late 1950s the Atlantic salmon stocks of each salmon-producing nation were almost completely under the control of their country of origin. Exploitation and management of the stocks was the exclusive concern of each nation to which they belonged. The salmon feeding-areas in the north Atlantic Ocean had not been located and so there was no exploitation of stocks prior to their return migration. The only exception to this stable situation was the southern Baltic long-line and drift-net fishery for salmon originating mainly from northern Swedish rivers and exploited principally by Denmark. A few other small open seas fisheries were already in existence and these do intercept some salmon returning to more distant home waters. These fisheries are confined to offshore areas within 6 to 12 miles of the coast and are operated, using drift-nets, by nations with their own salmon stocks. They occur along the west coast of Ireland, the north-east coast of England, and parts of the New Brunswick and Nova Scotia coasts of Canada's eastern seaboard.

In 1956, the capture of a tagged Scottish salmon kelt at a small inshore fishery off the west coast of Greenland was the signal for a new chapter in the history of salmon management. The subsequent capture of other salmon tagged in Canada, England, France, Ireland, Scotland, Sweden, the U.S.A. and Wales off the west coast of Greenland confirmed beyond doubt the importance of the Davis Strait as a major feeding area for the Atlantic salmon. Probably as a result of the advent of nylon monofilament net the West Greenland fishery developed rapidly from this time into an efficient high seas operation, with well-equipped foreign vessels using up to 20 miles of drift-net to increasingly exploit salmon stocks from North American and European rivers.

Another high seas salmon fishery using floating long-lines was developing almost simultaneously off the north-west Norwegian coast about the latitude of the Lofoten Islands, and, inshore, a drift-net fishery became established off the Norwegian coast in 1965. More recently, a floating long-line fishery was established north of the Faroe Islands, and this too, has been taking fish previously tagged in England, France, Ireland, Scotland, Norway and Sweden.

The salmon resource has therefore rapidly become an international one requiring international negotiations for its effective management.

In addition the problems of management at a national level have become more complex. The replacement of drift-nets made of natural fibre by the less visible and rot-proof nylon monofilament net has attracted more effort into the open-seas fisheries in home waters and has also encouraged the development of an illegal fishery off the Scottish coast and some breach in the regulations controlling the drift-net fishing off the west coast of Ireland.

The future overall management of these open seas fisheries requires urgent consideration before other such fisheries develop in salmon-feeding areas not yet located.

The Rationale of the Open Seas Fisheries

In considering the future of open seas fisheries it is necessary to review their history and the present methods used for their control and regulation. Such a review is provided in Appendix A and Appendix B.

(a) Biological: It can be very convincingly argued that there should be no open seas fisheries for Atlantic salmon and, on biological grounds, there are very sound reasons for not harvesting an anadromous species either on its feeding grounds or during the course of its return migration to spawn in its natal streams. The fisheries taking place on the salmon's feeding grounds, such as off West Greenland, to the north of the Faroes and in the Norwegian Sea, is harvesting fish which are still in the process of putting on substantial weight. Fish allowed to return to their parent rivers probably gain a great deal in net harvestable weight with relatively small marginal loss to natural mortality, although, as Crutchfield (1) points out, there is as yet little empirical verification of this point. Generally speaking then, salmon of maximum weight may be harvested at least cost per unit of effort in coastal waters. The first bone of contention now appears, as when speaking of 'least cost per unit of effort' one is assuming that the same nation is involved in both fisheries - the open sea and the coastal. In the case of the Pacific salmon fisheries, to which Crutchfield and Copes (2) refer, this is the case, but it is not so in that of the Atlantic salmon.

However, the second line of argument concerns the probable random exploitation of the stocks in the open seas. Salmon stocks become mixed on their feeding grounds with fish of European and North American origin being taken off West Greenland in relatively equal proportions. There is therefore no precise way of regulating the exploitation of stocks destined for each country, let alone each river, which should be the desired goal (3). Only by conducting all harvesting in the rivers or near the river mouths can selective escapement be regulated to achieve maximum runs. This would appear, biologically, to be an important reason for confining salmon harvesting to the relevant coastal states.

Those fisheries closer to the states-of-origin, the intercepting

fisheries, may be considered to be even more damaging to the stocks. They are exploiting fish which have almost ceased feeding, have survived the various sources of mortality and are on direct course to their spawning rivers. The Irish west coast fishery has now been recorded as taking fish destined for rivers in Scotland, England and Wales, while in the Northumberland and Yorkshire fisheries tagging experiments revealed that 80% and 61% respectively of the salmon are en route for Scottish rivers, with some estimates indicating that 94% of the fish in this fishery are of Scottish origin. A similar situation occurs in Canada, with the Newfoundland fisheries intercepting salmon travelling to rivers in the Maritime Provinces. As salmon move into coastal waters they are arriving in what might be considered to be collecting grounds from which they will disperse to rivers along the coast, and for that reason should be protected at this point on their migration.

It is generally agreed that in optimum stock management the regulation of spawning escapement up the rivers is important. Each river and spawning tributary has a particular capacity for spawning and for accommodation of juvenile fish. The maximum number of fish required is difficult to assess and exploitation rates by inshore commercial fisheries and anglers have only been fully investigated on a few river systems (4). It is on this subject that there tends to be a division of opinion over the numbers of salmon required to maintain a stock for both survival and for exploitation of the species. Fish are very resilient to overfishing and it has been said that large broods do not appear to depend on large numbers of adult spawners, and this lends support to the belief that certain fish populations are entirely unaffected by man (5). It is interesting to note that many Faroese fishermen found it hard to understand why there should be so much concern over the amount of salmon they are taking, as they say that the numbers of salmon they see while hauling their lines are countless.

Before one can state categorically that the salmon resource is experiencing serious depletion one has to consider whether or not the declines in any one stock are related to some environmental factor such as climate. There is considerable controversy concerning the weight to attach to human predation in contrast to natural factors, in explaining both short-term and long-term fluctuations in the vitality of salmon stocks (6). It should not surprise us that fish stocks respond to climatic factors and to climatic changes because they live their lives within the weight of water. Their migration circuits are tied to hydrodynamic structures, and reproductive isolation is obtained by the capacity of fishes to join or leave current systems as they will. Perturbations of a migration circuit with an unsuspected advection spills fish outside their normal range where they either establish a new spawning group or die, for they do not return (7).

(b) Social and Economic

Hardin in Tragedy of the Commons (8) pointed out that a tragedy in fisheries occurs when there is a rapid increase in the number of fishermen and the average success of the fishermen declines. However, he went on to divide the tragedy into (i) environmental - when the biomass of the resource reaches such a low level that it is threatened with extinction and (ii) human - when the participants harvesting a resource obtain less and less of it. This situation can occur when the biomass of a resource is decreasing at a faster rate than the number of participants.

With the open seas fisheries the participants are in direct competition with those harvesting the resource at its predictable point of return. On social or economic grounds how can one decide who has more right to what is a common-property resource? Commercial fishermen in traditional and long-established fisheries as well as sport fishermen have shown some resentment to these open seas fisheries, feeling that the harvest has to be divided further, with a consequent reduction in their share. For example, the Hunter Committee in its First Report in 1963 (9), reviewing the recently developed drift-net fishery off the Scottish east coast, obtained evidence that competition from drift-net fishermen had already had some effects on the structure of the salmon industry. The success of the drift-net fishermen was a threat to their employment. The appearance of the Scottish drift-net fishery which was quickly banned, may have been a sign that other fisheries had declined. Inshore Scottish fishermen who had traditionally fished for white fish (e.g. cod, haddock, plaice) claimed that this was indeed the reason for their having to switch to salmon in order to pay off the loans for purchasing their vessels.

In Greenland, the salmon fishery developed at a time when Denmark was investing large sums of money in the country as part of a vast programme of modernisation with a view to bringing up the Greenlanders' standard of living to the level of the Danes'. Modern fish-processing plants gave the Greenlanders an opportunity of disposing of their salmon catch and the fishery was a welcome additional source of employment for a rapidly expanding population (10) that was finding the seal and cod stocks declining. While it may be only a seasonal occupation for many, the domestic importance of the Greenland fishing industry, including salmon, renders unsuitable the principle of paying compensation to salmon fishermen for not fishing, as has happened since 1972 in the New Brunswick salmon fishery. Aside from the socially undesirable effects of such a tactic, due in part to an absence of alternative employment of any nature, there would be serious ripple effects on the entire fishing resource industry, of which fishermen form only one, albeit vital part. The loss of a source of income at a time when many younger people, students and unskilled labourers, are looking to the fishery ashore and afloat for a significant portion of their yearly needs, would have the potential to create social friction and much dissatisfaction with

international influences on Greenland's fisheries (11). The Greenlanders' own resentment to salmon sport fishermen, who have in the past demanded the closure of this fishery, is seen when they refer to them as 'hobby fishermen' who should do something to reduce pollution in their rivers. The Greenlanders, of course, feel they have a right to a share of the catch of a fish which spends a significant part of its time in their waters.

The Faroese fishery could arguably be justified on the same grounds. The fishing industry is of great importance to the Faroes. In 1977 about one-third of the gross factor income stemmed from fishing and 95% of exports consisted of fish or fish products (12). With the collapse of the herring fishery in the late 1960s and the reduction in the cod stocks, the salmon is a valuable substitute. The Faroese have a strong desire to see other salmon-producing nations also regulating their fisheries more effectively and rightly criticise the illegal Scottish drift-net fishery and the infringements for which the Irish drift-net fishery is so well-renowned (13). Regulations are made to be observed, but all too often the regulations proposed have conflicted so strongly with basic social and cultural features of fishing communities that they have been massively resisted. It has been argued that opposition to fisheries regulations will be minimised if such regulations are congruent with the social and economic system (14).

An Assessment of Present Regulations

Present regulations can be basically divided into two groups - those that limit the actual amount of fish taken using a quota system and those that restrict and control the type of effort applied to ensure some escapement of fish without limiting the fishermen to a fixed amount of the resource.

In the West Greenland fishery the quota is divided into a "free" component open to all licensed fishermen and a "local" component allocated to all communities within the fishery area. The allocation of a quota to the fishery as a whole has its drawbacks in that, providing fish are relatively abundant, the quota can be achieved in a short space of time and the fish-processing plants overloaded at a time when other fish are also being accepted. This tends to be the position in the Greenland fishery where, in 1980, the quota was achieved in under three weeks, and some poor quality salmon were being landed. The processing-plants at that time were also having to deal with landings of shrimp and cod. A "race" to achieve the quota results in lack of selection for fish condition and ends in an uneven distribution of fish among vessels. One Danish salmon smoke-house finds the quality of Faroese cage-reared salmon to be superior to Greenland drift-net caught fish, probably because of the poor quality of salmon being landed.

The allocation of individual and non-transferable quotas to licensed vessels, as in the Faroese fishery appears to be more logical. Here, each vessel is aware of its target and can adjust its effort and be more selective. Each vessel, on achieving its quota can then transfer to other types of fishing and there is no competition between fishermen. However, there can be more selection of salmon in the Faroese long-line fishery, as most discards can be returned to the sea alive; in the Greenland drift-net fishery discarded, poor condition fish would be dead and there would be a consequent wastage. One is only too aware of the practice of dumping catches of mackerel at sea if their quality is poor or the market unfavourable.

It is also of value to link the quota system to a season. Fish taken early in the year may be too small or in poor condition. Seasons should always be under review and be adjusted to cater for any changes in stock distribution and size composition. For example, the opening date for the West Greenland fishery was changed in 1981 with the aim of catching larger fish (the mesh-size of the drift-nets was also increased) so enabling a slightly larger quota to be permitted without a greater number of fish being taken. According to one report, the expected result did not in fact materialise and, unexpectedly, many more small fish were caught.

The present regulations controlling the open seas drift-net fisheries within 6 to 12 miles of the coast put no limits on the catch but simply restrict the fishermen's catching power. Much of the enforcement of these regulations must take place at sea using patrol vessels and aircraft. As there is no limit to the amount a fisherman may land he is in a position of being bribed to land the catch of a non-licensed vessel. In the illegal Scottish drift-net fishery some fish are passed to legal inshore commercial fisheries for dispatch to market, while others are landed and distributed undetected.

A licensing system which is now in force in all these fisheries does control illegal fishing if points of landing can be effectively monitored. However, one reason for discarding suggestions for a quota system for some of these fisheries has been the difficulty of checking on amounts landed. However, the recent salmon-tagging scheme introduced originally in New Brunswick (15, 16), and now adopted in Nova Scotia and Maine, has much to commend it, as each salmon on being caught has to have a numbered coloured tag attached. The colour of the tag depends on whether the fish has been caught commercially or by angling.

All salmon fishing out with the 12-mile limits has now been banned with the exception of the Greenland, Faroese and Norwegian Sea fisheries. There have been numerous demands to have the open sea drift-net fisheries within 12 miles also banned. The resistance to this is great and has become as much of a political issue as has the demand to close the fisheries off Greenland and the Faroes.

Fisheries Conflicts and the Future

The open seas fisheries off Greenland and the Faroes and in the Norwegian Sea have been a contentious issue since they first began. The International Commission for the North-West Atlantic Fisheries (ICNAF) had a limited effect on reducing the extent of the Greenland fishery but only the threat of an embargo on Danish imports by the U.S.A. was immediately effective in restricting this fishery. Other high seas fisheries have been less of a problem. Denmark is the only nation presently engaged in the Norwegian Sea fishery, the other previously participating countries having agreed to stop. A voluntary reduction in the quota by the Faroese met with general approval and has enabled co-operation between scientists to investigate the salmon stocks in the fishery.

However, regardless of the Convention for the Conservation of Salmon in the North Atlantic Ocean, a number of bodies in the states-of-origin are pressing for closure of these fisheries. In Iceland there is a call for the government to refuse to renew a fishery agreement that permits the Faroese a quota of 17,000 tonnes of cod from within Iceland's 200 miles fishery limit, unless they cease fishing for salmon.

There have in the past been a number of controversies over high seas fisheries that have put severe strains on major alliances vital to the political and economic stability of the free world. The threat of embargoes is probably more intolerable than the actual embargo. An embargo on trade might result in the opening up of a new outlet more profitable than the first and having serious repercussions on the country imposing the embargo (17). Before making threats a government should look ahead to a situation in which the threat has failed to exert the desired influence. Retaliatory restrictions on international trade can develop further and lead to denial of strategic bases for the NATO countries. This situation was close to occurring during the Anglo-Icelandic 'cod war' of 1972-73 (18), when the future of Keflavik as a NATO base was in some doubt. Greenland and the Faroes are also of immense strategic value to the western alliance (19). Many observers believe that deepseated sensitivities about security constitute serious barriers to co-ordinated resource management at the international level.

The future of the Greenland fishery, at least, would not appear to be in doubt although the quota may have to be more flexible. It is interesting to note that in 1982 the quota was not achieved even though boats continued fishing until December. The quota has a "grazing fee" component incorporated. The theory behind such a "fee" is that the salmon are using a common property resource and remove part of the biological potential of the ocean which will not be available to feed other commercial fish species in the same area. If state-of-origin ownership of the salmon is conceded and protected

then there has to be reciprocal recognition that the owners of the salmon pay for the value of the pasturage enjoyed at the expense of the community in whose waters they are grazing, the payment being in the form of an accepted amount of salmon. A similar "grazing fee" could be negotiated for Faroese waters.

In discussions with both the Greenland and Faroese authorities frequent reference has been made to the Scottish, English and Irish drift-net fisheries. The accusing finger is pointed particularly at the illegal Scottish drift-net fishery and the unknown amount of fish it catches. Unless solutions are found to the problems centred around these national fisheries one cannot expect the fullest co-operation internationally. The saying 'to put one's own house in order' is regularly uttered, and the question frequently asked is 'why have you no quota?'

In a draft report to the European Parliament's Committee on Agriculture in 1983, Mr. Brøndlund Nielsen of Denmark stated in his conclusions that the maintenance of a regulation of the Faroese fishery will be dependent in the longer term on proper controls of salmon fishing by Community fishermen. He went on to say that:

> "The Faroese have shown a co-operative and even generous attitude towards the scientists in negotiations to fish the present quota. This attitude will not be maintained if illegal drift net fishing continues in Scottish, English and Irish waters. Effective action must be taken by the Community to regulate salmon fishing by means of quotas, licences and effective inspection, if we are to expect the Faroese to co-operate in future talks as they have in these."

More rigorous enforcement of existing legislation could have more impact on the Scottish illegal drift-nets while the introduction of either a licensing and/or tagging system for the legal commercial and sports fisheries would go a long way to eliminate it entirely (16). However, such arrangements are opposed by certain organisations in Scotland, and the issue has become a political one which no one is prepared to attend to at present. Politics, too, prevent the north-east England fishery from being banned, and M.Ps. are not prepared to lose the support of the fishermen in these constituencies, probably because if the fishery was closed there would be further unemployment. The Irish drift-net fishery has the same problem and politicians are not anxious to see existing regulations more rigorously enforced, but are prepared to pass laws enabling their drift-net fishermen to fish with longer nets and in coastal areas previously regarded as sanctuaries. The name of the game is no longer 'resource management' but political 'snakes and ladders', with the Danes and Faroese as spectators. Unless the Scottish illegal fishery is effectively banned and the north-east England drift-net fishery controlled, at least initially, by a quota, the traditional Scottish

salmon firms, already being affected by the effects of increased numbers of farmed salmon on the falling fish price, could go out of business. Much of the money to finance Scottish salmon district fishery boards comes from the boards' rates levied on these commercial firms, who also do much to see that the coastal areas are "policed" and the rivers well-managed. While many would prefer to see traditional coastal netting banned and all catching of salmon in rivers left to sport fishermen, it is unlikely that the salmon resource would in fact be adequately exploited if this 'anglers' only' policy was adopted.

A more united and flexible approach to salmon management is the only solution if our future salmon stocks are to survive.

APPENDIX A

The Open Seas Fisheries

Historical

(i) The Greenland Fishery

Published records of the occurrence of Atlantic salmon in the Godthab region of west Greenland date back to 1780 and a fishery has operated in this area since at least 1906 (20). Around 1935 there were reports of numbers of salmon being caught in other areas along the coast and their range appears to have extended further north after this time as, in the late 1940s, foreign trawlers recorded salmon in their catches while fishing for cod on the Store Hellifiskebank. However, it was not until the early 1960s that salmon fishing became socially and economically important, probably as a result of a rising human population with improved living conditions, the provision of modern fish-processing plants and the availability of nylon monofilament nets. Over the same period a decline in cod and seal stocks may have hastened the salmon exploitation.

An offshore fishery was established in 1966 operated by larger fishing vessels from Denmark, the Faroes, Norway, Sweden and West Germany, and in 1969 the total catch from the inshore and offshore fisheries was 2,210 tonnes. The inshore catch 10 years earlier had amounted to only 13 tonnes.

In 1969, following an international conference called by the Atlantic Salmon Research Trust (now the Atlantic Salmon Trust) and the International Atlantic Salmon Foundation, the International Commission for the Northwest Atlantic Fisheries (ICNAF) adopted a resolution recommending a complete ban on fishing for salmon throughout the convention area. This was aimed directly at stopping high seas fishing off west Greenland, but because of formal objection to the resolution by West Germany (on a matter of principle) and by Denmark and Norway (the major participants in the fishery), it was rendered null and void. However, at the ICNAF meeting in 1970 countries objecting to the resolution agreed to curtail fishing to the four months from 1st August to 30th November, not to exceed the level of the 1969 catch and to forgo the use of pelagic trawls and monofilament nets, except for certain specified Danish boats already equipped with the latter. Additionally, West Germany agreed to refrain from fishing for salmon off Greenland. However, lobby pressure from the United States resulted in December, 1971, in the passage into law of a bill authorising the President to prohibit fish imports from countries whose fishing operations diminished the effectiveness of international conservation programmes. The bill

was obviously designed with the Danish participation in the Greenland fishery in mind. The Danes responded immediately to the threat aimed at their fish export trade to the United States. In negotiation with the United States they agreed to phase out their west Greenland high seas fishery for salmon by 1976. At the 1972 annual meeting of ICNAF it was finally agreed, without objection, that all fishing for salmon outside Greenland's national fishery limits would cease after 1st January 1976; that in the intervening years the catch taken by Danish vessels, including Faroese, by Norway, and by other countries fishing off Greenland, would be progressively reduced; and that for future years the annual catch taken by local Greenland fishermen would be limited to 1100 tonnes.

Although there was some excess fishing in the immediately following years, by and large these regulations have been observed and it was confirmed at the 1975 ICNAF meeting that from 1976 only local Greenland fishermen should be fishing in the Davis Strait and then their total annual catch would be limited to an adjusted figure of 1190 tonnes (21). This was raised to 1270 tonnes for the 1981 season.

(ii) Norwegian Sea long-line fishery

The Norwegian Sea long-line fishery, situated in an area up to 100 miles off the Norwegian coast about the latitude of the Lofoten Islands, began in 1965 and was the first instance within the North-east Atlantic Fisheries Commission (NEAFC) area of salmon being exploited on their feeding grounds. In the first two years no catch figures were made available, but the catch rose from 77 tonnes in 1967 to an estimated 958 tonnes in 1970. The main participants in the fishery were Denmark, Norway, Sweden and West Germany. In the light of this fishery's rapid expansion, at its annual meeting in 1970 NEAFC adopted a recommendation providing a variety of measures aimed at stabilizing the situation. In 1971 the United Kingdom was able to obtain a closed area or "box" around the British Isles to protect migratory routes and/or feeding grounds from any expansion of high seas fishing in the Convention Area, i.e. outside national fishery limits.

At the 1972 NEAFC meeting a Norwegian proposal for a complete prohibition from 1st January, 1974, of high seas fishing within NEAFC was opposed by Denmark. However, a further "box" was established around Iceland. The recommendation for a complete ban was raised again in 1973 and this time was adopted by all member countries except Denmark and West Germany, with Denmark expressing her intention of continuing fishing after 1976.

In 1977 the extension of the Norwegian fishery limits to 200 miles resulted in a shift of the fishery westwards to an area between 200 and 360 nautical miles from the Norwegian baselines, and mainly

between latitudes 67° and 75°N, but with some sporadic fishing between this area and that around the Faroes. In 1977 and 1979 fishing in the northern area was conducted exclusively by Danish vessels, but in 1978 some Faroese vessels participated.

(iii) The Faroese long-line fishery

A long-line fishery off the Faroes first started in 1968, but for the first 10 years it was operated only by Faroese vessels fishing relatively close to the Islands. Over this period the catches rose slowly from 5 to 40 tonnes, with no more than 9 vessels fishing in any one year. 1978 was the first year in which Danish vessels participated. The salmon catch increased in 1979 to 194 tonnes due to an extension of the fishing season and higher catch rates. Furthermore, the fishery had moved to an area 100 miles and more north of the Islands. There is no doubt also that, after the 200 mile fishery limits were established in 1977, there was a realignment of fisheries policy. In 1980 and 1981 there was a marked increase in fishing effort, with 42 Faroese and 7 Danish vessels participating. The catch escalated to 718 tonnes in 1980 and 968 tonnes in 1981 (12).

After an initial hard line being taken by the Faroese on the size of future salmon catches, a breakthrough came during EEC negotiations in the autumn of 1981. This resulted in the setting up of a Special Study Group by the International Council for the Exploration of the Sea which had its first meeting in Torshavn in December, 1981. Further promises of co-operation came with the signing in Reykjavik of the Final Act of 22nd January, 1982, of the Diplomatic Conference on the Conservation of Atlantic Salmon by Canada, the EEC, Faroe Islands, Iceland, Norway, Sweden and the U.S.A. An announcement at the time that the Faroese salmon quota for the 1981/82 season would be 750 tonnes, and would be reduced to 625 tonnes in 1982/83 was also encouraging.

Salmon tagged as smolts in Denmark, England, France, Ireland, Norway, Scotland and Sweden have been taken in this fishery. There is also the record of one Canadian fish being caught.

(iv) The Norwegian home waters drift-net fishery

From the early 1960s the salmon catches in the Norwegian fishery increased substantially to a level of about 2,000 tonnes. This was partly due to a change in fishing methods, with drift-nets replacing the long-established bag nets. The increase in the number of registered drift-nets, to a peak of 30,000 in 1977, was associated with a decline in the number of bag nets from more than 7,000 in 1967 to less than 2,000 in 1978. In 1979 the drift-net fishery was regulated by licensing and is legal only from the baselines out to 12 miles. About 24,000 drift-nets had been in use in that year and

about 85% of these were of monofilament. Only fish tagged as smolts in Denmark, Iceland, Norway and Sweden have been taken in this fishery.

(v) The Irish drift-net fishery

The open sea drift-net fishery off the north-west coast of Ireland started in about 1870 and increased gradually up to the end of the nineteenth century, but the years 1900 to 1908 saw a very great expansion due to the intervention of certain commercial interests (22). Up until the late 1960s open sea drift-netting was confined to the Donegal and North Mayo coast but extended some distance out to sea.

An increase in drift-netting in the late 1960s coincided with the expansion of the catching side of the fishery industry when the number of boats and boat sizes increased considerably. The larger vessels which engaged in sea fishing and shell fishing turned to salmon fishing during the summer months. The number of drift-net licences issued increased from 363 in 1962 to 1048 in 1974. Again, in the late 1960s and early 70s new drift-net fisheries were established off the west and south-west coast. The catch by drift-nets increased from 21% of the total in 1962 to 80% in 1979 (23).

There has been strong criticism of this fishery because of its indiscriminate cropping of stocks destined for more distant home waters and fish tagged as smolts in England, Scotland and Wales have been recaptured at various points around the west and south Irish coast.

(vi) The Northumberland and Yorkshire drift-net fishery

Although salmon fishing has been carried out along the Northumberland, Durham and Yorkshire coasts from time immemorial, before 1960 most of the netting was carried out using "J" nets which were not true drift-nets (24).

The first drift-nets used at about that time were made of the natural fibre, hemp, but were only successful if operated at night. However, with the advent of the nylon monofilament net, drift-netting, during the safer conditions of daylight, in this area escalated and was carried on out to 6 miles from the coast, which is the limit of regional water authority jurisdiction. The drift-net fishery is a licensed fishery and by 1971 the number of licences issued in the year had reached 275 in the Northumbrian Water Authority area and over 100 in the Yorkshire Water Authority area. Since that time the licence numbers have been reduced. The average annual weight of salmon landed in this fishery over the 10-year period 1971 to 1980 is 174 tonnes.

This fishery is being strongly criticised by Scottish salmon

fishermen as it is known that it is mainly salmon destined for Scottish rivers that are taken (25).

(vii) The illegal Scottish drift-net fishery

In the early 1960s a salmon drift-net fishery started off the east coast of Scotland. This was temporarily controlled under existing legislation until its future was reviewed by a government committee. The Committee considered the fishery should not be developed on the grounds that it introduced a serious risk of overfishing. Consequently drift-net fishing was banned under the Sea Fish Conservation Act of 1967. However, extensive drift-netting, using monofilament nets, now occurs off all parts of the Scottish coast, with some nets up to 1,000 metres in length. There is no reliable estimate of the numbers of salmon caught. However, the increase in the extent of this fishery can be judged by the increase in the numbers of nets confiscated by the authorities off the south-east coast of Scotland in the region of Berwick. In 1982, 37 drift-nets up to 1500 m. in length were confiscated by the River Tweed Commissioners and the government's fisheries protection service.

(viii) The Canadian east coast drift-net fisheries

There are a number of drift-net fisheries operating off the New Brunswick and Nova Scotia coasts in the Gulf of St. Lawrence and the Bay of Fundy, and extending out 10 miles from the shore (26).

The drift-net fishery has not been exercised off New Brunswick since the ban on commercial salmon fishing in New Brunswick since 1972. It recommenced in 1981.

APPENDIX B

The Open Seas Fisheries

Present methods for their control and regulation

There are various methods in force to control and regulate the open seas fisheries. These include quota allocations, limited licences, gear restrictions, fishing seasons and fishing zones. At present there is no consistency in the types of regulation in force in the various open seas fisheries. This is partly due to social and economic reasons. However, in certain instances there is a flagrant violation of these regulations, while in other cases they are strictly and conscientiously observed. This Appendix reviews the regulations at present in force in the various fisheries.

(i) Greenland fishery

This fishery is controlled by an overall quota (1270 t. from 1981) and, with the exception of three southerly communities the season begins on August 1st. The opening of the season was delayed from 1981 to start on August 25th. The quota is divided into two components - a "free" quota constituting the largest proportion (958 t. of the 1190 t. quota) and a local quota (232 t.). While all boats can fish the "free" quota only small boats (less than 8 m. length) can fish the local quota which is divided by negotiation, with each community along the west coast being allocated its own quota.

No commercial salmon fishing is allowed without a licence and the fishing industries are not allowed to buy salmon except from fishermen with a licence.

In addition to a quota, a licensing system, and a season, the fishery has a limited entry, with only Greenlanders engaged full-time in the fishing industry, commercial fishing or sheep-farming being allowed to participate. Authorisation cannot be given to incorporated bodies or forms of shared ownerships, only to an individual.

Further restrictions include size of vessel, with only vessels up to 150 gross registered tons being allowed to fish; type of gear - by drift-net and fixed hang-net; mesh size (stretched mesh of 140 mm.) and fishing limits - with fishing being allowed out 40 miles from the shore.

The regulations are strictly observed and the governor is responsible for closing the season when the quota is close to being achieved (11).

(ii) Norwegian Sea long-line fishery

There appears to be little information regarding the measures in force for controlling this fishery. There are, however, certain areas or "boxes" where fishing is not permitted. The fishing season starts

in April in the Norwegian Sea, but in the Faroese area has been extended to the period October - November to June - July.

(iii) Faroese long-line fishery

This fishery is controlled by a quota (750 tonnes in 1981/82 and 625 tonnes in 1982/83) and a season (15th October to 31st May). All vessels have to be licensed by the Fishermen's Association and each is allocated a quota which is not transferable. The quota is divided between vessels in different weight categories. Vessels up to 49 GRT are classified as small and are allocated a certain proportion of the total and vessels above 50 GRT are allocated the remainder. All vessels have to be licensed and must fish within the 200 mile fisheries zone.

As the fishery is with long-line there is less discrimination in the size of fish caught than with drift-nets, where mesh size regulates to some extent the size of fish retained. For this reason, any salmon under 60 cm. in length is considered undersized and must be returned to the water immediately.

Every Monday the master of the ship has to inform the Fishermen's Association of the number and weight of salmon caught. When the catch is unloaded and classified the master of the ship sends a note of the weight to the Fishermen's Association immediately.

In addition, for fishing licences, the Home Government department, Føroya Gjaldstova, charges 1 kroner per kilogramme landed weight of salmon. The fee has to be paid for each voyage separately. This levy goes towards the cost of smolt production in the Faroese hatcheries. Fishermen sell their salmon through the processors to one of the three export companies.

(iv) The Norwegian drift-net fishery

In 1979 the drift-net fishery was regulated by licensing and is legal only from the baselines out to 12 miles. There is limited entry to the fishery which is only open to persons with fishing or the combination of fishing and farming as their main source of living. All licence owners have to keep catch record books which, after the season, are sent to the Central Bureau of Statistics.

The fishing season is from 1st June to 4th August.

(v) The Irish drift-net fishery

Since 1974 the fishing effort has been controlled by the issue of licences which are limited by order to those who derived a substantial part of their income from salmon fishing in any two years since 1968. Licences are restricted to 1,000 fishermen.

The length of the drift-net in the open sea is limited to 731 metres except along the Donegal coast where nets 1371 metres long are permitted. All nets must bear a tag in which is inscribed the number of the licence and the boat used for fishing must also have the licence number inscribed on it. Nets must not be made of nylon monofilament or multistrand monofilament and they must not exceed a depth of 30 metres. The mesh size is set at 127 mm. stretched mesh.

The open season is from 15th March to 21st July and is restricted to 4 days a week. Fishing is only permitted up to 12 nautical miles from the coast.

(vi) The Northumberland and Yorkshire drift-net fishery

Both fisheries are operated by full-time fishermen only. The Northumberland fishery is divided into 2 areas. Under the Northumbrian Water Authority (Limitation of Net Licences) Order, 1981, 75 licences are issued in the northern area and 46 in the southern. A licence for the northern area costs £300 and one for the southern £175.

The netting season is from 26th March to 31st August with a weekly close season operating. Monofilament nets are permitted but must be no more than 550 metres in length.

Fishing is only permitted out to 6 miles from the shore.

The Yorkshire drift-net fishery has 33 licensed fishermen, although under the Yorkshire Water Authority (Licence Net Limitation) Order, 1980, only 29 licences are strictly permitted. A licence costs £198.

The netting season is from 1st February to 31st August and a weekly close season operates. Monofilament nets are permitted but they must be no more than 370 metres in length.

Fishing is only permitted out to 6 miles from the shore.

(vii) The Canadian east coast drift-net fisheries

The drift-net fisheries here, as in England, Ireland and Norway, are limited entry fisheries, with only full-time fishermen being issued with a licence. Most of the drift-net fisheries in New Brunswick have been affected by the ban on all commercial salmon fishing in New Brunswick which commenced in 1972 and ended in 1980. Commercial fishing recommenced in 1981.

The maximum length of drift-nets permitted is 1,234 metres. Nets must not be made of monofilament and must have a stretched mesh of more than 127 mm.

The open season in New Brunswick is from 7th June to 15th August while in Nova Scotia the open season varies as it opens on 15th April

in Atlantic coast waters, 1st May in the Bay of Fundy and 15th May in the Gulf of St. Lawrence, it closes in all areas on 15th August.

All salmon taken in New Brunswick must be tagged immediately after capture.

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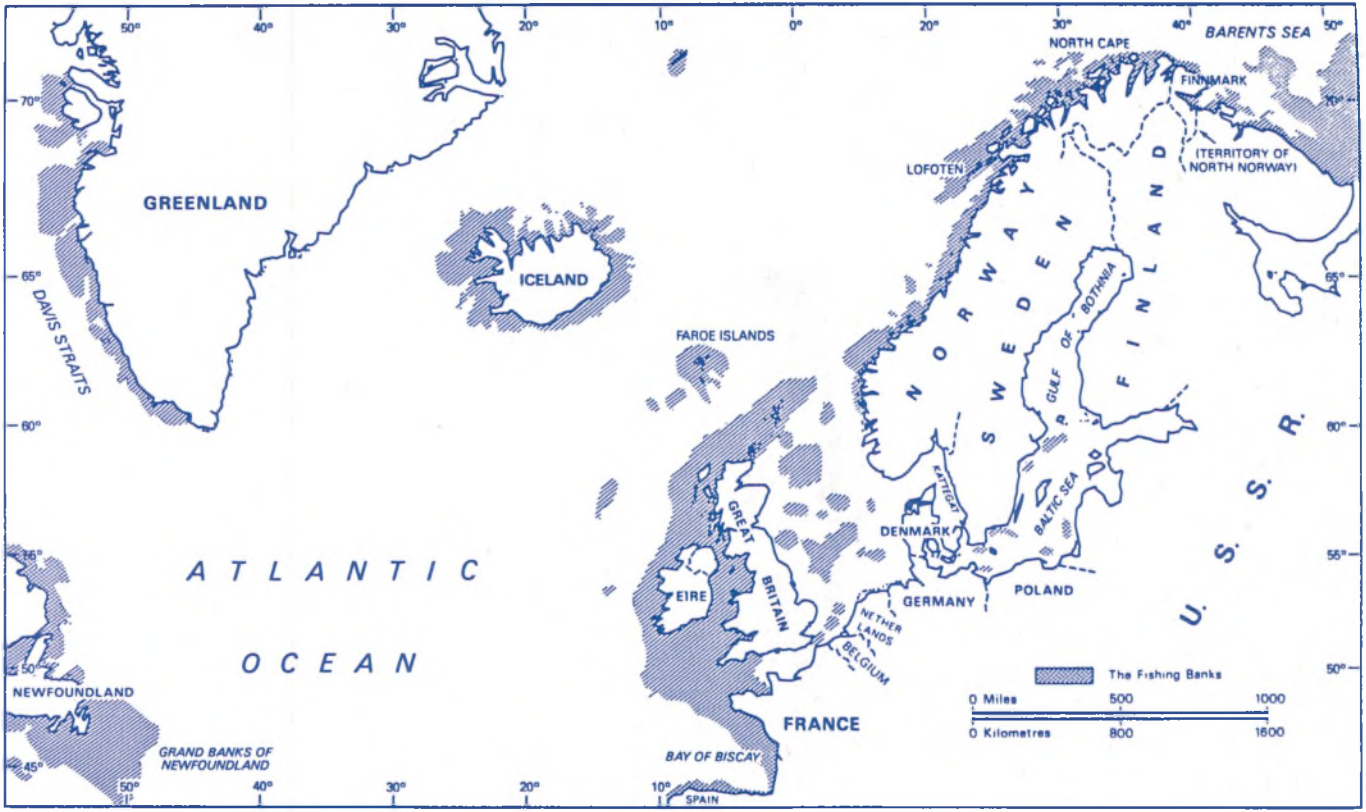

The North Atlantic
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