

NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION

ORGANISATION POUR LA CONSERVATION DU SAUMON DE L'ATLANTIQUE NORD



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***Special Liaison Meeting to Review Measures to Minimise Impacts of  
Aquaculture on Wild Stocks***

***Presentation by the European Union (UK, Scotland)***

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# IMPLEMENTATION OF THE OSLO RESOLUTION ON MEASURES TO MINIMISE IMPACTS OF AQUACULTURE ON THE WILD STOCKS

## THE POSITION IN SCOTLAND – A PRESENTATION BY MR G M THOMSON AND MR D DUNKLEY TO THE NORTH ATLANTIC SALMON CONSERVATION ORGANISATION MEETING IN MIRAMICHI, CANADA ON 5 JUNE 2000

1. This presentation is divided into two parts. Part I describes the context and offers an over-view of wild salmon and aquaculture in Scotland within which the Oslo Resolution is being implemented. Part II elaborates on the detailed responses to the Oslo Resolution provided in the Annex to this Paper.

### PART I

#### Wild salmon in Scotland

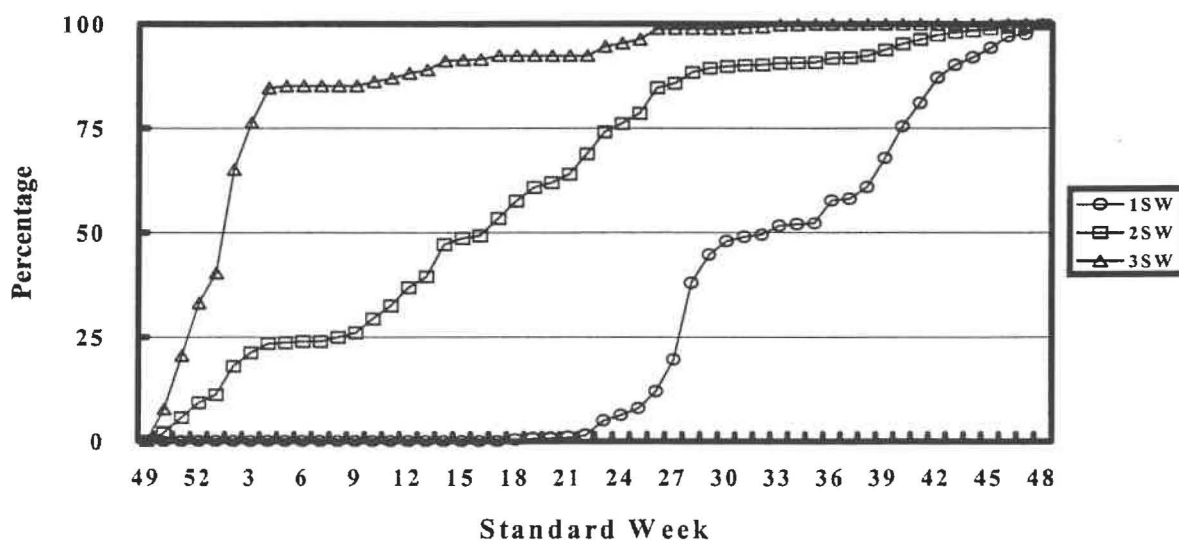
##### General

2. Salmon and Scotland are synonymous. With approximately 400 salmon rivers, one does not have to travel very far – certainly in the context of the great American continent – before stumbling into one. The rivers are located in the north, south, east and west of Scotland but it is on the east coast that the major salmon-carrying rivers occur. These include the Tweed, the Spey and the Tay.

3. Indeed it was on the Tay that history was made on 7 October 1922 when 32 year old Georgina Ballantyne landed the largest recorded salmon. It weighed 64lb (29 kg): a catch that current followers of the sport must envy.

4. It is worth pointing out that whilst grilse are dominant in Scotland's west coast rivers, rivers on the east receive both grilse and multi-sea winter fish: and fish are returning virtually every day of the year (see Figure 4.1 below).

**Figure 4.1. Cumulative Percentage Counts of Salmon Ascending North Esk**



5. This feature of east coast rivers, and the fact also that within individual rivers there are many different populations of salmon, contribute to the complexity of managing the rivers and of determining appropriate conservation, stocking and exploitation regimes.

#### Ownership/Management

6. The right to fish in Scotland for salmon, whether by rod and line or net, is a private heritable one. It is quite distinct from the right of landowners to fish other species in rivers adjoining their land (riparian rights). In some cases the two rights may be enjoyed by the same individual: and others not. The salmon fishery right is held to be pre-eminent.

7. A recognition that multiple ownership of salmon fishery rights within a river is not perhaps conducive to whole river management led to the UK Parliament passing legislation in 1828 (a mere 10 years after Canada/USA resolved minor issue of the 49<sup>th</sup> Parallel!) allowing proprietors to raise levies for bailiff etc activities. This was taken further in 1862 and 1868 when legislation first divided Scotland into districts for salmon purposes and in the later year created the concept of District Salmon Fishery Boards (DSFBs).

8. DSFBs embody the concept of subsidiarity and local management – long before the relatively recent acceptance and enunciation of such concepts. There are currently 53 Boards. The main players are the angling proprietors but there is also a legal requirement to include a representative of netting interests, where these exist, and anglers. In recent times, a number of Boards have opened their doors, on a non-voting basis, to bodies such as the Scottish Natural Heritage and Scottish Environment Protection Agency – offering Boards the opportunity to take a more holistic approach.

9. Funding of Salmon Boards is by means of levies on proprietors (angling and nets). There is no direct central funding but in 1989, central Government abolished rates payable to local Government bodies on sporting activities such as angling where there was a DSFB in place, and this was extended to all owners of salmon fishings in 1995.

#### Legislative framework

10. The law in Scotland governing salmon and its exploitation is ancient. Specific legislation can be traced back to 1424 but other references confirm earlier statutory interest. This includes the requirement of 12/13<sup>th</sup> century which in respect of weekly close times required cruive traps to be opened to such an extent that a three year old pig could circulate in the freed passage so that neither its tail nor nose touched the sides.

11. It is worth emphasising that succeeding legislation has always tended to be restrictive in terms of its effect, providing proof if proof were needed that concepts of sustainability and of precautionary principle/approach were recognised and applied long before current management jargon took ownership.

12. As indicated earlier, the main feature of legislation is the responsibility which it places on Boards for day to day management of salmon in their areas. For example



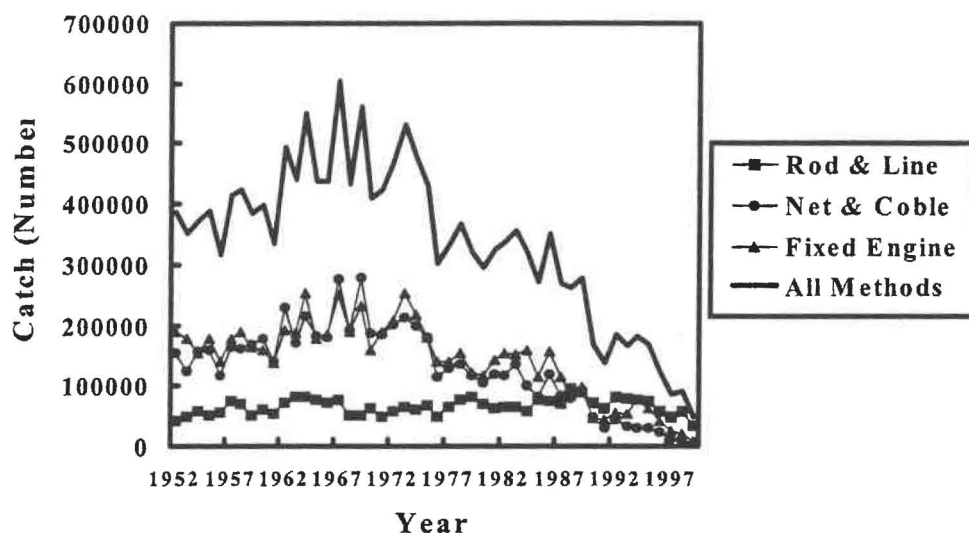
appointing bailiffs, determining fishing times, undertaking riverine works, devising stocking programmes. However this is within a national framework which:

- imposes close times (including a prohibition on fishing on Sundays);
- defines fishing methods including design and construction;
- prohibits the taking of unclean and unseasonable fish;
- prohibits the killing of juvenile fish;
- makes regulations on fish passes and screens.

### Current state of stocks

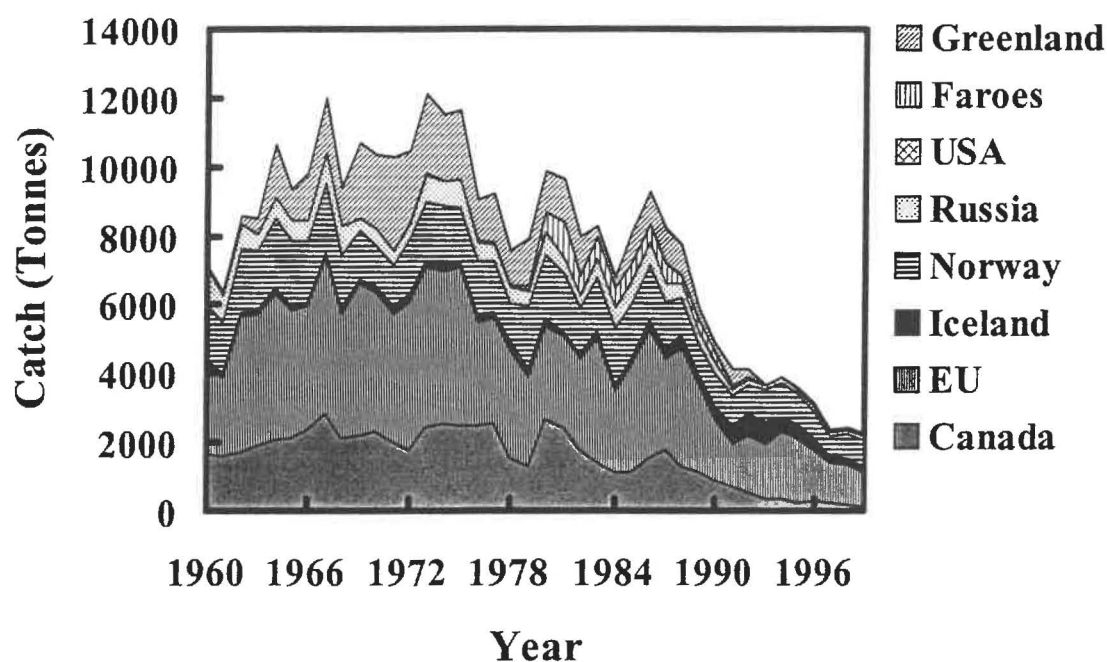
13. Catches of salmon in Scotland are revealed in Figure 13.1. These make depressing reading, the 1999 catch being 35% below the all-time low of the previous year.

**Figure 13.1. Scottish Salmon and Grilse Catches**



14. Whilst the declines can be attributed in part to a major reduction in netting effort, the constancy of the rod and line catches suggest a major decline in stock abundance. That the pattern is reflected throughout the range of the Atlantic salmon (see Figure 14.1) supports the contention that the problem occurs during the marine phase of the fish's life.

**Figure 14.1 Nominal Catches of Salmon**



#### Action in hand

15. The use of offshore gill nets has been banned in Scotland since 1962. Under the terms of netting regulations introduced in 1992, no net may be designed or constructed to catch salmon by enmeshing them, and the use of monofilament twine in any part of a net is prohibited. Coastal and estuary nets which, as mentioned earlier, are fished under private, heritable rights have been substantially reduced, both in number and effort. Fixed engine effort, for example, in 1998 was 15% of that in 1966. Total catch by nets in 1999 was 15% of that in 1995. This year Scottish netsmen voluntarily postponed the opening of their season by six weeks – a welcome gesture.

16. Eighteen Salmon Boards now have baits and lures regulations in place. By prohibiting the use of worms, shrimps, multiple hooks etc catching fish becomes more difficult and self-evidently more have a greater chance of surviving to spawn.

17. More Boards are now operating catch and release policies – admittedly on a voluntary basis. Nevertheless the contribution which this makes to salmon conservation should not be understated. In 1999, 29% of total rod and line catch and 22% of overall catch was returned. In weight terms this amounts to about 53 tonnes – greater than the total West Greenland catch (reported and unreported).

18. A significant feature of the response to declining stocks has been the activity of Boards in the area of restocking. Figures for 1999 point to one and a quarter million eyed ova, 3 million unfed fry, nearly 2 million fed fry, and 300,000 parr.

19. In this area of ongoing action the activity of the Scottish Executive's Freshwater Fisheries Laboratory (FFL) is worth mentioning. FFL is extensively involved in salmonid activities. It has major monitoring programmes on the Rivers North Esk, Shieldaig, and two tributaries of the River Dee, the Girnock and Baddoch. A number of innovative projects including one currently which will seek to plot seal activity in the Loch Shieldaig area are also being undertaken. The Laboratory is also working closely with a number of Boards on a major programme for reconditioning of kelts.

### **Aquaculture**

20. It is inevitable that at a conference of the North Atlantic Salmon Conservation Organisation and dealing with the Oslo Resolution that the main focus of aquaculture should be on Atlantic salmon. However it is worth bearing in mind that farming of other species is also undertaken in Scotland. These species include trout, turbot, halibut, cod and shellfish.

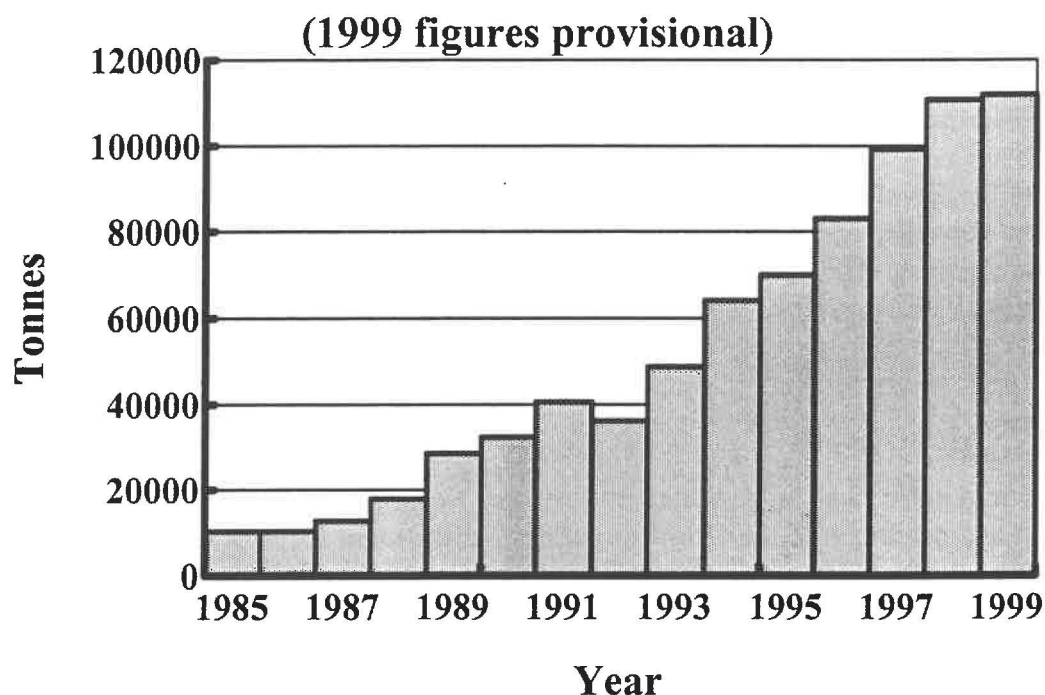
21. Compared with salmon the scale of production of these species is very small – production, for example, of cod this year will be a pilot 50 tonnes – but longer-term they could ease the pressure on salmon (wild and farmed) and there is a need to bear in mind the lessons, some times painfully learned, from salmon aquaculture.

### **Scale of salmon farming in Scotland**

22. The salmon farming industry in Scotland is essentially concentrated on the west coast, the Western Isles and Orkney and Shetland. The bald facts are that there are approximately 340 farms which produced roughly 110,000 tonnes in 1999 worth circa £500 million (initial production and processing). Some 6,300 jobs, direct and indirect, are involved.

23. These facts tend to mask the substantial growth the industry has made in a relatively short time (see 23.1). Also the significance of the jobs provided lies as much in their location as in their number. Seventy-five per cent of the jobs are in the Highlands and Islands: areas where alternative employment opportunities are scarce. For that same reason the socio economic contribution of wild salmon and sea trout and the angling opportunities which they offer need to be borne in mind.

**Figure 23.1 Scottish Salmon Farming  
Production**



#### Regulation of industry

24. There is a perception, even in Scotland, that the aquaculture industry is under-regulated. The facts are somewhat different. This regulation comes in a variety of forms including:

24.1 Leases from Crown Estates. Most of the foreshore around Great Britain is owned by the Crown. It is administered on the Crown's behalf by the Crown Estate Commissioners (but incidentally the income is payable to the National Treasury) who act as landlord and quasi-planning authority (local authority planning responsibility runs only to the high watermark). In exercising the latter role, the Crown Estate Commissioners consult a number of relevant bodies on fish farm applications including the Scottish Executive (for its broader fishery interests), local authorities, Scottish Natural Heritage and the Scottish Environment Protection Agency.

24.2 Registration with Scottish Executive. Under the terms of the Diseases of Fish Acts 1937 and 1993, fish farms are required to be registered with the Scottish Executive. Under EU/domestic legislation farms are inspected annually.

24.3 Navigational aspects. Fish farms are controlled under the Coastal Protection Act 1949.

24.4 Discharge consents. The impact of fish, feedstuff, medication, natural discharges have to be within limits authorised by the Scottish Environment Protection Agency under the Control of Pollution Act 1976.

24.5 Safety of Personnel. Fish farms are subject to the full panoply of Health and Safety legislation.

24.6 Use of medications. Medicines and veterinary medicinal products are licensed by the Veterinary Medicines Directorate under legislation set down by the EU.

#### Pressures facing the industry

25. The graph at 23.1 reveals a Scottish industry which has made remarkable growth in a short period but it faces a number of pressures. The sector remains highly competitive. The dominant player (nearly four times the size of the Scottish industry) is Norway. But this year Chile is expected to overtake Scotland as the second largest producer of farmed Atlantic salmon and substantial growth is also being made by the Faroese industry. The strength of sterling has also served to disadvantage the Scottish industry.

26. Pressures are also evident on the environment front. The industry continues to receive criticism from angling bodies and well-known environmental organisations. These criticisms focus on concerns about possible impact on the seabed, on the possible interaction on wild salmon through escapes, and on the problems of sea lice particularly on sea trout in the north west of Scotland.

27. The industry has also had to contend with the problems of infectious salmon anaemia. First identified in Norwegian waters in 1984, then in Canada in 1996, the first outbreak of the disease in Scotland occurred in May 1998. In total there have been 11 confirmed outbreaks and 25 suspect cases. The last confirmed case was in May 1999. Seen by some in the industry as draconian, the response to confirmed cases was to require immediate clearance of the site, disinfection of all facilities and extensive fallowing – all of this with no compensation provided.

#### Action being taken

28. Regulation of the aquaculture industry is not static. Changes are being made to reflect increased knowledge, in acknowledgement of concerns, and in accordance with EU and domestic legislation.

29. One of the changes proposed concerns the role of the Crown Estate Commissioners. It is recognised that the dual role of landowner and quasi-planning authority is not appropriate – notwithstanding the manner in which the latter is actually conducted (para 24.1). The Scottish Executive will be introducing legislation to assign planning responsibility to local authorities. The broad intention is that this will operate in a similar open, accountable way to that of terrestrial planning. This process will be underpinned by the Location Guidelines issued by the Scottish Executive in November 1999 which identified the suitability, or otherwise, of areas for further development and announced a presumption against any development on the north and east coasts.

30. In March 1999 new tougher environmental assessment regulations were introduced throughout the EU. These will apply to aquaculture developments – existing and new; in the case of the former when current development controls come up for renewal.

31. As mentioned at paragraph 27 a major challenge faced by the industry has been ISA. In response to that a Joint Government/industry Working Party was established to review all relevant practices. A report containing some 74 recommendations covering matters such as fallowing, husbandry, movement of stock, disinfection regimes etc has been produced and Scottish Executive Ministers have given a commitment to seeing these carried forward. The discovery of ISA in wild fish – some well removed from fish farms – has raised the possibility that the virus exists at a low level in the natural environment. In the light of this an increase surveillance programme in Scotland and England is being mounted.

32. The development of new treatments for sea lice, which is a major economic problem for the industry and which is seen by some as contributing to sea trout declines, continues – driven, understandably, by the industry. The major players in the industry in Scotland have also committed themselves to the development of an adherence to independently auditable Environment Management Systems.

33. A potentially major contribution to the development of improved relations between wild and farmed salmon interests has been the creation of a Tripartite Working Group, chaired by the Scottish Executive and comprising representatives of the two interests to look at problems of mutual interest in the north west of Scotland. From this it is planned that Area Management Agreements will be drawn up at a local level to address issues such as sea lice, fallowing and general siting. It is early days yet. Mutual suspicion remains and success will be dependent on the development of trust. However all concerned see this as holding out considerable promise for the future.



## **PART II**

### **Implementation of the Oslo Resolution in Scotland**

34. As part of the UK, which is a member state of the European Union, Scotland is committed to the implementation of the Oslo Resolution to minimise the impacts of aquaculture on wild stocks of Atlantic salmon.

35. Returns to NASCO giving details of the implementation of Oslo Resolution are divided into four categories:

1. General Measures
2. Measures to minimise genetic and other biological interactions.
3. Measures to minimise disease and parasite interactions.
4. Research and Development

36. The attached Annex provides details of the returns made to NASCO by Scotland.

37. A number of initiatives require special mention, and these are detailed in paragraphs 38-42 below.

38. Following the outbreak of Infectious Salmon Anaemia in Scotland in May 1998, a Joint Government/Industry Working Group was established to identify the measures required to prevent/minimise the occurrence and impact of further outbreaks. The Group made a number of recommendations that have been accepted by the Scottish Executive, including:

- Gametes from ISA infected salmon must not be used.
- Hatchery operations must include disinfection of equipment and ova.
- Seawater must not be used at any stage in the freshwater production phase.
- Strict hygiene must be observed at all times, including the use of helicopters, road tankers and wellboats.
- There should be a cessation of bus-stop deliveries by wellboats, except to empty sites.
- Stress on smolts should be minimised by reducing handling and minimising transport.
- Broodstock and juveniles should be kept separate at all times.
- Mortalities must be dealt with correctly, mortalities and waste must be ensiled in accordance with the requirements for dealing with ISA-infected material.
- Adequate protection against predators that might damage gear should be ensured.
- Risk assessments should be made before any smolt transfer operations.
- There shall be a presumption against sea water-sea water transfer between sites.
- Marine trout farms must be treated in the same way as salmon farms.

39. A Working Group on Farmed Fish Escapes, comprising members from the salmon farming industry, freshwater fish farming industry, Association of Salmon Fishery Boards and the Scottish Executive was established to investigate measures to improve containment of fish in aquaculture facilities and to develop plans for the recapture of escapes. The Group made a number of recommendations including:

- The Crown Estate Commissioners should consider whether adoption of the Environment Management Strategy developed by the largest industry group should be a condition of the lease for all farmers.
- An environmental impact assessment should include an assessment of the possible risks to wild stocks from escapes.
- There should be an accelerated replacement of old equipment.
- There should be rapid notification of escapes and this should be made a statutory requirement.
- There should be a full audit trail of all farming operations and equipment.
- Nets that could be used to effect recapture of escapes should be kept at strategic locations.
- A Code of Containment based on proposals from the joint NASFI/NASCO Liaison Group should be developed in Scotland.

40. A Tripartite Working Group has been established comprising representatives of the salmon farming industry, wild fish interests and chaired by the Scottish Executive to develop and promote the implementation of measures for the restoration and maintenance of healthy stocks of wild and farmed fish, to develop and promote the initiation of measures for the regeneration of wild salmon and sea trout stocks, and to propose arrangements at a local and national level for taking forward the foregoing and to ensure that the results of this work are reflected in the development of Local Authority fish farm planning guidelines and Framework Plans.

41. In addition, representatives of the Scottish salmon farming industry and the Scottish Executive have participated in the NASFI/NASCO Liaison Group and the Working Group established to develop internationally agreed codes of containment.

42. A consultation exercise to consider the management of Scotland's freshwater fish and fisheries was launched in April 2000. A document "Protecting and Promoting Scotland's Freshwater Fish and Fisheries: A Review" forms the background to this exercise.

## **Conclusion**

43. The Scottish Executive shares the widespread concern about the state of salmonid stocks and to that end has issued a consultation paper outlining possible proposals for increasing the statutory powers of District Salmon Fishery Boards and Scottish Ministers.

44. The Scottish Executive also recognises the important parts that both salmon fishing and aquaculture play in many remote parts of Scotland where alternative sources of economic activity are limited. The Executive believes that the farming industry has the potential for further development but accepts that this must be achieved in a way that has full regard to the environment and the wild stocks. The Executive sees the close involvement of both wild fish and farming interests as being crucial to a successful future and believes that the mechanisms being put in place as a result of the efforts of the Tripartite Working Group show the way forward.

# OSLO RESOLUTION

Notes on implementation of the Oslo resolution in Scotland.

1. General Measures	Details of Action Taken
<b>1.1 Sites:</b>	
1.1.1 Sites only to be assigned for aquaculture where hydrographical, epidemiological, biological and ecological standards can be met	Locational guidelines issued by Scottish Executive Rural Affairs Department in 1999. Leases for fish farm sites issued by Crown Estate Commissioners. Consultation with Local Authorities. Advice on hydrographical, biological, fisheries and ecological issues obtained from Fisheries Research Services, Scottish Natural Heritage, Salmon and Freshwater Fisheries Inspectorate, wild fishery interests. Consent to discharge required from Scottish Environment Protection Agency.
1.1.2 Siting of units to avoid risk of damage by collision	Siting must meet with approval of the Scottish Executive Development Department, Transport Division to ensure that the farm does not constitute a navigational hazard. Must comply with Coast Protection Act 1949.
1.1.3 Adequate marking of aquaculture units	Fish farms must be marked with appropriate navigational markers and lights.
<b>1.2 Operations:</b>	
1.2.1 Management of aquaculture units to prevent and control diseases and parasites	All aquaculture facilities are subject to inspection and disease testing under EU and national fish health legislation. GB is an approved zone for VHS and IHN, and has additional guarantees under EU legislation against the introduction of <i>Gyrodactylus salaris</i> .
1.2.2 Management of aquaculture units to prevent escape of fish	The establishment of freshwater fish farms is subject to Local Authority planning regulations. The Planning Authority consults widely and, if planning permission is granted, attaches conditions such as requirements for the prevention of escapes. Tripartite Working Group (Scottish Executive/fish farming industry/wild fish interests) has initiated development of Area Management Agreements, one aspect of which requires the implementation of measures to minimise escapes. Prevention of escapes has been considered by a joint government/industry/wild fish interest Working Group.

<b>1.3 Transfers:</b>	
1.3.1 Transfers conducted so as to minimise potential for disease/parasite transmission and for genetic and other biological interactions	Salmon or salmon eggs may not be introduced into a salmon fishery district for which there is a district salmon fishery board without permission from the board, except where the waters constitute or are part of a fish farm as defined in the Diseases of Fish Act 1937.
1.3.2 Introduction of mechanisms to control transfers where necessary	This issue has been addressed in the recent document "Protecting and Promoting Scotland's Freshwater Fish and Fisheries: a review".

<b>2. Measures To Minimise Genetic And Other Biological Interactions</b>	
<b>2.1 Design standards for Aquaculture Units:</b>	
2.1.1 Establishment of standards and technical specifications for the design and deployment of aquaculture units (marine and freshwater)	Joint government/fish farming/wild fish interests Working Group on Farmed Fish Escapes produced report addressing escapes. Recommendations include replacement of wooden cages with more modern, robust cages.
2.1.2 Optimisation of containment of fish through use of appropriate technology for prevailing conditions	NASFI/NASCO Liaison Group considering these issues. Working Group established to examine technical issues. Equipment deployed should be suitable for the site and for conditions likely to be experienced.
2.1.3 Regular routine inspection and maintenance of aquaculture systems and upgrading of equipment as new technological improvements become available	Working Group on Farmed Fish Escapes highlighted need for regular maintenance and inspection. NASFI/NASCO Liaison Group considering these issues. Working Group established to examine technical issues.
2.1.4 Regular monitoring and use of efficient security systems	NASFI/NASCO Liaison Group considering these issues. Working Group established to examine technical issues. Working Group highlighted need for research into the development of suitable security systems.
<b>2.2 Salmon Enhancement:</b>	
2.2.1 Use of local stocks wherever possible	Enhancement undertaken by district salmon fishery boards, or proprietors where there are no boards. Salmon or salmon eggs may not be introduced into a salmon fishery district for which there is a district salmon fishery board without permission from the board, except where the waters constitute or are part of a fish farm as defined in the Diseases of Fish Act 1937. Local stocks invariably used nowadays.
2.2.2 Implementation of criteria for broodstock selection and management	District salmon fishery boards and Fishery Trusts may, and do, seek advice from Fisheries Research Services to augment the advice provided by their own biologists.
<b>2.3 Salmon ranching:</b>	
2.3.1 Use of local stocks or alternatively local ranching stocks	No ranching in Scotland.
2.3.2 Harvesting of ranched fish at or close to release site or in fisheries managed in a way that prevents over-harvesting of wild stocks	No ranching in Scotland.

<b>2.4 Salmon farming:</b>	
2.4.1 Use of local broodstocks where practicable	Many farms relied on local fish to establish initial broodstocks. However, selection for traits such as low grilising and disease resistance have led to the use of mixes of different stocks where the desirable characteristics of different strains are combined.
2.4.2 Efforts to recapture escaped farmed salmon	Working Group on Farmed Fish Escapes recommended site-specific plans be developed to contain fish and contingency plans to deal with escapes. Full audit trails should be available in relation to the equipment used, the fish introduced, husbandry and harvesting. NASFI/NASCO Liaison Group considering these issues. Working Group established to examine technical issues.
2.4.3 Establishment of site specific contingency plan in the event of large escapes	Working Group on Farmed Fish Escapes recommended site-specific plans be developed to contain fish and contingency plans to deal with escapes. Full audit trails should be available in relation to the equipment used, the fish introduced, husbandry and harvesting. NASFI/NASCO Liaison Group considering these issues. Working Group established to examine technical issues.



<b>3. Measures To Minimise Disease And Parasite Interactions</b>	
<b>3.1 Control and prevention of diseases and parasites:</b>	
3.1.1 Aquaculture production process conducted in accordance with appropriate fish health protection and veterinary controls, including the application of appropriate husbandry techniques to minimise risk of diseases (vaccination, use of optimum stocking densities, careful handling, frequent inspection of fish, proper diet and feeding regimes, avoidance of unnecessary disturbance, detailed health inspections, disinfection of transportation equipment and use of disinfection baths at production facilities)	<p>EU and national fish health legislation in place. All registered fish farms must be inspected. Additional guarantees in GB and Ireland to prevent introduction of <i>Gyrodactylus salaris</i>. Following to restrict disease and parasites and to allow seabed recovery is standard practice nowadays.</p> <p>ISA has been confirmed at 11 Scottish farms and suspected of being present on a further 25 farms. All fish at sites where ISA confirmed were subject to immediate slaughter. Movement controls were introduced at all confirmed and suspect sites. Following is mandatory for infected (6 months) and suspect sites (3 months at sites where risk of disease is judged to be minimal). Increased levels of sampling and testing are in place. ISA virus detected in wild fish (trout, eel) in a number of locations around Scotland.</p>
3.1.2 Treatment or removal of diseased stock and measures to ensure diseased fish are not released to the wild	Where ISA was confirmed, all fish subject to immediate slaughter. At suspect sites, movement restrictions introduced immediately. All slaughtering to be done in contained conditions, including containment of blood, offal and water used in the process. All affected material must be ensiled by blending to a liquid state, then mixing with formic acid, the material being held for at least 24 hours at a pH of less than 3.9. Full audit trails of all actions must be maintained for inspection by Fish Health Inspectorate.
<b>3.2 Stocking density:</b>	
3.2.1 Aquaculture production adapted to the site's holding capacity and stocking density should not exceed levels based on good husbandry practices	Veterinary controls on animal welfare apply, as do voluntary controls through industry codes of practice. Pressure from consumers to comply with such codes. Increasing interest within EU in development of welfare protocols.
<b>3.3 Removal of dead or dying fish:</b>	
3.3.1 Removal of dead/dying fish and disposal along with waste materials in an approved manner	Controlled by a combination of statutory and voluntary codes. A variety of methods exist for the removal of dead fish, depending upon the design of the facility, e.g. dead sock method. There are regulations (EC Directive 90/667) to control fallen animals, which includes fish from aquaculture.
3.3.2 Establishment of procedures for effective removal and disposal of	Approved methods include incineration and burial at an approved site and are

infectious material	usually regulated by the local authorities. Where ISA identified, fish must be disposed of by means of ensilement as described above.
3.3.3 Establishment of contingency plans for disposal of mortalities from emergency situations	Contingency plans for the disposal of mortalities under emergency situations are covered under the Fish Health regulations. Encouragement by government to private companies to develop disposal facilities.
<b>3.4 Adequate Separation:</b>	
3.4.1 Separation of aquaculture facilities on the basis of a general assessment of local conditions	Fisheries Research Services, Scottish Environment Protection Agency, Salmon and Freshwater Fisheries Inspectorate, Scottish Natural Heritage, wild fish interests are consulted by Crown Estates and Local Authorities when applications or leases are to be renewed.
<b>3.5 Year Class Separation:</b>	
3.5.1 Rearing of different generations in separate locations where possible	Single year class stocking widely practised and actively encouraged.
<b>3.6 Fallowing of Sites:</b>	
3.6.1 Use of a fallowing regime wherever possible	Formal controls where ISA confirmed or suspected. SERAD strongly advise adoption of a fallowing strategy and the fallowing period should be as long as possible. Industry are developing Regional management plans and Tripartite Working Group has stimulated the development of Area Management Agreements.
<b>3.7 Use of Medicines and Disinfectants:</b>	
3.7.1 Careful use of medicines and disinfectants in accordance with manufacturers' instructions, Codes of Practice and in compliance with regulatory authorities	All medicinal products require authorisation by the Veterinary Products Committee and the assessment of each product covers a wide range of factors including pharmaceutical quality, efficacy and safety to the operator, the fish and the environment. In most cases, use of a product on a farm is also regulated through veterinary prescription and by the need for a consent to discharge from the Scottish Environment Protection Agency. Directive 96/23/EC on monitoring veterinary residues in farmed salmon is in force.
<b>3.8 Lists of Diseases:</b>	
3.8.1 Lists of prevailing infectious diseases and parasites and methods for control to be maintained by appropriate authorities	Covered by EC List I, II and III diseases, and UK legislation in place to implement the relevant Directives. Most effort is related to maintaining the UK as a zone free of VHS, IHN and <i>Gyrodactylus salaris</i> , and to regulate movements of fish with IPNV and BKD, and to eradicate ISA.

<b>4. Research And Development</b>	
<b>4.1 Research, small-scale testing and full-scale implementation of:</b>	
4.1.1 Wild salmon protection areas	Locational guidelines issued by SERAD in 1999. Presumption against further development of fish farming on the north and east coasts of Scotland.
4.1.2 Sterile salmon	The Scottish Executive is contributing to an EU funded collaborative study involving centres in Scotland (Fisheries Research Services (Marine Laboratory, Aberdeen); Gatty Marine Laboratory, St Andrews University), Ireland (University College, Galway) and Norway (Institute of Marine Research, Matre Aquaculture Research Station).
4.1.3 Tagging and Marking	Fish are not marked or tagged. Each smolt-rearing unit may supply a number of cage-rearing sites and each cage-rearing site may receive fish from a number of smolt-rearing units. Given sufficient information on the frequencies of a number of genetic markers in both source (i.e. fish farm) and sink (i.e. local salmonid populations), it is theoretically possible to identify the origin of individuals or parentage of progeny on a probabilistic basis, although this may identify the smolt-rearing unit rather than the farm from which fish escaped.
4.1.4 Designation of aquaculture regions	Locational guidelines introduced by SERAD propose 3 categories of areas: Category 1 where development acceptable only in exceptional circumstances, Category 2 where prospects for further development are limited but there may be potential for modifications of existing operations or limited expansion of existing sites, particularly where proposals will result in an overall reduction in environmental effect, Category 3 where there may be better prospects of satisfying environmental requirements. Detailed examination of each application always required.
4.1.5 Alternative production methods (land-based, closed or contained floating facilities and other containment technologies)	Land-based salmon grower sites have not proved to be economically viable in Scotland. Most of those that have been established have become specialised in broodstock production or have turned to other species, such as halibut.
4.1.6 Use of local broodstocks	Stocks from multiple sources are currently used in Scotland.
4.1.7 Understanding of genetic interactions	Subsumed within on-going work on genetics and population structuring.
4.1.8 Prevention and control of disease and parasites	Work undertaken on development of vaccines, better methods of disease

	<p>detection, control of disease and aetiology of diseases in the wild. Specific programmes include: improvements in control of <i>Furunculosis</i>; better methods for detection of <i>Gyrodactylus salaris</i>; detection and control of Bacterial Kidney Disease, Pancreas Disease and IPN Virus. Work underway in relation to salmon lice, ERM and Pasteurella. Research on understanding of fish immune systems. Interaction of disease in wild and farmed fish is being investigated. Occurrence of Rhabdoviruses in wild marine fish in European coastal waters being investigated.</p>
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