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Aquaculture, Introductions and Transfers and Transgenics Focus Area Report

EU-UK (England & Wales)

North Atlantic Salmon Conservation Organization

FOCUS AREA REPORT
ON
AQUACULTURE, INTRODUCTIONS AND TRANSFERS, AND TRANSGENICS

UK (England and Wales)

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CONTENTS

Note: Appendix 1 provides definitions of all terms underlined in the text and of the acronyms used.

1. Introduction.

1.1. Activities related to aquaculture, introductions, transfers and transgenics

1.1.1. Aquaculture

There is no saltwater farming of adult (post-smolt) salmon (*Salmo salar*) in England and Wales in either land-based or cage facilities. About 1.9 million salmon parr/smolts (2007 data) are reared each year in freshwater facilities in England for on-growing in marine cages in Scotland. In addition about 1.5 million salmon and sea trout (*Salmo trutta*) are reared each year for stocking programmes.

A total of 222 freshwater sites are registered for salmonid production in England and Wales, 93 producing brown trout (*Salmo trutta*) and 170 rainbow trout (*Onchorynchus mykiss*). Production is both for the table and for stocking into rivers and still waters. The total production of brown trout in 2007 was 355 t, of which 222 t (79%) was for the table and 74 t (21%) for stocking; the production of rainbow trout was 16,251 t of which 12,535 t (77%) was for the table and 3,716 t (23%) for stocking.

A range of non-salmonid fish species, including some non-indigenous species, is reared at 193 coarse fish farms mainly for stocking fisheries. The Environment Agency (see Section 1.2) also runs two coarse fish farms where it produces about 600,000 coarse fish each year for restocking waters to assist rehabilitation.

1.1.2. Introductions and transfers

Rearing of juvenile salmon and small numbers of sea trout sea trout (*Salmo trutta*) is undertaken to supply a range of mitigation, restoration and enhancement stocking programmes (see Appendix 1 for definitions of underlined terms); there is no stocking for ranching. The numbers of salmon eggs and juvenile fish stocked from 2006 to 2008 are shown in the text table below:

Stage	2006	2007	2008
Ova	47,190	38,000	10,000
Unfed fry	12,500	52,849	78,054
Fed fry	539,020	576,203	251,300
0+ parr	642,980	648,107	790,999
1+ parr	202,693	184,815	118,986
1+ smolts	108,450	186,556	100,106
2+ smolts	10,143	543	5,424

Brown and rainbow trout are stocked into a range of waters mainly to support put-and take fisheries (weights stocked in 2007 are given above). Brown trout are mainly stocked into still waters with only small numbers being released into rivers. Most stocking of rainbow trout is into still waters such as reservoirs and lakes with very restricted access to natural waterways containing salmon.

Non-salmonid species are mainly reared for stocking fisheries and for replacing losses after fish kills, for example caused by pollution events. Small numbers of certain non-indigenous species are reared and released into secure, enclosed waters run as specialist fisheries or for biomaniplilation (e.g. weed control). Stocking of coarse fish is

also undertaken by relocating fish between fishery sites. Several million coarse fish (e.g. 3.4 million in 2003) are released each year, including both reared and transferred fish.

1.1.3. Transgenics

There is no rearing of transgenic salmonids in aquaculture facilities in England and Wales at the present time.

1.2. Policy and management structure

The Environment Agency and the Department for Environment, Food and Rural Affairs (Defra), or the Welsh Assembly Government in Wales, each have roles in the monitoring and assessment of salmonid and freshwater fish stocks and the management of their fisheries. Defra and Welsh Assembly Government have overall responsibility for salmonid and freshwater fisheries within their areas of jurisdiction. They are jointly responsible for setting the statutory framework under which salmonid stocks and fisheries are managed, and the Secretary of State and Welsh Assembly Government have statutory responsibilities to consider the acceptability of all new fishery regulations and fishing licence duties proposed by the Environment Agency in England and Wales respectively.

The following subsections summarise the broad policy and management framework for aquaculture, introductions and transfers of fish and transgenics in England and Wales. The responsible authorities also operate a joint website (http://www.efishbusiness.co.uk/default.asp) which is a 'one-stop-shop' providing information on the regulations, guidance, news and mechanisms for on-line applications to move fish.

1.2.1. Aquaculture production businesses

The Aquatic Animal Health (England and Wales) Regulations 2009 (AAHR) require the authorisation of all Aquaculture Production Businesses by the Fish Health Inspectorate (FHI), based at the Centre for Environment, Fisheries and Aquaculture Science (Cefas). Authorisation requires the business owner or operator to meet minimum standards for biosecurity and record keeping, with the goal of preventing the introduction and limiting the spread of infectious disease within the UK.

It is a condition of an authorisation that the Aquaculture Production Business must:
(a) keep a record of:
- the movement of any aquaculture animal or any aquaculture animal product into or out of the business premises;
- the number of any aquaculture animals that have died in each epidemiological unit within the premises;
- the results of any surveillance carried out by the business; and
- the results of any surveillance carried out by the competent authority which have been notified to the business;

(b) follow good hygiene practice; and
(c) comply with any surveillance requirement imposed by the competent authority.

The Regulations also provide that fisheries stocked with aquaculture animals or fish translocated from other sites for angling purposes only (e.g. put-and-take fisheries) and other aquaculture production businesses in which aquatic animals are kept with no intention of placing them on the market (i.e. non-commercial installations) must be 'registered' with the FHI (rather than 'authorised'). Registration requires a named person - normally the owner, lease holder, operator or manager - to take responsibility for the

waters. That person must report any fish mortalities and provide all reasonable help and access to the FHI in the event of a fish mortality problem.

Non-commercial installations or put-and-take fisheries may be required to be authorised if the FHI considers that this is necessary to prevent or limit the spread of disease and serves the operator with a written notice to that effect.

1.2.2. Fish introductions and transfers

The Environment Agency, under Section 30 of the Salmon and Freshwater Fisheries Act 1975 (SAFFA), currently regulates the movement of fish within all inland waters in England and Wales (other than movements onto an authorised Aquaculture Production Business which consists exclusively of, or is part of, a fish farm and which, if it discharges into another inland water, does so only through a conduit constructed or adapted for the purpose). Anyone wishing to introduce any fish into any rivers, canals, reservoirs, lakes and ponds, whether public or private, in England and Wales must be in possession of written Section 30 consent from the Environment Agency. In practice, the Agency does not demand that consents are obtained to stock small, enclosed ornamental or garden ponds.

As part of the consenting procedure the Agency considers the effects that the fish stocking will have on the fisheries and the general ecology of the receiving and connected waters. This includes factors like fish health (see Section 1.2.4), fish ecology and the ecology of plants and other wildlife. In addition, anyone wishing to use certain methods to remove fish (principally netting, trapping and electric fishing) must also apply to the Agency for consent. Consent is normally issued where the operation does not pose a significant risk to fisheries and the wider environment. The Agency will not grant Section 30 or removal consents into or from any unregistered or unauthorised waters. Separate regulations apply if the fish are not native to the British Isles (see Section 1.2.3).

While a small amount of stocking is conducted purely for conservation reasons, the majority is to maintain, improve or create fisheries, which will have both social and economic values. However, regardless of the purpose, stocking and transfers will only be permitted if the ecological and fish health conditions are met, and there is a presumption that requirements for stocking should not override the maintenance of good ecological conditions.

The conservation status of the receiving water may affect the outcome of the consents procedure. If the water is designated as a Special Area of Conservation, or a Site of Special Scientific Interest, then under the Habitat Regulations 1992 an appropriate assessment may have to be carried out to demonstrate that the introduction of the fish will not disrupt the integrity of the site. Similar procedures are in place to safeguard Sites of Special Scientific Interests under the Countryside and Rights of Way Act 2000. Stocking any designated site generally requires consultation with and assent from the relevant statutory conservation agency (Natural England or the Countryside Council for Wales).

The Environment Agency is working with Defra and the Welsh Assembly Government to reform its fish movement controls, under new powers provided by the Marine and Coastal Access Act 2009. At the time of writing, the proposed controls will require:

- each stocked fishery to have a fish movement permit, which establishes which native and non-native fish can be stocked into, kept and removed from the water. Conditions can be placed on a permit, for example, to remove damaging species from sensitive sites;

- anyone supplying fish for restocking to have an operating permit and to carry a consignment note for each stocking operation; and
- suppliers to notify the Agency of certain (high risk) movements.

This will replace the current scheme where each and every stocking operation needs a consent. In future, only permitted fish suppliers may move fish and only then where this complies with the source and receiving water permits. This will reduce the administrative bureaucracy on the industry and the Agency, and allow the Agency to focus its resources on higher risk operations. The intention is to consult on the details of the scheme before the introduction of secondary legislation in spring 2011.

1.2.3. Non-native species

The owners of many stillwater fisheries wish to release a range of non-native species into their waters to support diverse and interesting fishing. However, it is recognised that introduced non-native species of fish can have direct impacts on native species and their habitats. To counteract this risk, there are three current regulations that cover non-native fish species:

- The Wildlife and Countryside Act 1981 which controls the release of all non-native 'kinds', and certain listed non-native species that are regarded as already established, in the wild;
- The Prohibition of Keeping or Release of Live Fish (Specified Species) Order 1998 (as amended in 2003), issued under the Import of Live Fish Act 1980 (ILFA); and
- European Council Regulation 708/2007 Concerning The Use Of Alien And Locally Absent Species In Aquaculture.

The Wildlife and Countryside Act 1981 makes it an offence to introduce non-native species (or 'kinds') of fish into 'the wild' without a licence issued by Defra or the Welsh Assembly Government. The ILFA Orders extend controls to the keeping as well as release of non-native fish species, thus covering aquaculture sites (not regarded as 'the wild') and the ornamental fish trade, including fish kept in aquaria and garden ponds. These provisions also require any person who releases or keeps any of the listed species to be in possession of a licence issued by Defra or the Welsh Assembly Government, although for the purposes of keeping in indoor aquaria and garden ponds a few, commonly used species are covered under a general licence. The ILFA measures thus apply to importers, fish dealers, fish farmers, the ornamental trade and fisheries. Given that the measures only apply to listed species, these do not provide blanket coverage and effectively operate as a 'black list', but the list can be updated if new threats are identified. The full list of species to which these Orders apply is given in the leaflet "Controls on Keeping or Release of Non- Native Fish in England and Wales", which also gives further details about this legislation. (The leaflet is available at http://www.efishbusiness.co.uk/formsandguides/ILFALeaflet.pdf.)

In recognition of the threat that non-native fish may pose to native species, there is a general presumption against the issue of licences for the keeping or release of the listed species. Licences will be issued for release to the wild only where a species is considered appropriate, the water is enclosed, there is no flood risk and where site security is considered to be adequate. In addition, nature conservation issues (e.g. the proximity of designated sites) will be taken into consideration and referred to the statutory conservation agencies. A licence for the introduction of non-native species cannot be issued where a Section 30 consent would be refused, and vice versa, and Section 30 consents are not issued (for non-native species) for any site which falls within the 1 in 100 year floodplain. It is also an offence for any vendor to sell ILFA-listed species to a person not in possession of the appropriate licence. As with native species, stocking of non-natives supports the maintenance and development of fisheries for socio-economic

purposes. However, to balance these needs against the risks, nearly all stocking of non-native species is restricted to fully enclosed, artificial or highly managed fisheries, and there is a presumption against permitting any stocking that would compromise the maintenance of good ecological conditions in natural waters.

European Council Regulation 708/2007 concerning the use of alien and locally absent species in aquaculture establishes a framework governing aquaculture practices aimed at minimising the possible impact of these and any associated non-native species on native species and aquatic habitats. A Statutory Instrument implementing the measures in England and Wales is currently under preparation. The measures will require all proposed farming of non-native species to be subject to permitting and, where necessary, comprehensive prior risk assessment. Certain commonly farmed species (listed on an Annex to the Regulation) will be exempt from these provisions, except where Member States wish to take measures to restrict their use.

Recent harmonisation of fish health rules, under European Council Directive 2006/88/EC has removed previous controls on the movements of fish, whether for farming, human consumption, ornamental purposes or other trade. As a result, importers are now able to import most of the world's temperate fish species into the UK, on the basis only of their clinical freedom from disease. In light of concerns about a potential increased trade in non-native species, proposals are currently being developed to provide better controls on the keeping and release of non-native species. These would replace the current reactive procedures, whereby risk assessments and legislative changes have to be applied retrospectively, with a mechanism which would allow appropriate risk assessment procedures and regulations to be applied in advance of fish becoming established in trade. A new ILFA list has been developed at the taxonomic Order level which would effectively cover all species of temperate / sub-tropical fish. It is anticipated that these proposed measures will be consulted on early in 2010 and implemented soon after.

1.2.4. Fish health

Fish in farms, freshwater fisheries, rivers and lakes in England and Wales are free from some of the most serious diseases that occur in other countries. This, in part, reflects our island status. However, legislation helps prevent the spread of fish diseases. It additionally helps minimise damage to fisheries or the environment potentially caused by unregulated or inappropriate fish movements.

Under the AAHR, all aquaculture production businesses (fish farms and fish dealer businesses) must be authorised by the FHI, and that authorisation includes the operation of an approved biosecurity measures plan, aimed at minimizing animal health risks to and from that business. In addition, all waters from which fish are removed, and waters into which fish are stocked, excluding rivers and canals, must be registered with the FHI. The registration requires a named person to take responsibility for the waters, and in the event of a fish mortality, that person must provide all reasonable help and access to the FHI. This includes the responsibility to report any suspicion of a notifiable disease. The AAHR also empowers the FHI to control the movements of fish stocks where a notifiable disease is suspected or confirmed.

For the purposes of gaining Section 30 consent for the movement of fish, a health check is mandatory if the fish are to be stocked into a river, stream, drain or canal, or if the receiving water is connected to any of these, or if the consenting Agency officer considers that there is a risk of fish escaping from the receiving water into adjacent waters. In such cases, having received a Section 30 application, the consenting Agency will request a health check of a sample of fish to detect the presence of specific fish parasites and/or evidence of clinical disease. This must be performed by a competent

fish health consultant and meet specific standards to make sure the sample represents the fish being introduced and their vulnerability to the listed parasites. On fully enclosed waters where the risk to other fisheries is considered to be minimal, a health check is not mandatory and may not be requested. In such cases the fishery owner has greater freedom for managing their own stocks on a 'buyer beware' basis. However, the Environment Agency would always recommends that health checks be carried out and retains the right to request a health check in all cases.

1.2.5. Transgenics

NASCO defines a transgenic organism as 'one that has been modified by genetic engineering to contain DNA from an external source'; this does not therefore include production of triploid salmonids. The use of genetically modified organisms (GMOs) in contained environments in England and Wales is controlled under the Genetically Modified Organisms (Contained Use) Regulations 2000. This Regulation defines genetic modification in relation to any organism as 'the altering of the genetic material in that organism by a way that does not occur naturally by mating or natural recombination or both' and therefore includes transgenic salmon as defined by NASCO.

Deliberate release of GMOs is regulated in the European Union by European Directive 2001/18/EC and Regulation (EC) 1829/2003 on genetically modified food and feed and in the UK by the Environmental Protection Act (1990) and the GMO Regulations (Deliberate Release) 2002. Unintentional movements of GMOs between Member States and exports of GMOs to third countries are governed by Regulation (EC) No 1946/2003 on transboundary movements of genetically modified organisms.

There is currently a presumption against releasing any genetically modified fish in England and Wales.

2. Implementation of the Williamsburg Resolution

2.1. Cooperation to minimise adverse effects

The Williamsburg Resolution proposes that Parties should cooperate in order to minimise adverse effects to the wild salmon stocks from aquaculture, introductions and transfers, and transgenics. The relevant authorities in England and Wales work closely with their counterparts in Europe and elsewhere to share best practice and minimise risks. For example, Cefas provides advice to international governments on the development of regulations and policy frameworks to create and maintain a sustainable industry and advises on EU standards for importing and exporting products and meeting the requirements for EU accession, working together with governments, industry and donor agencies to achieve this.

There is also close co-operation between the authorities responsible for regulating and authorising activities relating to aquaculture and fish movements within England and Wales, and they operate a joint website (http://www.efishbusiness.co.uk/default.asp) which is a 'one-stop-shop' providing information on the regulations, guidance, news and mechanisms for on-line applications relating to fish movements. They also work closely with organisations representing the aquaculture industry in England and Wales, such as the British Trout Association whose members account for about 80% of trout production in the UK, the Coarse Fish Farmers and Trades Association, and with fisheries interests, including on salmon stocking policies and plans.

The NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks (SLG(09)5) sets international goals

to ensure effective lice controls on 100% of farms and to retain 100% of farmed fish within production facilities. As there is no saltwater rearing of salmonids in England and Wales, there are no problems with sea lice attributable to farms. In relation to the retention of fish, the operator of any fish farm in England and Wales is required (under SAFFA as modified by the Environment Act 1995) to ensure that screens are in place to prevent the entrainment of salmon or migratory trout into the farm and to prevent the egress of farmed fish from the fish farm by way of the outfall, unless an exemption from the obligation is granted by the Environment Agency. The Agency assesses compliance by regular inspection of fish farm sites.

2.2. Provision of information by the proponent of an activity

Proponents of activities covered by the Williamsburg Resolution are required to complete a range of applications or notifications which provide the information enabling the regulatory authorities in England and Wales to assess the potential effects of the activities on wild stocks. These forms can be accessed on the internet via the efishbusiness website (see above) and cover the following topics:

- Application to register a fishery:
  http://www.efishbusiness.co.uk/formsandguides/FHI_RW1_Form.pdf
- Application to register aquatic animal holding (referring to any stocked or cropped waters, excluding rivers and canals):
  http://www.efishbusiness.co.uk/formsandguides/FHI_RW2_Form.pdf
- Application to authorise or change aquaculture production business:
  http://www.efishbusiness.co.uk/formsandguides/FHI_AW1_Form.pdf
- Application to introduce fish fry or ova:
  http://www.efishbusiness.co.uk/formsandguides/fr1.pdf
- Application to use fishing instruments (other than rod and line) and/or remove fish from inland waters:
  http://www.efishbusiness.co.uk/formsandguides/FR2v051.pdf
- Application to import live fish, live shellfish and eggs and gametes from fish and shellfish from outside the EU:
  http://www.efishbusiness.co.uk/formsandguides/Dof7.pdf
- Notification form for importation into Great Britain of live fish and shellfish from elsewhere within the European Union
  http://www.efishbusiness.co.uk/formsandguides/FHI_AAH1_Form.pdf
- Application for a licence to be issued under the Import of Live Fish (England and Wales) Act 1980 and/or Wildlife and Countryside Act 1981:
  http://www.efishbusiness.co.uk/formsandguides/ILFA1.PDF
- Notification form for import of live fish or shellfish from third countries:
  http://www.efishbusiness.co.uk/formsandguides/CVEDNotification.pdf
  and associated timetable:
  http://www.efishbusiness.co.uk/formsandguides/CVEDPage.pdf

2.3. Development and application of risk assessment methodologies

The Williamsburg Resolution requires Parties to develop and apply appropriate risk assessment methodologies in considering the measures to be taken in relation to aquaculture and fish movements.

2.3.1. Application of risk assessments

In England and Wales, the authorisation of fish farms under the AAHR includes the consideration of the risk posed by the farming of any given species at that site on the surrounding catchment. Authorisation would be refused for the introduction of a new species considered likely to have a significant detrimental impact on the receiving catchment. There are no marine fish farms in England and Wales and so there is no requirement for risk-based procedures to assess site selection of cage facilities.

All Section 30 stocking applications are assessed by local fisheries officers, in consultation with a senior technical specialist. The consent procedure applies a risk assessment protocol, which assesses the risk posed:

to:
- resident salmonid and other resident fish;
- designated sites and species; and
- other features of conservation interest,

by:
- the number, size and age of fish proposed to be stocked;
- their health status;
- the stocking location and timing; and
- their genetic integrity.

In addition, the Environment Agency Revised Salmon Stocking Policy (Appendix 2) indicates that both ecological and genetic risks must be assessed and considered acceptable before stocking with salmon will be permitted. (Socio-economic considerations are addressed in Section 1.2.2 and 1.2.3.)

EC Regulation 708/2007 applies to alien and locally absent species and requires specific risk assessments for introductions of such animals. In addition, a body has now been set up in Great Britain (GB), the Non-native Species Secretariat, to co-ordinate activities in relation to the management of non-native species in GB. This body includes the Non-native Species Risk Analysis Panel, which is a core group of risk assessment experts who provide advice on the risks associated with non-native species and pathways to ensure the provision of robust risk-based evidence to underpin decision making on non-native species. A number of peer-reviewed risk analyses have been completed in respect of non-native fish and shellfish species.

2.3.2. Development of risk assessment methodologies

Defra is funding research into the development of a risk assessment framework for the introduction of non-native species (Project SF0248 - Predicting the risks and impacts of non-native fishes under conditions of climate change). This will assist the implementation of existing and future UK legislation to regulate and control the keeping and release of imported fishes and their related diseases. Similarly, protocols are being developed to assess the impact of management initiatives (e.g. eradication) to combat the spread of non-native species.

Scientists from England were involved in an EU-funded project IMPASSE (Environmental impacts of alien species in aquaculture) which developed the European Non-native

Species in Aquaculture Risk Assessment Scheme (ENSARS) to support the new EU Regulation on the use of alien species in aquaculture (see Section 1.2.3). This aims to provide:

- guidelines for environmentally sound practices for introductions and translocations in aquaculture;
- guidelines on quarantine procedures; and
- risk assessment protocols and procedures for assessing the potential impacts of invasive alien species in aquaculture.

ENSARS provides a structured framework for evaluating the risks of escape, introduction to and establishment in open waters, of any non-native aquatic organism being used (or associated with those used) in aquaculture. In addition, it provides evaluation of potential risks posed by transport pathways, rearing facilities, non-target infectious agents and potential organisms, ecosystem and socio-economic impacts. It is anticipated that this scheme will be adopted in England and Wales in meeting the requirements of the EU Regulation.

2.4. Measures taken to:

2.4.1. minimise escapes of farmed salmon

The NASCO Guidelines on Containment of Farm Salmon (CNL(01)53) apply primarily to marine cages, although some reference is also made to land-based facilities. There is no farming of adult (post-smolt) salmon in England and Wales, and no significant escapes of parr/smolts produced for on-growing in Scottish farms have been reported.

As described in Section 2.1, operators of fish farms in England and Wales are required to ensure that screens are in place to prevent the entrainment of migratory salmonids (i.e. smolts or adults) into fish farms and the egress of farmed fish from the farms. The Environment Agency assesses compliance with this regulation by regular inspection of fish farm sites, and escapee numbers are assessed in routine juvenile salmonid monitoring programmes.

Surveys have been conducted to assess the numbers of farmed adult salmon escapees arriving from neighboring countries, and occurrences have generally been negligible (Cefas/EA, 2009), although small numbers were observed following a reported escape of salmon from a fish farm in Northern Ireland in 2001 (Milner & Evans, 2003).

2.4.2. minimise impacts of ranched salmon

There is currently no stocking of salmon for ‘ranching’ in England and Wales. Any proposals to stock for the purpose of ranching would be subject to the consent regulations outlined in Section 1.

2.4.3. minimise adverse interactions from enhancement activities

Measures to minimise adverse genetic and biological interactions from salmon stocking are given in the Environment Agency Revised Salmon Stocking Policy (Appendix 2).

The consenting of trout stocking in England and Wales, under Section 30 of the SAFFA, has historically been based upon the risk of disease and ecological impacts. Genetic impacts have rarely been an issue except in circumstances where a population may have been considered in need of special protection because of its unique nature, for example it may exist above an impassable barrier or there may be no history of stocking ever having

taken place. However, following a review of the evidence on the impact of stocking domesticated fertile brown trout on wild trout stocks, greater consideration is now being given to genetic concerns. After consulting fisheries, conservation and fish farming interests, the Environment Agency has decided to stop giving consent to stock rivers and most lakes with fertile (diploid) farm strain brown trout in England and Wales from 2015, with a phased introduction. From this date they will only permit fisheries to stock infertile (female triploid) brown trout or the progeny of local brood-stock reared under a suitable regime. The Agency is preparing guidance on local rearing schemes to make sure that these do not favour certain strains of wild fish that could dominate the wild population in the receiving water.

The only exception to this policy will be for stocking into totally enclosed waters with no significant natural brown trout production. 'Totally enclosed' waters are still waters with no outlet or inlet, or where there are adequate measures to stop the escape of brown trout. Stocking consents for diploid fish will still be granted for these waters**.** Further details are available at: http://www.environment-agency.gov.uk/static/documents/Leisure/consultation_summary_2026751.pdf

Stocking of non-native species or 'kinds' of fish would very rarely be permitted in waters containing salmon and then only subject to a risk assessment demonstrating that the expected effects on the salmon stocks would be minimal. In particular, the authorities will not permit farmed salmon or landlocked salmon (*Salmo salar,* Sebago) to be stocked in river catchments containing wild salmon, and releases in other catchments would only be permitted into fully enclosed stillwaters with no risk of flooding.

2.4.4. minimise risks of disease and parasite transmission

The guidance relating to risks of disease and parasite transmission in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks mainly involve the management of sea lice. This is not a problem in England and Wales because there are no marine fish farms. Issues relating to the comprehensive, regulated fish health programme including sampling, monitoring and disease control are addressed below and in Section 1.2.4.

The AAHR requires all waters from which fish are removed, and waters into which fish are stocked - excluding rivers and canals - to be registered with the FHI. The regulation also enables the FHI, to control the movements of fish stocks where a notifiable disease is suspected or confirmed. Efforts will be made to eradicate any outbreaks of a notifiable disease where possible, in order to maintain the high health status of farmed and wild fish.

For the purposes of Section 30 health checks, waters are divided into two categories, mandatory and non-mandatory. A health check will be mandatory if the fish are to be stocked into a river, stream, drain or canal, or if the receiving water is connected to any of these, or if the consenting Agency officer considers that there is a risk of fish escaping from the receiving water into adjacent waters. On waters where the risk to other fisheries is considered to be minimal, a health check may not be requested. (See Section 1.4.1 for further details).

2.5. Movements into UK of salmon from outside the NEAC area

The Williamsburg Resolution states that movements into a Commission area of reproductively viable Atlantic salmon or their gametes that have originated from outside that Commission area should not be permitted.

There is no specific legislation banning the import of live salmon or salmon ova, but anyone wishing to import salmon or their gametes must be authorized, and the fish must originate from sources of equivalent health status as regards the EU listed diseases for which GB has disease-free status or operates a control programme. Furthermore, no one would be permitted to release any such fish into the wild on conservation grounds. There are thus no imports of live salmon or salmon ova into England and Wales from other NASCO Commission areas.

2.6. Introductions of viable non-indigenous anadromous salmonids

The Williamsburg Resolution states that the introduction into any Commission area of reproductively viable non-indigenous anadromous salmonids or their gametes should not be permitted.

The keeping or release of non-indigenous species in England and Wales is covered by the regulations described in Section 1.2.3 (see also http://www.efishbusiness.co.uk/controls/part01.asp). All Pacific salmon and trout of the genus *Oncorhynchus* (except rainbow trout but including the migratory steelhead variety of this species) are included on the list of species to which The Prohibition of Keeping or Release of Live Fish (Specified Species) (Amendment) (England) and (Wales) Orders 2003 apply. Landlocked Atlantic salmon (all non-anadromous varieties of the species *Salmo salar*) are also covered by the regulations. Under these Orders a licence is required to keep or release any of the listed species; there is a presumption against issuing any such licences for non-indigenous anadromous salmonids. These Orders are enforced by the FHI, HM Revenue and Customs and the Environment Agency.

2.7. Introduction of non-indigenous fish into rivers containing salmon

The Williamsburg Resolution advises that no non-indigenous fish should be introduced into a river containing Atlantic salmon without a thorough evaluation of the potential adverse impacts on the Atlantic salmon population(s) which indicates that there is no unacceptable risk of adverse ecological interactions. The regulations pertaining to the release of non-native fish species in England and Wales are described in Section 1.2.3. There is a strong presumption against releasing any non-native fish into rivers containing salmon.

2.8. Application of the Guidelines for Action on Transgenic Salmon

The NASCO Guidelines for Action on Transgenic Salmon, CNL(97)48 (Annex 5), describes steps that the Council has agreed in relation to the potential risks posed to wild salmon stocks by transgenic salmonids. The regulations pertaining to the use of transgenic organisms in England and Wales are described in Section 1.2.5. There is no salmon farming in England and Wales and, in accordance with the Williamsburg Resolution, there is a strong presumption against the introduction of transgenic salmonids into the wild. As a result any use of transgenic salmon would be restricted to contained environments.

The Williamsburg Resolution also indicates that Parties should inform their salmon producers of the potentially serious risks to wild stocks from the development of transgenic salmon. There is currently no interest in the industry in England and Wales to employ transgenic fish because of consumer resistance.

2.9. Development and application of river classification and zoning systems

Annex 6 to the Williamsburg Resolution suggests options for developing river classification and zoning systems to assist with the development of management measures concerning aquaculture and introductions and transfers. As suggested, rivers in England and Wales have been classified according to the NASCO criteria for the Salmon Rivers Database. In addition, classification schemes are required in relation to the EU Water Framework Directive. All rivers have been assigned to River Basin Districts, which provide broad geographic groupings, and additional classification schemes are required including ecological and chemical status classification schemes for surface water bodies. However, such classification and zonation systems are not generally employed when assessing proposals in relation to aquaculture facilities or stocking activities because more detailed, up-to-date, river-specific information is utilised.

If a notifiable disease was detected in farmed or wild salmonids, the FHI would place restrictions on all movements of fish to and from that catchment until the disease had been eradicated or was believed to be no longer present. The principle for such control is enshrined in the EU Directive 2006/88/EC and it is implemented in England and Wales through the AAHR .

2.10. Initiation of corrective measures

The relevant authorities have powers to take prompt action where problems arise in relation to aquaculture and fish movements. The FHI is responsible for enforcing compliance with conditions of authorisation of Aquaculture Production Businesses and with the AAHR. Powers are provided for FHI to issue enforcement notices in respect of any non-compliance, while for serious non-compliance there are also powers to suspend and revoke authorisations. Where disease in aquatic animals is suspected, FHI will apply appropriate disease control measures in accordance with the AAHR. In the event of a notifiable disease outbreak, the controls under the AAHR override the Section 30 consent, and the presence of such a disease will prevent the issuing of further consents.

Under the proposed new legislation, fish movement permits will cover the introduction, removal and keeping of fish; these permits can be conditioned, amended and revoked.

Contingency Plans have been developed for major threats such as the possible introduction of *Gyrodactylus salaris*.

2.11. Steps to improve the effectiveness of the Williamsburg Resolution

The NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks indicates a need for a range of monitoring programmes for lice loads, containment breaches and escaped salmon. The issues relating to sea lice and escapes from marine cages are not relevant to England and Wales because there are no marine salmon farms. The management and monitoring of escapes from freshwater fish farms is discussed in Section 2.4.1.

Defra is funding research into the impacts of intensive in-river aquaculture on wild salmonids. An initial study (Defra Project SF0241 - Impact of intensive in-river aquaculture on wild salmonids), which was completed in 2007, investigated the effects of trout farms (both rainbow trout farms and brown trout) on both reproduction and smoltification in Atlantic salmon. The research involved laboratory-based studies on the impacts of identified contaminants within the fish farm effluents on salmon reproduction, smoltification and the ability of smolts to adapt to seawater. In addition, field-based studies were carried out where both male salmon and salmon smolts were caged

upstream and downstream of rainbow and brown trout fish farms to investigate the impact of the effluents on physiology and survival. The research suggested that the effluents from some fish farms may have significant impacts on Atlantic salmon particularly during sensitive life history stages such as reproduction and smoltification. In addition, effluents from rainbow trout farms may also have a deleterious effect on the macro-invertebrate populations, which include many of the prey items of juvenile salmonids.

These were only preliminary studies and do not provide the basis for determining the potential effects of aquaculture facilities on wild salmon populations. As a result a further study (Defra Project SF0256 -The impacts of contaminants and temperature on freshwater fish populations) has been initiated to follow up on the initial studies and assess the implications of environmental variability on the results. This project will be completed in 2014.

Defra is also funding research into the development of risk assessment protocols and management practices for the introduction of non-native fish species (see Sec 2.3). This project will be completed in 2012.

2.12. Development and distribution of educational materials

Maintaining public awareness of the risk posed by introductions and transfers of fish is recognised to be of great importance. As described above, the joint efishbusiness website (http://www.efishbusiness.co.uk/default.asp) is the primary source of information on fish movements in England and Wales and provides guidance, news items and details of the relevant regulatory procedures.

The various regulatory authorities have also developed a range of publicity leaflets which are supplied to anglers, fishery owners and operators of Aquaculture Production Businesses. Some examples of these are mentioned above, and further examples include:

- An FHI leaflet on the Aquatic Animal Health (England and Wales) Regulations 2009: http://www.efishbusiness.co.uk/formsandguides/Fisheries_Print2.pdf

- The 'Guide to protecting freshwater fish stocks from *Gyrodactylus* and other serious fish diseases' and the 'Guide to protecting freshwater fish stocks from Spring Viremia of Carp' prepared by Defra and the devolved administrations: http://www.defra.gov.uk/foodfarm/fisheries/documents/farm-health/keepout-gyrodactylosis.pdf and http://www.defra.gov.uk/foodfarm/fisheries/documents/farm-health/keepout-springviraemia.pdf

- Environment Agency internet advice on *Gyrodactylus salaris*: http://www.environment-agency.gov.uk/homeandleisure/recreation/fishing/38057.aspx

3. References

Cefas/EA. 2009 Annual assessment of Salmon Stocks and Fisheries in England and Wales 2008.

Milner, N.J. & Evans, R., 2003. The incidence of escaped Irish farmed salmon in English and Welsh rivers. Fisheries Management & Ecology, 10, 403-406.

Appendix 1: Glossary of Terms and Acronyms Used in this Report

AAHR: Aquatic Animal Health (England and Wales) Regulations 2009

CEFAS: Centre for Environment Fisheries and Aquaculture Science based at Lowesoft and Weymouth, UK

DEFRA: The Department for Environment, Food and Rural Affairs

Enhancement : stocking undertaken to help supplement fisheries that are limited by low stock levels and capable of supporting more.

ENSARS: European Non-native Species in Aquaculture Risk Assessment Scheme

ILFA: Import of Live Fish Act 1980

Mitigation: stocking may be done to overcome the effect of an activity on the productivity of a fishery. an example of stocking to mitigate such effects is the introduction of salmon parr to a river that has been obstructed, preventing the return of
adult salmon.

Notifiable disease: diseases which must be reported to the Ministers if there is a suspicion of their presence in any species of fish; this currently includes:

- Bacterial Kidney Disease (BKD)
- Epizootic Hematopoietic Necrosis **(**EHN**)**
- Epizootic Ulcerative Syndrome (EUS)
- *Gyrodactylosis salaris* (GS);
- Infectious Haematopoietic Necrosis (IHN)
- Koi Herpes Virus (KHV)
- Spring Viraemia of Carp (SVC)
- Viral Haemorrhagic Septicaemia (VHS)

Ranching: Artificially rearing juvenile fish and releasing them with the intention of harvesting all the adult survivors.

Restoration: stocking carried out to restore fish stocks that have been depleted, for example by pollution or mortalities

Stocking stages: 1+ parr/smolts are parr/smolts that are stocked out on or after 1st Jan in the first year after they hatched; 2+ smolts are stocked out on or after 1st Jan in the second year after they hatched.

Transgenic: This report uses the NASCO definition of a transgenic organism, which is 'one that has been modified by genetic engineering to contain DNA from an external source'.

Wild: a water from which it cannot be guaranteed that all the fish could be recovered with reasonable ease, or from which a viable life stage of the fish could escape into open watercourses or waters connected to a continuous body of water. In general, only small, fully enclosed sites from which fish can easily be recovered can be regarded as not 'the wild'.

Appendix 2: Environment Agency Revised Salmon Stocking Policy

1. CONTEXT & PURPOSE

The Agency's involvement in salmon[1] stocking in England and Wales is twofold:-

- undertaking salmon stocking;
- authorising the stocking of salmon by other parties under Section 30 of the Salmon & Freshwater Fisheries Act 1975.

The purpose of the document is to clarify the circumstances in which salmon stocking may take place, either by the Agency or by other parties. This is based on current policy, but takes account of recent international developments and advice in relation to salmon genetics.

2. GENERAL CONSIDERATIONS

The Agency has national policy and procedural documents that cover its own stocking activities and the determination of Section 30 consents. These are generic and cover all fish species. Staff involved in these activities are required to follow these policies and procedures.

All proposals to stock fish either by the Agency or by other parties are considered against generic criteria that are used to assess the potential impact on:

- fish stocks and fisheries (e.g. predation, competition, disease) and
- the wider environment.

In addition, species specific criteria may also apply, and in the case of salmon the potential genetic impacts on wild stocks must be considered (see Section 6 below)

Since salmon brood stock are usually obtained from the wild to support a stocking programme, the impacts on the donor stock must also be considered.

The principles that apply to the Agency's own stocking activity are essentially the same as those that apply to Section 30, but with the added requirements that:

- stocking must be considered against all other management options, and
- monitoring to assess efficacy is required.

As a consequence there are certain types of stocking that the Agency does not undertake.

3. CATEGORIES OF SALMON STOCKING & AGENCY INVOLVEMENT

3.1 <u>Restoration</u>

Definition: Stocking which is carried out after the removal of a factor(s), which has been limiting or preventing natural production.

[1] While this paper relates specifically to salmon, the Agency adopts the same principles in relation to sea trout

"Pump Priming" - Restoration of historic populations. In these cases the salmon run will have disappeared because of factors such as water quality decline or an impassable physical barrier. This type of stocking may be appropriate following the removal of a limiting factor(s), to facilitate or accelerate the reintroduction of a population. Examples where this has been done include the Thames, Trent, Tees, Tawe, Taff and Ogmore.

The aim here is to initiate or support the recovery of a self-sustaining run, not to introduce a stocking programme that is maintained in perpetuity. If salmon populations are initially absent there is no risk to native salmon stock (although potential impact on neighbouring stocks should be considered). However, if stocks are at a very low level genetic impacts could be substantial. The main factors which must be considered prior to stocking are:

- Impacts on existing species
- Impacts on existing fisheries (consult local fishery owners and clubs)

Rehabilitation of stocks following water and/or habitat improvements. This includes the replacement of fish following a fish mortality, land drainage operations and other activities, some of which may involve legal or contractual obligations. In these circumstances the potential impacts on the existing salmon stocks must also be considered.

Restoration stocking should not be undertaken until identified limiting factors have been removed or ameliorated. ***Where removal or amelioration of the limiting factor(s) requires a long-term programme of work, Restoration stocking may take place in parallel with the work programme, once started. The proposed programme of stocking relative to the programme of improvements works must be set out clearly in the project plan.*** An ongoing monitoring programme should be in place to assess the efficacy of the stocking programme.

The Agency may undertake restoration stocking of salmon in appropriate circumstances. Where possible the costs should be recharged in accordance with the polluter/impactor pays principle.

3.2 Mitigation

Definition: Stocking that is conducted to mitigate against lost production due to a scheme or activity that cannot be prevented or removed.

Examples of such schemes are the construction of reservoirs, power stations, barrages and impassable barriers that permanently eliminates production from part of a catchment. Mitigation stocking must be attributable to a specific scheme. There may be a legal requirement for stocking in mitigation of a scheme e.g Kielder. While the Agency may undertake the stocking this must always be fully funded either by an external body/developer or another Agency function; it must not be funded from the Agency's Fisheries budget.

Mitigation stocking should be limited to parts of the catchment where juvenile stocks are depleted (e.g. because of lack of spawning) and where water quality/flow conditions are such that survival may reasonably be expected to be high. However, if such areas cannot be identified or the catchment is at carrying capacity then stocking should be carried out using smolts.

The requirement for monitoring to assess efficacy of mitigation programmes will depend on the mitigation agreement in each case.

The Agency will not carry out mitigation stocking for migratory salmonids except where this is fully funded externally or from Agency sources other than fisheries.

3.3 Enhancement

Definition: Stocking that is carried out to supplement an existing stock where the production is less than the water body could potentially sustain.

This includes:

- Stocking undertaken to compensate for the effects of adverse environmental factors or lack of suitable natural habitat. Examples: extremes of flow, which may affect spawning success; lack of suitable spawning habitat where adequate nursery habitats exists.
- Stocking of fish above natural barriers to migration.

Enhancement stocking is generally carried out in those systems where the production is less than their potential. It is not a sustainable long-term answer to under production. In addition available economic data suggests that such a stocking programme may be uneconomic, the benefit to cost ratio low and there is a risk that such stocking may result in reduced returns.

For these reasons the Agency will not undertake or directly fund enhancement stocking of salmon.

3.4 Scientific Investigations

Definition: Stocking used as a tool to investigate fisheries management issues.

Salmon stocking can be a useful tool in scientific studies. For example in studying migration and behaviour, or in developing more effective breeding programmes.

Any Agency programme or application for Agency consent for this purpose, must be reviewed by the Agency's Fisheries Technical team. An assessment will be carried out to ensure that the proposal:

- is likely to contribute to further advancement of knowledge, and
- is not duplicated elsewhere, and
- is appropriate to the circumstances and
- will not risk irretrievable damage

Such programmes will also be subject to usual considerations concerning impacts on fish stocks, fisheries and the wider environment. Monitoring will only normally be appropriate for scientific investigations directly relating to breeding programmes. Stocking related to movement and behaviour studies, where there is no anticipated contribution to future stocks, will not normally require monitoring.

The Agency may undertake salmon stocking as part of a scientific investigation.

4.STOCKING CARRIED OUT BY OTHERS

For others wishing to undertake salmon stocking, the Agency may help in appropriate circumstances and as resources allow, with advice, brood stock collection, development of a monitoring programme (including tagging) and stocking out of fish. ***Agency assistance with Enhancement stocking only be given in the following circumstances where:***

- ***Analysis shows that the proposal can be expected to yield a net production gain.***
- ***The ecological and genetic risks have been addressed and are acceptable.***
- ***Cost benefit is demonstrated against other options.***
- ***A monitoring programme has been agreed, to determine the long-term effectiveness of the programme and feedback into future consenting decisions.***
- ***The stock programme is consistent with wider aspirations (e.g Fisheries Action Plans/Salmon Action Plans etc), and has broadly based local support.***

In addition stocking into inland waters requires Section 30 consent, and brood stock removal will normally require removal consents.

5. DESIGNATED SITES

5.1 SSSIs [Sites of Special Scientific Interest]
The Agency is required to consult formally with English Nature/CCW in relation to any proposals to stock salmon into a SSSI. In addition to all other criteria, the potential impact on the designated features of the SSSI must be considered.

5.2 Habitats Directive
Where a European or Ramsar site may be affected the Agency has an obligation under the Conservation (Natural Habitats etc) Regulations 1994 to ensure that there is no adverse effect on the integrity of the site from the introduction or removal of fish. Formal notice to EN/CCW is required. Depending on the designated features, an "Appropriate Assessment" may be required.

6. GENETIC CRITERIA & INTERNATIONAL AGREEMENTS

6.1 The Agency has sought advice on salmon genetics from leading experts in Ireland and Scotland, as well as England & Wales. There is a strongly held view, supported by both published and unpublished research that stocks can be highly adapted to local environmental conditions, and that these genetic adaptations have significant implications for the success or failure of stocking and potentially the whole salmon population (McGinnity et al 2003)

6.2 These views have recently been reinforced by the presentation at the Atlantic Salmon Trust 'Salmon at the Edge' symposium, of results from a major EU programme, the SALGEN project. These results show that:

- Fish derived from brood stock drawn from the same catchment give much better returns than 'non- native' introductions;
- There are important survival impacts in the second (and by implication subsequent) generations. Local/non local hybrids have poor survival when compared with local/local crosses.

- Stocking with non-local fish may result in lower production after two generations than if no fish had been introduced at all. (Obviously this only applies where a wild stock already exists).

6.3 International discussions via NASCO have also considered the question of genetics associated with stocking on a number of occasions. In March 2003 NASCO reviewed previous international agreements on salmon stocking and aquaculture, resulting in the Williamsburg Resolution. This was ratified by NASCO in June 2003 as Annex 4 CNL(03)57 Preliminary Guidelines for Stocking Atlantic Salmon.

6.4 Annex 4 sets out the key elements relating to salmon stocking and requires that:-

Where hatchery rearing programmes are used in support of stocking programmes specialist advice should be sought in order to minimise genetic impacts in resultant generations. Hatchery rearing programmes should comply with the following measures:

(a) Wherever possible, use eggs or progeny of wild fish;

(b) Ensure that wild fish removal will not significantly adversely impact on donor population(s);

(c) Derive broodstock from all phenotype age groups and components of a donor population[2];

(d) Careful consideration must be given to the size of the effective breeding population and its management. Geneticists have generally recommended that a minimum of a random group of 50 pairs be used for each cohort. However, that advice may not always be appropriate. For rehabilitation projects, where wild populations may be severely limited (i.e. remnant populations and live gene bank situations), it is essential that specialist advice be sought in order to minimise genetic impacts in resultant generations;

(e) Ideally, for genetic reasons, each male should be mated separately with a female so that the contribution of all males is equal (i.e. do not mix milt of males prior to fertilization, which can promote sperm competition);

(f) Where a river, or tributary, has completely lost its salmon population(s), several populations might be used for stocking to provide wide genetic variability for natural selection. However, genetic advice should be sought;

(g) Where there are suitable areas of unoccupied habitat, stocking with eggs or fry is recommended as stocked populations will benefit from natural selection during the juvenile phase.

Stocking and management programmes should take account of the fact that most Atlantic salmon in rivers are structured into a number of populations.

6.5 Annex 4 also provides guidelines for:

[2] The term 'population' here is used to denote a genetic population, i.e. populations are groups of animals within which mating is more or less random and among which interbreeding is more or less constrained.

- Considering alternatives to stocking – habitat improvement and fishery management;
- Preferred life stages for different categories of stocking;
- Administering stocking, and the information required by the permit-issuing agency, in order to evaluate the risks.

6.6 Other items of relevance included in the Williamsburg Resolution are:

- In accordance with the Precautionary Approach, the proponent of stocking must apply appropriate **risk assessmen**t methodologies, including identification of options.
- The **burden of proof** that the proposal will not have an adverse impact on wild salmon stocks, or lead to irreversible change, also rests with the proponent. It is implicit within this that the responsibility for post stocking monitoring lies with the proponent.

6.7 Taking account of all the above points, the following policies must be applied both to work undertaken directly by the Agency and to Section 30 consents given to others:

- Where no salmon stock exists, brood stock may be from any indigenous (British Isles) source, but would preferably be derived from local or similar systems.
- Where a salmon stock exists, brood stock may only be derived from the catchment to which the offspring will be introduced.
- Second generation hatchery reared fish must not be used as brood stock, (with the possible exception of circumstances where run restoration is starting from zero wild stocks, and hence there are no potential adverse impacts on existing wild stocks)
- Monitoring must be an integral part of any restoration or enhancement stocking programmes. For Agency stocking programmes, monitoring will be undertaken by the Agency; in other cases monitoring will be the responsibility of the proponent, although the Agency may assist, depending on resources and demonstration of cost effectiveness.