

A review of the regulation of salmon farming in Scotland

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Acronyms

AFP	Aquaculture Framework Plan
AMA	Area Management Agreement
APB	Aquaculture Production Business
CAR	Water Environment (Controlled Activities) (Scotland) Regulations 2005
CE	The Crown Estate
CoGP	Code of Good Practice for Scottish Finfish Aquaculture
CPA	Coast Protection Act 1949
DSFB	District Salmon Fishery Board
EIA	Environmental Impact Assessment
EMA	European Medicines Agency
EU	European Union
FAO	Food and Agriculture Organisation
FHI	Fish Health Inspectorate
FMA	Farm Management Agreement
FRS	Fisheries Research Services
FSAS	Food Standards Agency Scotland
HIE	Highlands and Islands Enterprise
HRC	Highland Regional Council
HSE	Health and Safety Executive
ICZM	integrated coastal zone management
IPN	Infectious Pancreatic Necrosis
ISA	Infectious Salmon Anaemia
ISLAD	Improved System for Licensing Aquaculture Development Working Group
LA	Local Authority
MCA	Maritime and Coastguard Agency
MGA	Ministerial Group on Aquaculture
MPP	Marine Planning Partnership
MS	Marine Scotland
MSS	Marine Scotland Science
MSP	Marine Spatial Plan
NMP	National Marine Plan
PD	Pancreas Disease
RBMP	River Basin Management Plan
SARF	Scottish Aquaculture Research Forum
SEPA	Scottish Environment Protection Agency
SFP	Sustainable Fisheries Partnership
SG	Scottish Government
SIC	Shetland Islands Council
SNH	Scottish Natural Heritage
SMR	Scottish Marine Region
SPP	Scottish Planning Policy
SSPO	Scottish Salmon Producers Organisation
TWG	Tripartite Working Group
UK	United Kingdom
VMD	Veterinary Medicines Directorate
WEWS	Water Environment and Water Services (Scotland) Act 2003
WFD	Water Framework Directive
WIC	Western Isles Council
WWF	World Wildlife Fund

I Introduction

This study has been commissioned by the Sustainable Fisheries Partnership (SFP), whose mission is “to maintain healthy ocean and aquatic ecosystems, enhance fishing and fish-farming livelihoods and secure food supplies.”

SFP has projects around the world in fisheries and aquaculture, mostly in Asia. This study is intended to help SFP decide whether to become involved with the Scottish salmon farming industry. In addition, the study will be used for their work in other regions.

SFP has a particular interest in finding out about the regulation of the Scottish salmon industry in terms of the regulatory framework, management practices, key issues, regional differences, and the lessons learned. The Terms of Reference for the study are set out in Annex I.

It is assumed that the main interest is in the production aspects of salmon farming and possible environmental impacts, rather than on issues such as food hygiene and health and safety, and thus the main emphasis is on the former.

The review starts with an assessment of the current status of salmon farming in Scotland, the national policy context and industry representation. It then goes on to examine some of the main issues facing the industry, what is being done to address them, and future challenges for the industry.

The regulation of the industry is discussed in terms of the key agencies involved, some of the joint initiatives put in place to address key issues, the principal legislation in force and under development, and regional differences. Finally a conclusion is made regarding the overall status of the regulation of salmon farming in Scotland.

2 Salmon farming in Scotland

2.1 The production process

The production of salmon has two distinct phases: the production of juvenile salmon in freshwater, and an ongrowing phase in seawater.

Freshwater phase: Eggs and milt are stripped from mature adult salmon in the autumn (October-December) and the fertilised eggs placed in incubators. The eggs hatch after a period of 2-3 months depending on temperature, and the fry start to feed around a month after that. Rearing of fry and fingerlings initially takes place in tanks, after which they may be transferred to freshwater cages or larger tanks for ongrowing to “smolts”, fish that are physiologically adapted to go to sea. Smolts that are ready to go to sea in the spring of their second year i.e. around 12 months after hatching are known as S1s. Those that are ready after around 6 months from hatching by virtue of temperature and/or photoperiod manipulation are known as S½s. Smolts are typically in the size range of 30-100g, depending on age and production process.

Seawater phase: Ongrowing of smolts to a market size of 3-5kg takes place in cages, typically over a period of 18 to 24 months. Fish that mature early after one winter at sea, known as “grilse”, may be harvested at a smaller size.

In both phases, fish are fed a high energy pelleted feed with a high proportion of fishmeal and oil, a proportion however which is diminishing all the time as alternative sources are tried and proven.

Biosecurity is a major concern, and strict measures are taken to prevent disease. The majority of smolts are now vaccinated against a variety of conditions before they go to sea. Fallowing of marine sites between production periods helps to break disease cycles, especially if synchronized with adjacent farms.

2.2 Evolution of salmon farming in Scotland

Salmon farming in Scotland started in the early 1970s on the West Coast. Systems consisted of relatively small wooden or steel cages in sheltered locations. Features of more traditional systems were:

- Relatively sheltered inshore sites with limited carrying capacity
- Use of relatively small cages (volume 2000-9000m³) (which however allowed better stock control and easier net cleaning)
- Such cage types were expensive to purchase and maintain, but allowed better surveillance and ease of working
- More emphasis on hand feeding and human assessment of appetite
- No fallowing of sites
- More emphasis on “hands on” husbandry, rather than automation
- Only one smolt intake per year in spring
- Labour costs were higher due to the extra handling associated with feeding, net cleaning, cage maintenance, and harvesting

Although a small number of farms in Scotland still favour more traditional systems on the grounds of claimed better stock welfare and sustainability, almost all of the industry has evolved to a higher level of operational efficiency with better economies of scale. As the industry has consolidated and production has increasingly been concentrated in the hands of a few larger companies, so too have the processes involved become more industrialised. Modern salmon farming in Scotland is increasingly characterised by the following features:

- Larger, more exposed sites with good flushing rates able to take larger cages and biomasses (several thousand tonnes per site)
- Sites well separated hydrographically from other sites to minimise disease and lice transfer
- Inexpensive yet robust plastic circle cages with low maintenance requirements and high volume (30-50,000m³/cage)
- Feed delivered cheaply in bulk by specialised vessels directly to site and stored in large capacity barges able to take several weeks supply
- High energy feeds based on least cost formulation

- Fully automated feeding systems incorporating appetite monitoring
- Underwater camera surveillance for fish and cage inspection
- Use of underwater lighting at sea to control maturation and increase feed intake
- Mortality removal facilitated by air lift systems
- Major tasks such as stocking, grading, counting, and harvesting carried out by well boat, either directly owned or contracted in
- Net changing carried out by specialist vessels, and net cleaning and maintenance carried out at specialist facilities
- Emphasis on maximising site utilisation through use of fast growing strains and feeding and harvesting strategies
- Production planning making use of smolt intakes at different times of year, use of different stocking sizes and strains
- Fallowing of sites but fallowing periods typically limited to 2-4 months
- Area Management Agreements (AMAs) to coordinate fallowing and disease treatment procedures
- Smolt production carried out at high densities in self contained recirculation units with good biosecurity and able to produce smolts at different times of year at low cost
- Use of strains from scientifically based family selection breeding programmes, selected for growth, conformation, disease resistance and other features
- High production volumes per unit of labour employed

Such features allow large scale production with low overheads and minimal production costs. However, large scale operations are not without risk: a cage failure can lead to the loss of hundreds of tonnes of fish, and disease management e.g. sea lice bath treatments can be very difficult.

2.3 Production trends and current status

2.3.1 Smolt production in freshwater

Over the 10 year period 2000 to 2009, smolt production in Scotland has fluctuated between 36 and 48 million smolts per annum, showing a generally declining trend which has now however stabilised, and in 2009 was around 37 million (Marine Scotland Science, 2010). Of this production, around two thirds were S1s and one third S½s. The number of smolts put to sea is closely correlated with smolts produced, being 38.5 million in 2009. Forecast production for 2010 is 28.7 million, increasing to 41.6 in 2011.

Production in 2009 was split more or less evenly between freshwater cages and tanks/raceways, this proportion being similar to previous years. Production per site has decreased by half since 1997, being around 0.6 million in 2009. The North West, West and the Western Isles were the main smolt producing areas in Scotland in 2009.

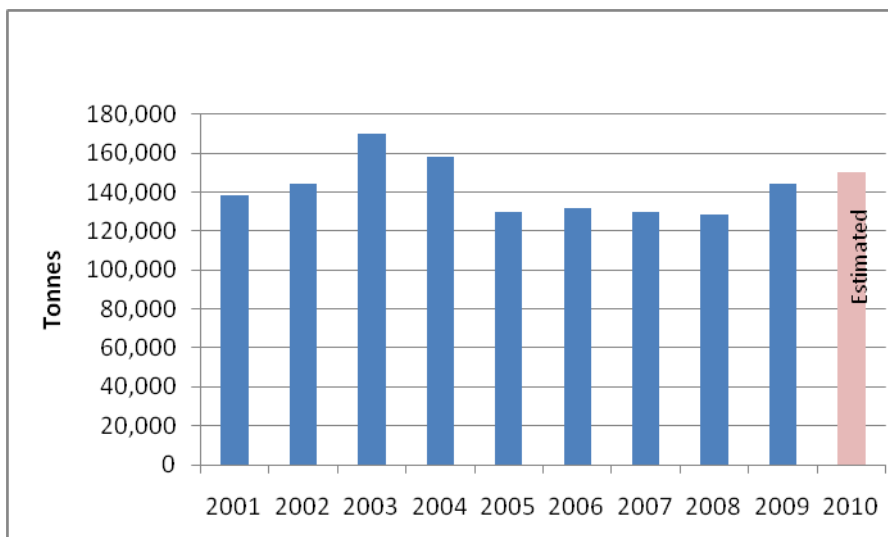
2.3.2 Salmon production in seawater

The production of salmon in Scotland from 2001 to 2009 is given in Figure 1. Production peaked at 160,000t in 2003, but in more recent years has stabilized at around 130,000t, rising to 144,000t in 2009 and forecast to grow to 150,000t in 2010 in response to strong market demand.

Virtually all production is from seawater cages, and with 253 active sites, average production per site was 568t in 2009. There is a trend towards concentrating production in larger sites, and in 2009 77% of production came from sites producing more than 1,000t p.a.. There were 31 companies registered as engaging in salmon production in 2009, of which 9 accounted for over 95% of production. There is a continuing trend of production being concentrated in the hands of fewer and larger producers.

The normal seawater production cycle is between 18 months and 2 years, and is normally followed by a fallow period to help break disease and parasite cycles. Of the 253 active sites in 2009, around 200 were fallowed for periods between 4 and 52 weeks. Although longer periods are likely to be beneficial for sea bed recovery, research carried out suggests that there is not much improvement over the period of a year. With regard to breaking disease and sea lice cycles, however, as little as 6 weeks fallow can be enough.

Figure 1. Production of Atlantic salmon in Scotland 2001-2009

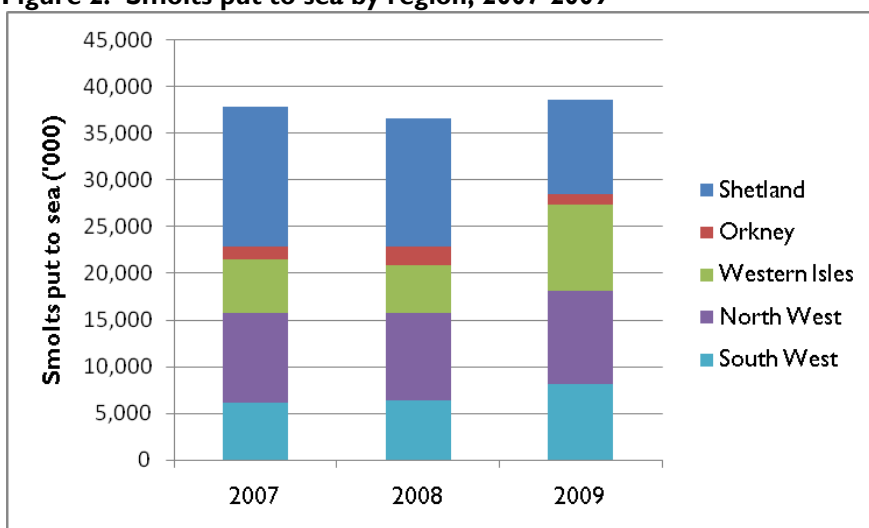


Source: Marine Scotland Science, 2010

2.4 Regional distribution of production

The annual production survey carried out by Marine Scotland does not give a regional breakdown of the overall annual production. It is assumed that this is due to the fact that each year’s production is made up of 2 or 3 year classes, and that survival and harvest size differs markedly from one region to another, making it difficult to determine regional output. Figures are however given for the number of smolts put to sea each year in each region, and the trends in such inputs for the years 2007 to 2009 are given in Figure 2. In the past, smolt inputs have tended to be greatest in Shetland, however in 2009 it was more evenly distributed between the regions (excluding Orkney).

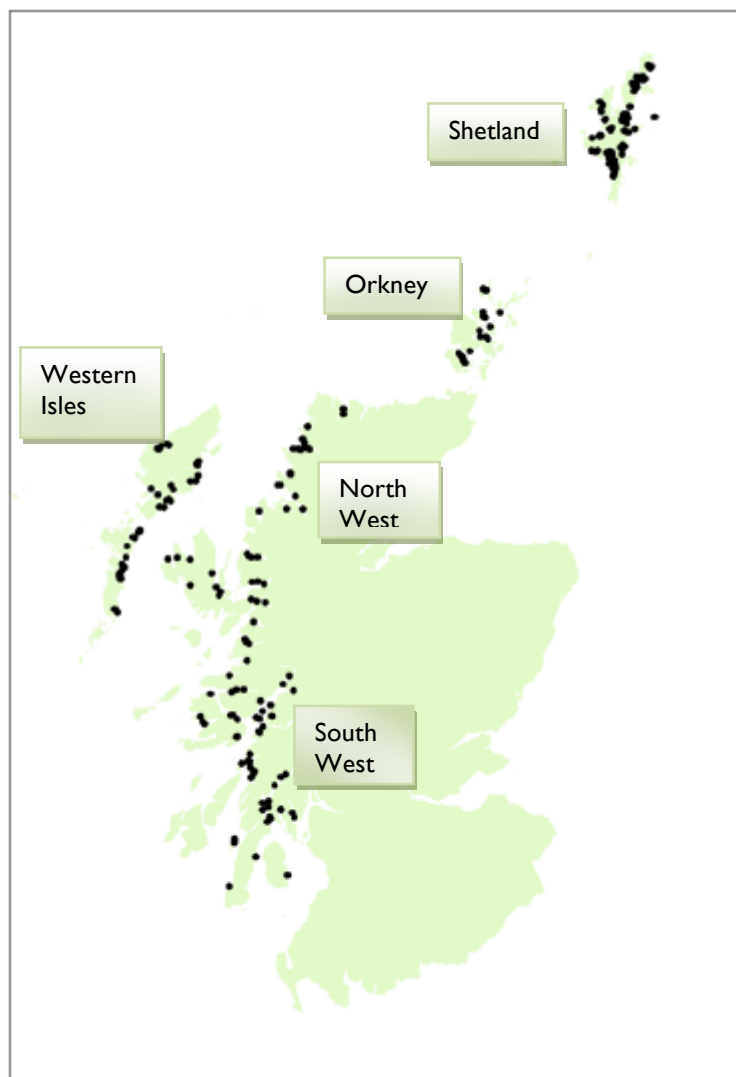
Figure 2. Smolts put to sea by region, 2007-2009



Source: Marine Scotland Science, 2010

The physical distribution of active salmon farm sites in Scotland in 2009 is given in Figure 3.

Figure 3. Distribution of active salmon farm sites in Scotland in 2009



Source: Marine Scotland Science, 2010.

2.5 National policy context

The current framework for aquaculture policy in Scotland is defined in “A Fresh Start: The renewed Strategic Framework for Scottish aquaculture” (The Scottish Government, 2009). This was developed from an extensive programme of consultations and an earlier Strategic Framework (The Scottish Government, 2003). The strategic framework takes as a starting point, the need for sustainable growth. This is defined with respect to economic, environmental and social criteria. It also draws strongly on the Scottish Government’s economic strategy (The Scottish Government, 2007) which established five thematic objectives for Government policy, namely:

- Wealthier and fairer
- Smarter
- Healthier
- Safer and stronger
- Greener

Other important policy initiatives underpinning the aquaculture framework are the Scottish Government Economic Recovery Programme, the Marine Bill for Scotland and the establishment of Marine Scotland, the European Common Fisheries Policy and European Fisheries Fund, and emerging policy on climate change. Account is also taken of the National Food and Drink Policy and recent legislation such as the Aquatic Animal

Health Directive and Aquaculture and Fisheries (Scotland) Act 2007. Industry and other stakeholder initiatives are also important, particularly the Salmon Industry Code of Good Practice (2006) and Tripartite Working Group on Area Management Agreements.

Taking this background into consideration, the strategic framework for aquaculture is developed around five main objectives:

- Healthier fish and shellfish
- Improved systems for licensing aquaculture developments
- Improved containment
- Better marketing and improved image
- Improved access to finance

These are further defined in relation to the 5 economic objectives listed above. With salmon farming the dominant aquaculture industry in Scotland, the challenges of this sector tend to shape the framework.

To work further on specific policy that will develop legislation, the Scottish Government has formed a Ministerial Group on Aquaculture (MGA) and six sub-groups to work on these themes. Each sub-group has a champion with responsibility to manage and facilitate the key actions identified under that theme and to deliver and report back to the MGA. With the support of the sub-groups the MGA will develop and update action plans for each theme. Since the sub-groups will be relatively small, only involving the most closely involved stakeholders, a wider National Aquaculture Forum is being formed to provide a platform for wider consultation. This will be chaired by Marine Scotland with a remit to feed into thematic action plans and ensure actions remain relevant and accommodate new issues of concern which may arise, or when there is lack of progress.

2.6 Industry representation

The Scottish Salmon Producers Organisation (SSPO) (www.scottishsalmon.co.uk), whose members account for around 95% of Scottish salmon production, is the trade association for the industry. It was formed in 2006 from the original SSPO and Scottish Quality Salmon, and is responsible for representing the industry in political, regulatory, technical and media issues.

Membership of the SSPO requires adherence to the Code of Good Practice for Scottish Finfish Aquaculture (CoGP), which has been developed in consultation with a wide range of stakeholders (Scottish Finfish Aquaculture Working Group, ongoing). The CoGP sets out the standards that farmers must demonstrate, and compliance is independently audited. Areas covered include:

- Consumer reassurance - traceability, use of approved treatments
- Fish Health - good husbandry, area management, harvesting operations
- Protecting the environment - including sea lice management and containment standards
- Welfare and husbandry - breeding and stocking density
- Feed and feeding - feed formulation and sustainability of fish feed
- The CoGP also contains detailed annexes giving further technical guidance on good practice, including the National Sea Lice Treatment Strategy, Integrated Sea Lice Management, Containment, and a Veterinary Health Plan.

3 Key issues affecting the industry

3.1 Introduction

The Scottish salmon farming industry has come a long way since it first started in the 1970s. It has gone through many cycles of development, with periods of low or negative profitability caused by over production, and times of crisis due to different disease problems. Many companies have come and gone, different approaches to operational management have been tried out, and new and improved technology has evolved along the way. The industry can now be considered to be in a relatively fit state, helped at the present time by strong market prices, with most companies being well managed and striving to achieve best practice. The regulatory framework now in place is supportive of the industry but at the same time ensures that proper controls are in place regarding planning, environmental impact, and fish health.

However, despite the present relatively healthy state of the industry, a number of issues still continue to cause concern, both to external stakeholders such as wild salmon fishery interests with regard to escaped fish and sea lice, and to the industry itself with regard to planning controls and fish health.

This section examines some of these issues, discusses what is being done, what if any regional differences there are, and what the future challenges for the industry might be.

3.2 Fish health

3.2.1 Introduction

According to the Scottish Fish Farms Annual Production Survey, 2009, (Marine Scotland Science, 2010) the survival rate of smolts from input to harvest was 72% for the 2007 year class, the last year for which survival could be estimated. This was lower than the average for the past 15 years and lower than the past 3 year classes, and, when compared with a survival of 90% or more on well managed farms with minimal disease problems, is suggestive of a growing disease problem.

Causes of loss can however vary greatly, and may include transfer mortality, bacterial and viral diseases, sea lice, damaged nets, seals, sea birds, jellyfish, and algal blooms. However, there is general agreement that sea lice are the most important disease issue especially in Shetland.

3.2.2 Sea lice

Sea lice, of which there are two species in Scotland, are a parasite of both wild and farmed salmon and sea trout in sea water. Not only do they cause serious problems for farmed salmon, but they are also said to cause serious losses to wild fish if they pass close to salmon farms, especially post-smolts migrating from freshwater in the spring. This issue is of major concern to wild fishery interests in Scotland, and the growing losses suffered by salmon farms mean that sea lice are considered to be the single most important disease issue in Scotland at the present time.

Major advances have been made in recent years in the control of sea lice through the use of improved monitoring procedures, in-feed drug treatments, fallowing and AMAs. Other elements of prevention include good net hygiene, filtration of fish pump effluent water for lice, and feeding with immunostimulants such as Immunosan and vitamin C. In addition, the regulatory framework regarding control of sea lice has been strengthened through the Aquaculture and Fisheries (Scotland) Act 2007 (see Section 4.4.3 **Error! Reference source not found.**). Despite these advances, there continues to be a need for pharmaceuticals to treat sea lice. There are however only a limited number of licensed treatments to which there is growing resistance.

Although there have been some improvements in medicinal licensing, feedback from growers suggests that regulatory restrictions in the UK mean there are fewer treatment options available compared with competitor countries. In addition, the low doses permitted mean that the efficacy of treatments is reduced and treatment frequency is increased. Because treatment is easier in smaller cages, this acts as a disincentive to the use of larger cages with better economies of scale (Hambrey Consulting, 2008).

There is growing interest in the use of wrasse as a biological control agent, and the SSPO is sponsoring research on wrasse biology and commercial production. In addition, a pilot project is underway in Shetland on hydrodynamic modelling to help improve the understanding of water movement and sea lice transfer between management zones.

With regard to the impact of sea lice on wild fish, there is concern that any expansion of the farmed salmon industry will have a detrimental effect. There have been examples of salmon farms being relocated to less sensitive areas, with a subsequent beneficial effect on wild fisheries. Such relocation has been proposed as one solution, but it will need the agreement and cooperation of planners, salmon growers, wild fishery interests and Government.

The Healthier Fish Working Group has made a number of recommendations to the MGA with regard to improved sea lice control (see Section 4.3.3).

3.2.3 Bacterial and viral disease

The industry in Scotland is considered to have a relatively high health status, largely due to the adoption of AMAs that have come into effect since the Infectious Salmon Anaemia (ISA) outbreak 10 years ago. Such AMAs are designed to reduce the risks of disease transfer between sites and are a key component of the Code of Practice for ISA formulated by the industry. The control measures were tested in 2009 when an outbreak of ISA was confined to a small area.

Other serious diseases of salmon include furunculosis, Pancreas Disease (PD), Infectious Pancreatic Necrosis (IPN), and vibriosis. All may cause serious losses but vaccines are available for all these conditions, although some are more effective than others. PD is said to be increasing in severity especially in Shetland.

3.2.4 Seals

Seals can also be a major cause of loss, and present an added concern in that damaged nets allow fish to escape, resulting in the further threat of genetic contamination to wild stocks. Although all the standard methods of control are employed, including acoustic scarers and culling, efficacy is poor and the SSPO is closely involved in seeking alternatives. Culling is strictly controlled and subject to licensing by Marine Scotland, recently updated through the Marine (Scotland) Act 2010.

3.3 Environmental impact

3.3.1 Nutrient and seabed impacts

Salmon farming in Scotland continues to be subject to criticism for its perceived impact on the environment, despite the fact that the regulations in place are probably the most stringent in the world.

A review of the scientific literature on the environmental impacts of aquaculture (SAMS, 2002) concluded that salmon farming in Scotland has no significant impact on nutrient enrichment except in extreme cases where there is poor water exchange. In addition, whilst the impacts of particulate settlement on the seabed may be profound in the immediate vicinity of fish cages, the overall area affected is insignificant in terms of the overall coastal resource. Nevertheless, research is underway to improve the models used by the Scottish Environmental Protection Agency (SEPA) as regulatory tools so that they are more appropriate to the future needs of the industry, in particular the development of offshore sites holding much larger biomasses.

3.3.2 Containment

Along with sea lice, containment is one of the most critical issues in salmon farming in Scotland, and is of major concern to wild fish interests. Escaped fish may impact wild fish in a number of ways, including the transfer of disease, the occupation of valuable freshwater habitats to the exclusion of wild fish, and interbreeding with wild fish, leading to a loss of genetic integrity.

Escapes in 2009 from 2 freshwater sites were around 44,000 and from 5 marine sites 88,000 (Marine Scotland Science, 2010), representing around 0.4% of smolts put to sea in that year. These figures marked a significant increase on 2008, and were largely due to 2 major incidents at marine sites. All known incidents of fish escape

must by law be reported to Marine Scotland. There is however said to be a problem with unattributed escapes in certain areas.

'Improved containment' is one of the themes of the renewed Strategic Framework for Scottish aquaculture, and the associated working group (see Section 4.3.4) has developed a new action plan aimed at improving the industry's record on containment. This plan includes improved staff training including workshops on best practice, and the development of technical standards for equipment. In addition, the regulatory framework regarding containment has been strengthened through the Aquaculture and Fisheries (Scotland) Act 2007 (see Section 4.4.3).

There has been a call in some quarters for all salmon farming to be confined to closed containment systems on land, and for the use of cages both in freshwater and the marine environment to cease. The growing of salmon in closed seawater systems on land is not however considered viable at the present time owing to the high capital and operating costs of such systems, and the welfare implications of the high stocking densities associated with them. With regard to the freshwater phase of salmon production, there are better prospects for closed containment systems given that they have already been proved to be viable, and in addition give much greater control over smolt quality and time of production. Around half of smolt production in freshwater in Scotland in 2009 was from tank/raceway systems, and of these a significant proportion are already fully recycling. A further option is to relocate freshwater cage systems away from sensitive areas.

3.4 Planning

Planning is of major concern to all stakeholders in the industry. The industry itself wants to be sure it has the space to expand, and to be able to relocate/rationalize sites if necessary. Wild fishery interests and other users of the marine environment need to know that their own sectors will not be impacted by the farming industry. The existing planning system is said to hamper the aquaculture industry, and some of the issues identified include:

- Poor availability of sites
- Large numbers of undeveloped leases
- Locational guidelines provided by Government need to be reviewed
- Existing licensing procedures for aquaculture are too complex
- Permitted development rights need to be clarified

Planning is another of the key themes of the renewed Strategic Framework for Scottish aquaculture, and the Improved System for Licensing Aquaculture Development Working Group (ISLAD) has been set up to deliver reform. In addition to ISLAD, the Scottish Government, the industry and Local Authorities agreed in March 2010 how they would work together to refine the existing planning system (The Scottish Government, 2010a). One of the outcomes of this agreement was the publication of the Aquaculture Working Arrangements (The Scottish Government, 2010b) in July 2010 (see also Section 4.3.2).

The legislation governing planning and the agencies involved are discussed in later sections.

3.5 Regional issues

Salmon production in Scotland takes place in a number of distinct regions, namely the Shetland Islands, the Orkney Islands, the Western Isles, and the North West and South West coasts of the mainland (see Figure 3). The different geographical, socio-economic and historical characteristics of the regions to some extent have a bearing on the way the industry has developed in each area, especially in the islands, and the issues they face. All the issues so far raised are to some extent common across the regions, although there are differences in the severity of disease from area to area, and planning and containment issues are more critical in some areas than others.

3.6 Future challenges for the industry

As stated at the start of this section, the industry has come a long way since it began in the 1970s, and it now forms a major part of the Scottish rural economy, roughly equivalent in value to the sea fishing industry. Many problems have been solved along the way, but issues such as those described in this section still remain and will probably continue to be major challenges for the industry in future, especially fish health.

With regard to planning, the challenge will be to ensure that there are sufficient new sites in the right places to accommodate any expansion in the industry. There is a need to rationalize unused sites and exchange them for more suitable sites in better areas. This will require a high degree of cooperation between industry, planners and other stakeholders.

It is likely that there will be a trend to move seawater production from inland sites to more exposed sites with better water exchange, using larger cages and holding greater biomass. Such sites offer better economies of scale, and could reduce the risk of disease. However, larger cages also mean a potentially greater impact from escaped fish in the event of equipment failure, and bath treatments for sea lice would become more difficult. In the latter case, the use of wrasse as cleaner fish if proven viable would be particularly helpful. There are still however significant hurdles to overcome in the use of wrasse.

There is also likely to be a move in freshwater to produce more smolts in closed containment systems, driven in particular by pressures from wild fishery interests. The challenge will be to close the gap between the production costs in such systems and those of freshwater cages.

Feed supply has not been raised as a particular issue in this review, as it is not presently holding the industry back and is not directly subject to regulation other than in the ingredients that can be used in feed manufacture. In addition, major advances have been made to reduce the amount of fishmeal and fish oil used in salmon feeds, and to ensure that such ingredients come from sustainable, certified sources. However, reducing fishmeal and oil in diets, whilst at the same time retaining the nutritional profile of the finished product, will undoubtedly remain a major challenge for the industry in future.

With regard to fish health, it is likely that new disease conditions will arise from time to time and have to be dealt with by the industry. However, the regulatory controls now in place and the adoption of better management practices such as single year class stocking, synchronized fallowing, and AMAs should help to ensure that impacts are minimized.

4 Regulation of the industry

4.1 Introduction

According to the SSPO, the Scottish salmon farming industry is the most tightly regulated aquaculture industry in the world - scrutinised by 10 different statutory bodies and subject to more than 60 pieces of legislation, 43 European directives, three European regulations and 12 European Commission decisions. Legislation is in the first instance often based on such European directives and regulations, and then is subsequently transposed into national law.

Official permissions and licenses are required for a range of activities. For new marine fish farm sites, planning consent must be obtained from the Local Authority, a discharge consent for fish farm wastes and veterinary medicines from SEPA, a navigation consent from Marine Scotland, and a seabed lease from the Crown Estate. New aquaculture businesses must be registered with the Scottish Government, and processing premises authorised.

Once a farm is established, scheduled and random visits occur frequently from SEPA and the Fish Health Inspectorate on behalf of the Scottish Government and the Veterinary Medicines Directorate (VMD) to check on compliance, and annual returns have to be made regarding fish mortalities and movements. Growers must comply with a wide range of legislation including that covering fish health, health and safety, food hygiene, and marine navigation.

As well as the statutory legislation with which the industry has to comply, the industry itself strives to attain high standards of operation through adherence to the CoGP, and a number of other voluntary codes specifically relating to salmon farming, such as the Code of Practice for ISA.

This section describes the key agencies responsible for regulation and their roles, joint initiatives between industry stakeholders, the main aquaculture legislation in force, recent developments, and regional differences.

4.2 Key agencies responsible for regulation

4.2.1 The Scottish Government

As described in Section 2.5, the Scottish Government has a clearly stated policy for aquaculture development, and is the competent authority responsible for the implementation of relevant EU and national legislation relating to salmon farming in Scotland. The Government directorate responsible for the implementation of such legislation is known as Marine Scotland (MS). MS was established in April 2009 and is responsible for the management of Scotland's seas, and all aquaculture activity both in freshwater and seawater.

With regard to salmon farming, MS plays a key role in promoting the sustainable development of the industry through the promotion of working groups on different aspects of industry activity including fish health, licensing of developments, containment, marketing and finance.

MS has responsibility for fish movements, fish welfare, and waste management, and plays a key role in marine planning and legislation. Marine Scotland Science (MSS) is a branch of MS with responsibility for research and surveys, and its Fish Health Inspectorate (FHI) is responsible for measures aimed at preventing the introduction and spread of serious fish and shellfish diseases in Scotland.

The FHI carries out inspection and testing of salmon farms, in particular for notifiable diseases such as ISA and *Gyrodactylus salaris*, and samples wild fish from all the major catchment areas of Scotland. It maintains a register of fish farming businesses, and farmers are required to submit an annual return detailing fish mortalities and movements on and off the farm. Such records help it to trace the source and spread of infection in the event of an outbreak of a notifiable disease. In such an event, FHI may serve controls on the movement of live fish to prevent the spread of disease. The FHI acts as an agent for the VMD and checks farms for compliance with the veterinary medicine residue regulations.

MS provides locational guidance on the siting of marine fish farms and categorises areas according to likely carrying capacity. It advises on separation distances between farms and issues navigational consents where required.

4.2.2 Local Authorities

For local government purposes, Scotland is divided up into 32 local authority areas. The most important for marine salmon farming are:

- Argyll and Bute
- Highland
- Western Isles
- Shetland Islands
- Orkney Islands

Local councils play a number of roles with regard to the regulation of salmon farming, of which the most important is planning. Councils are responsible for preparing development plans for aquaculture e.g. Aquaculture Framework Plans, and for handling planning applications for fish farm developments. They are also responsible for enforcing food hygiene legislation.

4.2.3 Scottish Environment Protection Agency

The Scottish Environment Protection Agency (SEPA) is a public body accountable to the SG, and is Scotland's environmental regulator. Its main role is to protect the environment and human health. With regard to salmon farming, SEPA is responsible in particular for regulating and licensing activities that may pollute water, in accordance with EU and national legislation (see Section 4.4.2).

4.2.4 Scottish Natural Heritage

Scottish Natural Heritage (SNH) is a government funded agency with a remit to care for and improve Scotland's natural heritage and promote its sustainable use.

SNH is a statutory consultee on aquaculture developments in both freshwater and the marine environment, and is a member of the Tripartite Working Group. It encourages the appropriate scale, location and design of aquaculture developments to minimise negative impacts on freshwater and marine environments, landscape and recreation. Particular issues associated with aquaculture include containment, disease and parasite transfer, water quality and quantity, and landscape capacity.

With regard to landscape capacity, SNH publishes guidance for planners and developers on the siting and design of coastal aquaculture facilities, with a view to minimising visual impact. SNH works with planning authorities in the preparation of Integrated Coastal Zone Management Plans and Aquaculture Framework Plans, and provides advice on planning applications.

4.2.5 The Crown Estate

The Crown Estate (CE) owns virtually all the seabed around the UK out to the 12 nautical mile territorial limit, and has a statutory duty to obtain a return from the land it owns. This includes any seabed used for salmon farming, the rent for which is calculated using a formula based on production and is reviewed every 5 years. A time-limited lease-option may be granted for developments still without planning permission. Once planning permission has been granted, and providing all other conditions have been met, the CE issues a lease agreement setting out rental terms. Leases are now granted for a period of 25 years (previously 15 years). The CE is an active partner with the industry, sponsoring R&D and participating in schemes such as the Tripartite Working Group.

4.2.6 Food Standards Agency Scotland

The Food Standards Agency Scotland (FSAS) is responsible for the implementation of food hygiene legislation in Scotland. It has a remit to improve food safety and standards and protect the health of Scotland's population in relation to food. With regard to salmon farming, food hygiene regulations cover the registration, inspection and approval of fish processing facilities, and assessment of fish handling procedures and systems. Enforcement of food hygiene legislation is carried out by the FSA in conjunction with local authority food law enforcement officers.

4.2.7 Veterinary Medicines Directorate

The Veterinary Medicines Directorate (VMD) is a UK government agency responsible for the safety, quality and efficacy of veterinary medicines. It authorises veterinary medicines and develops, updates and enforces the legislation concerning veterinary medicines. It monitors foodstuffs derived from animals for residues arising from the use of veterinary medicines and illegal substances. Any medicines used to treat salmon must have a product licence.

The VMD works closely with the European Medicines Agency (EMA), which is a decentralised agency of the European Union, located in London. The EMA is responsible for the scientific evaluation of medicines developed by pharmaceutical companies for use in the European Union.

4.2.8 Maritime and Coastguard Agency

The Maritime and Coastguard Agency (MCA) is responsible for implementing the UK Government's maritime safety policy. This includes search and rescue services, and checking that vessels meet UK and international safety rules. With regards to salmon farming, it licenses workboats and the staff that operate them, and is a key consultee in assessing applications under the Coast Protection Act 1949 - Section 34 (Provisions for Safety of Navigation).

4.2.9 Health and Safety Executive

The Health and Safety Executive (HSE) is a UK public body responsible for the encouragement, regulation and enforcement of workplace health, safety and welfare. All salmon farming operations are subject to a variety of health and safety legislation.

4.2.10 District Salmon Fishery Boards

The District Salmon Fishery Boards (DSFBs) are statutory bodies set up to manage, protect and improve salmon and sea trout fisheries in Scotland, according to a number of salmon fishery districts based on specific river catchment areas. They must be consulted on any planning application or EIA for advice on the possible impact of fish farms on wild salmon and sea trout populations. The 41 DSFBs are represented by the Association of Salmon Fishery Boards.

4.2.11 Other agencies

As well as the agencies described above, a number of other parties may be consulted in the course of a planning application including conservation bodies such as the Royal Society for the Protection of Birds, environmental groups such as the World Wildlife Fund, and wild fishery interest such as the Scottish Anglers National Association.

4.3 *Joint initiatives between agencies*

4.3.1 Tripartite Working Group

The Tripartite Working Group (TWG) was set up in 1999 and its members include Marine Scotland, SNH, SEPA, The Crown Estate, SSPO, and wild fishery interests. Its purpose is to address conflicts between wild fishery interests and salmon farming, and ensure healthy wild fish stocks whilst promoting a sustainable farming industry.

A key feature of the initiative is the formation AMAs between local wild fishery interest and salmon growers which share the same waters, and there are now 18 such AMAs on the West Coast and Western Isles. AMAs cover a range of objectives, but are primarily concerned with the control of sea lice, escapes, and disease. Not all farming areas subscribe to the AMA process.

4.3.2 Aquaculture Working Arrangements

The Aquaculture Working Arrangements (The Scottish Government, 2010b) were issued in July 2010 and aim to clarify the roles and responsibilities of public agencies involved in aquaculture development and to avoid duplication and overlap. Signatories include SNH, SEPA, Marine Scotland Science (MSS) and District Salmon Fishery Boards (DSFBs).

4.3.3 Healthier Fish Working Group

This Group was established in 2009 by Marine Scotland and includes representatives from industry, wild fisheries, and SEPA. It was set up to advise Government on the conditions to be attached to finfish business authorisations under the Aquatic Animal Health (Scotland) Regulations 2009, in particular measures for the better control of sea lice and reporting of mortality data. The Group made a number of recommendations in this respect to the Ministerial Group on Aquaculture in June 2010.

A key recommendation is that the Government make it a legal requirement for all operators in the marine environment to enter into a Farm Management Agreement (FMA), with independent arbitration to settle disputes. Such FMAs should cover such issues as single year class stocking of sites, fallowing within FMAs, biosecurity, management practices, sea lice control, and information sharing. At the present time, only those who are signed up to the industry's CoGP are required to enter into such an FMA.

With regard to sea lice, it recommended that a system be put in place for the mandatory reporting of non-efficacious treatments, such treatments being a major threat to continuing control within a management area. Alongside this system would be a database to record information on sea lice numbers and treatments to support FMAs and provide data to external stakeholders.

4.3.4 Improved Containment Working Group

This group was also established by Marine Scotland in 2009 with representation from all relevant stakeholders. Its purpose is to reduce or eliminate as far as possible escapes of fish from freshwater and marine installations. The principal causes of fish escape are human error and equipment failure, thus the main initiatives for dealing with the problem are skills development, the development of technical standards for the equipment used in salmon farming, and the elimination of sub-standard equipment.

4.3.5 Improved System for Licensing Aquaculture Development Working Group

With regard to planning provisions for aquaculture, including salmon farming, these will be advanced through the "Improved System for Licensing Aquaculture Development (ISLAD) Working Group", which was established in 2009. Members of ISLAD include SSPO, SEPA, SNH, CE, and Local Authorities. The remit of the Group is to ensure that opportunities exist for expansion of the industry in the right places, with streamlined and proportionate regulations and procedures to ensure faster decisions, and to minimise adverse impacts on other users of the marine and freshwater environment.

4.4 Key legislation

4.4.1 Planning legislation

Prior to the late 1990s, the CE was responsible for granting permission for marine aquaculture developments, taking applications and consulting all other interested parties including Local Authorities before granting a lease. In March 2007, following an interim changeover period, statutory planning powers for aquaculture developments in marine waters were then granted to the planning authorities under the Town and Country Planning (Marine Fish Farming) (Scotland) Order 2007. Under this legislation, new aquaculture developments and modifications to existing developments require an application to planning authorities for planning permission, whilst existing marine farms must be assessed by Marine Scotland to determine whether permission should be granted. If a site is approved, then there is a presumption that planning consent will be granted for an unlimited period – an important change to the previous system, where consent was subject to review at the end of the lease period (typically every 15 years).

The most recent development in marine planning is the passing of the Marine (Scotland) Act 2010, which came into effect in March 2010 and introduces a new, simplified system of marine planning. It provides a framework to help address the competing demands of different marine space users, including aquaculture. Marine Scotland is the overall body responsible for implementation of the Act, the main provisions of which include:

- a new statutory marine planning system to allow sustainable management of Scotland's seas
- a simpler licensing system, minimising the number of licences required for marine developments
- improved marine conservation with new powers to protect and manage areas of importance
- improved protection for seals and a new comprehensive licence system to ensure appropriate management.

With regard to planning, a National Marine Plan (NMP) will set out the strategic objectives for the Scottish marine area, and identify national priorities. Regional Marine Plans will be guided by the NMP and will be drawn up according to specific areas (Scottish Marine Regions (SMRs)). Regional planning in each SMR will be delegated to a lead organisation known as a Marine Planning Partnership (MPP), which may be a Local Authority or a group of stakeholders. Marine plans must be compatible with terrestrial plans, thus forming the basis for ICZM. Plans are to be subject to consultation and periodic review.

As well as planning consent, the majority of new marine farms fall under the Coast Protection Act 1949 - Section 34 (Provisions for Safety of Navigation) (CPA consent), which requires that wherever a marine installation poses a risk to safe navigation, the written consent of the Scottish Ministers is required. Applications for CPA consent now fall under the new licensing division of Marine Scotland, and key consultees include the Maritime and Coastguard Agency, the Northern Lighthouse Board and the Royal Yachting Association. The CPA consent sets out measures to be taken to minimise risks to navigation, such as the specifications of navigation marker buoys.

4.4.2 Environmental legislation

The over-arching European legislation governing the management of the water environment in Scotland, and for which SEPA is responsible, is the Water Framework Directive (WFD), which came into force in December 2000. It covers all water bodies including rivers, canals, lochs, estuaries, wetlands and coastal waters as well as water under the ground. The WFD became law in Scotland during 2003 through the Water Environment and Water Services (Scotland) Act 2003 (the WEWS Act) which sets out the arrangements for the protection of the water environment in Scotland. As a result of this legislation, any activities which affect the quality of water in Scotland are now controlled under the Water Environment (Controlled Activities) (Scotland) Regulations 2005 (CAR).

With regard to salmon farming, whether in freshwater or seawater, growers must have a licence granted under the CAR regulations. These regulations control any activities which might pose a risk to the water environment. SEPA sets limits on the amount of fish that can be held on a site, and also limits the amount of medicines that can be administered. In setting such limits, the aim is to ensure that a farm is operating within the capacity of the environment.

Applying for a CAR licence involves a number of procedures which for marine cage farms are described in the form of a "fish farm manual". Such procedures include seabed and hydrographical surveys and computer modelling of waste dispersion from the site. If a CAR licence is granted and a site is developed, SEPA carry out on-going monitoring and inspection. In addition, the farm operator must carry out regular surveys to check on sea bed impacts, and provide data on discharges which is published as part of the publically available Scottish Pollutant Release Inventory.

With regard to freshwater, a CAR licence is also required for activities such as discharges to surface water, abstractions, removal of sediments and the replacement of in-stream structures, such as weirs.

In addition to a CAR licence, it may be necessary for a new development to carry out an Environmental Impact Assessment (EIA) as required by the Environmental Impact Assessment (Scotland) Regulations 1999 (as amended). Marine fish farming is listed as a Schedule 2 development requiring that a project be assessed by a planning authority to determine whether it is an EIA development if production exceeds 100t p.a. or covers an area greater than 1,000m² or is located in a sensitive area. In addition, if a proposed site is close to an area with a nature conservation designation e.g. Special Protection Area, Special Areas of Conservation, Natura sites, Ramsar sites, consultation with SNH and other relevant stakeholders is mandatory.

4.4.3 Fish health legislation

The principal fish health legislation in Scotland is now covered by the Aquatic Animal Health (Scotland) Regulations 2009, which modernise the legislation to protect fish and shell fish from serious disease, and implement EU Council Directive 2006/88/EC. They introduce a system of authorisation for businesses engaged in aquaculture, amend and update measures used in the event of outbreaks of serious disease, and implement common EU rules on trade in these animals and their products. They do not apply to fish caught from the sea. The main features of these regulations include:

- authorisation of Aquaculture Production Businesses (APBs) and registration of put and take fisheries
- a public register of APBs
- a risk based approach to disease surveillance
- disease prevention requirements for transporters of aquaculture animals
- statutory controls on exotic and non-exotic diseases of aquatic animals
- a statutory requirement to notify the Department of any suspicion of disease
- rules for the placing of aquaculture animals on the market
- it will be an offence to operate an aquaculture production business, put and take fishery or non-commercial installation without a valid authorisation or registration.

Aspects of fish health are also covered by the Aquaculture and Fisheries (Scotland) Act 2007, which was introduced, amongst other aims, to support the sustainable development of the aquaculture industry in Scotland, to reinforce existing practices and ensure that all farms operate to certain standards. With regard to aquaculture, the Act is concerned mainly with the control of fish parasites (especially sea lice) and preventing the escape of fish. It places duties on growers to keep records with respect to these issues, and gives powers to the Government to allow inspection and take enforcement action. It sets out measures for preventing the introduction of the freshwater parasite *Gyrodactylus salaris*, for its control and eradication should it be introduced, and for compensation payments if fish have to be destroyed. In order to prevent the spread of disease, it prohibits the unauthorised introduction of fish to both fresh and sea water. Finally, it allows the Government to obtain information on the economic, social and environmental aspects of aquaculture, and to make payments in support of the industry.

For a further explanation of historical fish health legislation relevant to Scotland, please refer to Annex 6 of the CoGP (Scottish Finfish Aquaculture Working Group, ongoing).

4.4.4 Food hygiene legislation

Much of the detailed legislation on food standards originates in the European Union. From 1 January 2006, new EU food hygiene legislation has applied throughout the UK. The three basic EU food hygiene regulations are:

- Regulation (EC) 852/2004 on the hygiene of foodstuffs
- Regulation (EC) 853/2004 laying down specific hygiene rules for food of animal origin
- Regulation (EC) 854/2004 laying down specific rules for the organisation of official controls on products of animal origin intended for human consumption

Based on these regulations, the Food Hygiene (Scotland) Regulations 2006 (SSI 2006/3) and the Official Feed and Food Controls (Scotland) Regulations 2005 (SSI 2005/616) came into force in January 2006. The latter were superseded by the Official Feed and Food Controls (Scotland) Regulations 2009 on 25 January 2010.

With regard to salmon farming in Scotland, the regulations cover the registration, inspection and approval of fish processing facilities, and assessment of fish handling procedures and systems. Feed manufacturers must comply with the food control regulations. Enforcement of food hygiene legislation is carried out by the FSA in conjunction with local authority food law enforcement officers.

4.5 Recent developments in regulation

The most important recent development in the regulatory process was the passing of the Marine (Scotland) Act 2010, which contained important new provisions for marine planning and the control of seals, both of which are of concern to the salmon farming industry.

There was concern in the industry that this Bill proposed to maintain planning control for fish farm development under the Town and Country Planning (Marine Fish Farming) (Scotland) Order 2007, and thus under the control of the Local Authorities, whilst all other marine activities were to be licensed under a new system managed centrally by Marine Scotland. Efforts were made by the industry to amend this proposal but were narrowly defeated in parliamentary debate. Planning control for aquaculture thus remains in the hands of the Local Authorities, although continuing efforts by ISLAD and the 'Delivering Planning Reform' initiative (The Scottish Government, 2010a) should improve the present planning process. In addition, the provisions under the new Bill for greater area based planning remains, and should lead to clarification of where aquaculture development can take place in the future.

4.6 Regional differences in regulation

The national legislation in force applies across the country and regulations do not differ regionally, although there may be local variations in the way they are interpreted, especially with regard to planning. The planning policy for fish farming in Scotland is set out by the Government, and the Local Authorities in each region are expected to reflect such policy in their local development plans. The extent to which aquaculture is favoured in such plans depends very much on competing interests for marine space. In Shetland, for example, the economy has traditionally been based on maritime activities such as fishing, and aquaculture is thus more accepted than in some areas on the mainland where tourism is more important. Most Local Authorities have prepared or are in the process of preparing marine spatial plans that include aquaculture, and this process will be further encouraged by the new planning legislation introduced with the Marine (Scotland) Act 2010.

Shetland is possibly the only region of Scotland where different legislation applies by virtue of its key role in the North Sea oil industry. When oil was first discovered in the region, the local council was given full control over all developments around the islands through the Zetland County Council Act 1974. Thus aquaculture developments firstly require a Works Licence before a Crown Estate lease can be issued. A similar arrangement exists in Orkney.

5 Conclusion

It may be seen from the previous sections that the Scottish salmon farming industry is heavily regulated, and subject to a wide range of legislation. In addition, it has its own CoGP setting out the standards it aspires to. The fact that 95% of farmed salmon in Scotland is produced by just 9 companies who are represented by the quasi-statutory SSPO, an organization set up under European legislation, means that the channels for ensuring regulatory compliance are highly focused. Existing regulations are closely adhered to and new ones have a high chance of adoption. Not only that, but the regulatory framework now in place has to a large extent been developed through close cooperation between industry and the Scottish Government, and is backed up by highly supportive national policy in the “Renewed Strategic Framework for Scottish Aquaculture”. This Framework is the end result of a process of continuous policy development since the devolution of the Scottish Parliament, and the support given by Government is clearly in evidence through the activities and progress of the different Working Groups reporting to the Ministerial Group on Aquaculture, which is chaired by the Minister for the Environment.

Furthermore, continual pressure from wild fishery interests and environmental groups mean that there is no let up in the search for improvement with regard to such issues as fish health, containment and sea lice control.

Whilst there is still much to be done to simplify and improve many aspects of the regulatory environment, it is clear that initiatives are in place to allow progress to be made, and there is a clear desire by both industry and Government to make such progress happen.

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Annex I

5.1 Terms of Reference

The purpose of the consultancy is to develop a 10-20 pages report-lesson learned regarding the different approaches of the different salmon regions. This paper will outline how these regions address the issues on salmon farming and how they address the issues on a regional basis. The contractor shall deliver the white paper with the following content:

- Description of the Scottish farming system - (salmon) - evolution of management practices
- Issues surrounding Scottish salmon industry (individual farm and regional)
- Analysis of the present and recent regulation recently released in the year 2010.
- Discussion on the regulations (previous and current) and changes in the operational aspects that these will bring.
- How the industry manage to adopt/adjust/comply with these regulations
- Future challenges of the industry in the years to come.
- How these regulations address the issues on a regional basis
- Who and how these regulations are being implemented

5.2 Additional information

“Our interest in the Scottish salmon industry for the time being is to get lessons learned and better management practices in terms of improving the system, complying with regulations and addressing environmental issues. The white paper will serve as a guide for us to decide whether we will be doing aquaculture improvement partnership program in Scotland or not. Additionally, we will be using the white paper or the report in working with other aquaculture regions.

Our organization's goal is sustainability on seafood industry. We are doing this through information awareness and networking. We support certification but we are not offering accreditation schemes.”