



Submission to the Scottish Parliament Aquaculture Enquiry

Transport and Environment Committee

By

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Contents

SUMMARY.....	3
WHO WE ARE.....	3
IMAGE AND PERCEPTIONS.....	3
ENVIRONMENTAL ISSUES: LIMITS TO KNOWLEDGE	4
PRECAUTION, RISK, COSTS AND BENEFITS	5
UPSTREAM IMPACTS: SUSTAINABLE FEED SUPPLIES.....	6
ENVIRONMENTAL CAPACITY.....	6
CURRENT REGULATION AND MANAGEMENT.....	7
SITING	7
EIA.....	7
DISCHARGES OF CHEMICAL AND ORGANIC EFFLUENTS.....	8
LESSONS FROM ABROAD	9
IMPLICATIONS FOR A STRATEGY FOR AQUACULTURE DEVELOPMENT AND MANAGEMENT	9
KEY ELEMENTS IN AN IMPROVED ENVIRONMENTAL MANAGEMENT SYSTEM FOR AQUACULTURE IN SCOTLAND	10
ROLES.....	11
THE FUTURE.....	11

Summary

Scottish Salmon farming is suffering from unprecedented criticism relating to possible health and environmental impacts. Some, but not by all of this is ill-informed and biased, yet still receives very broad media coverage. This is despite the fact that Scottish Salmon farming is amongst the most highly regulated industries in the world.

For the sake of the industry and the people of the Highlands and Islands who benefit from the positive economic impacts of salmon farming, something must be done. Experience to date suggests that more regulation will be insufficient to convince environmental groups and a sceptical public.

While accepting the need for some improvements and rationalisation to the regulatory regime, we believe that the main thrust of change must be in three key areas:

1. Increased participation in and improvements to environmental and product quality certification and labelling schemes;
2. More widely understood, more broadly agreed and far better monitored environmental quality standards – at national and local level;
3. Making farmers both more aware of and more responsible for their effects on the environment.

Without these changes consumer confidence will continue to fall, pressure groups will continue to gain ascendancy, growth in the industry will be limited and prices will continue to decline in relative terms.

In this submission we elaborate on some of the issues facing the salmon industry and outline some key elements for a more cost effective and credible regulatory regime.

Who we are

The promotion of sustainable development is a key element in the mission of Nautilus Consultants. We bring together business/economic and environmental expertise to provide objective analysis of environment-development issues and provide a sound basis for rational decision making and policy development.

We have world-wide experience in the planning, management, assessment and evaluation of aquaculture development – from social, economic and environmental perspectives. We have written guidelines for planning, environmental assessment and best practice in the industry. We have undertaken analyses of social, economic and environmental issues related to aquaculture for international agencies and national agencies, including the World Bank, FAO, the UK Department for International Development, Highlands and Islands Enterprise, the British Trout Association, Seafish, and Scottish Natural Heritage. We also have direct practical professional experience of the Scottish Salmon Farming Industry, one of our staff having previously worked for Marine Harvest. Further information about our activities and competence can be found on our web site www.nautilus-consultants.co.uk

Image and perceptions

We make this submission primarily as a result of frustration with the quality of the debate over health and environmental issues associated with the cage farming of salmon in Scotland. This debate has been

characterised by biased and sensational reporting, polarisation of opinion, and a disturbing lack of thorough and objective – but accessible – information and analysis.

For an industry already struggling with low prices and slim profit margins this is bad news. And it is bad news for the people of the Highlands and Islands – both in terms of jobs and income, and in terms of our image as a country blessed with very high quality of natural environment.

It is essential that the industry itself now takes more responsibility for the environment, and demonstrates in practical terms its commitment to improvement. It is no longer sufficient to abide by regulation; the industry must demonstrate genuine concern, and work with other interests to address issues and problems. This will involve some costs, but should ultimately generate significant rewards in terms of product image and price.

Before considering in more detail how this might be done, and how industry and government roles can be complementary, we shall briefly review the environmental issues as we see them.

Environmental issues: limits to knowledge

The environmental problems associated with aquaculture development have been widely reported and debated. From a management perspective these impacts range in character from those which are relatively easy to quantify and predict – and therefore to manage - to those which are highly uncertain. This distinction is rarely highlighted in current analysis, but is critical to gaining broad agreement on future management of the industry.

Local impacts on the seabed – primarily the accumulation of organic matter – are relatively easy to model, and the nature of the impacts can be readily quantified and described. They are relatively severe but highly localised. Agreement on what is or is not acceptable should not be difficult to achieve amongst a group of representatives of key stakeholders. . The interests of the industry will generally be in line with those of environmentalists and other resource users.

Impacts of chemicals used in aquaculture production are more complex, but rough predictions can be made and confidence limits established. We can model dispersion, dilution and breakdown. The toxicity to key indicator organisms of different concentrations of chemicals is generally known or can be established relatively easily. Again, standards can be developed and agreement sought amongst scientists and representative stakeholders. Although there is likely to be more argument over acceptable levels and usage, an informed and fair process should lead to acceptable standards for all parties.

Similar arguments apply to the possibility of toxic residues (dioxins, flame retardant etc) in salmon flesh and their potential impact on human health. Although this is a highly sensitive issue and significant uncertainty exists, standards are in place and can be enforced, and standards can be modified in line with consumer risk preferences and/or new information.

Several other potentially significant impacts are poorly understood and difficult to determine or predict. These (possible) impacts include:

- Impacts of nutrients on the wider coastal environment (e.g. blooms of toxic plankton; knock-on effects on other elements in the marine ecosystem);
- exchange of parasites and disease between farmed and wild salmon;
- impacts of escaped salmon on wild salmon or other elements of the ecosystem through competition or genetic mixing.

The complexity of the various chains which could lead to these impacts is such that even major research initiatives are unlikely to yield clear answers or quantifiable relationships or predictions. Appropriate standards or targets are therefore difficult to define, response mechanisms subject to heated debate, and regulations – if not universally approved are likely to be resisted or avoided. There is no clear common ground.

It is inevitable that these uncertain impacts will be interpreted as less likely and of lesser importance by those in the industry than by those who may be affected by it. In environmental economic terms the willingness to pay for these possible impacts by the industry will be far lower than the willingness to accept these impacts by those outside the industry. This is especially true for those engaged, for example, in the remaining wild salmon fishery or those whose career is related to environmental conservation.

Furthermore, the uncertain nature of these impacts is such that environmental pressure groups have been able to invoke the precautionary principle in support of calls to apply radical curbs to the industry.

Precaution, risk, costs and benefits

Increasingly it is argued by environmental groups and policy makers that that we should implement the precautionary principle. The principle was internationally agreed in Principle 15 of the Rio Declaration of the UN Conference on Environment and Development (UNCED):

"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation"

Some organisations and individuals claim that the application of this principle requires a moratorium on cage culture of salmon. The rationale for this is that although some of the impacts described above are far from proven and not quantifiable, they are nonetheless possible, if not likely, and could be very serious. Precaution then requires that we take immediate measures to prevent these impacts, and do not wait for research to prove them.

While we agree that we cannot and should not wait for proof; we doubt that a moratorium represents a "cost-effective measure" – and certainly these groups have made no attempt to demonstrate this by analysing the costs and benefits associated with different measures.

Any rational human being confronted with risk does not automatically err on the side of precaution, but rather weighs up the possible costs associated with the risk, and sets these against the benefits. They also weigh the cost of actions they take to reduce risk against these costs and benefits. This is the rationale behind the use of the words "cost-effective" in the Rio declaration

To date, although there has been much discussion, and some research, on the risks, no-one seems to have grasped the nettle and weighed up the costs and benefits. The benefits have been addressed – 6,000 jobs in Scotland, more than 2 billion sales revenue (less rather hefty feed import costs). What about the worst case costs associated with possible environmental and health impacts?.

An independent and comprehensive study should be undertaken, examining the actual and possible costs and benefits associated with salmon farming, the distribution of these costs and benefits, and associated levels of ignorance, risk, and uncertainty.

Such a study would provide far more useful information for decision making than trying to work out the actual probabilities of all the links in some of the impact chains described above. For example, the jobs and value associated with the wild salmon fishery now and in the past could be estimated very easily. Ultimately, if salmon farming is in part responsible for the decline, then a proportion of the costs could be allocated. Others would argue that the cultural value is far higher. These values can and should be thoroughly characterised, and (although this is not easy) assigned cash values *as far as is realistic*.

Once we have characterised, assessed and quantified (as far as is reasonable) the worst case costs, we can make the judgement – is it worth the risk? This judgement is subjective, and therefore “we” should be the wider population. But the judgement of ordinary people will be far better if they are fully and reliably informed. The possible costs and benefits must be laid out clearly, along with all the associated uncertainties. Sadly, at the moment the information is almost all coming from interest groups (pro and anti) and is biased to say the least. The general public are currently more inclined to believe the anti-camp because of our traditional mistrust of big-business. But the truth, surely, lies between the two. An unbiased and comprehensive review and analysis, addressing the risks, costs and benefits is urgently required.

Upstream impacts: sustainable feed supplies

Salmon farming has also been criticised for its impact on capture fisheries. Far from taking the pressure off these fisheries it is argued, aquaculture actually increases the pressure through its heavy use of fishmeal and fish-oil.

It appears that aquaculture is being unfairly singled out for criticism in this regard. Fishmeal and fish oil is used widely in poultry and livestock feeds, and yet these industries have not received the same level of criticism. Furthermore, if the fishmeal industry is “unsustainable” (and many scientists and economists would dispute this), at least as much criticism should be targeted directly at the operators of these fisheries and fishmeal production plants.

In the longer term this is probably not a significant issue. Current nutrition research suggests that it will be possible to substitute a large proportion of fishmeal and oil with vegetable substitutes. The degree and rapidity of this substitution will increase as fishmeal prices rise in response to steadily increased demand and limited supply.

Environmental capacity

The terms *carrying capacity* (the total level of aquaculture production that can be sustained by the environment) and *environmental capacity* (usually meaning the total amount of waste that can be assimilated by the environment) are regularly referred to in the debate over the management of aquaculture.

These concepts can be applied relatively easily and usefully in fairly well bounded aquatic systems such as lakes and restricted sea lochs, but become increasingly difficult to apply in more open aquatic systems. Nonetheless they are fundamental concepts, since they force us to define environmental objectives and standards. This is because environmental capacity (from which carrying capacity can be deduced) is defined as the difference between the existing environmental state and some agreed limit to change or acceptable state.

While environmental capacity has been repeatedly raised as an issue in the debate, and much research funding is currently being applied to the issue, rather few have pointed to the need to start with agreed environmental quality standards. This is unfortunate, since agreement on objectives and standards is the classic first step in conflict resolution. If we agree on where we want to be, it will be much easier to agree on how we should get there. The tendency to leave the standards to SEPA or the EU is understandable, but no longer sufficient.

We believe that greater participation of local and relevant national interests in debating existing standards (and quite possibly agreeing to higher standards), will reduce some of the existing conflict,

facilitate and focus estimation of environmental capacity, and serve as the basis for a more informed environmental management system.

Current Regulation and management

Current regulation of aquaculture in Scotland rests (through rather a lot of intervening European, UK and Scottish legislation) on five fundamental elements:

1. Control of siting – lease conditions from the Crown Estate ;
2. EIA for new farms or farm developments of more than 100t or 1,000 m²;
3. Control of organic and inorganic chemical discharges with consents and authorisations (may include cage position, numbers, biomass);
4. Control of marketing of pharmaceutical products
5. Control of sale, supply, storage and use of pesticides

We do not believe that this system is effective in the delivery of environmental objectives. Indeed, we are unclear as to what the environmental quality objectives are, and how they relate to the regulatory framework.

Any new strategy must start from clear and broadly agreed environmental objectives, with associated indicators and standards, relating to all the major environmental issues associated with aquaculture development.

These objectives, standards and indicators should be developed, and broadly agreed between major stakeholder representatives, at both national and local level, taking full account of national, EU and international obligations

General agreement on these objectives and standards will be difficult, but once in place will significantly reduce the potential for conflict.

Siting

Siting is fundamental to both the success and the environmental impact of coastal aquaculture. The Crown Estate has not been in a position to take a strategic locational approach to the granting of leases beyond the broad guidance in the Scottish Executive Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters. Its financial interests have never sat easily with any kind of restriction of aquaculture development; and its powers were in any case limited in this regard.

We welcome the proposed shift of responsibility to local councils, and consider that they should take a significant role in facilitating agreement on appropriate local objectives and standards, and draw up local strategies and action plans to meet these objectives.

EIA

While EIA may be effective in rooting out poorly prepared and inadequately thought out proposals, it provides very limited insight and guidance with respect to the most significant environmental issues associated with aquaculture development. It offers no mechanism for dealing with the wider cumulative environmental impacts of the sector as a whole on water quality, biodiversity and wild populations, nor does it adequately address issues of risk, uncertainty and value. The assessment of impact significance is typically undertaken by consultants and reviewed by SEPA and other technical agencies. There is no formal framework or procedure for clearly identifying the potential costs and benefits, the risks and uncertainties, and making the necessarily

subjective judgement about the desirability or otherwise of the trade-offs involved. Environmental quality standards, essential for minimising the subjective components and for rational and consistent assessment of impact significance, are limited to national and EU standards relating to water quality and nature conservation. The interests of other local resource users are not generally reflected in these standards – or if they are, then these same interests are often not aware that this is the case.

Most EIAs put much weight on the dispersion of organic wastes in the vicinity of the farms. It is well established that seabed impacts associated with organic wastes from fish farms are relatively localised – and, except where a clear and specific conservation interest is threatened, will have no “significant” impact.

If well sited and committed to best environmental practice a proposal for a fish farm should have little difficulty in meeting the requirements of an EIA. The effect of EIA is therefore to promote good siting and improved environmental management of individual farms. This is of course commendable – but it could be achieved at lower cost and effort using a clear set of guidelines on siting and best practice, coupled with effective monitoring and response procedures.

Farm level EIA is fundamentally flawed as the main tool for the environmental management of an industry whose most important social and environmental impacts are cumulative and uncertain.

We strongly support the notion of independently commissioned sector environmental assessment (SEA): a periodic sector wide, geographically bounded review of impacts, leading to proposals for a sector wide management plan. The boundaries could relate to defined coastal aquatic systems, or possibly the whole Scottish West Coast Joint funding by the industry, national and local government, and relevant agencies would ensure quality and impartiality.

Discharges of chemical and organic effluents

Chemicals are controlled either directly through authorisations from SEPA or indirectly through control of sale, storage or use. While there may be room for some rationalisation, and increased public say in what is or is not acceptable, this appears to be the most appropriate approach. Better information on the nature of the chemicals and their effects on the marine environment should however be made widely available.

We are unclear as to how authorisations are set in respect of nutrient and organic matter loadings. It seems that if dispersal patterns are adequately researched described that this is then adequate basis for consent. The relation between these consent levels and environmental quality objectives is unclear.

This raises the issue of *effects based* and *process based* regulation. The current system is process based. Farmers are responsible for adhering to rules and standards relating to chemical use, effluent discharge, scale of production, feed use etc. They are not made responsible for maintaining the quality of the environment itself. They may see little relationship between the regulations they are subject to and wider environmental quality standards. Since policing is necessarily limited they may be tempted to circumvent regulations.

Effects based regulation would require less regulation of individual farms and farm operations but much more comprehensive environmental monitoring systems – run ideally by the industry, but with quality control and higher level monitoring by SEPA.

Agreed warning action threshold levels for environmental indicators, and clear response procedures should be established.

Farms should be required to keep more comprehensive operating records so that links between environmental quality and farm operations could be established – to allow the farmers to modify and improve their environmental performance, and to allow for investigations should warning thresholds be exceeded.

Where threshold standards are exceeded, and where fish farming can be shown to be responsible, a significant and proportionate cost should be imposed on the farmer – and in the extreme case loss of operating license.

The Norwegian MOMS system incorporates some of these elements, and we recommend further analysis of the strengths and weaknesses of Norwegian and other management systems.

We are aware that this contradicts some of the recent suggestions regarding a greater role for SEPA in influencing farm process and practice. We are of the view that if farmers are made more aware of and responsible for (and therefore pay an appropriate price for) the impacts they have, they will rapidly learn how to reduce these impacts.

Lessons from abroad

Aquaculture has developed rapidly in many parts of the world, and there is international concern over its social and environmental impacts. The growth of shrimp farming has been spectacular. Seabass and seabream cage culture has grown rapidly in the Mediterranean. Significant social and environmental benefits and costs have been associated with these developments. EIA, already a feature of regulation and management in most developed and many developing countries, has consistently failed to address the cumulative impacts of aquaculture. Governments have repeatedly failed to grasp the nettle by setting or facilitating the agreement of clear environmental standards, coupled with and associated sector wide limits on location/extent, discharges, production, or escapes. EIAs have become a costly and ineffective bureaucracy, and an excuse for lack of intervention. Cumulative development has led to large swathes of habitat being polluted or degraded to the detriment of fish farmers and other users alike.

Norway does not use EIA, but bases its regulation primarily on a licensing system administered by the Ministry of Fisheries, but with significant input from local government, especially in relation to limits and controls on individual farms. Environmental standards, designed to address the needs of different coastal resource users, serve as the basic criteria for agreeing controls and regulations. Strict record keeping (especially with respect to the use of chemicals) and environmental monitoring are key features. Much effort has been put into the estimation of environmental capacity and carrying capacity to inform the management process. While criticisms can be levelled at some aspects of the Norwegian system, it is more streamlined than the UK system, more democratic, and clear objectives are being pursued.

There are many interesting examples and models of aquaculture environmental management from around the world⁴, and these deserve consideration by the committee in their deliberations.

Implications for a strategy for aquaculture development and management

The above analysis reveals several important features of aquaculture development, with implications for improved environmental management of the sector:

- The environmental impacts from aquaculture are similar to those from agriculture. Although they may be deemed insignificant in relation to individual farms, cumulative impacts from a large number of farms can be damaging to the environment and to the aquaculture industry itself.

⁴ Especially Finland, Hong Kong, Australia and New Zealand

- Environmental assessment for the whole sector within a defined area or region (sector EA) is required to address cumulative impacts from many farms; to set the ground rules for any project and farm level EIA or regulation; and to pre-empt conflict.
- Widely agreed environmental quality standards and targets – informed by a sector EA process - are a pre-requisite for the assessment of carrying capacity; for assessment of impact significance; and for consistency between EIAs or restrictions applied to individual farms.
- Several potentially serious impacts are difficult to predict, highly uncertain, and associated with the whole sector rather than individual farms. They represent a significant risk, and possibly substantial cost to other coastal resource users. These costs and their associated risk and uncertainty levels should be explored in detail, and set against the likely potential benefits, and the distribution of these benefits. A thorough and objective analysis of this kind should be a key element in the sector environmental assessment.
- Public involvement in sector level assessment, and in the setting of environmental quality standards, should reduce the likelihood of conflict arising in relation to individual development projects and in respect of the whole sector.
- Farmers should be allowed as far as possible to seek their own solutions to meeting environmental objectives and associated standards. In other words environmental management should as far as practicable be *effects based* rather than process based, and farmers should be made responsible for environmental quality in general rather than adhering to a complex set of regulations which may or may not deliver environmental objectives.
- In practice any strategy and associated environmental management system will need to deliver decisions which involve trade-offs between relatively well established benefits on the one hand and uncertain impacts and costs on the other. This is a subjective and essentially political process and cannot be left entirely to a primarily scientific agency such as SEPA, or to a limited process such as farm level EIA.
- Simple mitigation measures can greatly reduce the environmental impacts of aquaculture. They apply to the aquaculture sector as a whole, and to individual farms. Incentives and structures must be put in place to encourage the implementation of mitigation measures. Positive economic and market incentives such as labelling schemes should be the key tool to promote these changes.
- Any new management framework should explicitly balance local needs and perspectives with national and international interests. To date local involvement in setting standards and decision making has been limited. The increased role for local councils should help in this regard.
- There remains tremendous ignorance and uncertainty about coastal environmental systems, and this will not change in the foreseeable future. Only through far more comprehensive monitoring, rigorous evaluation, and adaptation will effective and locally appropriate environmental management systems be developed.

Key elements in an improved environmental management system for aquaculture in Scotland

Bearing in mind the main points made above, and the need to take full account of consumer concerns, we suggest that the key to improved environmental performance of the fish farming industry should combine

strong push and pull elements pressuring the whole sector, but with rather little in the way of detailed and bureaucratic regulation of individual farms.

Environmental and quality certification and labelling schemes should serve as the pull (and at the same time directly impact consumer confidence);

More comprehensive, widely agreed, and effectively monitored environmental quality standards will provide the push.

A national strategy with broad guidance for local government and government agencies would provide the enabling context and ensure some degree of overall standardisation

Farmers should lose money if their activities lead to a breach in environmental quality standards, and make more if they improve their environmental performance as measured in certification schemes. The certification schemes should not be too prescriptive, but rather performance indicator and management system based. Farmers should be allowed to seek their own solutions to ensuring minimal environmental impact.

Roles

SERA D – as is already agreed – will facilitate and adopt the national strategy. SEPA and SNH would have major roles in advising on standards corresponding to national and local environmental objectives. They would also engage in far more comprehensive monitoring and regular national level reporting on the state of the environment in accessible format. They would have less, not more control over individual farm activities, except where environmental warning thresholds are breached.

Local Councils would play a significant role in facilitating the adoption by a broad range of stakeholders of local environmental quality objectives, standards and indicators (set within national guidelines or limits). They themselves, advised and supported by SEPA and SNH, would generate their own state of the environment reports, including analysis of relationships between all significant economic activities and environmental indicators.

A wide range of stakeholders would become involved in the development and improvement of environmental and quality certification schemes - in addition to farmers and independent advisors. For example, responsible environmental pressure groups must be brought into the certification process if the schemes are to gain the confidence of consumers and the wider population. SEPA and other independent scientists might also be brought in as advisors.

The future

With these elements in place, and a major facilitating effort by the Scottish Executive and the local councils, we see no reason why the interests of the salmon industry and those of health and environmental pressure groups should not converge to a point which benefits the consumer, the environment and the Scottish economy.