



BVA policy position on UK sustainable finfish aquaculture

Introduction

As the world population continues to grow, global consumption of animal-derived food is rapidly increasing¹. This provides challenges in protecting the welfare of all animals involved and minimising the impacts of our food production on the

individual or corporate ownership of the stock being cultivated, the planning, development and

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Sustainable aquaculture can be defined as aquaculture carried out in a way that meets the needs of the present without compromising the ability to meet the needs of the future⁵. Sustainable aquaculture should be undertaken in a way that is environmentally, ethically, and economically acceptable for consumers, producers and wider society. As part of this, animal health and welfare should not be unnecessarily compromised to address human need and in order to be considered sustainable, aquaculture systems must work towards the positive health and welfare of all fish raised within them.

UK aquaculture

Aquaculture is one of the , helping to underpin sustainable economic growth, both in rural and coastal communities and in the wider economy. The UK is the 8th largest producer of finfish from aquaculture globally, and worth an estimated £1.4billion, contributing significantly to the UK economy. It is particularly important in Scotland, providing essential jobs in remote and rural communities. A study showed that the Scottish aquaculture sector supported 11,700 jobs, generated £885 million gross value added, and paid £94.1 million in taxes in 2018⁶. The sector is expected to grow faster than the UK economy over the next 10 years⁷. Scottish salmon farming, specifically Atlantic salmon (*Salmo salar*), dominates UK aquaculture production, representing 95% of the industry by value and 90% by volume. In 2021, 51.1 million smolts (young fish, after the parr stage) were transferred to sea, producing 205,393 tonnes of salmon in total⁸. Although 30% of the fish eaten in UK is farmed salmon, nearly half of salmon produced in the UK is exported. The largest percentage goes to France, and a significant proportion is flown across the Atlantic.

The salmon aquaculture industry is relatively new, the first output being Unilever in 1970. The sector has since grown very rapidly but has recently plateaued as site development became a limiting factor. There has also been a consolidation of the companies involved, with just seven companies now responsible for the c.200 salmon sea farms in Scotland, including four international companies. Despite the huge scale of the sector, the total pen area measures just 168ha, representing an area smaller than Edinburgh Airport. This impacts an estimated 120 to 125 square miles of seabed. TETQq0.000008866 0 5

Recommendation 2: BVA should monitor any new research or evidence of new and emerging aquaculture systems in the UK, and consider developing additional positions on sustainable aquaculture for those species as appropriate.

Animal health and welfare as a key sustainability objective

In order to be considered sustainable, aquaculture systems must work towards the positive health and welfare of all farmed animals raised within them.

animals must have the opportunity to have positive experiences. Over time, positive experiences should outweigh negative experiences. This should encompass the health and welfare should not be unnecessarily compromised to address human want or need.

There has been growing research and evidence to show that fish feel pain, though different species have varying responses, so pain indicators have to be quantified on a species by species basis¹². For example, studies showed koi carp to move away from noxious stimuli and their response decrease when lightly anaesthetised¹³, rainbow trout learn to avoid an area where an electric shock is given¹⁴,

Mortality rates

One major challenge is the mortality rate on fish farms. High levels will have serious impacts on the ethical, economic and environmental sustainability of fish farms, so it is vital that they are addressed.

Fish have a very different reproductive strategy to mammals and birds, usually producing thousands of eggs at a time rather than a few offspring a year or single egg a day. This strategy is designed to cope with high mortality rates at all stages of the natural lifecycle, as a low percentage of wild fish survive to adulthood. Only a very small proportion survive to reproduce, with most of the mortalities occurring in the early life stages.

Mortality rates for more developed fish are of greatest concern to the industry. Salmon Scotland publishes monthly stock mortality rates, and in 2020 reported average monthly losses of 1.3% of post-smolt farmed salmon, compounding to 14.5% over the year. The Scottish salmon farming sector is the only UK farming sector to publish monthly stock mortality rates¹⁹. Gathering meaningful data is challenging for the trout sector due to its small size and high levels of variation between farms, but mortality rates are thought to be low once fish have developed beyond the early stages. Mortality rates may be higher if there is a significant event, eg a disease outbreak, oxygen depletion event, or jellyfish bloom.

The aquaculture sector is constantly working to reduce mortality rates, but more efforts are urgently needed to improve the survival rates of farmed fish. Identifying and mitigating existing risks and staying aware of emerging threats will be a vital part of this. This position discusses some of the major risks to fish health and welfare which directly contribute to mortality.

Stress and handling

Stress is an important factor in managing fish health and welfare, as it reduces resilience to disease and other threats. If an infection is present in the background and a stressful event occurs, it may lead to a sudden increase in mortality shortly afterwards.

Handling fish can cause significant stress, so must only be conducted when necessary and well managed to minimise harm. Where possible handling is avoided, but it is sometimes necessary and important, eg for vaccinations, controlling size variation, health checks and treatments. In these situations, stress should be controlled as much as possible, with measures such as limiting the number of fish in nets, corralling them slowly, and monitoring oxygen levels and fish behaviour.

Automated processes are becoming more common, including for vaccinating fish. These can remove some of the operator errors which can cause stress and can also speed up processes. For example, in some trout farms, a fish pump and grading machine transfers fish into graded tanks in less than one minute, with the impacts of stress noticeably reduced.

It can be very difficult to capture individual fish, especially in large systems. Capturing an individual may require crowding and handling of a large proportion of the population, therefore, treating or euthanising an individual fish can often only be achieved at the expense of stress to a large number of fish. Innovative methods or technology to identify and capture individuals with poor health and welfare without causing stress to others would be hugely beneficial.

Gills, skin, and fins

The health of fish gills is important to consider, as they are highly adapted organs and are involved in a number of critical functions such as gas exchange, osmoregulation, acid-base balance, excretion of nitrogenous wastes and immune function. However, they are easily damaged, which can have a significant impact on fish health and welfare. Gill health impacts the needs of fish in relation to water chemistry, especially in terms of oxygen and carbon dioxide concentrations. The efficacy of treatments used to control a range of diseases will be impacted by gill health, with some treatments having a negative effect if the gills are compromised, eg hydrogen peroxide treatments when fish have been exposed to Harmful Algal Blooms (HAB). Handling fish with compromised gills can also result in significant mortalities.

¹⁹ Salmon Scotland (2023) Mortality rates in Scottish salmon farming www.salmonscotland.co.uk/facts/fish-health-welfare/mortality-rates-in-scottish-salmon-farming Accessed March 2023

It is important to pay attention to gill condition and manage the needs of fish accordingly. A number of factors can affect gill health. Amoebic gill disease (AGD) is a significant challenge, especially for any fish transferred into the sea in autumn – see section on disease below. Thermal treatments, which can be an effective treatment for removing sea lice, can also be damaging to gills and the integument

farms, compared with 3,454 tonnes by seals and 400 tonnes by otters²⁴. Further research is being conducted into wild wrasse fisheries to ensure they are sustainable²⁵.

A combination of methods may be needed to treat an outbreak of sea lice. Integrated sea lice-

percentage increases or decreases into context of overall usage levels. Levels of antibiotics use

surgeon. Before feed withdrawal takes place, it is also important that the welfare of cleaner fish is taken into account eg the risk of predation. Protective measures, such as the potential

veterinary health plan

crowding should be managed to reduce the risk of distress and injury

handling and removal from water this must only be carried out when absolutely necessary

transportation from pen to harvesting station any transport should be in accordance with general safe transport guidance as set out in RSPCA standards and [The Code of Good](#)

animals must not recover consciousness until death ensues

Sustainable resource management to protect and conserve species, habitats and biodiversity

As a health-centred profession and key stakeholder in the One Health agenda, the veterinary profession also recognises that policies relating to sustainable aquaculture must address the use of natural resources, protection and conservation of wild species, habitats and biodiversity in order to better protect the environment which both humans and animals share and reduce the ecological footprint of animal agriculture as a whole.

With natural fish populations under pressure globally, the shift towards aquaculture could be vital for protecting remaining stocks, enabling consumption to continue without additional pressure on the wild populations. With a growing human population relying on protein from fish, it is unlikely that commercial fisheries alone will be able to keep up with demand in a sustainable way, and thus aquaculture must be considered as part of the solution.

Although it reduces reliance on wild fish species intended for human consumption, aquaculture has the potential to impact wild stocks in other ways, as well as other species and the wider environment. An overview of some of the biggest challenges and concerns about the sector are included below.

Fish feed sourcing

One of the biggest pressures in terms of sustainability of the sector is where feed for fish is sourced from³⁷.

The feed for most farmed species comes in the form of pellets made from fishmeal, fish oil, by-products, plants, and other sources. These pellets are very sophisticated, and so food conversion efficiency is often as good as 1.1. There is already a strong focus on making sure all ingredients currently being used in feed are sourced responsibly, and on checking compliance. Some retailers

framework n

It is important to consider that there are numerous sources of pollutants which can have negative environmental effects in our water systems. The relative impact of these must be understood such that critical risks can be mitigated in each and every sector.

Policy, legislation and planning permission

The sustainable development of aquaculture will be heavily influenced by international, UK and devolved nation legislation, policies, agreements and obligations. Climate change and biodiversity loss are major drivers for policy change globally, so the environmental impact of aquaculture will continue to be a key focus.

Scottish Government have significant environmental ambitions, including creation of more marine protected areas, an ambition to achieve net Zero by 2045, and a drive to increase the number of wind farms, so the [Blue Economy strategy](#) will play an important role in the future of the Scottish aquaculture industry. Across the UK, the [Marine Strategy](#), [Food Strategy](#), and the [Environment Act](#) could impact the future of the industry.

These policies and laws will have a particularly significant impact on which sites are approved for development, and how they are allowed to operate. The location of a fish farm is important to consider, in terms of suitability for the fish being farmed, impact on the environment and social license. Planning permission is required for any new sites and can only be attained through a lengthy process involving several key bodies.

efforts to consider the range of species farmed in the UK, with a view to improving sustainability

[standards for farmed Atlantic salmon](#) also include standards for care of cleaner fish. Further research is needed to ensure we understand the husbandry needs of all cleaner fish species, and how best to measure their welfare outcomes.

Monitoring behaviour

The importance of good husbandry, and of the competence of fish farmers in recognising positive and negative welfare indicators in their stock cannot be over-emphasised. We support the further development of training in welfare assessment, with vets playing a key role in developing and delivering such training.

Measuring behaviour is important for assessing welfare, but is particularly challenging in fish as:

is also evidence of affective states^{64,65}, where the behaviours can be rewarding as well as the outcomes, eg the act of hunting providing an adrenaline rush before the reward of the kill, so preventing rewarding behaviours may lead to frustration.

As the aquaculture sector rapidly develops, and farmed species become more genetically distant from their wild counterparts, our understanding of fish behavioural needs must also quickly improve. For example, the question of what motivates salmon to migrate, and how these needs can be met beyond the transfer from freshwater to saltwater urgently needs to be answered to decide how or whether their needs can be met in captivity. We would welcome further research into fish behaviour and positive welfare, with a view to developing animal welfare metrics across species so that indicators of positive welfare, emotional and behavioural states are incorporated into welfare outcomes assessment and lifetime welfare assessment where possible. In the meantime, keepers should improve welfare assessment through practical implementation of the existing knowledge on welfare,

It is important to recognise that fewer healthier and happier animals with better productivity have less of an impact at all levels compared to numerous animals with poorer health and welfare outcomes. Considering sustainable consumption and production together can therefore have a positive impact on animal welfare and provide an opportunity to drive consumer demand for high animal welfare products.

Within the context of One Health, the veterinary profession should promote the benefits of sustainable consumption, coupled with properly valuing quality animal-derived products, where quality encompasses good animal health and welfare, food safety, environmental protection, and fair returns

while maintaining proportional spend and directing this spend towards higher health and welfare products.

In many ways, aquaculture compares favourably with agriculture on sustainability metrics, with lower greenhouse gas emissions, use of nitrogen, phosphorus and fresh water, and land use per tonne of edible weight⁷². However, there is still room for improvement, such as around the sourcing of fish feed. Given the many differences it may be unwise to compare and contrast the aquaculture and agriculture sectors, but it is advisable to include both sectors when looking at how to sustainably feed the growing population. The language used and types of conversations taking place for the agriculture sector should also be used when considering aquaculture. Consumers should consider the fish they eat alongside other animal derived products as part of the 'less and better' approach.

Recommendations

Recommendation 46: The aquaculture sector needs to improve communication with the public to dispel common misconceptions, and engage with stakeholders on initiatives to tackle the challenges that exist. Veterinary professionals and organisations also have a role to play in educating others on current UK standards and advances in farmed fish welfare.

Recommendation 47: UK governments urgently need to introduce clear, streamlined legislation which standardises the conditions in which fish can legally be farmed and provides confidence to consumers on