

Aquaculture

Aquaculture is a growing and increasingly important industry in Scotland. It helps to underpin sustainable economic growth in rural and coastal communities, particularly in the Highlands and Islands, with many depending on the employment and revenue it provides.

Summary

Key messages

- Farmed Atlantic salmon is the dominant product of aquaculture (96%) in Scotland.
- Scotland is the largest producer of farmed Atlantic salmon in the EU, (93% of total EU production), and the third largest in the world, [producing 162,223 tonnes in 2012 worth approximately £537 million at the farm gate.](#)
- Using Scotland's seas, lochs and rivers for aquaculture requires careful management to minimise risks to the wider environment and wildlife.
- The pressures on aquaculture include disease and parasite control, as well as challenges that may arise as a result of climate change.
- Industry and regulators are working together to develop best practice in aquaculture, which will help to secure the industry's future in Scotland and protect stocks of wild fish.

State and trend

A summarised assessment of the state and trend has not been made for this topic.

Please read the topic for more information; if you have any questions about Scotland's Aquaculture please feel free to contact us using the comment button above.

Overview

Aquaculture is the cultivation of animals and plants in the aquatic environment. In Scotland, intensive farming of finfish and shellfish predominate, producing products for human use.

Aquaculture in Scotland mainly provides finfish for the table, producing Atlantic salmon and rainbow trout, with brown trout, sea trout, halibut and Arctic char making a small but important contribution.

Scotland also has a successful shellfish-farming sector specialising mainly in producing blue mussels and Pacific oysters, with smaller numbers of native oysters and scallops.

<http://www.environment.scotland.gov.uk/get-informed/water/aquaculture/>

A small seaweed aquaculture industry is also emerging. The products from these seaweed farms are likely to be used in several ways, including food for human consumption, animal feed, and fertilisers.

Aquaculture products can be used for many purposes, from food to biofuel. However, at present, food production is the main driver for Scottish aquaculture.

There are aquaculture sites across Scotland (Figure 1). The vast majority of shellfish and seawater finfish sites are on the west and north coasts of the mainland and in the Western Isles, Orkney and Shetland.

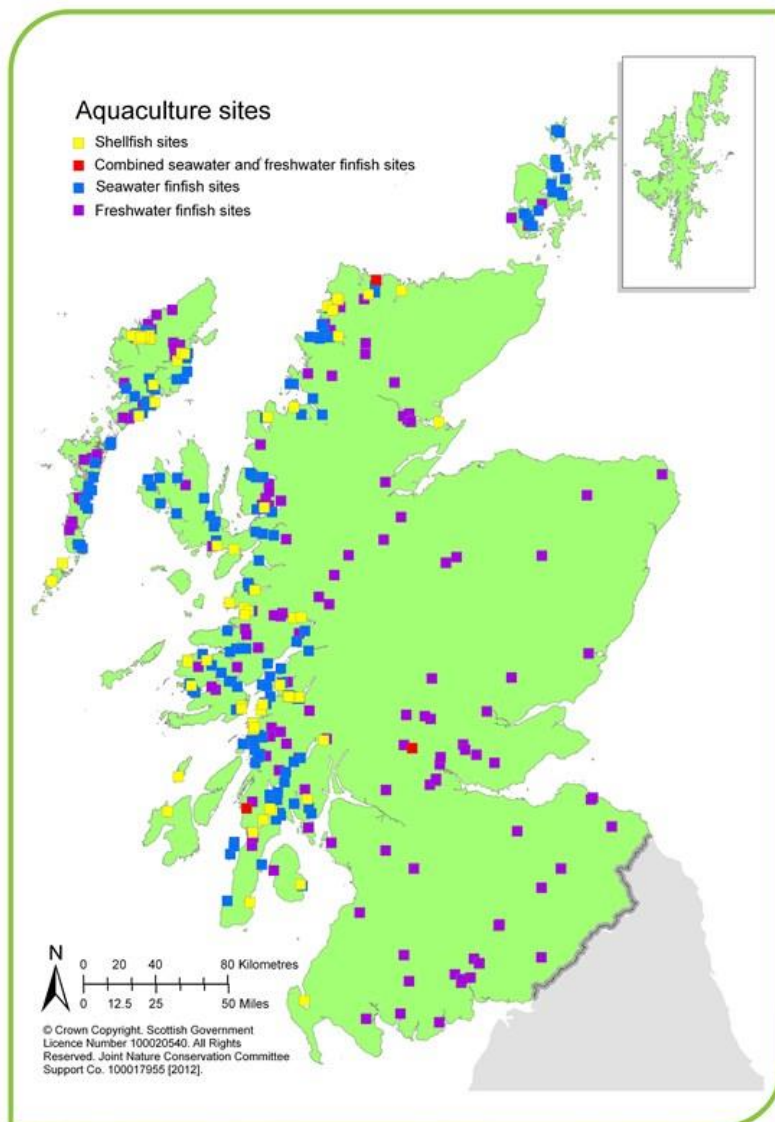


Figure 1: Aquaculture sites across Scotland

Source: [Scotland's Aquaculture](#)

These are the main types of Scottish aquaculture operations.

Marine finfish

Salmon are moved into [marine farms](#) after spending the first year of their lives in freshwater farms, mimicking the natural life cycle of salmon in which the fish spend their early years in lochs and rivers before migrating to the sea.

The marine farms where fish are grown are on the west and north coasts of the mainland and on the Western Isles, Orkney and Shetland (Figure 1). They are normally positioned in sea lochs, voes and inlets, where some shelter is provided from the worst of the weather.

The farms typically consist of one or more groups of cages arranged in a grid pattern and securely anchored to the seabed. These cages, also known as pens, consist of a floating ring on the surface of the sea, supporting a large net bag hanging in the water. The floating rings are normally 90-110 metres in circumference and the net bags are 15-20 metres deep, enclosing 10,000–15,000 cubic metres of water, equivalent to approximately 20 swimming pools.

The fish are held in the net bags, which allow water to flow past the fish – bringing fresh oxygen and carrying away waste products such as carbon dioxide and ammonia. Solid wastes such as faeces fall through the cage structure to the seabed. The fish are fed with feed pellets, and medicines can be administered either in the food or by adding them to the water in the cage.

In addition to salmon production, small quantities of rainbow trout, sea trout and marine species such as halibut, cod and haddock have been produced in recent years. The farming techniques and equipment have been adapted to meet the different requirements of each species.

Freshwater finfish

[Freshwater finfish aquaculture](#) is an important part of the aquaculture sector. It supplies young fish to marine farms, and is a producer in its own right.

Salmon naturally spend part of their lives in freshwater and part of their lives in seawater; salmon are hatched and reared through the early stages of life in land-based hatcheries. When they have reached a certain size the young salmon are transferred to cage sites in freshwater lochs. They stay in the cage sites until they are between 12 and 18 months old, when they become smolts and are able to survive in seawater. At this point the fish are transferred to marine farms, mimicking the natural migrations of wild salmon.

While cages in freshwater lochs account for the majority of freshwater aquaculture, a variety of other rearing systems are used. These include tank-based systems and rearing ponds.

The majority of freshwater finfish aquaculture produces fish, principally Atlantic salmon and rainbow trout, for human consumption.

Rainbow and brown trout are also produced to stock water bodies for angling and Atlantic salmon are produced to stock water bodies for angling and to replace stocks for conservation purposes.

Shellfish

Most shellfish production is centred on mussels, but oysters and scallops are also grown. Farming typically takes place in sea lochs and voes on the west coast of the Scottish mainland, on the Western Isles and on Shetland, with Scotland's irregular coastline offering many ideal sites for shellfish production. It is essential to have pristine clean water in which to grow wholesome shellfish.

Most cultivated mussels are grown on vertical ropes or fabric suspended in the water from horizontal flotation buoys arranged in long lines.

Scallops can be grown in a similar fashion, hanging from lines or grown in small, suspended net enclosures known as lanterns. Oysters are normally grown in bags made from heavy plastic mesh, either lying directly on the shore or set up on trestles.

The shellfish species cultivated in Scotland are all filter feeders; they feed by circulating water through their gills, filtering out the plankton and other food particles. Shellfish do not need to be fed, being entirely dependent on this naturally occurring food.

Similarly, mussel farms are populated by young larval mussels (known as spat) arriving naturally on the tide and settling on the ropes in the shellfish farm. The natural stocking and feeding means that shellfish farming is considered to be very environmentally sustainable.

State

Scottish aquaculture is dominated by Atlantic salmon. Scotland is currently the largest producer in the EU; globally, only Norway and Chile produce more Atlantic salmon than Scotland. In 2012 [162,223 tonnes were produced, estimated to be worth around £537 million](#). Shellfish production is dominated by blue mussel farming, which produced 6,277 tonnes in 2012.

Finfish

Over 96% of the fish farmed in Scotland were Atlantic salmon.

Table 1: [2012 Scottish Fish Farm Production Survey](#) figures

Species	Production (tonnes)
Atlantic salmon	162,223
Rainbow trout	5,670
Halibut	73
Brown trout	42
Arctic char	0.20

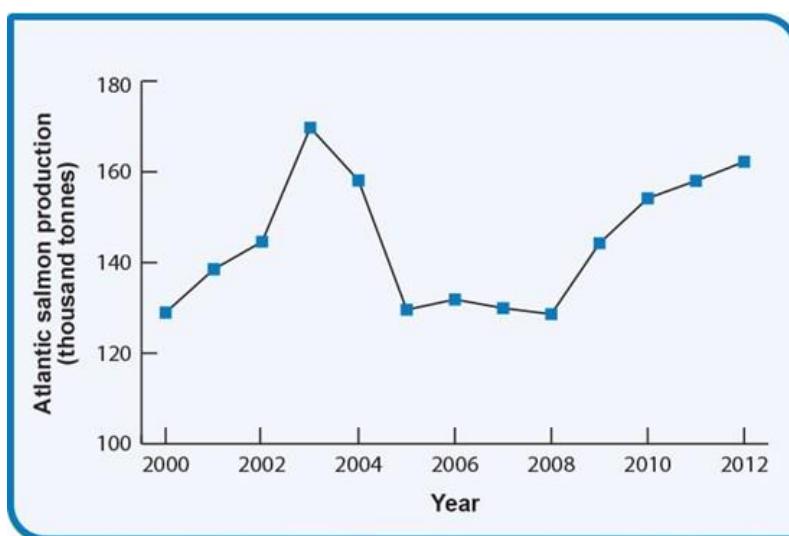


Figure 2: Atlantic salmon production, 2000 to 2012

The largest variation in salmon production occurred between 2002 and 2005 (Figure 2). This was due mainly to a large smolt placement in the years 2000-2002, with an increased average weight, which produced a higher yield of fish between 2002 and 2003.

The number of smolts placed between 2003 and 2005 were reduced, which was partly due to a low market price for salmon.

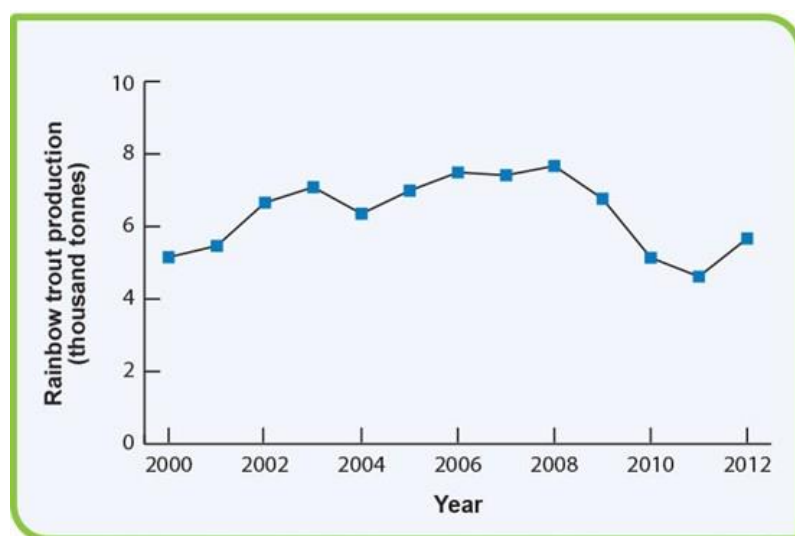


Figure 3: Rainbow trout production, 2000 to 2012

Rainbow trout production is at a fraction of the scale of salmon production, but there is growth in the sector. This is stimulated by increasing demand and a move to produce rainbow trout in marine cage sites as well as freshwater sites, similar to salmon production. This change allows larger production units to be developed, with faster growing fish. Overall, this should lead to further growth in this sector; [Marine Scotland predicted](#) that production in 2013 would be approximately 6,700 tonnes – 1,000 tonnes more than 2012.

Marine shellfish

Scotland has a successful shellfish farming sector, which mainly produces blue mussels and Pacific oysters. Smaller amounts of native oysters, as well as queen and king scallops, are also farmed. There are active shellfish sites throughout Scotland (Figure 1).

Table 2: [Scottish Shellfish Farm Production Survey, 2012](#)

Species	Production
Blue mussels (tonnes)	6,277
Pacific oysters (thousands of shells)	2,706
Native oysters (thousands of shells)	317
Scallops (thousands of shells)	58
Queen scallops (thousands of shells)	9

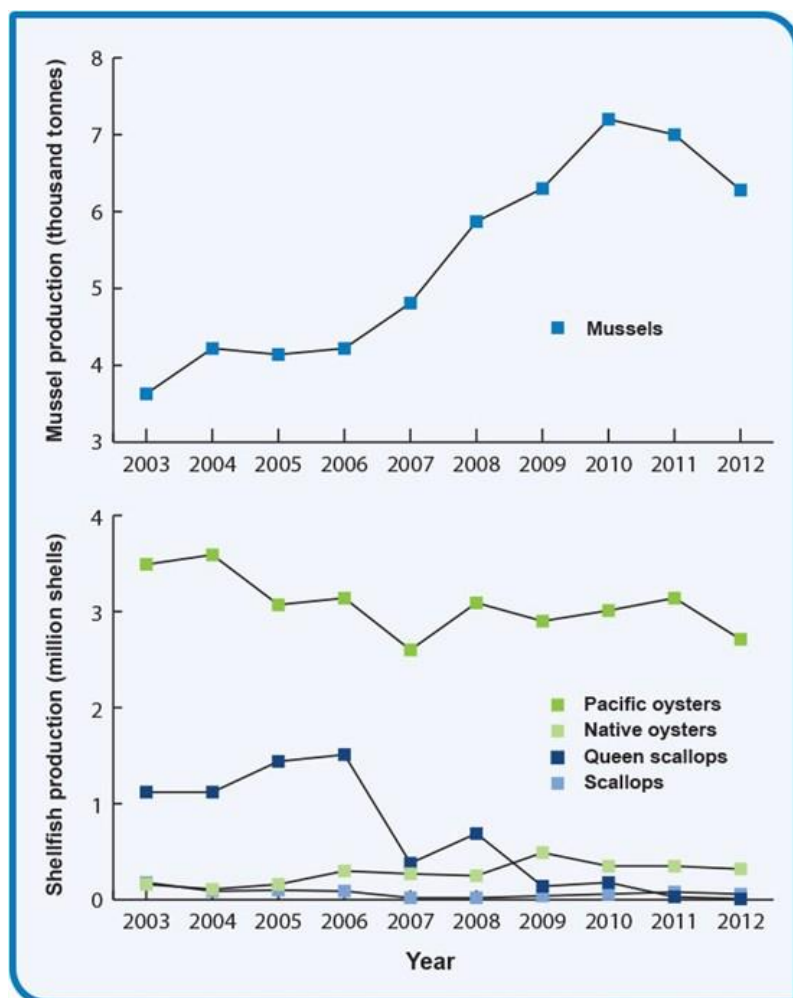


Figure 4: Shellfish production, 2003 to 2012

Between 2010 and 2012 mussel production decreased by 10% (Figure 4) and responses to the [shellfish production survey](#) attributed the cause to environmental effects, such as changes in recent years to where and when spats settle.

Economic contribution

The value of aquaculture production has grown by an [average of 4.6% a year between 2000 and 2009](#).

Scottish salmon is exported worldwide as a premium product, and key export markets include the EU and the USA, with emerging economies such as China becoming more important every year.

The aquaculture industry helps to support sustainable economic growth in rural and coastal communities, in particular in the more remote areas of the Highlands and Islands. According to a [2012 report](#) from the Scottish Salmon Farming Producers' Organisation, salmon farming provides 2,124 jobs directly, and the Scottish Government estimated that in 2012 [shellfish farming supported 358 jobs](#) throughout Scotland. It is estimated that [6,200 jobs](#) are reliant on the aquaculture industry in Scotland.

Pressures

Achieving sustainability in aquaculture is challenging, and pressures range from maintaining healthy fish stocks and protecting the environment, to staying competitive in global markets for aquaculture products.

Using Scotland's natural resources for aquaculture requires careful management. Development must be sustainable – economically, socially, culturally and environmentally – minimising risks to wildlife. The aquaculture industry must be considerate towards those who share the aquatic environment.

The key pressures affecting the aquaculture industry and its operating environment are:

- provision of feed;
- disease and parasite control;
- climate change;
- global trade and economic development.

Provision of feed

All of the finfish currently produced in Scotland are piscivorous; they eat other fish. To provide food for them requires a large volume of fish meals and fish oils.

If aquaculture is to expand at the rate the aquaculture industry intends, alternative sources of meals and oils will be required because the world supply of fish meal from current sources cannot keep up.

Research is being done to test food derived from alternative fish species, such as squid and krill. In addition, plant based oils and meals derived from soya bean, canola, peanut and cotton seed meals or other protein concentrates are being investigated.

Disease and parasite control

Diseases and parasites can be a significant problem and can cause losses in production and harm wildlife close to the sites where aquaculture operation takes place. Sea lice are a significant parasite problem in salmon farming, and much effort is needed to manage and control their numbers – this is achieved by applying licensed treatments or using cleaner fish, such as wrasse or lump suckers. Some diseases, such as infectious salmon anaemia (ISA), can significantly affect farmed salmon.

The effort to control parasites and prevent disease in aquaculture is demanding, and controls need to be developed that are acceptable in terms of protecting the environment, while keeping fish healthy and productive.

Climate change

Climate change is projected to result in temperature changes in our marine and inland waters and this could put pressure on aquaculture operations. These pressures could include:

- the spread of existing pests and pathogens, or the introduction of new ones;
- thermal stress for fish and shellfish, resulting them becoming more vulnerable to disease;
- an extended sea-lice season;
- [more frequent incidences of shellfish toxicity](#).

It is also possible that increased storminess could damage cages and other aquaculture equipment, particularly in coastal waters.

Global trade and economic development

The Scottish aquaculture industry competes with producers from around the world and is constantly under pressure from countries where production costs are lower. Strategies and actions to make the Scottish aquaculture industry more sustainable must combine marketing to international consumers with resilience to climate change and environmental conservation.

What is being done

Scotland's coastal and inland waters provide excellent conditions for further growth of the aquaculture industry.

The Scottish Government is fully supportive of the sustainable growth of aquaculture alongside a thriving recreational fisheries sector.

Both are key sectors underpinning sustainable economic growth that supports employment and economic wellbeing of many fragile rural communities across Scotland

As part of its policy to increase sustainable economic growth, the Scottish Government has identified the food and drink sector as a key area for development. The key industry targets for sustainable aquaculture growth by 2020 highlighted in [Scotland's National Marine Plan Consultation document](#) are:

- to increase marine finfish production sustainably to 210,000 tonnes (from 164,380 tonnes in 2012);

- to increase shellfish production to 13,000 tonnes (from 6,525 tonnes in 2012).

[A Fresh Start - the renewed Strategic Framework for Scottish Aquaculture](#) was published in 2009. The [Ministerial Group for Sustainable Aquaculture](#) (MGSA) has been established to help the industry achieve these sustainable growth targets and includes representation from industry, wild fish interests, environment non-governmental organisations (NGOs) and regulatory bodies.

MGSA builds upon the Aquaculture and Fisheries (Scotland) Act 2013 and further enhances the existing regulatory framework in Scotland to strike the right balance between growing the aquaculture sector and protecting the environment.

Policy and legislation

A fish farm must gain planning permission before it can start producing. This involves a significant application, with an environmental statement at its core. The outcome of the application is considered by the local council planning department, taking into account any comments made during the consultation process.

If an application is successful and development takes place, the business must obtain a licence (issued by SEPA) that determines the volume of fish that may be farmed and the medicinal treatments that may be used. The business has to be authorised by Marine Scotland for disease-control purposes, and will require a sea-bed lease provided by The Crown Estate. During the course of its operation, the site is monitored by all relevant regulators, with regular inspection visits.

Regulators seek compliance with many statutes controlling a range of issues. These include, for example, SEPA's role in controlling environmental impacts under [The Water Environment \(Controlled Activities\) \(Scotland\) Regulations 2011](#) and the requirement to monitor sea-louse numbers under the [Aquaculture and Fisheries \(Scotland\) Act 2007](#), regulated by Marine Scotland.

A failure to comply with the requirements of legislation can lead to regulators taking action against operators.

Sustainable aquaculture

The aquaculture industry has invested significantly in Scotland. To protect the industry in the long term, sustainable development continues to be at the centre of its values. The industry must protect and enhance the environment in which it operates, minimising the unavoidable impacts. The [Code of Good Practice for Scottish Finfish Aquaculture](#) has been developed by the industry to help make sure it has a long-term future by following disease and parasite-control strategies that also contribute to protecting the environment.

Compliance with the code of practice will help protect the environment surrounding aquaculture sites and demonstrate that the industry is committed to being a good neighbour and looking after Scotland's natural resources.