

Mussel Farming

An Expanding Industry in Shetland

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Fisheries Information Note

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Introduction

Mytilus edulis (blue mussel) is the world's most commonly farmed mussel, and cultivation takes place in over 20 countries throughout the world. In recent years Shetland has witnessed the rapid increase in the number of sea sites being utilised for mussel farming, and annual production over the period has steadily increased from under 20 tonnes in 1994 to approximately 140 tonnes in 1997.



Figure 1. Mussel long lines in Vaila Sound. Pegged ropes or droppers used to hold the mussels can be seen attached to the head ropes. The head ropes are in turn supported by purpose made plastic floats.

Mussels are bivalve molluscs, which filter diffuse plankton (mainly phytoplankton) from the water, converting them into nutritious palatable animal meat. Mussels are essentially primary consumers and as such the loss of energy, through several layers of food chain, is avoided. Being highly efficient,

mussels grow relatively quickly and profusely, making them ideal for marine culture.

Spawning & Spatfall

Mytilus edulis have separate sexes and during spawning, eggs and sperm are released into the water where fertilisation takes place (refer to figure 2). About 48 hours later, the mussel larvae begin to develop shells. The larvae can remain planktonic for some time, usually 2 to 4 weeks, depending on factors such as food supply, salinity, temperature and the availability of a suitable surface upon which to settle. The development of a foot allows the larva to crawl. If a surface is not suitable, the larva will withdraw its foot and resume swimming.

Although settlement patterns in *Mytilus* larvae are variable, primary and secondary settlement is thought to occur. During primary settlement mussel larvae prefer to settle on filamentous surfaces, such as filamentous algae, away from adult beds. Larvae may detach and re-settle several times before their preferred surface type changes and the larvae choose a permanent position on an established mussel bed, either in between adult mussels or at the edges of the colony; this is secondary settlement. They have been found to be attracted to the byssal threads of other mussels. Even after secondary settlement, juvenile mussels can still detach and re-attach until they find a more suitable site. A mussel's byssal threads enhance dispersal greatly and mussels may drift for considerable distances in currents.

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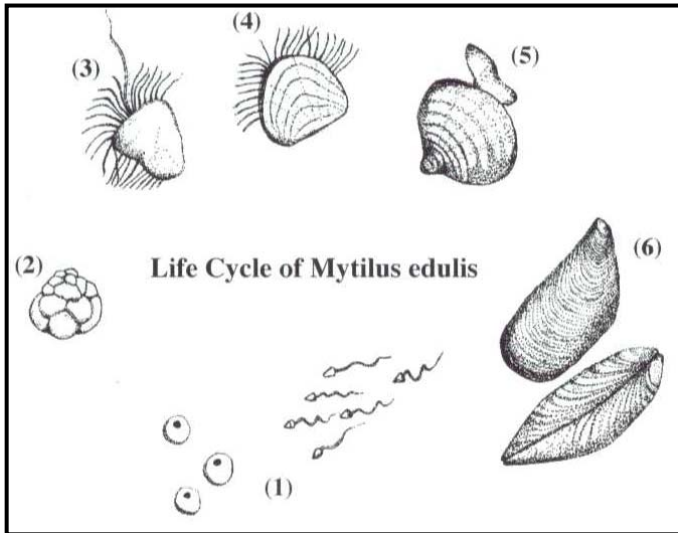


Figure 2: *Mytilus edulis* shown in main stages of development. (1) 0hrs: fertilisation after spawning (2) 1hr: first cell division takes place (3) 24 – 48 hrs: swimming embryo (4) 49 – 72hrs: shell forms (5) 2 – 4 weeks: settlement occurs after foot develops (6) over 18 months: adult mussels of marketable size.

In terms of mussel farming in Shetland, mussel settlement (spat fall) has been found to be quite variable from year to year and from site to site. Generally, however, late spring and early summer is deemed to be the best time to collect spat on the pegged downropes used for on-growing.



Figure 3: Mussel dropper with a covering of mussel spat. The pegs can clearly be seen, covered in small mussels

Placing the pegged ropes (droppers) into the water at

the right time of year is critical in order to avoid fouling by unwanted organisms or missing the spat fall altogether.

A dropper is shown in figure 3, which has received a good covering of spat. The function of the pegs is to increase settlement area and to prevent mussels sliding off the ropes.

Mussel droppers can vary in depth from 6 metres to over 10 metres. The weight of harvested mussels that can be expected per metre length of dropper depends on the amount of spat collected and the age of the mussels. An approximate figure used is 5-7kg per metre. When mussel spat is being collected the weight of the fully grown mussels should be kept in mind and sufficient buoyancy should be provided.

On-growing

When spat has been successfully collected, there are a number of methods available for the in-growing of the mussels. The method used in Shetland waters is suspended mussel culture. This is where droppers are suspended from a floating structure (either long lines or mussel rafts). Mussel rafts, usually a rectangular platform with floats attached, whilst providing a stable working platform are often deemed unsuitable for exposed sites.



Figure 4: Mussel rafts at Olnafirth near Voe.

This is perhaps why mussel long lines, as shown in figure 1, have become popular in recent years and are now a common sight in the voes around Shetland.

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Once the mussel droppers, suspended from either type of floating structure, have a sufficient covering of spat, the on-growing is a relatively straight forward process. Mussels require no additional feeding as they feed themselves, utilising plankton in the water, as they do in the wild.

After 18 months of on-growing the largest of the mussels are already large enough to harvest. There will however be a large proportion of mussels too small for sale and will either have to be discarded or replaced on site for further on-growing.

The longer the mussels are left to grow, the higher the percentage available for sale. If left too long however, the mussels can become too large for market tastes and are prone to becoming fouled.

Eider duck (dunters) pose a significant threat to the growing mussels and if a number of these birds descend on a set of mussel ropes they can wipe out the stock in a very short time. The birds find the farmed mussels a good food source due to the thinner shells found on cultured mussels. Hanging nets round the droppers would help prevent the birds gaining access to the mussels but this is often highly impractical and other methods are being pioneered.

Harvesting

The harvesting of mussels can be split into four stages: bringing lines aboard the vessel; stripping lines; washing and grading, and finally weighing and packaging.

The mussels can be brought onto the harvesting vessel by using either a crane, derrick or elevator. Figure 5 shows mussels being brought aboard a harvesting workboat using a crane, four droppers at a time.

Once aboard, the mussels must be stripped from the down ropes in order to grade them. Methods available for stripping include hand stripping, which can be a laborious, time consuming method, or by using a stripping machine which enables the process to be sped up.

The washing and grading processes are usually undertaken using special machines. The grading allows for the mussels of marketable size to be

separated from those that are too small. The smaller sizes can be disposed of or replaced. Replacing small mussels involves placing them into specialised 're-socking' net tubes which are then attached to the long line or raft for further on-growing.

Meanwhile, the mussels of marketable size can be weighed and packaged.

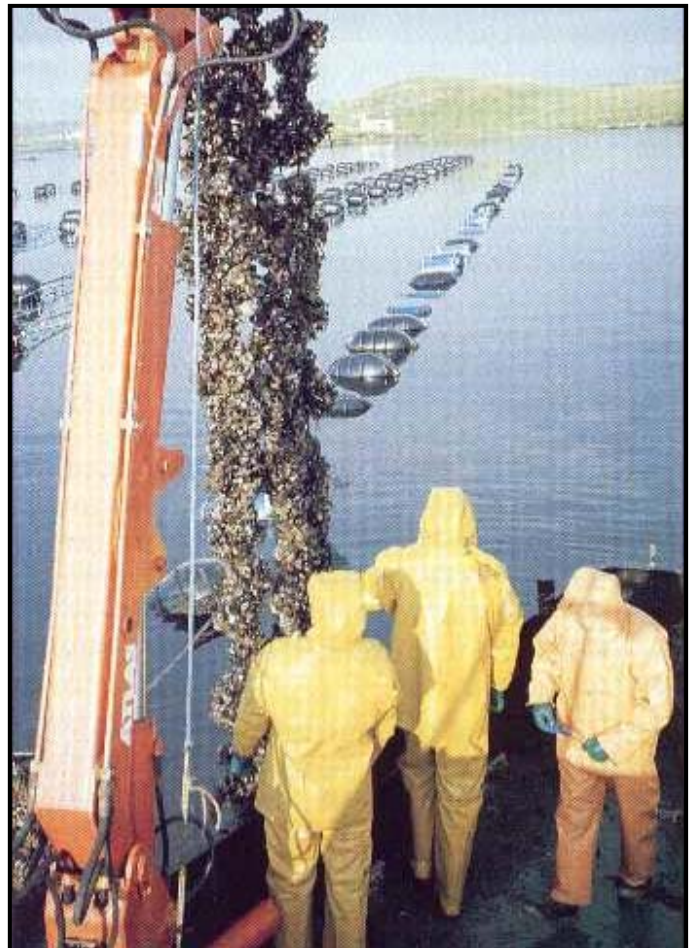


Figure 5: mussel ropes being brought aboard a harvesting workboat using a crane.

Mussels that have been grown using suspended culture have never had to close their shells as they would have never had to close their shells as they would have done if living in the tidal zone for a number of tidal cycles. It is usually sufficient, however, to place the mussels back into the water after harvesting, which allows them to take in water lost during the harvesting procedure.

Mussel harvesting is generally restricted to times of year when the mussels are free of algal toxins.

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Although harmless to the mussels, the toxins in the algae are accumulated in the mussel flesh. The algae which cause this phenomenon are present in sea water during the summer months when the water temperatures are at their highest. Lasting for several weeks the mussels feed on the bloom and then purge themselves of the toxins over a few months.

Mussels are also not suitable for sale after spawning since they redirect their energy reserves to producing eggs and sperm and therefore have a much lower meat content. Mussels spawn at various times of year and spawning can be brought about by any abrupt environmental changes of temperature, pressure, salinity or mechanical vibrations at a time when the mussels are ready to spawn.

The mussel harvesting season is generally between September and July depending on the factors mentioned above.

Depuration

Depuration is when mussels are placed in controlled conditions and allowed to purge themselves of bacteria. This can be achieved by either of two methods; either relaying to suitably clean water or placing them in holding tanks which have a supply of cleansed water running through them.

Mussel depuration is made possible by the fact that mussels quickly purify themselves given suitable conditions. A period of 48 hours is usually sufficient.

In certain areas depuration is mandatory, however in Shetland this is not the case. Any site from which mussels are to be harvested must have, by law, its water quality tested and classified by the Scottish Office Agriculture, Environment & Fisheries Department (SOAEFD) Marine Laboratory in Aberdeen. Most waters are of grade 'A' standard which requires no depuration of mussels being harvested from them. Some sites have been found, however, to be 'grade B' at certain times of year. Mussels being harvested from these sites at these times would have to be depurated before being sold. At this time mussels are simply not harvested from these sites at these times of year.

Sales & Marketing

Existing Shetland producers have been successful in

selling mussels packed in 5kg or 10kg open weave bags packed in 25kg polystyrene (salmon) boxes often with the addition of ice. Each pack must contain a health mark label issued from a registered dispatch centre. The label shows product and farm details. It is essential to provide higher than specified weights per pack to allow for water loss during transportation. Trials conducted by Shetland Seafood Quality Control (SSQC) have indicated that mussels remain alive for 12 days if kept chilled in this condition. This time limit is on the cautious side and contains a safety margin.

Current sales channels for live Shetland mussels have been through a network of UK wholesalers supplying principally the catering market and a smaller number of retail outlets. Response to date has been extremely positive. Shetland mussels appear to have both higher meat yield advantages over competitive products as well as excellent flavour characteristics.

For various reasons, mussels generally have a relatively 'unsafe' image with consumers. Shetland has significant advantages in terms of quality grade 'A' water for mussel growing as well as the back up of quality control facilities of the SSQC.

Significant brand advantage and premium price can be achieved if a coordinated marketing approach were to be taken for Shetland farmed mussels by exploiting the existing intrinsic product qualities underpinned by a quality (i.e. safety) assurance scheme.

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