Advice for the future Baltic mussel farmer - a summary of lessons learned from the BBG project

Lesson learned from the BBG project

Through the Baltic Blue Growth project and the five mussels farm pilots, different lessons have been learned and are provided in this fact sheet. Some areas may be unsuited for mussel production due to predation by (eider ducks), rough weather conditions, strong currents, poor settling and/or poor food availability. So, a suitable area is a prerequisite for successful mussel production. Specific substrates and mesh sizes are not key factors in successful production of small mussels. However, the structure of the mussel farm (anchoring, flexibility, buoys etc.) and logistics (having frequent inspections and adjustments of the farm, the farm being easily accessible, and good and flexible transport to and from the farm) related to it, is very important. These factors must be well investigated and planned before any new start-up of mussel production in the Baltic Sea.

Water salinity and water depth

The most determining factor on mussel production in the Baltic is salinity. Low salinity has chiefly three effects: the mussels grow slower; they reach smaller sizes; and they have a weakened byssus threads so they will dislodge easily from the mussel's substratum. Different from in the North Sea, where mussels grow best in the uppermost 1,5-3 m, they thrive on deeper waters in the Baltic. Ideally, all growth substrate should be submerged to at least 3 m sub-surface and at the same time, not touch the sea-floor. Given that the depth of ropes and nets of mussel farms is normally 3-6 m, the water-depth at a chosen farm-site should be at least 9-12 m. In most coastal areas of the Baltic, you will also need ice-safe buoys.

Technology

There are two different models of mussel farms commonly used: farms with various type of substrate rope or bands hanging down in loops from a submerged long-line, and rope nets of various mesh size that hangs down from a PP-pipe, floating in the surface. "Hybrids" of these technologies, like nets hanging from a submerged long-line, also exist (see Figure 1, 2, and 3). In the Baltic it is better to use a submerged construction because of the risk for occasional sea-ice. For details about submerged mussel farm technology, see the Latvian evaluation report on the BBG website: https://www.submariner-network.eu/projects/balticbluegrowth.

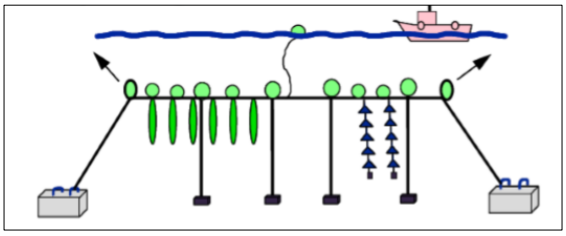

Figure 1: Submerged longline (Shelltech A/S).

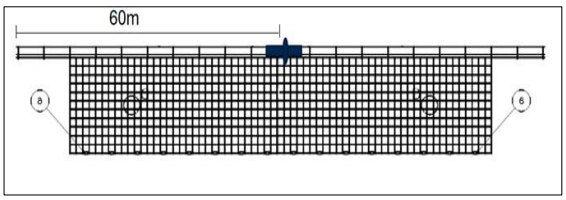

Figure 2: Net hanging from a floating PP-pipe (Smartfarm A/S).

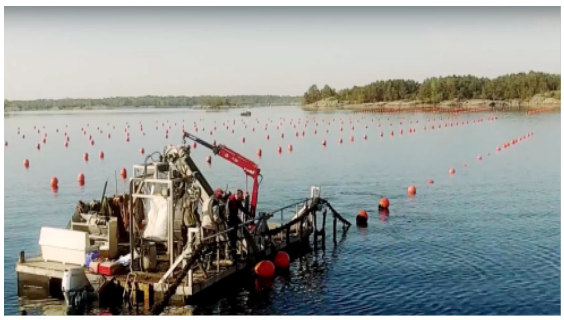

Figure 3: Longline farms with loose ropes placed at a reasonable protected site could be handled with smaller work-vessels.

Bigger farms are more efficient and stronger at exposed sites, but can have down sides like high investment costs and larger boats requirements. Smaller farms usually have lower efficiency leading to higher production cost, but they are easier to handle for the small entrepreneur. Mechanical mussel harvest is done with an elevator and stripper from the loose rope or band substrates, and with specially designed UW-harvesters from the nets. UW-harvesters are most efficient in

terms of kg per workhour, but workforce is not the only cost for mussel farming. When planning a mussel farm, one also has to consider the prize for investment of the different farm-systems. Lines can be harvested in a simple way, while the nets require more advanced and larger machinery that can only be cost-effective if the harvests are big.

Harvest period

If harvest should be done within one, two, or three years growth-cycle, and whether it should be done in the autumn or the spring, will vary from site to site, year to year and also depends on what the harvested mussels are used for (see Figure 4). In the Baltic it is recommended to do it in the springtime (April) in order to maximize the biomass and meat content and minimise the risk for toxic algal blooms.

Figure 4: Size of the mussels harvested in municipality of Kalmar, Sweden.

Production costs

For mussels to be used for human consumption on the fresh market (50-60 mm, 65 pieces/kg), production costs of up to 0.6-0.7€/kg may result in a viable business. But for small mussels for meal or other purposes, production costs cannot exceed max 0,1€/kg unless somebody pays for the ecosystem goods and services provided by the mussel farming.

Communication with neighbours

If larger mussel farming operations are planned, it is always good to inform them about the positive environmentally impact and to provide them with general information about what is going on under the surface. When people understand better they are more likely to appreciate the effort. The acceptance from neighbours can be very different from place to place. Sometimes, one or a few people can be very aggressive against any change in their neighbourhood but proper communication can help reducing this issue.

Use the ODDS platform

The BBG-project has launched a useful tool for the prospective Baltic mussel farmers who want to find out more about possible locations and information on mussel farming in the Baltic Sea. This "Plan your farm"-tool is available at http://www.sea.ee/bbg-odss. This tool gives useful information about mussel growth potential (based on salinity and phytoplankton availability), information on oceanographic challenges present in different areas, as well as the degree of fishing and maritime traffic.

Placement of the mussel farm

In order to achieve a viable business, it is extremely important to choose the best possible site for mussel farming. The following factors need to be considered:

1. ***Logistic issues*** will largely influence the costs for maintenance and harvest of the farm. In order to save work-time and fuel, the farm site or sites should be situated very close the harbour for the work-vessel/vessels that is used for inspection, putting out buoys, sampling and smaller repairs of the farm. Ideally, the farm site should also be fairly close to a fishing port or some other quay accessible by larger work vessels. The on and off need of larger vessels can easily raise the costs for mussel farming significantly, if this is not well planned from the beginning.

2. ***Exposure conditions:*** Wave size, under-water currents, wind and winter ice at a site influence both the cost for farm construction, vessels and maintenance, and they affect the mussel production. In the BBG-project, farming of mussels at off-shore and other exposed sites have proven more expensive and less successful compared to the more protected sites. At exposed sites, stronger (and thus more expensive) farm constructions are needed. Fixed substrates that cannot tangle, substantial anchoring and larger, more expensive work-vessels. Rough weather conditions limit the number of possible working days to maintain a farm, which increases the risk of damage to farm-units. In addition, strong wave action and currents can dislodge mussels from substratum so that the mussel harvests get lower than what it would have been at a more protected site.

3. ***Harmful substances and E.coli:*** To manage the regulations for feed and food mussel production, it is important that the environment (water and bottom sediment) at the chosen site is reasonable free from heavy metals and environmental toxins such as PCB and DDT. Environmental authorities can usually provide information about known contaminated sites, like larger harbours and present or previous industrial sites. Another

problem can be E.oli bacteria outlets from sewage systems, emergency drains from municipal pump stations, or agricultural ditches. Contact the local municipality and land-owners for more information.

4. ***Biological conditions**:* Food availability, mussel larvae, predators and biofouling are the biological factors of most interest. Mussels feed on microalgae, which depend on the nutrients and temperature. Water exchange and turbidity of the water is also important. Too little water exchange may lead to food shortage, but too high current or storms that stir up clay and other particles will both reduce phytoplankton availability and make mussels shut down their filtration systems. Areas that lack a wild mussel population should be avoided because: a) this is an indicator of less good conditions for mussel growth, and b) they might suffer from a lack of planktonic mussel larvae. This could be the case for example for areas that are far from the coast. Marine predators are a less of a problem in the Baltic compared to more saline areas. But large flocks of eider ducks feed along their migration route in springtime and autumn, and locally resident eider ducks can be a big threat to mussel farms in some coastal areas. Biofouling is normally not a problem in an area otherwise suitable for mussel growth as mussels in general out-compete other organisms settling on the substrate.

5. ***Conflicting interests*:** To increase the possibility to receive permit for mussel farming, but also to minimise possible future conflicts with neighbours, it is wise to aim for a site not too close to the following activities: shipping routes, harbours, anchorage points, bathing places, popular play areas for water scooters, water-skis and high speed boats, fishing, underwater cabling and underwater pipes and shoreline protection areas – these sea uses often occupy larger areas due to the buffer zones allocated to them. Nature conservation and other areas of national interest may or may not be in conflict with mussel farming activities, depending on the conclusion from managing authorities. The review "Overview of existing practice on integrating existing and planned mussels' cultivation in Marine Special Planning" may help the decision makers, providing some international examples and it is published here: https://bullmaritimeinstitute.com/resources/html/article/details?id=148750.

THE PROJECT

This factsheet has been elaborated by the Baltic Blue Growth project. The aim of Baltic Blue Growth is to advance mussel farming in the Baltic Sea from experimental to full scale to improve the water quality and to create blue growth in the feed industry. 18 partners from 7 countries are participating, with representatives from regional and national authorities, research institutions, private companies. The project is coordinated by Region Östergötland (Sweden) and has a total budget of € 4.7 million. It is a flagship project under the Policy Area "Nutri" of the European Union Strategy for the Baltic Sea Region (EUSBSR).

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