DHI CASE STORY

MARBIOSHELL

Taking the guesswork out of mussel production

The Danish Belt Sea is flushed with surpluss precipitation in the Baltic Sea catchment which gives rise to a yearly outflow of approximately 1000 km^3/ year of water. This water carries large amounts of phytoplankton, thereby giving rise to an unlimited capacity of shellfish production. These shellfish constitute a valuable food source for consumption by humans and can be used in fish feed instead of wild fish. In addition, the harvested mussels also help to capture nutrients – especially nitrogen, which is lost owing to intensive agricultural production. Despite the promising conditions in the area, we did not have a complete understanding of the potential of mussel farming in the Great Belt (Denmark) and the optimal design of the farm. As such, growers plan their line-mussel farming mainly on a trial and error basis – wasting time and money in the process. As part of the MarBioShell project, we developed a Decision Support System (DSS) to accurately predict shellfish production potentials in the area. With this tool, mussel growers can make the right decisions from the start, thereby saving time and money.

MARBIOSHELL – HOLISTIC RESEARCH FOR OPTIMAL BLUE MUSSEL PRODUCTION

The blue mussel (Mytilus edulis) has been harvested for centuries from both farmed and wild sources. Even today, blue mussels are widely distributed in the European waters . But the potential of farmed blue mussels is still highly under exploited.

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SUMMARY

CLIENT
Danish Agency for Science, Technology and Innovation

PARTNERS
- University of Southern Denmark
- Aalborg University
- Technical University of Denmark
- Nordshell
- Wittrup Seafood A/S
- Ørbech en gros

CHALLENGE
- Lack of clarity about the potential of blue mussel farming in the region
- Lack of knowledge about the optimal dimensioning of farms
- Necessity to resort to 'trial and error' in order to establish the farms

SOLUTION
A Decision Support System (DSS) tool to help in the design of optimal blue mussel farms, given the environmental conditions

VALUE
- Awareness of flow dynamics and food depletion within the farm
- Clarity of blue mussel cultivation potential in the region
- Financial savings of up to 15% because of accurate predictions of mussel production

LOCATION/COUNTRY
Denmark

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The MarBioShell research project is a network supported by the Danish Agency for Science Technology and Innovation. The main theme of this project is research and development of the production of line-mussels in the Great Belt in Denmark.

The research project approaches the challenge holistically. In the laboratory, bioreactor technology is applied to provide controlled mass production of planktonic algae. These algae are subsequently used in controlled growth experiments and bioenergetics & biochemical studies of food intake and assimilation in mussels.

Marked analyses are carried out to estimate whether product differentiation and consumer preferences contribute to the economic sustainability of the suggested new line-mussel production facilities in the Great Belt.

Business network and branding, as well as local innovation systems are surveyed and used in future investment decisions.

A research and demonstration line-mussel farm is established in the southern part of Kerteminde Bay, close to the Great Belt. The facility is a unique opportunity for all work packages within the MarBioShell project to work together in solving the main common task, namely to clarify the potential of cultivating mussels in the Great Belt.
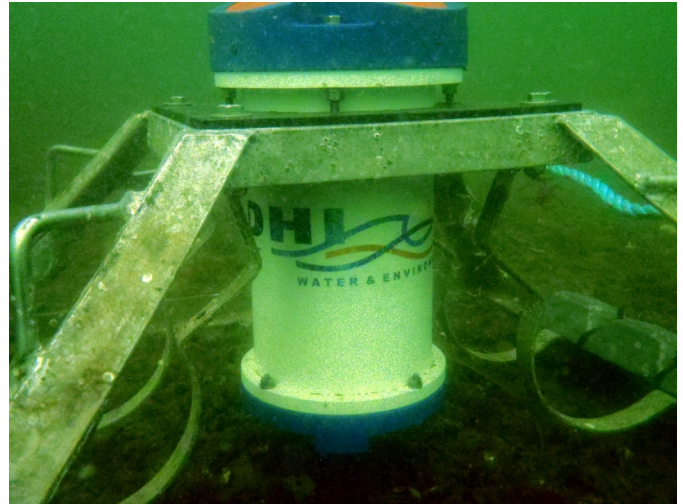

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WE PREDICT THE IMMENSE POTENTIAL OF THE GREAT BELT

Four years ago, we conducted certain modelling exercises via our MIKE by DHI software. In doing so, we predicted that the Great Belt provides unique opportunities for cost-efficient cultivation of blue mussels, due to steady currents and adequate food concentrations. Our main interests in the MarBioShell project were to substantiate the prediction using a combination of:

- Modelling
- In situ measurements (currents, salinity, temperature and chlorophyll-a)
- Extensive measurements of mussel growth

We conducted all our studies on a demonstration line-mussel farm, where the design was varied to optimize the design.

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A TOOL TO DESIGN THE OPTIMAL MUSSEL FARM

As part of the MarBioShell project, we developed Decision Support System (DSS) tools based on models generated by our Mike by DHI software. The DSS tools assist in planning, dimensioning and selection of production sites for mussel and oyster farms.

The tools allow mussel growers to design the optimal shellfish farm, keeping in mind the following variables:

- Size of the farm
- Length of and distance between long-lines
- Height of growth lines
- Currents and chlorophyll -a concentrations

The growth and harvest potential exceeded our initial predictions by almost 30%. This was caused by a higher food concentration than assumed initially. In all other aspects, our model prediction was spot-on.

We estimate that the financial outcome of most blue mussel farms can be enhanced by 5-15% by using these DSS tools.

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For more information visit: www.dhigroup.com

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