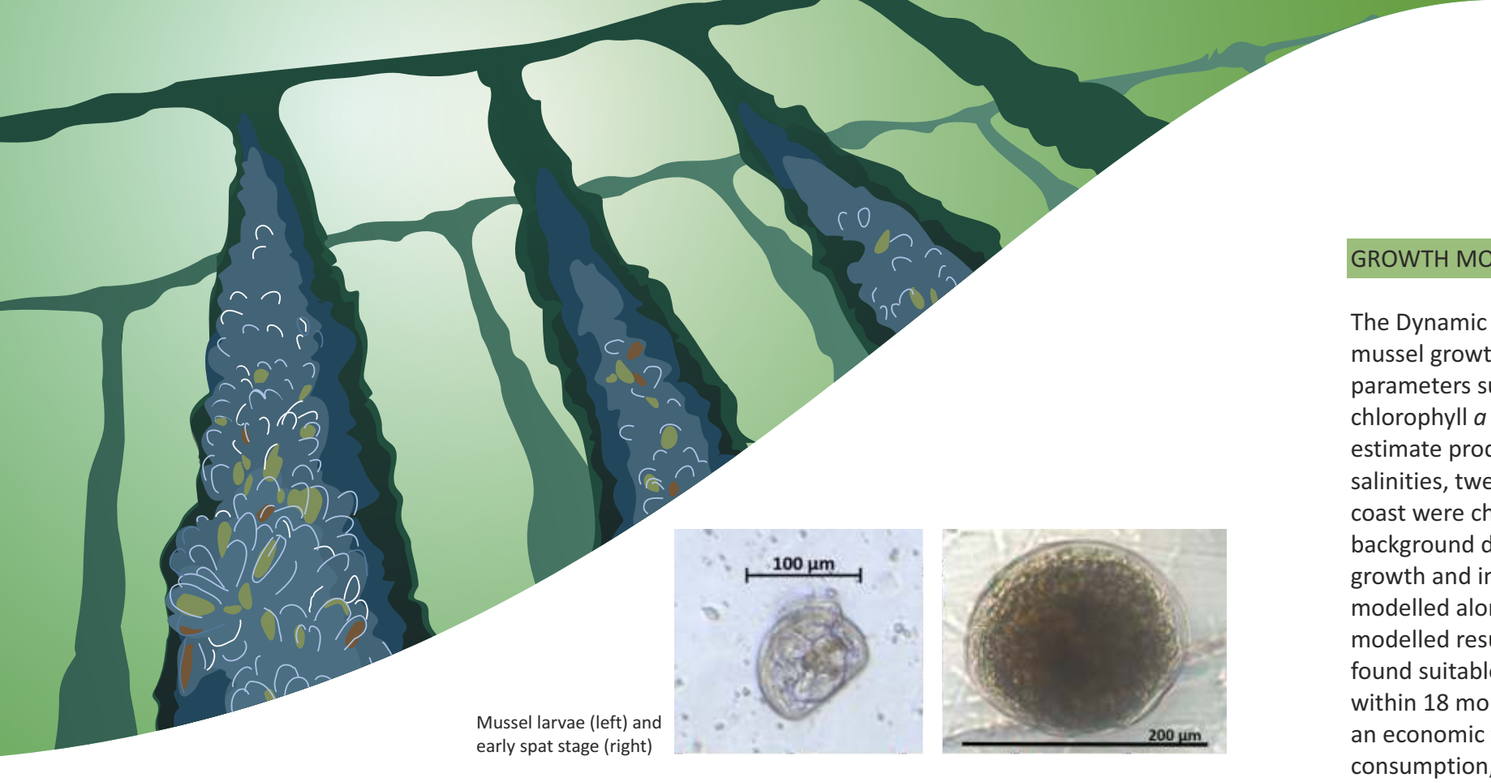
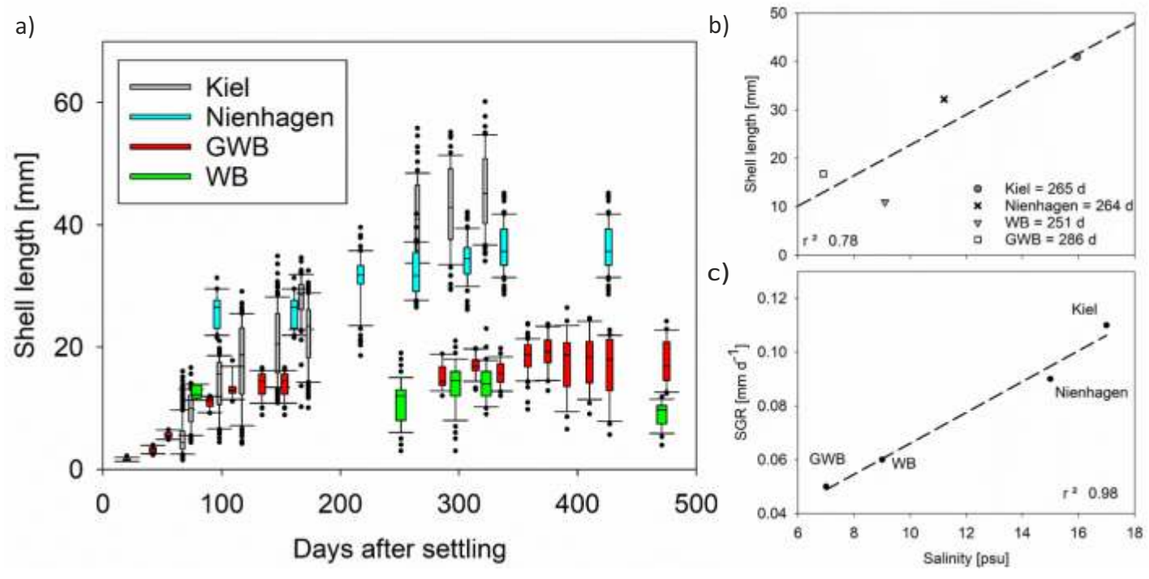


Mussel larvae (left) and early spat stage (right)

MUSSEL OCCURRENCE AND GROWTH

Mussel larvae occur at all case study sites along the German Baltic coast and mussel spat (juveniles) settle on the provided collector-material during late spring to early summer.
Mussel growth (specific growth rate, SGR) is described as the increase in shell length in mm per day and varies from 0.05 in Greifswald Bay (GWB) to 0.11 mm d^{-1} in Kiel.

Results show that mussel growth is highly influenced by the predominant salinity. The growth in low saline regions (GWB and Wieker Bay (WB)) becomes very slow after the first season and nearly stagnates. After approximately eight months, mussel size measurements show the smallest mussels in low saline areas GWB and WB and larger mussels in Kiel and Nienhagen at higher salinities.

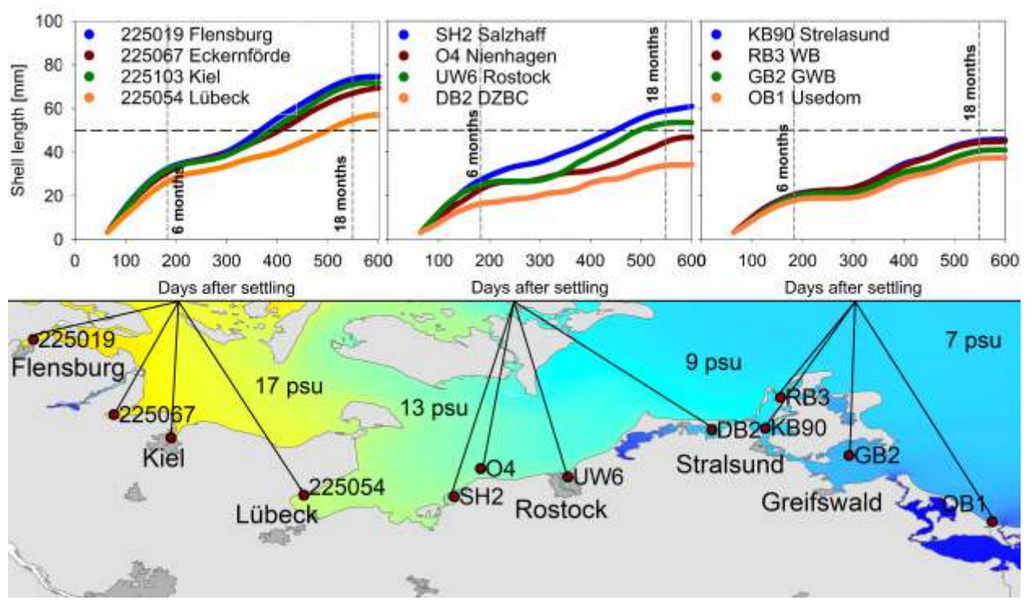


Comparison of mussel growth between the four study sites: a) shell length after settling, b) shell length after approx. eight months and c) specific growth rates (SGR) versus salinity

GROWTH MODEL

The Dynamic Energy Budget (DEB) model predicts mussel growth in relation to various environmental parameters such as salinity, water temperature, chlorophyll *a* concentrations and currents. To estimate production potential at different salinities, twelve monitoring stations along the coast were chosen to provide environmental background data. Based on these data, shell growth and increase in tissue dry weight were modelled along the German coast. Following the modelled results, the area west of Nienhagen is found suitable for growing mussels up to 5 cm within 18 months. 18 months is often referred to as an economic time span to grow mussels for human consumption, while 5 cm is the usual size for blue mussels on the German market. However, the selling of smaller mussels for human consumption is also possible. The consumers' willingness to buy and eat these smaller sized mussels (3-4 cm) is under investigation so as to predict the potential market for regional farmed mussels. Furthermore, within BONUS OPTIMUS, other options to use small size mussels, such as mussel meal production for fish aquaculture, are studied.

Blue mussels on longline



Modelled shell length at twelve sites along the German coast

CONCLUSION

As we knew before, mussels occur even in low saline areas of the Baltic Sea. Here we proved that mussel spat also settles onto farming equipment under low salinities and mussels grow on these structures up to a certain size. Mussel farming in general is therefore not limited by salinity. However, the economic potential and feasibility, especially based on mussels for human consumption, still sets a limit for mussel farming in low saline waters. So far, below 10 psu, mussel farming will not be profitable for human consumption nor for mussel meal production, since processing costs are still too high.
To further promote and support blue growth in terms of mussel farming in the Baltic Sea, new uses for small size mussel have to be investigated and realised. For many potential uses, low costs methods to separate shell and tissue of the mussels is another important issue to be considered and to be studied in future projects.

Anna-Lucia Buer
anna-lucia.buer@io-warnemuende.de
Lukas Ritzenhofen
lukas.ritzenhofen@io-warnemuende.de

More information:
Anna-Lucia Buer et al. (under review): Farming potential of the blue mussel (Mytilus spp.) along a salinity gradient. Frontiers in Marine Science.

ABOUT BONUS OPTIMUS: OPTIMIZATION OF MUSSEL MITIGATION CULTURES FOR FISH FEED IN THE BALTIC SEA

The BONUS OPTIMUS project aims to provide robust evidence-based documentation (ecological, social, and economic) on optimized use of farmed mussel. The mussels are used as a mitigation tool for eutrophication that in turn can be a sustainable protein-rich feedstuff for fish. The project has partners from Denmark, Germany, Poland and Sweden and is supported financially by the BONUS programme and national funds. The project runs from 2017 to 2020.

Contact:
Project coordinator Jens Kjerulf Petersen
jekjp@aqua.dtu.dk

www.bonus-optimus.eu

Layout: V. Gasiunaite/EUCC-D

MUSSEL FARMING IN THE LOW SALINITIES OF THE BALTIC SEA

Mussel aquaculture is considered extensive, sustainable and to have low environmental impact. Mussels provide a source of high-quality protein and even serve as a measure to reduce eutrophication. This is especially interesting with respect to the European Water Framework Directive and within the highly eutrophied Baltic Sea.

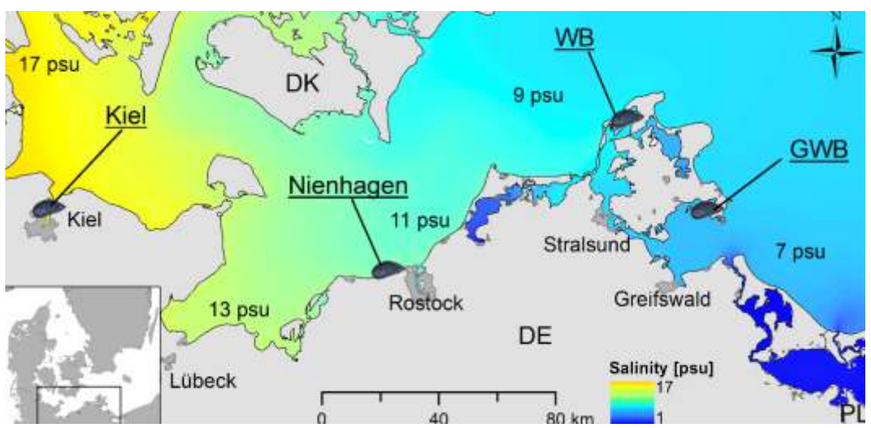
To expand mussel aquaculture in the Baltic Sea, where water usages are manifold and coastal areas are under great spatial pressure, new sites have to be identified.

Across the Baltic Sea, there is a natural salinity gradient shaped by the inflow of the North Sea. Salinity decreases from south-west to north-east and from 28 psu in the Kattegat down to 3 psu in the Bothnian Bay. The common blue mussel is widely distributed across the Baltic Sea, with the natural settlement of young mussels introduced by mussel larvae, occurring in most areas.

Whether mussel farming can be profitable in low salinities, where blue mussels are known to grow slower than in more saline waters, is still under investigation and depends not only on mussel growth rates but also on usage of the harvested mussel yield. Nevertheless, for a first step, to estimate the production potential of blue mussel farms in the Baltic Sea, growth rates under different salinity regimes are essential.

STUDY SITES WITH LOW SALINITIES

Mussel growth at four study sites, under different salinity conditions, were observed (2011-2019) and results fed into a growth model (Dynamic Energy Budget, DEB) to predict mussel growth and yields for a broad area. The German coastline, with a salinity gradient from 7 to 17 psu, was chosen as a representative area.



Case study sites and salinities along the German Baltic coast