An accelerometer-based monitoring system for mussel aquaculture off the Belgian coast

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The demand for seafood has increased in recent years, leading to growth in the aquaculture industry, particularly in the cultivation of mussels (FAO, 2018). Mussel aquaculture has the potential to address the challenge of providing food for the current and future global population in a manner that is both efficient and sustainable (Suplicy, 2020). Moreover, mussel aquaculture systems have been used to develop subtidal mussel reefs (Goedefroo *et al.*, 2022), a nature based solution with potential impacts on sand erosion in coastal environments.

Mussel farms are typically located in coastal areas, where mussels are grown by suspending them on ropes in sheltered waters or other hanging structures in the water column, which helps prevent them from touching the seabed (Tamburini *et al.*, 2020). The implementation of an in situ and low-cost monitoring system is key for supporting farmers to keep track of mussel populations and ensuring that mussels are healthy and growing properly (Massarelli *et al.*, 2021). To do so, accelerometers might enable the monitoring of the health and yield of mussel farms at relatively low cost (Ahmmed *et al.*, 2021). By attaching accelerometers to the hanging structures that hold the mussels, it is possible to gather data on the movement of the structures and potentially on the growth or amount of mussels (Stevens *et al.*, 2007). This information can be used to optimize the farm's production and ensure the sustainability of the mussels and provide information on the yield loss due to storms or extreme events.

In this poster, we will present a case study of a mussel line setup that has implemented accelerometer on its dropper lines within the Coastbusters 2.0 project (Semeraro *et al.*, 2022). The aquaculture setup is composed of several long lines with the aim of creating a mussel reef on the seafloor at two different sites off the coast of De Panne, in the Southeastern Belgian coast. The low-cost accelerometers used in the study are highly sensitive and can detect even the smallest movements of the dropper lines due to hydraulic loads (i.e. tide, current, waves).

The data collected by the accelerometers was consistent with other measures of mussel growth and productivity (e.g. through standard weighting of the dropper lines during seasonal monitoring campaigns), and the use of accelerometers was found to be a reliable and cost-effective way to track the performance of mussel farming operations. By monitoring the mussels' lines movement, the farmers can quickly detect and timely respond to any issues that may arise. Based on the lessons learned from a long-term monitoring, the accelerometers might also indicate the optimal time for harvesting or indicate loss of biomass from the mussel lines to the seabed after a storm event.

We conclude that the implementation of accelerometer monitoring on mussel farm is a powerful tool for improving the health and growth of the mussels. The innovative monitoring technique and results discussed will be valuable for mussel farmers and researchers looking to improve the performance and sustainability of their mussel aquaculture. However, this pilot study showed the application of using a mussel longline technique to provide protective natural barriers against erosion and strong storms.

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Keywords
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