

Plankton analysis using the PAMAS S4031 GO

The Norwegian Institute of Marine Research IMR in Bergen has been successfully using the PAMAS S4031 GO portable particle counter since 2010 for scientific research and for the exploration of marine biology. The institute investigates the dietary conditions of the blue mussel (*Mytilus Edulis*) which eats particulate plankton. They use their gills to filter the plankton from the water.

In a first study in 2012, plankton was analysed in the seawater in the east of Stavanger, in the Norwegian Lysefjord. At this place, blue mussels are cultivated in coastal aquacultures. The objective of the studies was to explore the energy supply of the blue mussel and to track down potential factors involved in dietary variations. For this purpose, the plankton population and the blue mussel's retention efficiency of blue mussel were analysed at two measuring points.

From May until August 2010, about 40 blue mussels were fixed with the aid of lantern nets in 7 metres sea depth at the measuring points. Water samples were taken from the very same depth where the mussels laid. The plankton particles in the seawater were counted with the PAMAS S4031 GO particle counter.



The blue mussel (*Mytilus Edulis*)
(Picture: Stock-Exchange)

The research team started with the water samples and measured the particle quantity and the particle size distribution within the range of 1 to 35 μm . Due to its freely adjustable size channels, the PAMAS S4031 GO is able to subdivide this measuring range very specifically.

Through seawater analysis via particle counting, seasonal variations of the plankton concentration could be detected in the period from May to August 2010. The marine biologists proved with this analysis that the plankton population increases and that the size distribution changes with the rise of the water temperature from 8° C to 16° C during the period of analysis.

Beside the plankton population in seawater, the marine research team also analysed the blue mussel's retention efficiency. For this purpose, 20 mussels were taken out of the net for a defined period of time and put into feeding chambers. The mussel's retention capacity was determined with the flow-through method, i.e. the plankton population at the feeding chamber entrance was compared with the particle concentration at the exit of the chamber.

Through the analysis of the mussel's retention efficiency, the marine biologists came to the following realizations: In May and June, the mussels mainly ate larger plankton particles in the

range of 20 to 35 μm . The seawater analysis had shown a well-balanced particle size distribution for this period of early summer. In late July and August however, the mussels filtered smaller plankton particles of 6 to 16 μm out of the seawater. For the late summer period, the particle counter had detected an increased plankton concentration of smaller particle sizes in the seawater. In a second study in 2015, the IMR used the PAMAS S4031 GO to successfully prove that controlled upwelling of nutrient deep water into upper, oligotrophic seawater levels has a significant impact on mussel production, since the plankton biomass can be largely increased by upwelling. As a consequence, the yield of the mussel production can be tripled through upwelling.

Conclusion

With the aid of the PAMAS S4031 GO particle counter, the Norwegian Institute of Marine Research could gain new knowledge in the field of marine biology. The measuring results gave evidence on the fact that the mussel's diet is subject to variations. Furthermore, the study proved that the energy supply of blue mussels cannot be regarded as pure mechanical filtration process. The blue mussel however adapts its diet to the existing plankton population in the environmental seawater level.

The PAMAS S4031 GO portable particle counter has been tried and tested for scientific research and proved to be a precise and reliable measuring instrument. Due to its 32 free selectable size channels, the particle counter enabled a very differentiated particle size analysis in low micron range.

New staff members

At the beginning of 2018, we welcomed two new colleagues at PAMAS headquarters in Rutesheim. Enzo Caradonna was employed in January 2018. He is responsible for supply management and stock control. The software engineer Nitin Narayan Nair joined the PAMAS R&D department in February 2018. The picture also shows Martin Fischer who has been working in the PAMAS manufacturing department since January 2014.



From left to right: Nitin Narayan Nair, Enzo Caradonna and Martin Fischer
(Picture: PAMAS)

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