



Grieg Seafood Shetland

CASE STUDY

FlowCam Assists Harmful Algal Bloom Mitigation in Salmon Aquaculture

In 2016, 23 million salmon died from a harmful algal bloom (HAB) at a farm in Chile. The economic cost of that die-off is estimated to have been \$800 million.

The impact of such mortality events is serious. Grieg Seafood is employing cutting-edge technology to expand monitoring, stay ahead of HABs, and keep their fish stocks healthy.

THE CLIENT

Grieg Seafood ASA is one of the world's leading fish farming companies, specializing in Atlantic salmon. They have farming facilities in Norway, British Columbia in Canada and the Shetland Islands in the UK.

THE CHALLENGE

Historically, Grieg has used manual microscopy to identify and count algae to determine if there was a need to employ mitigation strategies. On any given day, there could be upwards of 100 species of algae, and using manual microscopy can be like trying to find a needle in a haystack. The quality of data is not consistent with this manual process that is also prone to error.

"HABs move quickly," says Dean Tretheway, Seawater Production Director at Grieg Seafood, "the ocean is an ever-changing environment; for us it's not a matter of if we see HABs, but when. As climate change identifies increasing algae species, we need to adapt to this new environment more quickly."



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CASE STUDY CONTINUED ON REVERSE

CREATING A STANDARDIZED APPROACH

Rhanna Turberville is the Water Quality Technician at Grieg Seafood's Shetland, Scotland location. She's involved in the monitoring of between 12 -14 active sea sites around the island of Shetland. Every day water samples are collected from each location: 10 meter long water-column samples, discrete samples from different depths, and sometimes a tow sample. Everyday the water quality lab analyzes at least 12 water samples for algae counts. Within a few hours they have real-time feedback to the sea sites.

There are approximately 15 species of algae that are harmful to salmon in Shetland, and harmful at different concentrations. When Grieg first purchased the FlowCam, an imaging flow cytometer, for the Shetland facility, they wanted to develop an early warning system for staff to study water quality and improve their ability to monitor and mitigate harmful algae populations

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—Rhanna Turberville, Water Quality Technician

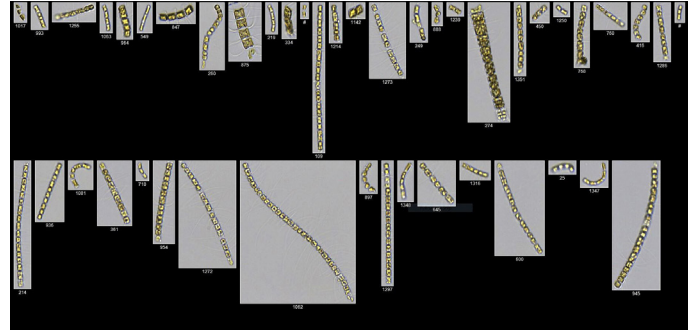
before they bloom. To execute this plan, they needed to collect huge amounts of field data and information.

"We've been building a big database with the FlowCam because we process so many samples and produce so much data," says Turberville. "All the daily samples go into the database, including weather and oxygen

levels. This makes it easier to track patterns."

"With over a year of daily data samples, we have a full picture of population trends to help with forecasting. We can anticipate and predict blooms with confidence. Now that the spring bloom is approaching, we can compare populations to the same time last year and make better forecasts," says Turberville.

The early warning system Grieg had envisioned is well-developed and provides staff with reliable data that can be compared to the same period last year. They have been able to develop a traffic light system (green, yellow, red) based on the abundance and severity of different plankton species. This removes the subjective component from the decision process and provides more confidence behind the feed/no feed decisions.



PICTURED ABOVE: Chaetoceros cells as imaged by the FlowCam

BENEFITS OF A SHARED RESOURCE

Beyond the quality assurance program that provides more accuracy in the identification and enumeration of algae, Grieg has also begun sharing library files of algae from different locations. This has been extremely helpful in training their global staff to recognize potentially new harmful algae that may be unfamiliar to a particular region. Turberville states that sharing library files has shortened the learning curve with training staff in the recognition and identification of algae.

Overall, the Grieg has been able to reduce fish mortality, proactively monitor their fish pens and water quality and reduce the effect of HABs on the health of their fish stocks by incorporating the FlowCam into their daily processes.