FlowCam®

FlowCam Assists Harmful Algae Mitigation in Salmon Aquaculture

THE CUSTOMER

In 2016, 23 million salmon died from a harmful algal bloom (HAB) at an aquaculture farm off the coast of Chile. The economic cost of that die-off is estimated to have been $800 million. The impact of such mortality events is serious: in order to avoid potential disasters of this kind, it is crucial to monitor harmful algae so that management decisions can be made quickly and confidently.

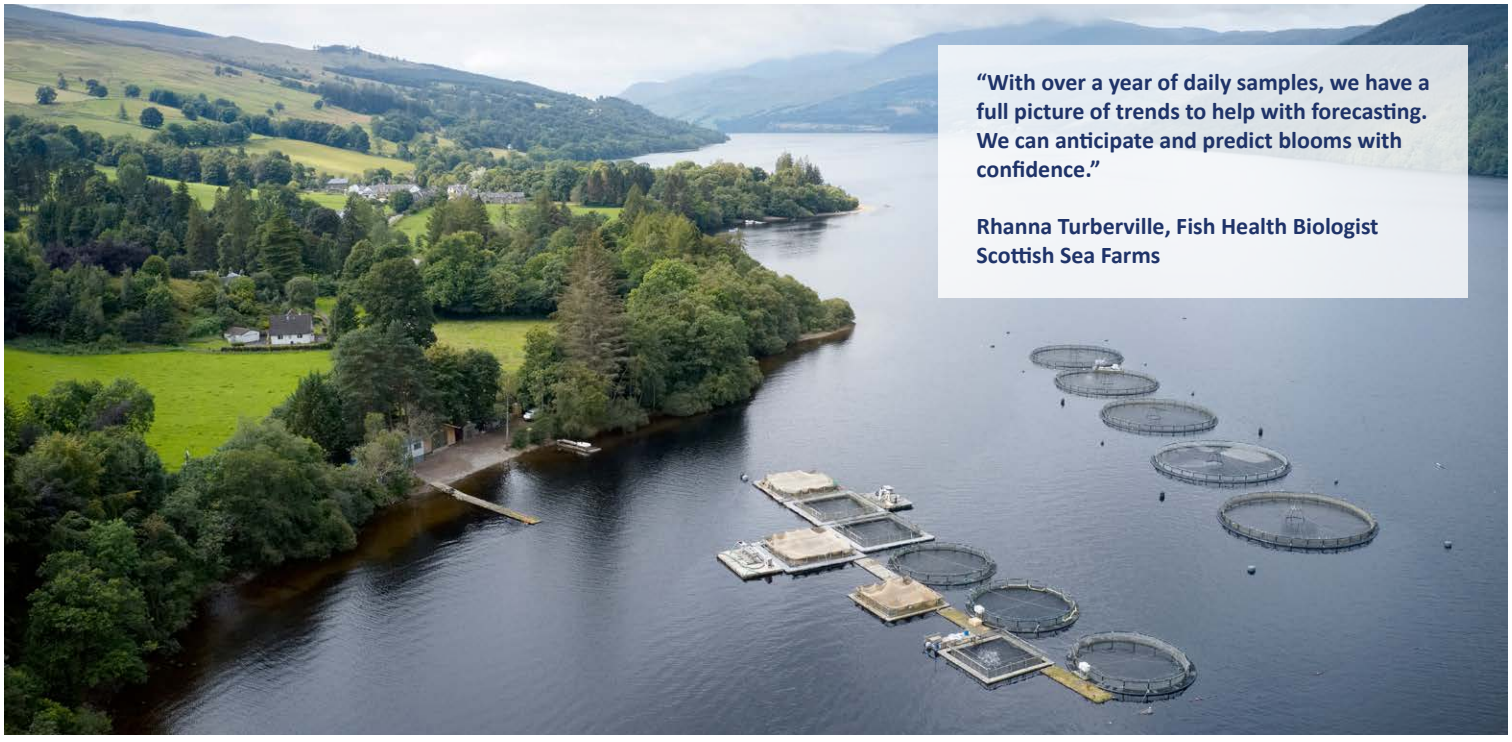
Aquaculture companies around the world grapple with HABs, not just in Chile. Countries like Canada, Norway, and Scotland are also hubs for aquaculture. Grieg Seafood and Scottish Sea Farms operate in these countries and specialize in Atlantic salmon. Grieg used to own farms in all three of these locations, but when they decided to concentrate their operations in Canada & Norway, Scottish Sea Farms purchased Grieg's Shetland sites. Today, FlowCam instruments are used by both companies to monitor harmful algae.

Historically, Grieg Seafood had 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 could be like trying to find a needle in a haystack. The quality of data was not consistent and was prone to error.

"HABs move quickly," said Dean Tretheway, Seawater Production Director at Grieg. "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."

CREATING A STANDARDIZED APPROACH

There are approximately 15 species of algae that are harmful to salmon in Scotland at different concentrations. When the team at Grieg first added FlowCam to their lab at the Shetland facility (now operated by Scottish Sea Farms), 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 before they bloom. To execute this plan, they needed to collect huge amounts of field data and information.



"With over a year of daily samples, we have a full picture of trends to help with forecasting. We can anticipate and predict blooms with confidence."

Rhanna Turberville, Fish Health Biologist
Scottish Sea Farms

"We've been building a big database with FlowCam because we process so many samples and produce so much data," said Rhanna Turberville, a Fish Health Biologist at Scottish Sea Farms. "All the daily samples go into the database, including weather and oxygen levels. This makes it easier to track patterns."

Turberville is involved in the monitoring of 12 to 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. Every day the water quality lab analyzes at least 12 water samples for algae counts. Within a few hours they have real-time feedback to send to the sea sites.

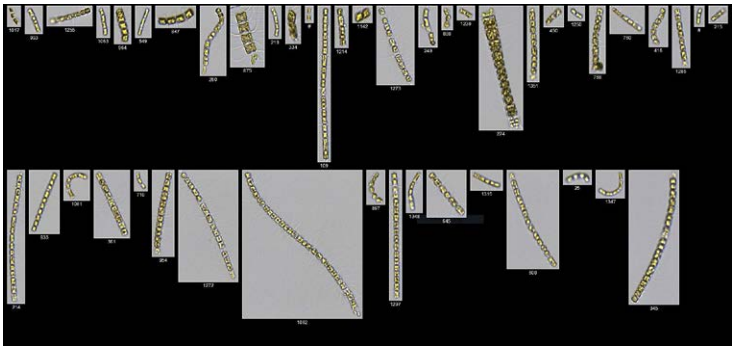
"With over a year of daily data samples, we have a full picture of population trends to help with forecasting. We can anticipate and predict blooms with confidence. Now that the spring bloom is approaching, we can compare populations to the same time last year and make better forecasts," said Turberville.

The early warning system Grieg first envisioned has been well-developed by Scottish Sea Farms and provides staff with reliable data that can be compared to the same period during previous years. They have been able to develop a traffic light system (green, yellow, red) based on the abundance and severity of different plankton taxa. This removes the subjective component from the decision-making process and provides more confidence behind the feed/no feed decisions.

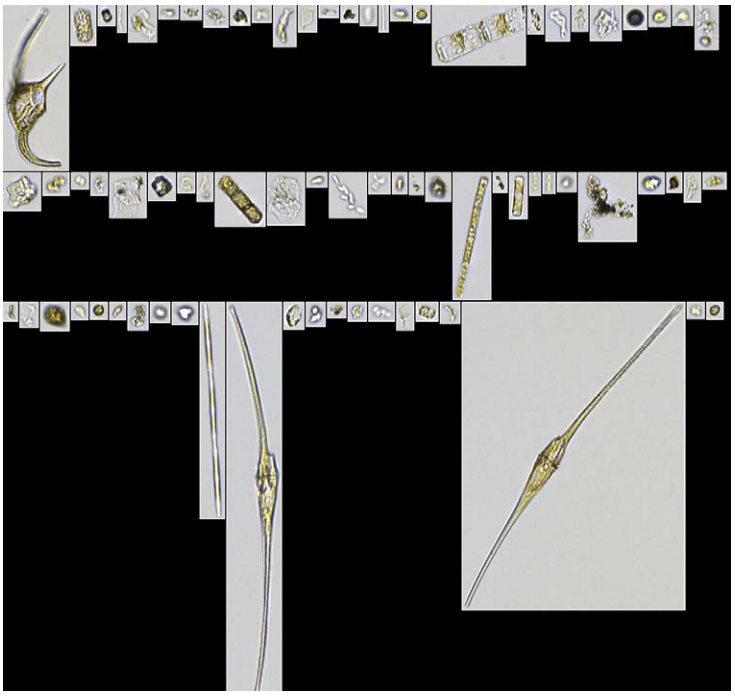
BENEFITS OF A SHARED RESOURCE

Beyond the quality assurance program that provides more accuracy in the identification and enumeration of algae, Scottish Sea Farms has also begun sharing FlowCam algae libraries between locations. This has been extremely helpful in training their staff to recognize potentially new harmful algae.

Turberville states that sharing libraries has shortened the learning curve for training staff to recognize and identify algae. Overall, Scottish Sea Farms 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 FlowCam into their daily processes.



Chaetoceros, a diatom that can irritate fish gills, as imaged by FlowCam



A sample from a salmon farm site showing harmful algal groups like *Ceratium* and *Pseudonichitzia*