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# Can environmental DNA transform seabed monitoring in Scottish salmon farms?

15 October 2024

**By Responsible Seafood Advocate**

## New environmental DNA method offers faster, cheaper seabed health monitoring, potentially transforming how salmon farms and regulators assess ecological impact

A new environmental DNA (eDNA) approach for monitoring seabed conditions around marine fish farms could transform how salmon producers and the Scottish Environment Protection Agency (SEPA) assess ecological impact.

Traditionally, such monitoring involves days of sorting through samples to identify tiny seabed animals that indicate seabed health – a slow and costly process that could take up to three days per sample and cost the industry around £1 million (U.S. $1.3 million) each year. However, a faster and more cost-effective method is now available, using DNA techniques originally developed for human forensics to identify the organisms in sediment samples.

“At the moment, we sample the seabed followed by sieving and sorting sediment to identify species, but it is a time-consuming, labor-intensive process that hasn’t been updated for 30 years or so,” said

A new environmental DNA (eDNA) approach for monitoring seabed conditions around marine fish farms could transform how salmon producers and regulators assess ecological impact. Photo courtesy of SAIC.

Stephen Macintyre, head of environment at Mowi Scotland."The DNA-based approach will enable us to understand our environmental performance much quicker, almost in real-time, and take action where required to improve the environmental picture."

Using this approach, Scientists apply metabarcoding, a process that compares DNA from the samples with a sequence database, allowing them to identify thousands of bacterial species at once. After gathering a sample, the bacteria in the sediment are analyzed using DNA, and a machine-learning model predicts the health of the invertebrate community based on the bacteria. The health of this community is then classified using the Infaunal Quality Index (IQI), a well-established ecological benchmark.

“Environmental DNA is already widely used elsewhere for nature-based assessments and also has the potential to be applied to assess the wider marine biodiversity that exists around our fish farms,” said Macintyre. “The practical outputs from this project are very promising, and we are now in talks with SEPA about integrating DNA-based compliance assessments into our site monitoring program.”

Following an extensive six-year project, samples analyzed using the new method are now being presented to SEPA for validation, with an open-source toolkit and standard operating procedures also being created for anyone in the sector to use.

The research was supported by the Sustainable Aquaculture Innovation Centre (SAIC), Institute of Biodiversity and Freshwater Conservation at UHI Inverness, Mowi (Scotland), SEPA, University of Kaiserslautern in Germany, Scottish Sea Farms, Salmon Scotland and lead research partner, the Scottish Association for Marine Science (SAMS).

“This project has been years in the making and it is great to see the results of a long-term collaboration between the sector, academia and regulators having the potential to transform a key aspect of aquaculture monitoring,” said Sarah Riddle, director of innovation and engagement at SAIC. “E-DNA sampling could provide widespread benefits to both the aquaculture sector and its regulators, with potential for this approach to be adopted across the global by seafood-producing nations. Armed with data, producers can be better informed to make decisions around key environmental and fish health factors influenced by the seabed.”

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