BactMetBar

Environmental DNA metabarcoding will revolutionise the monitoring of aquaculture-related change.

Environmental DNA (eDNA) is DNA present in environmental samples such as sediment. eDNA can be extracted, sequenced and, by comparison to databases, those sequences can be linked to taxa.

Recent changes in the way that aquaculture compliance is assessed means that farmers are now required to analyze six times as many sediment samples compared to the previous system. This increase will put considerable pressure on existing services and incur a considerable cost on the industry. eDNA offers an alternative to time-consuming, expensive traditional macrobenthic analyses in the characterization of sediments, that is quicker and more cost-effective.

We are working, with industry and regulators, to find the best way to use eDNA to replicate the results from traditional (macrobenthic) sampling. We are using machine learning algorithms to find bacterial patterns, identified via eDNA, that most closely and reliably predict macrobenthic metrics (such as the infaunal quality index).

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We are sequencing sub-samples from sediment grabs that are subsequently assessed in the traditional way, thus building a library of eDNA-results with corresponding macrobenthic data *(Figure 1)*. This library is the basis for training the machine *(Figure 2)*.

Our goal is to augment and, ultimately, replace macrobenthic assessments with those based on eDNA and to make the necessary code available for use across the aquaculture sector.
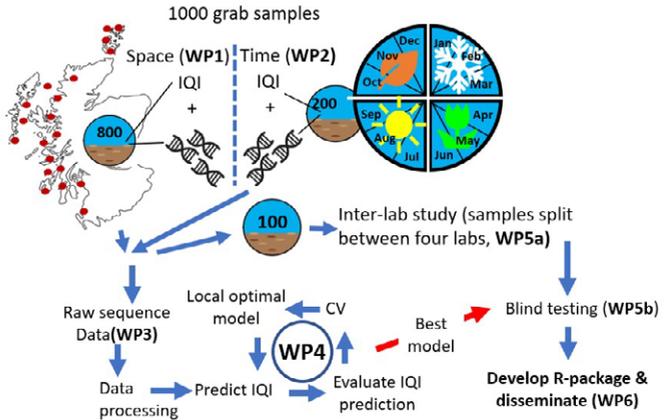

Figure 1

Summary of work-flow. We are sequencing 1000 samples, across both space and time, and linking the eDNA-bacterial patterns to traditional metrics of change (Figure 2).

Figure 2

We take sediment sub-samples from grabs taken around fish-cages and extract and sequence the eDNA. We are using machine to learn how best to link patterns observed in bacterial eDNA with the corresponding biotic indices and will then apply this pattern-matching algorithm to new samples, predicting their biological status.
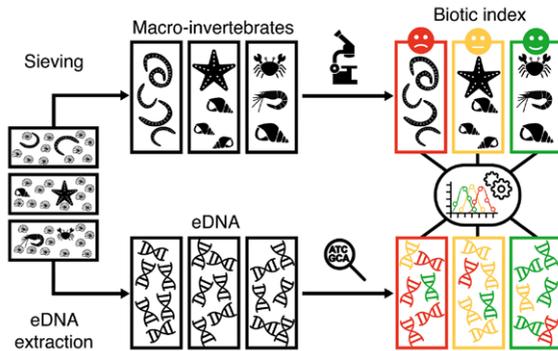
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