



Conference Abstract

Autonomous in situ sampling and analysis of eDNA using an Environmental Sample Processor (ESP)

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Abstract

Monitoring of marine offshore biodiversity is expensive and has traditionally relied on invasive techniques like net fishing or direct observations that can only be conducted in calm seas by experts. Analysis of environmental DNA (eDNA) is a non-invasive method and can easily be collected from sea water by water filtration followed by DNA extraction. Due to the fast degradation time in sea water it is considered a good proxy for present living biodiversity. It allows direct identification of species based on their unique DNA sequence and is cheaper compared to traditional methods, which often are carried out from dedicated fishing or research vessels. However, while eDNA collection may reduce operational cost of offshore sampling, it still relies on boat time. Thus, traditional eDNA sampling still presents substantial costs for offshore biodiversity monitoring. This may reduce the number of samples that can be collected and analysed, limiting the sampling to single 'time shots', which may not give an adequate picture of the present biodiversity.

The 2nd generation Environmental Sample Processor (2G-ESP) is an autonomous sampler/analyser of eDNA. It can collect, extract and analyse eDNA samples in situ using quantitative PCR (qPCR) or store filters for subsequent laboratory analysis after deployment. The instrument can be deployed directly on the seabed or in pelagic configuration where it can operate for several months depending on power supply and power consumption, while it is controlled by, and sends back results to scientists on land. These unique features make the 2G-ESP an interesting candidate for offshore monitoring of marine biodiversity, as well as a potential early warning/detection system e.g. for

invasive species. Moreover, the possibility to preserve filters aboard makes it possible to investigate temporal changes of full biological communities by applying metabarcoding techniques on the collected samples.

Here we present the major results of three years of work testing the potential use of a second generation Environmental Sample Processor (2G-ESP) for marine monitoring. These include both practical and analytical issues that we have encountered along the way, as well as results on target species detection and temporal analysis using qPCR and metabarcoding methods.

Keywords

autonomous sampling, in situ analysis, ESP, qPCR, metabarcoding

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