

Catch me if you can -
Sampling approaches for time integrated monitoring of priority substances and their related effects in marine water bodies using passive and active samplers

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The continuous and still growing anthropogenic impact on marine ecosystems recently results in a rising number of international frameworks and new legislative requirements, which demand the monitoring of a wide range of both priority and new substances of concern released into the aquatic environment.

However, surveillance of these compounds in the open ocean by classical grab sampling is costly and difficult to realise within close time intervals. In consequence, such approaches usually lead to meagre sampling frequencies and provide low resolution data sets. Additionally, pollutant concentrations in seawater are often too low to be detected in grab samples without time-consuming and labour-intensive enrichment techniques.

As an alternative marine biota such as mussels, which continuously concentrate waterborne pollutants in their tissues, can be used as natural active collectors ('active samplers'). Furthermore, mussels can be used to gain additional information on bio-molecular effects caused by the given contamination situation. As living organisms, however, mussels can vary in size, growth and resistance against environmental influences like salinity and temperature and the enrichment processes for the pollutants can show a high variability. Therefore the reliability and reproducibility of gained data is sometimes uncertain or require the measurement of further integrative physiological parameter like condition index or energy balances. In contrast, artificial passive sampling devices made of e.g. silicone or low-density polyethylene mimic the active sampling through diffusion processes without the difficulties of natural variability. Both sampling strategies are highly cost effective and provide data of time-weighted average concentrations over the deployment period.

In order to establish these sampling strategies into routine monitoring programs they have to be tested and validated under real environmental conditions within the area of their future application. In a joint research project of the Federal Maritime and Hydrographic Agency of Germany (BSH), the Helmholtz-Zentrum Geesthacht, Zentrum für Material- und Küstenforschung, Institute of Coastal Research (HZG) and the Center for Scientific Diving of

the Alfred Wegener Institute for Polar and Marine Research (AWI) a variety of passive sampler devices as well as blue mussels (*Mytilus edulis*) are time-synchronously deployed at the COSYNA/MarGate underwater experimental field near Helgoland. The deployment in this new underwater facility provides an ideal framework for a diver supported sampling approach to test active and passive sampling devices 50 km off the main coast under high sea conditions. Target compounds of the study are organic pollutants (HCH, PCB, PAH, DDX, HCB, pesticides and pharmaceuticals), heavy metals and element species as well as bio-markers. During deployment and retrieval grab samples of the water are taken to compare the results of time-integrated sampling and spot sampling. This contribution provides an overview of the developed infrastructure as well as the projected analytical parameters and will also give some first results. Practical consequences for maintaining passive and active sampler in the field will be shown.