

Monitoring of microplastics in port sediments. Evaluation of different analytical methods.

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Introduction: Pollution of the marine environment by microplastics is an emerging issue in the field of dredging. The development of monitoring of microplastics in the marine environment and in particular in sediments is recommended at national level, via the zero plastic waste at sea roadmap, at European level, via several measures of the Marine Strategy Framework Directive (MSFD), and at the international level via the various recommendations of the regional seas conventions.

The OSPAR convention is working in particular on the development of a microplastics indicator in sediments. In this context, a sampling and analysis protocol should be recommended by this agreement. Cerema is in charge of the technical management of the national maritime port surveillance network (REPOM). The purpose of this network is to monitor the quality of port sediments by relying on the services responsible for policing coastal waters.

In order to acquire data on the contamination of port sediments by microplastics, specific monitoring was initiated in 2021 at the ports of Brest and Douarnenez. In 2022, 15 additional ports, spread over several seaboard, were monitored.

Different analysis methods were tested in conjunction with Cedre, IFPEN and the Laboceia laboratory. The results of this test phase will make it possible to decide whether or not to generalize the monitoring of microplastics to all REPOM points.

Methods: Sampling is carried out by the Water Police services of each department. The sampling plan for REPOM points should not change from year to year in order to maintain some continuity in the data series. The same is true for the analysis of microplastics, the concentrations of which can thus be compared with those of other contaminants, in particular phthalates. Currently there is no standard for the analysis of microplastics in sediments. As part of the 2021 and 2022 test campaigns, several methods were tested in order to identify the method best suited to REPOM's needs:

- visual analysis
- Fourier Transform Infrared (FTIR)

- pyrolysis via IFPEN's Rock-Eval process
- pyrolysis coupled with gas chromatography and mass spectrometry (Pyr-GC/MS)

Results: The first results received concern the FTIR analyses. There is a marked disparity in the results. The contents vary between 470 MP/kg and nearly 35,000 MP/kg.

An important variability is also observed within the same port depending on the sampled points. The median of the values is 8,300 MP/kg for a standard deviation of more than 10,000 MP/kg. The most frequently identified polymers are polyethylene (23%), polypropylene (20%) and finally the polyethylene-propylene copolymer (12%).

The particles are mainly of size less than 500 µm. According to the first visual analyses, the microplastics found in the port sediments are mainly composed of fragments of hard plastic (45-80%) and synthetic fibers (15-60%).

Pyrolysis analyzes are in progress. Difficulties were encountered due to the high load of organic matter in the port sediments. Thus, the extraction method must be subject to adaptations.

Discussion: Currently there is no standard for the analysis of microplastics in sediments.

As part of the 2021 and 2022 test campaigns, several analysis methods were tested in order to identify the most suitable method for generalizing this monitoring via the REPOM. Several criteria will thus be evaluated: results obtained, speed of analysis, and cost.

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