

BASEMAN

Defining the baselines and standards for microplastics analyses in European waters



BASEMAN
MICROPLASTICS ANALYSES
IN EUROPEAN WATERS

Project acronym: BASEMAN

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Work package 1: Defining baselines for all relevant identification approaches

The MP reference kit was delivered (UBAY) and used to spike the ring trial samples (AWI, IMR, ICBM). Weathering of the kit was carried out under simulated marine and shoreline conditions. The influence of weathering was analytically monitored and demonstrated strong chemical and physical changes (UDC). Multi-spectroscopic databases for Fourier Transform infrared (FTIR) and Raman microscopy were generated and published (AWI)^{1, 2}. The strength and limitations of different analytical techniques were investigated individually for pyrolysis-gas chromatography/mass spectrometry (py-GC/MS, ICBM)³, py-GC/MS with Orbitrap⁴ (IMR) and FTIR imaging (AWI)⁵. Further, py-GC/MS was compared with attenuated reflectance transmission (ATR)-FTIR microscopy (ICBM⁶) and FTIR imaging with automated Raman microscopy (AWI)².

Work package 2: Preparation of standardized test samples for inter-lab comparisons

For interlab comparison three different sample matrices were spiked with the reference kit of WP1. For biota (IMR) three tissue types (i.e. wild haddock intestine, farmed salmon intestine and farmed blue mussel soft parts) were parted into subsamples and spiked with or without the reference kit. Samples were sent to 16 partner laboratories. Plankton samples (AWI) were taken with an 80 µm net from two different stations (Helgoland Roads and close to the river Elbe) during two different plankton blooms (spring bloom and summer bloom). From these two sets four samples each (spiked and non-spiked) were delivered to 12 partner laboratories. In total three types of spiked and non-spiked sediment (two from the Wadden Sea and Pleistocene sand) samples (ICBM) were delivered to 14 partners.

Work package 3: Inter-lab and inter-method comparisons. Defining baselines for all relevant identification approaches

The interlab comparison started and of 16 partners for the biota samples 3 partners finished their analysis while residual 13 partners are in progress. Of the plankton samples results of 4 partners were received while 8 partners are in progress. In the case of the sediments sample results of 4 partners were received while 10 partners are still in progress. The final results will be collected and the different extraction and analytical methods evaluated for their performance to extract microplastics from the samples and the outcome published.

Further, in the scope of this project several extraction methods were developed and/or optimized for the separation of microplastics from different aquatic environments and biota. These included small scale sediment separator based on density separation (ICBM, AWI, IVL, UBAY) and flotation (NIVA).

Different extraction methods were investigated of which the use of alkaline digestion (biota) enzymatic digestion (sediments, plankton, biota)⁷, wet oxidation (Arctic Sea Ice)⁸ and Fenton's reagent (sediments⁹ and others) were applied and evaluated¹⁰ by several project partners (AWI, UBAY, NIVA)⁷⁻¹². To reduce contamination risks and allow an easier handling a "purification reactor" was developed (AWI).

Work package 4: Sampling methodologies for MICROPLASTICS in the marine environment: standardization, suitability and intercomparison

For this task, two cruises were conducted, in Galway Bay (Ireland, GMIT) and in Rias de Vigo (Spain, IEO). Both cruises intended to collect environmental samples of benthic sediments and water samples from surface and water column. Samples collected in both cruises were aimed to be processed under the same conditions by the different laboratories involved (GMIT, IEO, NOVA-ID, OGS, IMMM, IPMA, AWI, SAHFOS, CNR-IAMAC and ICBM) in order to estimate the associated errors of microplastic counting and identification. Several publications based on these combined efforts and joined cruises were already published¹³⁻¹⁹ or are in the final steps of submission or preparation.

Two whitepapers “Standardization protocols for monitoring microplastics in sediments” and “Standardization protocols for monitoring microplastics in surface waters” (lead GMIT and IEO together with other partners) were already published and one in collaboration with the project EPHEMARE “Standardization protocols for and using biota to monitor microplastics” will be published soon.

A workshop in Portugal was organized, focusing on reaching consensus within the marine anthropogenic litter and microplastic pollution research to inform policy makers and relevant stakeholders (FCT-Nova).

Work package 5: Coordination, Integration and Synthesis:

The critical synthesis of analytical and sampling approaches and the subsequent recommendations for MP sampling and analysis are still ongoing and will be announced on the project homepage (<http://jpi-oceans.eu/baseman/main-page>) and the project side on ResearchGate (<https://www.researchgate.net/project/BASEMAN-Defining-the-baselines-and-standards-for-microplastics-analyses-in-European-waters>)

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NORCE Norwegian Research Centre AS