Significant progress in the first year of PlastTrack

For the PlastTrack project, it is crucial to clearly understand our current standing and the value we can bring to ongoing research around plastic pollution. We know it is a growing issue, and micro- and nanoplastics have not been investigated thoroughly. Around 70% of the marine litter in the Baltic Sea is plastic, where microplastics were found in up to 28% of all sampled fish. Research efforts have aimed to track the fate of plastics, but there is still a need for more knowledge about their sources, degradation rate, and dominant uptake processes.

We have identified methodological gaps in various areas, including detection, toxicity, and standardization of parameters. Clear definitions and detection methods for micro- and nanoplastics are still lacking. There is a need for standardized operating procedures for sampling these particles, including pretreatment, extraction, and concentration before detection. It is also crucial to compare these particles with standardized plastic types and sizes, but commercially available options are limited.

Within the PlastTrack project, we are committed to addressing these issues and offering viable solutions.

One ongoing challenge underscoring the urgency and importance of our work is the incomplete understanding of the distribution and pathways of microplastics in ecosystems. Toxicological tests have shown that various organisms, such as fish, crustaceans, nematodes, arthropods, and annelids, can ingest microplastics. Moving forward, our focus will be on the most common types of plastics, as listed in the table below.

Plastics type	Market share (Geyer et al.,2017; PlasticsEurope, 2019)	Main applications (PlasticsEurope 2019)
PE	31% (30%)	Building and construction, consumer goods, fibers and textiles, packaging
PP	18% (19%)	Automotive parts, building and construction, consumer goods, fibers and textiles, medical products, packaging
PVC	10% (10%)	Automotive parts, building and construction, consumer goods, fibers and textiles, medical products, packaging
PET	9% (8%)	Packaging
PUR	7% (8%)	Automotive parts, building and construction, consumer goods
PS/EPS	6% (6%)	Automotive parts, building and construction, consumer goods, packaging
Other	19% (19%)	—

TABLE 1. Global and European market share and applications of major types of plastic.

We have utilized Raman spectroscopy and Fourier-transform infrared spectroscopy (FTIR) to gather the chemical fingerprints of each type of plastic. These methods provide detailed molecular-level information for identifying and characterizing different plastic materials. We are developing a dashboard that will serve as a central reference for all this information.

Our quality assurance procedures for sampling micro- and nanoplastics (MNP) are evolving based on practical experience and best-practice examples from previous studies. This adaptability is essential as we are now dealing with the newly targeted 0.2–15 µm size fraction of MNP. For digesting and separating the 15–300 µm MNP size fraction by density, we will follow established protocols provided by our partner, AWI.

In the PlastTrack project, we have agreed to focus on the size fraction between 200 nm and 15 µm, which aligns with the lower size cutoff of the analytical filters currently under development.

In parallel, new instrumentation is being built to support the chemical analysis of micro- and nanoparticles. We plan to combine several techniques to identify the particles in our Baltic Sea samples not only by their size but also by their chemical composition.

We have finished 2 sampling cruises so far:

January 18–June 18, 2024: Sediment trap deployment (Boknis Eck/Eckernförde Bay)
June 18–21, 2024: Sampling test cruise (Kiel - Sonderborg - Kiel, sampling stations Bülk, Boknis Eck, Schleimünde & Flensburg Fjord)

We plan some longer campaigns for 2025:

Summer 2025: Sampling cruise 'Coasts' (e.g. sampling stations Bülk, Boknis Eck, Schleimünde, Flensburg Fjord, Åbenrå Fjord)
Spring/summer 2025: Sampling campaign 'Schlei'