# Weekly Report 2: North Sea Plastics I

**Stormy seas**

After passage through the Kiel Canal into a calm Elbe estuary, we steamed west past several of our first planned stations. Monday, 05.02, was especially stormy in the southeast North Sea, and we headed to station 4 in the west where seas were calmer. Many of the science crew were at sea for the first time, and had a first experience of seasickness.

**First station**

We arrived at Station 4 off the Dutch island of Terschelling at 8:00 on Tuesday, 06.02. Each station had the sample sampling plan: the "snow catcher" was deployed first. Essentially a large Niskin bottle, the snow catcher collects a large volume of seawater, and then is secure motionless on deck for several hours to allow suspended particles (or "marine snow") to settle out. The overlying water is then filtered and the settled flocs sampled. This was followed by deployment of the CTD-Niskin rosette to collect water samples and measure the salinity and temperature structure of the water column (Fig. 1). In parallel, a team of three scientists deployed Garrett screen samplers from the ship's bow to collect samples from the sea surface microlayer. This typically took 1.5 – 2 hours, but other devices could fortunately be deployed simultaneously to save time. A vertically-towed WP2 net was then deployed three times to collect zooplankton from the entire water column. Water depths were only about 30 m, so each deployment was quick. The WP2 net was followed by surface sediment sampling using a Van Veen grab. This station had sandy sediments with no infauna, so only one sample was collected, and the multi-corer was not deployed. Once the microlayer sampling was completed, we deployed the catamaran net to collect zooplankton and particles floating near the sea surface. The surface

*Figure 1. Preparing the CTD rosette for deployment at the first station.*

*Figure 2. Particles from a catamaran net tow. Th efloating white particles are suspected to be paraffin.*

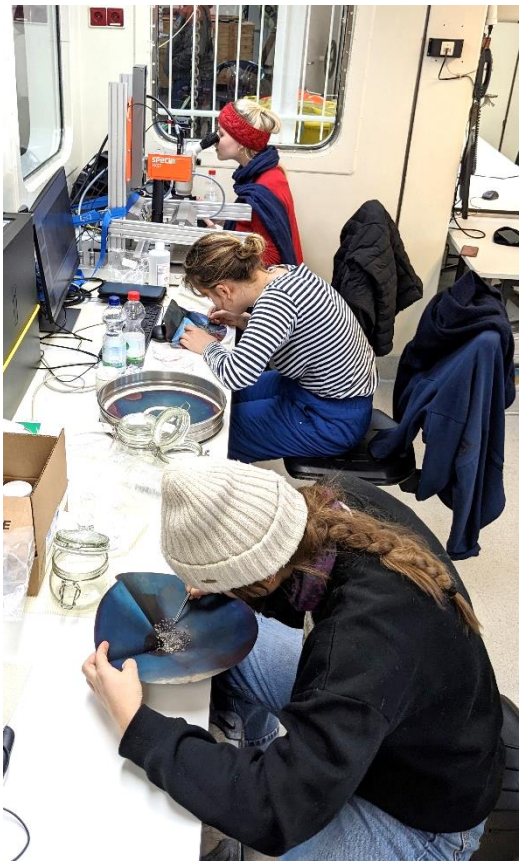

*Figure 3. Processing net tow samples for on-board microplastic analysis.*

net tows collected a large number of floating white particles (Fig. 2), which after some searching in the scientific literature, are suspected to be paraffin (Lorenz et al., 2021, Mar. Poll. Bull., 10.1016/j.marpolbul.2020.111807).

Station 4 was completed after about 5 hours of sampling, and we went to intermediate station 4-int for additional catamaran net tows. These net samples also had a large amount of the suspected paraffin particles. Discharge of paraffin into the ocean appears to be allowed from washing tanks carrying liquid waxes. We were surprised to find such a large amount of this material in the nets.

We then traveled to Station 6 near the Thames river estuary, and arrived on station at 8:00 on Wednesday, 07.02. The sampling sequence was the same as at Station 4, and went smoothly. Surface sediments at this station were coarse sand and shell hash, with no living infauna.

The weather forecast showed worsening weather near the Elbe estuary toward the end of the week. Since sampling the full transect was critical for LABPLAS objectives, we skipped Station 5 and traveled immediately back to Station 1 at the Elbe estuary. Weather conditions were good on the transit, so we were able to conduct several litter spotting surveys. Very few macrolitter objects were seen, only five likely non-natural objects over several hours of survey. After the long transit, we arrived on station at 13:30. The full sampling regime went smoothly. Sediments were again sandy, so no cores could be collected. However, there was abundant infauna so we did numerous grab samples to collect several organisms of the main species (sea urchins, brittle stars, clams, and polychaete worms). After completing the station, we began traveling back to Station 3.

We stopped around 19:00 at Station 1-int to conduct additional catamaran net tows. Only the tows at Station 4 and 4-int found paraffin particles. In the others, we found mostly natural biological materials and a large number of suspected microplastics. Particles were manually picked from the net samples and imaged on board using a near-infrared hyperspectral camera system (Fig. 3). This system allows the particle type to be determined and can identify the polymer type of microplastics.

We arrived at Station 3 early in the morning on 09.02, and waited to start sampling until weather conditions improved at 10:00. Most of the sampling went smoothly, although the WP2 net could only be deployed once due to strong currents. Microlayer sampling with the Garrett screen was also omitted due to large waves. The sediments at this station were fine sands with lots of infauna. Multiple grab samples were conducted to collect the biota, especially a number of large clams.

The forecast showed rapidly worsening conditions in the southeast North Sea over Friday and Saturday, which not only precluded sampling at station 2, but would potentially prevent us from reaching the Kiel Canal in time to return to Kiel. We therefore decided to return one day earlier than planned. After a rough transit through stormy seas, we arrived at the canal entrance on Friday morning, and completed the transit home.

*Figure 4. The scientific party for AL586 during the return transit through the Kiel Canal. (L-R) D. Stoll (GEOMAR), P. Ehrlebracht (U. Hamburg), W. Riom (KU Leuven), A. Meyer (GEOMAR), J. Caldwell (INL), L. Galgani (GEOMAR), B. Raupers (GEOMAR), S. Golde (GEOMAR), A. Beck (GEOMAR), J. Karnatz (GEOMAR), L. Caray-Counil (Sorbonne U.).*

With greetings on behalf of the cruise participants,

*Aaron Beck, GEOMAR Helmholtz Centre for Ocean Research Kiel*

Kiel, Sunday, 12 February 2023